



# COMMONWEALTH of VIRGINIA

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November 13, 2015

Mr. Michael Liberati  
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Wilmington, DE 19805  
**VIA ELECTRONIC MAIL**

**Re: Revised Final RCRA Facility Investigation and Human Health Risk Assessment  
Reports for AOC-4  
Former DuPont Waynesboro Plant, Waynesboro, Virginia  
EPA ID# VAD003114832**

Dear Mr. Liberati:

The Department of Environmental Quality, Office of Remediation Programs (DEQ) received the final revised AOC-4 RCRA Facility Investigation (RFI) Report, dated August 2015, and the revised Human Health Risk Assessment (HHRA), dated October 2015. These documents are associated with the Former DuPont Waynesboro Plant (Facility) located in Waynesboro, Virginia, and the Corrective Action requirements of the Hazardous Waste Management Permit for the facility.

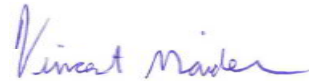
The RFI and HHRA have been reviewed and are hereby approved as part of the facility's Site-Wide Corrective Action with no further comments. The final Ecological Risk Assessment (ERA) associated with the RFI was previously approved by DEQ on July 13, 2015. This concludes the RFI phase for AOC-4. However, additional focused investigation may be warranted as part of the remedy selection process.

At this time the facility should continue with the design and implementation of the approved Phase I Interim Measures Workplan. In addition, please contact me to schedule a meeting focused on the remedy selection process. This meeting is intended to bring all of the key decision makers together to discuss the corrective action objectives, stakeholder concerns, and establish a clear path forward for the project.

EPA ID# VAD003114832, DuPont Waynesboro  
Final RCRA Facility Investigation and Human Health Risk Assessment Reports  
November 13, 2015

If you have any questions, you may contact me at 804-698-4064 or by email at [Vincent.Maiden@deq.virginia.gov](mailto:Vincent.Maiden@deq.virginia.gov).

Sincerely,



Vincent A. Maiden  
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Volume I of III

Human Health Risk Assessment Report  
Area of Concern (AOC) 4  
South River and a Segment of the South  
Fork Shenandoah River, Virginia

Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Date: September 2014  
(Revised July 2015 and October 2015)

Project No.: 60394935 (18986567)



URS Corporation  
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## Acronym List

| Acronym  | Explanation                                      |
|----------|--------------------------------------------------|
| AOC      | Area of Concern                                  |
| BCF      | Bulk Continuous Fiber                            |
| bgs      | Below Ground Surface                             |
| CD       | Consent Decree                                   |
| COPC     | Constituent of Potential Concern                 |
| CSM      | Conceptual Site Model                            |
| DAF      | Dilution and Attenuation Factor                  |
| DDR      | DuPont Data Review                               |
| EPA      | United States Environmental Protection Agency    |
| EPC      | Exposure Point Concentration                     |
| ETT      | Exposure Task Team                               |
| FGCM     | Fine Grained Channel Margin                      |
| HHRA     | Human Health Risk Assessment                     |
| HI       | Hazard Index                                     |
| HQ       | Hazard Quotient                                  |
| IHg      | Inorganic Mercury                                |
| IRIS     | Integrated Risk Information System               |
| MCL      | Federal Maximum Contaminant Level                |
| MeHg     | Methyl Mercury                                   |
| mg/kg    | Milligram per Kilogram                           |
| mg/kg ww | Milligram per Kilogram wet weight                |
| OWPC     | Office of Waste Permitting and Compliance        |
| PHS      | Pump House Sewer                                 |
| RCRA     | Resource Conservation and Recovery Act           |
| RDQA     | Retrospective Data Quality Assessment            |
| RfC      | Reference Concentration                          |
| RfD      | Reference Dose                                   |
| RFI      | RCRA Facility Investigation                      |
| SERCC    | Southeast Regional Climate Center                |
| SL       | Screening Level                                  |
| SRST     | South River Science Team                         |
| SSL      | Soil Screening Level                             |
| SWMU     | Solid Waste Management Unit                      |
| THg      | Total Mercury                                    |
| UCL      | Upper Confidence Limit                           |
| µg/L     | Microgram per Liter                              |
| TMDL     | Total Maximum Daily Load                         |
| URS      | URS Corporation                                  |
| VADEQ    | Virginia Department of Environmental Quality     |
| VDGIF    | Virginia Department of Game and Inland Fisheries |
| VDOH     | Virginia Department of Health                    |
| VRP      | Voluntary Remediation Program                    |
| WQC      | National Recommended Water Quality Criteria      |
| WQS      | Virginia Water Quality Standards                 |

## Executive Summary

On behalf of E.I. du Pont de Nemours and Company (DuPont), AECOM [formerly known as URS Corporation (URS)] has prepared this *Off-Site Human Health Risk Assessment Report* (HHRA) for the former DuPont Waynesboro Plant, located in Waynesboro, Virginia (the site). This HHRA has been prepared to provide a comprehensive assessment of potential risk to off-site human receptors from mercury that was accidentally released from the site between 1929 and 1950 when mercury was in use at the site. The area of the assessment includes the South River (SR) downstream of Waynesboro, VA, the upper segment of the South Fork Shenandoah (SFS) River and their associated floodplains [designated as area of concern (AOC) 4]. The Waynesboro Plant (on-site) has been addressed in a separate submittal (*On-Site Human Health and Ecological Risk Assessment Report* prepared by URS, dated March 2014). Likewise, potential risk to off-site ecological receptors has been addressed in a separate report.

This HHRA was conducted consistent with Resource Conservation and Recovery Act (RCRA) requirements to evaluate potential exposure of human receptors to mercury detected in environmental media in the South River watershed. The primary goals of this assessment were (1) to evaluate potential risk for AOC 4 human receptors; and, (2) to provide risk information sufficient for remedial decisions consistent with United States Environmental Protection Agency (EPA) and Commonwealth of Virginia, Department of Environmental Quality (VADEQ) requirements.

To support the risk assessment, conceptual site models (CSMs) were developed in collaboration with VADEQ to summarize potential human exposure pathways for the AOC. The CSMs form the basis of the risk assessment presented herein and have been used to guide the development of the report. Further, links to specific documents are included as part of the electronic version of the CSMs to provide comprehensive documentation of studies and findings used to support the CSMs. The CSMs are provided as part of this Executive Summary (see [Figures ES-1, ES-2 and ES-3](#)).

The technical approach for the HHRA consisted of the following basic steps: data review and identification of constituents of potential concern (COPCs), human exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis as described below.

- (1) As a general approach, this document compiles information from investigations and studies that have been performed as part of on-going investigations of the South River and South Fork of the Shenandoah River over the approximately last 10 years. As part of the data review, DuPont and VADEQ developed an assessment-mechanism [referred to herein as a retrospective data quality assessment (RDQA)] specifically for the data sets to be used in the HHRA. The objective of the RDQA was to document that the analytical data collected during numerous investigations was of sufficient quality for use in risk assessment. The original, historical source of mercury in the South River watershed is the Former DuPont Waynesboro Plant. Potential COPCs for AOC 4 are limited to total mercury (THg) and methyl mercury (MeHg).
- (2) Based on an evaluation of the available data compared to screening levels, South River sediment and fish, floodplain area soil and floodplain area pond fish were

identified as media of concern. In addition, floodplain area biota (such as wildlife, livestock and garden crops) were evaluated. South river surface water, floodplain area groundwater, floodplain area pond surface water and floodplain area pond sediment were not media of concern.

All properties along the approximately 25 miles of the South River watershed were reviewed for land use. Using a land use-based screening decision logic, potential receptors were identified consistent with land uses in the South River watershed, namely residents, industrial/commercial workers, construction/excavation workers, hunters, farmers, and, recreational users of floodplain area parks and the South River under both current and future conditions.

In addition, a hypothetical future residential scenario and hypothetical future subsistence farmer scenario were evaluated in exposure areas where soil concentrations were above a conservatively adjusted residential screening value of 17 mg/kg. Potential exposures to all media were combined to provide an upper-bound estimate of potential risk assuming uncontrolled exposures via all possible exposure pathways. The farmer scenario differed from the resident in that potential exposure to livestock and poultry was also included.

Exposure via ingestion, inhalation, and dermal contact was evaluated in all exposure scenarios, as applicable. Exposure calculations used reasonable maximum exposure assumptions. Exposure point concentrations were either 95% upper confidence limit (UCL) of the arithmetic mean or the maximum value based on all available data. In some instances for soil data, outliers (THg concentrations greater than 100 mg/kg) were removed and the analysis was repeated.

- (3) This health risk assessment provides noncancer hazards for both THg and MeHg.
- (4) Potential hazard associated with mercury exposure was evaluated at all properties. Hazard Indices (HI) were compared to EPA's and VADEQ's target HI of 1.0 (EPA, 1989 and VADEQ, 2011). Results and uncertainties are summarized below

In general,

- For all current potential receptors, exceedances were limited to potential exposure to floodplain area surface soils, ingestion of waterfowl (mallards and wood ducks) and snapping turtles. (The number of soil exceedances is reduced if the outlier analysis is performed.) Maximum exceedances by receptor and pathway are illustrated on [Figure ES-4](#).
- For potential future receptors, if floodplain area subsurface soils are assumed to be on the surface, garden crops are grown on the floodplain, poultry is raised on the floodplain and the fish advisory is not in place, these pathways also show exceedances. (Similar to above, the number of exceedances is reduced if the outlier analysis is performed). Maximum exceedances under this scenario by receptor and pathway are illustrated on [Figure ES-5](#).
- For the both the hypothetical future resident and hypothetical future subsistence farmer, where all pathways are assumed possible on any property where soil concentrations exceed 17 mg/kg, similar pathways as the future potential receptors

exceed the target HI, but the maximum HIs are higher. Maximum exceedances under this scenario by receptor and pathway are illustrated on [Figure ES-6](#).

In all cases, no exceedances are noted for potential exposures directly to sediments and air, nor indirect pathways associated with consumption of livestock (beef and milk), poultry (muscle) and game (represented by deer).

More specifically, the human health risk assessment supports the following conclusions:

- No unacceptable health risks were indicated for current residents (adult/child), current adult recreational users of floodplain area parks and current recreational users of the South River (adult/child).
- For current/future industrial/commercial workers and current/future construction/excavation workers, cumulative noncancer hazards ranged between 1.2 and 3.3. Ingestion of floodplain area surface soil was the exposure pathway of concern.
- Elevated THg concentrations were observed primarily in an area north of the Oxbow located on the Americast property. There are no current worker exposures to the area.
- Limited unacceptable health risks were indicated for current recreational users of floodplain area parks and current farmers. Cumulative noncancer hazards for current child recreational users of floodplain area parks ranged between 1.1 and 2.1. Total HIs above 1.0 were observed in two parks: Constitution Park and North Park. Removal of outliers from both locations resulted in total HIs less than 1.0. Cumulative noncancer hazards for current adult farmers were 1.5 and 2.2 and ranged between 1.1 and 3.9 for child farmers. Ingestion of floodplain soil was the exposure pathway of concern.
- Total HIs above acceptable levels were observed for current/future hunters. Ingestion of waterfowl (primarily mallards) was the exposure pathway of concern. Total HIs ranged between 7 and 8. Since snapping turtles would be obtained via trapping, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion was evaluated separately. The HQ for this pathway was 71 (based on a 90<sup>th</sup> percentile ingestion rate) and 38 (based on a mean ingestion rate).
- Likewise, total HIs above acceptable levels were observed for future recreational users of the South River, future recreational users of floodplain area parks, future farmers and future hunters. Indirect exposure to mercury in South River or floodplain pond surface water, sediment and pore water via ingestion of fish were the exposure routes of concern.
- A fish consumption advisory for the South River is currently in place. In the absence of the advisory, cumulative noncancer hazards ranged between 41 and 182 for a recreational user consuming fish from the South River (adult/child). The highest noncancer hazards were observed in Reach 3. Noncancer hazards were also observed in the upstream reference location. Similar hazards were observed for fish ingestion in private floodplain area ponds.
- Cumulative noncancer hazards for future hypothetical residents and future hypothetical subsistence farmers were also above acceptable levels. Noncancer cumulative hazards for hypothetical future adult and child residents exceeded the HI

of 1.0 in each of the properties evaluated. The cumulative noncancer hazards for adult residents ranged between 54 and 283 and for child residents ranged between 50 and 262. Cumulative noncancer hazards by critical effect were driven by the assumption that THg is present as MeHg in potential food sources. The exposure pathway of concern was primarily ingestion of fish from South River and floodplain area ponds, with ingestion of waterfowl a concern to a lesser extent.

In summary, this risk assessment shows limited potential for human health risks at the exposure areas evaluated under current land uses. Although some site-specific assumptions were made for the risk assessment, the evaluation is considered conservative based on the choice of receptors and exposure assumptions (e.g., exposure frequency and duration) that were based primarily on the EPA and VADEQ guidance cited herein. As a result, the risk estimates presented within this report provide a conservative yet meaningful basis upon which to evaluate remedial actions for AOC 4.

Exposure pathways that were identified in the risk assessment as being of potential concern under current or future potential land use conditions will be carried forward into the Corrective Measures Study (CMS) for further consideration. The CMS will evaluate remedial options and will recommend remedial measures to ensure the protectiveness of the AOC to human health. The CMS will also define the numeric criteria for judging the effectiveness of the remedy.

## 1.0 Introduction

On behalf of E.I. du Pont de Nemours and Company (DuPont), AECOM [formerly known as URS Corporation (URS)<sup>1</sup>] has prepared this *Off-Site Human Health Risk Assessment Report* (HHRA) for the former DuPont Waynesboro Plant, located in Waynesboro, Virginia (the site). This HHRA has been prepared to provide a comprehensive assessment of potential risk to off-site human receptors from mercury that was accidentally released from the site between 1929 and 1950 when mercury was in use at the site. The area of the assessment includes the South River (SR) downstream of Waynesboro, VA, the upper segment of the South Fork Shenandoah (SFS) River and their associated floodplains. The Waynesboro Plant (on-site) has been addressed in a separate submittal (*On-Site Human Health and Ecological Risk Assessment Report* prepared by URS, dated March 2014). Likewise, potential risk to off-site ecological receptors has been addressed in a separate report.

This assessment has been completed pursuant to a permit modification issued to DuPont by the Commonwealth of Virginia, Department of Environmental Quality (VADEQ) in February 2014 under the Resource Conservation and Recovery Act (RCRA) corrective action provision. The United States Environmental Protection Agency (EPA) issued a Hazardous Waste Permit for Corrective Action (Permit) for on-site areas under RCRA in September 1998. A revised Permit (VAD003114832) was approved by VADEQ - Office of Waste Permitting and Compliance (OWPC) on September 24, 2009 (VADEQ, 2009). VADEQ signed a modification to the existing on-site RCRA permit that now includes the off-site area. The off-site area was designated as area of concern (AOC) 4 (see [Figures 1-1 thru 1-7](#)).

This document has been revised from the September 2014 and July 2015 submittals to address VDEQ comments received in memoranda provided to DuPont dated December 5, 2014, March 30, 2015 (received by DuPont on April 28, 2015), and October 2, 2015; an email from VDEQ to DuPont dated January 30, 2015; and, meetings conducted between AECOM, DuPont and VDEQ on December 11, 2014, January 21, 2015 and January 23, 2015. The July 2015 response to agency comments matrix is provided as an appendix to this HHRA.

## 1.1 Background

In 1976, more than 25 years after use of mercury sulfate ended, mercury globules in soil were uncovered during on-site construction and excavation activities. Chemical analysis of the soil revealed concentrations of inorganic mercury of up to 7,000 milligrams per kilogram (mg/kg) (Carter, 1977). After initial reporting to state officials (Virginia, 1979), these findings were confirmed in subsequent investigations that occurred from 1977 to 1980 and included studies conducted both on- and off-site.

Based on the findings of these studies, on June 22, 1984 DuPont and the Commonwealth of Virginia concluded a legal settlement that selected monitoring and natural recovery as

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<sup>1</sup> URS and AECOM have merged into one company, AECOM.

the remedial option for the South River, and also set in motion a 100-year program to monitor the recovery of impacted biota and environmental media. The settlement between DuPont and the State Water Control Board in 1984 specified that DuPont establish a trust fund to support a 100-year monitoring program for the South River watershed, downstream of the site. The fund is intended to be used to investigate mercury contamination associated with the plant, and is managed by the VADEQ.

In February 2001, DuPont, VADEQ, and EPA agreed to voluntarily establish an interdisciplinary team of individuals from industry, government, citizens' groups, academic institutions, and private research organizations to revisit the issue of mercury contamination and its consequences. This group is called the South River Science Team (SRST). An Exposure Task Team (ETT) of the South River Science Team (SRST) was formed in 2008. The key objectives of the team's efforts are to identify possible routes of human exposure to mercury in the South River watershed, define possible risks and uncertainties, and communicate that information to the public.

The principal potential human mercury exposure pathway that has been identified by the SRST is consumption of fish caught from contaminated reaches of the South River. (Reference to the South River in this HHRA includes only the mercury-impacted part of the river between Waynesboro and Port Republic). A fish consumption advisory, in place for more than 30 years, continues to be the mechanism through which human exposure to contaminated fish has been controlled. Additional potential human exposure pathways associated with floodplain soils include, for example, direct contact with floodplain soils, consuming crops grown in floodplain soils, and consumption of animal-based food items like game, waterfowl, livestock and poultry. While this evaluation uses the results of studies performed SRST, the HHRA is performed consistent with RCRA requirements as detailed below.

## 1.2 Objectives and Technical Approach

This HHRA was conducted consistent with RCRA requirements to evaluate potential exposure of human receptors to mercury detected in environmental media in the South River watershed. The primary goals of this assessment were (1) to evaluate potential risk for AOC 4 human receptors and (2) to provide risk information sufficient for remedial decisions consistent with EPA and VADEQ requirements.

To support the risk assessment, conceptual site models (CSMs) were developed to summarize potential human exposure pathways for the AOC. The CSMs form the basis of the risk assessment and have been used to guide the development of the report. Further, hyperlinks to specific documents (summarized in the bibliography provided in [Appendix B](#)) are included as part of the electronic version of the CSMs (provided as [Appendix A](#)) to provide comprehensive documentation of studies and findings used to support the CSMs. The CSMs were transmitted to VADEQ on February 10, 2014 and discussed on a conference call on April 1, 2014. Comments from VADEQ during the conference call have been incorporated into the CSMs presented herein.

The technical approach for the HHRA consisted of the following basic steps: data review and identification of constituents of potential concern (COPCs), human exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. The risk

characterization evaluated potential risk from exposure to environmental media. Risk characterization results were compared to EPA's and VADEQ's hazard index (HI) of 1 for groups of toxicants that affect the same target organ (EPA, 1989 and VADEQ, 2011).

In addition, as a general approach, this document compiles information from investigations and studies that have been performed as part of on-going investigations of the South River and South Fork of the Shenandoah River. These efforts include those performed under the comprehensive RCRA Facility Investigation (RFI), the Ecological Study and the SRST activities. The full compendium of investigations, published papers, and academic theses has been included in the report as [Appendix B](#) to make readily available the numerous studies that demonstrate the level of assessment performed. A goal of the compilation was to demonstrate the level of characterization of potential human health exposure pathways off-site along the South River and adjacent floodplain.

Information from these studies relevant to the understanding of potential risks to human health was included in this HHRA. A retrospective data quality assessment (RDQA) was performed for each of the studies that are used either quantitatively or qualitatively. Revised versions, which address VADEQ comments,<sup>2</sup> are provided in [Appendix C](#). As detailed herein, the data used was consistent with VADEQ data quality requirements.

### 1.3 Report Organization

The remainder of this report is organized as follows:

- Section 2.0, Site Background, provides a brief description of the site history and environmental setting.
- Section 3.0, Conceptual Site Model, describes the media of concern, COPCs, potential migration pathways, and potential human health and ecological receptors and exposure pathways.
- Section 4.0, Exposure Assessment, describes the exposure assumptions for estimating chemical intake, and describes the concentration terms used in the HHRA.
- Section 5.0, Toxicity Assessment, discusses the sources of the toxicity factors used in the HHRA.
- Section 6.0, Risk Characterization, presents the risk calculation methodology, results, and discussion for the HHRA.
- Section 7.0, Uncertainty Analysis, provides a discussion of uncertainties associated with the findings of the risk assessment.
- Section 8.0, Conclusions and Recommendations, summarizes the results of the evaluation.
- Section 9.0, References, lists references used to prepare this document.

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<sup>2</sup> VADEQ provided comments to DuPont in emails dated March 7, 2014 and March 11, 2014, and memorandums dated August 12, 2014, September 4, 2014 and October 2, 2015. Responses to these comments are provided in Appendix C.

## 2.0 Site Background

This section provides a brief summary of the plant operational history, site regulatory history, and site environmental setting. Information contained in this section has been summarized from the *Comprehensive RFI Report* (URS, 2013) and *Final Report: Ecological Study of the South River and a Segment of the South Fork Shenandoah River* (URS, 2012a).

### 2.1 Site Location

The former DuPont Waynesboro Plant is located on approximately 177 acres of flat lying land along the South River in the southeastern corner of Waynesboro, Virginia, which lies in the Central Valley section of the Valley and Ridge Province and the Blue Ridge physiographic provinces (Gaithright et al., 1977). The Site location is shown in [Figure 1-1](#). The valley is bounded to the east by the Blue Ridge Mountains and to the west by the Massanutten Mountains.

The site abuts the South River within AOC 4. The South River flows approximately 25 miles north to its confluence with North River at Port Republic, Virginia where the combined flow forms the South Fork Shenandoah (SFS) River. The river channel within AOC 4 extends from RRM 0 at the outfall of the Site to approximately 5 miles downstream of the confluence (see [Figures 1-1 thru 1-7](#)).

AOC 4 includes the aquatic and riparian areas (including the floodplain) of parts of the South River downstream of the site and parts of the SFS River, Virginia. AOC 4 spans approximately 25 miles within the South River and SFS River systems (starting at site and including parts of SFS River) and covers approximately 626 to 3,570 acres (based on the 0.3-year or the 62-year floodplain along the 24 mile reach of the South River).

### 2.2 Site Operational History

In 1929 DuPont began operations at the Waynesboro site which was originally chosen because of the abundant water supply, railroad access, and an available workforce. Initial operations included the manufacture of acetate flake and yarn from 1929-1977. This process included the use of mercury from 1929-1950. In 1958, DuPont began producing Orlon®, the plant's second fiber. The flake and yarn process and Orlon® process were discontinued in 1977 and 1990, respectively. In the interim, Lycra® production had begun in 1962, with Permasep® production beginning in 1969 and Bulk Continuous Fiber (BCF) Nylon in 1978. The BCF production facility was idled in 2009 and the buildings have been demolished. Lycra is the only fiber currently manufactured at the site. In 2004, the plant assets were sold to subsidiaries of Koch Industries (INVISTA S.a.r.l. or "INVISTA"). Upon the completion of the Corrective Action Program at the site, the land will be transferred to INVISTA. However, DuPont will maintain a positive and consistent presence in the community due to its long manufacturing history at the site.

## 2.3 Regulatory History

### 2.3.1 On-Site

As discussed in Section 1, the Waynesboro Plant (on-site) has been assessed under a RCRA Corrective Action Permit since 1998. A summary of the on-site regulatory history is provided in the *On-Site Human Health and Ecological Risk Assessment Report* (URS, 2014a).

### 2.3.2 Off-Site

Prior to 1999, with the exception of a structured, long-term monitoring plan by the Commonwealth of Virginia, chemical and biological studies were conducted by numerous independent organizations to evaluate the distribution and potential effects of mercury released from the Site between 1929 and 1950 (legacy mercury) on the South River, Shenandoah River, and in the adjacent floodplains. These efforts featured limited coordination in study design, implementation, interpretation of results, and setting of data quality objectives. To address these issues, as previously noted in Section 1.1., in 2001, DuPont and various Virginia regulatory agencies established the SRST as a multi-stakeholder and collaborative program to address the legacy mercury contamination of the South River, Virginia. The initial goals of the SRST were to coordinate the multiple research efforts, better understand fate and transport mechanisms for mercury in the system, explore reasons for the continued presence of mercury in fish tissues, and ensure that findings are effectively communicated to stakeholders. The SRST now includes several state and federal regulatory agencies, an expert panel, academic research institutions, and environmental groups and is organized along issue-specific task teams (e.g., human exposure, remediation options, communications, and implementation).

As noted earlier, the Waynesboro Plant has been assessed under a RCRA Corrective Action Permit since 1998. On February 4, 2014, the RCRA Permit was modified to add AOC 4. VADEQ has acknowledged that the off-site Corrective Action program will be based in part on the on-going investigations performed by the SRST.

## 2.4 Environmental Setting

The following sections summarize the hydrogeological setting, hydrology and other South River watershed characteristics. The environmental setting is based on information compiled from regional and local literature, previous site environmental reports, and recent field activities conducted as part of the SRST investigations.

The environmental setting of the South River watershed, which surrounds the Waynesboro Plant, acts as an important control on the geomorphological, chemical, and biological components of the South River, which in turn influence the fate, transport, and potential risk associated with legacy mercury.

Additional information regarding the environmental setting of the site and South River watershed can be found in the *Comprehensive RFI Report* (URS, 2013), *Final Report: Ecological Study of the South River and a Segment of the South Fork Shenandoah River* (URS, 2012a) and *RCRA Facility Investigation (RFI) Report Former DuPont*

*Waynesboro Site Area of Concern (AOC) 4 South River and a Segment of the South Fork Shenandoah River, Virginia (AOC 4 RFI Report, AECOM, 2015a).*

### 2.4.1 Climate

Waynesboro features a humid temperate climate, with average January temperatures of 6.1 degrees centigrade (°C), average July temperatures of 29.4°C, and annual precipitation of 0.94 meters (m) as measured at the Staunton, Virginia, sewage plant [Southeast Regional Climate Center (SERCC), 2007]. Precipitation is highest from March to September and slightly lower from October to February (URS, 2012a). The average annual total snowfall in Staunton, Virginia, is 0.51 m.

### 2.4.2 Hydrogeology

The site is located within the Valley and Ridge Province of the Appalachian Chain, which consists of Quaternary-aged valley fill and highlands of Precambrian through Pennsylvanian-aged bedrock formations that have been subject to significant folding and deformation.

The uppermost geologic unit at the plant site and in the surrounding AOC 4 area is recent alluvium, which is comprised of floodplain and terrace deposits of the South River. This unit consists predominantly of fine to medium grained, silty sand and gravel as well as sandy silt and sandy clay. The thickness of this unit is typically 12 to 18 feet. Soil borings drilled during the RFI investigation and logs compiled from previous work by others are included in the *Comprehensive RFI Report* (URS, 2013).

These overburden deposits overlie the residuum of the Waynesboro Formation which grades to the bedrock of the Waynesboro formation at depth. Where the Waynesboro Formation is absent, the overburden deposits overlie the upper member of the Shady Formation, which is geologically older than the Waynesboro Formation (URS, 2013).

### 2.4.3 Hydrology

The South River is a fourth order, high gradient, cool water river system, and is classified as a single-thread, sinuous (but non-meandering) gravel-bed bedrock river (Turowski et al., 2008). The South River joins with the North River at Port Republic to form the SFS River. The South River has drainage basin areas of approximately 329 square kilometers (km<sup>2</sup>) at Waynesboro, Virginia, and 549 km<sup>2</sup> at Harriston, Virginia [United States Geological Survey (USGS), 2007]. Although several tributaries join the South River throughout its length, these tributaries are generally first-order streams and most are intermittent during periods of low precipitation. River substrate is primarily composed of cobbles and boulders, with frequent bedrock exposures along the channel perimeter. The bank-full width of the channel ranges between 20 to 30 meters (m), and the bank-full depth is approximately 2 to 3 m.

### 3.0 Conceptual Site Model

The use of a CSM provides a means of documenting and periodically updating general facility information and data regarding potential releases to the environment (EPA Region 6, 2008). The CSM also provides a framework for problem definition, aids in the identification of data gaps that can then be addressed in the site investigations, and assists in the identification of appropriate remedial technologies, if necessary.

The CSM is based on an integrated analysis of potential exposure pathways, including sources, environmental fate and transport mechanisms, and human and ecological receptors.

The CSM includes four primary elements:

- Identification and characterization of potential source areas
- Identification of COPCs
- Definition of primary transport mechanisms
- Identification of potential receptors and exposure points

In support of the CSM, an understanding of the geology, hydrology, and hydrogeology at and in the vicinity of the site must also be known, along with the spatial distribution of COPCs. A description of the environmental setting was previously presented in Section 2.0. This section discusses the remaining components of the CSM.

The CSM is a dynamic tool that is refined as additional data are collected. The CSM presented within this section represents the current understanding of site conditions.

#### 3.1 Known and Potential Source Areas

The original, historical source of mercury in the South River watershed is the Waynesboro Plant. Inorganic mercury was released from the plant between 1929-1950, during manufacturing and recycling of the mercury-based catalyst, and then likely transported through plant storm sewers and outfalls into and along the South River as suspended solids during storm events. Mercury then entered into secondary sources, including surface water, sediment, pore water, and soil of the South River and nearby floodplains (URS, 2012a). Low concentrations of mercury are present in South River alluvial groundwater. In some portions of the floodplain, bank soils and associated sediment continue to act as a reservoir of mercury in the South River system. In addition, the South River, like most aquatic systems in the northeastern U.S., receives mercury from atmospheric deposition (URS, 2012a).

As a result, mercury is the primary COPC for the South River. As such, fate and transport studies conducted by the SRST and others have focused on mercury transport in environmental media, the bioavailability of mercury for methylation, and bioaccumulation of methyl mercury (MeHg) in biota. Limited data have been collected for other analytical parameters.

The analysis of potential risk to human health in AOC 4 focuses on total mercury (THg) and MeHg. Although elemental mercury [Hg(0)] was used at the site, mercury speciation

off-site is restricted to THg and MeHg. This is based on the history of mercury use at the Waynesboro Plant, modes of transport from the plant to the South River as discussed above, and dominant biogeochemical reactions in surface water, sediment and floodplain soil.

During the period when mercury was used at the plant, Hg(0) was transported to the plant and converted to mercuric sulfate [Hg(II)SO<sub>4</sub>] for use as a catalyst. Retorting the spent catalyst and spills likely introduced Hg(0) to the site subsurface (e.g. sewers). As such, the Sewer Investigation identified Hg(0) in portions of the Pumphouse Sewer and Chemical Sewer in the area of the former Chemical Building and former Mercury Recovery Area.

Hg(0) in dark anaerobic environments is persistent. Hg(0) droplets in these environments form surface coatings of oxidized Hg(II) species that limits the volatilization and promotes persistence of Hg(0) (Amyot et al., 2004) and promotes solubility and transport of Hg(II). As a result, mercury has been detected in plant outfalls as Hg(II) and Hg(0) [detectable as dissolved gaseous mercury (DGM)] (Turner and Jensen, 2005). However, since the extensive remediation of the plant sewers, the loads from the plant are likely to decrease substantially.

Upon mixing with the South River, DGM concentrations decrease as the Hg(0) in solution rapidly volatilizes to the atmosphere (Turner and Jensen, 2005). There can be local increases in DGM from inputs of Hg(II) from bank erosion or other sources. DGM is generated from Hg(II) via photochemical reactions or other reductants, such as Fe(III) (Zhang and Lindberg, 2001). The DGM produced rapidly volatilizes to the atmosphere. The dominant species of mercury transported by surface water are particulate associated inorganic mercury (log K<sub>d</sub> = 6-7), small complexes or adsorbed to colloids [detectable as reactive mercury (Hg(II)R)] and MeHg (Flanders et al. 2010).

In floodplain soil, chemical analysis has confirmed that mercury in soil is present as inorganic mercury and MeHg. In floodplain soil, selective sequential extractions (SSE) and extended X-Ray Absorption Fine Structure (EXAFS) have demonstrated that 65-89% of THg in floodplain soil is present as metacinnabar or Hg-thiol, the most stable of the mercury complexes (Ptacek et al. 2013). Metacinnabar is also less bioavailable than other mercury complexes. Previous SSE results observed low mercury concentrations in the water soluble (F1) fraction (7 ng/L; Flanders et al., 2010), indicating that Hg(0) does not account for the species of mercury seen in the F4 fraction (the fraction where Hg(0), if present, would be found) (Bloom et al., 2003). MeHg is present at low concentrations in soil (<0.1% of total; Cinachetti et al., 2008).

Similar to surface water, while it is possible that Hg(II) can be reduced to Hg(0) in soil by both biotic and abiotic pathways, the vast majority of Hg(II) in soil is not available for reduction and release to the atmosphere (Obrist et al. 2010). Abiotic pathways include reduction of Hg(II) by humic substances (Alberts 1974) and ultraviolet (UV) radiation (particularly UV-B; Choi and Holsen 2009). Hg(II) can be reduced by both aerobic and anaerobic bacteria; rates are higher under anaerobic, reducing conditions (Obrist et al. 2010). The reduction of Hg(II) to Hg(0) does not result in formulation of Hg(0) droplets (Hussein et al. 2007).

Investigations relevant to evaluating potential human exposures to mercury on the South River are discussed in the following subsections.

### 3.1.1 South River Surface Water

An extensive dataset for surface-water mercury concentrations in the South River exists with records dating back to 1978. The first surface-water samples were collected and analyzed for unfiltered THg using trace metal clean techniques by Oak Ridge National Laboratory (ORNL) in 1978 and 1979. A number of samples were collected and analyzed in the 1970s and 1980s, but detection limits were relatively high (e.g., 0.5 µg/L), obscuring spatial or temporal trends, and limiting data usability.

VADEQ and DuPont have collected and analyzed samples on a monthly or seasonal basis since 2002 over a wide range of discharges and climatic conditions. The use of consistent sampling and analytical techniques over time has created confidence that these data can be combined for use in the HHRA (see also Section 3.2.2). Currently, the surface-water database contains over 5,100 THg data points, and over 3,300 MeHg data points collected from the South River and other rivers in the watershed.

Section 3.1 of the AOC 4 RFI Report (AECOM, 2015a) details the nature and extent of THg and MeHg in surface water. As discussed in the report, various surface water investigations under base flow conditions<sup>3</sup> conducted to date indicate that:

- Base flow THg and MeHg concentrations in surface water increase immediately downstream of the historical outfall at RRM 0 and reach maximum levels at or before RRM 10;
- The areas of the highest surface water MeHg concentrations tend to be more widely dispersed, likely due to the widespread methylating capacity of the South River sediment;
- Base flow MeHg concentrations exhibit strong seasonality (increasing when surface water temperatures reach approximately 12 °C, but do not necessarily increase with increasing temperature throughout the late summer); and
- Base flow loadings indicate that positive incremental THg and MeHg loadings are constrained to approximately the first 10 river miles downstream of the Site.

Episodic storm event investigations indicate that the:

- Storms have very strong, but temporary (lasting on the order of hours) effects on mercury concentrations; this limits the role of storms in controlling mercury distributions in the South River;
- Increased THg concentrations during storms resulted from the re-mobilization of mercury existing within the river channel and not from more distant sources (e.g., tributaries and floodplain features);

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<sup>3</sup> Base flow (as opposed to storm flow) refers to the periods when stream flow increases with distance downstream and the subsurface flow supplies the majority of stream flow.

- Incremental storm loads from the reach between RRM 2.3 and RRM 5.1 were the highest in three of the four storm events measured and second highest in the fourth storm; and
- THg and MeHg loads from tributaries and floodplain to the South River were generally several orders of magnitude lower than South River channel loads.

Additional discussion of storm water – to-surface water discharge is provided in Section 3.4.1

### **3.1.2 South River Sediment**

Sediment in the South River occurs within the gravel beds and other coarse-grained channel substrates, in deposits of varying thickness on the channel margins, behind obstructions, and in other low velocity areas of the river. As discussed in Section 3.4.4, sediment is an important medium for mercury fate and transport because mercury is strongly adsorbed to sediment in aquatic systems (URS, 2012a). Large scale sediment collection events in the South River have included VADEQ sampling (2007), Phase I Ecological Study (2006-2008), Phase II Ecological Study (2009-2011), and University of Delaware (UD) fine grained channel margin (FGCM) core sampling. In addition, studies have been conducted to understand the length of time that sediment is likely to remain in the river bed.

The findings of these studies have documented that the South River substrate is dominated by gravel and bedrock, limiting the amount of fine-grained sediment accumulation (or depositional areas) where direct contact by potential human receptors may occur.

Both bulk sediment (fine-grained sediment accumulated in depositional areas) and interstitial sediment (fine-grained sediment stored in the gravel matrix of the river bed) have been collected in the South River. Interstitial sediment was collected using a pump to entrain fine-grained sediment from interstitial spaces in a coarser substrate matrix. This technique was used in the South River because fine-grained sediment deposits that can be sampled using traditional sediment sampling techniques are relatively small and infrequent (URS, 2012a). However, sediment data collected in this manner is not considered appropriate to evaluate potential human health exposure. As a result, bulk sediment is considered the media of concern for the HHRA.

Section 3.3 of the AOC 4 RFI Report (AECOM, 2015a) details the nature and extent of THg and MeHg in bulk sediment. As presented in the report, FGCM deposits have highly variable THg concentrations, ranging from 0.1 to 884 mg/kg (URS, 2012a). Deeper FGCM deposits have higher THg concentrations than fine surficial sediment. FGCM deposits and fine-grained sediment embedded in the coarse-grained stream bed generally contain higher MeHg concentrations than other sediment types, including floodplain wetlands. Although concentrations are higher in FGCM deposits and embedded gravels, methylation is not limited to a particular sediment environment (Yu et al. 2011).

### **3.1.3 South River Aquatic Biota**

Off-site investigations of biota have included both aquatic and terrestrial organisms residing in the South River and associated floodplain. An overview of the off-site

biological investigations is discussed in Section 6.4 of the AOC 4 RFI Report (AECOM, 2015a) and in the *Ecological Risk Assessment Report for Former DuPont Waynesboro Site Area of Concern (AOC) 4* (AECOM, 2015b). Of relevance to the HHRA, numerous studies assessing various aspects of South River fish communities and other aquatic biota (such as waterfowl and turtles) have been conducted. For example, key fish tissue and fish consumption studies include the following:

- A Survey of Fish Consumption by Residents of Virginia Living Near the South fork of the Shenandoah River [Virginia Department of Health (VDOH), 1979].
- VADEQ Long-term tissue monitoring program (1977– to present)
- VADEQ Fish Consumption Advisories (1977, modified 2001)
- Uptake of Mercury and Relationship to Food Habits of Selected Fish Species in the Shenandoah River Basin, Virginia (Murphy, 2004)
- Virginia Department of Game and Inland Fisheries Angler Surveys (2005 and 2011)
- 2006 Phase I Ecological Study of the South River; Assessment of mercury in forage fish tissue (URS, 2008)
- 2009 – 2011 Phase II Ecological Study of the South River; Assessment of mercury in tissue of select fish species

The Ecological Study Report (URS, 2012a) provides the details of the above studies and findings. The major findings indicate that fish tissue THg concentrations:

- Generally increase with trophic level and increasing distance down river for all species.
- Are significantly different between seasons (in smallmouth bass and redbreast sunfish) but not between the years of the Ecological Study for all species.
- Are higher in forage fish inhabiting riffles [*Rhinichthys cataractae* (longnose dace)] than those inhabiting pools [*Luxilus cornutus* (common shiner)].

### 3.1.4 Floodplain Soil

The South River is subject to flooding; for example, between 1936 and 1996, the South River experienced nine major floods. In addition, the South River was used extensively as a source of power for mills. Fourteen mill dams were located on the South River between Waynesboro and Port Republic, 25 river miles downstream. All of the mill dams were breached by the 1970s, but many were functional at least during some of the time of mercury use at the site (Pizzuto and O’Neal, 2009). Historic mill dam locations are shown on figures provided in [Appendix D](#). Historical mercury releases at the site, the presence and subsequent deterioration/removal of mill dams, and the frequency of major flooding events created the potential for particle-bound mercury to be deposited on riverbank and floodplain soils, which are now considered the primary mercury repository in the South River watershed within AOC4 (AECOM, 2015a).

Initial floodplain sampling was conducted by the Virginia State Water Control Board in the early 1980s as part of the original investigation of the mercury release from the Site between 1929 and 1950. The investigation concluded that the majority of the mercury

mass in the South River system is associated with South River floodplain soils. Since 2003, several additional investigations have been conducted to further evaluate mercury levels and distribution in the floodplain. Investigation applicable to the evaluation of potential human health exposure pathways include:

- Augusta Forestry Center sampling for garden plot study area (2003)
- Greenway sampling near former DuPont plant (2003)
- South River floodplain soil sampling (2004 and 2005)
- Additional sampling of the tilled garden plots for garden data interpretation (RRM 11.8) (between 2003 and 2005)
- EPA soil sampling at RRM 3.0 (2006)

In 2008, the SRST conducted an extensive soil sampling program along 25 miles of the South River floodplain from Waynesboro to Port Republic. This sampling program was conducted in accordance with the Virginia DEQ 100-Year Mercury Monitoring Plan for the South River / South Fork Shenandoah River. The sampling approach divided the river into six reaches.

- First reach: Main Street (Waynesboro) Bridge to Hopeman Parkway Bridge- Approximate Relative River Mile (RRM) 0.5 to 2
- Second reach: Hopeman Parkway Bridge to Holsinger Farm Footbridge - Approximate RRM 2 to 5
- Third reach: Holsinger Farm Footbridge (Dooms) to New Hope and Crimora Rd Bridge- Approximate RRM 5 to 10
- Fourth reach: New Hope and Crimora Rd Bridge to Patterson Mill Bridge- Approximate RRM 10 to 16
- Fifth reach: Patterson Mill Bridge to Grand Caverns Bridge- Approximate RRM 16 to 20
- Sixth reach: Grand Cavern Bridge to Port Republic Rd Bridge- Approximate RRM 20 to 25

A stratified random (modified) sampling plan was then developed which further parceled each reach into floodplain inundation areas based on the results of a HEC-RAS model developed for the South River study area (further details regarding this model are found in Green et.al, 2012 which is provided in [Appendix B](#)). Floodplain inundation areas were developed and plotted for the 2-year, 5-year, and 62-year storm intervals. In each reach, upland floodplain soil locations were distributed equally among three inundation areas (i.e., 30 locations within each of the 2-year, 5-year and 62-year storm intervals). Further, land use categories were identified to help describe potential exposure scenarios. These categories varied between bridge reaches but included the following: open space (low intensity developed areas; e.g. parks and residential areas), agriculture (row crops), pasture and hay, and forested (e.g. deciduous). Wetland land-use was also identified as an important study component and was targeted for sample collection in each reach.

In summary, for each reach, the sampling plan consisted of 10 randomly selected samples in each combination of the three floodplains and the three primary land uses identified in

each reach-floodplain area combination. This was called the 30, 30, 30 plan, receiving its name from the 30 samples from each of the three flooding (or inundation) frequencies, i.e., the 2-yr, 5-yr and 62-yr (with 10 samples from each of the three predominant land uses within each floodplain or flooding frequency area). Hence (for each reach), this plan results in 30 samples in the 2-year (divided evenly among the three primary land use), 30 samples in the 5-year (divided evenly among the three primary land use), and 30 samples in the 62-year (divided evenly among the three primary land use). Further, this plan results in 30 samples from each land use (10 from each inundation area within that land use) (Green et. al, 2012).

The 30, 30, 30 plan was developed from power simulations done in SAS software version 9. This simulation indicated that (1) the power to distinguish THg levels between floodplains or land uses in the same river reach is small; (2) the power to distinguish THg levels across river reaches within the same floodplain or within the same land use is satisfactory (power > 75%); and (3) only substantial changes in THg will be statistically significant in a standard Analysis of Variance (ANOVA) model (Green et. al, 2012).

A total of 570 stations were planned for sample collection during the 2008 floodplain soil sampling event (90 stations within each bridge reach (a total of 540 stations) and 30 wetland soil stations). However, a total of 618 stations were sampled (which resulted in 1,252 floodplain upland and wetland soil samples).

In May/June of 2011, at the request of the EPA, 82 additional floodplain soil samples were collected to fill data gaps that would answer potential human health exposure questions. Sampling was conducted in seven properties, including two former mill race locations [North Park and KNK (Brenneman)].

All floodplain and wetland soil samples collected during the 2008 and 2011 investigations were analyzed for THg. In general, MeHg concentrations are low in upland soils and increase as the soil solution volume increases, such as in soils from wetlands or riparian zones (Skylberg et al. 2003). For this reason, soil samples from upland areas were analyzed for THg, and wetland samples were analyzed for THg and MeHg.

In a March 19, 2013 letter, the EPA requested additional sampling of floodplain soils from properties with either no or limited soil data. EPA had conducted a review of properties along the South River from Waynesboro to Port Republic, using aerial views overlaid with the 5 year floodplain interval. The objective was to identify homes/properties and parks within the 5 year floodplain, and then evaluate whether there was sufficient surface soil data to support a human health risk assessment. EPA selected the 5 year floodplain interval since surface soil mercury results that exceed the EPA Regional Screening Level (SL) for residential soil (23 mg/kg) are generally within the 5 year floodplain. DuPont met with EPA on April 17, 2013 and provided a path forward for sampling based on available data and use of the properties in the area. Responsibility for the site transitioned from EPA to VADEQ in September 2013. Subsequently, VADEQ reviewed EPA's request and conducted a site field visit (October 23, 2013). The purpose of the field visit was to verify or modify EPA's recommendations based on actual site conditions. VADEQ provided specific recommendations to DuPont in an email dated November 7, 2013. A follow-up meeting was held with VADEQ on December 2, 2013 during which a mutually agreed upon path forward (including the location and number of

samples) was developed. As a result and in accordance with the approved 2014 *Floodplain Soil Investigation Work Plan* (URS, 2014b), 68 additional floodplain soil samples from 34 locations were collected and analyzed for THg in April 2014.

Floodplain soil sample location figures are provided in [Appendix D](#). These figures detail floodplain soil sampling locations collected between 2003 and 2014. In summary, findings from floodplain soil investigations indicate that THg concentrations in the floodplain soil samples:

- Decreased with increasing distance into the floodplain from the river and increasing distance downstream from the site
- Were highest in the 2- and 5-year floodplains and tend to be the highest in forested areas
- Were similar in floodplain wetlands and surrounding floodplain
- Attenuated with depth so that a release to underlying alluvial groundwater has not been shown (AECOM, 2015a)

As a result, the relationship between soil mercury concentrations and soil depth is well understood within AOC 4 (SRST, 2009). Vertical sampling was performed from the surface to a 76 cm (2.5 feet) depth in 15 cm (6 inch) intervals (i.e., 0-0.5, 0.5-1.0, 1.0-1.5, 1.5-2.0, and 2.0-2.5 feet). Additional deeper sampling (depths up to 8 feet) was also conducted on several properties. The scope of vertical sampling was selected consistent with the CSM where mercury was transported along the South River as suspended solids during storm events. These solids settled out and were then deposited and stored as floodplain soils. Locations for deeper interval sampling (greater than 2.5 feet) were focused at depositional areas. However, the maximum depth to which mercury extends has not been established on some of the individual properties sampled in AOC 4.

### 3.1.5 Floodplain Groundwater

Plant site alluvial groundwater has been thoroughly evaluated as part of the on-site RFI, and on-site alluvial groundwater as a source to the river is unlikely. However, impacted floodplain soil downstream of the plant site may be an ongoing source of mercury to groundwater through leaching by rainwater infiltration (Grosso, 2006). Since 2005, investigations of off-site alluvial groundwater have been conducted to evaluate alluvial groundwater interactions with surface water; determine alluvial groundwater mercury contributions to the South River; and, understand the processes that govern biogeochemical transformation and mobilization of mercury from river bank soils in the South River. These investigations have included the following:

- 2005 Genicom Property [located at relative river mile (RRM) 2.6] Study conducted by EPA and USGS
- 2006 Shifflett Property Study (located at RRM 3.5) conducted by EPA and USGS
- 2006/2007 Basic Park Study (located at RRM 2) conducted by SRST
- 2013 RRM 3.5 (Shifflett Property) Study conducted by SRST

THg (total) and THg (dissolved) were analyzed in four monitoring wells installed on the Genicom property (November 2005 sampling event) and 18 temporary monitoring well locations installed on the Shifflett property (October 2006 sampling event). MeHg (dissolved) was also analyzed at the 18 Shifflett locations. THg (dissolved) and MeHg (dissolved) were analyzed in six locations at Basic Park (September 2007) and one location at the Forestry Center (April 2007). Additional data were also collected at Basic Park and the Forestry Center during other sampling events. Shallow alluvial groundwater sample locations are shown in [Appendix D \(Figure D-1\)](#).

### 3.1.6 Floodplain Ponds Surface Water, Sediment and Fish Tissue

Similar to floodplain soil, EPA requested additional sampling of pond surface water, sediment and fish tissue to fill data gaps associated with potential human health exposure pathways. Field reconnaissance of the 15 ponds recommended for sampling by EPA was conducted in August 2010 to determine the likelihood of complete human exposure pathways based on the potential presence of mercury and human use of the ponds. Few ponds are used actively for fishing, and most are remote or used as cow ponds. As a result, ten ponds were identified for sampling. Of these and based on discussions with EPA during the project planning, one pond (the Wertman pond) was selected to assess the sediment pathway and to determine the need for additional sampling.

Between May 2011 and June 2011, 27 surface water samples and 47 fish tissue samples were collected from nine pond locations. Landowner access was not granted for the tenth pond location (located at RRM 9.6). The locations of the ponds and surface water and fish stations, which were sampled between RRM 4.2 and RRM 22.1, are provided in [Appendix D \(Figures D-2 and Figure D-3\)](#). As noted above, Wertman Pond, located at RRM 9.4, was the only pond where sediments were collected and analyzed. Sediment sampling locations are shown in [Appendix D \(Figure D-4\)](#).

Three surface water samples and two dominant species of edible sized game fish (e.g., bass, sunfish, crappie, and catfish) present were sampled from each of the nine pond locations. Fish tissue was analyzed for THg and MeHg. Surface water samples were analyzed for total and dissolved THg and MeHg. Six surficial sediment samples were collected from Wertman Pond.

The findings of these investigations are discussed in *Technical Data Summary Memorandum: Floodplain Soil and Pond Investigation* (URS, 2012b).

### 3.1.7 Floodplain Crops

In 2003 and 2004 a garden study was conducted along the South River at the Augusta Forestry Center (RRM 11.58). The objective of the study was to evaluate garden crop mercury uptake and potential exposure from consumption of garden crops grown in the floodplain soils. The Augusta Forestry Center was specifically chosen as a study area since soil concentrations measured during floodplain soil investigations were above EPA Regional Screening Levels (SLs) for residential soil (Berti et. al, 2012) and overbank sediment accumulation rates are higher than the overall average because the site is located upstream of a former mill dam (Pizutto et. al, 2006). Soil concentrations in the study area ranged between 4.2 mg/kg to 78 mg/kg.

The study covered two growing seasons and 17 different crops in both test and reference gardens (see [Appendix D, Figure D-5](#)). Each crop in the floodplain garden was planted in four replicate plots using a completely randomized design in 2003. In 2004, the design was modified to a randomized complete block based on soil mercury concentrations measured in samples collected from November 2003. A layout of the garden planting is provided as [Figure D-6](#).

Information from the Virginia Cooperative Extension Service was used to help select popular crop species and growing methods for this region in the State of Virginia (Berti et. al, 2012). Fully-grown, edible portions of lettuce, squash, cabbage, green pepper, spinach, tomato, sweet corn, onion, radish, and carrot were harvested in 2003. In 2004, beets, turnips, potatoes, scallions, cauliflower, bush peas, and bush beans were added to list of crops planted. Sweet corn was not planted in 2004 to make room for the additional crops. The parts of the crops normally consumed were harvested from each of the sample plots.

More detailed discussion of the garden study and its findings can be found in *Evaluation of Garden Crop Mercury Uptake and Potential Exposure from Consumption of Garden Crops Grown on Floodplain Soils* (Berti et. al, 2012) and *Eating Vegetables Grown on the South River Floodplain* (SRST, 2010).

### 3.1.8 Floodplain Area Livestock, Poultry and Wildlife

The SRST has evaluated the potential for mercury to be present in other potential food sources that people may eat, such as livestock (beef and dairy), wild game and poultry. Historically, mercury was not found in edible portions of cattle (Virginia Department of Agriculture and Consumer Services, 1981). However, sampling was limited in the study, so additional investigation was conducted to confirm these findings. Less information is known regarding mercury concentrations in wildlife other than fish. As a result, the SRST has sampled wild game, such as deer, geese and ducks, and other wildlife (such as turtles and muskrats) to evaluate mercury uptake in this potential food source.

#### Livestock

Shortly after mercury was discovered on the floodplain in the 1970s, samples of milk and edible portions of a limited number of cattle (one test and one control) that grazed in the area were analyzed for mercury. No mercury was detected. However, details from these early investigations are lacking, and sampling appears to have been limited. In addition, analytical laboratory methods for mercury were less developed than today. As a result, an additional investigation of this issue was deemed necessary to provide a more up-to-date, and technically sound information base.

First, a literature review was completed to evaluate what other studies have found on the potential uptake of mercury by both domestic and wild animals that are consumed by people. Important findings from the literature review, which is included in [Appendix B](#), included the following (URS, 2012c):

- Domestic, game, and subsistence animals, as well as animal products generally display a narrow range of THg and MeHg concentrations in areas with no known or suspected impacts of mercury in environmental media.

- Study results indicate that game and subsistence animals can accumulate mercury from their environment, and the amount accumulated reflects, in part, the concentrations in soil.
- Within organisms, both inorganic mercury and MeHg partition preferentially to liver and kidney over other tissues, including muscle, blood, eggs or milk.
- The body burden resulting from an exposure to a MeHg dose is higher than that resulting from an equivalent inorganic mercury dose.
- Laboratory dosing studies and studies of mercury uptake from impacted environments demonstrate that ingestion is the most important pathway for mercury accumulation.
- Other environmental factors contribute to the accumulation of mercury, such as free-range foraging in poultry, and seasonal variation in food availability and preferences in game animals.

The results of the literature review were used to develop the sampling program, which was detailed in the November 2012 *Survey of Mercury in Edible Portions of Cattle from the South River Floodplain*. As part of the sampling program, livestock samples were collected in May 2013 (beef) and September 2013 (dairy) from cattle operations located in the South River floodplain. Two types of livestock (beef) samples [muscle tissue and organs (liver, kidney and heart)] and milk samples were collected and analyzed for THg and MeHg.

The muscle tissue and organs selected for sampling were based, in part, on the findings of the literature review. As presented in [Appendix B](#), dose partitioning results show notably higher percentages of inorganic mercury and MeHg in the liver and kidney over other tissues (such as the brain). This finding was observed in radiotracer-based studies in cattle (Ansari et al., 1973; Neathery et al., 1974; Stake et al., 1975; Crout et al., 2004), in studies of cattle grazing on impacted soil (Lopez-Alonso et al., 2003), and poultry fed organomercurials (phenyl mercury) (Marretova et al., 2003). Laboratory dosing studies also indicate low MeHg partitioning to food products. In both cows (Neathery et al., 1974) and goats (Neathery and Miller, 1975; Howe et al., 1972), less than one percent of ingested MeHg partitions to milk (URS, 2012c).

Samples in the study area were collected from one culled animal (designated with the prefix CC in the data set) and one market steer (designated with the prefix MS in the data set). Samples were also obtained from two reference locations (designated with the prefix PF or GS in the data set). Muscle tissue from the tenderloin and rear hind quarters was collected from the market steer and ground beef was collected from the culled animal. Similar cuts were also collected from the reference locations.

Milk samples were collected one dairy in the study area and from two reference locations.

Fur clips were also collected during the livestock sampling to determine whether this non-lethal sampling method may be applicable for any future investigations. There is limited information on non-lethal biomarkers in domestic animals, but the available information suggests that fur reflects the mercury dose (Wright et al., 1973). The findings

of fur analysis are not applicable to the HHRA and, as a result, are not evaluated further in this report.

## Wildlife

As part of sampling programs conducted between 2008 and 2011, tissue (muscle) and organ (liver) samples were collected from waterfowl (Canada goose, Mallard and Wood Duck) and white-tailed deer to determine THg and MeHg concentrations in edible portions of these game typically consumed as a result of hunting on the floodplain. During the investigation, samples were collected from 10 Canadian geese (*Branta canadensis*), 11 Mallards (*Platyrhynchos*), eight Wood Ducks (*Sponsa*) and four white-tailed deer (*Odocoileus virginianus*). Two additional white-tailed deer samples were also collected upland from the study area. Sampling was conducted by VADEQ consistent with the approach and collection methods outlined in *Waterfowl Collection Sample Preparation* (DuPont CRG, 2008) and *Survey of Mercury in Edible Portions of Wildlife Specifically Deer from the South River Floodplain* (SRST, 2009a).

Data collected as part of the Ecological Study for muskrat (*Ondatra zibethicus*), squirrel (*Sciurus niger* and *Sciurus carolinensis*) and snapping turtles (*Chelydra serpentine*) are also available to evaluate recreational hunter exposure pathways.

## Poultry

Between May 2014 and December 2014, the SRST conducted a Poultry Study at the Augusta Forestry Center (RRM 11.98). The objective of the study was to sample eggs and poultry (specifically chicken) muscle to determine the potential for chickens reared on the South River floodplain to accumulate mercury. The information can be used to inform decisions about exposure through potential food consumption of eggs and chickens reared on the floodplain.

Mature (i.e., of egg laying age) birds of common backyard breeds (Barred Rock, Red Star and White Leghorns) were reared in coops at the Augusta Forestry Center for a period of approximately 6 months. Eggs, organs and edible muscle from birds were sampled initially and at four other times over the six (6) months. Soils have been extensively sampled at the AFC and chickens were placed in coops that allow birds to forage in areas of mercury-impacted soils on the floodplain and separately in the non-impacted control area over the duration of the study. Supplemental feed required by these chickens were sampled at the start of the study. In addition, background samples of edible chicken parts and eggs were obtained from a local area farm (out of the contaminated area and not at the Augusta Forestry Center) and local area markets to provide context. Samples were analyzed for THg and MeHg. Feathers and blood were also sampled to evaluate non-lethal sampling methods. Results of these analyses will not be used in this HHRA.

The *Scope of Work: Evaluation of Mercury in Poultry from the South River Floodplain* (SRST, 2014) provides additional details regarding the sampling design and sampling methods.

### 3.1.9 Outdoor Air

An outdoor air study was performed to determine whether concentrations of mercury were elevated over background in the vicinity of the South River and its floodplain. The target area was also the location of the study evaluating mercury uptake by garden crops (August Forestry Center, RRM 11.8). The study took place between May and November in 2005 and 2006. A single station close to the garden study was used in 2005. In 2006, a second station was added. Findings of the study indicated that concentrations of mercury were below background levels in the vicinity of the South River and its floodplain (Turner, 2008).

This study is used qualitatively in the HHRA to support the transport mechanism discussion presented in Section 3.4.

## 3.2 Data Set for Risk Assessment

DuPont and VADEQ developed a framework for RDQAs specifically for the data sets to be used in the HHRA. The objective of the RDQA was to document that the analytical data collected during the SRST investigations is of sufficient quality for use in risk assessment. The data review consisted of two components: data usability and data completeness. The data usability portion of the review addressed overall data quality components such as analytical methods, quantitation limits, and quality control / quality assurance (QA/QC) procedures. The data completeness portion of the review addressed data quantity components such as sampling design and purpose, spatial distribution, and exposure pathway characterization.

This section identifies the data set which underwent the RDQA (Section 3.2.1) and the findings of the assessment (Section 3.2.2).

### 3.2.1 Summary of Data Set

The following environmental data were evaluated for use in the HHRA (see [Table 3-1](#)):

- South River Surface Water
  - 428 surface water samples (filtered/unfiltered) for THg analysis and 392 surface water samples (filtered/unfiltered) for MeHg analysis collected between January 2011 and December 2013 from bridges along the South River located at RRM -2.7 - -2.8, RRM 0.2-0.3, RRM 0.3 - 0.4, RRM 2.3 - 2.4, RRM 5-5.1, RRM 5.2 - 5.3, RRM 9.8 - 9.9, RRM 11.6 – 11.7, RRM 16.4 - 16.5, RRM 22 – 22.1, RRM 23.8 - 23.9 and RRM 26 - 27
- South River Sediment
  - 182 bulk surficial sediment samples for THg analysis and 99 bulk surficial sediment samples for MeHg analysis collected between May 2006 – April 2010 from locations sampled between RRM 0.1 to RRM 23.5. Samples were collected from a depth of 0 to 0.17 feet or 0 to 0.25 feet.
- South River Fish

- 648 fish tissue samples for THg analysis collected between May 2009 and October 2010 from four study sites (RRM 0.1, RRM 3.5, RRM 11.8, and RRM 23.5) and two regional reference areas, including SR-01 and MR-01
- 279 fish tissue samples for THg analysis collected between April 2012 and June 2012 from 8 study sites (between RRM 0.1 and RRM 22) and 2 regional reference areas, including SR-01 and NR-01
- 179 fish tissue samples for THg analysis collected between May 2014 and June 2014 from study sites located along the South River and SFS River, including one reference area.
- Floodplain Soil
  - Surface soil (from discrete intervals between 0 and 2 feet bgs) and subsurface soil samples (from discrete intervals greater than 2 feet bgs) collected from 893 soil boring locations during investigations conducted between April 2003 and April 2014.
  - A total of over 2,000 samples for THg analysis and over 70 samples for MeHg analysis.
- Floodplain Groundwater
  - 56 groundwater samples for THg (filtered) analysis, 18 groundwater samples for THg (unfiltered) analysis and 26 groundwater samples for MeHg (filtered) analysis collected from 26 locations sampled between September 2005 and September 2007 (RRM 2.1 – 11.58)
- Floodplain Pond Fish, Surface Water and Sediment
  - 47 fish tissue samples for THg and MeHg analysis collected in May 2011 from nine pond locations (RRM 4.2 -22.1)
  - 31 surface water samples for THg analysis (filtered and unfiltered) and MeHg analysis (filtered and unfiltered) collected in October 2006 and May 2011 from thirteen floodplain pond locations (RRM 3.1 – 22.1)
  - 6 surficial (from 0 to 6 inches) bulk sediment samples for THg and MeHg analysis collected in June 2011 from one floodplain pond location (Wertman Pond, RRM 9.4).
- Floodplain Crops
  - 139 samples for THg analysis collected from 17 different crop types harvested during two sampling events in August 2003 and December 2004 (RRM 11.58)
- Floodplain Area Livestock, Poultry and Wildlife
  - Beef - 12 Liver, 12 Kidney, 9 Heart and 27 Muscle samples for THg and MeHg analysis collected from 4 locations in May 2013
  - Milk – 9 milk samples for THg and MeHg analysis collected from 3 locations in September 2013

- o Poultry – 55 Liver, 52 Gizzard, 111 Muscle<sup>4</sup> and 138 egg samples for THg and MeHg analysis collected between June 2014 and December 2014
- o Waterfowl – 29 muscle samples and 29 liver samples for THg and MeHg analysis collected between September 2008 and October 2009
- o Deer – 6 muscle samples and 2 liver samples for THg and MeHg analysis collected between April 2010 and January 2011
- o Snapping Turtle – 120 muscle samples for THg and MeHg analysis collected between April 2010 and July 2011

THg and MeHg results from these investigations have been segregated in the screening tables referenced in Section 3.3, where applicable.

Bank soil data have been collected in river reaches 1 – 3, but were not further evaluated in this HHRA. Bulk sediment data collected at the toe of bank and within the river channel was available for use in the HHRA to evaluate potential South River sediment exposure pathways.

### 3.2.2 Data Quality Assessment

The purpose of the SRST QA/QC program was to ensure that collected data are both representative and valid. Data quality objectives (DQOs) are statements of the level of uncertainty that a decision-maker is willing to accept in results derived from environmental measurements. The uncertainty for sample parameter results may arise from a combination of factors, including sampling procedures, sample matrix characteristics, non-homogeneity of samples, and the inherent accuracy and precision limitations of analysis methods. DQOs are quantitatively and qualitatively described in terms of data quality characteristics (DQCs) (also referred to as data quality indicators), which include comparability, representativeness, precision, accuracy, and completeness. These characteristics are defined as follows:

- *Comparability*  
Comparability expresses the confidence with which one dataset can be compared to another. Data are comparable if siting considerations, collection techniques, measurement procedures/methods, and reporting are equivalent for the samples within a sample set. Data comparability was assured by the use of standard methods for sample collections, and standard procedures for laboratory analyses.
- *Representativeness*  
Representativeness expresses the degree to which sample data accurately and precisely represents a selected characteristic of a population, parameter variations at the sampling point, a process condition, or an environmental condition.

Representativeness is a qualitative parameter most concerned with the proper design of the sampling program. The representativeness criteria will be satisfied by collecting samples from potentially impacted media at appropriate locations,

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<sup>4</sup> 96 muscle samples were collected for MeHg and 111 muscle samples were collected for THg.

and by collecting a sufficient number of samples to fulfill each program's objectives. The rationale used to select representative sampling locations is described in each of the investigation Work Plans or Scopes of Work.

- *Precision*  
Precision is defined as the agreement between numeric values for two or more measurements that have been made in an identical fashion. The precision of field analyses were supported by adherence to the sampling and analysis procedures described in the respective Work Plans or Scopes of Work.
- *Accuracy*  
Accuracy is the measure of the bias in a system and can be defined as the degree of agreement between a measurement and an accepted reference or true value. The quality assurance objective with respect to accuracy for these analyses was to achieve the QC acceptance criteria of the analytical protocols.
- *Completeness*  
Completeness is a measure of the amount of the usable data obtained from the measurement system compared to the amount that was expected under normal conditions. Completeness is defined as the percentage of the total measurements that are judged to be valid in accordance with the methods used for analysis. The completeness objective is to generate a sufficient amount of valid data to support decision-making.

The approach for the RDQA was developed to evaluate data usability in terms of each of the above DQCs. The findings of the RDQA for each medium are provided in [Appendix C](#). For each RDQA, the following elements are included to document and support the assessment.

- Cover Sheet – For each medium, lists each project or study identified as applicable for the HHRA.
- Data Summary Table (DST) – Summarizes for each medium each applicable study, including the project objectives, sampling design, sampling dates and laboratory.
- Data Quality Checklists (DQC) completed for each study referenced.
- Data Usability Review (DUR) completed for each study or study group – Consists of a case narrative that discusses the findings of the automated DuPont Data Review (DDR) results, or if a DDR was not completed, then the findings of the manual QA/QC review.

The DDR is an internal review process used by DuPont's Corporate Remediation Group (CRG) Analytical Data Quality Management (ADQM) group to assist with the determination of data usability. The electronic data deliverables received from the laboratory were loaded into the Locus EIM™ database and processed through a series of data quality checks, which are a combination of software [Locus EIM™ database Data Validation Module (DVM)] and manual reviewer evaluations. The DDR essentially performs a summary level validation. Details of the DDR process are provided in the RDQAs included in [Appendix C](#).

As detailed in the RDQAs, with few exceptions, overall the data are acceptable for use with minor data validation qualifications added during the data review process. None of the data which underwent the automated DDR was qualified as unusable (R). Likewise, none of the data which was evaluated using a manual QA/QC reviewed was qualified as unusable. However, the following data sets were identified for use qualitatively in the HHRA.

- Floodplain Groundwater – *Genicom Facility (2005)* – Scope of work not available for review to confirm sampling methods
- Floodplain Groundwater - *Biogeochemistry Program (2013)* – Analytical data set not available to confirm data presentation findings (study is ongoing)
- Floodplain Soil –*Earthworm Studies* – Limited QA/QC supporting information was available
- Floodplain Area Wildlife - *Squirrels/Muskrats* – QA/QC supporting information was not available for review
- South River Sediment – *Geomorphological Study* - Sampling methods and QA/QC protocols could not be verified
- Outdoor Air – *Outdoor Air Study (2005)* - Limited QA/QC supporting information was available

In addition, in combining DQCs from sampling and analysis into a single assessment, potential issues regarding comparability were identified in the following areas:

- Samples of one medium collected using different sampling techniques (Fish)
- Samples of one medium analyzed by different analytical methods (Sediment)

Tables 3-2 and 3-3 provide a summary of studies evaluated in the HHRA and compare the sampling and analytical methods used for each study which formed that basis for recommendations to combine data. In evaluating the usability of a data set, issues regarding comparability were evaluated in context with other DQC findings (such as precision and accuracy) which were detailed in the RDQA. As a result, the potential for variability and bias in these data sets was not considered large.

An objective of the Phase II fish tissue sampling was to develop non-lethal sampling techniques to reduce impacts of intensive monitoring on local fish populations. An important aspect of developing this technology for the South River was to ensure that samples collected by one method are comparable to another (e.g., filets). For this HHRA, data collected by mid-dorsal dermal biopsy punches was transformed using the process described below to convert the biopsy data to filet fish concentrations.

- In 2009, three smallmouth bass filet samples that were collected in 2007 were re-analyzed in triplicate, i.e., and had three biopsy plugs were collected from the tissue of each of three frozen filets and analyzed by EPA Method 1631.
- The resulting data were used in a linear regression to predict filet concentrations. The regression indicated that THg concentration in biopsy plug samples was

highly predictive of filet THg ( $R^2 = 0.99$ ), but the regression slope suggested that biopsy samples were biased high.

- Also in 2009, biopsy plugs from approximately 600 smallmouth bass samples were collected. These data were converted to filet concentrations (i.e., “plug converted to filet”) using the regression described above.
- In order to determine if sample collection by biopsy plug could bias the THg concentration (e.g., through loss of moisture due to the higher surface area to volume ratio), the smallmouth bass samples were converted to filet; these the “plug converted to filet” data (from above) were compared to samples collected by filet using length as a covariate in an Analysis of Covariance (ANCOVA).
- The results of the ANCOVA indicated that although the y-intercepts were different between the two regressions, the differences were not consistent – biopsy plugs did not appear to systematically bias THg concentration. This was likely due to the small sample size of the prediction regression. It was recommended that more samples be collected where both biopsy plugs and filet samples were collected from the same fish.
- In 2014, approximately 200 smallmouth and largemouth bass were collected and sampled by both biopsy plugs and filet samples. These data were used to create a more robust statistical relationship between biopsy plug and filet data. Linear regression analysis of the paired plug-filet data set is included in [Appendix F](#).
- The 2014 linear regression was then used to convert the 2009 biopsy plug data set (of approximately 600 smallmouth and largemouth bass) to filet concentrations (largemouth bass, THg,  $y = 0.637x + 263.72$ ,  $R^2 = 0.93$ ; largemouth bass, MeHg,  $y = 0.6716x + 237.76$ ,  $R^2 = 0.93$ ; smallmouth bass, THg,  $y = 0.6993x + 89.986$ ,  $R^2 = 0.89$ ; smallmouth bass, MeHg,  $y = 0.7168x + 85.663$ ,  $R^2 = 0.90$ ). Conversion calculations are also provided in [Appendix F](#) with the fish data set.

For total mercury analysis in sediment, sediment was analyzed in a portion of the studies using EPA Method 1631 and in a portion of the studies using EPA SW846 Method 7471A. Split samples were not collected and analyzed for both EPA Method 1631 and EPA SW846 Method 7471A during the studies to assess comparability. Therefore, this discussion provides a qualitative evaluation in regards to comparability.

Both analytical methods use cold vapor atomic spectrometry instrumentation. However, EPA Method 1631 uses atomic fluorescence, rather than atomic absorption, which allows for the achievement of lower detection limits. Other than the lower detection limit achieved by EPA Method 1631, the methods are comparable in their ability to detect mercury in sediment. For both methods, detection limits were less than the screening levels. Both methods for the analysis of sediment use the same sample preparation and digestion methods (aqua regia) and both methods use the same type of QA/QC samples, frequency and performance criteria to evaluate method performance and assess accuracy and precision (such as blanks, laboratory control standards, matrix spikes, duplicates and calibration verification).

In regards to sensitivity, Section A.1.4 in the Appendix to EPA Method 1631 states the following “...*Because Hg concentrations in solids are typically  $10^3$  -  $10^7$  times higher*

*than those found in aqueous samples, the sensitivity provided by the dual amalgam trap system and fluorescence detector described in Method 1631B may be more sensitive than necessary, and a single trap and/or cold vapor atomic absorption spectroscopy (CVAAS) instrument may be adequate...*”As a result, sediment data from the methods were combined for the risk assessment.

Issues regarding comparability are also addressed further as part of the Uncertainty Evaluation provided in Section 7.

### 3.3 Distribution of Mercury in AOC 4 and Identification of COPCs and Media of Concern

As discussed in Section 3.1, THg and MeHg are the potential COPCs for AOC 4. Consequently, the purpose of this Section is to compare THg and MeHg concentration to the following screening criteria consistent with current EPA Region 3 and VADEQ guidance to identify environmental media to be evaluated further in this HHRA. Exceedances of screening levels do not in themselves indicate that an unacceptable exposure exists. Rather, the screening levels serve to indicate potential concerns for human exposure to be evaluated further in the risk assessment. If the maximum THg or MeHg concentration was less than the screening level in the medium, then the medium was eliminated as a medium of concern in the HHRA.

#### 3.3.1 Screening Criteria

##### South River and Floodplain Pond Surface Water

Surface water THg or MeHg concentrations were compared to the following EPA Regional Screening Levels (SLs) for tap water (EPA, 2015a) and Federal Maximum Contaminant Levels (MCLs).

| Analyte | Tap Water SL (ug/L) | Federal MCL (ug/L) |
|---------|---------------------|--------------------|
| THg     | 5.7                 | 2                  |
| MeHg    | 2                   | -                  |

The SLs were based on a hazard quotient (HQ) of 1 (for non-carcinogens). The HQ of 1 was considered appropriate for the screening because only two non-carcinogenic site-related constituents (THg and MeHg) are being evaluated. Therefore, cumulative effects of multiple non-carcinogens (which might otherwise suggest using a lower HQ of 0.1) are not a concern.

The SL for mercuric chloride was used for comparison to THg concentrations.

### South River and Floodplain Pond Sediment

Generic human health screening criteria for sediment is not available. As a result, sediment THg or MeHg concentrations were conservatively compared to the following EPA SLs for residential soil.

| Analyte | Residential Soil SL (mg/kg) |
|---------|-----------------------------|
| THg     | 23                          |
| MeHg    | 7.8                         |

Similar to surface water, the SL for mercuric chloride was used for comparison to THg concentrations.

As documented in each of the RFI Reports submitted to EPA for the Waynesboro Plant (DuPont, 2003; DuPont, 2007; DuPont, 2008; URS, 2013), the presence of elemental mercury has been confirmed at two on-site solid waste management units (SWMUs) (SWMUs 1 and 4). A review of observational data combined with the screening of soil cores for mercury vapor performed as part of the site characterization identified measurable mercury vapor readings at three additional units (SWMU 7 and AOCs 1 and 2). Elemental mercury was not identified at any of the other on-site units.

Because portions of the storm sewer system receive drainage from areas that include the former operating units, the potential existed for mercury migration to the on-site sewers. The Sewer Investigation identified elemental mercury in portions of the Pumphouse Sewer and Chemical Sewer in the area of the former Chemical Building and former Mercury Recovery Area. However, elemental mercury was not identified in the sewers which drain to Outfalls 003, 010, and 011 (URS, 2011). Elemental mercury has also not been identified in bank soil or river sediment samples (URS, 2012a).

The SRST has conducted mercury speciation in representative South River soils and sediments using selective chemical extraction (SCE) procedures. The purpose of the speciation was to understand the potential bioavailability of inorganic mercury in soil and sediment in the South River watershed. The findings of the study are described in the technical monograph *Speciation and Bioavailability of Inorganic Mercury in South River Soil, Sediments and their Extracts* (SRST, 2009b). Results for the soil samples indicated that most of the total mercury was bound in refractory compounds such as mercuric sulfide, which is less soluble and less bioavailable than mercury salts (such as mercuric chloride). Hence, the more conservative SL for mercuric chloride was used for comparison to THg concentrations.

### South River and Floodplain Pond Fish

THg concentrations in fish tissue were compared to the VDOH guideline of 0.5 mg/kg<sup>5</sup>. MeHg fish tissue concentrations were compared to the 9 VAC 25-260 Virginia Water Quality Standards (WQS) and the EPA National Recommended Water Quality Criteria (WQC) value of 0.3 mg/kg (as wet weight in edible tissue). The WQS and WQC are the basis for the TMDL value discussed in Section 6.4.

### Floodplain Soil

Floodplain soil THg and MeHg concentrations were compared to the following SLs for residential soil (EPA, 2015a).

| Analyte | Residential Soil SL (mg/kg) |
|---------|-----------------------------|
| THg     | 23                          |
| MeHg    | 7.8                         |

The SL represents a combined exposure, including inhalation of particulates and volatile compounds, dermal absorption, and ingestion. The SLs were based on a HQ of 1 (for non-carcinogens). Floodplain soil data collected on current industrial properties were also compared to SLs for industrial soil.

THg concentrations were also compared to the human health SL of 17 mg/kg, which is also protective of multi-pathway exposure (ingestion, dermal contact and inhalation). This site-specific SL was recommended by VADEQ in a memorandum to DuPont dated July 3, 2014.

### Floodplain Area Groundwater

Floodplain groundwater THg and MeHg concentrations were compared to the following EPA SLs for tap water and Federal MCLs.

| Analyte | Tap Water SL (ug/L) | Federal MCL (ug/L) |
|---------|---------------------|--------------------|
| THg     | 5.7                 | 2                  |
| MeHg    | 2                   | -                  |

<sup>5</sup> <http://www.vdh.state.va.us/epidemiology/DEE/PublicHealthToxicology/documents/pdf/Mercury.PDF>

Similar to soil, the SL for mercuric chloride was used for comparison to THg concentrations. Likewise, the tap water SL was based on a HQ of 1 (for non-carcinogens).

### Floodplain Area Food Sources

Screening criteria is not available for comparison to THg and MeHg concentrations in livestock, wildlife (waterfowl, deer or snapping turtles) or garden crops.

### 3.3.2 Identification of COPCs in South River Surface Water

As outlined in Section 3.1, surface water data have been collected from the South River, including upgradient (control) locations, under a variety of conditions. A statistical summary of THg concentrations and MeHg concentrations measured in South River surface water is provided as [Table 3-4](#). The analytical data set is provided in [Appendix E](#). Surface water sample locations are detailed in [Appendix D \(Figure D-7\)](#).

As shown on the table, concentrations of THg in surface water ranged from 0.00026 µg/L to 0.53 µg/L (total). Concentrations of MeHg in surface water from 0.000021 µg/L to 0.00352 µg/L (total). Concentrations of both constituents were below the conservative drinking water screening criteria (tap water SL or MCL).

Therefore, South River surface water not retained for further quantitative assessment in this HHRA.

### 3.3.3 Identification of COPCs in South River Sediment

Approximately 182 bulk sediment samples were collected during investigations conducted between May 2006 and April 2010. Sediment samples were collected in river Reach 1 (RRM 0.5-2), Reach 2 (RRM 2-5), Reach 3 (RRM 5-10) and Reach 6 (RRM 20-25) for analysis of THg and MeHg. Surficial sediment was collected from a depth of 0 to 0.17 feet or 0 to 0.25 feet, depending on the location and sampling event. The analytical data set is provided in [Appendix E](#).

[Table 3-5](#) summarizes THg and MeHg analytical results in South River sediment and provides a comparison to screening criteria by river reach. As indicated in the table and discussed below, THg was detected above the screening criteria (SL for residential soil, 23 mg/kg) in three reaches. MeHg concentrations were less than the screening criteria (7.8 mg/kg).

- Hopeman Parkway to Holsinger Farms Footbridge (2 – 5) – Fifteen (15) exceedances were observed in this reach in samples collected at RRM 2.1-2.2, RRM 2.9-3, RRM 3.4-3.5, RRM 3.6-3.7 and RRM 4.3-4.4. THg concentrations ranged between 0.0715 mg/kg and 99.6 mg/kg.
- Holsinger Farms Footbridge to New Hope-Crimora Road (5 – 10) – Nineteen (19) exceedances were observed in this reach in samples collected at RRM 5.3-5.4, RRM 8.5-8.6, RRM 8.6-8.7, RRM 9.4-9.5, RRM 9.7-9.8, RRM 11.5-11.6 and RRM 12.7-12.8. THg concentrations ranged between 0.197 mg/kg and 418 mg/kg.

- Grand Cavern to Port Republic Road (20 – 25) – Two (2) exceedances were observed in this reach in samples collected at RRM 23.5. THg concentrations were 24.1 mg/kg and 24.2 mg/kg.

### 3.3.4 Identification of COPCs in South River Fish

Fish tissues samples collected during the most recent VADEQ fish tissue monitoring program (2012) and the Phase II Ecological Study (May 2009 – May 2011) was used in the HHRA.

During the VADEQ fish tissue monitoring program, fish were collected at 19 stations between April 2012 and June 2012 for the South River mercury monitoring project. Target species were smallmouth bass, redbreast sunfish, and white suckers. Trout were also collected at two stocking sites on South River. As a result, 279 fish (including control areas) were sampled for tissue mercury concentrations in AOC 4.

During the Phase II Ecological Study, the species targeted for collection were the smallmouth bass, largemouth bass, and redbreast sunfish. In total, more than 600 fish were sampled for tissue mercury concentrations across four study sites and two seasons from 2009 to 2011.

[Table 3-6](#) provides a statistical summary of the THg concentrations. The analytical data set is provided in [Appendix F](#). Fish tissue monitoring stations from the Phase II Ecostudy are detailed in [Appendix D \(Figure D-7\)](#).

As detailed in the table, concentrations of THg in fish tissue are above the consumption advisory levels in both data sets. Concentrations of THg ranged from 0.179 mg/kg ww to 4.74 mg/kg ww in sunfish, 0.088 mg/kg ww to 7.12 mg/kg ww in smallmouth bass and 0.0587 mg/kg ww to 6.58 mg/kg ww in largemouth bass.

### 3.3.5 Identification of COPCs in Floodplain Area Soil

As part of investigations conducted between 2003 and 2014, over 2,000 soil samples (surface and subsurface) have been collected along 25 miles of the South River watershed within the floodplain areas ([Appendix D](#)). The distribution of THg and MeHg in these soil samples is discussed in the following sections.

#### Surface Soil

Of the 1,946 surface soil samples (defined as intervals collected between 0 and 2 feet bgs) collected for THg analysis during the sampling events, only a limited portion (~16%) exceeded the SL of 17 mg/kg, and only four samples were above the SL for industrial soil of 350 mg/kg (see [Table 3-6](#)).

[Table 3-7](#) compares THg in surface soil to the screening criteria by floodplain and reach. [Table 3-8](#) compares THg to the screening criteria by land use and inundation area. Floodplain soil sample locations are detailed in the figures provided in [Appendix D](#). The analytical data set is provided in [Appendix E](#).

As detailed in the tables, THg concentrations detected above the SL (17 mg/kg) for each of the six river reach areas are as follows:

- Main Street to Hopeman Parkway (RRM 0.5 – 2) – The second greatest number of exceedances (91) were observed in this area. THg concentrations ranged between 0.0118 mg/kg and 714 mg/kg. Land use in this reach consists of developed/high intensity (commercial/industrial), open space<sup>6</sup>, forest or wetlands. The maximum detected concentration in this area was also above the industrial soil SL (350 mg/kg). The location (MN-FP-61) was observed in near surface soil (collected from 1 to 1.5 feet bgs) collected in a forested portion of an area known as the Oxbow.
- Hopeman Parkway to Holsinger Farms Footbridge (RRM 2 – 5) – Fifty-six (56) exceedances were observed in this reach. THg concentrations ranged between 0.0121 mg/kg and 403 mg/kg. Land use in this reach consists of developed/high intensity (commercial/industrial and residential), open space, forest, pastureland/hayfields or wetlands. Most exceedances were observed in the 2-yr floodplain inundation area in pastureland/hayfields.
- Holsinger Farms Footbridge to New Hope-Crimora Road (RRM 5 – 10) – Twenty-one (21) exceedances were observed in this reach. THg concentrations ranged between 0.0137 mg/kg to 46.4 mg/kg. Land use in this reach consists of open space, cultivated crops, pastureland/hayfields, forest or wetlands. Most exceedances were observed in the 2-yr floodplain, forested areas.
- New Hope-Crimora Road to Paterson Mill (RRM 10 – 16) – The greatest number of exceedances (109) were observed in this reach. THg concentrations ranged between 0.0078 mg/kg and 124 mg/kg. Land use in this reach consists of cultivated crops, open space, pastureland/hayfields, forest or wetlands. Most samples within this reach were collected at the Augusta Forestry Center (RRM 11.58), where one of the highest concentrations (94.3 mg/kg) was also observed. The maximum detected concentration (124 mg/kg), however, was observed at August Park Crimora.
- Patterson Mill to Grand Cavern (RRM 16 – 20) – Six (6) exceedances were observed in this reach. THg concentrations ranged between 0.0138 mg/kg and 44.4 mg/kg. Land use in this reach consists of open space, pastureland/hayfields, forest or wetlands. The maximum detected concentration was observed in the 2-yr floodplain in a wetland area.
- Grand Cavern to Port Republic Road (RRM 20 – 25) – Twelve (12) exceedances were observed in this reach. THg concentrations ranged between 0.0185 mg/kg and 72.5 mg/kg. Land use in this reach consists of open space, forest, pastureland/hayfields or wetlands. Most exceedances were observed in the 2-yr floodplain inundation area in open space (KNK property).

Table 3-9 compares MeHg in surface soil to the screening criteria by floodplain and reach. Floodplain soil samples collected within wetland areas are included in this data set. As shown in the table, MeHg concentrations (maximum detect of 0.0318 mg/kg) were less than the screening criteria (7.8 mg/kg).

<sup>6</sup> Open space includes residential areas and recreational areas (parks and a dirt motorcycle track).

## Subsurface Soil

Seventy-six subsurface soil samples (defined as intervals collected between 2 and 12 feet bgs) were collected for THg analysis during the sampling events. Subsurface soil samples were collected in the first four river reaches. As indicated in [Table 3-7](#), a limited portion (~22%) exceeded the SL of 17 mg/kg, and only one sample was above the SL for industrial soil of 350 mg/kg.

[Table 3-7](#) compares THg in subsurface soil to the screening criteria by floodplain and reach. Floodplain soil sample locations are detailed in the figures provided in [Appendix D](#). The analytical data set is provided in [Appendix E](#).

As indicated in the tables, most exceedances were observed in Reach 2 (Hopeman Parkway to Holsinger Farms Footbridge: RRM 2-5). However, consistent with surface soil, the maximum detected concentration of 400 mg/kg was observed in Reach 1 (Main Street to Hopeman Parkway: RRM 0.5-2), at location (MN-FP-61) collected in the Oxbow.

[Table 3-9](#) compares MeHg in subsurface soil to the screening criteria by floodplain and reach. Floodplain soil samples collected within wetland areas are included in this data set. As shown in the table, similar to surface soil, MeHg concentrations in subsurface soil were less than the screening criteria.

### 3.3.6 Identification of COPCs in Floodplain Area Shallow Groundwater

[Table 3-10](#) summarizes THg (total and dissolved) and MeHg (dissolved) analytical results in off-site alluvial groundwater and provides a comparison to groundwater screening criteria. Shallow groundwater sample locations are detailed in [Appendix D](#) ([Figure D-1](#)). The analytical data set is provided in [Appendix E](#). Due to the shallow depth of groundwater in portions of the floodplain (~ 4 feet bgs), off-construction/excavation workers may come into contact with shallow groundwater during intrusive activities.

As shown in the table, THg and MeHg concentrations were less than the tap water SL and Federal MCL. For instance, the maximum detected concentration of THg was 0.778 µg/L (location SB-14). The tap water SL is 5.7 µg/L. Alluvial groundwater data collected during the most recent 2013 RRM 3.5 investigation are not included in the tabulation, since the data set was not available. However, a review of data presented during a meeting on February 25, 2014, does not indicate THg or MeHg concentrations above tap water SLs (reported maximum detected THg value was 0.538 µg/L) (Lazareva, 2014).

These findings are consistent with those observed on-site at the Waynesboro Plant. Groundwater monitoring on-site data indicate that the occurrence of mercury in groundwater is localized and related to known source areas (SWMUs 1, 4, and 7). The maximum detected concentration of THg in groundwater was observed at monitoring well location A at the Former Mercury Recovery Area (SWMU 1). While dissolved mercury has been detected above screening criteria, no widespread area of dissolved-phase mercury impact-to-groundwater (or “plume”) has been identified at the site (URS, 2013 and 2014a). In addition, total and dissolved mercury did not exceed tap water SLs at perimeter monitoring well locations (MW-15, MW-16, MW-18, MW-19, and MW-20, B, F, H and H’) (see [Appendix C](#), [Table C-5](#) in URS, 2014a).

Therefore, off-site shallow groundwater was not retained for further quantitative assessment in this HHRA.

### 3.3.7 Identification of COPCs in Floodplain Area Pond Fish, Surface Water and Sediment

#### Floodplain Area Pond Fish

Fish tissue samples were collected in May 2011 from edible-sized fish in nine pond locations (RRM 4.2 -22.1). The following four species were collected from the floodplain ponds: green sunfish, bluegill, largemouth bass, and redbreast sunfish. Largemouth bass was the most common species collected from seven of the nine ponds. Green sunfish and bluegill were collected from four of the nine ponds. Redbreast sunfish was collected only from the Meadows property pond. Pond locations are detailed in [Appendix D \(Figures D-2 and D-3\)](#).

Fish tissue results are presented in [Table 3-11](#). The analytical data set is provided in [Appendix F](#). Concentrations of both THg and MeHg in fish tissue are above the consumption advisory levels at all ponds except on the Schlappi property. Concentrations of THg ranged from 0.11 mg/kg ww to 1.51 mg/kg ww in sunfish, and 0.12 mg/kg ww to 3.69 mg/kg ww in largemouth bass. Concentrations of MeHg ranged from 0.08 mg/kg ww to 1.2 mg/kg ww in sunfish, and 0.11 mg/kg ww to 3.35 mg/kg ww in largemouth bass. Maximum concentrations of THg and MeHg were detected in fish tissue collected from the Yount property pond (RRM 7.7).

#### Floodplain Area Pond Surface Water and Sediment

Surface water samples were collected from nine floodplain pond locations in 2011. Ponds selected for sample analysis were determined based on a field reconnaissance conducted in August 2010 to determine the likelihood of complete human exposure pathways based on the potential presence of mercury and human use of the ponds. Surface water sample locations are shown in [Appendix D \(Figures D-2 and D-3\)](#). The analytical data set is provided in [Appendix E](#).

[Table 3-12](#) presents a comparison of the surface water analytical results to the screening levels. As shown in the table, concentrations of THg in surface water ranged from 0.0022 µg/L to 0.2938 µg/L (total). Maximum concentrations of THg were detected in surface water collected from the pond on the Meadows property located at RRM 6.9 (see [Appendix D, Figure D-2](#)). Concentrations were below conservative drinking water screening criteria (tap water SLs and Federal MCLs).

Concentrations of MeHg in surface water ranged from 0.000029 µg/L to 0.0255 µg/L (total). Maximum concentrations of MeHg were detected in surface water samples collected from the pond on the Yount property located at RRM 7.7 (see [Appendix D, Figure D-3](#)). Concentrations were below conservative drinking water screening criteria (tap water SLs and Federal MCLs).

Data collected from the 2011 investigation was consistent with that observed in floodplain ponds and a surface channel sampled by EPA in October 2006 at the Shifflett property (RRM 3.1-4.3). THg in the cow ponds and channel ranged between 0.0371 µg/L

and 0.281 µg/L and MeHg in the cow ponds and channel ranged between 0.0015 µg/L and 0.0035 µg/L (EPA Region 3, 2007).

During the floodplain investigation in 2011, sediment samples were collected from Wertman pond and analyzed for THg and MeHg. Concentrations of THg in sediment ranged from 1.68 mg/kg to 6.34 mg/kg, and concentrations of MeHg in sediment ranged from 0.00103 mg/kg to 0.016 mg/kg. The maximum concentrations of both constituents were collected at location WSR-E-BASE-C2 in the center of the pond (see [Appendix D, Figure D-4](#)). As shown in [Table 3-13](#), concentrations were below SLs for residential soil.

Based on these findings, floodplain pond surface water and sediment was not retained as a medium for further quantitative assessment in this HHRA.

### 3.3.8 Distribution of Mercury in Floodplain Area Food Sources

#### Floodplain Crops

The garden study was conducted to investigate mercury uptake from soil into the edible plant tissue of crops grown and harvested for human consumption and to evaluate the significance of this potential route for human exposure. As detailed in *Evaluation of Garden Crop Uptake and Potential Exposure from Consumption of Garden Crops Grown on Floodplain Soils* (Berti et. al, 2012), THg concentrations in most crop samples were very low (< 3 mg/kg) and often THg could not be detected (see [Table 3-14](#)). Based on the measured concentrations and several conservative assumptions (e.g., that all crops eaten were grown in soils with high mercury levels), it was determined that consumption of crops with these mercury levels is not expected to be a significant source of mercury exposure. These conclusions are consistent with other scientific studies associated with the uptake of mercury into food crops, suggesting that mercury uptake by edible crops is not a major route of exposure for people. However, potential exposure to floodplain crops was retained as a medium of exposure in the HHRA.

#### Floodplain Livestock

Livestock samples (beef and dairy) were collected in May 2013 (beef) and September 2013 (dairy) from cattle operations located in the South River floodplain.

During the May 2013 investigation, a total of 60 livestock samples [muscle tissue and organs (liver, kidney and heart)] were collected and analyzed for THg and MeHg. Samples were collected both from the study area and a reference area. The analytical data set is provided in [Appendix F](#).

[Table 3-15](#) provides a statistical summary of the data set. As shown in the table, THg concentrations ranged between 0.00069 mg/kg ww and 0.00229 mg/kg ww in muscle tissue (ground beef, hindquarter and tenderloin), and were higher in concentration in the kidney and liver than in the muscle tissue or heart. THg was also detected in both the study and reference areas.

MeHg concentrations in muscle tissue, which ranged between 0.00105 mg/kg ww and 0.0024 mg/kg ww, were slightly higher in the kidney; but, compared to THg, a distinct partitioning between muscle tissue and organs was not observed. MeHg was not detected in the reference area samples.

During the September 2013 investigation, a total of nine (9) milk samples were collected and analyzed for THg and MeHg. Similar to beef, samples were collected from both the study area and a reference area.

[Table 3-15](#) provides a statistical summary of the data set. As shown in the table, THg and MeHg were not detected in the milk samples. The analytical data set is provided in [Appendix F](#).

### **Floodplain Poultry**

Poultry samples were collected between June 2014 and December 2014 from the study area located in the South River floodplain at the Augusta Forestry Center. For each breed (Barred Rock, Red Star and White Leghorn), four sampling events were conducted: a baseline sampling and three subsequent sampling events. Reference samples were also collected.

During the investigation, a total of 356 poultry samples [muscle tissue, organs (liver and gizzard) and eggs] were collected and analyzed for THg and a total of 342 poultry samples were collected and analyzed for MeHg. Samples were collected both from the study area and a reference area. The analytical data set is provided in [Appendix F](#).

[Table 3-16](#) provides a statistical summary of the data set. As shown in the table, THg concentrations in the study area ranged between 0.00008 mg/kg ww and 0.002 mg/kg ww in muscle tissue (leg and breast), and were higher in concentration in the liver and gizzard. THg concentrations in eggs in the study area ranged between 0.00005 mg/kg ww and 0.12 mg/kg ww. THg was also detected in the reference areas (control and background).

MeHg concentrations in muscle tissue, which ranged between 0.00008 mg/kg ww and 0.0014 mg/kg ww, were slightly higher in the liver; but, compared to THg, a distinct partitioning between concentrations in muscle tissue and organs was not observed. MeHg concentrations in eggs in the study area ranged between 0.00007 mg/kg ww and 0.0029 mg/kg ww. MeHg was also detected in the reference areas (control and background). For example, MeHg concentrations in background samples ranged between 0.001 mg/kg ww and 0.0021 mg/kg ww.

### **Floodplain Wildlife**

Between September 2008 and July 2011, tissue samples were collected from waterfowl (Canada Goose, Mallard and Wood Duck), white-tailed deer and snapping turtles. [Table 3-17](#) provides a statistical summary of the data set. Concentrations of THg in muscle tissue ranged from 0.00305 mg/kg ww to 1.42 mg/kg ww in waterfowl, from 0.00014 mg/kg ww to 0.0014 mg/kg in white-tailed deer and from 0.0268 mg/kg ww to 7.65 mg/kg ww in snapping turtles. Concentrations of MeHg in muscle tissue ranged from 0.0036 mg/kg ww to 3.59 mg/kg ww in waterfowl. In white-tailed deer, MeHg was detected in one sample at a concentration of 0.0013 mg/kg ww. MeHg was not analyzed in snapping turtles.

### 3.4 Discussion of Primary Transport Mechanisms

Based on the chemical and physical properties of THg and MeHg in the floodplain and the known physical, topographic, meteorological, and hydrologic conditions in the AOC 4 area, potential migration pathways include the following: surface runoff, airborne transport, leaching, and groundwater migration. Each of these potential transport mechanisms (as well as ongoing efforts to understand and mitigate transport) are discussed within this section.

In addition, an important component of the CSM is illustrating how mercury is methylated through biological processes, and ultimately enters and bioaccumulates within members of the aquatic food web, such as fish that then may be consumed by human receptors. As a result, this section also includes a discussion of mercury methylation and bioaccumulation.

#### 3.4.1 Surface Runoff

Mercury loading to the South River that is attributable to on-site plant outfalls has been evaluated by the SRST.

The present day and historical dynamics between the South River and its floodplain are the primary drivers of mercury transport. Historically, mercury was released from the site during manufacturing and recycling of the mercury-based catalyst and then likely transported into and along the South River as suspended solids during storm events. These solids settled out and were deposited and stored as floodplain soils or as sediment in the stream bed and along the channel margins, often behind downed trees or other obstructions such as rocks, boulders, or storm-related debris piles. Over time, eroding river banks or re-suspended sediments have served as an ongoing source of suspended mercury-impacted sediment. Although the cycles of erosion and resuspension are continuous, some areas of sediment storage remained and became a more permanent part of the floodplain. In these areas, the sediment contains high concentrations of historical mercury (URS, 2012a).

Interim measures to address the stormwater-to-surface water transport pathway have been conducted on-site, and additional interim measures are underway. Additional off-site evaluation of this transport pathway by the SRST is ongoing, including a pilot project studying riverbank stabilization techniques.

#### 3.4.2 Airborne Transport

Airborne transport of particulates generated by wind erosion of floodplain area surface soils and physical disturbance of floodplain area surface and subsurface soils to downwind locations is a potential migration pathway. An off-site outdoor air study was completed by the SRST in 2005 and 2006 to evaluate this transport pathway. The objective of monitoring was to determine whether atmospheric concentrations of mercury are elevated over regional or global background in the vicinity of the South River and its floodplain at the Virginia Department of Forestry Station near Waynesboro. Findings of the study indicated that concentrations of mercury were below background levels in the vicinity of the South River and its floodplain (Turner, et al., 2008). However, this study,

which is being used qualitatively in the HHRA, does not eliminate the migration pathway or conclude in any way that this is not a potential transport mechanism.

As documented in each of the RFI Reports submitted to the agency (DuPont, 2003; DuPont, 2007; DuPont, 2008; URS, 2013) for the Waynesboro Plant, the presence of Hg(0) was confirmed at two SWMUs: SWMU 1 (Mercury Recovery) and SWMU 4 (Incineration Area). As discussed in Section 3.2.3 of the on-site HHRA (URS, 2014a), lines of evidence were used to determine the potential for mercury vapor to be present at 13 other units where Hg(0) has not been visually observed in soil.

Lines of evidence included a review of historical information at each of the corrective action units (such as history of mercury use, handling or disposal); observational field data (i.e., visual observation of mercury globules); and, evaluation of RFI soil screening mercury vapor data. During the RFI, screening of RFI soil cores for mercury vapor was conducted using a portable mercury analyzer (Jerome J405 or J431-X). All monitoring equipment was calibrated in accordance with manufacturer's instructions prior to the first use of the day and documented in the field logbook and/or air monitoring data sheets (e.g., specify calibration gas/flow rates). In addition, background levels were established before the field activities began. Mercury vapor readings were indicated on the boring logs included with each of the aforementioned RFI reports.

A review of the boring logs identified measurable mercury vapor readings in the screening of soil cores at only three other on-site units (SWMU 7 – Sludge Pond, AOC 1 and AOC 2, which are both drum storage pads) in addition to SWMU 1 (Mercury Recovery) and SWMU 4 (Incineration Area). Mercury vapors detected during screening of the soil cores at these five units generally had higher values associated with the presence of sources. Mercury vapor was not detected at the other 10 units.

Mercury vapor sampling has also been conducted along AOC 4 during sampling activities conducted in 2014, including recent soil sampling in Constitution Park and bank soil sampling. All mercury vapor readings were non-detect. The Jerome Analyzer used for the screening has an instrument sensitivity down to 0.003 milligrams per cubic meter (mg/m<sup>3</sup>).

### 3.4.3 Leaching

Leaching of mercury in floodplain soil to underlying shallow alluvial groundwater is a potential transport pathway. To evaluate the soil migration to groundwater pathway, THg concentrations in floodplain soils were compared to generic soil screening levels (SSLs) derived using equations provided in EPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (EPA, 2002a). The equations and SSLs are detailed in [Table 3-18](#). Consistent with EPA guidance, SSLs were derived for a dilution attenuation factor (DAF) of 1 (no attenuation/dilution) and a DAF of 20 (0.5-acre source area).

In addition to SSLs, direct observations of concentrations of THg in the soil column and in groundwater were conducted. Empirical groundwater data is more appropriate to evaluate the migration pathway than a comparison to the generic criteria, particularly taking into account how shallow alluvial groundwater is used. Paired soil and groundwater samples collected from 18 locations during the 2006 EPA investigation at

RRM 3.1 to 4.3 (Shifflett Property) were used. Locations are within the 2-year and 5-year inundation areas. Subsurface soil data have been collected at nine other properties (at depths between 2 and 10.5 ft bgs) within AOC 4. However, subsurface soil data collected at the Shifflett Farm Property were used for the evaluation since both groundwater and soil were available.

As shown in [Table 3-19](#), soil data collected from the investigation demonstrate decreasing THg concentrations to below the SSL with depth. THg was not detected above the SSL in subsurface soil samples collected at depths greater than 2.5 feet bgs. In addition, as detailed in [Table 3-10](#), THg was not detected in shallow alluvial groundwater above the tap water SL (5.7 µg/L) in the 18 monitoring wells sampled during the investigation.

Soil types described in boring logs at the Shifflett Property (see Attachment 2 in ICOR, 2007) are similar to those observed in on-site plant soils, where limited leaching to underlying groundwater has also been observed. The uppermost geologic unit at the plant is recent alluvium, which is comprised of floodplain and terrace deposits of the South River. This unit consists predominantly of fine to medium grained, silty sand and gravel as well as sandy silt and sandy clay (URS, 2013). Therefore, observations regarding leaching in on-site plant soils can be extrapolated to reflect off-site properties within AOC 4 with similar soil lithology.

On-site subsurface soil concentrations of THg were several orders of magnitude higher than those observed in floodplain soil (i.e., maximum detected concentration of 35,600 mg/kg in source area SWMU 4 and 4,000 mg/kg in source area SWMU 1). Based on Synthetic Precipitation Leaching Procedure (SPLP) data collected during the on-site RFI at potential source areas (including SWMU 1), SPLP concentrations were less than the tap water SL (2 µg/L for elemental mercury) in 10 of 13 samples; and, SPLP mercury was non-detect in the deepest subsurface soil sample interval collected at four of six boring locations (see Table 4-1 in DuPont CRG, 2003). In addition, no widespread area of dissolved-phase mercury impact-to-groundwater (or “plume”) has been identified on site. Dissolved-phase groundwater data are considered to be more representative of potential leaching from soil to groundwater.

Based on these observations and also that speciation of off-site floodplain soil indicates the presence of the less mobile metacinnabar, the potential for leaching of THg in floodplain soil to underlying groundwater is low. However, study of this transport pathway is on-going. As discussed in the AOC 4 RFI Report (AECOM, 2015a), Dr. Carol J. Ptacek of the University of Waterloo is conducting studies to further characterize mercury leachability from South River sediments and bank soils to groundwater and surface water. These studies are intended to improve the understanding of biogeochemical mechanisms influencing mercury release to surface water along the South River. Further details of the study can be found in the *Biogeochemical Research and Investigation Work Plan* (AECOM, 2015c).

#### 3.4.4 Groundwater Migration

Groundwater provides a potential mercury transport pathway from floodplain soils to the South River. Groundwater may account for 40-70% of river discharge in some reaches

(Grosso, 2006), but as noted above it has relatively low mercury concentrations (see Section 3.3.3).

Groundwater contribution to mercury transport is not as important as the potential mercury transport due to the groundwater flow in the hyporheic zone, in which groundwater and surface water interact within an open channel system. A 2006 Study by the SRST at RRM 3.5 (Shifflett Property) detected MeHg and THg in five of the nine monitoring wells. Concentrations ranged from  $< 0.0015$  to  $0.0258 \mu\text{g/L}$  for THg, and  $< 0.00004$  to  $0.00023 \mu\text{g/L}$  for MeHg in filtered groundwater samples.

The hyporheic zone includes river channel deposits that are primarily coarse-grained gravel and sand, but which store fine-grained sediment, in some locations, with high mercury concentrations. Hyporheic zones can be important for inorganic mercury storage and perhaps mercury methylation. Methylated mercury in these areas can flux from pore water to overlying water via advection and diffusion, or adsorb to particles in surface water, which can then serve as food items for detritus-feeding and filter-feeding aquatic invertebrates at the base of the aquatic food web. Due to the coarse materials present in the hyporheic zone, the direction and magnitude of water flow within these deposits may be affected by small-scale sediment features such as riffles or short-term weather pattern changes (e.g., precipitation events). These small-scale sediment features create a potential loading mechanism from the hyporheic zone to overlying surface water.

### 3.4.5 Mercury Methylation and Bioaccumulation

Mercury methylation is the primary mechanism that links the presence of mercury in media to biological receptors in the South River system. Mercury methylation is a biochemical reaction in which inorganic mercury is taken up by bacteria and converted to MeHg, which has different chemical, physical, and toxicological properties than inorganic mercury. A key difference between the two chemical species is that MeHg is much more efficiently bioaccumulated than inorganic mercury (URS, 2012a).

Mercury methylation is performed by anaerobic bacteria, including sulfate- and iron-reducing bacteria in anoxic or suboxic aquatic habitats. In the South River, areas of mercury methylation are diffuse throughout the system, and likely include limited areas of wetlands and remnant channels on the floodplain, fine-grained sediment deposits located in the channel, or the hyporheic zone (Flanders et al., 2010; Yu et al., 2011). While wetlands are not prominent features along the South River Floodplain, they are generally considered to provide favorable geochemical conditions for methylation (i.e., organic carbon, anoxic or suboxic sediment, and electron acceptors), and as such can be important sources of MeHg to ecological receptors foraging in wetlands, such as wading birds, invertebrates, and mammals. Drying/wetting cycles in the floodplain wetlands can promote methylation of mercury. For instance, the rewetting of wetland floodplain soils during wetter, spring months may stimulate MeHg production by increasing favorable geochemical conditions. Likewise, research suggests higher levels of MeHg in areas that flood at less frequent intervals (where more complete drying may take place between inundation events), than areas that do not become fully dry between inundation events (Alpers et. al, 2008).

Fine-grained sediment deposits provide favorable conditions for methylation and sequester high concentrations of inorganic mercury. Much of the channel margin area, particularly in the first few miles of the South River, consists largely of fine-grained sediment. The hyporheic zone, the area below the surface of the streambed also may be an important source of MeHg in aquatic systems due to a high surface area and the presence of fine-grained sediment within the gravel matrix of the hyporheic zone (URS, 2012a).

MeHg, once produced, can adsorb to particles or flux from sediment to pore water or overlying water via advection and diffusion. These particles can then serve as food items for detritus-feeding and filter-feeding aquatic invertebrates, which form the basis of the aquatic food web.

### 3.5 Identification of Potential Receptors and Exposure Points

An exposure pathway consists of the following:

- Source of constituents
- Mechanism of constituent release to the environment
- Transport or exposure medium containing the constituents
- Exposure point where human receptors can contact the exposure medium
- Exposure route (e.g., inhalation, ingestion, or dermal contact)

All of these elements must be present for an exposure to occur. The human health conceptual exposure model in [Figures 3-1, 3-2 and 3-3](#) show both potentially complete and incomplete pathways for each of the potential receptors identified in Section 3.5.1. A description of each of the potentially complete exposure pathways is provided in Section 3.5.2 by exposure medium. Incomplete exposure pathways are discussed in Section 3.5.3.

#### 3.5.1 Potential HHRA Receptors

Potential receptors are defined as human populations or individuals that are susceptible to contaminant exposure from the site. Both current and future land-use conditions were considered in determining exposure scenarios for the human health CSM.

Currently, AOC 4 land use consists of the South River, adjacent floodplains, ponds, and agricultural and residential properties ([Figure 3-4](#)). Vacant lands and the South River are utilized for recreation and hunting.

The land use composition of the South River watershed is 33% agricultural, 56% forested, and 11% developed. Wetlands cover 0.01% of the watershed, which is less than the coverage of open water (0.6%) and barren lands (0.05%; Fry et al., 2009). The area immediately adjacent to the South River predominantly consists of agricultural pastures and fields with a narrow border of trees along the banks, although riparian forests are present in some areas.

Future AOC 4 land use is expected to vary consistent with watershed development.

Given the AOC 4 site setting and land uses, the following potential human receptors were identified:

- Current/Future Industrial/Commercial Worker
- Current/Future Resident (Adult/Child)
- Current/Future Construction/Excavation Worker
- Current/Future Floodplain Area Hunter
- Current/Future Floodplain Area Farmer
- Current/Future Floodplain Area Recreational User (Adult/Child) (Floodplain Area Parks)
- Current/Future Floodplain Area Recreational User (Adult/Child) (South River)

In addition, hypothetical future residents (adult/child) were considered potential receptors for areas not currently used as residential to provide an upper bound estimate of potential risk. Likewise, at the request of VADEQ, a hypothetical future subsistence farmer was also considered. The farmer scenario assumed that all food items in the diet come from the area covered by the floodplain soils.

Sensitive receptors (such as daycare or nursing homes) have not been identified within AOC 4 where mercury has been found in floodplain soil (see [Appendix D Extent Maps for Reaches 1 - 6](#)). Therefore, these receptors were not considered potential receptors.

### 3.5.2 Potentially Complete Exposure Pathways

Based on the evaluation presented in Section 3.3, the following media were carried forward for further evaluation in the HHRA:

- South River Sediment
- South River Fish
- Floodplain Soil
- Floodplain Pond Fish
- Floodplain Area Garden Crops
- Floodplain Area Livestock (Beef and Milk)
- Floodplain Area Poultry (Eggs, Organs and Edible Muscle)
- Floodplain Area Wildlife (Waterfowl, Deer or Snapping Turtles)

A description of each of the potentially complete exposure pathways quantified in this risk assessment is provided below. The pathways presented herein are consistent with those discussed with VADEQ and DuPont during a conference call on April 1, 2014.

South River surface water, floodplain area shallow groundwater, floodplain pond surface water and floodplain pond sediment were not identified as media of concern in Section 3.3. However, pathways associated with each of these media are also described below for completeness.

## **South River Surface Water and Sediment**

Access to the South River shoreline by recreational users canoeing along the river and fishing in the river was considered in the risk assessment. Contact with South River surface water and sediment was also considered in the cumulative assessment for hypothetical future residents and hypothetical future subsistence farmers.

Potentially complete exposure pathways for South River surface water and sediment include:

- Current/Future Potential Recreational User (Adult/Child) (South River): Incidental ingestion of and dermal contact with South River surface water and sediment while fishing, swimming or wading.
- Hypothetical Future Resident (Adult/Child): Incidental ingestion of and dermal contact with South River surface water and sediment while fishing, swimming or wading.
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Incidental ingestion of and dermal contact with South River surface water and sediment while fishing, swimming or wading

THg and MeHg concentrations in surface water were less than tap water SLs and Federal MCLs (see Table 3-12). As a result, no further quantitative evaluation of South River surface water exposure pathways was conducted.

## **South River Fish**

THg concentrations in smallmouth bass, largemouth bass and redbreast sunfish are above VDOH action levels in the South River. However, there is a fish consumption advisory for mercury in place, and the river has a voluntary catch-and-release program.

The current advisory, which includes the South River from Waynesboro to Port Republic and the South Fork Shenandoah River from Port Republic to the Page/Warren County line, has been in place since the 1980s. The advisory is enforced by the VDOH through posted signs and monitored by the Virginia Department of Game and Inland Fisheries and the VADEQ. A creel study conducted by the Virginia Department of Game and Inland Fisheries indicated adherence to the catch-and-release program (Bugas, 2011).

Therefore, the following potentially complete exposure pathways were included in the risk assessment:

- Future Potential Floodplain Area Recreational User (Adult/Child) (South River): Indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of fish
- Hypothetical Future Resident (Adult/Child): Indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of fish
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of fish.

## Floodplain Soil

Where the maximum detection of THg was detected above the SL of 17 mg/kg in floodplain soil (surface and subsurface), current and reasonably anticipated future land use was used to identify potential receptors and associated pathways for further quantitative evaluation in the HHRA. For example, current/future recreational users at floodplain area parks.

Properties with a maximum detection equal to the decision criteria (17 mg/kg) were carried forward for further quantitative evaluation. Floodplain area hunters were considered at each private property with an exceedance in a forested area. Hunting, under current conditions, was not considered on commercial/industrial properties or active cattle and dairy farms. Floodplain area farmers were identified in river reaches where properties are currently used for pasture/hay. In addition, adult farmers were assumed to be exposed to surface soil and subsurface soil during agricultural practices. Farming was not considered within city limits (in River Reach 1).

Hypothetical future residents were considered at each property with an exceedance. Hypothetical future subsistence farmers were also considered at each property currently used for pasture/hay. Potential exposures to all media were combined to provide an upper-bound estimate of potential risk assuming uncontrolled exposures via all possible pathways.

Where the maximum detection of THg was also detected above the industrial soil SL (350 mg/kg), current/future industrial/commercial workers and current/future construction/excavation workers were identified for further quantitative evaluation. Industrial soil SL exceedances were limited to one property in Reach 1 and one property in Reach 2.

In summary, the following decision logic was used:

| Decision Criteria                     | Current Use           | Current Receptor  | Future Receptor                                              |
|---------------------------------------|-----------------------|-------------------|--------------------------------------------------------------|
| If THg > 17 mg/kg                     | Residential           | Resident          | Resident , Hypothetical Resident                             |
|                                       | Park                  | Recreational User | Hypothetical Resident; Recreational User                     |
|                                       | Forested              | Hunter            | Hypothetical Resident; Hunter                                |
|                                       | Hay/Pasture           | Farmer            | Hypothetical Resident ; Farmer (subsistence)                 |
|                                       | Open Space            | Location-specific | Hypothetical Resident                                        |
|                                       | Industrial/Commercial |                   | Hypothetical Resident                                        |
| If THg > 350 mg/kg, then add to above | Residential           |                   | Industrial/Commercial Worker; Construction/Excavation Worker |
|                                       | Park                  |                   | Industrial/Commercial Worker; Construction/Excavation Worker |

| Decision Criteria | Current Use           | Current Receptor                                                | Future Receptor                                                 |
|-------------------|-----------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
|                   | Forested              |                                                                 | Industrial/Commercial Worker;<br>Construction/Excavation Worker |
|                   | Hay/Pasture           |                                                                 | Industrial/Commercial Worker;<br>Construction/Excavation Worker |
|                   | Open Space            |                                                                 | Industrial/Commercial Worker;<br>Construction/Excavation Worker |
|                   | Industrial/Commercial | Industrial/Commercial Worker;<br>Construction/Excavation Worker | Industrial/Commercial Worker;<br>Construction/Excavation Worker |

Because exposure to subsurface soil is only achieved during excavation and construction activities, the potential for exposure is limited to construction/excavation workers under current conditions. However, an evaluation of THg in subsurface soil for potential future receptors was also considered, since hypothetical future excavation activities may bring deeper soil to the surface. This is also consistent with comments provided by VADEQ to DuPont in a memorandum dated November 22, 2013. Subsurface floodplain soil data have been collected at the following properties:

- City of Waynesboro - Loth Springs Park
- DuPont (Plant Parking Lot)
- City of Waynesboro - Constitution Park
- Bottom Alley (Hopeman Brothers)
- City of Waynesboro - North Park
- Americast Inc (Allied Ready Mix)
- Solutions Way LLC
- Shifflett, Floyd
- Augusta Forestry Center
- Augusta Park Crimora

Therefore, based on the decision logic presented above, the following potentially complete exposure pathways have been identified for further quantitative evaluation in the HHRA. Tables 4-7 through Table 4-15 provide additional evaluation for each property and receptor.

#### Resident

Seventeen properties have been identified as having current residential land use. Of these, one property (KNK in Reach 6) had exceedances of the decision criteria (17 mg/kg) in surface soil. At this location, the following potentially complete exposure pathways were identified.

- Current/Future Potential Resident (Adult/Child): Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates

Subsurface soils samples (i.e., greater than 2 feet) have not been collected at any of the 17 properties. As a result, potential subsurface soil exposure pathways are not applicable and have been identified as such in Figures 3-2 and 3-3.

#### Industrial/Commercial Workers and Construction/Excavation Workers

Based on current commercial/industrial land use, one property (Americast in Reach 1) had exceedances of the SL for industrial soil (350 mg/kg). An additional property (Shifflett in Reach 2) was evaluated for future land use. At these locations, the following potentially complete exposure pathways were identified:

- Current Potential Industrial/Commercial Worker: Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates
- Future Potential Industrial/Commercial Worker: Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area soil-derived particulates.
- Current/Future Potential Construction/Excavation Worker: Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area soil-derived particulates.

#### Recreational User

Seven parks had exceedances of the decision criteria (17 mg/kg). At these locations, the following potentially complete exposure pathways were identified.

- Current Potential Recreational User (Adult/Child) (Floodplain Area Parks): Incidental ingestion of and dermal contact with floodplain area surface soil; inhalation of floodplain area surface soil-derived particulates
- Future Potential Recreational User (Adult/Child) (Floodplain Area Parks): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area soil-derived particulates

#### Hunter

Eight properties with forested areas that may be suitable for hunting were considered for current potential floodplain area hunters. Seventeen additional private properties, which are currently used for commercial/industrial purposes or active cattle/dairy operations, were considered for future potential floodplain area hunters. At these locations, the following potentially complete exposure pathways were identified:

- Current Potential Floodplain Area Hunter: Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates

- Future Potential Floodplain Area Hunter: Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area soil-derived particulates

#### Farmer

Current potential floodplain area farmers were considered at 20 properties with active cattle or dairy operations. Future potential floodplain area farmers were considered at an additional two properties with current pasture/hay land use. At these locations, the following potentially complete exposure pathways were identified:

- Current Potential Floodplain Area Farmer (Child): Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates
- Future Potential Floodplain Area Farmer (Child): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area soil-derived particulates
- Current/Future Potential Floodplain Area Farmer (Adult): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area soil-derived particulates

#### Hypothetical Future Scenarios

As noted above, a hypothetical future resident and hypothetical future subsistence farmer scenario was considered at each property with an exceedance of the decision criteria (17 mg/kg). At these locations, the following potentially complete exposure pathways were identified.

- Hypothetical Future Resident (Adult/Child): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); and, inhalation of floodplain area soil-derived particulates
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); and, inhalation of floodplain area soil-derived particulates

### **Floodplain Area Shallow Groundwater**

As described in Section 4.3.4 of the AOC 4 RFI Report, a well search was conducted to identify potential receptors of groundwater exposure within AOC 4. The well search was completed by querying available VDEQ GIS datasets, and the Virginia Department of Health (VDH) Well Database. As indicated in [Appendix D, Figure D-8](#), no drinking water wells were identified within the 62-year floodplain. The well search identified 123 parcels with wells where at least a portion of the parcel was within the 62-year floodplain of the South River. The main data sources for the well search (the Augusta County parcel data and the VDH Well Database) did not provide coordinates or other information as to a well's location within a parcel, nor information regarding its use (such as whether for irrigation or for domestic use). A weight-of-evidence approach, including field verification and aerial photo interpretation, was used to determine the locations of wells within these parcels. Field verification was conducted using a roadside survey to visually

document the presence of a well and to determine, if possible, whether or not the well was located within the 62-year floodplain of the South River. For parcels where the well location was not visible from the road, and/or if a determination could not be readily confirmed on whether the well was within or outside of the 62-year floodplain, a desktop review of aerial photography was conducted to determine the relative location of the well.

The well search identified 39 properties within AOC 4 where groundwater wells of unknown use may be present. These 39 parcels include properties where the well was either visually verified to be located within the floodplain, or could not be ruled out to be outside of the floodplain based on aerial photography. Potentially complete exposure pathways at these locations may include ingestion of groundwater as drinking water and dermal contact with groundwater while bathing or showering.

As detailed in Table 3-10, THg and MeHg concentrations were less than tap water SLs in shallow alluvial groundwater. As a result, no further quantitative evaluation of floodplain area shallow groundwater exposure pathways was conducted.

Further investigation of groundwater use is proposed as part of the CMS.

### **Floodplain Pond Surface Water and Sediment**

As described in Section 3.3.7, in 2011 surface water samples were collected from nine floodplain pond locations and sediment samples were collected from one floodplain pond location. Ponds selected for sample analysis were determined based on a field reconnaissance conducted in August 2010 to determine the likelihood of complete human exposure pathways based on the potential presence of mercury and human use of the ponds. Potentially complete floodplain pond surface water and sediment exposure pathways include:

- Current and Future Potential Recreational User (Adult/Child) (Floodplain Area Parks<sup>7</sup>): Incidental ingestion of and dermal contact with floodplain pond surface water and sediment while fishing, swimming or wading
- Current and Future Potential Floodplain Area Farmer: Incidental ingestion of and dermal contact with floodplain pond surface water and sediment while fishing, swimming or wading
- Hypothetical Future Resident (Adult/Child): Incidental ingestion of and dermal contact with floodplain pond surface water and sediment while fishing, swimming or wading
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Incidental ingestion of and dermal contact with floodplain pond surface water and sediment while fishing, swimming or wading

THg and MeHg concentrations were less than tap water SLs (for surface water) or residential soil SLs (for sediment). As a result, no further quantitative evaluations of potentially complete floodplain pond surface water and sediment exposure pathways were conducted.

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<sup>7</sup> Limited to Grottoes Town Park

## Floodplain Pond Fish

THg and MeHg concentrations in fish collected in floodplain area ponds were also above the VDOH consumption advisory levels. This information has been communicated to the Town of Grottoes, where one pond is located. Fish Advisory signs have been posted at this pond. The results have also been communicated to the other pond owners, which are located on private property (farms).

Therefore, the following potentially complete exposure pathways were included in the risk assessment:

- Future Potential Recreational User (Adult/Child) (Floodplain Area Parks<sup>8</sup>): Indirect exposure to mercury in floodplain pond surface water, sediment and pore water via ingestion of fish
- Future Potential Floodplain Area Farmer: Indirect exposure to mercury in floodplain pond surface water, sediment and pore water via ingestion of fish
- Hypothetical Future Resident (Adult/Child): Indirect exposure to mercury in floodplain pond surface water, sediment and pore water via ingestion of fish
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Indirect exposure to mercury in floodplain pond surface water, sediment and pore water via ingestion of fish.

## Floodplain Area Food Sources

There is potential for mercury to be present in the following potential food sources that people may eat: garden crops, livestock (such as beef), and wild game (such as deer). Ingestion of livestock was considered only at farms with current beef or dairy operations and at all land with pasture/hay land use under future conditions. Likewise, since there is no indication of residences currently growing garden crops on the floodplain, ingestion of garden crops was evaluated as a future land use scenario. Similarly, based on the understanding about how turtles are caught (i.e., trapping rather than traditional hunting) in the floodplain, the hunter (trapper) scenario was developed specifically to address turtles consumption.. Therefore, the following potentially complete exposure pathways were retained for further evaluation.

- Future Potential Resident (Adult/Child): Indirect exposure to mercury in floodplain soil via ingestion of garden crops
- Current/Future Potential Floodplain Area Hunter: Indirect exposure to mercury in floodplain soil via ingestion of wildlife; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl
- Current/Future Potential Floodplain Area Hunter (Trapper): Indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of aquatic biota (turtles)

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<sup>8</sup> Limited to Grottoes Town Park

- Current Potential Floodplain Area Farmer: Indirect exposure to mercury in floodplain soil via ingestion of livestock
- Future Potential Floodplain Area Farmer: Indirect exposure to mercury in floodplain soil via ingestion of livestock, poultry and garden crops
- Hypothetical Future Resident (Adult/Child): Indirect exposure to mercury in floodplain soil via ingestion of garden crops and wildlife; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl and other aquatic biota (turtles)
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Indirect exposure to mercury in floodplain soil via ingestion of livestock, poultry and garden crops; indirect exposure to mercury in floodplain soil via ingestion of wildlife; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl and other aquatic biota (turtles)

Infant exposure to mercury via the ingestion of their mother's breast milk, who is exposed to mercury in floodplain area soil, was also identified as a potentially complete pathway for hypothetical future residents and hypothetical future floodplain area subsistence farmers.

### 3.5.3 Incomplete Exposure Pathways

Mitigating factors were used in the evaluation of the completeness of an exposure pathway under current and future land-use conditions. The evaluation of mitigating factors uses logical and scientifically defensible reasoning based on a broader, more site-specific understanding of the CSM to predict more accurately the potential effects of evaluated releases.

The following incomplete exposure pathways identified in this section were not evaluated further quantitatively in the HHRA. Rationale for their exclusion is detailed herein.

#### Floodplain Area Subsurface Soil

Because exposure to subsurface soil is only achieved during intrusive activities (excavation and construction activities), the only potential receptor is the on-site construction/excavation worker. As a result, under current conditions, direct contact with subsurface soil (depths greater than 2 feet) is not anticipated for the following receptors: resident, industrial/commercial worker, floodplain area recreational user and floodplain area hunter.

## 3.6 Summary

In summary, the following potentially complete exposure pathways were identified for quantitative evaluation in the HHRA.

#### Resident

- Current Potential Resident (Adult/Child): Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates

- Future Potential Resident (Adult/Child): Incidental ingestion of and dermal contact with floodplain area surface soil; inhalation of floodplain area surface soil-derived particulates; and, indirect exposure to mercury in floodplain soil via ingestion of garden crops

Industrial/Commercial Workers and Construction/Excavation Workers

- Current Potential Industrial/Commercial Worker: Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates
- Future Potential Industrial/Commercial Worker: Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates.
- Current/Future Potential Construction/Excavation Worker: Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates.

Recreational User

- Current Potential Recreational User (Adult/Child) (Floodplain Area Parks): Incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates
- Future Potential Recreational User (Adult/Child) (Floodplain Area Parks): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates; and, indirect exposure to mercury in floodplain pond<sup>9</sup> surface water, sediment and pore water via ingestion of fish
- Current Potential Floodplain Area Recreational User (Adult/Child) (South River): Incidental ingestion of and dermal contact with South River sediment while fishing, swimming or wading
- Future Potential Floodplain Area Recreational User (Adult/Child) (South River): Incidental ingestion of and dermal contact with South River sediment while fishing, swimming or wading; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of fish

Hunter

- Current Potential Floodplain Area Hunter: Incidental ingestion of and dermal contact with floodplain area surface soil; inhalation of floodplain area surface soil-derived particulates; indirect exposure to mercury in floodplain soil via ingestion of wildlife; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl
- Future Potential Floodplain Area Hunter: Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain

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<sup>9</sup> Grottoes Town Park only

area surface and subsurface soil-derived particulates; indirect exposure to mercury in floodplain soil via ingestion of wildlife; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl

- Current/Future Potential Floodplain Area Hunter (Trapping): indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of aquatic biota (turtles)

#### Farmer

- Current Potential Floodplain Area Farmer (Child): Incidental ingestion of and dermal contact with floodplain area surface soil; inhalation of floodplain area surface soil-derived particulates; and, indirect exposure to mercury in floodplain soil via ingestion of livestock
- Current Potential Floodplain Area Farmer (Adult): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates; and, indirect exposure to mercury in floodplain soil via ingestion of livestock and poultry
- Future Potential Floodplain Area Farmer (Adult/Child): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates; indirect exposure to mercury in floodplain pond surface water, sediment and pore water via ingestion of fish; and, indirect exposure to mercury in floodplain soil via ingestion of livestock, poultry and garden crops

#### Hypothetical Future Scenarios

- Hypothetical Future Resident (Adult/Child): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates; incidental ingestion of and dermal contact with South River sediment while swimming or wading; indirect exposure to mercury in floodplain soil via ingestion of garden crops and wildlife; indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl and fish; and, infant exposure via breast milk from mother who is exposed to mercury in soil from the pathways listed above.
- Hypothetical Future Floodplain Area Subsistence Farmer (Adult/Child): Incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates; incidental ingestion of and dermal contact with South River sediment while swimming or wading; indirect exposure to mercury in floodplain soil via ingestion of livestock, poultry and garden crops; indirect exposure to mercury in floodplain soil via ingestion of wildlife; indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl, fish and other aquatic biota (turtles); and, infant exposure via breast milk from mother who is exposed to mercury in soil from the pathways listed above.

## 4.0 Exposure Assessment

In addition to the characterization of the exposure setting and identification of potential receptors and potentially complete exposure pathways, the exposure assessment process includes the development of exposure assumptions describing the magnitude of chemical intake and the calculation of exposure point concentrations of THg and MeHg in environmental media. This section addresses each of these two components.

### 4.1 Exposure Assumptions

Tables 4-1 through 4-6 provide the exposure factors that were used to estimate reasonable maximum magnitude of exposure for the various receptors. The exposure factors are used to estimate chemical intake via each exposure pathway for each receptor. Chemical intake is expressed in terms of milligrams of chemical per kilogram of body weight per day (mg/kg BW-day), using the following general equation:

$$\text{Intake} = \frac{\text{chemical concentration} \times \text{contact rate} \times \text{exposure frequency} \times \text{exposure duration}}{\text{body weight} \times \text{averaging time}}$$

Omitting the chemical concentration from the intake equation yields a pathway-specific “intake factor.” The intake factor is multiplied by the concentration term for each chemical to obtain the pathway-specific intake of that chemical. The estimates of chemical intake were combined with toxicity values to yield estimates of potential health risk (see Section 5).

References for the exposure assumptions are listed in the tables. As shown in the tables, exposure assumptions were based on a combination of EPA-recommended values and best professional judgment considering site-specific information. The rationale for selection of the exposure assumptions, which were based on professional judgment, is detailed in the following subsections. The exposure assumptions utilized in this HHRA were selected consistent with feedback provided by VADEQ in an email to DuPont dated April 8, 2014, discussed during a meeting between VADEQ, DuPont and AECOM on January 21, 2015 and provided by VADEQ in a memorandum to DuPont dated March 30, 2015 (received by DuPont on April 28, 2015).

#### 4.1.1 Soil and Sediment Exposure Frequency and Time

Exposure frequency refers to the number of days per year that an individual is exposed to site COPCs. Exposure time refers to the number of hours in which exposure occurs.

##### Recreational User

Based on professional judgment, conservative estimates of exposure time and frequency were assumed for recreational users of floodplain area parks and recreational users of the South River. It was assumed potential receptors would visit floodplain area Parks 3 days per week in the summer months and 2 days per week in the spring and fall months (or 84 days per year). It was assumed that the ground is frozen three months out of the year. This value is considered consistent with activity patterns discussed in the EPA’s Exposure Factors Handbook (EPA, 2011) and values recommended by other states and regions for recreational land use (such as Maine – 90 days per year).

A site-specific value of three events per week, 4 months out of the year (May-August) or 48 days per year was assumed for wading activities in the river. This value is consistent with a value recommended by EPA Region 4 for swimming in the southeast.

For both recreational user receptors, as recommended by VADEQ, each visit was assumed to last 3.3 hours for an adult and 2.4 hours for a child. This assumption is consistent with recommendations in EPA's EFH for time spent in an outdoor park. The exposure time variable is applicable to the soil inhalation pathway calculations only.

### **Floodplain Area Hunter**

An exposure frequency of 28 days per year was assumed for a floodplain area hunter exposed to floodplain area soil while hunting or South River sediment while fishing. This value was based on the average reported days hunted per year for all game (USFW, 2011) and the results of the 2011 angler survey (Bugas, 2011). An additional 7 days was added to these reported values (21 days) at the request of VADEQ as an additional level of conservatism. Each hunting event was assumed to last 8 hours.

#### **4.1.2 Exposed Skin Surface Area**

Exposed skin surface area is relevant when evaluating uptake of chemicals that are absorbed dermally. EPA default body surface area (3,527 cm<sup>2</sup>) calculated for potential exposure to head, hands and forearms was used to evaluate floodplain area soil exposures for workers and hunters.

EPA default body surface areas for adults (6,032 cm<sup>2</sup>) and young children (2,373 cm<sup>2</sup>) were used for residents, recreational users and farmers. The body surface area represents exposure to head, hands, forearms and lower legs.

The body surface area used in the HHRA for workers and young children was revised from the September 2014 submittal to incorporate corrections described in EPA's February 24, 2015 *Frequently Asked Questions (FAQS) About Update of Standard Default Exposure Factors* ([http://www.epa.gov/reg3hwmd/risk/human/rb-concentration\\_table/documents/FAQ\\_ExpF\\_Directive.pdf](http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/documents/FAQ_ExpF_Directive.pdf)).

Age-specific body part measurements were used to calculate exposed skin surface area for recreational users exposed to sediment while fishing, swimming or wading in the South River (EPA, 2011). Recreational users exposed to sediment were assumed to wear short-sleeved shirts, shorts and no shoes; therefore, the exposed skin surface is limited to head, hands, forearms, lower legs and feet.

#### **4.1.3 Dermal Absorption**

Dermal absorption values are used to estimate chemical absorption from soil through the skin. EPA recommends that the dermal pathway not be quantitated for inorganics without an available chemical-specific dermal absorption factor, since the speciation of the compound is critical to the dermal absorption (EPA, 2004). However, consistent with assumptions used in the on-site HHRA (URS, 2014a), EPA's Region 3 default dermal absorption factor of 1% was used for THg, which does not have a chemical-specific factor.

#### 4.1.4 Particulate Emission Factor

Inhalation of contaminants adsorbed to respirable particles (PM<sub>10</sub>) was assessed using EPA's default particulate emission factor (PEF) equal to  $1.36 \times 10^9 \text{ m}^3/\text{kg}$ . The PEF relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils (EPA, 2015a).

#### 4.1.5 Food Ingestion Rates

Both a high end (90<sup>th</sup> percentile) and central tendency (mean) estimate of consumer-only intake rates were used in the hazard evaluation for ingestion of game, fish and garden crops. Mean ingestion rates were used to support the uncertainty evaluation presented in Section 7. If available, regional values (for the South) were selected as the intake rates. The values were obtained from the EFH (EPA, 2011). These consumption rates represent only the home-produced portion of the diet.

No adjustment to the ingestion rate for cooking or preparation losses was assumed.

##### Fish

The consumer-only intake rate for home-produced fish (South Region) was used for the evaluation (see [Table 4-3](#)). For adults, ingestion rates for households who fish was used. While for children, ingestion rates for the general population was assumed since age-specific rates were not available.

##### Garden Crops

Consumer-only intake rates for each home-produced garden crop type (South Region) was used in the evaluation (see [Table 4-4](#)). For residents, the value for households who garden was used. For farmers, the value for households who farm was used. Where 90<sup>th</sup> percentile consumer-only intake rates were not available for a specific crop (such as spinach), the mean ingestion rate for a crop type (leafy vegetables) was used.

##### Livestock

The consumer-only intake rate for home-produced beef or home-produced dairy (South Region) was used for the evaluation (see [Table 4-5](#)). The value for households who raise animals or farm was used. The same ingestion rate for home-produced dairy was used for both children and adults, since age-specific rates were not available for young children.

##### Poultry

The consumer-only intake rate for home-produced eggs or home-produced poultry (South Region) was used for the evaluation (see [Table 4-5](#)). The intake rate for households who raise animals or who farm was used. The same ingestion rate was used for both children and adults, since age-specific rates were not available for young children.

##### Game

The consumer-only intake rate for home-produced game (South Region) for households who hunt was used for the evaluation (see [Table 4-6](#)). The same ingestion rate was used

for both children and adults, since age-specific rates were not available for young children.

## 4.2 Exposure Point Concentrations

Exposure point concentrations were estimated to represent the reasonable maximum exposure that is expected to occur at the site. Exposure point concentrations were estimated using available monitoring data.

### 4.2.1 Soil

Each property with an exceedance of SLs in floodplain soil was addressed quantitatively in the HHRA. The exposure point concentration (EPC) selected for each parcel (or exposure unit) was based on the size of the data set and the statistical distribution of the data results. Consistent with EPA and VADEQ guidance, the exposure point concentration for soil was the 95% upper confidence limit (UCL) on the mean or the maximum detected concentration, whichever was lower (EPA, 1989). The 95% UCL was calculated using parametric methods (for a normal or lognormal distribution) or nonparametric methods if the data were neither normally nor lognormally distributed (EPA 1992, 2002). Statistical calculations were performed using EPA's ProUCL software version 5.0.00. Statistical treatment was not conducted for constituents having less than 10 samples in a data set; and, therefore, the maximum detected concentration was used as the EPC for those exposure areas.

For data sets that contained values reported as nondetect, EPA's ProUCL software chose the methodology used in calculating the 95% UCL. The results of the statistical analyses conducted using EPA's ProUCL software are provided in [Appendix G](#) and 95% UCLs are presented in [Tables 4-7](#) through [4-15](#). Where applicable, UCLs were derived both with and without "outliers" to provide information potentially for risk management. Outliers in floodplain soil were generally defined as samples with THg concentrations greater than 100 mg/kg. Sample locations considered as outliers are highlighted in the figures provided in [Appendix D](#). The value of 100 mg/kg has not been identified as a 'de facto' cleanup level or an endpoint to demonstrate "remediation complete", and should not be construed as such.

Exposure to surface soil and subsurface soil was conservatively evaluated separately in the EPC calculation, where applicable, for each potential receptor. Surface soil, for the purposes of this risk assessment, was defined as 0 to 2 feet bgs. Subsurface soil was generally defined as soil between 2 and 12 feet bgs (or that depth above the uppermost level of seasonal low water table).

As shown in [Tables 4-7](#) through [4-15](#), for some exposure units, EPCs were calculated to represent both the entire exposure unit and smaller sub-areas based on site-specific activity patterns. For instance, an EPC was calculated to represent a recreational user who may utilize all of North Park and an EPC was calculated to represent a recreational user who may only visit a portion of the park during each visit (such as the baseball field). Each exposure area is detailed in the figures provided in [Appendix D](#). Risk characterization evaluations for the parcel-wide EPC and sub-area EPCs provides useful information for risk management. The following sub-area EPCs were calculated:

- Constitution Park – The ~6-acre park was divided into three geographic sub-areas for the evaluation. One area consists of the soccer fields and arboretum; one area consists of the portion of the site which contains the greenway, and one area consists of the picnic pavilion north of Main Street. Each exposure area is detailed in the figures provided in [Appendix D \(Reach 1 – Extent 8 map\)](#).
- Bottom Alley – This ~17-acre commercial/industrial property was divided into two sub-areas (see [Appendix D Reach 1 – Extent 7 map](#)). One area consists of samples collected at and within the forested river corridor, and the second area consists of samples collected within landscaped/maintained grassy areas.
- North Park – The ~14-acre park was divided into five geographic sub-areas for the evaluation (see [Appendix D Reach 1 – Extent 6 map](#)). One area consisted of wetlands located across South River. These wetlands are not currently used for any purpose. The second area consisted of the baseball field. The third area consisted of the northern perimeter/basketball court. This area includes samples collected in the vicinity of a former mill race. The fourth area consists of the parking lot, picnic pavilion and playground area. The playground was constructed above ground and is filled with mulch. The fifth area consists of open space on the southern portion of the park which is used for volleyball. Exposed dirt has been observed in this area.
- Americast – This ~47-acre commercial/industrial property is located where the South River was straightened opposite the Waynesboro sewage treatment plant in the late 1960s, cutting off a large meander in the river that is referred to as the Oxbow. A nearby tributary, Steele Run, thereafter became the primary source of water to this part of the old river channel. During high flow stages, the South River can still flow through the Oxbow, but Steele Run feeds the area under all but the highest flows (Jensen and Turner, 2006). This area was divided into five geographic areas: forested portion along the river adjacent to the facility; former motorcross area; portion of the parcel east of the Oxbow; portion of the parcel south of the Oxbow; and, portion of the parcel north of the Oxbow (see [Appendix D Reach 1 – Extent 5 map](#)).
- Basic Park – This ~18-acre park is downstream and adjacent to the Oxbow (see [Appendix D Reach 1 – Extent 4 map](#)). The park was divided into three geographic areas: the Oxbow portion; the recreational ball field area which is used for adult softball and youth football leagues; and, the forested area east of the ball fields.
- Solutions Way – This over 100-acre commercial/industrial property was divided into three geographic areas based on land use (see [Appendix D Reach 2 – Extent 3 map](#)). The first area consists of the developed portion of the site located within the floodplain. The second area consists of the undeveloped, forested ~5-acre corridor which runs perpendicular to the river. The third area consists of ~50-acres of cultivated fields, which are currently leased to a local cattle farmer.

At the request of VADEQ, a data gap analysis was conducted to identify EPCs for properties located in the South River floodplain, which were not sampled during prior investigations (either due to access issues or for other reasons). The following

considerations were used to identify an appropriate EPC for these areas: floodplain inundation, land use and topography/bank and river channel characteristics. This analysis is presented in [Table 4-17](#). The EPC was then compared to the site-specific screening level of THg of 17 mg/kg and the decision logic presented in Section 3.5.2 was applied.

#### 4.2.2 Sediment

EPCs for South River bulk sediment were segregated by river reach. The EPC was either the maximum detected concentration or 95% UCL, depending on the data set for each river reach. [Table 4-16](#) provides a summary of exposure point concentrations.

#### 4.2.3 Potential Food Sources

EPCs for each food type (e.g., garden crops, fish or waterfowl) were either the maximum detected concentration or 95% UCL, depending on the data set. Biota EPCs are included in [Table 4-16](#).

##### Fish

Data exists for several fish species within a reach in South River and in the floodplain ponds. For South River fish, an EPC was calculated using data from smallmouth bass and largemouth bass. These species were selected as they have the highest MeHg levels and are the most sought species by recreational anglers. For floodplain area pond fish, an EPC was calculated using data from all species obtained. For both exposure areas (South River and floodplain ponds), a species-weighted EPC was used to calculate doses and risks for each reach due to the robustness of the data set (time period collected and the number of samples). Weighting is reach- or pond-specific and was based on the number of species for which there are data, assuming that anglers eat an equal portion of each species collected at that particular reach or pond. The EPC was calculated as follows:

$$\text{Weighted-EPC} = \frac{EPC_1 + EPC_2 + EPC_n}{\text{Total Number of Species (n)}}$$

##### Garden Crops

As detailed in Section 3.1.7, the Augusta Forestry Center was specifically chosen as the Garden Crop study area since, 1) soil concentrations measured during floodplain soil investigations were above residential soil SLs (Berti et. al, 2012); and, 2) overbank sediment accumulation rates are higher than the overall average because the site is located upstream of a former mill dam (Pizutto et. al, 2006). THg soil concentrations in the Garden Crop study area ranged between 4.2 mg/kg to 78 mg/kg.

As shown in [Table 4-16](#), EPCs were derived for each garden crop type. Depending on the crop type, the EPC was either the maximum detected concentration or one-half of the reporting limit (for crops where THg was not detected). In addition, the geometric mean of individual crop THg concentrations was used as the EPC to represent THg concentrations in the intake calculation for the “all garden crop” grouping.

## **Livestock**

EPCs were derived for each cut of beef (e.g., ground beef, hindquarter) and for milk. For beef, the EPC was the maximum detected concentration for each cut of beef sampled in the study area. For milk, the EPC was the method detection limit since THg or MeHg was not detected in the milk samples.

For this risk assessment, sample data from edible muscle tissue was used to determine representative concentrations. Organs not typically consumed on a frequent basis (such as liver or kidney and the heart) were also used in the risk characterization to provide information for risk management purposes.

## **Poultry**

EPCs were derived for muscle, each organ (liver or gizzard) and for eggs. For poultry muscle, organs and eggs, the EPC was the maximum detected concentration (regardless of the breed sampled) in the study area. For eggs, a 95% UCL was also calculated and used in the uncertainty evaluation. The 95% UCL was based on the maximum UCLs calculated for the October 2014 and December 2014 sampling events.

For this risk assessment, similar to livestock, sample data from edible muscle tissue and eggs were used to determine representative concentrations. Organs not typically consumed on a frequent basis (liver or gizzard) were also used in the risk characterization to provide information for risk management purposes.

## **Wildlife (Waterfowl, Deer and Snapping Turtle)**

EPCs for each game type were either the maximum detected concentration or 95% UCL, depending on the data set. For waterfowl, an individual EPC and species-weighted EPC was calculated. Since the waterfowl data set was not as large as the fish data set discussed earlier, both individual and species-weighted EPCs were calculated for waterfowl. The species-weighted EPC for waterfowl (0.32 mg/kg ww) was within the range of individual EPCs (0.0447 mg/kg ww to 0.791 mg/kg ww).

Sample types for waterfowl consist of muscle and liver samples. Sample types for snapping turtles include eggs. For this risk assessment, only sample data for muscle tissue were used to determine representative concentrations. Other sample types are not typically consumed on a frequent basis; and, therefore, were not used in the risk characterization.

As noted in Section 3.2.2, squirrel and muskrat data were only used qualitatively in the HHRA.

#### **4.2.4 Exposures To Infants Via Breast Milk**

EPA has identified significant uncertainty associated with the parameters used to estimate mercury HQs for breastfeeding infants. As a result, EPA does not recommend quantitative modeling of mercury exposure via breast milk (EPA, 2009a). However, for MeHg, data suggest that HQs for breastfeeding infants will be very similar to HQs for the nursing mother (EPA, 2009a). As a result, the risk characterization results for the hypothetical future adult resident were used to qualitatively evaluate infant exposure to breast milk.

## 5.0 Toxicity Assessment

Toxicity values for use in the human health risk assessment are presented in [Table 5-1](#). The table contains reference doses (RfDs) and reference concentrations (RfCs) for THg and MeHg, which are both non-carcinogens. In accordance with EPA guidance, toxicity values specific to the oral and inhalation pathways were obtained from the sources listed below in the following hierarchy (EPA, 2003):

- IRIS online database (EPA, 2015b)
- Provisional toxicity values obtained from the EPA Environmental Criteria and Assessment Office (ECAO) as reported in the EPA Regional SL Table (EPA, 2015a)
- Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) (ATSDR, 2013)
- California EPA toxicity values as cited in the EPA SL Table (EPA, 2015a)
- Health Effects Assessment Summary Tables (HEAST) (EPA, 1997)

### 5.1 Oral Toxicity Factors

RfDs may be available for the oral exposure route, and RfCs may be available for the inhalation exposure routes. The RfD is a pathway-specific (e.g., oral) estimate of a daily chemical intake per unit body weight that is likely to be without deleterious effects (chronic) for a lifetime of exposure, including sensitive subpopulations (EPA, 1989). The RfDs are derived from experimental data and include safety factors to account for differences among species and within populations and other uncertainties in the experimental data. The EPA has developed chronic RfDs to evaluate long-term exposures (7 years to a lifetime) and subchronic RfDs to evaluate exposures of shorter duration (2 weeks to 7 years). Consistent with EPA guidance, subchronic RfDs were used, where available, in the risk assessment to evaluate construction/excavation worker exposure scenarios. [Table 5-1](#) includes a summary of the subchronic RfDs used.

When assessing the health effects of chemicals in a risk assessment such as this, it is EPA's practice to assume that carcinogenic effects are additive, regardless of the specific end organ that may be affected by a particular constituent. For noncancer effects, however, it is appropriate to assume that additive effects apply only to constituents that affect the same target organ (EPA, 1989). [Table 5-1](#) identifies the critical effect (target organ) for each COPC (THg and MeHg). This information was used in evaluating cumulative noncancer hazards in the risk assessment.

For the HHRA, the RfD for mercuric chloride was used to assess THg. However, in assessing food sources, it was conservatively assumed that all THg is present as MeHg. Therefore, the MeHg toxicity values were applied to the EPCs calculated for THg.

For THg, the RfD [0.0003 milligrams per kilogram per day (mg/kg-day)] is based on the back calculations from a Drinking Water Equivalent Level (DWEL), recommended to and subsequently adopted by EPA, of 0.010 mg/L: (RfD = 0.010 mg/L x 2 L/day/70 kg bw = 0.0003 mg/kg bw/day). The lowest observed adverse effects level (LOAEL)

exposure levels, utilized in the following three studies were selected by EPA as the basis of the recommended DWEL: Druet et al. (1978), Bernaudin et al. (1981) and Andres (1984) (EPA, 2015b).

For MeHg, the RfD (0.0001 mg/kg-day) is based on developmental neuropsychological impairment observed in human epidemiological studies (EPA, 2015b). The nervous system is considered to be the most sensitive target organ for which there are data suitable for derivation of an RfD.

## **5.2 Inhalation Toxicity Factors**

In accordance with RAGS Part F (EPA, 2009b), inhalation toxicity values (RfCs), expressed in terms of concentration in air rather than in terms of dose, were used in the risk assessment. Subchronic RfCs were used, where available, in the risk assessment to evaluate construction/excavation worker exposure scenarios (see [Table 5-1](#)).

The RfC for elemental mercury were conservatively used in the HHRA to evaluate the soil-to-air inhalation pathway for THg. The RfC was derived from the LOAEL based on neurobehavioral effects of low-level mercury exposures with an applied uncertainty factor and modifying factor to account for the protection of sensitive human subpopulations and lack of database (EPA, 2015b).

## **5.3 Dermal Toxicity Factors**

Oral toxicity values used to evaluate dermal absorption were adjusted for use in risk assessment using the recommended criteria as found in the 2004 EPA *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Following the guidance document, the mercuric chloride oral RfD will be adjusted for gastrointestinal absorption, since the chemical-specific gastrointestinal absorption value is less than 50%. [Table 5-1](#) includes the available gastrointestinal absorption rates.

## **5.4 Bioavailability**

Bioavailability is defined as the fraction of an ingested dose that crosses the gastrointestinal epithelium and becomes available for distribution to internal target tissues and organs (EPA, 2007). RAGs Part A recommends that, in the absence of site-specific data, the bioavailability of a chemical should be assumed to be equal in soil, diet, and water (i.e., 100%). As a result, no adjustment was made to the oral toxicity values for THg or MeHg. All mercury was assumed to be 100% bioavailable.

## 6.0 Risk Characterization

In the risk characterization, the toxicity factors (such as RfDs and RfCs) were applied in conjunction with COPC concentrations and intake assumptions to estimate noncarcinogenic health risk. This section describes the risk calculation methodology and numerical risk results for potential exposure to constituents detected in floodplain soil, South River sediment and biota for the identified exposure scenarios.

This section also describes the methodology and approach used to evaluate consumption of wildlife (waterfowl and game).

### 6.1 Risk Characterization Methodology

Noncancer health hazards (represented by the HQ) were estimated using the exposure assumptions and toxicity factors identified in Sections 4 and 5. For example, the general equations for estimating chemical-specific HQs for direct contact with soil are as follows:

$$HQ = C \times IF / RfD$$

where

C = chemical concentration (mg/kg),  
IF = intake factor (kg soil/kg BW-day),  
HQ = hazard quotient (unitless), and  
RfD = reference dose (mg/kg BW-day).

The potential for noncancer effects is expressed as a chemical-specific HQ. HQs are not an estimate of the likelihood that an effect will occur but rather an indication of whether there is potential cause for concern for adverse effects. Furthermore, the magnitude of a HQ is not a direct guide to the potential severity of effect because there is considerable variability in the derivations of RfDs and in the type and severity of critical effect on which the RfDs are based.

Risk characterization results for THg were compared to EPA's and VADEQ's target hazard index (HI) of 1 (EPA, 1989 and VADEQ, 2011).

Cumulative noncancer hazard is the summation of individual pathway-specific HIs determined separately, based on exposure of the same individual to THg in multiple media. The HI must also not exceed 1 to meet cumulative noncancer hazard requirements.

### 6.2 Summary of Risk Characterization Results

The potential noncancer hazards associated with AOC 4 are summarized in [Table 6-1](#) and presented for each of the following potential receptors and associated potentially complete exposure pathways in [Tables 6-2](#) through [6-11](#). In the tables, the pathway-specific HI is shown as well as cumulative hazards (or HI) summed across all pathways. [Appendix H](#) contains the intake factor calculations, HQ and HI calculations.

### 6.2.1 Residents

Reasonably anticipated potentially complete exposure pathways for current potential residents (adult/child) involve incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates. Floodplain area subsurface soil was not identified as a medium of concern for the property evaluated [KNK (Brenneman)]. As summarized in [Table 6-2](#), potential noncancer hazards did not exceed the target HI of 1.0.

In addition to the above pathways, the future potential resident (adult/child) included indirect exposure to mercury in floodplain soil via ingestion of garden crops. As summarized in [Table 6-2](#), potential noncancer hazards exceeded the target HI of 1.0 for future potential adult or child residents. Cumulative noncancer hazards were 1.8 for a future potential adult resident and 2.5 for a future potential child resident.

The HI used in the cumulative hazard evaluation (1.7) was based on the summation of HQs for individual garden crop types, which ranged between 0.004 (bell pepper) and 0.5 (spinach). The cumulative noncancer hazard did not exceed 1.0 when based on a garden crop ingestion HQ of 0.2 which represented the geometric mean of all garden crop concentrations (see Section 4.2.3).

An evaluation of hypothetical future residents is presented in Section 6.2.7.

### 6.2.2 Workers

#### Industrial/Commercial Workers

Reasonably anticipated potentially complete exposure pathways for current potential industrial/commercial workers at the Americast property involve incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates. As summarized in [Table 6-3](#), potential noncancer hazards exceeded the target HI of 1.0 in one exposure unit (North of Oxbow). Current site operations are not located in this area. The target HI was not exceeded in the outlier analysis for the exposure unit.

Potentially complete exposure pathways for future potential industrial/commercial workers at the Americast and Shifflett properties involve incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface soil); and, inhalation of floodplain area soil-derived particulates. As summarized in [Table 6-3](#), potential noncancer hazards did not exceed the target HI of 1.0 for the Shifflett property. However, the cumulative noncancer hazard for the Americast property was 2.6 (parcel-wide exposure unit) and 3.3 (North of Oxbow exposure unit). The exposure pathway of concern was incidental ingestion of soil. Similar to the current assessment, removal of outliers from the analysis resulted in a HI of less than 1.0.

#### Construction/Excavation Workers

Potentially complete exposure pathways for current/future potential construction/excavation workers at the Americast and Shifflett properties involve incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface soil); and, inhalation of floodplain area soil-derived particulates. As

summarized in [Table 6-3](#), potential noncancer hazards did not exceed the target HI of 1.0 for the Shifflett property. However, the cumulative noncancer hazard for the Americast property was 1.2 (parcel-wide exposure unit) and 1.5 (North of Oxbow exposure unit). The exposure pathway of concern was incidental ingestion of soil. The target HI was not exceeded in the outlier analysis.

### **6.2.3 Recreational User - Floodplain Area Parks**

Potentially complete exposure pathways for current potential recreational users at the seven floodplain area parks involve incidental ingestion of and dermal contact with floodplain area surface soil; and, inhalation of floodplain area surface soil-derived particulates. One of the parks, Grottoes Town Park, contains a pond which is stocked with trout by VDGIF. Due to the fish advisory that is in place, ingestion of fish caught in the pond was not considered under current land use. As summarized in [Table 6-4](#), potential noncancer hazards exceeded the target HI of 1.0 at two parks (Constitution Park and North Park). The target HI of 1.0 was not exceeded at the other parks evaluated.

At Constitution Park, the noncancer hazard for child recreational users was 1.5 in one exposure unit (Soccer Field/Arboretum). The exposure pathway of concern was incidental ingestion of soil. Noncancer hazards were not exceeded in other exposure units evaluated or in the park-wide exposure unit. Likewise, removal of outliers from the analysis resulted in a HI of less than 1.0.

At North Park, the noncancer hazard for child recreational users was 1.1 (park-wide) and 2.1 (Northern Perimeter/Basketball Court exposure unit). The exposure pathway of concern was incidental ingestion of soil. The HI of 2.1 was observed in a portion of the park where samples were collected in the vicinity of a former mill race. Most of these samples are located in a forested portion of the park (see [Reach 1 – Extent 6 map in Appendix D](#)). Noncancer hazards were not exceeded in the other exposure units evaluated. Likewise, removal of outliers from the analysis resulted in a HI of less than 1.0.

Potentially complete exposure pathways for future potential recreational users at the seven floodplain area parks involve incidental ingestion of and dermal contact with soil (surface and subsurface); and, inhalation of surface and subsurface soil-derived particulates. In addition, for Grottoes Town Park, indirect exposure to mercury in floodplain pond surface water, sediment and pore water via ingestion of fish was also included. As summarized in [Table 6-4](#), potential noncancer hazards exceeded the target HI of 1.0 at three parks (Constitution Park, North Park and Grottoes Town Park). The target HI of 1.0 was not exceeded at the other parks evaluated.

At Constitution Park, the noncancer hazard for child recreational users was 1.5 in one exposure unit (Soccer Field/Arboretum). The exposure pathway of concern was incidental ingestion of soil. Noncancer hazards were not exceeded in other exposure units evaluated or in the park-wide exposure unit. Likewise, removal of outliers from the analysis resulted in a HI of less than 1.0.

At North Park, the noncancer hazard for child recreational users was 5.7 (park-wide) and 2.1 (Northern Perimeter/Basketball Court exposure unit). The exposure pathway of concern was incidental ingestion of floodplain soil (surface and subsurface soil). The HQ

of 5.7 was observed in a portion of the park where samples were collected in the vicinity of a former mill race. Most of these samples are located in a forested portion of the park (see [Reach 1 – Extent 6 map in Appendix D](#)). In floodplain subsurface soil, the exceedance was limited to one sample location. Noncancer hazards were not exceeded in the other exposure units evaluated. Likewise, removal of outliers from the analysis resulted in a HQ of less than 1.0.

At Grottoes Town Park, noncancer hazards for adult and child recreational users was 65 and 60, respectively. These cumulative hazards were based on ingestion of pond fish using the 90<sup>th</sup> percentile food ingestion rate. The cumulative hazard based on ingestion of pond fish using the mean food ingestion rate was 53 and 49, for adult and child recreational users respectively. As discussed in Section 3.5.2, fish consumption advisory signs have been posted at this pond.

#### 6.2.4 Recreational User - South River

Potentially complete exposure pathways for current potential recreational users of South River involve incidental ingestion of and dermal contact with South River sediment while fishing, swimming or wading. Due to the fish consumption advisory that is in place, ingestion of fish caught in the South River was not considered under current land use. As summarized in [Table 6-5](#), potential noncancer hazards did not exceed the target HI of 1.0 in the river reaches evaluated.

Assuming that the fish advisory is not in place, potentially complete exposure pathways for future potential recreational users of South River involve incidental ingestion of and dermal contact with South River sediment while fishing, swimming or wading; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of fish. As summarized in [Table 6-5](#), noncancer hazards for adult and children recreational users exceeded the target HI of 1.0 in each of the river reaches evaluated. As shown in the table, noncancer hazards ranged between 44 and 182 for an adult recreational user and 41 and 167 for a child recreational user. The highest noncancer hazards were observed in Reach 3. Noncancer hazards observed in the upstream reference location were 27 and 25, for an adult and child recreational user respectively. These cumulative hazards were based on ingestion of South River fish using the 90<sup>th</sup> percentile food ingestion rate. As detailed in [Table 6-5](#), the cumulative hazard based on ingestion of South River fish using the mean food ingestion rate was slightly lower. As noted above, a fish consumption advisory is in place for the South River.

#### 6.2.5 Floodplain Area Hunter

Under current land use conditions, hunters were identified as potential receptors for eight properties with forested land located in the South River floodplain. Potentially complete exposure pathways for current potential floodplain area hunters involve incidental ingestion of and dermal contact with floodplain area surface soil; inhalation of floodplain area surface soil-derived particulates; indirect exposure to mercury in floodplain soil via ingestion of wildlife (deer); and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl (mallard, wood duck and Canada goose). For the floodplain area hunter, it was conservatively assumed that all game ingested was hunted on the floodplain.

As summarized in [Table 6-6](#), noncancer total hazards for current potential floodplain area hunters exceeded the target HI of 1.0 for each of the properties evaluated. The exposure pathway of concern was ingestion of waterfowl, primarily mallards. The HQ for this pathway was 7.4 (based on a 90<sup>th</sup> percentile ingestion rate) and 3.9 (based on a mean ingestion rate).

Under future land use conditions, hunters were identified as potential receptors for 25 properties with forested land located in the South River floodplain. Potentially complete exposure pathways for future potential floodplain area hunters involve incidental ingestion of and dermal contact with soil (surface and subsurface); inhalation of soil-derived particulates; indirect exposure to mercury in floodplain soil via ingestion of wildlife; and, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion of waterfowl. Similar to the current land use assessment, noncancer total hazards for future potential floodplain area hunters exceeded the target HI of 1.0 for each of the properties evaluated (see [Table 6-7](#)). The exposure pathway of concern was also ingestion of waterfowl.

Since snapping turtles would be obtained via trapping, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion was evaluated separately. The HQ for this pathway was 71 (based on a 90<sup>th</sup> percentile ingestion rate) and 38 (based on a mean ingestion rate). Trapping of snapping turtles does not frequently occur. Therefore, the food ingestion rate used for this scenario, which was the same as that used for other wildlife (deer and waterfowl), is considered overly conservative.

### **6.2.6 Floodplain Area Farmer**

Under current land use conditions, farmers were identified as potential receptors for 20 properties with pasture/hay land located in the South River floodplain. Potentially complete exposure pathways for current potential adult farmers involve incidental ingestion of and dermal contact with floodplain area soil (surface and subsurface); inhalation of floodplain area surface and subsurface soil-derived particulates; and, indirect exposure to mercury in floodplain soil via ingestion of livestock. Potentially complete exposure pathways for current potential child farmers involve incidental ingestion of and dermal contact with floodplain area surface soil; inhalation of floodplain area surface soil-derived particulates; and, indirect exposure to mercury in floodplain soil via ingestion of livestock.

As summarized in [Table 6-8](#), noncancer total hazards for current potential floodplain area adult farmers exceeded the target HQ of 1.0 for two (2) of the 20 properties evaluated [Shifflett (Floyd) and Shifflett(Roger)]. The cumulative noncancer hazards were 2.2 and 1.5 for each property, respectively. The exposure pathway of concern at the Floyd Shifflett property (Reach 2) was ingestion of floodplain area subsurface soil. The exposure pathway of concern at the Roger Shifflett property (Reach 4) was ingestion of floodplain area surface soil. The removal of outliers at the Floyd Shifflett property reduced the cumulative noncancer hazard slightly to a value of 1.8. Cumulative noncancer hazards, when ingestion of livestock includes organs not typically consumed on a frequent basis (such as liver or kidney and the heart), ranged between 19 and 21.

Noncancer total hazards for a child of current potential floodplain area farmers exceeded the target HQ of 1.0 for 12 properties evaluated. Cumulative noncancer hazards ranged between 1.1 and 3.9. The highest cumulative noncancer hazard was observed at the Roger Shiflett property located in Reach 4. The exposure pathway of concern for each property was ingestion of floodplain area surface soil. Cumulative noncancer hazards, when ingestion of livestock includes organs not typically consumed on a frequent basis (such as liver or kidney and the heart), ranged between 1.2 and 32.

Potentially complete exposure pathways for future potential floodplain area farmers (adult/child) involve incidental ingestion of and dermal contact with soil (surface and subsurface); inhalation of soil-derived particulates; and, indirect exposure to mercury in floodplain soil via ingestion of livestock, poultry and garden crops. In addition, where applicable, indirect exposure to mercury in floodplain area pond surface water, sediment and pore water via ingestion of fish was also included.

As summarized in [Table 6-9](#), noncancer total hazards for future potential floodplain area adult farmers exceeded the target HI of 1.0 in each of the properties evaluated. The cumulative noncancer hazards for properties without ponds ranged between 3.8 and 4.8. Ingestion of poultry (eggs) and garden crops were the exposure pathways of concern. These cumulative hazards were based on ingestion of poultry (eggs) using the 90th percentile food ingestion rate and the assumption that all THg is present as MeHg. As detailed in [Table 6-9](#), the cumulative hazard based on ingestion of poultry (eggs) using the mean food ingestion rate was lower (pathway-specific HQ =0.6) and even lower (HQ=0.3) when the 95% UCL was used as the EPC, rather than the maximum detected concentration. Cumulative noncancer hazards, when ingestion of livestock and poultry includes organs not typically consumed on a frequent basis (such as liver or kidney and the heart), ranged between 48 and 49.

Noncancer total hazards for future potential floodplain area child farmers also exceeded the target HI of 1.0 in each of the properties. The cumulative noncancer hazards for properties without ponds ranged between 4.2 and 7.2. Ingestion of poultry (eggs) and garden crops were the exposure pathways of concern. As noted above, conservative assumptions the cumulative hazards were based on 90<sup>th</sup> percentile food ingestion rates and the assumption that all THg is present as MeHg. Ingestion of soil was also an exposure pathway of concern for a few additional properties. Cumulative noncancer hazards, when ingestion of livestock and poultry includes organs not typically consumed on a frequent basis (such as liver or kidney and the heart), ranged between 59 and 62.

The cumulative noncancer hazards for properties with ponds ranged between 48 to 140 (for adult receptors) and 59 to 143 (for child receptors). These cumulative hazards were based on ingestion of floodplain area pond fish using the 90<sup>th</sup> percentile food ingestion rate. As detailed in [Table 6-9](#), the cumulative hazard based on ingestion of floodplain area pond fish using the mean food ingestion rate was slightly lower. Likewise, exclusion of ingestion of livestock and poultry organs not typically consumed on a frequent basis, resulted in lower cumulative hazards.

### 6.2.7 Hypothetical Future Scenarios

The exposure scenarios presented in Section 6.2.1 through Section 6.2.6 represent the general population in the South River Floodplain. At the request of VADEQ, an evaluation of hypothetical cumulative hazards for receptors (resident and subsistence farmer) whose activities result in increased exposure was also conducted.

#### Hypothetical Future Resident

The hypothetical future resident scenario is based on the assumption that a resident (adult/child) in AOC 4 obtains 100% of his/her food (fish, garden crops and game) from the floodplain. The resident is also exposed to both floodplain soil and South River sediment. An infant of the resident may be exposed to mercury in breast milk from the mother who is exposed to mercury in floodplain area soil from the aforementioned exposure pathways.

As summarized in [Table 6-10](#), noncancer cumulative hazards for hypothetical future adult and child residents exceeded the HI of 1.0 in each of the properties evaluated. The cumulative noncancer hazards for adult residents ranged between 54 and 283. Cumulative noncancer hazards by critical effect were driven by the assumption that THg is present as MeHg in potential food sources. The exposure pathway of concern was primarily ingestion of fish from South River and floodplain area ponds, with ingestion of waterfowl a concern to a lesser extent. Infant exposure to breast milk from mothers exposed to mercury in fish would also be a pathway of concern. As indicated in the table, noncancer hazards for exposure to floodplain soil were acceptable at all but two properties (North Park and Americast).

The cumulative noncancer hazards for child residents ranged between 50 and 262. Similar to adult residents, the exposure pathway of concern was also primarily ingestion of fish from the South River and floodplain area ponds. However, unlike the adult resident, noncancer hazards for exposure to floodplain soil were also above 1.0 in most of the individual exposure areas evaluated. HIs ranged between 1.1 and 41. The highest HI was observed for the Americast property (North of Oxbow exposure unit).

#### Hypothetical Future Subsistence Farmer

The exposure pathways for the hypothetical future subsistence farmer scenario are the same as those evaluated for the resident, but the farmer also consumes livestock (beef and dairy) and poultry from the floodplain.

As summarized in [Table 6-11](#), noncancer cumulative hazards for hypothetical future adult and child farmers exceeded the HI of 1.0 in each of the properties evaluated. The cumulative noncancer hazards for adult farmers ranged between 75 and 283. Cumulative noncancer hazards for adult farmers, when ingestion of livestock and poultry includes organs not typically consumed on a frequent basis (such as liver or kidney and the heart), ranged between 120 and 327. The exposure pathway of concern was primarily ingestion of fish from South River and floodplain area ponds, with ingestion of waterfowl and ingestion of chicken liver a potential concern to a lesser extent. Infant exposure to breast milk from mothers exposed to mercury in fish would also be a pathway of concern. As

indicated in the table, noncancer hazards for exposure to floodplain soil was acceptable at all but one property (Roger Shifflett in Reach 4). At that property, the HI was 1.1.

The cumulative noncancer hazards for child residents ranged between 72 and 264. Cumulative noncancer hazards for child farmers, when ingestion of livestock and poultry includes non-typical organs, ranged between 127 and 318. Similar to adult residents, the exposure pathway of concern was also primarily ingestion of fish from the South River and floodplain area ponds. Noncancer hazards for exposure to floodplain soil were also above 1.0 in nine of the exposure areas evaluated. At these properties, individual HIs ranged between 1.1 and 3.3. The highest HI in surface soil was observed at the Roger Shifflett property in Reach 4. The highest total HI (4.4 for surface and subsurface soil) was observed at the Floyd Shifflett property in Reach 2.

### **6.3 Consumption-Based Evaluation**

Further evaluation of potential noncancer hazards identified for fish ingestion and wildlife ingestion pathways are detailed in this Section.

#### **6.3.1 Fish Consumption**

As detailed in Section 6.2, ingestion of fish from the South River or floodplain ponds is the driving exposure pathway of concern where evaluated in each of the receptor scenarios. Fish consumption bans and advisories issued by VDOH and VADEQ have effectively managed the fish consumption exposure pathway. A 1977 ban on fish consumption was replaced with a consumption advisory in 1980, which was modified again in 2001 to reflect new guidance from the U.S. National Academy of Sciences on an acceptable daily intake of mercury (VDOH, 2001). The 2001 fish consumption advisory was subsequently modified in 2011 and remains in effect. The advisory is as follows:

- South River: No fish other than trout should be eaten from these waters. Stocked trout have been tested and are safe to eat.
- SFS River: No more than two meals ( $\frac{1}{2}$  pound each or the size of your hand) of fish per month should be eaten from these waters. Women who are pregnant or may become pregnant, nursing mothers, and young children should not eat fish from these waters.

The SRST and Promotores de Salud began collaborating in early 2011 as part of the SRST's effort to effectively educate communities along the South River and SFS River about the fish consumption advisories due to mercury. The Hispanic population in the Central and Northern Shenandoah Valley has increased significantly in recent years, and the SRST has responded by taking a more interactive approach to communicate the fish consumption advisory to this community. Promotores de Salud is a community outreach program that the SRST, working through James Madison University, developed and implemented in 2010. The program has been in place for several years and has graduated more than a dozen "Promotores," members of the local community who educate numerous fellow residents in the watershed regarding fish consumption. The benefits go well beyond communication of fishing precautions, such as general health, nutrition, and well-being of the local Hispanic community. Recently, other non-English speaking

groups, including Russian and Arabic speaking populations, have been identified and incorporated into the Promotores de Salud program (AECOM, 2015a).

### 6.3.2 Wildlife Consumption

Ingestion of waterfowl (in particular mallard ducks) was also identified as an exposure pathway of concern in the risk assessment. Risk-based consumption limits for chronic exposure health effects were developed for adults to relate the number of meals that can be eaten to tissue concentrations of THg. A range of consumption limits were calculated for consumers of waterfowl, large mammals (white-tailed deer) and reptiles (snapping turtles) to provide information for risk management. Though not evaluated quantitatively in the risk assessment, consumption limits were also calculated for small mammals (muskrats and squirrels).

Derivation of consumption limits for individuals consuming this wild game harvested from the AOC 4 floodplain is described in [Appendix I](#). Results of the evaluation show that waterfowl, game, and other animals (other than fish) from the South River watershed may be safely eaten to some degree over the course of one year without being a health concern. As detailed in the tables provided in the appendix, consumption limits [based on an 8 ounce (oz) meal size] ranged between 4 meals per year for snapping turtles to unrestricted meals for white-tailed deer.

## 6.4 Other Considerations

The Clean Water Act (CWA) requires a Total Maximum Daily Load (TMDL) be developed for those water bodies identified as impaired by a State where technology based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a Margin of Safety (MOS), that may be discharged to a water quality-limited waterbody (EPA, 2010). In general terms, the TMDL is the maximum amount of mercury that can enter the South River and still produce fish that are safe to eat.

EPA's June 2010 document *Decision Rationale Total Maximum Daily Loads Mercury Impairment South River, South Fork Shenandoah and Shenandoah River, Virginia* outlines the approach used to establish TMDLs to address impairments of water quality, caused by mercury, as identified in Virginia's 1998 Section 303(d) list of impaired waters. The TMDL proposed by VADEQ and approved by EPA was determined to be a fish tissue MeHg concentration of 0.3 mg/kg. Based on a site-specific empirical bioaccumulation model, water column target concentrations were then developed for South River (3.8 ng/L), South Fork Shenandoah River (3.2 ng/L), and Shenandoah River (2.5 ng/L). Finally, mercury TMDLs were developed to meet these in-stream target water column concentrations. The mercury TMDLs identify reductions to mercury loading that will result in fish safe to eat.

## 7.0 Uncertainty Analysis

Uncertainties are inherent in the risk assessment process because of the numerous assumptions that are made in estimating exposure, toxicity, and potential risk. Conservative assumptions are made at every step of the process so as not to underestimate potential risk. The key factors and assumptions described in the subsections below contributed to uncertainty in the HHRA:

- Sampling approach
- COPC identification and exposure pathway selection
- Exposure point concentrations
- Exposure assessment
- Toxicity factors
- Risk Characterization

### 7.1 Sampling Approach

A portion of the floodplain soil samples collected during the June 2004 sampling event could not be collected with hand coring equipment. In these cases, a pit was dug at each boring location, and samples were collected from the carefully cleaned sides of the pit to avoid vertical contamination of the samples. The potential for uncertainty in these samples, which represents less than 1% of the total floodplain soil sample data set, is considered low.

Some surface soil samples were collected from a depth interval of 0 to 0.5 ft bgs while some others were collected from a depth interval of 0.5 to 2.5 ft bgs. However, all of these data were grouped together as surface soil irrespective of sampling locations and current/future use land use consideration. As a result, this approach may result in an over- or under- estimation of the risk.

As noted in Section 3.1.4, the maximum depth to which mercury extends has not been established on some of the individual properties sampled in AOC 4 which may underestimate potential risk from subsurface soil exposure pathways. However, while subsurface soil data are limited in some areas, the strategy for sample collection depths is consistent with the release mechanism (surface deposition during storm events).

Samples collected at particular parcels were not collected to represent the entire parcel, but to characterize inundation areas and land use conditions within the parcel. In addition, it should be noted that applying data collected within the 2-yr, 5-yr or 62- yr floodplain to areas outside of these inundation areas may over-estimate risks.

Field QC collected during each floodplain soil study was indicated on the DQC for each study. If a particular item was not applicable (such as field blanks), it was indicated on the DQC. If field QC was omitted or was not collected at the specified frequency then it was discussed in the DUR. The impact of omitted field QC on data usability (such as sensitivity or precision) is discussed in the DUR. In each case, other QC information was available to assess data quality. Therefore, the potential for uncertainty is considered low.

## 7.2 COPC Identification and Exposure Pathway Selection

As indicated in the COPC identification provided in Section 3.3.6, MeHg was eliminated as a COPC in floodplain soil for further quantitative evaluation in the risk assessment. This may potentially underestimate the overall risk by calculating noncancer hazards for only THg instead of THg and MeHg. However, note that paired THg/MeHg samples were collected in areas of the floodplain most favorable to methylation (wetlands). In these samples, MeHg was not detected above EPA SLs.

The evaluation of the soil migration-to-groundwater transport pathway also used data from on-site (plant) to evaluate the off-site pathway. Soil types in the on-site and off-site data set were similar. Therefore, the potential for uncertainty associated with this extrapolation is low. However, where soil types may vary (i.e., less sand and more clay) in off-site locations the potential for uncertainty may be greater.

Shallow alluvial groundwater data are limited for AOC 4. Therefore, the elimination of groundwater as a medium of concern for further quantitative evaluation in the risk assessment could result in an underestimation of risk.

## 7.3 Exposure Point Concentrations

### 7.3.1 Floodplain Soil

As detailed in Section 3.1.1, a stratified random (modified) sampling plan was used to characterize floodplain soils. Where higher concentrations (or outliers) have been observed at individual locations, the extent of these areas has been well characterized at most locations. However, for some areas, complete delineation (vertical and horizontal) has not been achieved; and, therefore, removal of the outlier from EPC calculations may result in an underestimation of potential risk.

Table 4-5 in the *AOC 4 RFI Report* (AECOM, 2015a) provides a summary of floodplain soil samples collected at historic mill race locations. As shown in the table, floodplain soil samples have been collected at 10 of the 11 historic mill race locations evaluated. Three mill race locations could not be confirmed. As shown in the table, the sample density is greater for some mill races (such as the Oxbow) than others. Potential data gaps for these areas with low sample density will be addressed as part of the Corrective Measures Study (CMS), where identified. As shown in the floodplain soil sample location maps provided in Appendix D, the distance and depositional differences between the sample and actual mill race, in some cases, may introduce uncertainty in the risk assessment. As a result, this approach may result in an over-or under- estimation of the risk.

Surrogate soil EPCs were identified for properties in AOC 4 which did not have floodplain soil data. These EPCs were developed based on the assumptions presented in Section 4.2.1. These assumptions might result in underestimating or overestimating the intake calculated for specific receptors, depending on the accuracy of the surrogate used in the evaluation relative to actual property THg concentrations. Both surface and subsurface exposure pathways were evaluated separately for future receptor scenarios and considered additive. (Rather than calculating an EPC for the entire soil depth representative of future exposure). Because the EPC would likely be lower in the larger

combined data set, this approach is considered conservative resulting in an over-estimation of risk.

### 7.3.2 South River Sediment

As noted in [Table 3-2](#), bulk sediment collected from the South River during various investigations was analyzed for THg by either USEPA SW846 Method 7471A or EPA Method 1631. These methods have been determined to provide comparable data for this media since similar method-performance requirements have been met. An EPC was calculated using data from the combined data set. If one method has the potential to bias the results low compared to the other method, the EPC calculated from the combined data set may result in underestimating the intake calculated for each applicable river reach. Conversely, if one method has the potential to bias the results high compared to the other method, the EPC calculated from the combined data set may result in overestimating the intake calculated for each applicable river reach. Split samples have not been collected to quantitatively assess the potential for bias.

### 7.3.3 Floodplain Food Sources

EPCs for game (deer) were based on the maximum detected concentration. The data set was limited (n=4). Therefore, the use of the maximum detected concentration may overestimate or underestimate risk.

EPCs for garden crops and poultry based on studies conducted at the Augusta Forestry Center, may potentially result in an underestimation of risk for properties with higher THg floodplain soil concentrations. However, most properties (in particular those within Reaches 3-6) have concentrations less than those observed at the Augusta Forestry Center.

In identifying EPCs for individual garden crops, one-half the detection limit was assumed for garden crop types where THg was nondetect. The use of one-half the detection limit as an EPC may result in overestimating the intake calculated for a particular garden crop type.

Aggregate-species EPCs were used for fish. However, some individuals may target particular fish, or eat a combination of fish species different from that which was used to develop the aggregate EPC. As a result, the aggregate EPC may not accurately reflect fish consumption patterns in the South River or floodplain area ponds.

Since the evaluation was done on a per-reach basis, it is not known if this assumption would under- or overestimate risk. However, if an individual fishes more than one reach within AOC 4, their overall potential for experiencing adverse health effects from the ingestion of mercury may be underestimated.

Aggregate-species EPCs did not consider trophic levels. For the South River, both the largemouth bass and smallmouth bass are from the same higher trophic level. However, fish sampled from the floodplain ponds represented different trophic levels in some locations. Since fish consumption rates used in the risk assessment were not adjusted to reflect trophic level (i.e., higher trophic levels would likely be caught for consumption than lower trophic levels), the aggregation of species between trophic levels to derive the EPC would likely overestimate potential risk.

The use of filet data to represent mercury concentrations in the whole body in the risk assessment is conservative and may overestimate risk. MeHg binds to red blood cells and is rapidly transported to all organs, including the brain, blood, spleen, kidney, and liver. However, it is well documented that most MeHg ultimately accumulates in muscle, bound to sulfhydryl groups in protein (Weiner and Spry, 1994). Pharmacodynamic studies confirm that the brain receives less than 1% of an administered MeHg dose, whereas muscle account for 50% of the dose (Giblin and Massaro, 1973). This results in generally similar or lower concentrations in the brain as compared to muscle tissue (e.g., Cizdiel et al. 2003). Given that the brain accounts for a relatively small proportion of the total fish weight, the brain would have to accumulate much more mercury than the rest of the tissues to account for a significant portion of the mercury dose. Consequently, the highest concentrations of mercury in fish tend to occur in the axial muscle (i.e., the fillet tissue) and concentrations measured in the whole body are lower (Bevelheimer et. al., 1997).

In addition, subsistence fishers, who may consume whole fish, were not identified as potential receptors in HHRA. Subsistence fishing considers most, if not all, of the individual's dietary protein is derived from fish caught locally. Subsistence fishing is often associated with populations exhibiting strong ethnic and cultural behavior, such as certain Native American populations. There is no evidence of the likelihood of subsistence fishing occurring on the South River.

## 7.4 Exposure Assessment

The assumption that current farmers are raising poultry on the floodplain has not been confirmed at each of the 22 properties evaluated. As a result, the evaluation provided for this receptor may provide an overestimation of the potential for risk. Similarly, the assumption that there may be subsistence farming in AOC 4 has not been confirmed. As a result, the evaluation provided for this receptor may provide an overestimation of the potential for risk.

Values assumed for exposure parameters (e.g., ingestion rate and exposure frequency) used in calculations of intakes were primarily recommended default values based on EPA guidance. These assumptions might result in underestimating or overestimating the intakes calculated for specific receptors, depending on the accuracy of the assumptions relative to actual site conditions and land uses. For food ingestion rates, EPA has acknowledged uncertainty in the use of ingestion rates based on short-term dietary recall (EPA, 2011). As a result, the use of food ingestion rates developed from the 1987-1988 NHANES study, may result in overestimating or underestimating the intakes assumed for receptors ingesting food grown or caught on the floodplain.

For the food ingestion rates, no adjustment to the ingestion rate for cooking or preparation losses was conducted. This approach is considered conservative resulting in an over-estimation of risk. Adjustment for cooking/preparation losses and post-cooking losses, which involves losses from cutting, bones, excess fat, scraps and juices, reflects what is actually consumed during a meal. HQs calculated for fish, for example, were less when an adjustment was applied (see [Appendix H](#)). For example, for adult recreational users, cumulative noncancer hazards ranged between 27 and 110 (as compared to 44-182 unadjusted).

EPA recommends that the dermal pathway not be quantitated for inorganics without an available chemical-specific dermal absorption factor because the speciation of the compound is critical to the dermal absorption (EPA, 2004). A chemical-specific dermal absorption factor is not available for mercury. Therefore, the use of a default dermal absorption factor for mercury, for example, may overestimate risks for that pathway.

Consistent with the evaluation of mercury as mercuric chloride and the lines of evidence presented in Section 3.4.2, a volatilization factor (VF) was not used in the intake factor calculations for soil. Data from the Jerome Mercury Analyzer was used to support the weight of evidence approach. The detection limit for the analyzer was slightly above EPA's SL for industrial or residential air. Therefore, there is potential uncertainty in non-detect data obtained at a detection limit above the screening criteria.

## 7.5 Toxicity Assessment

Uncertainty is inherent in the toxicity values used in evaluating the carcinogenic and noncarcinogenic risks. Such uncertainty is chemical-specific and is incorporated into the toxicity value during its development. For example, an uncertainty factor may be applied for interspecies and intrahuman variability, for extrapolation from subchronic to chronic exposures, or for epidemiological data limitations. Application of uncertainty factors is expected to overestimate toxicity and risks.

The risk assessment assumed that THg in biota is present as MeHg. This assumption roughly overestimated HQs by a factor of 3, in particular for biota where bioaccumulation has not been demonstrated (such as garden crops) or where MeHg concentrations are lower (such as livestock and poultry).

Toxicity information was not available for dermal exposure; hence, several assumptions were made in order to calculate dermal-adjusted SFs and RfDs. These assumptions may overestimate or underestimate risk.

## 7.6 Risk Characterization

When evaluating cumulative noncancer hazards for garden crops, HQs for individual garden crop types were summed to yield a HI. This cumulative evaluation has the potential to overestimate potential risk as it assumes that an individual eats on a daily basis each of the 18 garden crops evaluated and that each garden crop type contains THg. THg was not detected in half of the garden crops (n=9). If the cumulative hazard is evaluated by using the geometric mean as the EPC, combined with an ingestion rate which is considered representative of all garden crops, then the resulting HQ was less (0.3 compared to 1.8).

Similarly, the summation of cumulative noncancer hazards for different target organs and critical effect may potentially overestimate or underestimate risk.

## **7.7 Summary**

As described in this Section, although some key factors and assumptions contributed to uncertainty in the HHRA, the evaluation is considered conservative based on the choice of receptors and exposure assumptions (e.g., exposure frequency and duration) that were based primarily on the EPA and VADEQ guidance cited herein. As a result, the risk estimates presented within this report provide a conservative yet meaningful basis upon which to evaluate remedial actions for AOC 4.

## 8.0 Conclusions and Recommendations

This HHRA was conducted consistent with RCRA requirements to evaluate potential exposure of human receptors to mercury detected in environmental media in the South River watershed. The primary goals of this assessment were (1) to evaluate potential risk for AOC 4 human receptors and (2) to provide risk information sufficient for remedial decisions consistent with EPA and VADEQ requirements.

In general,

- For all current potential receptors, exceedances were limited to potential exposure to floodplain area surface soils, ingestion of waterfowl (mallards and wood ducks) and snapping turtles. (The number of soil exceedances is reduced if the outlier analysis is performed.) Maximum exceedances by receptor and pathway are illustrated on [Figure 8-1](#).
- For future potential receptors, if floodplain area subsurface soils are assumed to be on the surface, garden crops are grown on the floodplain, poultry are raised on the floodplain and the fish advisory is not in place, these pathways also show exceedances. (Similar to above, the number of soil exceedances is reduced if the outlier analysis is performed). Maximum exceedances under this scenario by receptor and pathway are illustrated on [Figure 8-2](#).
- For the both the hypothetical future resident and hypothetical future subsistence farmer, where all pathways are assumed possible on any property where soil concentrations exceed 17 mg/kg, similar pathways as the future potential receptors exceed the target HI, but the maximum HIs are higher. Maximum exceedances under this scenario by receptor and pathway are illustrated on [Figure 8-3](#).

In all cases, no exceedances are noted for potential exposures directly to sediments and indirect pathways associated with consumption of livestock (beef and dairy), poultry (muscle) and game (represented by deer).

More specifically, the human health risk assessment supports the following conclusions:

- Potential exposure to South River surface water and floodplain area groundwater, surface water and sediment was not considered a potential concern for human health. Concentrations in samples collected from each of the media were below screening criteria.
- No unacceptable health risks were indicated for current residents (adult/child), current adult recreational users of floodplain area parks and current recreational users of the South River (adult/child).
- For current/future industrial/commercial workers and current/future construction/excavation workers, cumulative noncancer hazards ranged between 1.2 and 3.3. Ingestion of floodplain area surface soil was the exposure pathway of concern. Elevated THg concentrations were observed primarily in an area north of the Oxbow located on the Americast property. There are no current worker exposures to the area.

- Limited unacceptable health risks were indicated for current recreational users of floodplain area parks and current farmers. Cumulative noncancer hazards for current child recreational users of floodplain area parks ranged between 1.1 and 2.1. Total HIs above 1.0 were observed in two parks: Constitution Park and North Park. Removal of outliers from both locations resulted in total HIs less than 1.0. Cumulative noncancer hazards for current adult farmers were 1.5 and 2.2 and ranged between 1.1 and 3.9 for child farmers. Ingestion of floodplain soil was the exposure pathway of concern.
- Total HIs above acceptable levels were observed for current/future hunters. Ingestion of waterfowl (primarily mallards) was the exposure pathway of concern. Total HIs ranged between 7 and 8. Since snapping turtles would be obtained via trapping, indirect exposure to mercury in South River surface water, sediment and pore water via ingestion was evaluated separately. The HQ for this pathway was 71 (based on a 90<sup>th</sup> percentile ingestion rate) and 38 (based on a mean ingestion rate).
- Likewise, total HIs above acceptable levels were observed for future recreational users of the South River, future recreational users of floodplain area parks, future farmers and future hunters. Indirect exposure to mercury in South River or floodplain pond surface water, sediment and pore water via ingestion of fish were the exposure routes of concern.
- A fish consumption advisory for the South River is currently in place. In the absence of the advisory, cumulative noncancer hazards ranged between 41 and 182 for a recreational user of the South River (adult/child). The highest noncancer hazards were observed in Reach 3. Noncancer hazards were also observed in the upstream reference location. Similar hazards were observed for fish ingestion in private floodplain area ponds.
- Cumulative noncancer hazards for future hypothetical residents and future hypothetical subsistence farmers were also above acceptable levels. Noncancer cumulative hazards for hypothetical future adult and child residents exceeded the HI of 1.0 in each of the properties evaluated. The cumulative noncancer hazards for adult residents ranged between 54 and 283 and for child residents ranged between 50 and 262. Cumulative noncancer hazards by critical effect were driven by the assumption that THg is present as MeHg in potential food sources. The exposure pathway of concern was primarily ingestion of fish from South River and floodplain area ponds, with ingestion of waterfowl a concern to a lesser extent.

In summary, this risk assessment shows limited potential for human health risks at the exposure areas evaluated under current land uses. Although some site-specific assumptions were made for the risk assessment, the evaluation is considered conservative based on the choice of receptors and exposure assumptions (e.g., exposure frequency and duration) that were based primarily on the EPA and VADEQ guidance cited herein. As a result, the risk estimates presented within this report provide a conservative yet meaningful basis upon which to evaluate remedial actions for AOC 4.

Exposure pathways that were identified in the risk assessment as being of potential concern under current or future potential land use conditions will be carried forward into the Corrective Measures Study (CMS) for further consideration. [Table 8-1](#) provides a

summary of floodplain soil areas (in each river reach) recommended for further evaluation in the CMS. The CMS will evaluate remedial options and will recommend remedial measures to ensure the protectiveness of the AOC to human health. The CMS will also define the numeric criteria for judging the effectiveness of the remedy. In addition, the CMS will also evaluate the use of institutional controls (such as consumption advisories) to manage potential risk associated with indirect exposure pathways.

## 9.0 References

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## Tables

**Table 3-1 - Summary of Studies Applicable to the HHRA**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| MEDIA              | PROJECT NAME                                                       | Sampling Date                     |
|--------------------|--------------------------------------------------------------------|-----------------------------------|
| FLOODPLAIN SOIL    | Floodplain Soil Sampling: Augusta Forestry Center                  | April 2003 - April 2005           |
|                    | Floodplain Soil Sampling: Greenway Sampling                        | October-03                        |
|                    | Floodplain Soil Sampling: South River Sampling Event (2004 & 2005) | June 2004 - September 2005        |
|                    | Earthworm Studies                                                  | April-06                          |
|                    | <i>EPA Shifflett Soil Sampling</i>                                 | <i>October-06</i>                 |
|                    | 2008 Floodplain Soil Investigation                                 | February 2008 - April 2008        |
|                    | 2011 Floodplain Pond and Soil Investigation                        | June-11                           |
|                    | 2014 Floodplain Soil Investigation                                 | April-14                          |
| GROUNDWATER        | Alluvial Groundwater                                               | September 2005 - September 2007   |
|                    | <i>Genicom Facility</i>                                            | <i>November-05</i>                |
|                    | <i>EPA Shifflet Sampling</i>                                       | <i>October-06</i>                 |
|                    | Biogeochemistry Program                                            | July-13                           |
| SURFACE WATER      | <i>EPA Shifflet Sampling</i>                                       | <i>October-06</i>                 |
|                    | 2011 Floodplain Pond and Soil Investigation                        | May-11                            |
|                    | Phase II Ecostudy                                                  | January 2011 - December 2013      |
|                    | <i>VADEQ Surface Water Monitoring Program</i>                      | <i>September-13</i>               |
| BULK SEDIMENT      | Geomorphological Study                                             | August 2005 - June 2009           |
|                    | Mercury Source Tracing and Mechanistic Studies                     | May 2006 - February 2007          |
|                    | Phase I Ecostudy                                                   | August 2007 - October 2008        |
|                    | Phase II Ecostudy                                                  | March 2009 - April 2010           |
|                    | Pilot Bank Stabilization                                           | March-10                          |
| AIR                | Outdoor Air Study                                                  | May-05                            |
| FISH               | Phase II Ecostudy                                                  | May 2009 - May 2011               |
|                    | 2011 Floodplain Pond and Soil Investigation                        | May-11                            |
|                    | Long-Term Monitoring Program                                       | May 2014 - June 2014              |
|                    | <i>VADEQ Fish Tissue Monitoring Program</i>                        | February-12                       |
| OTHER WILDLIFE     | Wildlife (Squirrels, Muskrats)                                     | January-08                        |
|                    | Wildlife (Snapping Turtles)                                        | May-10                            |
| WATERFOWL AND GAME | Wildlife (Waterfowl)                                               | September 2008 - October 2009     |
|                    | <i>Wildlife (Deer)</i>                                             | <i>March 2010 - November 2011</i> |
| BEEF/MILK          | South River Beef Study                                             | May 2013 - September 2013         |
| GARDEN CROPS       | Garden Study                                                       | September 2003 - December 2004    |
| Poultry            | Poultry Study                                                      | June 2014 - December 2014         |

Notes:

Data collected by others and provided to SRST.

Data to be used qualitatively in HHRA

Academic study (analysis not conducted by commercial laboratory).

Table 3-2 - Summary of THg Analysis by Media and Study

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Media                         | Entity                             | Study                                       | Sampling Method               | Analytical Method | Analyte         | No. of Samples | % of Total | Recommendation                                                                                                                                                                     |
|-------------------------------|------------------------------------|---------------------------------------------|-------------------------------|-------------------|-----------------|----------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Floodplain Soil               | SRST                               | Augusta Forestry Center                     | Hand Auger                    | EPA SW846 7471A   | THg             | 257            | 13%        | Evaluate as combined data set, sampling methods and analytical methods are comparable. Less than 2% of the data analyzed using a low-level method.                                 |
|                               | SRST                               | Greenway Sampling                           | Hand Auger                    | EPA SW846 7471A   | THg             | 61             | 3%         |                                                                                                                                                                                    |
|                               | SRST                               | Floodplain Soil Sampling 2004-2005          | Hand Auger                    | EPA SW846 7471A   | THg             | 199            | 10%        |                                                                                                                                                                                    |
|                               |                                    |                                             | Hand Auger                    | EPA 1631          | THg             | 31             | 2%         |                                                                                                                                                                                    |
|                               | EPA                                | EPA Shifflett Sampling                      | Geoprobe Direct Push          | EPA SW846 7471A   | THg             | 95             | 5%         |                                                                                                                                                                                    |
|                               | URS                                | 2008 Floodplain Soil Investigation          | Protocol SRSO-1               | EPA SW846 7471A   | THg             | 1402           | 69%        |                                                                                                                                                                                    |
|                               |                                    | 2011 Floodplain Pond and Soil Investigation |                               |                   |                 |                |            |                                                                                                                                                                                    |
|                               | 2014 Floodplain Soil Investigation |                                             |                               |                   |                 |                |            |                                                                                                                                                                                    |
| South River Bulk Sediment     | SRST                               | Mercury Source Tracing                      | Protocol SRSE-2               | EPA 1631          | THg             | 75             | 41%        | Combine data set. Sediment results are comparable between the two analytical methods.                                                                                              |
|                               | URS                                | Phase I Ecostudy                            | Protocol SRSE-2               | EPA 1631          | THg             |                |            |                                                                                                                                                                                    |
|                               | URS                                | Phase II Ecostudy                           | Protocol SRSE-2               | EPA 1631          | THg             |                |            |                                                                                                                                                                                    |
|                               | URS                                | Pilot Bank Stabilization                    | Protocol SRSE-2               | EPA 1631          | THg             |                |            |                                                                                                                                                                                    |
|                               | URS                                | Phase I Ecostudy                            | Protocol SRSE-2               | EPA SW846 7471A   | THg             | 107            | 59%        |                                                                                                                                                                                    |
|                               | URS                                | Phase II Ecostudy                           | Protocol SRSE-2               | EPA SW846 7471A   | THg             |                |            |                                                                                                                                                                                    |
| South River Fish              | URS                                | Phase II Ecostudy                           | Fish Biopsy                   | EPA SW846 7473    | THg             | 648            | 56%        | Will apply a regression analysis to convert biopsy to filet for combination with VADEQ filet data                                                                                  |
|                               | VADEQ                              | VADEQ 2/12 Event                            | Fish Filet                    | EPA SW846 7471B   | THg             | 518            | 44%        |                                                                                                                                                                                    |
| South River Surface Water     | URS                                | Phase II Ecostudy                           | Protocol SRSW-1 (2)           | EPA 1631          | THg, Unfiltered | 182            | 85%        | Maximum detected concentration less than tap water SL (5.7 ug/L) and Federal MCL (2 ug/L). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable.         |
|                               | URS                                | Phase II Ecostudy                           | Protocol SRSW-1 (2)           | EPA 1631          | THg, Filtered   | 182            |            |                                                                                                                                                                                    |
|                               | VADEQ                              | VADEQ 9/11 Event                            | VADEQ Protocol (2)            | ULTRA TRACE (3)   | THg, Unfiltered | 9              | 4%         |                                                                                                                                                                                    |
|                               | VADEQ                              | VADEQ 9/11 Event                            | VADEQ Protocol (2)            | ULTRA TRACE (3)   | THg, Filtered   | 9              |            |                                                                                                                                                                                    |
|                               | VADEQ                              | VADEQ 11/11 Event                           | VADEQ Protocol (2)            | ULTRA TRACE (3)   | THg, Unfiltered | 9              | 4%         |                                                                                                                                                                                    |
|                               | VADEQ                              | VADEQ 11/11 Event                           | VADEQ Protocol (2)            | ULTRA TRACE (3)   | THg, Filtered   | 9              |            |                                                                                                                                                                                    |
|                               | VADEQ                              | VADEQ 9/13 Event                            | VADEQ Protocol (2)            | EPA 1631          | THg, Unfiltered | 14             | 7%         |                                                                                                                                                                                    |
|                               | VADEQ                              | VADEQ 9/13 Event                            | VADEQ Protocol (2)            | EPA 1631          | THg, Filtered   | 14             |            |                                                                                                                                                                                    |
| Floodplain Pond Fish          | URS                                | 2011 Floodplain Pond and Soil Investigation | Protocol SRBF-1 (Filet)       | EPA 1631          | THg             | 47             | 100%       | Floodplain Pond fish evaluated separately for each land owner                                                                                                                      |
| Floodplain Groundwater        | EPA/USGS                           | Genicom Facility                            | Not provided                  | Not provided      | THg, Unfiltered | 4              | 11%        | Identified for qualitative evaluation only                                                                                                                                         |
|                               | EPA/USGS                           | Genicom Facility                            | Not provided                  | Not provided      | THg, Filtered   | 4              | 5%         |                                                                                                                                                                                    |
|                               | EPA                                | EPA Shifflet Sampling                       | Peristaltic Pump/Low Flow     | EPA 1631          | THg, Unfiltered | 18             | 49%        | Maximum detected concentration less than tap water SL (5.7 ug/L) and Federal MCL (2 ug/L). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable.         |
|                               | EPA                                | EPA Shifflet Sampling                       | Peristaltic Pump/Low Flow     | EPA 1631          | THg, Filtered   | 18             | 24%        |                                                                                                                                                                                    |
|                               | SRST                               | Alluvial Groundwater                        | Peristaltic Pump/Low Flow     | EPA 1631          | THg, Filtered   | 38             | 51%        | Identified for qualitative evaluation only                                                                                                                                         |
|                               | SRST                               | Biogeochemistry Program                     | Peristaltic Pump/Low Flow     | Academic          | THg, Unfiltered | 15             | 41%        |                                                                                                                                                                                    |
|                               | SRST                               | Biogeochemistry Program                     | Peristaltic Pump/Low Flow     | Academic          | THg, Filtered   | 15             | 20%        |                                                                                                                                                                                    |
| Floodplain Pond Surface Water | URS                                | 2011 Floodplain Pond and Soil Investigation | Protocol SRSW-1               | EPA 1631          | THg, Filtered   | 27             | 100%       | Maximum detected concentration less than tap water SL (5.7 ug/L) and Federal MCL (2 ug/L). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable.         |
|                               | URS                                | 2011 Floodplain Pond and Soil Investigation | Protocol SRSW-1               | EPA 1631          | THg, Unfiltered | 27             | 100%       |                                                                                                                                                                                    |
|                               | EPA                                | EPA Shifflet Sampling                       | Jar-Sampling Device           | EPA 1631          | THg, Filtered   | 4              | 100%       |                                                                                                                                                                                    |
|                               | EPA                                | EPA Shifflet Sampling                       | Jar-Sampling Device           | EPA 1631          | THg, Unfiltered | 4              | 100%       |                                                                                                                                                                                    |
| Floodplain Pond Sediment      | URS                                | 2011 Floodplain Pond and Soil Investigation | Protocol SRSE-2               | EPA 1631          | THg             | 6              | 100%       | Maximum detected concentration less than screening criteria (EPA residential soil SL of 23 mg/kg). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable. |
| Floodplain Garden Crops       | SRST                               | Garden Study                                | Crop samples from SRST Garden | EPA SW846 7471A   | THg             | 139            | 100%       | Each garden crop type will be evaluated separately                                                                                                                                 |
| Floodplain Livestock (Beef)   | URS                                | South River Beef Study                      | Individual samples from farms | EPA 1631          | THg             | 60             | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
| Floodplain Livestock (Milk)   | URS                                | South River Beef Study                      | Individual samples from farms | EPA 1631          | THg             | 9              | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
| Floodplain Poultry            | URS                                | South River Poultry Study                   | Individual species sampled    | EPA 1631          | THg             | 356            | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
| Floodplain Wildlife (1)       | SRST                               | Waterfowl (Canada Goose)                    | Individual species sampled    | EPA 1631          | THg             | 20             | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
|                               | SRST                               | Waterfowl (Mallard)                         | Individual species sampled    | EPA 1631          | THg             | 22             | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
|                               | SRST                               | Waterfowl (Wood Duck)                       | Individual species sampled    | EPA 1631          | THg             | 16             | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
|                               | SRST                               | Game (White-Tailed Deer)                    | Individual species sampled    | EPA 1631          | THg             | 8              | 100%       | Each potential food source will be evaluated separately                                                                                                                            |
|                               | SRST                               | Snapping Turtles                            | Individual species sampled    | EPA 7473          | THg             | 120            | 100%       | Each potential food source will be evaluated separately                                                                                                                            |

Notes:

- (1) Wildlife collected include waterfowl, deer and snapping turtles. Muskrats and squirrels have also been collected, but will be used qualitatively.
- (2) Both protocols follow the guidelines set forth in EPA Method 1669 Sampling Ambient Water for Determination of Metals at EPA Water Quality Criteria Levels (July 1996).
- (3) VADEQ electronic data deliverable (EDD) specifies analytical method as Ultra Trace (Mercury Low Level). VADEQ provided Data Usability Assessment indicates that the method is EPA 245.7
- (4) EPA Regional Screening Level (SL) dated May 2014. Federal maximum contaminant level (MCL) dated Summer 2010.

THg - total mercury  
ug/L - micrograms per liter  
mg/kg - milligrams per kilogram

SRST - South River Science Team

Table 3-3 - Summary of MeHg Analysis by Media and Study  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Media                         | Entity | Study                                       | Sampling Method               | Analytical Method | Analyte          | No. of Samples | % of Total | Recommendation                                                                                                                                                                      |
|-------------------------------|--------|---------------------------------------------|-------------------------------|-------------------|------------------|----------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Floodplain Soil               | SRST   | Floodplain Soil Sampling 2004-2005          | Hand Auger                    | EPA 1630          | MeHg             | 17             | 22%        | Maximum detected concentration less than screening criteria (EPA residential soil SL of 7.8 mg/kg). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable. |
|                               | URS    | 2008 Floodplain Soil Investigation          | Protocol SRSO-1               | EPA 1630          | MeHg             | 60             | 78%        |                                                                                                                                                                                     |
| South River Bulk Sediment     | SRST   | Mercury Source Tracing                      | Protocol SRSE-2               | EPA 1630          | MeHg             | 10             | 10%        | Maximum detected concentration less than screening criteria (EPA residential soil SL of 7.8 mg/kg). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable. |
|                               | URS    | Phase I Ecostudy                            | Protocol SRSE-2               | EPA 1630          | MeHg             | 89             | 90%        |                                                                                                                                                                                     |
| South River Surface Water     | URS    | Phase II Ecostudy                           | Protocol SRSW-1 (2)           | EPA 1630          | MeHg, Unfiltered | 182            | 85%        | Maximum detected concentration less than tap water SL (2 ug/L). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable.                                     |
|                               | URS    | Phase II Ecostudy                           | Protocol SRSW-1 (2)           | EPA 1630          | MeHg, Filtered   | 182            |            |                                                                                                                                                                                     |
|                               | VADEQ  | VADEQ 9/13 Event                            | VADEQ Protocol (2)            | EPA 1630          | MeHg, Unfiltered | 14             | 7%         |                                                                                                                                                                                     |
|                               | VADEQ  | VADEQ 9/13 Event                            | VADEQ Protocol (2)            | EPA 1630          | MeHg, Filtered   | 14             |            |                                                                                                                                                                                     |
| Floodplain Pond Fish          | URS    | 2011 Floodplain Pond and Soil Investigation | Protocol SRBF-1 (Filet)       | EPA 1630          | MeHg             | 47             | 100%       | Floodplain pond fish evaluated separately for each land owner                                                                                                                       |
| Floodplain Groundwater        | EPA    | EPA Shifflett Sampling                      | Peristaltic Pump/Low Flow     | EPA 1630          | MeHg, Filtered   | 18             | 44%        | Maximum detected concentration less than tap water SL (2 ug/L). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable.                                     |
|                               | SRST   | Alluvial Groundwater                        | Peristaltic Pump/Low Flow     | EPA 1630          | MeHg, Filtered   | 8              | 20%        |                                                                                                                                                                                     |
|                               | SRST   | Biogeochemistry Program                     | Peristaltic Pump/Low Flow     | Academic          | MeHg, Filtered   | 15             | 37%        | Identified for qualitative evaluation only                                                                                                                                          |
|                               | SRST   | Biogeochemistry Program                     | Peristaltic Pump/Low Flow     | Academic          | MeHg, Unfiltered | 15             | 100%       |                                                                                                                                                                                     |
| Floodplain Pond Surface Water | URS    | 2011 Floodplain Pond and Soil Investigation | Protocol SRSW-1               | EPA 1630          | MeHg, Filtered   | 27             | 100%       | Maximum detected concentration less than tap water SL (2 ug/L). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable.                                     |
|                               | URS    | 2011 Floodplain Pond and Soil Investigation | Protocol SRSW-1               | EPA 1630          | MeHg, Unfiltered | 27             | 100%       |                                                                                                                                                                                     |
|                               | EPA    | EPA Shifflett Sampling                      | Jar-Sampling Device           | EPA 1631          | MeHg, Filtered   | 4              | 100%       |                                                                                                                                                                                     |
|                               | EPA    | EPA Shifflett Sampling                      | Jar-Sampling Device           | EPA 1631          | MeHg, Unfiltered | 4              | 100%       |                                                                                                                                                                                     |
| Floodplain Pond Sediment      | URS    | 2011 Floodplain Pond and Soil Investigation | Protocol SRSE-2               | EPA 1630          | MeHg             | 6              | 100%       | Maximum detected concentration less than screening criteria (EPA residential soil SL of 7.8 mg/kg). Medium not carried forward in HHRA. Issue of combining for HHRA not applicable. |
| Floodplain Livestock (Beef)   | URS    | South River Beef Study                      | Individual samples from farms | EPA 1630          | MeHg             | 60             | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
| Floodplain Livestock (Milk)   | URS    | South River Beef Study                      | Individual samples from farms | EPA 1630          | MeHg             | 9              | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
| Floodplain Poultry            | URS    | South River Poultry Study                   | Individual species sampled    | EPA 1630          | MeHg             | 342            | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
| Floodplain Wildlife (1)       | SRST   | Waterfowl (Canada Goose)                    | Individual species sampled    | EPA 1630          | MeHg             | 20             | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
|                               | SRST   | Waterfowl (Mallard)                         | Individual species sampled    | EPA 1630          | MeHg             | 22             | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
|                               | SRST   | Waterfowl (Wood Duck)                       | Individual species sampled    | EPA 1630          | MeHg             | 16             | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
|                               | SRST   | Game (White-Tailed Deer)                    | Individual species sampled    | EPA 1630          | MeHg             | 8              | 100%       | Each potential food source will be evaluated separately                                                                                                                             |
|                               | SRST   | Snapping Turtles                            | Individual species sampled    | EPA 1630          | MeHg             | 120            | 100%       | Each potential food source will be evaluated separately                                                                                                                             |

Table only includes studies where MeHg was analyzed

Notes:

- (1) Wildlife collected include waterfowl, deer and snapping turtles. Muskrats and squirrels have also been collected, but will be used qualitatively.
- (2) Both protocols follow the guidelines set forth in EPA Method 1669 Sampling Ambient Water for Determination of Metals at EPA Water Quality Criteria Levels (July 1996).
- (3) VADEQ electronic data deliverable (EDD) specifies analytical method as Ultra Trace (Mercury Low Level). VADEQ provided Data Usability Assessment indicates that the method is EPA 245.7

No distinction was made between SG-015/SG-021 and EPA 1630. Studio Geochimica method is equivalent to EPA 1630.

- (4) EPA Regional Screening Level (SL) dated May 2014. MeHg does not have a Federal maximum contaminant level (MCL)

MeHg - methyl mercury  
ug/L - micrograms per liter  
mg/kg - milligrams per kilogram

SRST - South River Science Team

**Table 3-4 - Summary of South River Surface Water Analytical Data**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | Total (T) /<br>Dissolved (D) | No. of<br>Samples | No. of<br>Detects | Minimum<br>Detect | Maximum<br>Detect | Federal<br>MCL | EPA Tap<br>Water SL | No. of<br>Locations ><br>SL |
|---------|-------|------------------------------|-------------------|-------------------|-------------------|-------------------|----------------|---------------------|-----------------------------|
| THg     | ug/L  | T                            | 224               | 224               | 4.80E-04          | 5.30E-01          | 2.00E+00       | 5.70E+00            | 0                           |
| THg     | ug/L  | D                            | 224               | 224               | 2.60E-04          | 4.56E-02          | 2.00E+00       | 5.70E+00            | 0                           |
| MeHg    | ug/L  | T                            | 224               | 207               | 2.20E-05          | 3.52E-03          | -              | 2.00E+00            | 0                           |
| MeHg    | ug/L  | D                            | 224               | 195               | 2.10E-05          | 1.16E-03          | -              | 2.00E+00            | 0                           |

ug/L - micrograms per liter      THg - total mercury, MeHg - methyl mercury

- 1 - South river surface water samples collected between January 2011 and December 2013. Complete data set is provided in Appendix E.
- 2 - EPA Regional Screening Level (EPA SL) for tap water (June 2015 version) (based on a HQ=1). Federal maximum contaminant level (MCL) (Summer 2010).
- 3 - Field duplicates included in summary statistics.

Indicates an exceedance of screening criteria

Table 3-5 - Summary of South River Sediment Analytical Data  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | RRM Description                                   | Analyte | No. of Locations | No. of Samples | Units | Minimum Detect | Maximum Detect | EPA SL Res Soil | No. of Samples > SL <sub>res</sub> | Data Distribution | 95 % UCL with outlier | Maximum Detect - without outlier | 95% UCL without outlier |
|----------|-------|---------------------------------------------------|---------|------------------|----------------|-------|----------------|----------------|-----------------|------------------------------------|-------------------|-----------------------|----------------------------------|-------------------------|
| 1        | 0.5-2 | Main Street to Hopeman Parkway                    | THg     | 4                | 25             | mg/kg | 1.32E-01       | 1.05E+01       | 2.30E+01        | 0                                  | N/A               | NC                    | -                                | NC                      |
| 2        | 2-5   | Hopeman Parkway to Holsinger Farms Footbridge     | THg     | 19               | 56             | mg/kg | 7.15E-02       | 9.96E+01       | 2.30E+01        | 15                                 | Gamma             | 2.36E+01              | 6.09E+01                         | 1.99E+01                |
| 3        | 5-10  | Holsinger Farms Footbridge to New Hope-Crimora Rd | THg     | 14               | 83             | mg/kg | 1.97E-01       | 4.18E+02       | 2.30E+01        | 19                                 | Nonparametric     | 5.23E+01              | 8.62E+01                         | 2.59E+01                |
| 6        | 20-25 | Grand Cavern to Port Republic Rd                  | THg     | 1                | 18             | mg/kg | 7.82E-01       | 2.42E+01       | 2.30E+01        | 2                                  | Normal            | 1.49E+01              | -                                | NC                      |
| 1        | 0.5-2 | Main Street to Hopeman Parkway                    | MeHg    | 2                | 17             | mg/kg | 2.05E-03       | 9.34E-03       | 7.80E+00        | 0                                  | N/A               | NC                    | -                                | NC                      |
| 2        | 2-5   | Hopeman Parkway to Holsinger Farms Footbridge     | MeHg    | 6                | 6              | mg/kg | 2.61E-02       | 2.23E-01       | 7.80E+00        | 0                                  | N/A               | NC                    | -                                | NC                      |
| 3        | 5-10  | Holsinger Farms Footbridge to New Hope-Crimora Rd | MeHg    | 11               | 76             | mg/kg | 2.44E-03       | 1.24E-01       | 7.80E+00        | 0                                  | N/A               | NC                    | -                                | NC                      |

Notes:

SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015 version) for mercuric chloride (23 mg/kg)  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).  
Results are reported by the laboratory with three significant figures. Complete data set is provided in Appendix E.  
UCLs not shown if maximum detected value was less than 17 mg/kg

THg - total mercury, MeHg - methyl mercury  
mg/kg - milligrams per kilogram  
N/A - Not applicable  
NC - Not calculated

**Table 3-6 - Summary of South River Fish Tissue Analytical Data**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM         | RRM Description                                   | Species         | No. of Samples <sup>1</sup> | Tissue Type | Units    | Minimum Detect | Maximum Detect |
|----------|-------------|---------------------------------------------------|-----------------|-----------------------------|-------------|----------|----------------|----------------|
| 1        | 0.5-2       | Main Street to Hopeman Parkway                    | Largemouth Bass | 87                          | Filet       | mg/kg ww | 3.01E-01       | 6.41E+00       |
|          |             |                                                   | Smallmouth Bass | 104                         | Filet       | mg/kg ww | 1.00E-01       | 2.75E+00       |
| 2        | 2-5         | Hopeman Parkway to Holsinger Farms Footbridge     | Largemouth Bass | 20                          | Filet       | mg/kg ww | 4.96E-01       | 3.56E+00       |
|          |             |                                                   | Smallmouth Bass | 46                          | Filet       | mg/kg ww | 2.98E-01       | 4.27E+00       |
| 3        | 5-10        | Holsinger Farms Footbridge to New Hope-Crimora Rd | Largemouth Bass | 6                           | Filet       | mg/kg ww | 1.67E+00       | 7.13E+00       |
|          |             |                                                   | Smallmouth Bass | 1                           | Filet       | mg/kg ww | 3.20E+00       | 3.20E+00       |
| 4        | 10-15       | New Hope-Crimora Rd to Patterson Mill             | Largemouth Bass | 64                          | Filet       | mg/kg ww | 6.13E-01       | 5.13E+00       |
|          |             |                                                   | Smallmouth Bass | 99                          | Filet       | mg/kg ww | 6.51E-01       | 4.01E+00       |
| 5        | 15-20       | Patterson Mill to Grand Cavern                    | Largemouth Bass | 3                           | Filet       | mg/kg ww | 2.48E+00       | 3.51E+00       |
|          |             |                                                   | Smallmouth Bass | 14                          | Filet       | mg/kg ww | 3.70E-01       | 4.01E+00       |
| 6        | 20-25       | Grand Cavern to Port Republic Rd                  | Largemouth Bass | 75                          | Filet       | mg/kg ww | 1.76E-01       | 4.45E+00       |
|          |             |                                                   | Smallmouth Bass | 124                         | Filet       | mg/kg ww | 1.52E-01       | 5.07E+00       |
| Ref      | -2.7 - -0.7 |                                                   | Largemouth Bass | 10                          | Filet       | mg/kg ww | 1.47E-01       | 2.59E+00       |
|          |             |                                                   | Smallmouth Bass | 6                           | Filet       | mg/kg ww | 9.96E-02       | 2.31E-01       |

Notes:

mg/kg - milligrams per kilogram wet weight

1) Combined URS and VADEQ data set. URS biopsy plugs converted to filet using regression analysis discussed in Section 3.2.2.

Complete data set is provided in Appendix F.

Table 3-7 - Summary of Total Mercury Floodplain Soil Data, Segregated by Floodplain Year and Sample Depth  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Floodplain                                        | All   |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 0-2'  |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 436            | 1.18E-02               | 7.14E+02               | 91                        |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 345            | 1.21E-02               | 4.03E+02               | 56                        |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 205            | 1.37E-02               | 4.64E+01               | 21                        |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 541            | 7.80E-03               | 1.24E+02               | 109                       |
| Patterson Mill to Grand Cavern                    | 16-20 | 167            | 1.38E-02               | 4.44E+01               | 6                         |
| Grand Cavern to Port Republic Rd                  | 20-25 | 302            | 1.85E-02               | 7.29E+01               | 12                        |

| Floodplain                                        | 2-Yr  |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 0-2'  |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 139            | 1.43E-02               | 1.67E+02               | 32                        |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 169            | 7.05E-02               | 4.03E+02               | 51                        |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 78             | 1.09E-01               | 4.64E+01               | 15                        |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 245            | 7.80E-03               | 9.43E+01               | 89                        |
| Patterson Mill to Grand Cavern                    | 16-20 | 61             | 4.26E-02               | 4.44E+01               | 4                         |
| Grand Cavern to Port Republic Rd                  | 20-25 | 105            | 2.18E-01               | 7.29E+01               | 10                        |

| Floodplain                                        | 5-Yr  |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 0-2'  |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 199            | 1.18E-02               | 7.14E+02               | 44                        |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 110            | 1.21E-02               | 3.87E+01               | 5                         |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 64             | 2.78E-02               | 3.58E+01               | 6                         |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 146            | 3.36E-02               | 1.24E+02               | 19                        |
| Patterson Mill to Grand Cavern                    | 16-20 | 50             | 3.04E-02               | 2.25E+01               | 2                         |
| Grand Cavern to Port Republic Rd                  | 20-25 | 119            | 2.96E-02               | 2.60E+01               | 2                         |

| Floodplain                                        | 62-Yr |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 0-2'  |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 98             | 3.42E-02               | 3.41E+02               | 15                        |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 66             | 1.40E-02               | 2.81E+00               | 0                         |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 63             | 1.37E-02               | 3.16E+00               | 0                         |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 106            | 1.68E-02               | 2.09E+01               | 1                         |
| Patterson Mill to Grand Cavern                    | 16-20 | 56             | 1.38E-02               | 1.53E+01               | 0                         |
| Grand Cavern to Port Republic Rd                  | 20-25 | 72             | 1.85E-02               | 1.47E+01               | 0                         |

Notes:  
mg/kg - milligrams per kilogram  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable). Complete data set is provided in Appendix E.

Data from the sampling program 2006/2007 Earthworm Study not included in the statisical summary.

| Floodplain                                        | All   |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 2-12' |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 22             | 4.69E-02               | 4.00E+02               | 3                         |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 37             | 0.00E+00               | 8.77E+01               | 11                        |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 0              |                        |                        |                           |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 17             | 5.13E-02               | 2.83E+01               | 3                         |
| Patterson Mill to Grand Cavern                    | 16-20 | 0              |                        |                        |                           |
| Grand Cavern to Port Republic Rd                  | 20-25 | 0              |                        |                        |                           |

| Floodplain                                        | 2-Yr  |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 2-12' |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 7              | 7.69E-02               | 2.09E+01               | 1                         |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 33             | 0.00E+00               | 8.77E+01               | 11                        |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 0              |                        |                        |                           |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 7              | 5.13E-02               | 2.83E+01               | 2                         |
| Patterson Mill to Grand Cavern                    | 16-20 | 0              |                        |                        |                           |
| Grand Cavern to Port Republic Rd                  | 20-25 | 0              |                        |                        |                           |

| Floodplain                                        | 5-Yr  |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 2-12' |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 13             | 4.69E-02               | 4.00E+02               | 1                         |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 4              | 2.00E-01               | 3.00E-01               | 0                         |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 10             | 7.93E-01               | 2.35E+01               | 1                         |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 0              |                        |                        |                           |
| Patterson Mill to Grand Cavern                    | 16-20 | 0              |                        |                        |                           |
| Grand Cavern to Port Republic Rd                  | 20-25 | 0              |                        |                        |                           |

| Floodplain                                        | 62-Yr |                |                        |                        |                           |
|---------------------------------------------------|-------|----------------|------------------------|------------------------|---------------------------|
| Depth                                             | 2-12' |                |                        |                        |                           |
| RRM Descripton                                    | RRM   | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 2              | 4.14E+00               | 3.38E+02               | 1                         |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 0              |                        |                        |                           |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 0              |                        |                        |                           |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 0              |                        |                        |                           |
| Patterson Mill to Grand Cavern                    | 16-20 | 0              |                        |                        |                           |
| Grand Cavern to Port Republic Rd                  | 20-25 | 0              |                        |                        |                           |

Table 3-8 - Summary of Total Mercury Floodplain Soil Data, Segregated by Floodplain Year and Inundation Area  
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Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Depth          | 0-2'                           |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
|----------------|--------------------------------|----------------|------------------------|------------------------|----------------------------------------------|---------------------------------------------|---------------------------|------------------------------------|----------|--------------------------|
| RRM Descripton | Main Street to Hopeman Parkway |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| RRM            | 0.5-2                          |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| Floodplain     | Land Use Type                  | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub> 350 mg/kg | No. of Samples > SL <sub>res</sub> 23 mg/kg | No. of Samples > 17 mg/kg | No. of Outlier Samples (Locations) | 95% UCL  | 95% UCL without outliers |
| 2 Year         | Developed, High Intensity      | 21             | 1.92E-02               | 1.64E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Forest                         | 63             | 2.77E-02               | 1.67E+02               | 0                                            | 13                                          | 16                        | 1 (1)                              | 2.42E+01 | 2.05E+01                 |
|                | Open Space                     | 40             | 1.43E-02               | 5.28E+01               | 0                                            | 9                                           | 13                        | 0                                  | 1.97E+01 | -                        |
|                | Wetlands                       | 15             | 5.62E-01               | 6.28E+01               | 0                                            | 3                                           | 3                         | 0                                  | 2.61E+01 | -                        |
| 5 year         | Developed, High Intensity      | 20             | 2.01E-01               | 6.50E+01               | 0                                            | 1                                           | 2                         | 0                                  | 2.20E+01 | -                        |
|                | Forest                         | 64             | 1.41E-02               | 7.14E+02               | 3                                            | 27                                          | 29                        | 11 (6)                             | 1.46E+02 | 2.51E+01                 |
|                | Open Space                     | 109            | 1.18E-02               | 1.85E+02               | 0                                            | 8                                           | 13                        | 1 (1)                              | 2.30E+01 | 1.66E+01                 |
|                | Wetlands                       | 6              | 1.65E-01               | 1.01E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
| 62 year        | Developed, High Intensity      | 1              | 5.95E-01               | 5.95E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Forest                         | 37             | 4.03E-02               | 5.99E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Open Space                     | 60             | 3.42E-02               | 3.41E+02               | 0                                            | 10                                          | 15                        | 5 (2)                              | 7.65E+01 | 1.32E+01                 |

| Depth          | 0-2'                                          |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
|----------------|-----------------------------------------------|----------------|------------------------|------------------------|----------------------------------------------|---------------------------------------------|---------------------------|------------------------------------|----------|--------------------------|
| RRM Descripton | Hopeman Parkway to Holsinger Farms Footbridge |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| RRM            | 2-5                                           |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| Floodplain     | Land Use Type                                 | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub> 350 mg/kg | No. of Samples > SL <sub>res</sub> 23 mg/kg | No. of Samples > 17 mg/kg | No. of Outlier Samples (Locations) | 95% UCL  | 95% UCL without outliers |
| 2 Year         | Forest                                        | 45             | 1.40E-01               | 4.03E+02               | 1                                            | 14                                          | 16                        | 5 (2)                              | 5.80E+01 | 2.83E+01                 |
|                | Open Space                                    | 18             | 7.05E-02               | 3.46E+01               | 0                                            | 3                                           | 3                         | 0                                  | 1.44E+01 | -                        |
|                | Pasture/Hay                                   | 98             | 7.35E-02               | 1.36E+02               | 0                                            | 20                                          | 30                        | 1 (1)                              | 1.92E+01 | 1.68E+01                 |
|                | Wetlands                                      | 8              | 3.45E-01               | 6.69E+01               | 0                                            | 2                                           | 2                         | 0                                  | NC       | -                        |
| 5 year         | Forest                                        | 43             | 3.00E-02               | 3.14E+01               | 0                                            | 1                                           | 3                         | 0                                  | 7.38E+00 | -                        |
|                | Open Space                                    | 25             | 1.21E-02               | 3.82E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Pasture/Hay                                   | 42             | 3.65E-02               | 3.87E+01               | 0                                            | 1                                           | 2                         | 0                                  | 7.76E+00 | -                        |
| 62 year        | Developed, High Intensity                     | 2              | 2.01E-01               | 3.10E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Forest                                        | 20             | 1.85E-02               | 7.18E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Open Space                                    | 18             | 2.15E-02               | 5.40E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Pasture/Hay                                   | 26             | 1.40E-02               | 2.81E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |

Table 3-8 - Summary of Total Mercury Floodplain Soil Data, Segregated by Floodplain Year and Inundation Area  
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Former DuPont Waynesboro Plant  
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| Depth          | 0-2'                                              |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
|----------------|---------------------------------------------------|----------------|------------------------|------------------------|----------------------------------------------|---------------------------------------------|---------------------------|------------------------------------|----------|--------------------------|
| RRM Descripton | Holsinger Farms Footbridge to New Hope-Crimora Rd |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| RRM            | 5-10                                              |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| Floodplain     | Land Use Type                                     | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub> 350 mg/kg | No. of Samples > SL <sub>res</sub> 23 mg/kg | No. of Samples > 17 mg/kg | No. of Outlier Samples (Locations) | 95% UCL  | 95% UCL without outliers |
| 2 Year         | Cultivated Crops                                  | 20             | 1.76E-01               | 2.54E+01               | 0                                            | 1                                           | 5                         | 0                                  | 1.33E+01 | -                        |
|                | Forest                                            | 22             | 1.09E-01               | 4.64E+01               | 0                                            | 4                                           | 6                         | 0                                  | 2.20E+01 | -                        |
|                | Pasture/Hay                                       | 26             | 2.30E-01               | 3.73E+01               | 0                                            | 4                                           | 4                         | 0                                  | 1.47E+01 | -                        |
|                | Wetlands                                          | 10             | 2.82E-01               | 1.30E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
| 5 year         | Cultivated Crops                                  | 22             | 4.71E-02               | 1.99E+01               | 0                                            | 0                                           | 1                         | 0                                  | 5.28E+00 | -                        |
|                | Forest                                            | 20             | 5.65E-02               | 3.58E+01               | 0                                            | 2                                           | 5                         | 0                                  | 1.86E+01 | -                        |
|                | Open Space                                        | 2              | 1.81E-01               | 3.38E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Pasture/Hay                                       | 20             | 2.78E-02               | 1.14E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
| 62 year        | Cultivated Crops                                  | 22             | 1.57E-02               | 3.35E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Forest                                            | 19             | 1.53E-02               | 3.98E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Pasture/Hay                                       | 22             | 1.37E-02               | 3.16E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |

| Depth          | 0-2'                                  |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
|----------------|---------------------------------------|----------------|------------------------|------------------------|----------------------------------------------|---------------------------------------------|---------------------------|------------------------------------|----------|--------------------------|
| RRM Descripton | New Hope-Crimora Rd to Patterson Mill |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| RRM            | 10-16                                 |                |                        |                        |                                              |                                             |                           |                                    |          |                          |
| Floodplain     | Land Use Type                         | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub> 350 mg/kg | No. of Samples > SL <sub>res</sub> 23 mg/kg | No. of Samples > 17 mg/kg | No. of Outlier Samples (Locations) | 95% UCL  | 95% UCL without outliers |
| 2 Year         | Cultivated Crops                      | 160            | 3.76E-02               | 7.93E+01               | 0                                            | 85                                          | 74                        | 0                                  | 3.57E+01 | -                        |
|                | Forest                                | 33             | 3.75E-01               | 9.43E+01               | 0                                            | 4                                           | 7                         | 0                                  | 1.84E+01 | -                        |
|                | Open Space                            | 15             | 1.34E+00               | 1.66E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Pasture/Hay                           | 22             | 6.74E-02               | 5.79E+01               | 0                                            | 3                                           | 3                         | 0                                  | 1.82E+01 | -                        |
|                | Wetlands                              | 19             | 7.80E-03               | 6.76E+01               | 0                                            | 5                                           | 5                         | 0                                  | 3.75E+01 | -                        |
| 5 year         | Cultivated Crops                      | 68             | 6.00E-02               | 2.89E+01               | 0                                            | 1                                           | 1                         | 0                                  | 5.49E+00 | -                        |
|                | Forest                                | 21             | 1.51E-01               | 2.30E+01               | 0                                            | 0                                           | 3                         | 0                                  | 1.03E+01 | -                        |
|                | Open Space                            | 42             | 5.70E-02               | 1.24E+02               | 0                                            | 7                                           | 15                        | 2 (1)                              | 2.43E+01 | 1.64E+01                 |
|                | Pasture/Hay                           | 22             | 3.36E-02               | 1.06E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Wetlands                              | 3              | 9.99E-01               | 1.41E+01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
| 62 year        | Cultivated Crops                      | 53             | 1.68E-02               | 5.42E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Forest                                | 20             | 2.66E-02               | 7.13E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Open Space                            | 2              | 9.02E-01               | 3.09E+00               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Pasture/Hay                           | 20             | 2.01E-02               | 4.54E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |
|                | Wetlands                              | 11             | 8.58E-01               | 2.09E+01               | 0                                            | 0                                           | 1                         | -                                  | 1.61E+01 | -                        |
| --             | Cultivated Crops                      | 30             | 1.20E-02               | 2.07E-01               | 0                                            | 0                                           | 0                         | -                                  | -        | -                        |

Table 3-8 - Summary of Total Mercury Floodplain Soil Data, Segregated by Floodplain Year and Inundation Area  
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Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Depth          | 0-2'                           |                |                        |                        |                                              |                                             |                           |                                    |          |
|----------------|--------------------------------|----------------|------------------------|------------------------|----------------------------------------------|---------------------------------------------|---------------------------|------------------------------------|----------|
| RRM Descripton | Patterson Mill to Grand Cavern |                |                        |                        |                                              |                                             |                           |                                    |          |
| RRM            | 16-20                          |                |                        |                        |                                              |                                             |                           |                                    |          |
| Floodplain     | Land Use Type                  | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub> 350 mg/kg | No. of Samples > SL <sub>res</sub> 23 mg/kg | No. of Samples > 17 mg/kg | No. of Outlier Samples (Locations) | 95% UCL  |
| 2 Year         | Forest                         | 22             | 1.48E-02               | 1.83E+01               | 0                                            | 0                                           | 1                         | 0                                  | 9.81E+00 |
|                | Open Space                     | 14             | 5.15E-01               | 1.11E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Pasture/Hay                    | 18             | 4.26E-02               | 2.12E+01               | 0                                            | 0                                           | 1                         | 0                                  | 8.47E+00 |
|                | Wetlands                       | 7              | 6.31E+00               | 4.44E+01               | 0                                            | 1                                           | 2                         | 0                                  | NC       |
| 5 year         | Forest                         | 22             | 3.54E-01               | 2.25E+01               | 0                                            | 0                                           | 2                         | 0                                  | 9.74E+00 |
|                | Open Space                     | 6              | 3.04E-02               | 2.30E+00               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Pasture/Hay                    | 22             | 5.85E-02               | 1.37E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |
| 62 year        | Forest                         | 18             | 1.59E-02               | 1.53E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Open Space                     | 14             | 1.84E-02               | 4.09E+00               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Pasture/Hay                    | 24             | 1.38E-02               | 1.10E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |

| Depth          | 0-2'                             |                |                        |                        |                                              |                                             |                           |                                    |          |
|----------------|----------------------------------|----------------|------------------------|------------------------|----------------------------------------------|---------------------------------------------|---------------------------|------------------------------------|----------|
| RRM Descripton | Grand Cavern to Port Republic Rd |                |                        |                        |                                              |                                             |                           |                                    |          |
| RRM            | 20-25                            |                |                        |                        |                                              |                                             |                           |                                    |          |
| Floodplain     | Land Use Type                    | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub> 350 mg/kg | No. of Samples > SL <sub>res</sub> 23 mg/kg | No. of Samples > 17 mg/kg | No. of Outlier Samples (Locations) | 95% UCL  |
| 2 Year         | Forest                           | 42             | 1.15E+00               | 2.82E+01               | 0                                            | 1                                           | 4                         | 0                                  | 1.10E+01 |
|                | Open Space                       | 36             | 2.68E-01               | 7.29E+01               | 0                                            | 4                                           | 5                         | 0                                  | 1.35E+01 |
|                | Pasture/Hay                      | 24             | 2.18E-01               | 3.31E+01               | 0                                            | 1                                           | 1                         | 0                                  | 1.27E+01 |
|                | Wetlands                         | 3              | 9.14E-01               | 1.18E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |
| 5 year         | Forest                           | 36             | 4.25E-02               | 1.96E+01               | 0                                            | 0                                           | 1                         | 0                                  | 6.04E+00 |
|                | Open Space                       | 59             | 2.96E-02               | 2.60E+01               | 0                                            | 1                                           | 1                         | 0                                  | 4.96E+00 |
|                | Pasture/Hay                      | 21             | 7.71E-02               | 4.21E+00               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Wetlands                         | 3              | 4.96E-01               | 7.90E+00               | 0                                            | 0                                           | 0                         | -                                  | -        |
| 62 year        | Forest                           | 20             | 4.09E-02               | 1.00E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Open Space                       | 32             | 1.99E-02               | 1.47E+01               | 0                                            | 0                                           | 0                         | -                                  | -        |
|                | Pasture/Hay                      | 20             | 1.85E-02               | 2.67E+00               | 0                                            | 0                                           | 0                         | -                                  | -        |
| --             | Open Space                       | 6              | 2.01E+00               | 8.06E+00               | 0                                            | 0                                           | 0                         | -                                  | -        |

Notes:  
mg/kg - milligrams per kilogram  
Duplicates included in sample count shown, higher of parent/dup used in UCL calculation (where applicable). Therefore, sample count in UCL output may differ. Complete data set is provided in Appendix E.  
*Data from the sampling program 2006/2007 Earthworm Study not included in the statisical summary.*  
Outlier defined as concentration around or exceeding 100 mg/kg  
SL - EPA Regional Screening Level for industrial soil (SL<sub>ind</sub>) and residential soil (SL<sub>res</sub>) (June 2015 version)

**Table 3-9 - Summary of Methyl Mercury Floodplain Soil Data, Segregated by Floodplain Year and Sample Depth**

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Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Floodplain                                        | All   |                |                |                        |                        |                                                 |                                                 |
|---------------------------------------------------|-------|----------------|----------------|------------------------|------------------------|-------------------------------------------------|-------------------------------------------------|
| Depth                                             | 0-2'  |                |                |                        |                        |                                                 |                                                 |
| RRM Descripton                                    | RRM   | No. of Samples | No. of Detects | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub><br>120 mg/kg | No. of Samples > SL <sub>res</sub><br>7.8 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 11             | 10             | 7.50E-05               | 1.21E-02               | 0                                               | 0                                               |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 18             | 18             | 1.88E-04               | 9.19E-03               | 0                                               | 0                                               |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 10             | 10             | 5.40E-05               | 3.18E-02               | 0                                               | 0                                               |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 14             | 14             | 4.48E-04               | 1.18E-02               | 0                                               | 0                                               |
| Patterson Mill to Grand Cavern                    | 16-20 | 10             | 10             | 3.20E-05               | 1.34E-02               | 0                                               | 0                                               |
| Grand Cavern to Port Republic Rd                  | 20-25 | 10             | 10             | 3.58E-04               | 2.41E-02               | 0                                               | 0                                               |

| Floodplain                                        | All   |                |                |                        |                        |                                                 |                                                 |
|---------------------------------------------------|-------|----------------|----------------|------------------------|------------------------|-------------------------------------------------|-------------------------------------------------|
| Depth                                             | 2-12' |                |                |                        |                        |                                                 |                                                 |
| RRM Descripton                                    | RRM   | No. of Samples | No. of Detects | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > SL <sub>ind</sub><br>120 mg/kg | No. of Samples > SL <sub>res</sub><br>7.8 mg/kg |
| Main Street to Hopeman Parkway                    | 0.5-2 | 0              |                |                        |                        |                                                 |                                                 |
| Hopeman Parkway to Holsinger Farms Footbridge     | 2-5   | 2              | 2              | 2.58E-03               | 3.15E-03               | 0                                               | 0                                               |
| Holsinger Farms Footbridge to New Hope-Crimora Rd | 5-10  | 0              |                |                        |                        |                                                 |                                                 |
| New Hope-Crimora Rd to Patterson Mill             | 10-16 | 2              | 2              | 2.00E-05               | 5.40E-05               | 0                                               | 0                                               |
| Patterson Mill to Grand Cavern                    | 16-20 | 0              |                |                        |                        |                                                 |                                                 |
| Grand Cavern to Port Republic Rd                  | 20-25 | 0              |                |                        |                        |                                                 |                                                 |

**Notes:**

mg/kg - milligrams per kilogram

Duplicates included in sample count shown. Complete data set is provided in Appendix E.

SL - EPA Regional Screening Level for industrial soil (SL<sub>ind</sub>) and residential soil (SL<sub>res</sub>) (June 2015 version)

**Table 3-10 - Summary of Shallow Alluvial Groundwater Analytical Data**

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Analyte | Units | Total (T) /<br>Dissolved (D) | No. of<br>Samples | No. of<br>Detects | Minimum<br>Detect | Maximum<br>Detect | Federal<br>MCL | EPA Tap<br>Water SL | No. of<br>Locations ><br>SL |
|---------|-------|------------------------------|-------------------|-------------------|-------------------|-------------------|----------------|---------------------|-----------------------------|
| THg     | ug/L  | T                            | 22                | 20                | 1.50E-03          | 7.78E-01          | 2.00E+00       | 5.70E+00            | 0                           |
| THg     | ug/L  | D                            | 52                | 35                | 1.60E-04          | 5.92E-02          | 2.00E+00       | 5.70E+00            | 0                           |
| MeHg    | ug/L  | D                            | 25                | 7                 | 4.00E-05          | 1.05E-02          | -              | 2.00E+00            | 0                           |

ug/L - micrograms per liter      THg - total mercury, MeHg - methyl mercury

- 1 - Mercury analyses in shallow flow zone monitoring wells sampled between 2005 and 2007. Complete data set provided in Appendix E.
- 2 - EPA Regional Screening Level (EPA SL) for tap water (June 2015 version) (based on a HQ=1). Federal maximum contaminant level (MCL) (Summer 2010).
- 3 - Field duplicates included in summary statistics.

Indicates an exceedance of screening criteria

Table 3-11 - Summary of Floodplain Area Pond Fish Tissue Analytical Data

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Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Pond Location      | Species           | Type  | Analyte | Units    | No. of Samples | No. of Detects | Minimum Detect | Maximum Detect | VDOH Action Level | No. of Locations > SL |
|--------------------|-------------------|-------|---------|----------|----------------|----------------|----------------|----------------|-------------------|-----------------------|
| Shifflet           | Green Sunfish     | Filet | THg     | mg/kg ww | 3              | 3              | 0.8142         | 1.1352         | 0.5               | 3                     |
| Schlappi           | Bluegill          | Filet | THg     | mg/kg ww | 3              | 3              | 0.1059         | 0.3204         | 0.5               | 0                     |
|                    | Largemouth Bass   | Filet | THg     | mg/kg ww | 2              | 2              | 0.1159         | 0.1574         | 0.5               | 0                     |
| Meadows            | Largemouth Bass   | Filet | THg     | mg/kg ww | 3              | 3              | 2.1674         | 2.5314         | 0.5               | 3                     |
|                    | Redbreast Sunfish | Filet | THg     | mg/kg ww | 3              | 3              | 0.3568         | 1.4007         | 0.5               | 2                     |
| Yount              | Bluegill          | Filet | THg     | mg/kg ww | 3              | 3              | 1.1618         | 1.5055         | 0.5               | 3                     |
|                    | Largemouth Bass   | Filet | THg     | mg/kg ww | 3              | 3              | 2.433          | 3.6851         | 0.5               | 3                     |
| Wertman            | Bluegill          | Filet | THg     | mg/kg ww | 3              | 3              | 1.0281         | 1.3766         | 0.5               | 3                     |
|                    | Largemouth Bass   | Filet | THg     | mg/kg ww | 3              | 3              | 1.6032         | 2.453          | 0.5               | 3                     |
| Hill               | Green Sunfish     | Filet | THg     | mg/kg ww | 3              | 3              | 0.6254         | 1.3023         | 0.5               | 3                     |
|                    | Largemouth Bass   | Filet | THg     | mg/kg ww | 3              | 3              | 1.406          | 1.743          | 0.5               | 3                     |
|                    | Green Sunfish     | Filet | THg     | mg/kg ww | 3              | 3              | 0.8468         | 1.0745         | 0.5               | 3                     |
|                    | Largemouth Bass   | Filet | THg     | mg/kg ww | 3              | 3              | 1.2128         | 1.9238         | 0.5               | 3                     |
|                    | Green Sunfish     | Filet | THg     | mg/kg ww | 3              | 3              | 0.4549         | 0.6948         | 0.5               | 1                     |
| Grottoes Town Park | Bluegill          | Filet | THg     | mg/kg ww | 3              | 3              | 0.3412         | 0.4634         | 0.5               | 0                     |
|                    | Largemouth Bass   | Filet | THg     | mg/kg ww | 3              | 3              | 1.2151         | 1.3771         | 0.5               | 3                     |

| Pond Location      | Species           | Type  | Analyte | Units    | No. of Samples | No. of Detects | Minimum Detect | Maximum Detect | 9 VAC 25-260 WQS | No. of Locations > SL |
|--------------------|-------------------|-------|---------|----------|----------------|----------------|----------------|----------------|------------------|-----------------------|
| Shifflett          | Green Sunfish     | Filet | MeHg    | mg/kg ww | 3              | 3              | 5.04E-01       | 6.95E-01       | 3.00E-01         | 3.00E+00              |
| Schlappi           | Bluegill          | Filet | MeHg    | mg/kg ww | 3              | 3              | 7.54E-02       | 2.84E-01       | 3.00E-01         | 0.00E+00              |
|                    | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 2              | 2              | 1.07E-01       | 1.45E-01       | 3.00E-01         | 0.00E+00              |
| Meadows            | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 3              | 3              | 1.85E+00       | 2.28E+00       | 3.00E-01         | 3.00E+00              |
|                    | Redbreast Sunfish | Filet | MeHg    | mg/kg ww | 3              | 3              | 2.67E-01       | 1.00E+00       | 3.00E-01         | 2.00E+00              |
| Yount              | Bluegill          | Filet | MeHg    | mg/kg ww | 3              | 3              | 7.88E-01       | 1.20E+00       | 3.00E-01         | 3.00E+00              |
|                    | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 3              | 3              | 2.12E+00       | 3.35E+00       | 3.00E-01         | 3.00E+00              |
| Wertman            | Bluegill          | Filet | MeHg    | mg/kg ww | 3              | 3              | 7.03E-01       | 9.24E-01       | 3.00E-01         | 3.00E+00              |
|                    | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 3              | 3              | 1.57E+00       | 2.06E+00       | 3.00E-01         | 3.00E+00              |
| Hill               | Green Sunfish     | Filet | MeHg    | mg/kg ww | 3              | 3              | 4.03E-01       | 8.26E-01       | 3.00E-01         | 3.00E+00              |
|                    | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 3              | 3              | 1.33E+00       | 1.55E+00       | 3.00E-01         | 3.00E+00              |
|                    | Green Sunfish     | Filet | MeHg    | mg/kg ww | 3              | 3              | 6.28E-01       | 8.88E-01       | 3.00E-01         | 3.00E+00              |
|                    | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 3              | 3              | 9.03E-01       | 1.95E+00       | 3.00E-01         | 3.00E+00              |
|                    | Green Sunfish     | Filet | MeHg    | mg/kg ww | 3              | 3              | 3.69E-01       | 5.51E-01       | 3.00E-01         | 3.00E+00              |
| Grottoes Town Park | Bluegill          | Filet | MeHg    | mg/kg ww | 3              | 3              | 2.19E-01       | 3.60E-01       | 3.00E-01         | 2.00E+00              |
|                    | Largemouth Bass   | Filet | MeHg    | mg/kg ww | 3              | 3              | 1.17E+00       | 1.31E+00       | 3.00E-01         | 3.00E+00              |

Notes:

VDOH - Virginia Department of Health action level for mercury in fish tissue  
Virginia Water Quality Standards (VA WQS) for protection of aquatic life or human health  
Results are reported by the laboratory with three significant figures.  
Complete data set provided in Appendix F.

THg - total mercury, MeHg - methyl mercury  
mg/kg ww - milligrams per kilogram wet weight

**Table 3-12 - Summary of Floodplain Area Pond Surface Water Analytical Data**

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Analyte | Units | Total (T) /<br>Dissolved (D) | No. of<br>Samples | No. of<br>Detects | Minimum<br>Detect | Maximum<br>Detect | Federal<br>MCL | EPA Tap<br>Water SL | No. of<br>Locations ><br>SL |
|---------|-------|------------------------------|-------------------|-------------------|-------------------|-------------------|----------------|---------------------|-----------------------------|
| THg     | ug/L  | T                            | 31                | 31                | 2.20E-03          | 2.94E-01          | 2.00E+00       | 5.70E+00            | 0                           |
| THg     | ug/L  | D                            | 31                | 31                | 1.30E-03          | 7.38E-02          | 2.00E+00       | 5.70E+00            | 0                           |
| MeHg    | ug/L  | T                            | 31                | 31                | 2.90E-05          | 2.55E-02          | -              | 2.00E+00            | 0                           |
| MeHg    | ug/L  | D                            | 31                | 31                | 3.20E-05          | 1.56E-02          | -              | 2.00E+00            | 0                           |

ug/L - micrograms per liter

THg - total mercury, MeHg - methyl mercury

1 - Floodplain pond water samples collected in October 2006 and May 2011. Complete data set provided in Appendix E.

2 - EPA Regional Screening Level (EPA SL) for tap water (June 2015 version) (based on a HQ=1). Federal maximum contaminant level (MCL) (Summer 2010).

3 - Field duplicates included in summary statistics.

Indicates an exceedance of screening criteria

Table 3-13 - Summary of Floodplain Area Pond Sediment Analytical Data  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Floodplain Pond   | RRM  | RRM Description                                   | Analyte | No. of Locations | No. of Samples | Units | Minimum Detect | Maximum Detect | EPA SL Res Soil | No. of Samples > SL <sub>res</sub> |
|-------------------|------|---------------------------------------------------|---------|------------------|----------------|-------|----------------|----------------|-----------------|------------------------------------|
| Wertman (RRM 9.4) | 5-10 | Holsinger Farms Footbridge to New Hope-Crimora Rd | THg     | 6                | 6              | mg/kg | 1.68E+00       | 6.90E+00       | 2.30E+01        | 0                                  |
| Wertman (RRM 9.4) | 5-10 | Holsinger Farms Footbridge to New Hope-Crimora Rd | MeHg    | 6                | 6              | mg/kg | 1.03E-03       | 1.58E-02       | 7.80E+00        | 0                                  |

Notes:

SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).  
Results are reported by the laboratory with three significant figures.  
UCLs not shown if maximum detected value was less than 17 mg/kg  
Complete data set provided in Appendix E.

THg - total mercury, MeHg - methyl mercury  
mg/kg - milligrams per kilogram  
N/A - Not applicable  
NC - Not calculated

**Table 3-14 - Summary of Floodplain Area Garden Crop Analytical Data**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Crop Type         | Analyte | Units    | No. of Samples | No. of Detects | Minimum Detect | Maximum Detect | Minimum Detection Limit | Maximum Detection Limit |
|-------------------|---------|----------|----------------|----------------|----------------|----------------|-------------------------|-------------------------|
| Bean              | THg     | mg/kg ww | 7              | 0              | ND             | ND             | 3.20E-03                | 3.30E-03                |
| Beet Greens       | THg     | mg/kg ww | 7              | 7              | 3.30E-03       | 2.50E-02       |                         |                         |
| Beets, Sugar      | THg     | mg/kg ww | 7              | 0              | ND             | ND             | 3.10E-03                | 3.30E-03                |
| Cabbage           | THg     | mg/kg ww | 6              | 0              | ND             | ND             | 3.70E-02                | 4.26E-02                |
| Carrot            | THg     | mg/kg ww | 20             | 10             | 3.10E-03       | 1.88E-01       |                         |                         |
| Corn              | THg     | mg/kg ww | 6              | 1              | 3.10E-03       | 3.10E-03       |                         |                         |
| Lettuce           | THg     | mg/kg ww | 21             | 18             | 8.90E-04       | 8.30E-01       |                         |                         |
| Onion, Red        | THg     | mg/kg ww | 11             | 0              | ND             | ND             | 2.70E-03                | 3.30E-03                |
| Pea, Bush         | THg     | mg/kg ww | 7              | 0              | ND             | ND             | 3.20E-03                | 3.30E-03                |
| Pepper, Bell      | THg     | mg/kg ww | 11             | 0              | ND             | ND             | 3.10E-03                | 4.71E-02                |
| Potato, Red       | THg     | mg/kg ww | 7              | 0              | ND             | ND             | 3.20E-03                | 3.30E-03                |
| Radish            | THg     | mg/kg ww | 20             | 6              | 9.40E-03       | 1.15E-01       |                         |                         |
| Scallions         | THg     | mg/kg ww | 7              | 3              | 3.90E-03       | 5.70E-03       |                         |                         |
| Spinach           | THg     | mg/kg ww | 22             | 19             | 5.07E-03       | 8.65E-01       |                         |                         |
| Squash            | THg     | mg/kg ww | 5              | 5              | 3.40E-02       | 4.05E-02       |                         |                         |
| Squash, Butternut | THg     | mg/kg ww | 8              | 3              | 4.26E-02       | 7.69E-02       |                         |                         |
| Squash, Small     | THg     | mg/kg ww | 3              | 0              | ND             | ND             | 4.23E-02                | 4.77E-02                |
| Tomato            | THg     | mg/kg ww | 8              | 1              | 4.80E-03       | 4.80E-03       |                         |                         |
| Turnip            | THg     | mg/kg ww | 7              | 5              | 7.50E-04       | 1.91E-03       |                         |                         |
| Turnip Greens     | THg     | mg/kg ww | 11             | 11             | 1.65E-03       | 1.01E-01       |                         |                         |

Notes:

Garden crops harvested between September 2003 and December 2004

Summary includes crops harvested in the control area and study area

Results are reported by the laboratory with three significant figures.

Duplicates included in the sample count

B-qualified result (mercury below the blank action limit) excluded from the statistical summary

Complete data set provided in Appendix F.

THg - total mercury

mg/kg ww - milligrams per kilogram wet weight

**Table 3-15 - Summary of Floodplain Area Livestock (Beef and Dairy) Analytical Data**

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Location        | Cut         | Type   | Units    | THg      | MeHg     |
|-----------------|-------------|--------|----------|----------|----------|
| CC - Study Area | Ground Beef | Muscle | mg/kg ww | 2.17E-03 | 2.40E-03 |
| MS - Study Area | Hindquarter | Muscle | mg/kg ww | 2.29E-03 | 1.52E-03 |
| MS - Study Area | Tenderloin  | Muscle | mg/kg ww | 2.04E-03 | 1.25E-03 |
| PF - Reference  | Ground Beef | Muscle | mg/kg ww | 2.40E-04 | ND       |
| PF - Reference  | Ribeye      | Muscle | mg/kg ww | 1.50E-04 | ND       |
| PF - Reference  | Sirloin     | Muscle | mg/kg ww | ND       | ND       |
| GS - Reference  | Ground Beef | Muscle | mg/kg ww | 2.30E-04 | ND       |
| GS - Reference  | Ribeye      | Muscle | mg/kg ww | 6.60E-04 | ND       |
| GS - Reference  | Sirloin     | Muscle | mg/kg ww | 2.50E-04 | ND       |
| CC - Study Area | -           | Liver  | mg/kg ww | 6.92E-02 | 2.07E-03 |
| MS - Study Area | -           | Liver  | mg/kg ww | 1.06E-01 | 9.90E-04 |
| PF - Reference  | -           | Liver  | mg/kg ww | 3.81E-03 | ND       |
| GS - Reference  | -           | Liver  | mg/kg ww | 2.90E-04 | ND       |
| CC - Study Area | -           | Kidney | mg/kg ww | 1.94E-01 | 2.94E-03 |
| MS - Study Area | -           | Kidney | mg/kg ww | 1.33E-01 | 1.92E-03 |
| PF - Reference  | -           | Kidney | mg/kg ww | 5.04E-03 | ND       |
| GS - Reference  | -           | Kidney | mg/kg ww | 7.80E-04 | ND       |
| CC - Study Area | -           | Heart  | mg/kg ww | 2.40E-03 | 1.21E-03 |
| MS - Study Area | -           | Heart  | mg/kg ww | 1.72E-03 | ND       |
| PF - Reference  | -           | Heart  | mg/kg ww | ND       | ND       |
| MILK-GROCERY    | -           | -      | mg/kg ww | ND       | ND       |
| MILK-HOLSDAIRY  | -           | -      | mg/kg ww | ND       | ND       |
| MILK-MTCRAW     | -           | -      | mg/kg ww | ND       | ND       |

Notes:

ND - detection limits for THg 0.0001 mg/kg and MeHg 0.001 mg/kg

THg - total mercury, MeHg - methyl mercury

mg/kg - milligrams per kilogram wet weight

Complete data set provided in Appendix F.

Table 3-16 - Summary of Floodplain Area Poultry Analytical Data  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Study Area                 | Breed Type           | Tissue Type   | Units    | THg            |                |                |                | MeHg           |                |                |                |
|----------------------------|----------------------|---------------|----------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|                            |                      |               |          | No. of Samples | No. of Detects | Minimum Detect | Maximum Detect | No. of Samples | No. of Detects | Minimum Detect | Maximum Detect |
| Control                    | White Leghorn        | Muscle Breast | mg/kg ww | 9              | 9              | 4.86E-05       | 1.80E-04       | 9              | 4              | 6.49E-05       | 1.12E-04       |
| Control                    | Barred Rock          | Muscle Breast | mg/kg ww | 6              | 6              | 7.74E-05       | 9.83E-04       | 5              | 5              | 7.81E-05       | 7.68E-04       |
| Control                    | Red Star             | Muscle Breast | mg/kg ww | 8              | 8              | 4.14E-05       | 1.62E-04       | 5              | 5              | 6.66E-05       | 1.73E-04       |
| Grocery - Background       | --                   | Muscle Breast | mg/kg ww | 6              | 6              | 7.34E-05       | 3.08E-04       | 6              | 5              | 8.29E-05       | 3.62E-04       |
| Polyface Farm - Background | --                   | Muscle Breast | mg/kg ww | 3              | 3              | 1.60E-03       | 1.99E-03       | 3              | 3              | 1.26E-03       | 1.68E-03       |
| Floodplain                 | White Leghorn        | Muscle Breast | mg/kg ww | 10             | 10             | 1.09E-04       | 1.61E-03       | 10             | 9              | 7.69E-05       | 4.59E-04       |
| Floodplain                 | Barred Rock          | Muscle Breast | mg/kg ww | 9              | 9              | 4.32E-04       | 2.03E-03       | 9              | 9              | 2.19E-04       | 1.36E-03       |
| Floodplain                 | Red Star             | Muscle Breast | mg/kg ww | 7              | 5              | 8.84E-05       | 1.20E-03       | 5              | 5              | 7.88E-05       | 5.33E-04       |
| Control                    | White Leghorn        | Muscle Leg    | mg/kg ww | 7              | 7              | 5.71E-05       | 1.03E-04       | 7              | 0              | -              | -              |
| Control                    | Barred Rock          | Muscle Leg    | mg/kg ww | 6              | 6              | 5.99E-05       | 5.52E-04       | 3              | 3              | 7.83E-05       | 5.57E-04       |
| Control                    | Red Star             | Muscle Leg    | mg/kg ww | 7              | 7              | 4.58E-05       | 2.55E-04       | 3              | 3              | 7.64E-05       | 2.30E-04       |
| Grocery - Background       | --                   | Muscle Leg    | mg/kg ww | 6              | 6              | 1.02E-04       | 2.27E-04       | 6              | 4              | 1.12E-04       | 1.32E-04       |
| Polyface Farm - Background | --                   | Muscle Leg    | mg/kg ww | 3              | 3              | 9.47E-04       | 1.22E-03       | 3              | 3              | 7.93E-04       | 1.02E-03       |
| Floodplain                 | White Leghorn        | Muscle Leg    | mg/kg ww | 10             | 10             | 9.18E-05       | 1.61E-03       | 10             | 6              | 8.67E-05       | 3.87E-04       |
| Floodplain                 | Barred Rock          | Muscle Leg    | mg/kg ww | 9              | 9              | 3.65E-04       | 1.45E-03       | 8              | 8              | 2.22E-04       | 1.13E-03       |
| Floodplain                 | Red Star             | Muscle Leg    | mg/kg ww | 5              | 5              | 7.86E-05       | 1.34E-03       | 4              | 4              | 1.20E-04       | 5.56E-04       |
| Control                    | White Leghorn        | Liver         | mg/kg ww | 8              | 8              | 2.95E-04       | 3.39E-03       | 8              | 8              | 9.10E-05       | 2.33E-04       |
| Control                    | Barred Rock          | Liver         | mg/kg ww | 6              | 6              | 4.32E-04       | 3.42E-03       | 6              | 6              | 1.45E-04       | 1.91E-03       |
| Control                    | Red Star             | Liver         | mg/kg ww | 8              | 8              | 3.09E-04       | 1.40E-03       | 8              | 8              | 9.77E-05       | 3.76E-04       |
| Grocery - Background       | --                   | Liver         | mg/kg ww | 6              | 6              | 2.61E-04       | 4.02E-04       | 6              | 6              | 1.40E-04       | 2.08E-04       |
| Polyface Farm - Background | --                   | Liver         | mg/kg ww | 3              | 3              | 5.53E-03       | 5.95E-03       | 3              | 3              | 3.94E-03       | 5.01E-03       |
| Floodplain                 | White Leghorn        | Liver         | mg/kg ww | 10             | 10             | 1.15E-03       | 4.37E-01       | 10             | 10             | 1.09E-04       | 1.90E-03       |
| Floodplain                 | Barred Rock          | Liver         | mg/kg ww | 9              | 9              | 2.71E-03       | 1.97E-01       | 9              | 9              | 3.76E-04       | 4.33E-03       |
| Floodplain                 | Red Star             | Liver         | mg/kg ww | 5              | 5              | 4.61E-04       | 1.26E-01       | 5              | 5              | 1.26E-04       | 2.38E-03       |
| Control                    | White Leghorn        | Gizzard       | mg/kg ww | 8              | 8              | 6.10E-05       | 1.40E-04       | 8              | 0              | -              | -              |
| Control                    | Barred Rock          | Gizzard       | mg/kg ww | 6              | 6              | 1.36E-04       | 5.56E-04       | 6              | 2              | 1.33E-04       | 4.33E-04       |
| Control                    | Red Star             | Gizzard       | mg/kg ww | 8              | 8              | 5.88E-05       | 6.73E-04       | 8              | 3              | 6.86E-05       | 1.26E-04       |
| Grocery - Background       | --                   | Gizzard       | mg/kg ww | 6              | 6              | 7.74E-05       | 2.40E-04       | 6              | 6              | 8.56E-05       | 1.66E-04       |
| Floodplain                 | White Leghorn        | Gizzard       | mg/kg ww | 10             | 10             | 2.14E-04       | 1.50E-01       | 10             | 4              | 7.17E-05       | 4.95E-04       |
| Floodplain                 | Barred Rock          | Gizzard       | mg/kg ww | 9              | 9              | 4.04E-04       | 3.40E-02       | 9              | 8              | 8.48E-05       | 8.03E-04       |
| Floodplain                 | Red Star             | Gizzard       | mg/kg ww | 5              | 5              | 9.13E-05       | 2.08E-02       | 5              | 5              | 9.35E-05       | 4.93E-04       |
| Control                    | White Leghorn        | Egg           | mg/kg ww | 23             | 23             | 6.22E-05       | 3.08E-04       | 24             | 17             | 6.47E-05       | 2.80E-04       |
| Control                    | Barred Rock/Red Star | Egg           | mg/kg ww | 34             | 34             | 6.15E-05       | 1.22E-03       | 35             | 32             | 6.95E-05       | 1.25E-03       |
| Grocery - Background       | --                   | Egg           | mg/kg ww | 12             | 12             | 8.96E-05       | 2.73E-04       | 12             | 2              | 1.07E-04       | 1.71E-04       |
| Polyface Farm - Background | --                   | Egg           | mg/kg ww | 6              | 6              | 9.73E-04       | 2.49E-03       | 6              | 6              | 8.50E-04       | 2.08E-03       |
| Floodplain                 | White Leghorn        | Egg           | mg/kg ww | 28             | 28             | 9.19E-05       | 7.03E-02       | 28             | 25             | 9.02E-05       | 1.12E-03       |
| Floodplain                 | Barred Rock/Red Star | Egg           | mg/kg ww | 35             | 33             | 4.88E-05       | 1.22E-01       | 34             | 34             | 7.09E-05       | 2.97E-03       |

Notes:

THg - total mercury, MeHg - methyl mercury  
ug/kg ww - micrograms per kilogram wet weight  
Complete data set provided in Appendix F.

**Table 3-17 - Summary of Floodplain Area Wildlife Analytical Data**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Species         | Tissue Type   | Analyte | Units    | No. of Samples | No. of Detects | Minimum Detect | Maximum Detect |
|-----------------|---------------|---------|----------|----------------|----------------|----------------|----------------|
| Waterfowl       |               |         |          |                |                |                |                |
| Canada Goose    | Muscle        | THg     | mg/kg ww | 10             | 10             | 5.17E-03       | 6.11E-02       |
| Mallard         | Muscle        | THg     | mg/kg ww | 11             | 11             | 3.23E-02       | 1.42E+00       |
| Wood Duck       | Muscle        | THg     | mg/kg ww | 8              | 8              | 3.05E-03       | 2.62E-01       |
| Canada Goose    | Muscle        | MeHg    | mg/kg ww | 10             | 10             | 4.20E-03       | 4.66E-02       |
| Mallard         | Muscle        | MeHg    | mg/kg ww | 11             | 11             | 2.09E-02       | 1.25E+00       |
| Wood Duck       | Muscle        | MeHg    | mg/kg ww | 8              | 8              | 3.60E-03       | 2.53E-01       |
| Large Mammal    |               |         |          |                |                |                |                |
| Deer            | Muscle        | THg     | mg/kg ww | 6              | 6              | 7.00E-05       | 1.39E-03       |
| Deer            | Muscle        | MeHg    | mg/kg ww | 6              | 1              | 1.30E-03       | 1.30E-03       |
| Reptiles        |               |         |          |                |                |                |                |
| SNAPPING TURTLE | <i>Muscle</i> | THg     | mg/kg ww | 120            | 120            | 2.68E-02       | 7.65E+00       |

Notes:

Tissue data from the South River floodplain. Data collected from the Middle River and South River reference locations is not included in the summary statistics shown.

Snapping turtle data is a summary of all South River and South Fork Shenandoah River locations (reference locations excluded)  
Complete data set provided in Appendix F.

THg - total mercury, MeHg - methyl mercury  
mg/kg - milligrams per kilogram wet weight

Table 3-18 - Mercury Soil Screening Level (SSL) for Protection of Migration to Groundwater  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Soil Screening Level Partitioning Equation for Migration to Groundwater

SSL (mg/kg) =

C<sub>w</sub> \* [ K<sub>d</sub> +  $\frac{\Theta_w + \Theta_a H'}{P_b}$  ]

USEPA, 1996 Equation 22

| Parameter      | Definition                                                          | Value             | Source                                                                       |
|----------------|---------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------|
| SSL            | Soil screening level (mg/kg)                                        |                   | USEPA, 1996                                                                  |
| C <sub>w</sub> | Target soil leachate concentration (mg/L)                           | Calculated        |                                                                              |
| where          | C <sub>w</sub> = SL x DAF                                           |                   |                                                                              |
| SL             | Target soil leachate concentration (mg/L)                           | Chemical-Specific | EPA Tap Water SL for Mercuric Chloride                                       |
| DAF            | Dilution Attenuation Factor, unitless                               | 1 or 20           | DAF = 1 (no dilution/attenuation), DAF=20 (0.5-acre source area)             |
| K <sub>d</sub> | Soil-water distribution coefficient (L/kg), inorganics              | Chemical-Specific | USEPA, 2002 for elemental mercury, value for mercuric chloride not available |
| Θ <sub>w</sub> | Water-filled soil porosity (L <sub>water</sub> /L <sub>soil</sub> ) | 0.2               | Default                                                                      |
| Θ <sub>a</sub> | Air-filled soil porosity (L <sub>pore</sub> /L <sub>soil</sub> )    | 0.13              | Default                                                                      |
| H'             | Henry's Law Constant (dimensionless)                                | Chemical-Specific | USEPA, 2002 for elemental mercury, value for mercuric chloride not available |
| P <sub>b</sub> | Dry Soil Bulk Density (kg/L)                                        | 1.5               | Default                                                                      |

| Chemical | H'       | Kd       | Source      | SL (mg/L) | Cw (mg/L) | SSL (mg/kg) (DAF=1) | Cw (mg/L) | SSL (mg/kg) (DAF=20) |
|----------|----------|----------|-------------|-----------|-----------|---------------------|-----------|----------------------|
| Mercury  | 4.67E-01 | 5.20E+01 | USEPA, 2002 | 5.70E-03  | 5.70E-03  | 2.97E-01            | 1.14E-01  | 5.95E+00             |

References:

USEPA, 1996. Soil Screening Guidance: User's Guide. Interim Final. Office of Solid Waste and Emergency Response. Washington, D.C. July.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response. OSWER 9355.4-24. March.

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB1 (0-0.5)    | SB1 (0.5-1)    | SB1 (1-1.5)    | SB1 (1.5-2)    | SB1 (2-2.5)    | SB2 (0-0.5)    | SB2 (0.5-1)    | SB2 (0.5-1)    | SB2 (1-1.5)    | SB2 (1.5-2)    |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     |
|         |       |                          | Start Depth (feet) | 0              | 0.5            | 1              | 1.5            | 2              | 0              | 0.5            | 0.5            | 1              | 1.5            |
|         |       |                          | End Depth (feet)   | 0.5            | 1              | 1.5            | 2              | 2.5            | 0.5            | 1              | 1              | 1.5            | 2              |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 11             | 14.7           | 5              | 1              | 0.1            | 5.7            | 6.3            | 6.3            | 5.6            | 3.9            |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB2 (2-2.5)    | SB2 (10-10.5)  | SB-3 (0-0.5)   | SB-3 (0.5-1)   | SB-3 (1-1.5)   | SB-3 (1.5-2)   | SB-3 (2-2.5)   | SB-4 (0-0.5)   | SB-4 (0.5-1)   | SB-4 (1-1.5)   |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     |
|         |       |                          | Start Depth (feet) | 2              | 10             | 0              | 0.5            | 1              | 1.5            | 2              | 0              | 0.5            | 1              |
|         |       |                          | End Depth (feet)   | 2.5            | 10.5           | 0.5            | 1              | 1.5            | 2              | 2.5            | 0.5            | 1              | 1.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 0.2            | < 0.041        | 1.9            | 0.2            | 0.1            | 0.5            | 0.2            | 16.9           | 29.3           | 35.8           |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-4 (1.5-2)   | SB-4 (2-2.5)   | SB-5 (0-0.5)   | SB-5 (0.5-1)   | SB-5 (1-1.5)   | SB-5 (1.5-2)   | SB-5 (2-2.5)   | SB-6 (0-0.5)   | SB-6 (0.5-1)   | SB-6 (1-1.5)   |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     |
|         |       |                          | Start Depth (feet) | 1.5            | 2              | 0              | 0.5            | 1              | 1.5            | 2              | 0              | 0.5            | 1              |
|         |       |                          | End Depth (feet)   | 2              | 2.5            | 0.5            | 1              | 1.5            | 2              | 2.5            | 0.5            | 1              | 1.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 47.6           | 35             | 10.7           | 11.4           | 20.8           | 27.1           | 15.1           | 8.9            | 8.8            | 5.6            |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-6 (1.5-2)   | SB-6 (2-2.5)   | SB-7 (0-0.5)   | SB-7 (0.5-1)   | SB-7 (1-1.5)   | SB-7 (1.5-2)   | SB-7 (5.5-6)   | SB-8 (0-0.5)   | SB-8 (0.5-1)   | SB-8 (1-1.5)   |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     |
|         |       |                          | Start Depth (feet) | 1.5            | 2              | 0              | 0.5            | 1              | 1.5            | 5.5            | 0              | 0.5            | 1              |
|         |       |                          | End Depth (feet)   | 2              | 2.5            | 0.5            | 1              | 1.5            | 2              | 6              | 0.5            | 1              | 1.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 0.8            | < 0.037        | 23.9           | 31.5           | 24.3           | 0.5            | < 0.038        | 14.6           | 56.1           | 136            |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-8 (1.5-2)   | SB-8 (2.5-3)   | SB-8 (3-3.5)   | SB-9 (0-0.5)   | SB-9 (0.5-1)   | SB-9 (1-1.5)   | SB-9 (1.5-2)   | SB-9 (2.5-3)   | SB-9 (3.5-4)   | SB-10 (0-0.5)  |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     |
|         |       |                          | Start Depth (feet) | 1.5            | 2.5            | 3              | 0              | 0.5            | 1              | 1.5            | 2.5            | 3.5            | 0              |
|         |       |                          | End Depth (feet)   | 2              | 3              | 3.5            | 0.5            | 1              | 1.5            | 2              | 3              | 4              | 0.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 6.1            | < 0.034        | 0.047          | 33.2           | 31.3           | 4.9            | 2.6            | 0.1            | 0.1            | 43.6           |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-10 (0.5-1)  | SB-10 (1-1.5)  | SB-10 (1.5-2)  | SB-10 (2.5-3)  | SB-10 (3.5-4)  | SB-11 (0-0.5)  | SB-11 (0.5-1)  | SB-11 (1-1.5)  | SB-11 (1.5-2)  | SB-11 (2-2.5)  |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/16/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     |
|         |       |                          | Start Depth (feet) | 0.5            | 1              | 1.5            | 2.5            | 3.5            | 0              | 0.5            | 1              | 1.5            | 2              |
|         |       |                          | End Depth (feet)   | 1              | 1.5            | 2              | 3              | 4              | 0.5            | 1              | 1.5            | 2              | 2.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 2.5            | 0.3            | 0.2            | 0.04           | 0.044          | 7.1            | 4.2            | 0.9            | 0.7            | 0.3            |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-12 (0-0.5)  | SB-12 (0.5-1)  | SB-12 (1-1.5)  | SB-12 (1.5-2)  | SB-12 (2-2.5)  | SB-13 (0-0.5)  | SB-13 (0.5-1)  | SB-13 (1-1.5)  | SB-13 (1.5-2)  | SB-13 (2-2.5)  |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     |
|         |       |                          | Start Depth (feet) | 0              | 0.5            | 1              | 1.5            | 2              | 0              | 0.5            | 1              | 1.5            | 2              |
|         |       |                          | End Depth (feet)   | 0.5            | 1              | 1.5            | 2              | 2.5            | 0.5            | 1              | 1.5            | 2              | 2.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 48.8           | 69.1           | 40.1           | 27.1           | 1              | 62.1           | 56.8           | 21.7           | 1.7            | < 0.041        |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-14 (0-0.5)  | SB-14 (0.5-1)  | SB-14 (1-1.5)  | SB-14 (1.5-2)  | SB-14 (2-2.5)  | SB-15 (0-0.5)  | SB-15 (0.5-1)  | SB-15 (1-1.5)  | SB-15 (1.5-2)  | SB-15 (2-2.5)  |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     |
|         |       |                          | Start Depth (feet) | 0              | 0.5            | 1              | 1.5            | 2              | 0              | 0.5            | 1              | 1.5            | 2              |
|         |       |                          | End Depth (feet)   | 0.5            | 1              | 1.5            | 2              | 2.5            | 0.5            | 1              | 1.5            | 2              | 2.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 12             | 14.7           | 17.4           | 29.5           | 74.6           | 12.9           | 19.1           | 29.8           | 6.7            | 0.6            |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-16 (0-0.5)  | SB-16 (0.5-1)  | SB-16 (1-1.5)  | SB-16 (1.5-2)  | SB-16 (2-2.5)  | SB-17 (0-0.5)  | SB-17 (0.5-1)  | SB-17 (1-1.5)  | SB-17 (1.5-2)  | SB-17 (2-2.5)  |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     |
|         |       |                          | Start Depth (feet) | 0              | 0.5            | 1              | 1.5            | 2              | 0              | 0.5            | 1              | 1.5            | 2              |
|         |       |                          | End Depth (feet)   | 0.5            | 1              | 1.5            | 2              | 2.5            | 0.5            | 1              | 1.5            | 2              | 2.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 15.1           | 3.7            | 0.089          | < 0.038        | 0.055          | 5.2            | 1.6            | 0.4            | 0.1            | 0.045          |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 3-19 - Comparison of 2006 Investigation (RRM 3.1- 4.3) Soil Analytical Results to SSLs  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Analyte | Units | SSL<br>DAF=1<br>(DAF=20) | Sample ID          | SB-18 (0-0.5)  | SB-18 (0.5-1)  | SB-18 (1-1.5)  | SB-18 (1.5-2)  | SB-18 (2-2.5)  |
|---------|-------|--------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|
|         |       |                          | Sample Date        | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     | 10/17/2006     |
|         |       |                          | Start Depth (feet) | 0              | 0.5            | 1              | 1.5            | 2              |
|         |       |                          | End Depth (feet)   | 0.5            | 1              | 1.5            | 2              | 2.5            |
|         |       |                          | Sample Purpose     | Regular Sample | Regular Sample | Regular Sample | Regular Sample | Regular Sample |
| Mercury | MG/KG | 0.30 (5.95)              |                    | 7.2            | 0.6            | 0.3            | < 0.035        | < 0.041        |

Soil screening level (SSL) for protection of migration to groundwater

Value for mercury is based on mercuric chloride

Indicates an exceedance of screening criteria based on DAF=20

Table 4-1 - Values Used for Daily Intake Calculations, Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Soil Ingestion

Chemical Intake = EPC x Intake Factor  
HQ = Chemical Intake / RfDo

Where:

EPC = Exposure Point Concentration (mg/kg)  
HQ = Hazard Quotient for noncancer effects  
RfD = Reference Dose, oral (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{IR \times EF \times ED \times CFs}{AT \times BW}$$

Soil Dermal Contact

Chemical Intake = EPC x Intake Factor  
HQ = Chemical Intake / RfDd

Where:

EPC = Exposure Point Concentration (mg/kg)  
HQ = Hazard Quotient for noncancer effects  
RfDd = Reference Dose, dermal (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{SA \times AF \times ABSd \times EF \times ED \times CFs}{AT \times BW}$$

Soil Inhalation

Chemical Intake = EPC x Intake Factor  
HQ = Chemical Intake / RfC

Where:

EPC = Exposure Point Concentration (mg/kg)  
RfC = Reference Concentration (mg/m³)  
HQ = Hazard Quotient for noncancer effects

And:

$$Intake\ Factor\ (kg/m^3) = \frac{ET \times EF \times ED \times \left(\frac{1\ day}{24\ hours}\right) \times \left(\frac{1}{VF} + \frac{1}{PEF}\right)}{AT}$$

| Parameter                                          | Receptor                                                 | Value    | Comment                                                                                                                                                   |
|----------------------------------------------------|----------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Soil Ingestion<br>Rate<br>(IR)<br>(mg/day)         | Industrial/Commercial Worker                             | 100      | Recommended value for outdoor worker in EPA, 2014                                                                                                         |
|                                                    | Construction/Excavation Worker                           | 330      | Recommended values in EPA, 2002: Exhibit 1-2                                                                                                              |
|                                                    | Resident - Adult                                         | 100      | Recommended value for resident in EPA, 2014                                                                                                               |
|                                                    | Resident - Child (Age 0-6 yr)                            | 200      | Recommended value for resident in EPA, 2014                                                                                                               |
|                                                    | Recreational User - Adult                                | 100      | Value for adult resident assumed for recreational user.                                                                                                   |
|                                                    | Recreational User - Child (Age 0-6 yr)                   | 200      | Value for child resident assumed for recreational user.                                                                                                   |
|                                                    | Floodplain Area Hunter                                   | 100      | Value for adult resident assumed for hunter.                                                                                                              |
|                                                    | Floodplain Area Farmer - Adult                           | 330      | VDEQ recommended value, assumes farmers conduct earth-moving work similar to a construction worker                                                        |
|                                                    | Floodplain Area Farmer - Child (Age 0-6 yr)              | 200      | Value for child resident assumed for farmer.                                                                                                              |
| Exposure<br>Frequency (EF)<br>(days/year)          | Industrial/Commercial Worker                             | 250      | Recommended value for outdoor worker in EPA, 2014                                                                                                         |
|                                                    | Construction/Excavation Worker                           | 250      | Recommended value in EPA, 2002: Exhibit 5-1                                                                                                               |
|                                                    | Resident - Adult                                         | 350      | Recommended value for resident in EPA, 2014                                                                                                               |
|                                                    | Resident - Child (Age 0-6 yr)                            | 350      | Recommended value for resident in EPA, 2014                                                                                                               |
|                                                    | Recreational User - Adult                                | 84       | Based on professional judgement, site-specific value of three events per week, 7 months out of the year (April - October)or 84 days per year was assumed. |
|                                                    | Recreational User - Child (Age 0-6 yr)                   | 84       |                                                                                                                                                           |
|                                                    | Floodplain Area Hunter                                   | 28       | Average reported days hunted per year for all game (USFW, 2011) with an additional 7 days added for conservatism                                          |
|                                                    | Floodplain Area Farmer - Adult                           | 350      | Value for resident assumed for farmer                                                                                                                     |
| Exposure<br>Duration<br>(ED)<br>(years)            | Floodplain Area Farmer - Child (Age 0-6 yr)              | 350      | Value for resident assumed for farmer                                                                                                                     |
|                                                    | Industrial/Commercial Worker                             | 25       | Recommended value for worker in EPA, 2014                                                                                                                 |
|                                                    | Construction/Excavation Worker                           | 1        | Recommended value in EPA, 2002: Exhibit 5-1                                                                                                               |
|                                                    | Resident - Adult                                         | 20       | Recommended value for adult resident in EPA, 2014                                                                                                         |
|                                                    | Resident - Child (Age 0-6 yr)                            | 6        | Recommended value for child resident in EPA, 2014                                                                                                         |
|                                                    | Recreational User - Adult                                | 20       | Value for adult resident assumed for recreational user.                                                                                                   |
|                                                    | Recreational User - Child (Age 0-6 yr)                   | 6        | Value for child resident assumed for recreational user.                                                                                                   |
|                                                    | Floodplain Area Hunter                                   | 20       | Value for adult resident assumed for hunter.                                                                                                              |
| Exposure<br>Time<br>(ET)<br>(hours)                | Floodplain Area Farmer - Adult                           | 20       | Value for adult resident assumed for farmer.                                                                                                              |
|                                                    | Floodplain Area Farmer - Child (Age 0-6 yr)              | 6        | Value for child resident assumed for farmer.                                                                                                              |
|                                                    | Industrial/Commercial Worker                             | 8        |                                                                                                                                                           |
|                                                    | Construction/Excavation Worker                           | 8        |                                                                                                                                                           |
|                                                    | Resident - Adult                                         | 24       |                                                                                                                                                           |
|                                                    | Resident - Child (Age 0-6 yr)                            | 24       |                                                                                                                                                           |
|                                                    | Recreational User - Adult                                | 3.3      | EFH, 2011 - Table 16-20, Mean Value for an adult age 18-64, outdoor park/golf course                                                                      |
|                                                    | Recreational User - Child (Age 0-6 yr)                   | 2.4      | EFH, 2008 - Table 16-13, Mean value for child age 3-6 years, outdoor park. Mean value not reported for age 0-3 years.                                     |
| Particulate<br>Emission<br>Factor (PEF)<br>(m³/kg) | Floodplain Area Hunter                                   | 8        | Best professional judgment, assumes each hunting trip lasts 8 hours                                                                                       |
|                                                    | Floodplain Area Farmer - Adult                           | 24       |                                                                                                                                                           |
|                                                    | Floodplain Area Farmer - Child (Age 0-6 yr)              | 24       |                                                                                                                                                           |
|                                                    | All Receptors                                            | 1.36E+09 | Default - EPA, 2014                                                                                                                                       |
|                                                    | Soil to Air<br>Volatilization<br>Factor (VF),<br>(m³/kg) | -        | Mercury is present as mercuric chloride. VF is not applicable.                                                                                            |

Table 4-1 - Values Used for Daily Intake Calculations, Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Parameter                                          | Receptor                                    | Value | Comment                                                                                                                                                                                                       |
|----------------------------------------------------|---------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dermal Absorption Fraction (ABSd) (unitless)       | All Receptors                               | 0.01  | EPA Region III default value (EPA Region III, 1995) used for mercury, which does not have a chemical-specific value.                                                                                          |
| Skin Surface Area (SA) (cm <sup>2</sup> )          | Industrial/Commercial Worker                | 3527  | Adult commercial/industrial receptor was assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms (Default - EPA, 2015). |
|                                                    | Construction/Excavation Worker              | 3527  |                                                                                                                                                                                                               |
|                                                    | Resident - Adult                            | 6032  | Adult resident was assumed to wear a short-sleeved shirt, shorts and shoes; therefore, the exposed skin surface is limited to the head, hands, forearms and lower legs (Default - EPA, 2014)                  |
|                                                    | Resident - Child (Age 0-6 yr)               | 2373  | Child resident was assumed to wear a short-sleeved shirt and shorts (no shoes); therefore, the exposed skin is limited to the head, hands, forearms, lower legs, and feet (EPA, 2015).                        |
|                                                    | Recreational User - Adult                   | 6032  | Value for adult resident assumed for recreational user.                                                                                                                                                       |
|                                                    | Recreational User - Child (Age 0-6 yr)      | 2373  | Value for child resident assumed for recreational user.                                                                                                                                                       |
|                                                    | Floodplain Area Hunter                      | 3527  | Hunter assumed to wear a short-sleeved shirt, long pants, and shoes; therefore, the exposed skin surface is limited to the head, hands, and forearms (Worker Default - EPA, 2015).                            |
|                                                    | Floodplain Area Farmer - Adult              | 6032  | Value for adult resident assumed for farmer.                                                                                                                                                                  |
| Dermal Adherence Factor (AF) (mg/cm <sup>2</sup> ) | Floodplain Area Farmer - Child (Age 0-6 yr) | 2373  | Value for child resident assumed for farmer.                                                                                                                                                                  |
|                                                    | Industrial/Commercial Worker                | 0.12  | Recommended value for worker in EPA, 2014                                                                                                                                                                     |
|                                                    | Construction/Excavation Worker              | 0.3   | EPA, 2002: Exhibit 1-2                                                                                                                                                                                        |
|                                                    | Resident - Adult                            | 0.07  | Recommended value in EPA, 2014 (source EPA, 2004: Exhibit 3-3, based on the 50th percentile weighted AF for gardeners)                                                                                        |
|                                                    | Resident - Child (Age 0-6 yr)               | 0.2   | Recommended value in EPA, 2014 (source EPA, 2004: Exhibit 3-3, based on 50th percentile for children playing in wet soil (high-end soil contact activity))                                                    |
|                                                    | Recreational User - Adult                   | 0.07  | Value for adult resident assumed for recreational user.                                                                                                                                                       |
|                                                    | Recreational User - Child (Age 0-6 yr)      | 0.2   | Value for child resident assumed for recreational user.                                                                                                                                                       |
|                                                    | Floodplain Area Hunter                      | 0.07  | Value for adult resident assumed for recreational user.                                                                                                                                                       |
| Body Weight (BW) (kg)                              | Floodplain Area Farmer - Adult              | 0.3   | VDEQ recommended value, assumes farmers conduct earth-moving work similar to a construction worker                                                                                                            |
|                                                    | Floodplain Area Farmer - Child (Age 0-6 yr) | 0.2   | Value for child resident assumed for farmer.                                                                                                                                                                  |
|                                                    | Industrial/Commercial Worker                | 80    | Recommended value in EPA, 2014                                                                                                                                                                                |
|                                                    | Construction/Excavation Worker              | 80    | Recommended value in EPA, 2014                                                                                                                                                                                |
|                                                    | Resident - Adult                            | 80    | Recommended value in EPA, 2014                                                                                                                                                                                |
|                                                    | Resident - Child (Age 0-6 yr)               | 15    | Recommended value in EPA, 2014                                                                                                                                                                                |
|                                                    | Recreational User - Adult                   | 80    | Value for adult resident assumed for recreational user.                                                                                                                                                       |
|                                                    | Recreational User - Child (Age 0-6 yr)      | 15    | Value for child resident assumed for recreational user.                                                                                                                                                       |
| Conversion Factor (CFs) (kg/mg)                    | Floodplain Area Hunter                      | 80    | Value for adult resident assumed for hunter.                                                                                                                                                                  |
|                                                    | Floodplain Area Farmer - Adult              | 80    | Value for adult resident assumed for farmer.                                                                                                                                                                  |
|                                                    | Floodplain Area Farmer - Child (Age 0-6 yr) | 15    | Value for child resident assumed for farmer.                                                                                                                                                                  |
|                                                    |                                             |       |                                                                                                                                                                                                               |
| Averaging Time (AT), Noncancer (days)              | Industrial/Commercial Worker                | 9125  | Equal to ED x 365 days/year                                                                                                                                                                                   |
|                                                    | Construction/Excavation Worker              | 365   |                                                                                                                                                                                                               |
|                                                    | Resident - Adult                            | 7300  |                                                                                                                                                                                                               |
|                                                    | Resident - Child (Age 0-6 yr)               | 2190  |                                                                                                                                                                                                               |
|                                                    | Recreational User - Adult                   | 7300  |                                                                                                                                                                                                               |
|                                                    | Recreational User - Child (Age 0-6 yr)      | 2190  |                                                                                                                                                                                                               |
|                                                    | Floodplain Area Hunter                      | 7300  |                                                                                                                                                                                                               |
|                                                    | Floodplain Area Farmer - Adult              | 7300  |                                                                                                                                                                                                               |
|                                                    | Floodplain Area Farmer - Child (Age 0-6 yr) | 2190  |                                                                                                                                                                                                               |

**Table 4-1 - Values Used for Daily Intake Calculations, Soil**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

**References:**

EPA, 1991. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals). Interim Final. Office of Emergency and Remedial Response, Washington D.C. December.

EPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Emergency and Remedial Response. OSWER 9355.4-24. December.

EPA, 2004. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E Supplemental Guidance for Dermal Risk Assessment).Final. EPA/540/R/99/005. July 2004 (updated November 2007)

EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120 dated February 6, 2014.

Table 4-2 - Values Used for Daily Intake Calculations, Sediment  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Sediment Ingestion

Chemical Intake = EPC x Intake Factor  
HQ = Chemical Intake / RfDo

Where:

EPC = Exposure Point Concentration (mg/kg)  
HQ = Hazard Quotient for noncancer effects  
RfD = Reference Dose, oral (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{IR \times EF \times ED \times CFs}{AT \times BW}$$

Sediment Dermal Contact

Chemical Intake = EPC x Intake Factor  
HQ = Chemical Intake / RfDd

Where:

EPC = Exposure Point Concentration (mg/kg)  
HQ = Hazard Quotient for noncancer effects  
RfDd = Reference Dose, dermal (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{SA \times AF \times ABSd \times EF \times ED \times CFs}{AT \times BW}$$

| Parameter                                     | Receptor                               | Value    | Comment                                                                                                                                                                                 |
|-----------------------------------------------|----------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sediment Ingestion Rate (IR) (mg/day)         | Recreational User - Adult              | 100      | Value for adult resident assumed for recreational user.                                                                                                                                 |
|                                               | Recreational User - Child (Age 0-6 yr) | 200      | Value for child resident assumed for recreational user.                                                                                                                                 |
|                                               | Floodplain Area Hunter                 | 100      | Value for adult resident assumed for hunter.                                                                                                                                            |
| Exposure Frequency (days/year)                | Recreational User - Adult              | 48       | Based on professional judgement, site-specific value of three events per week, 4 months out of the year (May-August)or 48 days per year was assumed for wading activities in the river. |
|                                               | Recreational User - Child (Age 0-6 yr) | 48       | Value is consistent with EPA Region IV recommended values for swimming in the southeast.                                                                                                |
|                                               | Floodplain Area Hunter                 | 28       | Exposure frequency for fishing based on results of the 2011 angler survey (Bugas, 2011) with 7 days added for conservatism.                                                             |
| Exposure Duration (years)                     | Recreational User - Adult              | 20       | Value for adult resident assumed for recreational user.                                                                                                                                 |
|                                               | Recreational User - Child (Age 0-6 yr) | 6        | Value for child resident assumed for recreational user.                                                                                                                                 |
|                                               | Floodplain Area Hunter                 | 20       | Value for adult resident assumed for hunter.                                                                                                                                            |
| Exposure Time (hour/day)                      | Recreational User - Adult              | 3.3      | EFH, 2011 - Table 16-20, Mean Value for an adult age 18-64, outdoor park/golf course                                                                                                    |
|                                               | Recreational User - Child (Age 0-6 yr) | 2.4      | EFH, 2008 - Table 16-13, Mean value for child age 3-6 years, outdoor park. Mean value not reported for age 0-3 years.                                                                   |
|                                               | Floodplain Area Hunter                 | 4.85     | Reported value of time spent per angler in 2011 angler survey                                                                                                                           |
| Parameter                                     | Receptor                               | Value    | Comment                                                                                                                                                                                 |
| Skin Surface Area (cm <sup>2</sup> ) sediment | Recreational User - Adult              | 6570     | Assumes wearing a short-sleeved shirt, shorts and no shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, lower legs and feet (Table 7-2 - EPA, 2011)    |
|                                               | Recreational User - Child (Age 0-6 yr) | 2720     | Assumes wearing short-sleeved shirt, shorts, no shoes; therefore, the exposed skin surface is limited to the head, hands, forearms, lower legs and feet (Table 7-2 EPA, 2008).          |
|                                               | Floodplain Area Hunter                 | 6570     | Value for adult recreational user assumed for hunter.                                                                                                                                   |
| Dermal Absorption Fraction (ABSd) (unitless)  | All Receptors                          | 0.01     | EPA Region III default value (EPA Region III, 1995) used for mercury, which does not have a chemical-specific value.                                                                    |
| Dermal Adherence Factor (mg/cm <sup>2</sup> ) | Recreational User - Adult              | 0.3      | Sediment value based on mean value for reed gathers in EPA, 2004: Exhibit 3-3                                                                                                           |
|                                               | Recreational User - Child (Age 0-6 yr) | 0.3      | Sediment value based on mean value for reed gathers in EPA, 2004: Exhibit 3-3                                                                                                           |
|                                               | Floodplain Area Hunter                 | 0.3      | Sediment value based on mean value for reed gathers in EPA, 2004: Exhibit 3-3                                                                                                           |
| Body Weight (kg)                              | Recreational User - Adult              | 80       | EPA, 2011: Table 8-1                                                                                                                                                                    |
|                                               | Recreational User - Child (Age 0-6 yr) | 15       | Default - EPA, 1991 and EPA, 2014                                                                                                                                                       |
|                                               | Floodplain Area Hunter                 | 80       | EPA, 2011: Table 8-1                                                                                                                                                                    |
| Conversion Factor (CFs) (kg/mg)               | All Receptors                          | 1.00E-06 |                                                                                                                                                                                         |
| Averaging Time (AT), Noncancer (days)         | Recreational User - Adult              | 7300     | Equal to ED x 365 days/year                                                                                                                                                             |
|                                               | Recreational User - Child (Age 0-6 yr) | 2190     |                                                                                                                                                                                         |
|                                               | Floodplain Area Hunter                 | 7300     |                                                                                                                                                                                         |

**Table 4-2 - Values Used for Daily Intake Calculations, Sediment**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

**References:**

Bugas. 2011. Angler survey South River Augusta County and Waynesboro, VA

EPA, 1991. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part B: Development of Risk-Based Preliminary Remediation Goals). Interim Final. Office of Emergency and Remedial Response, Washington D.C. December.

EPA, 2004. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E Supplemental Guidance for Dermal Risk Assessment).Final. EPA/540/R/99/005. July 2004 (updated November 2007)

EPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-09/052F. September.

EPA, 2014. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120 dated February 6, 2014.

EPA Region III, 1995. Technical Guidance Manual: Assessing Dermal Exposure from Soil. December.

EPA Region IV, 2014. Region 4 Human Health Risk Assessment Supplemental Guidance Technical Services Section, Superfund Division. January 2014 Draft Final.

United States Fish and Wildlife Service, 2011. National Survey of Fishing, Hunting, & Wildlife-Associated Recreation.

Table 4-3 - Values Used for Daily Intake Calculations, Fish  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Ingestion of Fish

Chemical Intake = EPC x Intake Factor

HQ = Chemical Intake / RfDo

Where:

EPC = Exposure Point Concentration (mg/kg ww)

HQ = Hazard Quotient for noncancer effects

RfD = Reference Dose, oral (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{IR \times EF \times ED \times CF}{AT}$$

| Food Source | Adult Resident |      | Child Resident |      | Adult Hunter        |      | Adult Farmer        |      | Child Farmer        |      | Ingestion Rate (g/kg-day)<br>EPA, 2011 Reference                          |
|-------------|----------------|------|----------------|------|---------------------|------|---------------------|------|---------------------|------|---------------------------------------------------------------------------|
|             | Total          |      | Total          |      | Households who fish |      | Households who fish |      | Households who fish |      |                                                                           |
|             | Mean           | 90%  | Mean           | 90%  | Mean                | 90%  | Mean                | 90%  | Mean                | 90%  |                                                                           |
| Fish        | 2.74           | 3.37 | 2.74           | 3.37 | 3                   | 3.67 | 3                   | 3.67 | 3                   | 3.67 | Consumer-Only Intake Rate for Home-Caught Fish, South Region, Table 13-23 |

Notes:

Ingestion rates shown have not been adjusted for pre-cooking or post-cooking losses, this may be conducted.  
Age-specific data not available for fish in some. In those cases, values for total population used for both adult and child receptors.  
EF and ED values are consistent with a residential scenario  
CF = conversion factor, kg/1000 g

References:

EPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-09/052F. September.  
  
EPA. 2008. Child-Specific Exposure Factors Handbook. EPA/600/R-06/096F

Table 4-4 - Values Used for Daily Intake Calculations, Garden Crops  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Ingestion of Garden Crops

Chemical Intake = EPC x Intake Factor

HQ = Chemical Intake / RfDo

Where:

EPC = Exposure Point Concentration (mg/kg ww)

HQ = Hazard Quotient for noncancer effects

RfD = Reference Dose, oral (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{IR \times EF \times ED \times CF}{AT}$$

| Garden Crop Type  | IR<br>EPA, 2011<br>Reference | Ingestion Rate Home-Produced Vegetables (g/kg-day) |      |                     |      |                                   |
|-------------------|------------------------------|----------------------------------------------------|------|---------------------|------|-----------------------------------|
|                   |                              | Resident                                           |      | Farmer              |      | Comment                           |
|                   |                              | Households who garden                              |      | Households who farm |      |                                   |
|                   |                              | Mean                                               | 90%  | Mean                | 90%  |                                   |
| Bell pepper       | 13-50                        | 0.24                                               | 0.48 | 0.3                 | 0.6  | South Region, total not available |
| Bush bean         | 13-54                        | 0.79                                               | 1.6  | 0.8                 | 1.54 | snap beans                        |
| Bush pea          | 13-49                        | 0.51                                               | 1.04 | 0.46                | 0.9  |                                   |
| Cabbage           | 13-36                        | 1.07                                               | 1.97 | 1                   | 1.79 |                                   |
| Carrot            | 13-37                        | 0.4                                                | 0.76 | 0.36                | 0.62 |                                   |
| Cauliflower       | 13-35                        | 0.42                                               | 0.82 | 0.47                | 0.89 | broccoli                          |
| Lettuce           | 13-42                        | 0.39                                               | 0.84 | 0.39                | 0.84 |                                   |
| Radish            | 9-5                          | 0.18                                               | -    | 0.18                | -    | bulb vegetable                    |
| Red Onion         | 13-45                        | 0.3                                                | 0.61 | 0.38                | 0.94 |                                   |
| Red potato        | 13-57                        | 1.65                                               | 3.1  | 1.83                | 3.8  | white potatoes                    |
| Scallions         | 13-45                        | 0.3                                                | 0.61 | 0.38                | 0.94 |                                   |
| Spinach           | 9-5                          | 0.54                                               | -    | 0.54                | -    | leafy vegetables                  |
| Squash            | 9-5                          | 0.34                                               | -    | 0.34                | -    | cucurbits                         |
| Sugar beet        | 13-34                        | 0.53                                               | 1.03 | 0.53                | 1.03 | beets                             |
| Sugar beet greens | 13-34                        | 0.53                                               | 1.03 | 0.53                | 1.03 | beets                             |
| Sweet corn        | 13-38                        | 0.88                                               | 1.82 | 1.2                 | 3.37 |                                   |
| Tomato            | 13-56                        | 1.21                                               | 2.51 | 1.42                | 3.55 |                                   |
| Turnip            | 9-5                          | 1.15                                               | -    | 1.15                | -    | root tuber                        |
| Turnip greens     | 9-5                          | 0.54                                               | -    | 0.54                | -    | leafy vegetables                  |
| All Crops - South | 13-13                        | 2.27                                               | 5.18 | 3.34                | 9.56 |                                   |

Notes:

Ingestion rates shown have not been adjusted for pre-cooking or post-cooking losses, this may be conducted.

Age-specific data not available for most crop types

EF and ED values are consistent with a residential scenario

CF = conversion factor, kg/1000 g

References:

EPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-09/052F. September.

Table 4-5 - Values Used for Daily Intake Calculations, Beef, Poultry and Dairy

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

Ingestion of Beef, Poultry and Dairy

Chemical Intake = EPC x Intake Factor

HQ = Chemical Intake / RfDo

Where:

EPC = Exposure Point Concentration (mg/kg ww)

HQ = Hazard Quotient for noncancer effects

RfD = Reference Dose, oral (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{IR \times EF \times ED \times CF}{AT}$$

| Food Source | Adult Farmer                         |      | Child Farmer                         |      | Ingestion Rate (g/kg-day)<br>EPA, 2011 Reference                               |
|-------------|--------------------------------------|------|--------------------------------------|------|--------------------------------------------------------------------------------|
|             | Households who raise animals or farm |      | Households who raise animals or farm |      |                                                                                |
|             | Mean                                 | 90%  | Mean                                 | 90%  |                                                                                |
| Beef        | 2.45                                 | 6.36 |                                      |      | Consumer-Only Intake Rate for Home-Produced Beef, South Region, Table 13-33    |
|             |                                      |      | 4.60                                 | 9.83 | Consumer-Only Intake Rate for Home-Produced Meats, Table 13-15                 |
| Milk        | 17.1                                 | 34.9 | 17.1                                 | 34.9 | Consumer-Only Intake Rate for Home-Produced Dairy, Table 13-25                 |
| Eggs        | 0.54                                 | 1.18 | 0.54                                 | 1.18 | Consumer-Only Intake Rate for Home-Produced Eggs, South Region, Table 13-40    |
| Poultry     | 1.67                                 | 4.59 | 1.67                                 | 4.59 | Consumer-Only Intake Rate for Home-Produced Poultry, South Region, Table 13-52 |

| Time-Weighted Calculation, Child |          |      |      |
|----------------------------------|----------|------|------|
|                                  |          | Meat |      |
| Age                              | ED       | Mean | 90%  |
| 1-2                              | 2        | 3.65 | 8.68 |
| 3-5                              | 3        | 3.61 | 7.84 |
| 6-12                             | 1        | 3.65 | 8.00 |
| Time-Weighted Avg                |          | 3.63 | 8.15 |
|                                  | TWA-Farm | 4.60 | 9.83 |

Based on recommendations presented in Equation 6-2: EPA, 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities.

Notes:

Ingestion rates shown have not been adjusted for pre-cooking or post-cooking losses, this may be conducted.

Home-produced meats intake rates in EFH include beef, poultry and pork

Age-specific data not available for most home-produced poultry or dairy items. In those cases, values for total population used for both adult and child receptors.

EF and ED values are consistent with a residential scenario

CF = conversion factor, kg/1000 g

References:

EPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-09/052F. September.

EPA. 2008. Child-Specific Exposure Factors Handbook. EPA/600/R-06/096F

Table 4-6 - Values Used for Daily Intake Calculations, Wildlife (Waterfowl, Deer and Snapping Turtles)  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Ingestion of Wildlife (Waterfowl, Deer and Snapping Turtles)

Chemical Intake = EPC x Intake Factor  
HQ = Chemical Intake / RfDo  
Where:  
EPC = Exposure Point Concentration (mg/kg ww)  
HQ = Hazard Quotient for noncancer effects  
RfD = Reference Dose, oral (mg/kg-day)

And:

$$Intake\ Factor\ (kg/kg\text{-}day) = \frac{IR \times EF \times ED \times CF}{AT}$$

| Food Source | Adult Resident |      | Child Resident |      | Adult Hunter        |      | Adult Farmer       |      | Child Farmer        |      | Ingestion Rate (g/kg-day)<br>EPA, 2011 Reference                                                        |
|-------------|----------------|------|----------------|------|---------------------|------|--------------------|------|---------------------|------|---------------------------------------------------------------------------------------------------------|
|             | Total          |      | Total          |      | Households who hunt |      | Household who farm |      | Households who farm |      |                                                                                                         |
|             | Mean           | 90%  | Mean           | 90%  | Mean                | 90%  | Mean               | 90%  | Mean                | 90%  |                                                                                                         |
| Game (Deer) | 1.26           | 2.38 | 1.26           | 2.38 | 1.26                | 2.38 | 1.26               | 2.38 | 1.26                | 2.38 | Consumer-Only Intake Rate for Home-Produced Game, Table 13-41, South Region. General population values. |
| Waterfowl   | 1.26           | 2.38 | 1.26           | 2.38 | 1.26                | 2.38 | 1.26               | 2.38 | 1.26                | 2.38 | See earlier note for game                                                                               |
| Turtle      | 1.26           | 2.38 | 1.26           | 2.38 | 1.26                | 2.38 | 1.26               | 2.38 | 1.26                | 2.38 | See earlier note for game                                                                               |

Notes:

Ingestion rates shown have not been adjusted for pre-cooking or post-cooking losses, this may be conducted.  
Where, age-specific data not available for most home-produced items, values for total population used.  
EF and ED values are consistent with a residential scenario  
CF = conversion factor, kg/1000 g

References:

EPA. 2011. Exposure Factors Handbook: 2011 Edition. EPA/600/R-09/052F. September.

EPA. 2008. Child-Specific Exposure Factors Handbook. EPA/600/R-06/096F

Table 4-7 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 1 Surface Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID                                            | 1                                                |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         | Current/Future Potential Receptors |                                 |                        |                        |                        |                                                         | Hypothetical Future               |                                    |
|-----------------------------------------------------|--------------------------------------------------|------------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|-------------------|-----------------------|------------------------------------------|-------------------------|------------------------------------|---------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
| RRM                                                 | 0.5-2                                            |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM Description                                     | Main Street to Hopeman Parkway                   |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Property Owner                                      | Land Use                                         | Map ID     | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>ind</sub> | Data Distribution | 95 % UCL with outlier | Maximum Detect (mg/kg) - without outlier | 95% UCL without outlier | Industrial/ Commercial Worker      | Construction/ Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| River Town LC (Crompton)                            | Open Space - Commercial/Industrial               | Extent 8   | 2                | 4              | 4.90E-01               | 9.61E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| DuPont                                              | Plant Parking Lot                                | Extent 8   | 7                | 15             | 1.92E-02               | 6.50E+01               | 1                         | 1                                  | 0                                  | Gamma             | 2.39E+01              | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         | ✓                                 |                                    |
| North of Rockfish Run (multitple parcels)           | Open Space - Residential                         | Extent 8   | 20               | 42             | 1.16E-02               | 2.61E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro - Constitution Park              | Park                                             | Extent 8   | 20               | 41             | 8.57E-02               | 2.49E+02               | 10                        | 7                                  | 0                                  | Gamma             | 2.49E+01              | 4.75E+01                                 | 1.43E+01                |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Soccer Field/Arboretum <sup>2</sup>                 | Park                                             | Extent 8   | 6                | 12             | 8.57E-02               | 2.49E+02               | 4                         | 3                                  | 0                                  | Gamma             | 1.08E+02              | 2.80E+01                                 | UCL > Max               |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Pavilion/Paved Greenway <sup>3</sup>                | Park                                             | Extent 8   | 8                | 17             | 3.69E-01               | 2.30E+01               | 2                         | 0                                  | 0                                  | Gamma             | 1.11E+01              | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Pavilion North of West Main Street <sup>4</sup>     | Park                                             | Extent 8   | 6                | 12             | 2.34E-01               | 4.75E+01               | 4                         | 4                                  | 0                                  | Lognormal         | UCL > Max             | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| City of Waynesboro                                  | Open Space - Commercial                          | Extent 8   | 2                | 4              | 2.11E+00               | 2.51E+01               | 1                         | 1                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         | ✓                                 |                                    |
| Bottom Alley (Hopeman Brothers)                     | Forest - Commercial/Industrial                   | Extent 7   | 10               | 23             | 3.12E-02               | 2.48E+02               | 7                         | 7                                  | 0                                  | Gamma             | 6.65E+01              | 5.67E+01                                 | 2.47E+01                |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| Forested Portion <sup>5</sup>                       | Forest - Commercial/Industrial                   | Extent 7   | 7                | 17             | 6.52E-01               | 2.48E+02               | 7                         | 7                                  | 0                                  | Gamma             | 8.31E+01              | 5.67E+01                                 | 3.01E+01                |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| Landscaped - Southern Portion <sup>6</sup>          | Forest - Commercial/Industrial                   | Extent 7   | 3                | 6              | 3.12E-02               | 6.73E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro - North Park                     | Park                                             | Extent 6   | 27               | 57             | 4.38E-02               | 3.41E+02               | 17                        | 12                                 | 0                                  | Lognormal         | 8.09E+01              | 8.80E+01                                 | 2.02E+01                |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Wetland Portion Across River <sup>7</sup>           | Open Space                                       | Extent 6   | 3                | 6              | 5.62E-01               | 4.10E+01               | 1                         | 1                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Ball Field <sup>8</sup>                             | Park                                             | Extent 6   | 5                | 10             | 9.17E-01               | 1.84E+01               | 1                         | 0                                  | 0                                  | Lognormal         | 9.68E+00              | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Northern Perimeter/Basketball Court <sup>9</sup>    | Park                                             | Extent 6   | 8                | 19             | 4.38E-02               | 3.41E+02               | 13                        | 11                                 | 0                                  | Gamma             | 1.57E+02              | 8.80E+01                                 | 4.55E+01                |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Parking Lot/Pavilion/Playground <sup>10</sup>       | Park                                             | Extent 6   | 8                | 16             | 4.38E-02               | 2.24E+01               | 2                         | 0                                  | 0                                  | Normal            | 1.13E+01              | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Open Space/VolleyBall Court <sup>11</sup>           | Park                                             | Extent 6   | 3                | 6              | 1.78E-01               | 5.12E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Breeden, Earl                                       | Open Space                                       | Extent 6   | 1                | 2              | 3.44E+00               | 5.31E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro                                  | Open Space - Residential                         | Extent 6   | 2                | 4              | 8.68E+00               | 1.59E+01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Americast Inc (Allied Ready Mix)                    | Forest (Oxbow) / Former Motorcross <sup>12</sup> | Extent 5   | 30               | 66             | 2.77E-02               | 7.14E+02               | 27                        | 25                                 | 3                                  | Lognormal         | 1.67E+02              | 8.93E+01                                 | 3.10E+01                | ✓                                  | ✓                               |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| Forested Portion adjacent to facility <sup>13</sup> | Forest                                           | Extent 5   | 7                | 14             | 2.77E-02               | 1.67E+02               | 5                         | 5                                  | 0                                  | Gamma             | 1.29E+02              | 8.93E+01                                 | UCL > Max               |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| Former Motorcross <sup>14</sup>                     | Forest/Former Motorcross                         | Extent 5   | 11               | 22             | 1.65E-01               | 3.07E+02               | 2                         | 2                                  | 0                                  | Nonparametric     | 8.25E+01              | 8.93E+01                                 | 2.50E+01                |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| East of Oxbow <sup>15</sup>                         | Forest (Oxbow)                                   | Extent 5   | 1                | 2              | 3.22E+01               | 1.43E+02               | 2                         | 2                                  | 0                                  | N/A               | NC                    | 3.22E+01                                 | NC                      |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| South of Oxbow <sup>16</sup>                        | Forest (Oxbow)                                   | Extent 5   | 6                | 15             | 5.35E+00               | 2.26E+02               | 12                        | 11                                 | 0                                  | Gamma             | 1.00E+02              | 7.04E+01                                 | 4.27E+01                |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| North of Oxbow <sup>17</sup>                        | Forest (Oxbow)                                   | Extent 5   | 5                | 13             | 3.31E-01               | 7.14E+02               | 5                         | 5                                  | 3                                  | Lognormal         | UCL > Max             | 7.15E+01                                 | UCL > Max               | ✓                                  | ✓                               |                        | ✓                      |                        | ✓                                                       |                                   |                                    |
| City of Waynesboro                                  | Industrial (WWTP)                                | Extent 5/4 | 11               | 24             | 5.95E-01               | 1.64E+01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro - Basic Park                     | Park                                             | Extent 4   | 53               | 119            | 3.42E-02               | 7.21E+01               | 26                        | 19                                 | 0                                  | Gamma             | 1.49E+01              | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Oxbow <sup>18</sup>                                 | Park                                             | Extent 4   | 22               | 53             | 4.60E-02               | 7.21E+01               | 14                        | 10                                 | 0                                  | Gamma             | 1.96E+01              | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Park <sup>19</sup>                                  | Park                                             | Extent 4   | 24               | 52             | 3.42E-02               | 5.28E+01               | 12                        | 9                                  | 0                                  | Gamma             | 1.63E+01              | -                                        | NC                      |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Forested Area East of Park <sup>20</sup>            | Park                                             | Extent 4   | 7                | 14             | 6.81E-02               | 5.99E+00               | 0                         | 0                                  | 0                                  | Lognormal         | 3.08E+00              | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| MTECH Group                                         | Forest-Commercial/Industrial                     | Extent 4   | 7                | 14             | 4.03E-02               | 3.23E+01               | 1                         | 1                                  | 0                                  | Lognormal         | 2.59E+01              | -                                        | NC                      |                                    |                                 |                        | ✓                      |                        | ✓                                                       |                                   |                                    |

Table 4-7 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 1 Surface Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Notes:

Property owner boundaries are designated by a brown outline in the extent map:  
SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)  
SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable)  
Results are reported by the laboratory with three significant figures  
UCLs not shown if maximum detected value was less than 17 mg/kg  
Outlier defined as concentration around or exceeding 100 mg/kg  
*Data from the sampling program 2006/2007 Earthworm Study not included in the statistical summary*

mg/kg - milligrams per kilogram  
N/A - Not applicable  
NC - Not calculated

Footnotes:

- 1 - Includes three adjacent locations part of DuPont parcel (GWAY-7, GWAY-8 and MN-AFP-557).
- 2 - Locations MN-AFP-552, 553, 554, 555, 556 and 557
- 3 - Locations GWAY-1, -2, -3, -4, -5, -6, -7 and -8
- 4 - Locations MN-FP-001, -002, -003, -004, -005 and -016
- 5 - Locations MN-AFP-561, -562 and -563, MN-WET-001, MN-FP-10, MN-FP-18 and MN-FP-19
- 6 - Locations MN-FP-08, -09 and -11
- 7 - Locations MN-WET-002, -003 and MN-FP-020
- 8 - Locations MN-FP-025, -026, -027, -029 and MN-AFP-547
- 9 - Locations MN-FP-015, -022, -024 and -032; MN-AFP-544, -546, -548 and -549
- 10 - Locations FPS-NP-R-1, -2 and -3; MN-FP-012 and -023; MN-AFP-542, -543 and -545
- 11 - Locations MN-FP-014 and -021 and MN-AFP-541
- 12 - Currently zoned and used as commercial/industrial; samples collected from forested undeveloped portion of the property
- 13 - Locations MN-FP-028, -31, -33, -34, -35 and -37; MN-WET-004
- 14 - Locations MN-MOTO-01, -02, -03, -04, -05, -06, -07, -08 and -09; MN-WET-005 and -006
- 15 - Location MN-FP-038
- 16 - Locations MN-FP-039, -040, -041, -042, -051 and -052
- 17 - Locations MN-FP-061, -70, -74 and -82; MN-WET-010
- 18 - Locations FPS-BP-R-1, -2 and -3; FPS-AR-CM-1, -2, -3 and -4; FPS-AR-R-1, -2 and -3; MN-MOTO-10; MN-FP-043, -044, -045, -046, -047, -048, -049 and -054; MN-WET-007, -008 and -009
- 19 - Locations BP-7-10; MN-FP-013, -017, -036, -050, -053, -055, -056, -057, -059, -060, -062, -063, -064, -065, -068, -069, -072, -073, -078, -079, -080, -081, -083
- 20 - Locations MN-FP-058, -066, -067, -071, -075, -076 and -077

Table 4-8 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 1 Subsurface Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

|                                                     |                                                 |           |                  |                |                        |                        |                           |                                    |                                    |                                          |                              |                                    |                        |                        |                        |                                                         |                                   |                                    |
|-----------------------------------------------------|-------------------------------------------------|-----------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|------------------------------------------|------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
| Reach ID                                            | 1                                               |           |                  |                |                        |                        |                           |                                    |                                    |                                          |                              |                                    |                        |                        |                        |                                                         |                                   |                                    |
| RRM                                                 | 0.5-2                                           |           |                  |                |                        |                        |                           |                                    |                                    |                                          |                              |                                    |                        |                        |                        |                                                         |                                   |                                    |
| RRM Description                                     | Main Street to Hopeman Parkway                  |           |                  |                |                        |                        |                           |                                    |                                    |                                          |                              | Current/Future Potential Receptors |                        |                        |                        |                                                         |                                   |                                    |
| Property Owner                                      | Land Use                                        | Map ID    | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>ind</sub> | Maximum Detect (mg/kg) - without outlier | Industrial/Commercial Worker | Construction/Excavation Worker     | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| City of Waynesboro - Loth Springs Park              | Park                                            | Not Shown | 6                | 6              | 4.69E-02               | 6.40E-01               | 0                         | 0                                  | 0                                  | -                                        |                              |                                    |                        |                        |                        |                                                         |                                   |                                    |
| DuPont                                              | Plant Parking Lot                               | Extent 8  | 6                | 6              | 1.04E+00               | 9.93E+00               | 0                         | 0                                  | 0                                  | -                                        |                              |                                    |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro - Constitution Park <sup>1</sup> | Park                                            | Extent 8  | 6                | 6              | 3.69E-01               | 2.09E+01               | 1                         | 0                                  | 0                                  | -                                        |                              |                                    |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Bottom Alley (Hopeman Brothers)                     | Forest - Commercial/Industrial                  | Extent 7  | 1                | 1              | 1.56E+01               | 1.56E+01               | 0                         | 0                                  | 0                                  | -                                        |                              |                                    |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro - North Park                     | Park                                            | Extent 6  | 1                | 1              | 3.38E+02               | 3.38E+02               | 1                         | 1                                  | 0                                  | N/A                                      |                              |                                    |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Americast Inc (Allied Ready Mix)                    | Forest (Oxbow) / Former Motorcross <sup>2</sup> | Extent 5  | 2                | 2              | 3.53E+00               | 4.00E+02               | 1                         | 1                                  | 1                                  | 3.53E+00                                 | ✓                            | ✓                                  |                        | ✓                      |                        |                                                         | ✓                                 |                                    |

**Notes:**  
Property owner boundaries are designated by a brown outline in the extent maps  
mg/kg - milligrams per kilogram  
SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)  
SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)  
N/A - Not applicable  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).  
Results are reported by the laboratory with three significant figures.  
Outlier defined as concentration around or exceeding 100 mg/kg

**Footnotes:**  
1 - Includes three adjacent locations part of DuPont parcel (GWAY-7, GWAY-8 and MN-AFP-557).  
2 - Currently zoned and used as commercial/industrial; samples collected from forested undeveloped portion of the property.

Table 4-9 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 2 Surface Soil

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

|                                                  |                                               |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
|--------------------------------------------------|-----------------------------------------------|------------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|-------------------|-----------------------|------------------------------------------|-------------------------|------------------------------------|---------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
| Reach ID                                         | 2                                             |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM                                              | 2-5                                           |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM Description                                  | Hopeman Parkway to Holsinger Farms Footbridge |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         | Current/Future Potential Receptors |                                 |                        |                        |                        |                                                         | Hypothetical Future               |                                    |
| Property Owner                                   | Land Use                                      | Map ID     | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>ind</sub> | Data Distribution | 95 % UCL with outlier | Maximum Detect (mg/kg) - without outlier | 95% UCL without outlier | Industrial/ Commercial Worker      | Construction/ Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| Davis, Marshall E (Parcel 1)                     | Open Space/Pasture                            | Extent 3   | 1                | 2              | 6.68E+00               | 8.95E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Davis, Lillian & Margaret                        | Pasture/Hay                                   | Extent 3   | 1                | 2              | 3.14E-02               | 8.61E-02               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| City of Waynesboro (North of Hopeman Pkwy)       | Forest                                        | Extent 3   | 4                | 8              | 4.09E-02               | 1.69E+01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Windy Acres                                      | Forest                                        | Extent 3   | 3                | 6              | 1.85E-02               | 1.95E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Commonwealth Investors                           | Open Space/Developed                          | Extent 3   | 2                | 4              | 1.11E-01               | 1.55E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Meadows, Eugene & Mary                           | Forest                                        | Extent 3   | 3                | 7              | 3.00E-02               | 3.24E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Carroll, Richard Travis                          | Open Space/Commercial                         | Extent 3   | 1                | 2              | 1.73E-01               | 4.63E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Solutions Way LLC                                |                                               |            |                  |                |                        |                        |                           |                                    |                                    |                   |                       |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Developed Portion <sup>1</sup>                   | Open Space/Industrial                         | Extent 3   | 6                | 13             | 2.74E-02               | 3.82E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Forested corridor adjacent to river <sup>2</sup> | Forest                                        | Extent 3   | 10               | 38             | 1.40E-01               | 1.02E+02               | 10                        | 9                                  | 0                                  | Gamma             | 3.18E+01              | 8.64E+01                                 | 2.49E+01                |                                    |                                 |                        | ✓                      |                        |                                                         | ✓                                 |                                    |
| Cultivated Fields <sup>3</sup>                   | Pasture/Hay/Forest                            | Extent 3/2 | 16               | 32             | 1.23E-02               | 9.25E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Davis, Marshall E (Parcel 2)                     | Pasture/Hay                                   | Extent 3   | 1                | 2              | 9.66E+00               | 1.26E+01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Aitcheson, Andrew T Jr Trustee                   | Forest                                        | Extent 3   | 1                | 2              | 1.99E-01               | 5.21E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Wood, L E Jr                                     | Pasture/Hay/Forest                            | Extent 3   | 4                | 8              | 2.13E+00               | 2.15E+01               | 1                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Argenbright, Harold or Deborah                   | Pasture/Hay                                   | Extent 2   | 8                | 16             | 7.35E-02               | 3.87E+01               | 2                         | 1                                  | 0                                  | Lognormal         | 1.50E+01              | -                                        | NC                      |                                    |                                 |                        |                        | ✓                      |                                                         | ✓                                 | ✓                                  |
| Shifflett, Floyd                                 | Pasture/Hay/Forest                            | Extent 2   | 31               | 112            | 3.50E-02               | 4.03E+02               | 38                        | 32                                 | 1                                  | Approx Gamma      | 3.42E+01              | 7.07E+01                                 | 1.86E+01                | ✓                                  | ✓                               |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Simmons, Michael or Sandra                       | Open Space                                    | Extent 2   | 1                | 2              | 7.55E-02               | 1.27E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| McDaniel, Lloyd or Dreama                        | Pasture/Hay/Forest                            | Extent 2   | 14               | 28             | 3.55E-02               | 6.69E+01               | 4                         | 4                                  | 0                                  | Lognormal         | 2.49E+01              | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Brand, Laura Jean and Asher Trustee              | Pasture/Hay/Open Space                        | Extent 2   | 2                | 4              | 3.96E-02               | 2.18E+00               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Dooms, James Millard                             | Pasture/Hay/Forest/Open Space                 | Extent 1   | 15               | 29             | 2.15E-02               | 1.12E+00               | 0                         | 0                                  | 0                                  | Gamma             | 3.02E-01              | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Holsinger Farms LLC                              | Pasture/Hay/Forest                            | Holsinger  | 11               | 22             | 8.79E-02               | 2.19E+01               | 1                         | 0                                  | 0                                  | Gamma             | 7.80E+00              | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Dooms Crossing                                   | Open Space/Residential                        | Extent 1   | 2                | 5              | 1.20E-02               | 3.95E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Denney, Ronald W and Kathryn Trustees            | Pasture/Hay/Open Space                        | Extent 1   | 1                | 2              | 6.62E-02               | 4.21E-01               | 0                         | 0                                  | 0                                  | N/A               | NC                    | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |

Notes:

Property owner boundaries are designated by a brown outline in the extent maps

SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)

SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)

Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).

Results are reported by the laboratory with three significant figures.

UCLs not shown if maximum detected value was less than 17 mg/kg

Outlier defined as concentration around or exceeding 100 mg/kg

Data from the sampling program 2006/2007 Earthworm Study not included in the statisical summary.

mg/kg - milligrams per kilogram

N/A - Not applicable

NC - Not calculated

Footnotes:

- 1 - Locations HO-FP-100, -102, -104, -107, -110 and -112
- 2 - Locations FPS-WH-CM-1 through -CM-5, FPS-WH-R-1, -R-2 and -R-3, HO, HP
- 3 - Locations HO-FP-111, -113, -114, -118, -119, -120, -121, -122, -125 through -131 and -173

Table 4-10 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 2 Subsurface Soil

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

|                   |                                                  |          |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |                     |  |
|-------------------|--------------------------------------------------|----------|---------------------|-------------------|------------------------------|------------------------------|---------------------------------|------------------------------------------|------------------------------------------|----------------------|----------|----------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------------|--------------------------------------|---------------------------------------|---------------------|--|
| Reach ID          | 2                                                |          |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |                     |  |
| RRM               | 2-5                                              |          |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |                     |  |
| RRM Description   | Hopeman Parkway to<br>Holsinger Farms Footbridge |          |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                  | Current/Future Potential Receptors |                        |                        |                        |                                                               |                                      |                                       | Hypothetical Future |  |
| Property Owner    | Land Use                                         | Map ID   | No. of<br>Locations | No. of<br>Samples | Minimum<br>Detect<br>(mg/kg) | Maximum<br>Detect<br>(mg/kg) | No. of<br>Samples ><br>17 mg/kg | No. of<br>Samples ><br>SL <sub>res</sub> | No. of<br>Samples ><br>SL <sub>ind</sub> | Data<br>Distribution | 95 % UCL | Industrial/<br>Commercial Worker | Construction/<br>Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User<br>(Floodplain Area Parks)<br>(Adult/Child) | Resident (Adult/Child)<br>Cumulative | Floodplain Area<br>Subsistence Farmer |                     |  |
| Solutions Way LLC | Forest                                           | Extent 3 | 2                   | 14                | 1.07E+00                     | 8.77E+01                     | 9                               | 9                                        | 0                                        | Normal               | 4.38E+01 |                                  |                                    |                        | ✓                      |                        |                                                               | ✓                                    |                                       |                     |  |
| Shifflett, Floyd  | Pasture/Hay/Forest                               | Extent 2 | 19                  | 23                | 4.00E-02                     | 7.46E+01                     | 2                               | 2                                        | 0                                        | Nonparametric        | 4.17E+01 |                                  |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |                     |  |

Notes:

Property owner boundaries are designated by a brown outline in the extent maps

SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)

SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)

Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).

Results are reported by the laboratory with three significant figures.

mg/kg - milligrams per kilogram

N/A - Not applicable

NC - Not calculated

| Table 4-11 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 3 Surface Soil |                                                   |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
|------------------------------------------------------------------------------------------------|---------------------------------------------------|------------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|-------------------|----------|------------------------------------------|-------------------------|------------------------------------|---------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
| Human Health Risk Assessment Report, Area of Concern (AOC) 4                                   |                                                   |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Former DuPont Waynesboro Plant                                                                 |                                                   |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Waynesboro, Virginia                                                                           |                                                   |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Reach ID                                                                                       | 3                                                 |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM                                                                                            | 5-10                                              |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM Description                                                                                | Holsinger Farms Footbridge to New Hope-Crimora Rd |            |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                          |                         | Current/Future Potential Receptors |                                 |                        |                        |                        |                                                         | Hypothetical Future               |                                    |
| Property Owner                                                                                 | Land Use                                          | Map ID     | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>ind</sub> | Data Distribution | 95 % UCL | Maximum Detect (mg/kg) - without outlier | 95% UCL without outlier | Industrial/ Commercial Worker      | Construction/ Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| Holsinger Farms LLC                                                                            | Cultivated Crops, Forest,Pature/Hay,Wetlands      | Holsinger  | 22               | 45             | 1.53E-02               | 1.15E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Hatton Jerry or Mary                                                                           | Cultivated Crops, Pature/Hay                      | Extent 1   | 7                | 14             | 3.55E-02               | 2.54E+01               | 5                         | 1                                  | 0                                  | Normal            | 1.45E+01 | -                                        | NC                      |                                    |                                 |                        |                        | ✓                      |                                                         | ✓                                 | ✓                                  |
| Rexrode Arval and Bernice                                                                      | Cultivated Crops                                  | Extent 2   | 1                | 2              | 8.46E-01               | 3.81E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Rexrode David and Sharon                                                                       | Cultivated Crops                                  | Extent 2   | 2                | 4              | 2.62E-02               | 2.74E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Holloway Howard or Edith                                                                       | Cultivated Crops, Forest,Pature/Hay,Wetlands      | Extent 2   | 9                | 18             | 4.90E-02               | 3.88E+01               | 2                         | 1                                  | 0                                  | Gamma             | 1.28E+01 | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Holsinger Daniel A or Ellen                                                                    | Cultivated Crops                                  | Extent 2   | 1                | 2              | 2.20E-02               | 2.56E-02               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Yount Joseph                                                                                   | Forest                                            | Yount      | 9                | 18             | 1.02E-01               | 4.64E+01               | 5                         | 3                                  | 0                                  | Gamma             | 2.50E+01 | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
|                                                                                                | Pasture/Hay, Cultivated Crops                     | Yount      | 22               | 44             | 2.99E-02               | 3.73E+01               | 5                         | 4                                  | 0                                  | Gamma             | 1.06E+01 | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Thumps Up LLC (Parcel 1)                                                                       | Pasture/Hay                                       | Thumbs Up  | 3                | 6              | 1.45E-02               | 8.33E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Thumps Up LLC (Parcel 2)                                                                       | Pasture/Hay, Forest                               |            | 3                | 6              | 2.76E+00               | 1.31E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Wertman Charles F or Delores K                                                                 | Forest, Pasture/Hay                               | Extent 4-5 | 18               | 36             | 1.37E-02               | 3.35E+01               | 2                         | 1                                  | 0                                  | Nonparametric     | 1.16E+01 | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Wertman Charles M or Tammy                                                                     | Forest                                            | Extent 4-5 | 1                | 2              | 2.28E-02               | 6.40E-02               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Ambler Tamara                                                                                  | Forest                                            | Extent 5   | 3                | 6              | 3.32E-01               | 3.58E+01               | 1                         | 1                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Lane John or Linda                                                                             | Open Space (Residential), Pasture/Hay             | Extent 5   | 2                | 4              | 1.81E-01               | 3.38E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       | -                                        | NC                      |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |

Notes:

Property owner boundaries are designated by a brown outline in the extent maps

SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)

SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)

Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).

Results are reported by the laboratory with three significant figures.

UCLs not shown if maximum detected value was less than 17 mg/kg

Outlier defined as concentration around or exceeding 100 mg/kg

Data from the sampling program 2006/2007 Earthworm Study not included in the statistical summary.

mg/kg - milligrams per kilogram

N/A - Not applicable

NC - Not calculated

Table 4-12 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 4 Surface Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID                                                  | 4                                                  |                               |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                                      |                               |                                  | Current/Future Potential Receptors |                        |                        |                        |                                                               |                                      | Hypothetical Future                   |  |  |  |  |  |  |  |  |  |
|-----------------------------------------------------------|----------------------------------------------------|-------------------------------|---------------------|-------------------|------------------------------|------------------------------|---------------------------------|------------------------------------------|------------------------------------------|----------------------|----------|------------------------------------------------------|-------------------------------|----------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------------|--------------------------------------|---------------------------------------|--|--|--|--|--|--|--|--|--|
| RRM                                                       | 10-16                                              |                               |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                                      |                               |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| RRM Description                                           | New Hope-Crimora Rd to<br>Patterson Mill           |                               |                     |                   |                              |                              |                                 |                                          |                                          |                      |          |                                                      |                               |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Property Owner                                            | Land Use                                           | Map ID                        | No. of<br>Locations | No. of<br>Samples | Minimum<br>Detect<br>(mg/kg) | Maximum<br>Detect<br>(mg/kg) | No. of<br>Samples ><br>17 mg/kg | No. of<br>Samples ><br>SL <sub>res</sub> | No. of<br>Samples ><br>SL <sub>ind</sub> | Data<br>Distribution | 95 % UCL | Maximum<br>Detect<br>(mg/kg) -<br>without<br>outlier | 95% UCL<br>without<br>outlier | Industrial/<br>Commercial Worker | Construction/<br>Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User<br>(Floodplain Area Parks)<br>(Adult/Child) | Resident (Adult/Child)<br>Cumulative | Floodplain Area<br>Subsistence Farmer |  |  |  |  |  |  |  |  |  |
| Augusta Park Crimora <sup>1</sup>                         | Open Space (Park), Wetland                         | Augusta Park<br>Crimora       | 18                  | 65                | 2.40E-01                     | 1.24E+02                     | 18                              | 7                                        | 0                                        | Gamma                | 1.88E+01 | 3.12E+01                                             | 1.63E+01                      |                                  |                                    |                        |                        |                        | ✓                                                             | ✓                                    |                                       |  |  |  |  |  |  |  |  |  |
| Moynihan Richard or Lindsey Wins                          | Cultivated Crops, Forest                           | Extent 6                      | 9                   | 18                | 1.28E-01                     | 1.35E+01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               | ✓                                    |                                       |  |  |  |  |  |  |  |  |  |
| Shifflett Roger or Sharon                                 | Cultivated Crops, Pasture/Hay                      | Extent 6                      | 3                   | 6                 | 1.23E-02                     | 5.79E+01                     | 2                               | 2                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        | ✓                      |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Augusta Forestry Center                                   | Cultivated Crops, Forest,<br>Wetland (site-wide)   | Augusta<br>Forestry<br>Center | 197                 | 314               | 7.80E-03                     | 9.43E+01                     | 94                              | 83                                       | 0                                        | Nonparametric        | 2.52E+01 | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
|                                                           | Cultivated Crops, Forest,<br>Wetland (2-yr)        |                               | 99                  | 173               | 1.64E-02                     | 9.43E+01                     | 93                              | 82                                       | 0                                        | Nonparametric        | 3.63E+01 | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
|                                                           | Cultivated Crops, Forest,<br>Wetland (5-yr,62-yr)  |                               | 98                  | 141               | 1.68E-02                     | 2.89E+01                     | 1                               | 1                                        | 0                                        | Approx<br>Lognormal  | 4.13E+00 | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Pursley Nancy                                             | Pasture/Hay                                        | Extent 7                      | 1                   | 2                 | 4.24E-02                     | 4.92E-02                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Wolf Allen or Cecilia                                     | Forest                                             | Extent 7 - 8                  | 1                   | 2                 | 1.74E+00                     | 1.38E+01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Red Mill <sup>2</sup>                                     | Open Space (Residential)                           | Extent 8                      | 3                   | 6                 | 5.70E-02                     | 1.66E+01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Landram Darrell (Black Bear Compositing Inc) <sup>3</sup> | Forest                                             | Extent 8                      | 1                   | 2                 | 9.00E+00                     | 1.12E+01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Patterson William                                         | Pasture/Hay                                        | Extent 8                      | 4                   | 8                 | 3.36E-02                     | 1.06E+00                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| LaPierre Victor                                           | Forest, Pasture/Hay                                | Extent 8                      | 2                   | 4                 | 1.04E+00                     | 1.36E+01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Patterson Crawford S                                      | Pasture/Hay                                        | Extent 8                      | 4                   | 8                 | 3.72E-01                     | 3.66E+01                     | 1                               | 1                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        | ✓                      |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Harris Doris                                              | Forest                                             | Freed/Harris                  | 2                   | 4                 | 4.47E-02                     | 1.31E-01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               | ✓                                    |                                       |  |  |  |  |  |  |  |  |  |
| Freed Carl                                                | Forest, Pasture/Hay                                | Freed/Harris                  | 9                   | 18                | 6.74E-02                     | 2.30E+01                     | 1                               | 0                                        | 0                                        | Approx Normal        | 8.62E+00 | -                                                    | NC                            |                                  |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Thompson Guy                                              | Cultivated Crops, Pasture/Hay,<br>Forest, Wetlands | Extent 9                      | 10                  | 21                | 2.66E-02                     | 1.88E+01                     | 1                               | 0                                        | 0                                        | Gamma                | 6.96E+00 | -                                                    | NC                            |                                  |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Wampler Mary                                              | Pasture/Hay                                        | Extent 10                     | 1                   | 2                 | 1.82E+00                     | 1.06E+01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| EJS Weyers Caves LLC                                      | Forest                                             | Extent 10                     | 3                   | 6                 | 8.14E-01                     | 1.81E+01                     | 1                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        | ✓                      |                        |                                                               | ✓                                    |                                       |  |  |  |  |  |  |  |  |  |
| Shaver Edward                                             | Pasture/Hay                                        | Extent 10                     | 3                   | 6                 | 2.01E-02                     | 4.54E-01                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Boe Kathleen                                              | Forest                                             | Extent 10                     | 2                   | 4                 | 2.30E-01                     | 4.97E+00                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Thumps Up LLC (Parcel 3)                                  | Wetlands/Pasture Hay (62-yr)                       | Thumps Up                     | 3                   | 6                 | 2.62E-02                     | 1.05E+00                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Thumps Up LLC (Parcel 3)                                  | Forest, Pasture/Hay (2-yr/5-yr)                    | Thumps Up                     | 7                   | 15                | 1.00E-01                     | 2.35E+01                     | 2                               | 1                                        | 0                                        | Gamma                | 1.21E+01 | -                                                    | NC                            |                                  |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Thumps Up LLC (Parcel 4)                                  | Forest                                             | Thumps Up                     | 1                   | 2                 | 6.61E-01                     | 7.64E+00                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Kaminski Joseph                                           | Forest                                             | Extent 11                     | 1                   | 2                 | 3.01E+00                     | 2.00E+01                     | 1                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        | ✓                      |                        |                                                               | ✓                                    |                                       |  |  |  |  |  |  |  |  |  |
| Echols Laura                                              | Forest, Pasture/Hay                                | Extent 11                     | 3                   | 6                 | 3.17E-02                     | 6.11E+00                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |
| Custard William and Amanda Trustee                        | Forest, Pasture/Hay                                | Extent 11                     | 4                   | 8                 | 6.91E-02                     | 1.79E+01                     | 1                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |  |  |  |  |  |  |  |  |  |
| Patterson Charles or Donna                                | Forest                                             | Extent 12                     | 2                   | 4                 | 2.84E-01                     | 1.16E+00                     | 0                               | 0                                        | 0                                        | N/A                  | NC       | -                                                    | NC                            |                                  |                                    |                        |                        |                        |                                                               |                                      |                                       |  |  |  |  |  |  |  |  |  |

Notes:

Property owner boundaries are designated by a brown outline in the extent maps  
SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)  
SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).  
Results are reported by the laboratory with three significant figures.  
UCLs not shown if maximum detected value was less than 17 mg/kg  
Outlier defined as concentration around or exceeding 100 mg/kg  
*Data from the sampling program 2006/2007 Earthworm Study not included in the statistical summary.*

mg/kg - milligrams per kilogram  
N/A - Not applicable  
NC - Not calculated

Footnotes:

- 1 - Augusta Park Crimora, which extends across Reach 3 and 4, included in Reach 4  
2 - Red Mill refers to three samples collected around home on Wolf Parcel. The home is located over a former mill race.  
3 - Ownership change as indicated former owner (current owner) as listed in Augusta County GIS Tax Records searched in July 2015.

Table 4-13 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 4 Subsurface Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

|                                   |                                       |                         |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
|-----------------------------------|---------------------------------------|-------------------------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|-------------------|----------|------------------------------------|---------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
| Reach ID                          | 4                                     |                         |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM                               | 10-16                                 |                         |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM Description                   | New Hope-Crimora Rd to Patterson Mill |                         |                  |                |                        |                        |                           |                                    |                                    |                   |          | Current/Future Potential Receptors |                                 |                        |                        |                        |                                                         | Hypothetical Future               |                                    |
| Property Owner                    | Land Use                              | Map ID                  | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>ind</sub> | Data Distribution | 95 % UCL | Industrial/ Commercial Worker      | Construction/ Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| Augusta Forestry Center           | Cultivated Crops, Forest, Wetland     | Augusta Forestry Center | 7                | 7              | 5.13E-02               | 2.83E+01               | 2                         | 1                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         | ✓                                 | ✓                                  |
| Augusta Park Crimora <sup>1</sup> | Open Space (Park), Wetland            | Extent 5-6              | 3                | 10             | 7.93E-01               | 2.35E+01               | 1                         | 1                                  | 0                                  | Lognormal         | 1.58E+01 |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |

Notes:  
Property owner boundaries are designated by a brown outline in the extent maps  
SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)  
SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).  
Results are reported by the laboratory with three significant figures.  
UCLs not shown if maximum detected value was less than 17 mg/kg

mg/kg - milligrams per kilogram  
N/A - Not applicable  
NC - Not calculated

Data from the sampling program 2006/2007 Earthworm Study not included in the statistical summary.

Footnotes:  
1 - Augusta Park Crimora, which extends across Reach 3 and 4, included in Reach 4

Table 4-14 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 5 Surface Soil  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

|                              |                                                         |                |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
|------------------------------|---------------------------------------------------------|----------------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|-------------------|----------|------------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|--|
| Reach ID                     | 5                                                       |                |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| RRM                          | 16-20                                                   |                |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| RRM Description              | Patterson Mill to Grand Cavern                          |                |                  |                |                        |                        |                           |                                    |                                    |                   |          | Current/Future Potential Receptors |                                    |                        |                        |                        |                                                         |                                   | Hypothetical Future                |  |
| Property Owner               | Land Use                                                | Map ID         | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>Ind</sub> | Data Distribution | 95 % UCL | Industrial/<br>Commercial Worker   | Construction/<br>Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |  |
| Patterson Charles or Donna   | Open Space (Wetland)                                    | Extent 12      | 1                | 2              | 1.04E+01               | 1.11E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| Southard LP                  | Forest, Open Space (Boat Launch)                        | Extent 12      | 4                | 8              | 1.43E+00               | 1.83E+01               | 1                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        | ✓                      |                        |                                                         | ✓                                 |                                    |  |
| Kalimon John                 | Forest, Pasture/Hay, Wetlands                           | Extent 13      | 4                | 8              | 9.16E-02               | 4.44E+01               | 3                         | 1                                  | 0                                  | N/A               | NC       |                                    |                                    |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |  |
| Hill Thomas                  | Forest, Pasture/Hay                                     | Extent 13      | 8                | 16             | 2.23E-01               | 1.73E+01               | 1                         | 0                                  | 0                                  | Normal            | 8.60E+00 |                                    |                                    |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |  |
| Rankin Ralph (a)             | Forest, Open Space (Residential), Pasture/Hay           | Rankin         | 14               | 28             | 1.48E-02               | 1.16E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| Patterson Frances            | Forest, Pasture/Hay                                     | Extent 13      | 5                | 10             | 5.85E-02               | 1.20E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| Edwards Terry                | Forest, Pasture/Hay                                     | Extent 14      | 14               | 28             | 1.38E-02               | 1.53E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| South River Farms LLC        | Pasture/Hay                                             | Extent 14 - 15 | 7                | 14             | 2.32E-02               | 2.12E+01               | 1                         | 0                                  | 0                                  | Nonparametric     | 2.12E+01 |                                    |                                    |                        |                        | ✓                      |                                                         | ✓                                 | ✓                                  |  |
| Wolters Dwayne               | Forest, Open Space (Residential), Pasture/Hay, Wetlands | Wolters        | 10               | 22             | 3.20E-02               | 1.08E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| Shifflett Wayne A            | Forest, Open Space (Residential), Pasture/Hay, Wetlands | Extent 15      | 14               | 27             | 1.72E-01               | 1.29E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |
| Alcoa Flexible Packaging LLC | Open Space (Commercial)                                 | Extent 15      | 3                | 6              | 2.73E-02               | 8.53E-02               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                    |                        |                        |                        |                                                         |                                   |                                    |  |

**Notes:**  
Property owner boundaries are designated by a brown outline in the extent maps  
mg/kg - milligrams per kilogram  
SL<sub>res</sub> - EPA Regional Screening Level for residential soil (June 2015) for mercuric chloride (23 mg/kg)  
N/A - Not applicable  
SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (June 2015) for mercuric chloride (350 mg/kg)  
NC - Not calculated  
Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).  
Results are reported by the laboratory with three significant figures.  
UCLs not shown if maximum detected value was less than 17 mg/kg  
(a) Samples collected from this parcel are considered representative of the area since other portions of the parcel are higher in elevation.

Data from the sampling program 2006/2007 Earthworm Study not included in the statisical summary.

| Table 4-15 - Floodplain Soil Exposure Point Concentrations and Receptors, Reach 6 Surface Soil |                                                         |           |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
|------------------------------------------------------------------------------------------------|---------------------------------------------------------|-----------|------------------|----------------|------------------------|------------------------|---------------------------|------------------------------------|------------------------------------|-------------------|----------|------------------------------------|---------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
| Human Health Risk Assessment Report, Area of Concern (AOC) 4                                   |                                                         |           |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Former DuPont Waynesboro Plant                                                                 |                                                         |           |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Waynesboro, Virginia                                                                           |                                                         |           |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Reach ID                                                                                       | 6                                                       |           |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM                                                                                            | 20-25                                                   |           |                  |                |                        |                        |                           |                                    |                                    |                   |          |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| RRM Description                                                                                | Grand Cavern to Port Republic Rd                        |           |                  |                |                        |                        |                           |                                    |                                    |                   |          | Current/Future Potential Receptors |                                 |                        |                        |                        |                                                         | Hypothetical Future               |                                    |
| Property Owner                                                                                 | Land Use                                                | Map ID    | No. of Locations | No. of Samples | Minimum Detect (mg/kg) | Maximum Detect (mg/kg) | No. of Samples > 17 mg/kg | No. of Samples > SL <sub>res</sub> | No. of Samples > SL <sub>ind</sub> | Data Distribution | 95 % UCL | Industrial/ Commercial Worker      | Construction/ Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| Park at Grand Cavern (Town of Grottoes) <sup>1</sup>                                           | Forest, Open Space (Park)                               | Extent 16 | 28               | 56             | 1.84E-02               | 2.03E+01               | 2                         | 0                                  | 0                                  | Gamma             | 6.06E+00 |                                    |                                 |                        | ✓                      |                        | ✓                                                       | ✓                                 |                                    |
| Cave Hill LLC                                                                                  | Forest, Pasture/Hay, Wetlands                           | Extent 16 | 5                | 9              | 7.27E-02               | 1.96E+01               | 1                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        | ✓                      |                        | ✓                                                       | ✓                                 |                                    |
| Wonderley Percy and Mary                                                                       | Forest                                                  | Extent 16 | 1                | 2              | 6.41E+00               | 6.45E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Lucas Bert                                                                                     | Forest                                                  | Extent 17 | 6                | 12             | 4.09E-02               | 5.34E-01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Smith Paving Inc                                                                               | Forest, Open Space (Commercial)                         | Extent 17 | 3                | 6              | 3.77E-02               | 1.90E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Grottoes Town Park                                                                             | Forest, Open Space (Park)                               | Extent 18 | 17               | 34             | 2.96E-02               | 7.29E+01               | 1                         | 1                                  | 0                                  | Nonparametric     | 1.79E+01 |                                    |                                 |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
| Craun Martha Ann                                                                               | Forest                                                  | Extent 18 | 2                | 4              | 7.56E-01               | 7.65E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Groah William J                                                                                | Forest, Pasture/Hay                                     | Extent 18 | 15               | 30             | 1.85E-02               | 2.82E+01               | 1                         | 1                                  | 0                                  | Gamma             | 5.76E+00 |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Scott Jessica B (North of Swope)                                                               | Forest, Open Space (Residential), Pasture/Hay, Wetlands | Scott     | 9                | 18             | 2.77E-02               | 1.13E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Scott Jessica B (South of Swope)                                                               |                                                         |           | 13               | 26             | 1.47E-02               | 1.18E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Swope Francis                                                                                  | Forest, Pasture/Hay, Wetlands                           | Extent 19 | 14               | 28             | 1.22E-02               | 3.31E+01               | 3                         | 1                                  | 0                                  | Gamma             | 9.28E+00 |                                    |                                 |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
| Bowman Patricia                                                                                | Forest                                                  | Extent 19 | 5                | 10             | 1.88E+00               | 2.21E+01               | 1                         | 0                                  | 0                                  | Normal            | 1.37E+01 |                                    |                                 |                        | ✓                      |                        |                                                         | ✓                                 |                                    |
| Bowman William                                                                                 | Pasture/Hay                                             | Extent 19 | 1                | 2              | 3.56E-01               | 1.73E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| KNK (Brenneman) <sup>2</sup>                                                                   | Forest, Open Space (Residential)                        | Extent 19 | 14               | 29             | 8.62E-02               | 3.31E+01               | 5                         | 0                                  | 0                                  | Gamma             | 1.33E+01 |                                    |                                 | ✓                      | ✓                      |                        |                                                         | ✓                                 |                                    |
| Via John Albert                                                                                | Open Space (Residential)                                | Extent 20 | 1                | 2              | 1.31E-01               | 2.40E-01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Water Street <sup>3</sup>                                                                      | Open Space (Residential)                                | Extent 20 | 3                | 6              | 5.06E-02               | 4.36E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Schubert David                                                                                 | Open Space (Residential)                                | Extent 20 | 4                | 8              | 2.78E-02               | 1.45E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Rankin Ruby                                                                                    | Open Space (Residential)                                | Extent 20 | 1                | 2              | 1.31E-02               | 1.80E-01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Valley Real Estate LLC                                                                         | Open Space (Residential)                                | Extent 20 | 1                | 2              | 1.10E-01               | 5.25E-01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Port Republic United Methodist Church                                                          | Forest, Open Space (Residential)                        | Extent 20 | 4                | 8              | 2.68E-01               | 1.47E+01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Bradburn Dorothy                                                                               | Open Space (Residential)                                | Extent 20 | 1                | 2              | 1.67E-01               | 2.92E-01               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |
| Port Republic (Board of Commonwealth VA)                                                       | Open Space                                              | Extent 20 | 3                | 6              | 2.01E+00               | 8.06E+00               | 0                         | 0                                  | 0                                  | N/A               | NC       |                                    |                                 |                        |                        |                        |                                                         |                                   |                                    |

Notes:

Property owner boundaries are designated by a brown outline in the extent maps

mg/kg - milligrams per kilogram

SL<sub>res</sub> - EPA Regional Screening Level for residential soil (May 2014) for mercuric chloride (23 mg/kg)

N/A - Not applicable

SL<sub>ind</sub> - EPA Regional Screening Level for industrial soil (May 2014) for mercuric chloride (350 mg/kg)

NC - Not calculated

Duplicates included in sample count, higher of parent/dup used in UCL calculation (where applicable).

Results are reported by the laboratory with three significant figures.

UCLs not shown if maximum detected value was less than 17 mg/kg

Data from the sampling program 2006/2007 Earthworm Study not included in the statisical summary.

Footnotes:

1 - Park at Grand Caverns, which extends across Reach 5 and 6, included in Reach 6

2 - KNK is defined as locations GC-FP-525, GC-FP-527, GC-AFP-570 through -577, GC-620 through GC-623

3 - Water Street is defined as locations GC-624, GC-625 and GC-626

Table 4-16 - Exposure Point Concentration Summary - Other Media  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

South River Sediment

| Reach <sup>1</sup> | EPC      | Units | Type <sup>2</sup> | Notes <sup>2</sup> |
|--------------------|----------|-------|-------------------|--------------------|
| 2                  | 2.36E+01 | mg/kg | UCL               | a                  |
| 3                  | 5.23E+01 | mg/kg | UCL               | b                  |
| 6                  | 1.49E+01 | mg/kg | UCL               | d                  |

South River Fish

| Reach <sup>1</sup> | Species         | EPC      | Units    | Type <sup>2</sup> | Notes <sup>2</sup> | Weighted-EPC |
|--------------------|-----------------|----------|----------|-------------------|--------------------|--------------|
| 1                  | Largemouth Bass | 1.79E+00 | mg/kg ww | UCL               | c                  | 1.26E+00     |
|                    | Smallmouth Bass | 7.33E-01 | mg/kg ww | UCL               | a                  |              |
| 2                  | Largemouth Bass | 1.99E+00 | mg/kg ww | UCL               | d                  | 1.86E+00     |
|                    | Smallmouth Bass | 1.73E+00 | mg/kg ww | UCL               | d                  |              |
| 3                  | Largemouth Bass | 7.13E+00 | mg/kg ww | MAX               | --                 | 5.16E+00     |
|                    | Smallmouth Bass | 3.20E+00 | mg/kg ww | MAX               | --                 |              |
| 4                  | Largemouth Bass | 2.31E+00 | mg/kg ww | UCL               | a                  | 2.29E+00     |
|                    | Smallmouth Bass | 2.28E+00 | mg/kg ww | UCL               | d                  |              |
| 5                  | Largemouth Bass | 3.51E+00 | mg/kg ww | MAX               | --                 | 3.21E+00     |
|                    | Smallmouth Bass | 2.91E+00 | mg/kg ww | MAX               | d                  |              |
| 6                  | Largemouth Bass | 2.15E+00 | mg/kg ww | UCL               | d                  | 2.05E+00     |
|                    | Smallmouth Bass | 1.95E+00 | mg/kg ww | UCL               | b                  |              |
| Reference          | Largemouth Bass | 1.31E+00 | mg/kg ww | UCL               | d                  | 7.68E-01     |
|                    | Smallmouth Bass | 2.31E-01 | mg/kg ww | MAX               | --                 |              |

Floodplain Pond Fish

| Pond <sup>1</sup>  | Species           | EPC      | Units    | Type <sup>2</sup> | Notes <sup>2</sup> | Weighted-EPC |
|--------------------|-------------------|----------|----------|-------------------|--------------------|--------------|
| Shifflett          | Green Sunfish     | 1.14E+00 | mg/kg ww | MAX               | --                 | 1.14E+00     |
| Schlappi           | Bluegill          | 3.20E-01 | mg/kg ww | MAX               | --                 | 2.39E-01     |
|                    | Largemouth Bass   | 1.57E-01 | mg/kg ww | MAX               | --                 |              |
| Meadows            | Largemouth Bass   | 2.53E+00 | mg/kg ww | MAX               | --                 | 1.97E+00     |
|                    | Redbreast Sunfish | 1.40E+00 | mg/kg ww | MAX               | --                 |              |
| Yount              | Bluegill          | 1.51E+00 | mg/kg ww | MAX               | --                 | 2.60E+00     |
|                    | Largemouth Bass   | 3.69E+00 | mg/kg ww | MAX               | --                 |              |
| Wertman            | Bluegill          | 1.38E+00 | mg/kg ww | MAX               | --                 | 1.91E+00     |
|                    | Largemouth Bass   | 2.45E+00 | mg/kg ww | MAX               | --                 |              |
| Hill (1)           | Green Sunfish     | 1.30E+00 | mg/kg ww | MAX               | --                 | 1.52E+00     |
|                    | Largemouth Bass   | 1.74E+00 | mg/kg ww | MAX               | --                 |              |
| Hill (2)           | Green Sunfish     | 1.07E+00 | mg/kg ww | MAX               | --                 | 1.50E+00     |
|                    | Largemouth Bass   | 1.92E+00 | mg/kg ww | MAX               | --                 |              |
| Hill (3)           | Green Sunfish     | 6.95E-01 | mg/kg ww | MAX               | --                 | 6.95E-01     |
| Grottoes Town Park | Bluegill          | 4.63E-01 | mg/kg ww | MAX               | --                 | 1.84E+00     |
|                    | Largemouth Bass   | 1.38E+00 | mg/kg ww | MAX               | --                 |              |

Table 4-16 - Exposure Point Concentration Summary - Other Media  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Garden Crops

| Garden Crop Type  | EPC      | Units    | Type <sup>2</sup> | Notes <sup>2</sup> |
|-------------------|----------|----------|-------------------|--------------------|
| Bell pepper       | 1.55E-03 | mg/kg ww | DL/2              |                    |
| Bush bean         | 1.60E-03 | mg/kg ww | DL/2              |                    |
| Bush pea          | 1.60E-03 | mg/kg ww | DL/2              |                    |
| Cabbage           | 1.85E-02 | mg/kg ww | DL/2              |                    |
| Carrot            | 3.80E-03 | mg/kg ww | MAX               | --                 |
| Lettuce           | 1.15E-01 | mg/kg ww | MAX               | --                 |
| Radish            | 9.40E-03 | mg/kg ww | MAX               | --                 |
| Red Onion         | 1.55E-03 | mg/kg ww | DL/2              |                    |
| Red potato        | 1.60E-03 | mg/kg ww | DL/2              |                    |
| Scallions         | 5.70E-03 | mg/kg ww | MAX               | --                 |
| Spinach           | 1.96E-01 | mg/kg ww | MAX               | --                 |
| Squash            | 4.05E-02 | mg/kg ww | MAX               | --                 |
| Sugar beet        | 1.55E-03 | mg/kg ww | DL/2              |                    |
| Sugar beet greens | 1.55E-03 | mg/kg ww | DL/2              |                    |
| Sweet corn        | 1.55E-03 | mg/kg ww | DL/2              |                    |
| Tomato            | 4.80E-03 | mg/kg ww | MAX               | --                 |
| Turnip            | 1.91E-03 | mg/kg ww | MAX               | --                 |
| Turnip greens     | 1.01E-01 | mg/kg ww | MAX               | --                 |

Livestock (Beef, Dairy)

| Cut                | Type   | EPC      | Units    | Type <sup>2</sup> | Notes <sup>2</sup> |
|--------------------|--------|----------|----------|-------------------|--------------------|
| Beef (Hindquarter) | Muscle | 2.29E-03 | mg/kg ww | MAX               | --                 |
| Beef (Ground Beef) | Muscle | 2.17E-03 | mg/kg ww | MAX               | --                 |
| Beef (Tenderloin)  | Muscle | 2.04E-03 | mg/kg ww | MAX               | --                 |
| Beef Liver         | Organ  | 1.06E-01 | mg/kg ww | MAX               | --                 |
| Beef Kidney        | Organ  | 1.94E-01 | mg/kg ww | MAX               | --                 |
| Beef Heart         | Organ  | 2.40E-03 | mg/kg ww | MAX               | --                 |
| Milk               | -      | 1.00E-05 | mg/kg ww | DL                |                    |

Poultry

| Cut             | Type          | EPC      | Units    | Type <sup>2</sup> | Notes <sup>2</sup> |
|-----------------|---------------|----------|----------|-------------------|--------------------|
| Muscle (Leg)    | <i>Muscle</i> | 1.61E-03 | mg/kg ww | MAX               | --                 |
| Muscle (Breast) | <i>Muscle</i> | 2.03E-03 | mg/kg ww | MAX               | --                 |
| Liver           | <i>Organ</i>  | 4.37E-01 | mg/kg ww | MAX               | --                 |
| Gizzard         | <i>Organ</i>  | 1.50E-01 | mg/kg ww | MAX               | --                 |
| Eggs            | -             | 1.22E-01 | mg/kg ww | MAX               | --                 |
| Eggs            | -             | 5.96E-02 | mg/kg ww | UCL               | (3)                |

Table 4-16 - Exposure Point Concentration Summary - Other Media  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

Game

| Wildlife Species<br>(Common Name) | Tissue Type | EPC      | Units    | Type <sup>2</sup> | Notes <sup>2</sup> |
|-----------------------------------|-------------|----------|----------|-------------------|--------------------|
| Waterfowl                         |             |          |          |                   |                    |
| CANADA GOOSE                      | Muscle      | 4.47E-02 | mg/kg ww | UCL               | b                  |
| MALLARD                           | Muscle      | 7.91E-01 | mg/kg ww | UCL               | d                  |
| WOOD DUCK                         | Muscle      | 1.38E-01 | mg/kg ww | UCL               | d                  |
| Large Mammals                     |             |          |          |                   |                    |
| WHITE-TAILED DEER                 | Muscle      | 1.39E-03 | mg/kg ww | MAX               | --                 |
| WHITE-TAILED DEER                 | Liver       | 5.23E-03 | mg/kg ww | MAX               | --                 |
| Reptiles                          |             |          |          |                   |                    |
| SNAPPING TURTLE <sup>4</sup>      | Muscle      | 3.12E+00 | mg/kg ww | UCL               | b                  |

Footnotes:

- 1- Reaches identified for further evaluation in Table 3-5.
- 2 - ProUCL Recommended UCL Type. Outputs provided in Appendix G.
- a) 95% Adjusted Gamma UCL
  - b) 95% Chebyshev (Mean, Sd) UCL was selected as the UCL
  - c) 99% Chebyshev (MVUE) UCL was selected as the UCL
  - d) 95% Students-t UCL
  - e) 95% Chebyshev was selected as the UCL
- No UCL was calculated due to a limited sample size (n<8), low frequency of detection or study type (poultry).
- MAX - Maximum detected conentratation is the UCL.
- Higher of field dup and parent sample used in the UCL calculation
- B-qualified data excluded
- 3 - Both the maximum detected concentration and UCL was used in the evaluation.
- 4 - Snapping turtle data is a summary of all South River and South Fork Shenandoah River locations (reference locations excluded)

| Reach | Property Owner     | Land Use                 | Location Description                                                                                                 | Inundation Map ID | Recommended Surrogate Data Set For Use in HHRA | 95% UCL   | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Current/Future Potential Receptors |                                |                        |                        |                        |                                                         | Hypothetical Future               |                                    |
|-------|--------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------|-----------------------------------|------------------------------------|
|       |                    |                          |                                                                                                                      |                   |                                                |           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Industrial/Commercial Worker       | Construction/Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User (Floodplain Area Parks) (Adult/Child) | Resident (Adult/Child) Cumulative | Floodplain Area Subsistence Farmer |
| 1     | Various            | Open Space (Residential) | Left Side of River Across from Bottom Alley                                                                          | Figure 1          | 5-yr forest (exclude Oxbow) for Reach 1        | 6.14E+01  | Greenway to be constructed within 62-yr floodplain                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |                                |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
|       | City of Waynesboro | Open Space (Park)        | Left Side of River Across from Augusta Lumber LLC (Forested portion of North Park)                                   | Figure 2          | 5-yr forest (exclude Oxbow) for Reach 1        | 6.14E+01  | Greenway to be constructed within 62-yr floodplain                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |                                |                        |                        |                        | ✓                                                       | ✓                                 |                                    |
|       | Augusta Lumber     | Com/Ind                  | Augusta Lumber LLC                                                                                                   | Figure 2          | 5-yr developed, high-intensity for Reach 1     | 2.20E+01  | Area currently paved. Evaluate hypothetical future use in absence of pavement                                                                                                                                                                                                                                                                                                                                                                                                      | ✓                                  |                                |                        |                        |                        |                                                         | ✓                                 |                                    |
|       | City of Waynesboro | Com/Ind                  | Right Side of River Across North Park Ball Field (Downstream of Wetland)                                             | Figure 3          | N/A                                            |           | Steep bank, 10 foot elevation change from top of bank to bottom of bank                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
|       | City of Waynesboro | Com/Ind                  | Left Side of River Across from Southern End of Americast (MN-FP-37); Adjacent to entrance to City of Waynesboro WWTP | Figure 4          | N/A                                            |           | 10-foot elevation change from top of bank to bottom of bank in this area. Samples were collected on other side of parking lot adjacent to former mill race. Samples were also collected in lower elevation portion across from Oxbow.                                                                                                                                                                                                                                              |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
|       | Americast          | Com/Ind                  | Right Side of River, strip of forested land of Americast property                                                    | Figure 5          | See note                                       | 167 (MAX) | The description refers to land owned by Americast between 2nd Street downstream to location MN-FP-037. Data from MN-FP-037, MN-FP-034 and MN-WET-004 in the Forested Portion Adjacent to Facility exposure area could be used as surrogate data for this area. The maximum detected concentration from these locations (167 mg/kg) is the same as the parcel-wide EPC (167 mg/kg). Therefore, results from the parcel-wide evaluation will be used to also evaluate this sub-area. | ✓                                  | ✓                              |                        | ✓                      |                        |                                                         | ✓                                 |                                    |
|       | City of Waynesboro | Com/Ind                  | Left Side of River Across from Americast (MN-FP-034), southern portion of WWTP wetlands area                         | Figure 6          | N/A                                            |           | Samples were collected from other portions of the WWTP property within the same 2-yr inundation                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
|       |                    | Open Space (Residential) | Left Side of River Across from Basic Park (between WWTP and Hopeman Parkway)                                         | Figure 7          | N/A                                            |           | Properties located primarily within 62-year/100-year floodplain. Steep banks with up to a 40 foot elevation change from top of bank to bottom of bank                                                                                                                                                                                                                                                                                                                              |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
| 2     | Smith              | Pasture/Hay              | Left Side of River Across from City of Waynesboro Forested Land (Smith parcel)                                       | Figure 8          | 2-yr pasture/hay for Reach 2                   | 1.92E+01  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        |                        | ✓                      |                                                         | ✓                                 | ✓                                  |
|       | Byrne              | Open Space/Pasture/Hay   | Left Side of River Across L Wood (HO-FP-134)                                                                         | Figure 9          | N/A                                            |           | Steep bank, 10 foot elevation change from top of bank to bottom of bank, then road, other side of road outside of 62-yr/100-yr floodplain                                                                                                                                                                                                                                                                                                                                          |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
|       | Brand              | Pasture/Hay              | Left Side of River Adjacent to Shifflett across the McDaniel                                                         | Figure 10         | 2-yr pasture/hay for Reach 2                   | 1.92E+01  | Pasture/hay, most within 62-yr/100-yr floodplain, current cattle farm                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                |                        |                        | ✓                      |                                                         | ✓                                 | ✓                                  |
|       | Lam                | Pasture/Hay              | Left Side of River Across from McDaniel, downstream of Brand                                                         | Figure 11         | 2-yr pasture/hay for Reach 2                   | 1.92E+01  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        |                        | ✓                      |                                                         | ✓                                 | ✓                                  |
|       | Malouin            | Pasture/Hay              | Left Side of River Across from Dooms                                                                                 | Figure 12         | N/A                                            | 1.12E+00  | Use data from Dooms property, similar elevation, land use and inundation                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
| 3     | McDonough          | Forest                   | Left Side of River Across from Holsinger Farms (forested parcel)                                                     | Figure 13         | 2-yr forest for Reach 3                        | 2.20E+01  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
|       | Various            | Pasture/Hay              | Left Side of River Across from Holsinger Farms (parcels up to Hatton property)                                       | Figure 13         | 2-yr pasture/hay for Reach 3                   | 1.47E+01  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
|       | May                | Pasture/Hay              | Left Side of River Across from Holsinger Farms (North End), north of Garst property                                  | Figure 14         | 2-yr pasture/hay for Reach 3                   | 1.47E+01  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |
|       | Meadows            | Forest/Pasture/Hay       | Left Side of River Across from Daniel Holsinger                                                                      | Figure 15         | 2-yr forest for Reach 3                        | 2.20E+01  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                                |                        | ✓                      | ✓                      |                                                         | ✓                                 | ✓                                  |
|       | Thumbs Up          | Pasture/Hay              | Left Side of River Across from Wertman (Thumbs Up LLC property)                                                      | Figure 16         | N/A                                            |           | Thumps Up LLC parcel addressed in Table 4-11. This portion of the property is Thumbs Up LLC (Parcel 2)                                                                                                                                                                                                                                                                                                                                                                             |                                    |                                |                        |                        |                        |                                                         |                                   |                                    |

Table 4-17 - Inundation Data Gap Analysis  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach | Property Owner               | Land Use                              | Location Description                                                                          | Inundation Map ID | Recommended Surrogate Data Set For Use in HHRA | 95% UCL     | Comments                                                                                                                                                       | Current/Future Potential Receptors |                                    |                        |                        |                        |                                                               | Hypothetical Future                  |                                       |
|-------|------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------|-------------------|------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------------|--------------------------------------|---------------------------------------|
|       |                              |                                       |                                                                                               |                   |                                                |             |                                                                                                                                                                | Industrial/<br>Commercial Worker   | Construction/<br>Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User<br>(Floodplain Area Parks)<br>(Adult/Child) | Resident (Adult/Child)<br>Cumulative | Floodplain Area<br>Subsistence Farmer |
| 4     | Gochenour                    | Cultivated Crops, Pasture/Hay, Forest | Left Side of River Across from Augusta Park Crimora                                           | Figure 17         | 5-yr pasture/hay for Reach 4                   | 1.06E+01    | Most of the parcel is within 5-yr pasture/hay                                                                                                                  |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       |                              |                                       |                                                                                               |                   | 5-yr forest for Reach 4                        | 1.03E+01    | 5-yr forest adjacent to the river                                                                                                                              |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       |                              |                                       |                                                                                               |                   | 2-yr forest for Reach 4                        | 1.84E+01    | 2-yr forest limited to northern corner near mill race                                                                                                          |                                    |                                    |                        | ✓                      |                        |                                                               | ✓                                    | ✓                                     |
|       | Pursley                      | Pasture/Hay                           | Left Side of River Across from August Forestry Center (Pursley Parcel)                        | Figure 18         | 5-yr forest for Reach 4                        | 1.03E+01    | Limited portion within 62-yr floodplain, sample collected in this area. Rest of parcel within 62-yr/100-yr floodplain. Higher elevation on this side of river. |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Patterson                    | Pasture/Hay                           | Left Side of River Across from August Forestry Center (North of Pursley Parcel)               | Figure 19         | 5-yr forest for Reach 4                        | 1.03E+01    | Most of parcel is within 62-yr/100-yr floodplain. Higher elevation on this side of river.                                                                      |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Johnston                     | Forest                                | Right Side of River Across from Crawford Patterson, Forested Parcels North of LaPierre        | Figure 20         | 2-yr forest for Reach 4                        | 1.84E+01    |                                                                                                                                                                |                                    |                                    |                        | ✓                      |                        |                                                               | ✓                                    | ✓                                     |
|       | Freed                        | Pasture/Hay                           | Left Side of River (Carl Freed Parcel)                                                        | Figure 21         | See note                                       | 23 (MAX)    | Use data collected from other portions of the forested area, to evaluate the entire forested portion                                                           |                                    |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |
|       | William Shaver               | Forest                                | Left Side of River (parcel north of Freed)                                                    | Figure 22         | 2-yr forest for Reach 4                        | 1.84E+01    | Limited portion of forested land located within 2-yr floodplain                                                                                                |                                    |                                    |                        | ✓                      |                        |                                                               | ✓                                    | ✓                                     |
|       | Edward K. Shaver             | Pasture/Hay, Forest                   | Left Side of River Across from Wampler (southern portion of Shaver property)                  | Figure 23         | 2-yr forest for Reach 4                        | 1.84E+01    | Data not collected within forested strip of land                                                                                                               |                                    |                                    |                        | ✓                      |                        |                                                               | ✓                                    | ✓                                     |
|       | Edward K. Shaver             | Pasture/Hay                           | Left Side of River Across from Wampler (southern portion of Shaver property)                  | Figure 23         | N/A                                            | 0.454 (MAX) | Use data collected from other portions of the parcel to evaluate entire parcel, land use/inundation area the same                                              |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Reinmiller                   | Forest                                | Right Side of River Reinmiller Property                                                       | Figure 24         | 2-yr forest for Reach 4                        | 1.84E+01    |                                                                                                                                                                |                                    |                                    |                        | ✓                      |                        |                                                               | ✓                                    | ✓                                     |
|       | Keating                      | Pasture/Hay                           | Right Side of River (property between Echols and Kaminski)                                    | Figure 25         | 5-yr pasture/hay for Reach 4                   | 1.06E+01    | Most of parcel within 62-yr floodplain                                                                                                                         |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
| 5     | Brandon East                 | Forest/Pasture/Hay                    | Right Side of River Across from Custard+D53                                                   | Figure 26         | See note                                       | 1.79E+01    | Use data from Custard property (CR-WET-039 and CR-WET-040), similar elevation, land use and inundation. Other portions of property outside of 62-yr floodplain |                                    |                                    |                        | ✓                      | ✓                      |                                                               | ✓                                    | ✓                                     |
|       | Various                      | Open Space/Forest                     | Left Side of River Across from Southard parcel                                                | Figure 27         | N/A                                            |             | Most of parcel within 62-yr/100-yr floodplain. Higher elevation on this side of river.                                                                         |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Addison                      | Forest                                | Left Side of River Across from Southard parcel (northern portion)                             | Figure 28         | 5-yr pasture/hay for Reach 5                   | 1.37E+01    | Most of parcel within 62-yr floodplain, narrow strip within 2-yr/5-yr                                                                                          |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Various                      | Open Space (Residential)              | South River Road downstream of Harrison. Right Side of River Across from Hill/Kalimon parcels | Figure 29         | 5-yr forest for Reach 5                        | 9.74E+00    | Boat ramp access. However, homes east of the road are located outside of 100-yr floodplain.                                                                    |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | G&G Enterprises              | Forest                                | Left Side of River Across from Edwards parcel                                                 | Figure 30         | N/A                                            |             | Located outside of 62-yr floodplain                                                                                                                            |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | South River Farms            | Pasture/Hay                           | Right Side of River Across from Wolters parcel                                                | Figure 31         | See note                                       | 2.12E+01    | Use data collected from other portions of parcel to evaluate entire parcel, land use/inundation area the same                                                  |                                    |                                    |                        |                        | ✓                      |                                                               | ✓                                    | ✓                                     |
|       | Alcoa Flexible Packaging LLC | Forest                                | Right Side of River Across from Park at Grand Caverns                                         | Figure 32         | 5-yr forest for Reach 5                        | 9.74E+00    | Limited forested strip located within 62-yr floodplain                                                                                                         |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |

Table 4-17 - Inundation Data Gap Analysis

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach | Property Owner       | Land Use                      | Location Description                                                        | Inundation Map ID | Recommended Surrogate Data Set For Use in HHRA | 95% UCL  | Comments                                                                                                                                                                                                                                                                                            | Current/Future Potential Receptors |                                    |                        |                        |                        |                                                               | Hypothetical Future                  |                                       |
|-------|----------------------|-------------------------------|-----------------------------------------------------------------------------|-------------------|------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------|------------------------|------------------------|------------------------|---------------------------------------------------------------|--------------------------------------|---------------------------------------|
|       |                      |                               |                                                                             |                   |                                                |          |                                                                                                                                                                                                                                                                                                     | Industrial/<br>Commercial Worker   | Construction/<br>Excavation Worker | Resident (Adult/Child) | Floodplain Area Hunter | Floodplain Area Farmer | Recreational User<br>(Floodplain Area Parks)<br>(Adult/Child) | Resident (Adult/Child)<br>Cumulative | Floodplain Area<br>Subsistence Farmer |
| 6     | Various              | Open Space                    | Right Side of River Across from Cave Hill                                   | Figure 33         | N/A                                            |          | Located outside of 62-yr floodplain                                                                                                                                                                                                                                                                 |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Carr/Wonderley Percy | Forest                        | Left and Right Side of River North of Cave Hill/South of Weyers Cave Rd     | Figure 34         | 2-yr wetland for Reach 6                       | 1.18E+01 | Most of property outside of 62-yr floodplain, limited wetland area on both sides of the river                                                                                                                                                                                                       |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Wonderley Percy      | Forest                        | North of Weyers Cave Rd - Right side of river                               | Figure 35         | 5-yr forest for Reach 6                        | 6.04E+00 | One sample collected in 2-yr inundation area, forested area in 5-yr inundation area                                                                                                                                                                                                                 |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Various              | Open Space/Forest/Pasture/Hay | North of Weyers Cave Rd - Left side of river                                | Figure 36         | 5-yr forest for Reach 6                        | 6.04E+00 | Parcels between Weyers Cave Road and Bridges Parcel                                                                                                                                                                                                                                                 |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Bridges              | Open Space (Residential)      | North of Weyers Cave Rd - Left side of river                                | Figure 37         | 5-yr forest for Reach 6                        | 6.04E+00 | House is outside 62-yr floodplain but a boat ramp has been identified with access off Bingham Road                                                                                                                                                                                                  |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Florey               | Open/Space/Forest/Pasture/Hay | North of Weyers Cave Rd - Left side of river                                | Figure 38         | 5-yr forest for Reach 6                        | 6.04E+00 | House south of Florey parcel. Has access to boat ramp off Bingham Road.                                                                                                                                                                                                                             |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Florey/Saufley       | Pasture/Hay                   | Florey/Saufley Parcels on Left Side of River. Saufley (Pasture/Hay portion) | Figure 39         | 5-yr pasture/hay                               | 4.21E+00 |                                                                                                                                                                                                                                                                                                     |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Various              | Open Space/Pasture/Hay        | Across Florey/Saufley Parcels on Right Side of River                        | Figure 40         | N/A                                            |          | Located outside of 62-yr floodplain                                                                                                                                                                                                                                                                 |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Saufley              | Forest                        | Left Side of River Across from Bert parcel. Saufley (forested portion)      | Figure 41         | 5-yr forest                                    | 6.04E+00 |                                                                                                                                                                                                                                                                                                     |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Bowman, William      | Forest                        | Bowman Parcel South/Southeast of Millrace                                   | Figure 42         | 2-yr forest                                    | 1.10E+01 | Bowman William owns three contiguous parcels. One sample GC-FP-520 is associated with Bowman William in Table 4-15. Two other samples (GC-FP-574 and GC-AFP-572) are segregated with the KNK (Brenneman) data set as indicated in the table. The third Bowman William parcel does not have samples. |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |
|       | Scott                | Pasture/Hay                   | Right Side of River Across from KNK (Herman Property)                       | Figure 43         | 2-yr pasture/hay                               | 1.27E+01 | Data collected within 5-yr, limited data in 2-yr                                                                                                                                                                                                                                                    |                                    |                                    |                        |                        |                        |                                                               |                                      |                                       |

Notes:

Property location maps provided in Appendix D

N/A - Not included in assessment, see comments for rationale

mg/kg - milligrams per kilogram

**Table 5-1- Toxicity Factors and Dermal Constants**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Constituent    | RfDo     |   | RfC      |   | Glabs | Adjust Req.? | RfD      | Critical Effect Category - Oral | Critical Effect Category - Inhalation | Subchronic RfDo |   | Subchronic RfC |   | Subchronic RfD | Subchronic Critical Effect Category - Oral | Subchronic Critical Effect Category - Inhalation | AB       | VF soil |
|----------------|----------|---|----------|---|-------|--------------|----------|---------------------------------|---------------------------------------|-----------------|---|----------------|---|----------------|--------------------------------------------|--------------------------------------------------|----------|---------|
| Mercury        | 3.00E-04 | i | 3.00E-04 | i | 0.07  | Yes          | 2.10E-05 | Systemic (whole body)           | Neurological (CNS)                    | 2.00E-03        | a | 3.00E-04       | a | 1.40E-04       | Systemic (Kidney)                          | Neurological (CNS)                               | 1.00E-02 | -       |
| Methyl mercury | 1.00E-04 | i | -        |   | 1.00  | No           | 1.00E-04 | Neurological (CNS)              | -                                     | 1.00E-04        | i | -              |   | 1.00E-04       | Neurological (CNS)                         | -                                                | 1.00E-02 | -       |

RfDo = oral reference dose

RfC = inhalation reference concentration

$$\text{RfDd} = \text{dermal reference dose} = \text{RfDo} \times \text{GI ABS}$$

Toxicity Factor Sources:

i -IRIS USEPA's Integrated Risk Information System (IRIS) (<http://www.epa.gov/ngispgm3/iris/irisdat/>) (searched August 2014 and updated June 2015)

The following sources were obtained from USEPA's Regional Screening Level Table dated June 2015

a - ATSDR

Oral toxicity value is mercuric chloride; inhalation toxicity value is elemental mercury

Subchronic reference doses were obtained from the sources as listed in the Risk Assessment Information System (RAIS) website (<http://rais.ornl.gov>), Chronic value for MeHg used for subchronic value.

Critical effects listed were obtained from IRIS and Risk Assessment Information System (RAIS) searched August 2014.

## Critical Effects Categories and Target Organs:

Systemic - Liver, kidney, urinary tract

Circulatory - Arteries, veins, heart and blood

GI - Buccal cavity, esophagus, stomach, intestines, gall bladder

Dermal-Ocular - Skin and eyes

Respiratory - Lungs, trachea, and nasal passageway

Neurological - Brain, spinal cord, neurons and neuroglia

Reproductive/Endocrine - Testes, ovaries, thyroid, adrenal, pituitary, pancreas, and parathyroid

Developmental - Tetralogy, growth retardation, structural malformations, abnormal development

AB = Dermal absorbed fraction (USEPA, 2004). As requested by EPA Region III, a default AB value of 0.01 was used for mercury (where chemical-specific values were unavailable).

GI ABS = Gastrointestinal absorbed fraction (USEPA, 2004). GI absorption efficiencies may be used to adjust oral toxicity factors for use in evaluating dermally absorbed doses.

Following recommendations by USEPA, the oral toxicity factors were adjusted if the GI absorption fraction was significantly less than 1 (i.e., less than 50%).

Only values reported for non-aqueous media were used.

VFsoil = Chemical-specific volatilization factors for soil obtained from USEPA Regional Screening Level Table (dated June 2015). VF is not applicable for mercuric chloride.

### References:

USEPA, 2004. Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E Supplemental Guidance for Dermal Risk Assessment).Final. EPA/540/R/99/005. July 2004 (updated November 2007)

Table 6-1 - Summary of Cumulative Risk Characterization Calculations  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Exposure Route                                       | Current Industrial/ Commercial Worker | Future Potential Industrial/ Commercial Worker | Current/Future Potential Construction/ Excavation Worker | Current Resident (Adult) | Current Resident (Child) | Future Potential Resident (Adult) | Future Potential Resident (Child) | Current Recreational User (Floodplain Area Parks) (Adult) | Current Recreational User (Floodplain Area Parks) (Child) | Future Potential Recreational User (Floodplain Area Parks) (Adult) | Future Potential Recreational User (Floodplain Area Parks) (Child) | Current Recreational User (South River) (Adult) |
|------------------------------------------------------|---------------------------------------|------------------------------------------------|----------------------------------------------------------|--------------------------|--------------------------|-----------------------------------|-----------------------------------|-----------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------|
| Hazard from Surface Soil (Ing, Der, Inh)             | 3.3                                   | 3.3                                            | 1.5                                                      | 0.09                     | 0.8                      | 0.09                              | 0.8                               | 0.2                                                       | 2.1                                                       | 0.3                                                                | 2.4                                                                |                                                 |
| Hazard from Subsurface Soil (Ing, Der, Inh)          |                                       | 1.8                                            | 0.8                                                      |                          |                          |                                   |                                   |                                                           |                                                           | 0.5                                                                | 4.6                                                                |                                                 |
| Hazard from South River Sediment (Ing, Der)          |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    | 0.1                                             |
| Hazard from South River Fish Ingestion               |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Floodplain Area Pond Fish Ingestion      |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           | 65                                                                 | 59                                                                 |                                                 |
| Hazard from Ingestion of Waterfowl (Mallard)         |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Waterfowl (Wood Duck)       |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Waterfowl (Canada Goose)    |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Game (Deer, all cuts)       |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Wildlife (Snapping Turtles) |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Livestock (Beef, Dairy)     |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Livestock (Beef - Liver)    |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Livestock (Beef - Kidney)   |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Livestock (Beef - Heart)    |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Poultry (Muscle)            |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Poultry (Liver)             |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Poultry (Gizzard)           |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Poultry (Eggs)              |                                       |                                                |                                                          |                          |                          |                                   |                                   |                                                           |                                                           |                                                                    |                                                                    |                                                 |
| Hazard from Ingestion of Garden Crops                |                                       |                                                |                                                          |                          |                          | 1.7                               | 1.7                               |                                                           |                                                           |                                                                    |                                                                    |                                                 |

Notes:  
Maximum HI for each exposure route/receptor is shown.

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

Exceeds acceptable levels  
Blank cell - No COPCs identified and/or pathway incomplete

Table 6-1 - Summary of Cumulative Risk Characterization Calculations  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Exposure Route                                       | Current<br>Recreational<br>User (South<br>River) (Child) | Future<br>Potential<br>Recreational<br>User (South<br>River) (Adult) | Future<br>Potential<br>Recreational<br>User (South<br>River) (Child) | Current<br>Floodplain<br>Area Hunter | Current<br>Floodplain<br>Area Hunter<br>(Trapper) | Future<br>Potential<br>Floodplain<br>Area Hunter | Future<br>Potential<br>Floodplain<br>Area Hunter<br>(Trapper) | Current<br>Floodplain<br>Area Farmer<br>(Adult) | Current<br>Floodplain<br>Area Farmer<br>(Child) | Future<br>Potential<br>Floodplain<br>Area Farmer<br>(Adult) | Future<br>Potential<br>Floodplain<br>Area Farmer<br>(Child) | Hypothetical<br>Future<br>Resident<br>(Adult) | Hypothetical<br>Future<br>Resident<br>(Child) |
|------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------|---------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Hazard from Surface Soil (Ing, Der, Inh)             |                                                          |                                                                      |                                                                      | 0.02                                 |                                                   | 0.5                                              |                                                               | 1.1                                             | 3.3                                             | 1.1                                                         | 3.3                                                         | 4.6                                           | 41                                            |
| Hazard from Subsurface Soil (Ing, Der, Inh)          |                                                          |                                                                      |                                                                      |                                      |                                                   | 0.2                                              |                                                               | 1.0                                             |                                                 | 1.0                                                         | 2.4                                                         | 2.6                                           | 23                                            |
| Hazard from South River Sediment (Ing, Der)          | 0.5                                                      | 0.1                                                                  | 0.5                                                                  |                                      |                                                   |                                                  |                                                               |                                                 |                                                 |                                                             |                                                             | 0.1                                           | 0.5                                           |
| Hazard from South River Fish Ingestion               |                                                          | 182                                                                  | 167                                                                  |                                      |                                                   |                                                  |                                                               |                                                 |                                                 |                                                             |                                                             | 182                                           | 167                                           |
| Hazard from Floodplain Area Pond Fish Ingestion      |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               |                                                 |                                                 | 91                                                          | 84                                                          | 91                                            | 84                                            |
| Hazard from Ingestion of Waterfowl (Mallard)         |                                                          |                                                                      |                                                                      | 18                                   |                                                   | 18                                               |                                                               |                                                 |                                                 |                                                             |                                                             | 18                                            | 18                                            |
| Hazard from Ingestion of Waterfowl (Wood Duck)       |                                                          |                                                                      |                                                                      | 3.1                                  |                                                   | 3.1                                              |                                                               |                                                 |                                                 |                                                             |                                                             | 3.1                                           | 3.1                                           |
| Hazard from Ingestion of Waterfowl (Canada Goose)    |                                                          |                                                                      |                                                                      | 1.0                                  |                                                   | 1.0                                              |                                                               |                                                 |                                                 |                                                             |                                                             | 1.0                                           | 1.0                                           |
| Hazard from Ingestion of Game (Deer, all cuts)       |                                                          |                                                                      |                                                                      | 0.2                                  |                                                   | 0.2                                              |                                                               |                                                 |                                                 |                                                             |                                                             | 0.2                                           | 0.2                                           |
| Hazard from Ingestion of Wildlife (Snapping Turtles) |                                                          |                                                                      |                                                                      |                                      | 71                                                |                                                  | 71                                                            |                                                 |                                                 |                                                             |                                                             |                                               |                                               |
| Hazard from Ingestion of Livestock (Beef, Dairy)     |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               | 0.4                                             | 0.6                                             | 0.4                                                         | 0.6                                                         |                                               |                                               |
| Hazard from Ingestion of Livestock (Beef - Liver)    |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               | 6.5                                             | 10                                              | 6.5                                                         | 10                                                          |                                               |                                               |
| Hazard from Ingestion of Livestock (Beef - Kidney)   |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               | 12                                              | 18                                              | 12                                                          | 18                                                          |                                               |                                               |
| Hazard from Ingestion of Livestock (Beef - Heart)    |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               | 0.1                                             | 0.2                                             | 0.1                                                         | 0.2                                                         |                                               |                                               |
| Hazard from Ingestion of Poultry (Muscle)            |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               |                                                 |                                                 | 0.2                                                         | 0.2                                                         |                                               |                                               |
| Hazard from Ingestion of Poultry (Liver)             |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               |                                                 |                                                 | 19                                                          | 19                                                          |                                               |                                               |
| Hazard from Ingestion of Poultry (Gizzard)           |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               |                                                 |                                                 | 6.6                                                         | 6.6                                                         |                                               |                                               |
| Hazard from Ingestion of Poultry (Eggs)              |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               |                                                 |                                                 | 1.4                                                         | 1.4                                                         |                                               |                                               |
| Hazard from Ingestion of Garden Crops                |                                                          |                                                                      |                                                                      |                                      |                                                   |                                                  |                                                               |                                                 |                                                 | 1.8                                                         | 1.8                                                         | 1.7                                           | 1.7                                           |

Notes:

Maximum HI for each exposure route/receptor is shown.

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

Exceeds acceptable levels  
Blank cell - No COPCs identified and/or pathway incomplete

Table 6-1 - Summary of Cumulative Risk Characterization Calculations  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Exposure Route                                       | Hypothetical Floodplain Area Subsistence Farmer (Adult) | Hypothetical Floodplain Area Subsistence Farmer (Child) |
|------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------|
| Hazard from Surface Soil (Ing, Der, Inh)             | 1.1                                                     | 3.3                                                     |
| Hazard from Subsurface Soil (Ing, Der, Inh)          | 1.0                                                     | 2.4                                                     |
| Hazard from South River Sediment (Ing, Der)          | 0.1                                                     | 0.5                                                     |
| Hazard from South River Fish Ingestion               | 182                                                     | 167                                                     |
| Hazard from Floodplain Area Pond Fish Ingestion      | 91                                                      | 84                                                      |
| Hazard from Ingestion of Waterfowl (Mallard)         | 18                                                      | 18                                                      |
| Hazard from Ingestion of Waterfowl (Wood Duck)       | 3.1                                                     | 3.1                                                     |
| Hazard from Ingestion of Waterfowl (Canada Goose)    | 1.0                                                     | 1.0                                                     |
| Hazard from Ingestion of Game (Deer, all cuts)       | 0.2                                                     | 0.2                                                     |
| Hazard from Ingestion of Wildlife (Snapping Turtles) |                                                         |                                                         |
| Hazard from Ingestion of Livestock (Beef, Dairy)     | 0.4                                                     | 0.6                                                     |
| Hazard from Ingestion of Livestock (Beef - Liver)    | 6.5                                                     | 10                                                      |
| Hazard from Ingestion of Livestock (Beef - Kidney)   | 12                                                      | 18                                                      |
| Hazard from Ingestion of Livestock (Beef - Heart)    | 0.1                                                     | 0.2                                                     |
| Hazard from Ingestion of Poultry (Muscle)            | 0.2                                                     | 0.2                                                     |
| Hazard from Ingestion of Poultry (Liver)             | 19                                                      | 19                                                      |
| Hazard from Ingestion of Poultry (Gizzard)           | 6.6                                                     | 6.6                                                     |
| Hazard from Ingestion of Poultry (Eggs)              | 1.4                                                     | 1.4                                                     |
| Hazard from Ingestion of Garden Crops                | 1.8                                                     | 1.8                                                     |

**Notes:**  
Maximum HI for each exposure route/receptor is shown.

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

Exceeds acceptable levels  
Blank cell - No COPCs identified and/or pathway incomplete

Table 6-2 - Summary of Risk Characterization Calculations, Current/Future Potential Resident  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Exposure Unit <sup>2</sup> | Land Use                         | Floodplain Soil Map ID | Current Resident (Adult)                              | Current Resident (Child)                              |
|----------|-------|-----------------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|-------------------------------------------------------|
|          |       |                             |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> |
| 6        | 20-25 | KNK (Brenneman)             | Parcel-Wide                | Forest, Open Space (Residential) | KNK                    | 0.1                                                   | 0.8                                                   |

| Reach ID | RRM   | Property Owner <sup>1</sup> | Exposure Unit <sup>2</sup> | Land Use                         | Floodplain Soil Map ID | Future Potential Resident (Adult)                     |                                                          |                                                  |                           | Future Potential Resident (Adult)                     |                                                          |                                      |                           |
|----------|-------|-----------------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------|---------------------------|-------------------------------------------------------|----------------------------------------------------------|--------------------------------------|---------------------------|
|          |       |                             |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Garden Crops (Ing), 90 <sup>th</sup> | Total Hazard <sup>4</sup> | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Garden Crops (Ing), mean | Total Hazard <sup>4</sup> |
| 6        | 20-25 | KNK (Brenneman)             | Parcel-Wide                | Forest, Open Space (Residential) | KNK                    | 0.1                                                   | --                                                       | 1.7                                              | 1.8                       | 0.1                                                   | --                                                       | 1.3                                  | 1.4                       |

| Reach ID | RRM   | Property Owner <sup>1</sup> | Exposure Unit <sup>2</sup> | Land Use                         | Floodplain Soil Map ID | Future Potential Resident (Child)                     |                                                          |                                                  |                           | Future Potential Resident (Child)                     |                                                          |                                      |                           |
|----------|-------|-----------------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------|---------------------------|-------------------------------------------------------|----------------------------------------------------------|--------------------------------------|---------------------------|
|          |       |                             |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Garden Crops (Ing), 90 <sup>th</sup> | Total Hazard <sup>4</sup> | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Garden Crops (Ing), mean | Total Hazard <sup>4</sup> |
| 6        | 20-25 | KNK (Brenneman)             | Parcel-Wide                | Forest, Open Space (Residential) | KNK                    | 0.8                                                   | --                                                       | 1.7                                              | 2.5                       | 0.8                                                   | --                                                       | 1.3                                  | 2.1                       |

**Footnotes:**

1 - Property identified for further evaluation on Table 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps  
Other properties with exceedances which are not currently used as residential (i.e., current farming or industrial/commercial) have been addressed as part of the hypothetical future resident scenario (see Table 6-10).

2 - Samples corresponding to each exposure unit, where applicable, defined in Table 4-15 and detailed in Section 4.2.1.

3 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

4 - Total hazard is the sum of hazards across all exposure pathways.

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

2

Exceeds acceptable levels

--

Not Available, subsurface soil samples have not been collected

Table 6-3 - Summary of Risk Characterization Calculations, Industrial/Commercial Worker and Construction/Excavation Worker  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                                                 | Exposure Unit <sup>2</sup>               | Land Use                              | Floodplain<br>Soil Map ID | Current<br>Industrial/<br>Commercial<br>Worker              | Future Potential<br>Industrial/Commercial Worker            |                                                                |                           |                                                             | Current/Future Potential<br>Construction/Excavation Worker     |                              |  |
|----------|-------|-----------------------------------------------------------------------------|------------------------------------------|---------------------------------------|---------------------------|-------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------|---------------------------|-------------------------------------------------------------|----------------------------------------------------------------|------------------------------|--|
|          |       |                                                                             |                                          |                                       |                           | Hazard from<br>Surface Soil<br>(Ing, Der, Inh) <sup>3</sup> | Hazard from<br>Surface Soil<br>(Ing, Der, Inh) <sup>3</sup> | Hazard from<br>Subsurface Soil<br>(Ing, Der, Inh) <sup>3</sup> | Total Hazard <sup>4</sup> | Hazard from<br>Surface Soil (Ing,<br>Der, Inh) <sup>3</sup> | Hazard from<br>Subsurface Soil<br>(Ing, Der, Inh) <sup>3</sup> | Total<br>Hazard <sup>4</sup> |  |
| 1        | 0.5-2 | Americast Inc<br>(Allied Ready Mix)                                         | Parcel-Wide                              | Forest (Oxbow) /<br>Former Motorcross | Reach 1 -<br>Extent 5     | 0.8                                                         | 0.8                                                         | 1.8                                                            | 2.6                       | 0.3                                                         | 0.8                                                            | 1.2                          |  |
|          |       |                                                                             | Forested Portion adjacent<br>to facility | Forest                                | Reach 1 -<br>Extent 5     | N/A                                                         | N/A                                                         | --                                                             | N/A                       | N/A                                                         | --                                                             | N/A                          |  |
|          |       |                                                                             | Former Motorcross                        | Forest/Former<br>Motorcross           | Reach 1 -<br>Extent 5     | N/A                                                         | N/A                                                         | --                                                             | N/A                       | N/A                                                         | --                                                             | N/A                          |  |
|          |       |                                                                             | East of Oxbow                            | Forest (Oxbow)                        | Reach 1 -<br>Extent 5     | N/A                                                         | N/A                                                         | --                                                             | N/A                       | N/A                                                         | --                                                             | N/A                          |  |
|          |       |                                                                             | South of Oxbow                           | Forest (Oxbow)                        | Reach 1 -<br>Extent 5     | N/A                                                         | N/A                                                         | N/A                                                            | N/A                       | N/A                                                         | N/A                                                            | N/A                          |  |
|          |       |                                                                             | North of Oxbow                           | Forest (Oxbow)                        | Reach 1 -<br>Extent 5     | 3.3                                                         | 3.3                                                         | 1.8                                                            | 5.1                       | 1.5                                                         | 0.8                                                            | 2.3                          |  |
|          |       | Americast Inc<br>(Allied Ready Mix)<br><i>outliers removed</i> <sup>5</sup> | Parcel-Wide                              | Forest (Oxbow) /<br>Former Motorcross | Reach 1 -<br>Extent 5     | 0.1                                                         | 0.8                                                         | 0.02                                                           | 0.8                       | 0.06                                                        | 0.01                                                           | 0.07                         |  |
|          |       | Americast Inc<br><i>outliers removed</i> <sup>5</sup>                       | North of Oxbow                           | Forest (Oxbow)                        | Reach 1 -<br>Extent 5     | 0.3                                                         | 0.3                                                         | N/A                                                            | 0.3                       | 0.1                                                         | N/A                                                            | 0.1                          |  |
| 1        | 0.5-2 | Augusta Lumber LLC                                                          | --                                       | Developed/High<br>Intensity           | Reach 1 -<br>Extent 6     | N/A                                                         | 0.1                                                         | --                                                             | 0.1                       | N/A                                                         | --                                                             | N/A                          |  |
| 2        | 2-5   | Shifflett, Floyd                                                            | Parcel-Wide                              | Pasture/Hay/<br>Forest                | Reach 2 -<br>Extent 2     | N/A                                                         | 0.2                                                         | N/A                                                            | 0.2                       | 0.07                                                        | N/A                                                            | 0.07                         |  |

Footnotes:

- 1 - Property identified for further evaluation in Tables 4-7 through 4-9 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL for industrial soil).Property owner boundaries are designated by a brown outline in the extent maps  
Results from Americast-Parcel-Wide can be applied as a surrogate for the forested portion of the property upstream of this area to 2nd Street Bridge.
- 2 - Samples corresponding to each exposure unit, where applicable, defined in Tables 4-7 through 4-9 and detailed in Section 4.2.1.
- 3 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.
- 4 - Total hazard is the sum of hazards across all exposure pathways.
- 5 - Outlier defined as concentration around or exceeding 100 mg/kg

Notes:

HI - Hazard index for noncancer effects. HI should not exceed 1 for groups of chemicals that affect the same target organ (USEPA, 1989).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-4 - Summary of Risk Characterization Calculations, Current/Future Potential Recreataionl User (Floodplain Area Parks)

Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner                         | Exposure Unit <sup>1</sup>                                        | Land Use   | Floodplain Soil Map ID | Current Recreational User (Floodplain Area Parks) (Adult) | Current Recreational User (Floodplain Area Parks) (Child) | Future Potential Recreational User (Floodplain Area Parks) (Adult) |                                             |                                                              |                           | Future Potential Recreational User (Floodplain Area Parks) (Child) |                                             |                                                              |                           |
|----------|-------|----------------------------------------|-------------------------------------------------------------------|------------|------------------------|-----------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|---------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|---------------------------|
|          |       |                                        |                                                                   |            |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup>     | Hazard from Surface Soil (Ing, Der, Inh)                  | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Total Hazard <sup>3</sup> | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Total Hazard <sup>3</sup> |
| 1        | 0.5-2 | City of Waynesboro - Constitution Park | Park-Wide                                                         | Park       | Reach 1 - Extent 8     | 0.04                                                      | 0.3                                                       | 0.04                                                               | 0.03                                        | N/A                                                          | 0.07                      | 0.34                                                               | 0.29                                        | N/A                                                          | 0.6                       |
|          |       |                                        | Soccer Field/Arboretum                                            | Park       | Reach 1 - Extent 8     | 0.2                                                       | 1.5                                                       | 0.2                                                                | --                                          | N/A                                                          | 0.2                       | 1.5                                                                | --                                          | N/A                                                          | 1.5                       |
|          |       |                                        | Soccer Field/Arboretum outliers removed <sup>4</sup>              | Park       | Reach 1 - Extent 8     | 0.04                                                      | 0.4                                                       | 0.04                                                               | --                                          | N/A                                                          | 0.04                      | 0.4                                                                | --                                          | N/A                                                          | 0.4                       |
|          |       |                                        | Pavilion/Paved Greenway                                           | Park       | Reach 1 - Extent 8     | 0.02                                                      | 0.2                                                       | 0.02                                                               | 0.03                                        | N/A                                                          | 0.05                      | 0.2                                                                | 0.29                                        | N/A                                                          | 0.4                       |
|          |       |                                        | Pavilion North of West Main Street                                | Park       | Reach 1 - Extent 8     | 0.07                                                      | 0.7                                                       | 0.07                                                               | --                                          | N/A                                                          | 0.07                      | 0.7                                                                | --                                          | N/A                                                          | 0.7                       |
|          |       | Various                                | Greenway                                                          | Open Space | Reach 1 - Extent 7     | 0.09                                                      | 0.8                                                       | 0.09                                                               | --                                          | N/A                                                          | 0.09                      | 0.8                                                                | --                                          | N/A                                                          | 0.8                       |
|          |       | City of Waynesboro - North Park        | Park-Wide                                                         | Park       | Reach 1 - Extent 6     | 0.1                                                       | 1.1                                                       | 0.1                                                                | 0.5                                         | N/A                                                          | 0.6                       | 1.1                                                                | 4.6                                         | N/A                                                          | 5.7                       |
|          |       |                                        | Park-Wide outliers removed <sup>4</sup>                           | Park       | Reach 1 - Extent 6     | 0.03                                                      | 0.3                                                       | 0.03                                                               | NC                                          | N/A                                                          | 0.03                      | 0.3                                                                | NC                                          | N/A                                                          | 0.3                       |
|          |       |                                        | Wetland Portion Across River                                      | Open Space | Reach 1 - Extent 6     | 0.06                                                      | 0.6                                                       | 0.06                                                               | --                                          | N/A                                                          | 0.06                      | 0.6                                                                | --                                          | N/A                                                          | 0.6                       |
|          |       |                                        | Ball Field                                                        | Park       | Reach 1 - Extent 6     | 0.01                                                      | 0.1                                                       | 0.01                                                               | --                                          | N/A                                                          | 0.01                      | 0.1                                                                | --                                          | N/A                                                          | 0.1                       |
|          |       |                                        | Northern Perimeter/Basketball Court                               | Park       | Reach 1 - Extent 6     | 0.2                                                       | 2.1                                                       | 0.2                                                                | 0.5                                         | N/A                                                          | 0.8                       | 2.1                                                                | 4.6                                         | N/A                                                          | 6.8                       |
|          |       |                                        | Northern Perimeter/Basketball Court outliers removed <sup>4</sup> | Park       | Reach 1 - Extent 6     | 0.07                                                      | 0.6                                                       | 0.07                                                               | NC                                          | N/A                                                          | 0.07                      | 0.6                                                                | NC                                          | N/A                                                          | 0.6                       |
|          |       |                                        | Parking Lot/Pavilion/Playground                                   | Park       | Reach 1 - Extent 6     | 0.02                                                      | 0.2                                                       | 0.02                                                               | --                                          | N/A                                                          | 0.02                      | 0.2                                                                | --                                          | N/A                                                          | 0.2                       |
|          |       |                                        | Open Space/VolleyBall Court                                       | Park       | Reach 1 - Extent 6     | N/A                                                       | N/A                                                       | N/A                                                                | --                                          | N/A                                                          | N/A                       | N/A                                                                | --                                          | N/A                                                          | N/A                       |
|          |       |                                        | Forested Area/Greenway                                            | Park       | Reach 1 - Extent 6     | 0.09                                                      | 0.8                                                       | 0.09                                                               | --                                          | N/A                                                          | 0.09                      | 0.8                                                                | --                                          | N/A                                                          | 0.8                       |
|          |       | City of Waynesboro - Basic Park        | Park-Wide                                                         | Park       | Reach 1 - Extent 4     | 0.02                                                      | 0.2                                                       | 0.02                                                               | --                                          | N/A                                                          | 0.02                      | 0.2                                                                | --                                          | N/A                                                          | 0.2                       |
|          |       |                                        | Oxbow                                                             | Park       | Reach 1 - Extent 4     | 0.03                                                      | 0.3                                                       | 0.03                                                               | --                                          | N/A                                                          | 0.03                      | 0.3                                                                | --                                          | N/A                                                          | 0.3                       |
|          |       |                                        | Park                                                              | Park       | Reach 1 - Extent 4     | 0.03                                                      | 0.2                                                       | 0.03                                                               | --                                          | N/A                                                          | 0.03                      | 0.2                                                                | --                                          | N/A                                                          | 0.2                       |
|          |       |                                        | Forested Area East of Park                                        | Park       | Reach 1 - Extent 4     | N/A                                                       | N/A                                                       | N/A                                                                | --                                          | N/A                                                          | N/A                       | N/A                                                                | --                                          | N/A                                                          | N/A                       |

Table 6-4 - Summary of Risk Characterization Calculations, Current/Future Potential Recreataionl User (Floodplain Area Parks)

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner       | Exposure Unit <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Current Recreational User (Floodplain Area Parks) (Adult) | Current Recreational User (Floodplain Area Parks) (Child) | Future Potential Recreational User (Floodplain Area Parks) (Adult) |                                             |                                                              |                           | Future Potential Recreational User (Floodplain Area Parks) (Child) |                                             |                                                              |                           |
|----------|-------|----------------------|----------------------------|-------------------------------|------------------------|-----------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|---------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|---------------------------|
|          |       |                      |                            |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup>     | Hazard from Surface Soil (Ing, Der, Inh)                  | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Total Hazard <sup>3</sup> | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Total Hazard <sup>3</sup> |
| 4        | 10-16 | Augusta Park Crimora | Park-Wide                  | Open Space (Park), Wetland    | Augusta Park Crimora   | 0.03                                                      | 0.3                                                       | 0.03                                                               | 0.02                                        | N/A                                                          | 0.05                      | 0.3                                                                | 0.22                                        | N/A                                                          | 0.47                      |
| 6        | 20-25 | Park at Grand Cavern | Park-Wide                  | Forest, Open Space (Park)     | Park at Grand Cavern   | 0.01                                                      | 0.08                                                      | 0.01                                                               | --                                          | N/A                                                          | 0.01                      | 0.08                                                               | --                                          | N/A                                                          | 0.08                      |
|          |       | Cave Hill LLC        | Park-Wide                  | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 16    | 0.03                                                      | 0.3                                                       | 0.03                                                               | --                                          | N/A                                                          | 0.03                      | 0.3                                                                | --                                          | N/A                                                          | 0.3                       |
|          |       | Grottoes Town Park   | Park-Wide                  | Forest, Open Space (Park)     | Grottoes Town Park     | 0.03                                                      | 0.2                                                       | 0.03                                                               | --                                          | 65                                                           | 65                        | 0.2                                                                | --                                          | 59                                                           | 60                        |

**Footnotes:**

1 - Samples corresponding to each exposure unit, where applicable, defined in Tables 4-7 through 4-15 and detailed in Section 4.2.1.

2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

3 - Total hazard is the sum of hazards across all exposure pathways.

4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |
| NC  | Outlier analysis not conducted                                 |

Table 6-4 - Summary of Risk Characterization Calculations, Current/Future Potential Recreataionl User (Floodplain Area Parks)

Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner                         | Exposure Unit <sup>1</sup>                                        | Land Use   | Floodplain Soil Map ID | Future Potential Recreational User (Floodplain Area Parks) (Adult) |                                             |                                                  |                           | Future Potential Recreational User (Floodplain Area Parks) (Child) |                                             |                                                  |                           |
|----------|-------|----------------------------------------|-------------------------------------------------------------------|------------|------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------|---------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------|---------------------------|
|          |       |                                        |                                                                   |            |                        | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Total Hazard <sup>3</sup> | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Total Hazard <sup>3</sup> |
| 1        | 0.5-2 | City of Waynesboro - Constitution Park | Park-Wide                                                         | Park       | Reach 1 - Extent 8     | 0.04                                                               | 0.03                                        | N/A                                              | 0.07                      | 0.3                                                                | 0.3                                         | N/A                                              | 0.6                       |
|          |       |                                        | Soccer Field/Arboretum                                            | Park       | Reach 1 - Extent 8     | 0.2                                                                | --                                          | N/A                                              | 0.2                       | 1.5                                                                | --                                          | N/A                                              | 1.5                       |
|          |       |                                        | Soccer Field/Arboretum outliers removed <sup>4</sup>              | Park       | Reach 1 - Extent 8     | 0.04                                                               | --                                          | N/A                                              | 0.04                      | 0.4                                                                | --                                          | N/A                                              | 0.4                       |
|          |       |                                        | Pavilion/Paved Greenway                                           | Park       | Reach 1 - Extent 8     | 0.02                                                               | 0.03                                        | N/A                                              | 0.05                      | 0.2                                                                | 0.3                                         | N/A                                              | 0.4                       |
|          |       |                                        | Pavilion North of West Main Street                                | Park       | Reach 1 - Extent 8     | 0.07                                                               | --                                          | N/A                                              | 0.07                      | 0.7                                                                | --                                          | N/A                                              | 0.7                       |
|          |       | Various                                | Greenway                                                          | Open Space | Reach 1 - Extent 7     | 0.09                                                               | --                                          | N/A                                              | 0.09                      | 0.8                                                                | --                                          | N/A                                              | 0.8                       |
|          |       | City of Waynesboro - North Park        | Park-Wide                                                         | Park       | Reach 1 - Extent 6     | 0.1                                                                | 0.5                                         | N/A                                              | 0.6                       | 1.1                                                                | 4.6                                         | N/A                                              | 5.7                       |
|          |       |                                        | Park-Wide outliers removed <sup>4</sup>                           | Park       | Reach 1 - Extent 6     | 0.03                                                               | NC                                          | N/A                                              | 0.03                      | 0.3                                                                | NC                                          | N/A                                              | 0.3                       |
|          |       |                                        | Wetland Portion Across River                                      | Open Space | Reach 1 - Extent 6     | 0.06                                                               | --                                          | N/A                                              | 0.06                      | 0.6                                                                | --                                          | N/A                                              | 0.6                       |
|          |       |                                        | Ball Field                                                        | Park       | Reach 1 - Extent 6     | 0.01                                                               | --                                          | N/A                                              | 0.01                      | 0.1                                                                | --                                          | N/A                                              | 0.1                       |
|          |       |                                        | Northern Perimeter/Basketball Court                               | Park       | Reach 1 - Extent 6     | 0.2                                                                | 0.5                                         | N/A                                              | 0.8                       | 2.1                                                                | 4.6                                         | N/A                                              | 6.8                       |
|          |       |                                        | Northern Perimeter/Basketball Court outliers removed <sup>4</sup> | Park       | Reach 1 - Extent 6     | 0.07                                                               | NC                                          | N/A                                              | 0.07                      | 0.6                                                                | NC                                          | N/A                                              | 0.6                       |
|          |       |                                        | Parking Lot/Pavilion/Playground                                   | Park       | Reach 1 - Extent 6     | 0.02                                                               | --                                          | N/A                                              | 0.02                      | 0.2                                                                | --                                          | N/A                                              | 0.2                       |
|          |       |                                        | Open Space/VolleyBall Court                                       | Park       | Reach 1 - Extent 6     | N/A                                                                | --                                          | N/A                                              | N/A                       | N/A                                                                | --                                          | N/A                                              | N/A                       |
|          |       |                                        | Forested Area/Greenway                                            | Park       | Reach 1 - Extent 6     | 0.09                                                               | --                                          | N/A                                              | 0.09                      | 0.8                                                                | --                                          | N/A                                              | 0.8                       |
|          |       | City of Waynesboro - Basic Park        | Park-Wide                                                         | Park       | Reach 1 - Extent 4     | 0.02                                                               | --                                          | N/A                                              | 0.02                      | 0.2                                                                | --                                          | N/A                                              | 0.2                       |
|          |       |                                        | Oxbow                                                             | Park       | Reach 1 - Extent 4     | 0.03                                                               | --                                          | N/A                                              | 0.03                      | 0.3                                                                | --                                          | N/A                                              | 0.3                       |
|          |       |                                        | Park                                                              | Park       | Reach 1 - Extent 4     | 0.03                                                               | --                                          | N/A                                              | 0.03                      | 0.2                                                                | --                                          | N/A                                              | 0.2                       |
|          |       |                                        | Forested Area East of Park                                        | Park       | Reach 1 - Extent 4     | N/A                                                                | --                                          | N/A                                              | N/A                       | N/A                                                                | --                                          | N/A                                              | N/A                       |

Table 6-4 - Summary of Risk Characterization Calculations, Current/Future Potential Recreataionl User (Floodplain Area Parks)

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner       | Exposure Unit <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Recreational User (Floodplain Area Parks) (Adult) |                                             |                                                  |                           | Future Potential Recreational User (Floodplain Area Parks) (Child) |                                             |                                                  |                           |
|----------|-------|----------------------|----------------------------|-------------------------------|------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------|---------------------------|--------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------|---------------------------|
|          |       |                      |                            |                               |                        | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Total Hazard <sup>3</sup> | Hazard from Surface Soil (Ing, Der, Inh)                           | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Total Hazard <sup>3</sup> |
| 4        | 10-16 | Augusta Park Crimora | Park-Wide                  | Open Space (Park), Wetland    | Augusta Park Crimora   | 0.03                                                               | 0.02                                        | N/A                                              | 0.05                      | 0.3                                                                | 0.2                                         | N/A                                              | 0.5                       |
| 6        | 20-25 | Park at Grand Cavern | Park-Wide                  | Forest, Open Space (Park)     | Park at Grand Cavern   | 0.01                                                               | --                                          | N/A                                              | 0.01                      | 0.08                                                               | --                                          | N/A                                              | 0.08                      |
|          |       | Cave Hill LLC        | Park-Wide                  | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 16    | 0.03                                                               | --                                          | N/A                                              | 0.03                      | 0.3                                                                | --                                          | N/A                                              | 0.3                       |
|          |       | Grottoes Town Park   | Park-Wide                  | Forest, Open Space (Park)     | Grottoes Town Park     | 0.03                                                               | --                                          | 53                                               | 53                        | 0.2                                                                | --                                          | 48                                               | 49                        |

**Footnotes:**

1 - Samples corresponding to each exposure unit, where applicable, defined in Tables 4-7 through 4-15 and detailed in Section 4.2.1.

2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

3 - Total hazard is the sum of hazards across all exposure pathways.

4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |
| NC  | Outlier analysis not conducted                                 |

Table 6-5 - Summary of Risk Characterization Calculations, Currrent/Future Potential Recreational User (South River)  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | RRM Description                                   | Current Recreational User (South River) (Adult) | Current Recreational User (South River) (Child) |
|----------|-------|---------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
|          |       |                                                   | Hazard from Sediment (Ing, Der)                 | Hazard from Sediment (Ing, Der)                 |
| 1        | 0.5-2 | Main Street to Hopeman Parkway                    | N/A                                             | N/A                                             |
| 2        | 2-5   | Hopeman Parkway to Holsinger Farms Footbridge     | 0.05                                            | 0.2                                             |
| 3        | 5-10  | Holsinger Farms Footbridge to New Hope-Crimora Rd | 0.1                                             | 0.5                                             |
| 4        | 10-16 | New Hope-Crimora Rd to Patterson Mill             | N/A                                             | N/A                                             |
| 5        | 16-20 | Patterson Mill to Grand Cavern                    | N/A                                             | N/A                                             |
| 6        | 20-25 | Grand Cavern to Port Republic Rd                  | 0.03                                            | 0.1                                             |
| Ref      | -2.7  | South River, Reference                            | N/A                                             | N/A                                             |

| Reach ID | RRM   | RRM Description                                   | Future Potential Recreational User (South River) (Adult) |                                                          |                           |                                 |                                              |                           | Future Potential Recreational User (South River) (Child) |                                                          |                           |                                 |                                              |                           |
|----------|-------|---------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------|---------------------------|---------------------------------|----------------------------------------------|---------------------------|----------------------------------------------------------|----------------------------------------------------------|---------------------------|---------------------------------|----------------------------------------------|---------------------------|
|          |       |                                                   | Hazard from Sediment (Ing, Der)                          | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Total Hazard <sup>1</sup> | Hazard from Sediment (Ing, Der) | Hazard from South River Fish Ingestion, mean | Total Hazard <sup>1</sup> | Hazard from Sediment (Ing, Der)                          | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Total Hazard <sup>1</sup> | Hazard from Sediment (Ing, Der) | Hazard from South River Fish Ingestion, mean | Total Hazard <sup>1</sup> |
| 1        | 0.5-2 | Main Street to Hopeman Parkway                    | N/A                                                      | 44                                                       | 44                        | N/A                             | 36                                           | 36                        | N/A                                                      | 41                                                       | 41                        | N/A                             | 33                                           | 33                        |
| 2        | 2-5   | Hopeman Parkway to Holsinger Farms Footbridge     | 0.05                                                     | 65                                                       | 66                        | 0.05                            | 54                                           | 54                        | 0.2                                                      | 60                                                       | 60                        | 0.2                             | 49                                           | 49                        |
| 3        | 5-10  | Holsinger Farms Footbridge to New Hope-Crimora Rd | 0.1                                                      | 182                                                      | 182                       | 0.1                             | 149                                          | 149                       | 0.5                                                      | 167                                                      | 167                       | 0.5                             | 136                                          | 136                       |
| 4        | 10-16 | New Hope-Crimora Rd to Patterson Mill             | N/A                                                      | 81                                                       | 81                        | N/A                             | 66                                           | 66                        | N/A                                                      | 74                                                       | 74                        | N/A                             | 60                                           | 60                        |
| 5        | 16-20 | Patterson Mill to Grand Cavern                    | N/A                                                      | 113                                                      | 113                       | N/A                             | 92                                           | 92                        | N/A                                                      | 104                                                      | 104                       | N/A                             | 84                                           | 84                        |
| 6        | 20-25 | Grand Cavern to Port Republic Rd                  | 0.03                                                     | 72                                                       | 72                        | 0.03                            | 59                                           | 59                        | 0.1                                                      | 66                                                       | 66                        | 0.1                             | 54                                           | 54                        |
| Ref      | -2.7  | South River, Reference                            | N/A                                                      | 27                                                       | 27                        | N/A                             | 22                                           | 22                        | N/A                                                      | 25                                                       | 25                        | N/A                             | 20                                           | 20                        |

**Footnotes:**  
1 - Total hazard is the sum of hazards across all exposure pathways.

**Notes:**  
Hazard shown is total hazard across all routes (ingestion, dermal) for the pathway. Individual pathway calculations are provided in Appendix H.  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

**2** Exceeds acceptable levels  
N/A No COPCs identified and/or pathway incomplete

Table 6-6 - Summary of Risk Characterization Calculations, Currrent Floodplain Area Hunter

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1,2</sup> | Land Use                         | Floodplain Soil Map ID  | Current Floodplain Area Hunter                        |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                           | Current Floodplain Area Hunter                        |                                                    |                                                      |                                                         |                                                             |                                            |                                                    |                           |
|----------|-------|-------------------------------|----------------------------------|-------------------------|-------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|---------------------------|-------------------------------------------------------|----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------|----------------------------------------------------|---------------------------|
|          |       |                               |                                  |                         | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> | Total Hazard <sup>4</sup> | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Ingestion of Waterfowl (Mallard), mean | Hazard from Ingestion of Waterfowl (Wood Duck), mean | Hazard from Ingestion of Waterfowl (Canada Goose), mean | Hazard from Ingestion of Waterfowl (Weighted-Species), mean | Hazard from Ingestion of Game (Deer), mean | Hazard from Ingestion of Game (Deer - Liver), mean | Total Hazard <sup>4</sup> |
| 3        | 5-10  | Ambler Tamara                 | Forest                           | Reach 3 - Extent 5      | 0.02                                                  | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.02                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
|          |       | Reach 3 Surrogate             | Forest                           | Reach 3 - Extent 1 - 2  | 0.01                                                  | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.01                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
| 4        | 10-16 | Kaminski Joseph               | Forest                           | Reach 4 - Extent 11     | 0.009                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.01                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
|          |       | Reach 4 Surrogate             | Forest                           | Reach 4 - Extent 8 - 10 | 0.008                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.008                                                 | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
| 5        | 16-20 | Southard LP                   | Forest, Open Space (Boat Launch) | Reach 5 - Extent 12     | 0.008                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.01                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
|          |       | Kalimon John                  | Forest, Pasture/Hay, Wetlands    | Reach 5 - Extent 13     | 0.02                                                  | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.02                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
|          |       | Hill Thomas                   | Forest, Pasture/Hay              | Reach 5 - Extent 13     | 0.004                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.004                                                 | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
| 6        | 20-25 | Swope Francis                 | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 19     | 0.004                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.004                                                 | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
|          |       | Bowman Patricia               | Forest                           | Reach 6 - Extent 19     | 0.006                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.01                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |
|          |       | KNK (Brenneman)               | Forest, Open Space (Residential) | KNK                     | 0.006                                                 | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.1                                                            | 7.6                       | 0.01                                                  | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.02                                       | 0.06                                               | 4.0                       |

**Footnotes:**

1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Other properties with exceedances which are not currently for hunting (i.e., current farming or industrial/commercial) have been addressed as part of the future hunter scenario (see Table 6-9).  
Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller

2 - Samples corresponding to each exposure unit, where applicable, defined in Tables 4-11 through 4-15 and detailed in Section 4.2.1.

3 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

4 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

**2** Exceeds acceptable levels  
N/A No COPCs identified and/or pathway incomplete

**Table 6-7 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Hunter**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>        | Exposure Unit <sup>2</sup>            | Land Use                                        | Floodplain Soil Map ID  | Future Potential Hunter                               |                                             |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |     | Total Hazard <sup>4</sup> |
|----------|-------|------------------------------------|---------------------------------------|-------------------------------------------------|-------------------------|-------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|-----|---------------------------|
|          |       |                                    |                                       |                                                 |                         | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> |     |                           |
| 1        | 0.5-2 | Americast Inc (Allied Ready Mix)   | Parcel-Wide                           | Forest (Oxbow) / Former Motorcross              | Reach 1 - Extent 5      | 0.07                                                  | 0.2                                         | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.9 |                           |
|          |       |                                    | Forested Portion adjacent to facility | Forest                                          | Reach 1 - Extent 5      | 0.06                                                  | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       |                                    | Former Motorcross                     | Forest/Former Motorcross                        | Reach 1 - Extent 5      | 0.04                                                  | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       |                                    | East of Oxbow                         | Forest (Oxbow)                                  | Reach 1 - Extent 5      | 0.06                                                  | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       |                                    | South of Oxbow                        | Forest (Oxbow)                                  | Reach 1 - Extent 5      | 0.04                                                  | N/A                                         | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       |                                    | North of Oxbow                        | Forest (Oxbow)                                  | Reach 1 - Extent 5      | 0.3                                                   | 0.2                                         | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 8.2 |                           |
|          |       | MTECH Group                        | --                                    | Forest-Commercial/Industrial                    | Reach 1 - Extent 4      | 0.01                                                  | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
| 2        | 2-5   | Solutions Way LLC                  | Forested corridor adjacent to river   | Forest                                          | Reach 2 - Extent 3      | 0.01                                                  | 0.02                                        | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Wood, L E Jr                       | --                                    | Pasture/Hay/Forest                              | Reach 2 - Extent 3      | 0.01                                                  | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Shifflett, Floyd                   | --                                    | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 0.01                                                  | 0.02                                        | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | McDaniel, Lloyd or Dreama          | --                                    | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 0.011                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Holsinger Farms LLC                | --                                    | Pasture/Hay/Forest                              | Holsinger               | 0.003                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
| 3        | 5-10  | Holloway Howard or Edith           | --                                    | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2      | 0.006                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Yount Joseph                       | --                                    | Forest                                          | Yount                   | 0.011                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       |                                    | --                                    | Pasture/Hay, Cultivated Crops                   | Yount                   | 0.005                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Wertman Charles F or Delores K     | --                                    | Forest, Pasture/Hay                             | Reach 3 - Extent 4 - 5  | 0.005                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Ambler Tamara                      | --                                    | Forest                                          | Reach 3 - Extent 5      | 0.015                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
| 4        | 10-16 | Freed Carl                         | Parcel-Wide                           | Forest, Pasture/Hay                             | Freed/Harris            | 0.004                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       |                                    | Forested Portion                      | Forest                                          | Freed/Harris            | 0.010                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Thompson Guy                       | --                                    | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9      | 0.003                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | EJS Weyers Caves LLC               | --                                    | Forest                                          | Reach 4 - Extent 10     | 0.008                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Thumps Up LLC                      | --                                    | Forest, Pasture/Hay, Wetlands                   | Thumps Up               | 0.005                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Kaminski Joseph                    | --                                    | Forest                                          | Reach 4 - Extent 11     | 0.009                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Custard William and Amanda Trustee | --                                    | Forest, Pasture/Hay                             | Reach 4 - Extent 11     | 0.008                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |
|          |       | Reach 4 Surrogate                  | --                                    | Forest                                          | Reach 4 - Extent 8 - 10 | 0.008                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7 |                           |

| Table 6-7 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Hunter |       |                             |                            |                                  |                        |                                                       |                                             |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                           |
|----------------------------------------------------------------------------------------------------|-------|-----------------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|---------------------------|
| Human Health Risk Assessment Report, Area of Concern (AOC) 4                                       |       |                             |                            |                                  |                        |                                                       |                                             |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                           |
| Former DuPont Waynesboro Plant                                                                     |       |                             |                            |                                  |                        |                                                       |                                             |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                           |
| Waynesboro, Virginia                                                                               |       |                             |                            |                                  |                        |                                                       |                                             |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                           |
| Reach ID                                                                                           | RRM   | Property Owner <sup>1</sup> | Exposure Unit <sup>2</sup> | Land Use                         | Floodplain Soil Map ID | Future Potential Hunter                               |                                             |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                           |
|                                                                                                    |       |                             |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> | Total Hazard <sup>4</sup> |
| 5                                                                                                  | 16-20 | Southard LP                 | --                         | Forest, Open Space (Boat Launch) | Reach 5 - Extent 12    | 0.008                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | Kalimon John                | --                         | Forest, Pasture/Hay, Wetlands    | Reach 5 - Extent 13    | 0.02                                                  | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | Hill Thomas                 | --                         | Forest, Pasture/Hay              | Reach 5 - Extent 13    | 0.004                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
| 6                                                                                                  | 20-25 | Cave Hill LLC               | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 16    | 0.008                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | Park at Grand Cavern        | --                         | Forest, Open Space (Park)        | Park at Grand Cavern   | 0.009                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | Groah William J             | --                         | Forest, Pasture/Hay              | Reach 6 - Extent 18    | 0.002                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | Swope Francis               | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 19    | 0.004                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | Bowman Patricia             | --                         | Forest                           | Reach 6 - Extent 19    | 0.006                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |
|                                                                                                    |       | KNK (Brenneman)             | --                         | Forest, Open Space (Residential) | KNK                    | 0.006                                                 | --                                          | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.2                                                    | 0.1                                                            | 7.7                       |

Footnotes:

1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17. Results from Americast-Parcel-Wide can be applied as a surrogate for the forested portion of the property upstream of this area to 2nd Street Bridge. Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Samples corresponding to each exposure unit, where applicable, defined in Tables 4-11 through 4-15 and detailed in Section 4.2.1.  
3 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
4 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

Notes:

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-7 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Hunter

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>        | Exposure Unit <sup>2</sup>            | Land Use                                        | Floodplain Soil Map ID  | Future Potential Hunter                               |                                             |                                                    |                                                      |                                                         |                                                             |                                            |                                                    |     | Total Hazard <sup>4</sup> |
|----------|-------|------------------------------------|---------------------------------------|-------------------------------------------------|-------------------------|-------------------------------------------------------|---------------------------------------------|----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------|----------------------------------------------------|-----|---------------------------|
|          |       |                                    |                                       |                                                 |                         | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Ingestion of Waterfowl (Mallard), mean | Hazard from Ingestion of Waterfowl (Wood Duck), mean | Hazard from Ingestion of Waterfowl (Canada Goose), mean | Hazard from Ingestion of Waterfowl (Weighted-Species), mean | Hazard from Ingestion of Game (Deer), mean | Hazard from Ingestion of Game (Deer - Liver), mean |     |                           |
| 1        | 0.5-2 | Americast Inc (Allied Ready Mix)   | Parcel-Wide                           | Forest (Oxbow) / Former Motorcross              | Reach 1 - Extent 5      | 0.07                                                  | 0.2                                         | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.3 |                           |
|          |       |                                    | Forested Portion adjacent to facility | Forest                                          | Reach 1 - Extent 5      | 0.06                                                  | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       |                                    | Former Motorcross                     | Forest/Former Motorcross                        | Reach 1 - Extent 5      | 0.04                                                  | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       |                                    | East of Oxbow                         | Forest (Oxbow)                                  | Reach 1 - Extent 5      | 0.06                                                  | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       |                                    | South of Oxbow                        | Forest (Oxbow)                                  | Reach 1 - Extent 5      | 0.04                                                  | N/A                                         | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       |                                    | North of Oxbow                        | Forest (Oxbow)                                  | Reach 1 - Extent 5      | 0.3                                                   | 0.2                                         | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.5 |                           |
|          |       | MTECH Group                        | --                                    | Forest-Commercial/Industrial                    | Reach 1 - Extent 4      | 0.01                                                  | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
| 2        | 2-5   | Solutions Way LLC                  | Forested corridor adjacent to river   | Forest                                          | Reach 2 - Extent 3      | 0.01                                                  | 0.02                                        | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Wood, L E Jr                       | --                                    | Pasture/Hay/Forest                              | Reach 2 - Extent 3      | 0.01                                                  | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Shifflett, Floyd                   | --                                    | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 0.01                                                  | 0.02                                        | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | McDaniel, Lloyd or Dreama          | --                                    | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 0.011                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Holsinger Farms LLC                | --                                    | Pasture/Hay/Forest                              | Holsinger               | 0.003                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
| 3        | 5-10  | Holloway Howard or Edith           | --                                    | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2      | 0.006                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Yount Joseph                       | --                                    | Forest                                          | Yount                   | 0.011                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       |                                    | --                                    | Pasture/Hay, Cultivated Crops                   | Yount                   | 0.005                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Wertman Charles F or Delores K     | --                                    | Forest, Pasture/Hay                             | Reach 3 - Extent 4 - 5  | 0.005                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Ambler Tamara                      | --                                    | Forest                                          | Reach 3 - Extent 5      | 0.015                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
| 4        | 10-16 | Freed Carl                         | Parcel-Wide                           | Forest, Pasture/Hay                             | Freed/Harris            | 0.004                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       |                                    | Forested Portion                      | Forest                                          | Freed/Harris            | 0.010                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Thompson Guy                       | --                                    | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9      | 0.003                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | EJS Weyers Caves LLC               | --                                    | Forest                                          | Reach 4 - Extent 10     | 0.008                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Thumps Up LLC                      | --                                    | Forest, Pasture/Hay, Wetlands                   | Thumps Up               | 0.005                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Kaminski Joseph                    | --                                    | Forest                                          | Reach 4 - Extent 11     | 0.009                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Custard William and Amanda Trustee | --                                    | Forest, Pasture/Hay                             | Reach 4 - Extent 11     | 0.008                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |
|          |       | Reach 4 Surrogate                  | --                                    | Forest                                          | Reach 4 - Extent 8 - 10 | 0.008                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1 |                           |

Table 6-7 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Hunter

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Exposure Unit <sup>2</sup> | Land Use                         | Floodplain Soil Map ID | Future Potential Hunter                               |                                             |                                                    |                                                      |                                                         |                                                             |                                            |                                                    |                           |
|----------|-------|-----------------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|----------------------------------------------------|------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------|----------------------------------------------------|---------------------------|
|          |       |                             |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>3</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Ingestion of Waterfowl (Mallard), mean | Hazard from Ingestion of Waterfowl (Wood Duck), mean | Hazard from Ingestion of Waterfowl (Canada Goose), mean | Hazard from Ingestion of Waterfowl (Weighted-Species), mean | Hazard from Ingestion of Game (Deer), mean | Hazard from Ingestion of Game (Deer - Liver), mean | Total Hazard <sup>4</sup> |
| 5        | 16-20 | Southard LP                 | --                         | Forest, Open Space (Boat Launch) | Reach 5 - Extent 12    | 0.008                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | Kalimon John                | --                         | Forest, Pasture/Hay, Wetlands    | Reach 5 - Extent 13    | 0.02                                                  | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | Hill Thomas                 | --                         | Forest, Pasture/Hay              | Reach 5 - Extent 13    | 0.004                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
| 6        | 20-25 | Cave Hill LLC               | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 16    | 0.008                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | Park at Grand Cavern        | --                         | Forest, Open Space (Park)        | Park at Grand Cavern   | 0.009                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | Groah William J             | --                         | Forest, Pasture/Hay              | Reach 6 - Extent 18    | 0.002                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | Swope Francis               | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 19    | 0.004                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | Bowman Patricia             | --                         | Forest                           | Reach 6 - Extent 19    | 0.006                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |
|          |       | KNK (Brenneman)             | --                         | Forest, Open Space (Residential) | KNK                    | 0.006                                                 | --                                          | 9.6                                                | 1.7                                                  | 0.5                                                     | 3.9                                                         | 0.08                                       | 0.06                                               | 4.1                       |

**Footnotes:**

1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17. Results from Americast-Forested Portion Adjacent to the Facility can be applied as a surrogate for the forested portion of the prop

Reach 3 Surrogate results apply to the following properties: McDonough and Meadows

Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller

Results from Custard property to be applied as a surrogate to the Brandon property

2 - Samples corresponding to each exposure unit, where applicable, defined in Tables 4-11 through 4-15 and detailed in Section 4.2.1.

3 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

4 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011)

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

**2** Exceeds acceptable levels

N/A No COPCs identified and/or pathway incomplete

-- Not Available, subsurface soil samples have not been collected

**Table 6-8 - Summary of Risk Characterization Calculations, Current Floodplain Area Farmer**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                        | Floodplain Soil Map ID | Current Floodplain Area Farmer (Adult)                |                                             |                                                        |                             |                                                       |                                                        |                                                       |                             |                                 |
|----------|-------|----------------------------------------------------------|-------------------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------|-----------------------------|-------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------|-----------------------------|---------------------------------|
|          |       |                                                          |                                                 |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing) | Total Hazard A <sup>3</sup> | Hazard from Ingestion of Livestock (Beef Liver) (Ing) | Hazard from Ingestion of Livestock (Beef Kidney) (Ing) | Hazard from Ingestion of Livestock (Beef Heart) (Ing) | Total Hazard B <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 2        | 2-5   | Wood, L E Jr                                             | Pasture/Hay/Forest                              | Reach 2 - Extent 3     | 0.5                                                   | --                                          | N/A                                                    | 0.5                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.5                             |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 0.4                                                   | --                                          | N/A                                                    | 0.4                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.4                             |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 0.8                                                   | 1.0                                         | 0.4                                                    | 2.2                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 21                              |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 0.4                                                   | 1.0                                         | 0.4                                                    | 1.8                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 20                              |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 0.6                                                   | --                                          | 0.4                                                    | 1.0                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                              | Holsinger              | 0.2                                                   | --                                          | 0.4                                                    | 0.6                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                     | Reach 2 - Extent 2-3   | 0.5                                                   | --                                          | 0.4                                                    | 0.9                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
| 3        | 5-10  | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                    | Reach 3 - Extent 1     | 0.3                                                   | --                                          | N/A                                                    | 0.3                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.3                             |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2     | 0.3                                                   | --                                          | N/A                                                    | 0.3                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.3                             |
|          |       | Yount Joseph                                             | Forest                                          | Yount                  | 0.6                                                   | --                                          | 0.4                                                    | 1.0                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                   | Yount                  | 0.3                                                   | --                                          | 0.4                                                    | 0.6                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                             | Reach 3 - Extent 5     | 0.3                                                   | --                                          | N/A                                                    | 0.3                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.3                             |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                             | Reach 3 - Extent 1 - 2 | 0.5                                                   | --                                          | N/A                                                    | 0.5                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.5                             |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                   | Reach 4 - Extent 6     | 1.1                                                   | --                                          | 0.4                                                    | 1.5                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 20                              |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                     | Reach 4 - Extent 8     | 0.7                                                   | --                                          | N/A                                                    | 0.7                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.7                             |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                             | Freed/Harris           | 0.2                                                   | --                                          | 0.4                                                    | 0.6                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Freed Carl (Forested Portion)                            | Forest                                          | Freed/Harris           | 0.4                                                   | --                                          | 0.4                                                    | 0.8                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9     | 0.1                                                   | --                                          | N/A                                                    | 0.1                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.1                             |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                   | Thumps Up              | 0.2                                                   | --                                          | 0.4                                                    | 0.6                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                             | Reach 4 - Extent 11    | 0.3                                                   | --                                          | 0.4                                                    | 0.7                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |

Table 6-8 - Summary of Risk Characterization Calculations, Current Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Current Floodplain Area Farmer (Adult)                |                                             |                                                        |                             |                                                       |                                                        |                                                       |                             |                                 |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------|-----------------------------|-------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------|-----------------------------|---------------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing) | Total Hazard A <sup>3</sup> | Hazard from Ingestion of Livestock (Beef Liver) (Ing) | Hazard from Ingestion of Livestock (Beef Kidney) (Ing) | Hazard from Ingestion of Livestock (Beef Heart) (Ing) | Total Hazard B <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 0.8                                                   | --                                          | N/A                                                    | 0.8                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.8                             |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 0.2                                                   | --                                          | N/A                                                    | 0.2                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.2                             |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 0.4                                                   | --                                          | 0.4                                                    | 0.8                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.1                                                   | --                                          | 0.4                                                    | 0.5                         | 6.5                                                   | 12                                                     | 0.1                                                   | 18                          | 19                              |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.2                                                   | --                                          | N/A                                                    | 0.2                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.2                             |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

2 Exceeds acceptable levels  
N/A No COPCs identified and/or pathway incomplete  
-- Not Available, subsurface soil samples have not been collected

**Table 6-8 - Summary of Risk Characterization Calculations, Current Floodplain Area Farmer**  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                        | Floodplain Soil Map ID | Current Floodplain Area Farmer (Child)                |                                                        |                             |                                                       |                                                        |                                                       |                             |                                 |
|----------|-------|----------------------------------------------------------|-------------------------------------------------|------------------------|-------------------------------------------------------|--------------------------------------------------------|-----------------------------|-------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------|-----------------------------|---------------------------------|
|          |       |                                                          |                                                 |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing) | Total Hazard A <sup>3</sup> | Hazard from Ingestion of Livestock (Beef Liver) (Ing) | Hazard from Ingestion of Livestock (Beef Kidney) (Ing) | Hazard from Ingestion of Livestock (Beef Heart) (Ing) | Total Hazard B <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 2        | 2-5   | Wood, L E Jr                                             | Pasture/Hay/Forest                              | Reach 2 - Extent 3     | 1.2                                                   | N/A                                                    | 1.2                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 1.2                             |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 0.9                                                   | N/A                                                    | 0.9                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.9                             |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 2.0                                                   | 0.6                                                    | 2.6                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 31                              |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 1.1                                                   | 0.6                                                    | 1.7                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 1.4                                                   | 0.6                                                    | 2.0                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 31                              |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                              | Holsinger              | 0.4                                                   | 0.6                                                    | 1.1                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                     | Reach 2 - Extent 2-3   | 1.1                                                   | 0.6                                                    | 1.7                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
| 3        | 5-10  | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                    | Reach 3 - Extent 1     | 0.8                                                   | N/A                                                    | 0.8                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.8                             |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2     | 0.7                                                   | N/A                                                    | 0.7                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.7                             |
|          |       | Yount Joseph                                             | Forest                                          | Yount                  | 1.4                                                   | 0.6                                                    | 2.0                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 31                              |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                   | Yount                  | 0.6                                                   | 0.6                                                    | 1.2                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                             | Reach 3 - Extent 5     | 0.7                                                   | N/A                                                    | 0.7                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.7                             |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                             | Reach 3 - Extent 1 - 2 | 1.3                                                   | N/A                                                    | 1.3                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 1.3                             |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                   | Reach 4 - Extent 6     | 3.3                                                   | 0.6                                                    | 3.9                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 32                              |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                     | Reach 4 - Extent 8     | 2.1                                                   | N/A                                                    | 2.1                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 2.1                             |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                             | Freed/Harris           | 0.5                                                   | 0.6                                                    | 1.1                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
|          |       | Freed Carl (Forested Portion)                            | Forest                                          | Freed/Harris           | 1.3                                                   | 0.6                                                    | 1.9                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9     | 0.4                                                   | N/A                                                    | 0.4                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.4                             |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                   | Thumps Up              | 0.7                                                   | 0.6                                                    | 1.3                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                             | Reach 4 - Extent 11    | 1.0                                                   | 0.6                                                    | 1.6                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |

Table 6-8 - Summary of Risk Characterization Calculations, Current Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Current Floodplain Area Farmer (Child)                |                                                        |                             |                                                       |                                                        |                                                       |                             |                                 |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|--------------------------------------------------------|-----------------------------|-------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------|-----------------------------|---------------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing) | Total Hazard A <sup>3</sup> | Hazard from Ingestion of Livestock (Beef Liver) (Ing) | Hazard from Ingestion of Livestock (Beef Kidney) (Ing) | Hazard from Ingestion of Livestock (Beef Heart) (Ing) | Total Hazard B <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 2.5                                                   | N/A                                                    | 2.5                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 2.5                             |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 0.5                                                   | N/A                                                    | 0.5                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.5                             |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 1.2                                                   | 0.6                                                    | 1.8                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 30                              |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.3                                                   | 0.6                                                    | 0.9                         | 10                                                    | 18                                                     | 0.2                                                   | 29                          | 29                              |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.5                                                   | N/A                                                    | 0.5                         | N/A                                                   | N/A                                                    | N/A                                                   | N/A                         | 0.5                             |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

**Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer**  
 Human Health Risk Assessment Report, Area of Concern (AOC) 4  
 Former DuPont Waynesboro Plant  
 Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)       |                                             |                                                              |                                                                          |                                                                   |                                                                 |                                                               |                             |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Muscle) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Eggs) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops (Ing), 90 <sup>th</sup> | Total Hazard A <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | N/A                                                   | --                                          | 69                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 73                          |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 0.5                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.2                         |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.4                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.1                         |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.8                                                   | 1.0                                         | 40                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 45                          |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.4                                                   | 1.0                                         | 40                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 45                          |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.6                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.3                         |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 0.2                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 3.9                         |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 0.5                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.2                         |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | N/A                                                   | --                                          | 8.4                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 12                          |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 0.3                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.0                         |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 0.3                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.0                         |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 0.6                                                   | --                                          | 91                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 96                          |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 0.3                                                   | --                                          | 91                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 95                          |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 0.3                                                   | --                                          | 67                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 71                          |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 0.5                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.2                         |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 1.1                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.8                         |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 0.7                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.4                         |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 0.2                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 3.9                         |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 0.4                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.1                         |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 0.1                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 3.8                         |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 0.2                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 3.9                         |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 0.3                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.0                         |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)       |                                             |                                                              |                                                                          |                                                                   |                                                                 |                                                               |                             |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Muscle) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Eggs) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops (Ing), 90 <sup>th</sup> | Total Hazard A <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 0.8                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.6                         |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 0.2                                                   | --                                          | 54                                                           | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 57                          |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 0.4                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.1                         |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.1                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 3.8                         |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.2                                                   | --                                          | N/A                                                          | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 3.9                         |

Footnotes:

- 1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.
- Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam
- Reach 3 Surrogate results apply to the following properties: McDonough and Meadows
- Results from Custard property to be applied as a surrogate to the Brandon property
- 2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.
- 3 - Total hazard is the sum of hazards across all exposure pathways.
- 4 - Outlier defined as concentration around or exceeding 100 mg/kg

Notes:

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

- 2Exceeds acceptable levels
- N/ANo COPCs identified and/or pathway incomplete
- Not Available, subsurface soil samples have not been collected

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)                         |                                                                          |                                                                         |                                                                  |                                                                    |                                    |                                        |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|----------------------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Heart) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Gizzard) (Ing), 90 <sup>th</sup> | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard <i>(A+B)</i> <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 117                                    |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 90                                     |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 89                                     |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 49                                     |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 56                                     |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 140                                    |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 140                                    |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 116                                    |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 49                                     |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 49                                     |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
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Former DuPont Waynesboro Plant  
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| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)                         |                                                                          |                                                                         |                                                                  |                                                                    |                                    |                                        |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|----------------------------------------|
|          |       |                             |                               |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Heart) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Gizzard) (Ing), 90 <sup>th</sup> | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard <i>(A+B)</i> <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 49                                     |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 102                                    |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 6.5                                                                     | 12                                                                       | 0.1                                                                     | 19                                                               | 6.6                                                                | 44                                 | 48                                     |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)       |                                             |                                                  |                                                              |                                                       |                                                     |                                                   |                             |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------|-----------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), mean | Hazard from Ingestion of Poultry (Muscle) (Ing), mean | Hazard from Ingestion of Poultry (Eggs) (Ing), mean | Hazard from Ingestion of Garden Crops (Ing), mean | Total Hazard A <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | N/A                                                   | --                                          | 57                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 59                          |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 0.5                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.6                         |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.4                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.5                         |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.8                                                   | 1.0                                         | 33                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 37                          |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.4                                                   | 1.0                                         | 33                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 36                          |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.6                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.7                         |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 0.2                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.3                         |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 0.5                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.6                         |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | N/A                                                   | --                                          | 6.9                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 9.0                         |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 0.3                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.5                         |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 0.3                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.4                         |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 0.6                                                   | --                                          | 75                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 77                          |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 0.3                                                   | --                                          | 75                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 77                          |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 0.3                                                   | --                                          | 55                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 57                          |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 0.5                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.7                         |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 1.1                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.2                         |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 0.7                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.8                         |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 0.2                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.3                         |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 0.4                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.6                         |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 0.1                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.3                         |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 0.2                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.4                         |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 0.3                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.5                         |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
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Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)       |                                             |                                                  |                                                              |                                                       |                                                     |                                                   |                             |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------|-----------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), mean | Hazard from Ingestion of Poultry (Muscle) (Ing), mean | Hazard from Ingestion of Poultry (Eggs) (Ing), mean | Hazard from Ingestion of Garden Crops (Ing), mean | Total Hazard A <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 0.8                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.0                         |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 0.2                                                   | --                                          | 44                                               | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 46                          |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 0.4                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.5                         |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.1                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.3                         |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.2                                                   | --                                          | N/A                                              | 0.2                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.3                         |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
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Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                        | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)             |                                                              |                                                             |                                                      |                                                        |                                    |                                        |
|----------|-------|----------------------------------------------------------|-------------------------------------------------|------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|------------------------------------|----------------------------------------|
|          |       |                                                          |                                                 |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), mean | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), mean | Hazard from Ingestion of Livestock (Beef Heart) (Ing), mean | Hazard from Ingestion of Poultry (Liver) (Ing), mean | Hazard from Ingestion of Poultry (Gizzard) (Ing), mean | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard <i>(A+B)</i> <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                          | Reach 2 - Extent 3     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 75                                     |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                              | Reach 2 - Extent 3     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 53                                     |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 53                                     |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                              | Reach 2 - Extent 2     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                              | Holsinger              | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                     | Reach 2 - Extent 2-3   | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                              | Reach 3 - Extent 1     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 26                                     |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                    | Reach 3 - Extent 1     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Yount Joseph                                             | Forest                                          | Yount                  | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 94                                     |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                   | Yount                  | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 94                                     |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                             | Reach 3 - Extent 5     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 74                                     |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                             | Reach 3 - Extent 1 - 2 | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                   | Reach 4 - Extent 6     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 20                                     |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                     | Reach 4 - Extent 8     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                             | Freed/Harris           | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Freed Carl (Forested Portion)                            | Forest                                          | Freed/Harris           | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9     | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                   | Thumps Up              | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                             | Reach 4 - Extent 11    | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Adult)             |                                                              |                                                             |                                                      |                                                        |                                    |                                        |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|------------------------------------|----------------------------------------|
|          |       |                             |                               |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), mean | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), mean | Hazard from Ingestion of Livestock (Beef Heart) (Ing), mean | Hazard from Ingestion of Poultry (Liver) (Ing), mean | Hazard from Ingestion of Poultry (Gizzard) (Ing), mean | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard <i>(A+B)</i> <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 63                                     |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 2.5                                                         | 4.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 17                                 | 19                                     |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)       |                                             |                                                              |                                                                          |                                                                   |                                                                 |                                                               |                             |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Muscle) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Eggs) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops (Ing), 90 <sup>th</sup> | Total Hazard A <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | N/A                                                   | --                                          | 64                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 67                          |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 1.2                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 5.1                         |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.9                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.8                         |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 2.0                                                   | 2.4                                         | 37                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 45                          |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 1.1                                                   | 2.4                                         | 37                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 44                          |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 1.4                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 5.3                         |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 0.4                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.4                         |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 1.1                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 5.0                         |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | N/A                                                   | --                                          | 7.7                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 12                          |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 0.8                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.7                         |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 0.7                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.6                         |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 1.4                                                   | --                                          | 84                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 89                          |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 0.6                                                   | --                                          | 84                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 88                          |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 0.7                                                   | --                                          | 62                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 66                          |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 1.3                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 5.2                         |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 3.3                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 7.2                         |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 2.1                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 6.0                         |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 0.5                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.4                         |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 1.3                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 5.2                         |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 0.4                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.3                         |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 0.7                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.6                         |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 1.0                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.9                         |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)       |                                             |                                                              |                                                                          |                                                                   |                                                                 |                                                               |                             |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|-----------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Muscle) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Eggs) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops (Ing), 90 <sup>th</sup> | Total Hazard A <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 2.5                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 6.5                         |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 0.5                                                   | --                                          | 49                                                           | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 54                          |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 1.2                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 5.1                         |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.3                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.2                         |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.5                                                   | --                                          | N/A                                                          | 0.6                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           | 4.4                         |

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1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Results from Custard property to be applied as a surrogate to the Brandon property  
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3 - Total hazard is the sum of hazards across all exposure pathways.  
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**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)                         |                                                                          |                                                                         |                                                                  |                                                                    |                                    |                                 |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|---------------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Heart) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Gizzard) (Ing), 90 <sup>th</sup> | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 122                             |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 99                              |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 98                              |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 60                              |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 66                              |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 144                             |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 143                             |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 121                             |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 60                              |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 62                              |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 60                              |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 60                              |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                              |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)                         |                                                                          |                                                                         |                                                                  |                                                                    |                                    |                                        |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------------|----------------------------------------|
|          |       |                             |                               |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef Heart) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Gizzard) (Ing), 90 <sup>th</sup> | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard <i>(A+B)</i> <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 61                                     |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 108                                    |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                                     |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                                     |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 10                                                                      | 18                                                                       | 0.2                                                                     | 19                                                               | 6.6                                                                | 54                                 | 59                                     |

Footnotes:

1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.

Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam

Reach 3 Surrogate results apply to the following properties: McDonough and Meadows

Results from Custard property to be applied as a surrogate to the Brandon property

2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

3 - Total hazard is the sum of hazards across all exposure pathways.

4 - Outlier defined as concentration around or exceeding 100 mg/kg

Notes:

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)       |                                             |                                                  |                                                              |                                                       |                                                     |                                                   |                             |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------|-----------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), mean | Hazard from Ingestion of Poultry (Muscle) (Ing), mean | Hazard from Ingestion of Poultry (Eggs) (Ing), mean | Hazard from Ingestion of Garden Crops (Ing), mean | Total Hazard A <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | N/A                                                   | --                                          | 52                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 54                          |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 1.2                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.5                         |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 0.9                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.1                         |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 2.0                                                   | 2.4                                         | 30                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 36                          |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 1.1                                                   | 2.4                                         | 30                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 36                          |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 1.4                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.7                         |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 0.4                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.7                         |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 1.1                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.4                         |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | N/A                                                   | --                                          | 3.8                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 6.1                         |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 0.8                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.1                         |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 0.7                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.0                         |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 1.4                                                   | --                                          | 68                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 72                          |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 0.6                                                   | --                                          | 68                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 71                          |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 0.7                                                   | --                                          | 50                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 53                          |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 1.3                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.5                         |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 3.3                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 5.6                         |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 2.1                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 4.4                         |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 0.5                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.8                         |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 1.3                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.6                         |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 0.4                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.7                         |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 0.7                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.0                         |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 1.0                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.3                         |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)       |                                             |                                                  |                                                              |                                                       |                                                     |                                                   |                             |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|--------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------|-----------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from Floodplain Pond Fish Ingestion, mean | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), mean | Hazard from Ingestion of Poultry (Muscle) (Ing), mean | Hazard from Ingestion of Poultry (Eggs) (Ing), mean | Hazard from Ingestion of Garden Crops (Ing), mean | Total Hazard A <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 2.5                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 4.8                         |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 0.5                                                   | --                                          | 40                                               | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 43                          |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 1.2                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 3.5                         |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.3                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.6                         |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.5                                                   | --                                          | N/A                                              | 0.3                                                          | 0.1                                                   | 0.6                                                 | 1.3                                               | 2.8                         |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>                              | Land Use                                         | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)             |                                                              |                                                             |                                                      |                                                        |                                    |                                 |
|----------|-------|----------------------------------------------------------|--------------------------------------------------|------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|------------------------------------|---------------------------------|
|          |       |                                                          |                                                  |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), mean | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), mean | Hazard from Ingestion of Livestock (Beef Heart) (Ing), mean | Hazard from Ingestion of Poultry (Liver) (Ing), mean | Hazard from Ingestion of Poultry (Gizzard) (Ing), mean | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary                                   | Forest                                           | Reach 2 - Extent 3     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 77                              |
|          |       | Wood, L E Jr                                             | Pasture/Hay/Forest                               | Reach 2 - Extent 3     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Argenbright, Harold or Deborah                           | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Shifflett, Floyd                                         | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 59                              |
|          |       | Shifflett, Floyd<br><i>outliers removed</i> <sup>4</sup> | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 58                              |
|          |       | McDaniel, Lloyd or Dreama                                | Pasture/Hay/Forest                               | Reach 2 - Extent 2     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Holsinger Farms LLC                                      | Pasture/Hay/Forest                               | Holsinger              | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 25                              |
|          |       | Reach 2 Surrogate                                        | Pasture/Hay                                      | Reach 2 - Extent 2-3   | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
| 3        | 5-10  | Schlappi                                                 | Pasture/Hay/Forest                               | Reach 3 - Extent 1     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 29                              |
|          |       | Hatton Jerry or Mary                                     | Cultivated Crops, Pature/Hay                     | Reach 3 - Extent 1     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Holloway Howard or Edith                                 | Cultivated Crops, Forest,Pature/Hay,Wetl<br>ands | Reach 3 - Extent 2     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Yount Joseph                                             | Forest                                           | Yount                  | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 95                              |
|          |       |                                                          | Pasture/Hay, Cultivated Crops                    | Yount                  | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 94                              |
|          |       | Wertman Charles F or Delores K                           | Forest, Pasture/Hay                              | Reach 3 - Extent 5     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 76                              |
|          |       | Reach 3 Surrogate                                        | Forest, Pasture/Hay                              | Reach 3 - Extent 1 - 2 | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
| 4        | 10-16 | Shifflett Roger or Sharon                                | Cultivated Crops, Pasture/Hay                    | Reach 4 - Extent 6     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 28                              |
|          |       | Patterson Crawford S                                     | Pasture/Hay                                      | Reach 4 - Extent 8     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 27                              |
|          |       | Freed Carl (Parcel-Wide)                                 | Forest, Pasture/Hay                              | Freed/Harris           | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Freed Carl (Forested Portion)                            | Forest                                           | Freed/Harris           | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Thompson Guy                                             | Cultivated Crops, Pasture/Hay, Forest, Wetlands  | Reach 4 - Extent 9     | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 25                              |
|          |       | Thumps Up LLC                                            | Forest, Pasture/Hay, Wetlands                    | Thumps Up              | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
|          |       | Custard William and Amanda Trustee                       | Forest, Pasture/Hay                              | Reach 4 - Extent 11    | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |

Table 6-9 - Summary of Risk Characterization Calculations, Future Potential Floodplain Area Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Future Potential Floodplain Area Farmer (Child)             |                                                              |                                                             |                                                      |                                                        |                                    |                                 |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------|------------------------------------|---------------------------------|
|          |       |                             |                               |                        | Hazard from Ingestion of Livestock (Beef Liver) (Ing), mean | Hazard from Ingestion of Livestock (Beef Kidney) (Ing), mean | Hazard from Ingestion of Livestock (Beef Heart) (Ing), mean | Hazard from Ingestion of Poultry (Liver) (Ing), mean | Hazard from Ingestion of Poultry (Gizzard) (Ing), mean | Total Hazard <i>B</i> <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 5        | 16-20 | Kalimon John                | Forest, Pasture/Hay, Wetlands | Reach 5 - Extent 13    | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 28                              |
|          |       | Hill Thomas                 | Forest, Pasture/Hay           | Reach 5 - Extent 13    | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 66                              |
|          |       | South River Farms LLC       | Pasture/Hay                   | Reach 5 - Extent 14-15 | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 25                              |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 4.7                                                         | 8.6                                                          | 0.1                                                         | 7.0                                                  | 2.4                                                    | 23                                 | 26                              |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways.  
4 - Outlier defined as concentration around or exceeding 100 mg/kg

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-10 - Summary of Risk Characterization Calculations, Hypothetical Future Resident  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner                         | Exposure Unit <sup>1</sup>            | Land Use                           | Floodplain Soil Map ID | Hypothetical Future Resident (Adult)                  |                                             |                                             |                                                          |                                                   |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                                       |                           |
|----------|-------|----------------------------------------|---------------------------------------|------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|---------------------------------------|---------------------------|
|          |       |                                        |                                       |                                    |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops | Total Hazard <sup>3</sup> |
| 1        | 0.5-2 | DuPont                                 | --                                    | Plant Parking Lot                  | Reach 1 - Extent 8     | 0.2                                                   | N/A                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | City of Waynesboro - Constitution Park | Park-Wide                             | Park                               | Reach 1 - Extent 8     | 0.2                                                   | 0.1                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Soccer Field/Arboretum                | Park                               | Reach 1 - Extent 8     | 0.7                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Pavilion/Paved Greenway               | Park                               | Reach 1 - Extent 8     | 0.07                                                  | 0.1                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Pavilion North of West Main Street    | Park                               | Reach 1 - Extent 8     | 0.3                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | City of Waynesboro                     | --                                    | Open Space - Commercial            | Reach 1 - Extent 8     | 0.2                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | Bottom Alley (Hopeman Brothers)        | Parcel-Wide                           | Forest - Commercial/Industrial     | Reach 1 - Extent 7     | 0.4                                                   | N/A                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Forested Portion                      | Forest - Commercial/Industrial     | Reach 1 - Extent 7     | 0.5                                                   | N/A                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | Various                                | Greenway                              | Open Space                         | Reach 1 - Extent 7     | 0.4                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | Augusta Lumber LLC                     | --                                    | Developed/High Intensity           | Reach 1 - Extent 6     | 0.1                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | City of Waynesboro - North Park        | Park-Wide                             | Park                               | Reach 1 - Extent 6     | 0.5                                                   | 2.2                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 56                        |
|          |       |                                        | Wetland Portion Across River          | Open Space                         | Reach 1 - Extent 6     | 0.3                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Ball Field                            | Park                               | Reach 1 - Extent 6     | 0.06                                                  | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Northern Perimeter/Basketball Court   | Park                               | Reach 1 - Extent 6     | 1.0                                                   | 2.2                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 57                        |
|          |       |                                        | Parking Lot/Pavilion/Playground       | Park                               | Reach 1 - Extent 6     | 0.07                                                  | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Open Space/VolleyBall Court           | Park                               | Reach 1 - Extent 6     | N/A                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Forested Area/Greenway                | Park                               | Reach 1 - Extent 6     | 0.4                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | Americast Inc (Allied Ready Mix)       | Parcel-Wide                           | Forest (Oxbow) / Former Motorcross | Reach 1 - Extent 5     | 1.1                                                   | 2.6                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 57                        |
|          |       |                                        | Forested Portion adjacent to facility | Forest                             | Reach 1 - Extent 5     | 0.8                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 55                        |
|          |       |                                        | Former Motorcross                     | Forest/Former Motorcross           | Reach 1 - Extent 5     | 0.5                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | East of Oxbow                         | Forest (Oxbow)                     | Reach 1 - Extent 5     | 0.9                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 55                        |
|          |       |                                        | South of Oxbow                        | Forest (Oxbow)                     | Reach 1 - Extent 5     | 0.6                                                   | N/A                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | North of Oxbow                        | Forest (Oxbow)                     | Reach 1 - Extent 5     | 4.6                                                   | 2.6                                         | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 61                        |
|          |       | City of Waynesboro - Basic Park        | Park-Wide                             | Park                               | Reach 1 - Extent 4     | 0.1                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Oxbow                                 | Park                               | Reach 1 - Extent 4     | 0.1                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Park                                  | Park                               | Reach 1 - Extent 4     | 0.1                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       |                                        | Forested Area East of Park            | Park                               | Reach 1 - Extent 4     | N/A                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |
|          |       | MTECH Group                            | --                                    | Forest-Commercial/Industrial       | Reach 1 - Extent 4     | 0.2                                                   | --                                          | N/A                                         | 44                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 54                        |

Table 6-10 - Summary of Risk Characterization Calculations, Hypothetical Future Resident  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
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Waynesboro, Virginia

| Reach ID | RRM   | Property Owner                     | Exposure Unit <sup>1</sup>          | Land Use                                        | Floodplain Soil Map ID  | Hypothetical Future Resident (Adult)                  |                                             |                                             |                                                          |                                                   |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                                       |                           |
|----------|-------|------------------------------------|-------------------------------------|-------------------------------------------------|-------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|---------------------------------------|---------------------------|
|          |       |                                    |                                     |                                                 |                         | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops | Total Hazard <sup>3</sup> |
| 2        | 2-5   | Solutions Way                      | Forested corridor adjacent to river | Forest                                          | Reach 2 - Extent 3      | 0.2                                                   | 0.3                                         | 0.05                                        | 65                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 75                        |
|          |       | Meadows, Eugene & Mary             | --                                  | Forest                                          | Reach 2 - Extent 3      | N/A                                                   | --                                          | 0.05                                        | 65                                                       | 69                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 144                       |
|          |       | Wood, L E Jr                       | --                                  | Pasture/Hay/Forest                              | Reach 2 - Extent 3      | 0.1                                                   | --                                          | 0.05                                        | 65                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 75                        |
|          |       | Argenbright, Harold or Deborah     | --                                  | Pasture/Hay                                     | Reach 2 - Extent 2      | 0.1                                                   | --                                          | 0.05                                        | 65                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 75                        |
|          |       | Shifflett, Floyd                   | --                                  | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 0.2                                                   | 0.3                                         | 0.05                                        | 65                                                       | 40                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 115                       |
|          |       | McDaniel, Lloyd or Dreama          | --                                  | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 0.2                                                   | --                                          | 0.05                                        | 65                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 75                        |
|          |       | Holsinger Farms LLC                | Reach 2 portion                     | Pasture/Hay/Forest                              | Holsigner               | 0.05                                                  | --                                          | 0.05                                        | 65                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 75                        |
|          |       | Reach 2 Surrogate                  | --                                  | Pasture/Hay                                     | Reach 2 - Extent 2-3    | 0.1                                                   | --                                          | 0.05                                        | 65                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 75                        |
| 3        | 5-10  | Schlappi                           | --                                  | Pasture/Hay/Forest                              | Reach 3 - Extent 1      | N/A                                                   | --                                          | 0.1                                         | 182                                                      | 8.4                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 200                       |
|          |       | Hatton Jerry or Mary               | --                                  | Cultivated Crops, Pature/Hay                    | Reach 3 - Extent 1      | 0.1                                                   | --                                          | 0.1                                         | 182                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 191                       |
|          |       | Holloway Howard or Edith           | --                                  | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2      | 0.08                                                  | --                                          | 0.1                                         | 182                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 191                       |
|          |       | Yount Joseph                       | --                                  | Forest                                          | Yount                   | 0.2                                                   | --                                          | 0.1                                         | 182                                                      | 91                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 283                       |
|          |       |                                    | --                                  | Pasture/Hay, Cultivated Crops                   | Yount                   | 0.07                                                  | --                                          | 0.1                                         | 182                                                      | 91                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 283                       |
|          |       | Wertman Charles F or Delores K     | --                                  | Forest, Pasture/Hay                             | Reach 3 - Extent 5      | 0.07                                                  | --                                          | 0.1                                         | 182                                                      | 67                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 259                       |
|          |       | Ambler Tamara                      | --                                  | Forest                                          | Reach 3 - Extent 5      | 0.2                                                   | --                                          | 0.1                                         | 182                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 191                       |
|          |       | Reach 3 Surrogate                  | 2-Yr Forest                         | Forest                                          | Reach 3 - Extent 1      | 0.1                                                   | --                                          | 0.1                                         | 182                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 191                       |
| 4        | 10-16 | Augusta Park Crimora               | --                                  | Open Space (Park), Wetland                      | Augusta Park Crimora    | 0.1                                                   | 0.1                                         | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Shifflett Roger or Sharon          | --                                  | Cultivated Crops, Pasture/Hay                   | Reach 4 - Extent 6      | 0.4                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Augusta Forestry Center            | Parcel-Wide                         | Cultivated Crops, Forest, Wetland               | Augusta Forestry Center | 0.2                                                   | 0.2                                         | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       |                                    | 2-yr                                | Cultivated Crops, Forest, Wetland               | Augusta Forestry Center | 0.2                                                   | 0.2                                         | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       |                                    | 5-yr/62-yr                          | Cultivated Crops, Forest, Wetland               | Augusta Forestry Center | 0.03                                                  | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Patterson Crawford S               | --                                  | Pasture/Hay                                     | Reach 4 - Extent 8      | 0.2                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Freed Carl                         | Parcel-Wide                         | Forest, Pasture/Hay                             | Freed/Harris            | 0.06                                                  | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       |                                    | Forested Portion                    | Forest                                          | Freed/Harris            | 0.1                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Thompson Guy                       | --                                  | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9      | 0.04                                                  | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | EJS Weyers Caves LLC               | --                                  | Forest                                          | Reach 4 - Extent 10     | 0.1                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Thumps Up LLC                      | --                                  | Forest, Pasture/Hay, Wetlands                   | Thumps Up               | 0.08                                                  | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Kaminski Joseph                    | --                                  | Forest                                          | Reach 4 - Extent 11     | 0.1                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Custard William and Amanda Trustee | --                                  | Forest, Pasture/Hay                             | Reach 4 - Extent 11     | 0.1                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |
|          |       | Reach 4 Surrogate                  | --                                  | Forest                                          | Reach 4 - Extent 8 - 10 | 0.1                                                   | --                                          | N/A                                         | 81                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 90                        |

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Former DuPont Waynesboro Plant  
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| Reach ID | RRM   | Property Owner        | Exposure Unit <sup>1</sup> | Land Use                         | Floodplain Soil Map ID | Hypothetical Future Resident (Adult)                  |                                             |                                             |                                                          |                                                   |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                |                                       |                           |
|----------|-------|-----------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------------|---------------------------------------|---------------------------|
|          |       |                       |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops | Total Hazard <sup>3</sup> |
| 5        | 16-20 | Southard LP           | --                         | Forest, Open Space (Boat Launch) | Reach 5 - Extent 12    | 0.1                                                   | --                                          | N/A                                         | 113                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 122                       |
|          |       | Kalimon John          | --                         | Forest, Pasture/Hay, Wetlands    | Reach 5 - Extent 13    | 0.3                                                   | --                                          | N/A                                         | 113                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 123                       |
|          |       | Hill Thomas           | --                         | Forest, Pasture/Hay              | Reach 5 - Extent 13    | 0.06                                                  | --                                          | N/A                                         | 113                                                      | 54                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 176                       |
|          |       | South River Farms LLC | --                         | Pasture/Hay                      | Reach 5 - Extent 14-15 | 0.1                                                   | --                                          | N/A                                         | 113                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 122                       |
| 6        | 20-25 | Park at Grand Cavern  | --                         | Forest, Open Space (Park)        | Park at Grand Cavern   | 0.04                                                  | --                                          | 0.03                                        | 72                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 81                        |
|          |       | Cave Hill LLC         | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 16    | 0.1                                                   | --                                          | 0.03                                        | 72                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 81                        |
|          |       | Grottoes Town Park    | --                         | Forest, Open Space (Park)        | Grottoes Town Park     | 0.1                                                   | --                                          | 0.03                                        | 72                                                       | 65                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 146                       |
|          |       | Groah William J       | --                         | Forest, Pasture/Hay              | Reach 6 - Extent 18    | 0.04                                                  | --                                          | 0.03                                        | 72                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 81                        |
|          |       | Swope Francis         | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 19    | 0.06                                                  | --                                          | 0.03                                        | 72                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 81                        |
|          |       | Bowman Patricia       | --                         | Forest                           | Reach 6 - Extent 19    | 0.09                                                  | --                                          | 0.03                                        | 72                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 81                        |
|          |       | KNK (Brenneman)       | --                         | Forest, Open Space (Residential) | Reach 6 - Extent 19    | 0.09                                                  | --                                          | 0.03                                        | 72                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                           | 1.7                                   | 81                        |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Results from Americast-Parcel-Wide can be applied as a surrogate for the forested portion of the property upstream of this area to 2nd Street Bridge. Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-10 - Summary of Risk Characterization Calculations, Hypothetical Future Resident  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner                         | Exposure Unit <sup>1</sup>            | Land Use                           | Floodplain Soil Map ID | Hypothetical Future Resident (Child)                  |                                             |                                             |                                                          |                                                   |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                              |                                       |                           |
|----------|-------|----------------------------------------|---------------------------------------|------------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------|---------------------------------------|---------------------------|
|          |       |                                        |                                       |                                    |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer-Liver), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops | Total Hazard <sup>3</sup> |
| 1        | 0.5-2 | DuPont                                 | --                                    | Plant Parking Lot                  | Reach 1 - Extent 8     | 0.3                                                   | N/A                                         | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 50                        |
|          |       | City of Waynesboro - Constitution Park | Park-Wide                             | Park                               | Reach 1 - Extent 8     | 1.4                                                   | 1.2                                         | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 53                        |
|          |       |                                        | Soccer Field/Arboretum                | Park                               | Reach 1 - Extent 8     | 6.2                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 56                        |
|          |       |                                        | Pavilion/Paved Greenway               | Park                               | Reach 1 - Extent 8     | 0.6                                                   | 1.2                                         | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 52                        |
|          |       |                                        | Pavilion North of West Main Street    | Park                               | Reach 1 - Extent 8     | 2.7                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 53                        |
|          |       | City of Waynesboro                     | --                                    | Open Space - Commercial            | Reach 1 - Extent 8     | 1.4                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       | Bottom Alley (Hopeman Brothers)        | Parcel-Wide                           | Forest - Commercial/Industrial     | Reach 1 - Extent 7     | 3.8                                                   | N/A                                         | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 54                        |
|          |       |                                        | Forested Portion                      | Forest - Commercial/Industrial     | Reach 1 - Extent 7     | 4.7                                                   | N/A                                         | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 55                        |
|          |       | Various                                | Greenway                              | Open Space                         | Reach 1 - Extent 7     | 3.5                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 54                        |
|          |       | Augusta Lumber LLC                     | --                                    | Developed/High Intensity           | Reach 1 - Extent 6     | 1.3                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       | City of Waynesboro - North Park        | Park-Wide                             | Park                               | Reach 1 - Extent 6     | 4.6                                                   | 19                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 74                        |
|          |       |                                        | Wetland Portion Across River          | Open Space                         | Reach 1 - Extent 6     | 2.3                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 52                        |
|          |       |                                        | Ball Field                            | Park                               | Reach 1 - Extent 6     | 0.6                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       |                                        | Northern Perimeter/Basketball Court   | Park                               | Reach 1 - Extent 6     | 9                                                     | 19                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 78                        |
|          |       |                                        | Parking Lot/Pavilion/Playground       | Park                               | Reach 1 - Extent 6     | 0.6                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       |                                        | Open Space/VolleyBall Court           | Park                               | Reach 1 - Extent 6     | N/A                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 50                        |
|          |       |                                        | Forested Area/Greenway                | Park                               | Reach 1 - Extent 6     | 3.5                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 54                        |
|          |       | Americast Inc (Allied Ready Mix)       | Parcel-Wide                           | Forest (Oxbow) / Former Motorcross | Reach 1 - Extent 5     | 9.5                                                   | 23                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 82                        |
|          |       |                                        | Forested Portion adjacent to facility | Forest                             | Reach 1 - Extent 5     | 7.4                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 57                        |
|          |       |                                        | Former Motorcross                     | Forest/Former Motorcross           | Reach 1 - Extent 5     | 4.7                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 55                        |
|          |       |                                        | East of Oxbow                         | Forest (Oxbow)                     | Reach 1 - Extent 5     | 8.2                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 58                        |
|          |       |                                        | South of Oxbow                        | Forest (Oxbow)                     | Reach 1 - Extent 5     | 5.7                                                   | N/A                                         | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 56                        |
|          |       |                                        | North of Oxbow                        | Forest (Oxbow)                     | Reach 1 - Extent 5     | 41                                                    | 23                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 114                       |
|          |       | City of Waynesboro - Basic Park        | Park-Wide                             | Park                               | Reach 1 - Extent 4     | 0.8                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       |                                        | Oxbow                                 | Park                               | Reach 1 - Extent 4     | 1.1                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       |                                        | Park                                  | Park                               | Reach 1 - Extent 4     | 0.9                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 51                        |
|          |       |                                        | Forested Area East of Park            | Park                               | Reach 1 - Extent 4     | N/A                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 50                        |
|          |       | MTECH Group                            | --                                    | Forest-Commercial/Industrial       | Reach 1 - Extent 4     | 1.5                                                   | --                                          | N/A                                         | 41                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 52                        |

Table 6-10 - Summary of Risk Characterization Calculations, Hypothetical Future Resident  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner                     | Exposure Unit <sup>1</sup>          | Land Use                                        | Floodplain Soil Map ID  | Hypothetical Future Resident (Child)                  |                                             |                                             |                                                          |                                                   |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                              |                                       |                           |
|----------|-------|------------------------------------|-------------------------------------|-------------------------------------------------|-------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------|---------------------------------------|---------------------------|
|          |       |                                    |                                     |                                                 |                         | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer-Liver), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops | Total Hazard <sup>3</sup> |
| 2        | 2-5   | Solutions Way                      | Forested corridor adjacent to river | Forest                                          | Reach 2 - Extent 3      | 1.8                                                   | 2.5                                         | 0.2                                         | 60                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 74                        |
|          |       | Meadows, Eugene & Mary             | --                                  | Forest                                          | Reach 2 - Extent 3      | N/A                                                   | --                                          | 0.2                                         | 60                                                       | 64                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 133                       |
|          |       | Wood, L E Jr                       | --                                  | Pasture/Hay/Forest                              | Reach 2 - Extent 3      | 1.2                                                   | --                                          | 0.2                                         | 60                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 71                        |
|          |       | Argenbright, Harold or Deborah     | --                                  | Pasture/Hay                                     | Reach 2 - Extent 2      | 0.9                                                   | --                                          | 0.2                                         | 60                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 71                        |
|          |       | Shifflett, Floyd                   | --                                  | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 2.0                                                   | 2.4                                         | 0.2                                         | 60                                                       | 37                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 111                       |
|          |       | McDaniel, Lloyd or Dreama          | --                                  | Pasture/Hay/Forest                              | Reach 2 - Extent 2      | 1.4                                                   | --                                          | 0.2                                         | 60                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 71                        |
|          |       | Holsinger Farms LLC                | Reach 2 portion                     | Pasture/Hay/Forest                              | Holsigner               | 0.45                                                  | --                                          | 0.2                                         | 60                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 70                        |
|          |       | Reach 2 Surrogate                  | --                                  | Pasture/Hay                                     | Reach 2 - Extent 2-3    | 1.1                                                   | --                                          | 0.2                                         | 60                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 71                        |
| 3        | 5-10  | Schlappi                           | --                                  | Pasture/Hay/Forest                              | Reach 3 - Extent 1      | N/A                                                   | --                                          | 0.5                                         | 167                                                      | 7.7                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 184                       |
|          |       | Hatton Jerry or Mary               | --                                  | Cultivated Crops, Pature/Hay                    | Reach 3 - Extent 1      | 0.8                                                   | --                                          | 0.5                                         | 167                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 177                       |
|          |       | Holloway Howard or Edith           | --                                  | Cultivated Crops, Forest,Pature/Hay,Wetlands    | Reach 3 - Extent 2      | 0.7                                                   | --                                          | 0.5                                         | 167                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 177                       |
|          |       | Yount Joseph                       | --                                  | Forest                                          | Yount                   | 1.4                                                   | --                                          | 0.5                                         | 167                                                      | 84                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 262                       |
|          |       |                                    | --                                  | Pasture/Hay, Cultivated Crops                   | Yount                   | 0.6                                                   | --                                          | 0.5                                         | 167                                                      | 84                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 261                       |
|          |       | Wertman Charles F or Delores K     | --                                  | Forest, Pasture/Hay                             | Reach 3 - Extent 5      | 0.7                                                   | --                                          | 0.5                                         | 167                                                      | 62                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 239                       |
|          |       | Ambler Tamara                      | --                                  | Forest                                          | Reach 3 - Extent 5      | 2.0                                                   | --                                          | 0.5                                         | 167                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 179                       |
|          |       | Reach 3 Surrogate                  | 2-Yr Forest                         | Forest                                          | Reach 3 - Extent 1      | 1.3                                                   | --                                          | 0.5                                         | 167                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 178                       |
| 4        | 10-16 | Augusta Park Crimora               | --                                  | Open Space (Park), Wetland                      | Augusta Park Crimora    | 1.1                                                   | 0.9                                         | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 85                        |
|          |       | Shifflett Roger or Sharon          | --                                  | Cultivated Crops, Pasture/Hay                   | Reach 4 - Extent 6      | 3.3                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 87                        |
|          |       | Augusta Forestry Center            | Parcel-Wide                         | Cultivated Crops, Forest, Wetland               | Augusta Forestry Center | 1.4                                                   | 1.7                                         | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 86                        |
|          |       |                                    | 2-yr                                | Cultivated Crops, Forest, Wetland               | Augusta Forestry Center | 1.5                                                   | 1.7                                         | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 87                        |
|          |       |                                    | 5-yr/62-yr                          | Cultivated Crops, Forest, Wetland               | Augusta Forestry Center | 0.2                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       | Patterson Crawford S               | --                                  | Pasture/Hay                                     | Reach 4 - Extent 8      | 2.1                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 85                        |
|          |       | Freed Carl                         | Parcel-Wide                         | Forest, Pasture/Hay                             | Freed/Harris            | 0.5                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       |                                    | Forested Portion                    | Forest                                          | Freed/Harris            | 1.3                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 85                        |
|          |       | Thompson Guy                       | --                                  | Cultivated Crops, Pasture/Hay, Forest, Wetlands | Reach 4 - Extent 9      | 0.4                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       | EJS Weyers Caves LLC               | --                                  | Forest                                          | Reach 4 - Extent 10     | 1.0                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       | Thumps Up LLC                      | --                                  | Forest, Pasture/Hay, Wetlands                   | Thumps Up               | 0.7                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       | Kaminski Joseph                    | --                                  | Forest                                          | Reach 4 - Extent 11     | 1.1                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       | Custard William and Amanda Trustee | --                                  | Forest, Pasture/Hay                             | Reach 4 - Extent 11     | 1.0                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |
|          |       | Reach 4 Surrogate                  | --                                  | Forest                                          | Reach 4 - Extent 8 - 10 | 1.0                                                   | --                                          | N/A                                         | 74                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 84                        |

Table 6-10 - Summary of Risk Characterization Calculations, Hypothetical Future Resident  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner        | Exposure Unit <sup>1</sup> | Land Use                         | Floodplain Soil Map ID | Hypothetical Future Resident (Child)                  |                                             |                                             |                                                          |                                                   |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                              |                                       |                           |
|----------|-------|-----------------------|----------------------------|----------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------|---------------------------------------|---------------------------|
|          |       |                       |                            |                                  |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer-Liver), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops | Total Hazard <sup>3</sup> |
| 5        | 16-20 | Southard LP           | --                         | Forest, Open Space (Boat Launch) | Reach 5 - Extent 12    | 1.0                                                   | --                                          | N/A                                         | 104                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 114                       |
|          |       | Kalimon John          | --                         | Forest, Pasture/Hay, Wetlands    | Reach 5 - Extent 13    | 2.5                                                   | --                                          | N/A                                         | 104                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 116                       |
|          |       | Hill Thomas           | --                         | Forest, Pasture/Hay              | Reach 5 - Extent 13    | 0.5                                                   | --                                          | N/A                                         | 104                                                      | 49                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 163                       |
|          |       | South River Farms LLC | --                         | Pasture/Hay                      | Reach 5 - Extent 14-15 | 1.2                                                   | --                                          | N/A                                         | 104                                                      | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 114                       |
| 6        | 20-25 | Park at Grand Cavern  | --                         | Forest, Open Space (Park)        | Park at Grand Cavern   | 0.3                                                   | --                                          | 0.1                                         | 66                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 76                        |
|          |       | Cave Hill LLC         | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 16    | 1.1                                                   | --                                          | 0.1                                         | 66                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 77                        |
|          |       | Grottoes Town Park    | --                         | Forest, Open Space (Park)        | Grottoes Town Park     | 1.0                                                   | --                                          | 0.1                                         | 66                                                       | 59                                                | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 136                       |
|          |       | Groah William J       | --                         | Forest, Pasture/Hay              | Reach 6 - Extent 18    | 0.3                                                   | --                                          | 0.1                                         | 66                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 76                        |
|          |       | Swope Francis         | --                         | Forest, Pasture/Hay, Wetlands    | Reach 6 - Extent 19    | 0.5                                                   | --                                          | 0.1                                         | 66                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 76                        |
|          |       | Bowman Patricia       | --                         | Forest                           | Reach 6 - Extent 19    | 0.8                                                   | --                                          | 0.1                                         | 66                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 76                        |
|          |       | KNK (Brenneman)       | --                         | Forest, Open Space (Residential) | Reach 6 - Extent 19    | 0.8                                                   | --                                          | 0.1                                         | 66                                                       | N/A                                               | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.12                                                         | 1.7                                   | 76                        |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Results from Americast-Forested Portion Adjacent to the Facility can be applied as a surrogated for the forested portion of the proj  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>        | Land Use                                              | Floodplain<br>Soil Map ID | Hypothetical Future Subsistence Farmer (Adult)              |                                                   |                                                      |                                                                |                                                                        |                                                                         |                                                                              |                                                                                 |                                                                                      |                                                                    |                                                                                      |                                                                               |                                                                             |                                                                        |
|----------|-------|------------------------------------|-------------------------------------------------------|---------------------------|-------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------|
|          |       |                                    |                                                       |                           | Hazard from<br>Surface Soil<br>(Ing, Der, Inh) <sup>2</sup> | Hazard from<br>Subsurface Soil<br>(Ing, Der, Inh) | Hazard from<br>South River<br>Sediment<br>(Ing, Der) | Hazard from<br>South River Fish<br>Ingestion, 90 <sup>th</sup> | Hazard from<br>Floodplain Area<br>Pond Fish (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Mallard), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Wood Duck),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Canada Goose),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Weighted-<br>Species), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Game<br>(Deer),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock<br>(Beef, Dairy)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Muscle)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Eggs)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Garden Crops<br>(Ing), 90 <sup>th</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary             | Forest                                                | Reach 2 -<br>Extent 3     | N/A                                                         | --                                                | 0.05                                                 | 65                                                             | 69                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Wood, L E Jr                       | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 3     | 0.5                                                         | --                                                | 0.05                                                 | 65                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Argenbright, Harold or Deborah     | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.4                                                         | --                                                | 0.05                                                 | 65                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Shifflett, Floyd                   | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.8                                                         | 1.0                                               | 0.05                                                 | 65                                                             | 40                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | McDaniel, Lloyd or Dreama          | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.6                                                         | --                                                | 0.05                                                 | 65                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Holsinger Farms LLC                | Pasture/Hay/<br>Forest                                | Holsinger                 | 0.2                                                         | --                                                | 0.05                                                 | 65                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Reach 2 Surrogate                  | Pasture/Hay                                           | Reach 2 -<br>Extent 2-3   | 0.5                                                         | --                                                | 0.05                                                 | 65                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
| 3        | 5-10  | Schlappi                           | Pasture/Hay/Forest                                    | Reach 3 -<br>Extent 1     | N/A                                                         | --                                                | 0.11                                                 | 182                                                            | 8.4                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Hatton Jerry or Mary               | Cultivated Crops,<br>Pature/Hay                       | Reach 3 -<br>Extent 1     | 0.3                                                         | --                                                | 0.11                                                 | 182                                                            | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Holloway Howard or Edith           | Cultivated Crops,<br>Forest,Pature/Hay,W<br>etlands   | Reach 3 -<br>Extent 2     | 0.3                                                         | --                                                | 0.11                                                 | 182                                                            | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Yount Joseph                       | Forest                                                | Yount                     | 0.6                                                         | --                                                | 0.11                                                 | 182                                                            | 91                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       |                                    | Cultivated Crops,<br>Pasture/Hay                      | Yount                     | 0.3                                                         | --                                                | 0.11                                                 | 182                                                            | 91                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Wertman Charles F or Delores K     | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 5     | 0.3                                                         | --                                                | 0.11                                                 | 182                                                            | 67                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Reach 3 Surrogate                  | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 1 - 2 | 0.5                                                         | --                                                | 0.11                                                 | 182                                                            | 67                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
| 4        | 10-16 | Shifflett Roger or Sharon          | Cultivated Crops,<br>Pasture/Hay                      | Reach 4 -<br>Extent 6     | 1.1                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Patterson Crawford S               | Pasture/Hay                                           | Reach 4 -<br>Extent 8     | 0.7                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Freed Carl (Parcel-Wide)           | Forest, Pasture/Hay                                   | Freed/Harris              | 0.2                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Freed Carl (Forested Portion)      | Forest                                                | Freed/Harris              | 0.4                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Thompson Guy                       | Cultivated Crops,<br>Pasture/Hay,<br>Forest, Wetlands | Reach 4 -<br>Extent 9     | 0.1                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Thumps Up LLC                      | Forest, Pasture/Hay,<br>Wetlands                      | Thumps Up                 | 0.2                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Custard William and Amanda Trustee | Forest, Pasture/Hay                                   | Reach 4 -<br>Extent 11    | 0.3                                                         | --                                                | N/A                                                  | 81                                                             | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
| 5        | 16-20 | Kalimon John                       | Forest, Pasture/Hay,<br>Wetlands                      | Reach 5 -<br>Extent 13    | 0.8                                                         | --                                                | N/A                                                  | 113                                                            | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | Hill Thomas                        | Forest, Pasture/Hay                                   | Reach 5 -<br>Extent 13    | 0.2                                                         | --                                                | N/A                                                  | 113                                                            | 54                                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |
|          |       | South River Farms LLC              | Pasture/Hay                                           | Reach 5 -<br>Extent 14-15 | 0.4                                                         | --                                                | N/A                                                  | 113                                                            | N/A                                                                    | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                               | 0.4                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Hypothetical Future Subsistence Farmer (Adult)        |                                             |                                             |                                                          |                                                               |                                                                |                                                                  |                                                                     |                                                                         |                                                        |                                                                          |                                                                   |                                                                 |                                                               |
|----------|-------|-----------------------------|-------------------------------|------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------|
|          |       |                             |                               |                        | Hazard from Surface Soil (Ing, Der, Inh) <sup>2</sup> | Hazard from Subsurface Soil (Ing, Der, Inh) | Hazard from South River Sediment (Ing, Der) | Hazard from South River Fish Ingestion, 90 <sup>th</sup> | Hazard from Floodplain Area Pond Fish (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Mallard), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Wood Duck), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Canada Goose), 90 <sup>th</sup> | Hazard from Ingestion of Waterfowl (Weighted-Species), 90 <sup>th</sup> | Hazard from Ingestion of Game (Deer), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef, Dairy) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Muscle) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Eggs) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Garden Crops (Ing), 90 <sup>th</sup> |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 0.1                                                   | --                                          | 0.03                                        | 72                                                       | N/A                                                           | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 0.2                                                   | --                                          | 0.03                                        | 72                                                       | N/A                                                           | 18                                                             | 3.1                                                              | 1.0                                                                 | 7.4                                                                     | 0.03                                                   | 0.4                                                                      | 0.2                                                               | 1.4                                                             | 1.8                                                           |

**Footnotes:**

1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.

Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam

Reach 3 Surrogate results apply to the following properties: McDonough and Meadows

Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller

Results from Custard property to be applied as a surrogate to the Brandon property

2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

3 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>        | Land Use                                              | Floodplain<br>Soil Map ID | Hypothetical Future Subsistence Farmer (Adult) |                                                                         |                                                                                       |                                                                                        |                                                                                       |                                                                              |                                                                                |                                       |                                       |
|----------|-------|------------------------------------|-------------------------------------------------------|---------------------------|------------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|
|          |       |                                    |                                                       |                           | Total Hazard<br><i>A</i> <sup>3</sup>          | Hazard from<br>Ingestion of<br>Game (Deer -<br>Liver), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Liver) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Kidney) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Heart) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Liver)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Gizzard)<br>(Ing), 90 <sup>th</sup> | Total Hazard<br><i>B</i> <sup>3</sup> | Total<br>Hazard<br>(A+B) <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary             | Forest                                                | Reach 2 -<br>Extent 3     | 144                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 189                                   |
|          |       | Wood, L E Jr                       | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 3     | 75                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 120                                   |
|          |       | Argenbright, Harold or Deborah     | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 75                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 120                                   |
|          |       | Shifflett, Floyd                   | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 117                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44.4                                  | 161                                   |
|          |       | McDaniel, Lloyd or Dreama          | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 76                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 120                                   |
|          |       | Holsinger Farms LLC                | Pasture/Hay/<br>Forest                                | Holsinger                 | 75                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 120                                   |
|          |       | Reach 2 Surrogate                  | Pasture/Hay                                           | Reach 2 -<br>Extent 2-3   | 75                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 120                                   |
| 3        | 5-10  | Schlappi                           | Pasture/Hay/Forest                                    | Reach 3 -<br>Extent 1     | 200                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 244                                   |
|          |       | Hatton Jerry or Mary               | Cultivated Crops,<br>Pature/Hay                       | Reach 3 -<br>Extent 1     | 192                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 236                                   |
|          |       | Holloway Howard or Edith           | Cultivated Crops,<br>Forest,Pature/Hay,W<br>etlands   | Reach 3 -<br>Extent 2     | 192                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 236                                   |
|          |       | Yount Joseph                       | Forest                                                | Yount                     | 283                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 328                                   |
|          |       |                                    | Cultivated Crops,<br>Pasture/Hay                      | Yount                     | 283                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 327                                   |
|          |       | Wertman Charles F or Delores K     | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 5     | 259                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 303                                   |
|          |       | Reach 3 Surrogate                  | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 1 - 2 | 259                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 304                                   |
| 4        | 10-16 | Shifflett Roger or Sharon          | Cultivated Crops,<br>Pasture/Hay                      | Reach 4 -<br>Extent 6     | 91                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 135                                   |
|          |       | Patterson Crawford S               | Pasture/Hay                                           | Reach 4 -<br>Extent 8     | 91                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 135                                   |
|          |       | Freed Carl (Parcel-Wide)           | Forest, Pasture/Hay                                   | Freed/Harris              | 90                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 135                                   |
|          |       | Freed Carl (Forested Portion)      | Forest                                                | Freed/Harris              | 90                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 135                                   |
|          |       | Thompson Guy                       | Cultivated Crops,<br>Pasture/Hay,<br>Forest, Wetlands | Reach 4 -<br>Extent 9     | 90                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 134                                   |
|          |       | Thumps Up LLC                      | Forest, Pasture/Hay,<br>Wetlands                      | Thumps Up                 | 90                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 135                                   |
|          |       | Custard William and Amanda Trustee | Forest, Pasture/Hay                                   | Reach 4 -<br>Extent 11    | 90                                             | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 135                                   |
| 5        | 16-20 | Kalimon John                       | Forest, Pasture/Hay,<br>Wetlands                      | Reach 5 -<br>Extent 13    | 123                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 168                                   |
|          |       | Hill Thomas                        | Forest, Pasture/Hay                                   | Reach 5 -<br>Extent 13    | 176                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 220                                   |
|          |       | South River Farms LLC              | Pasture/Hay                                           | Reach 5 -<br>Extent 14-15 | 123                                            | 0.1                                                                     | 6.5                                                                                   | 12                                                                                     | 0.1                                                                                   | 19                                                                           | 6.6                                                                            | 44                                    | 167                                   |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                      | Floodplain Soil Map ID | Hypothetical Future Subsistence Farmer (Adult) |                                                                |                                                                           |                                                                            |                                                                           |                                                                  |                                                                    |                             |                                 |
|----------|-------|-----------------------------|-------------------------------|------------------------|------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------|---------------------------------|
|          |       |                             |                               |                        | Total Hazard A <sup>3</sup>                    | Hazard from Ingestion of Game (Deer - Liver), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef - Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef - Kidney) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Livestock (Beef - Heart) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Liver) (Ing), 90 <sup>th</sup> | Hazard from Ingestion of Poultry (Gizzard) (Ing), 90 <sup>th</sup> | Total Hazard B <sup>3</sup> | Total Hazard (A+B) <sup>3</sup> |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay           | Reach 6 - Extent 18    | 82                                             | 0.1                                                            | 6.5                                                                       | 12                                                                         | 0.1                                                                       | 19                                                               | 6.6                                                                | 44                          | 126                             |
|          |       | Swope Francis               | Forest, Pasture/Hay, Wetlands | Reach 6 - Extent 19    | 82                                             | 0.1                                                            | 6.5                                                                       | 12                                                                         | 0.1                                                                       | 19                                                               | 6.6                                                                | 44                          | 126                             |

**Footnotes:**

1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.

Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam

Reach 3 Surrogate results apply to the following properties: McDonough and Meadows

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Results from Custard property to be applied as a surrogate to the Brandon property

2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.

3 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**

HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).

HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.

Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation

90th -Intake calculated using the 90th percentile ingestion rate

mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>        | Land Use                                              | Floodplain<br>Soil Map ID | Hypothetical Future Subsistence Farmer (Child)              |                                                   |                                                      |                                                                   |                                                         |                                                                         |                                                                              |                                                                                 |                                                                                      |                                                                 |                                                                                      |                                                                               |                                                                             |                                                                        |     | Total Hazard<br>A <sup>3</sup> |
|----------|-------|------------------------------------|-------------------------------------------------------|---------------------------|-------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------|-----|--------------------------------|
|          |       |                                    |                                                       |                           | Hazard from<br>Surface Soil<br>(Ing, Der, Inh) <sup>2</sup> | Hazard from<br>Subsurface Soil<br>(Ing, Der, Inh) | Hazard from<br>South River<br>Sediment<br>(Ing, Der) | Hazard from<br>South River<br>Fish Ingestion,<br>90 <sup>th</sup> | Floodplain<br>Area Pond Fish<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Mallard), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Wood Duck),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Canada<br>Goose), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Weighted-<br>Species), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Game (Deer),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock<br>(Beef, Dairy)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Muscle)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Eggs)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Garden Crops<br>(Ing), 90 <sup>th</sup> |     |                                |
| 2        | 2-5   | Meadows, Eugene & Mary             | Forest                                                | Reach 2 -<br>Extent 3     | N/A                                                         | --                                                | 0.2                                                  | 60                                                                | 64                                                      | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 135 |                                |
|          |       | Wood, L E Jr                       | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 3     | 1.2                                                         | --                                                | 0.2                                                  | 60                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 73  |                                |
|          |       | Argenbright, Harold or Deborah     | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.9                                                         | --                                                | 0.2                                                  | 60                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 73  |                                |
|          |       | Shifflett, Floyd                   | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 2.0                                                         | 2.4                                               | 0.2                                                  | 60                                                                | 37                                                      | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 113 |                                |
|          |       | McDaniel, Lloyd or Dreama          | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 1.4                                                         | --                                                | 0.2                                                  | 60                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 73  |                                |
|          |       | Holsinger Farms LLC                | Pasture/Hay/<br>Forest                                | Holsinger                 | 0.4                                                         | --                                                | 0.2                                                  | 60                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 72  |                                |
|          |       | Reach 2 Surrogate                  | Pasture/Hay                                           | Reach 2 -<br>Extent 2-3   | 1.1                                                         | --                                                | 0.2                                                  | 60                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 73  |                                |
| 3        | 5-10  | Schlappi                           | Pasture/Hay/Forest                                    | Reach 3 -<br>Extent 1     | N/A                                                         | --                                                | 0.5                                                  | 167                                                               | 7.7                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 186 |                                |
|          |       | Hatton Jerry or Mary               | Cultivated Crops,<br>Pature/Hay                       | Reach 3 -<br>Extent 1     | 0.8                                                         | --                                                | 0.5                                                  | 167                                                               | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 180 |                                |
|          |       | Holloway Howard or Edith           | Cultivated Crops,<br>Forest,Pature/Hay,W<br>etlands   | Reach 3 -<br>Extent 2     | 0.7                                                         | --                                                | 0.5                                                  | 167                                                               | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 179 |                                |
|          |       | Yount Joseph                       | Forest                                                | Yount                     | 1.4                                                         | --                                                | 0.5                                                  | 167                                                               | 84                                                      | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 264 |                                |
|          |       |                                    | Cultivated Crops,<br>Pasture/Hay                      | Yount                     | 1.4                                                         | --                                                | 0.5                                                  | 167                                                               | 84                                                      | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 264 |                                |
|          |       | Wertman Charles F or Delores K     | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 5     | 0.7                                                         | --                                                | 0.5                                                  | 167                                                               | 62                                                      | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 241 |                                |
|          |       | Reach 3 Surrogate                  | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 1 - 2 | 1.3                                                         | --                                                | 0.5                                                  | 167                                                               | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 180 |                                |
| 4        | 10-16 | Shifflett Roger or Sharon          | Cultivated Crops,<br>Pasture/Hay                      | Reach 4 -<br>Extent 6     | 3.3                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 89  |                                |
|          |       | Patterson Crawford S               | Pasture/Hay                                           | Reach 4 -<br>Extent 8     | 2.1                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 87  |                                |
|          |       | Freed Carl (Parcel-Wide)           | Forest, Pasture/Hay                                   | Freed/Harris              | 0.5                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 86  |                                |
|          |       | Freed Carl (Forested Portion)      | Forest                                                | Freed/Harris              | 1.3                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 87  |                                |
|          |       | Thompson Guy                       | Cultivated Crops,<br>Pasture/Hay,<br>Forest, Wetlands | Reach 4 -<br>Extent 9     | 0.4                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 86  |                                |
|          |       | Thumps Up LLC                      | Forest, Pasture/Hay,<br>Wetlands                      | Thumps Up                 | 0.7                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 86  |                                |
|          |       | Custard William and Amanda Trustee | Forest, Pasture/Hay                                   | Reach 4 -<br>Extent 11    | 1.0                                                         | --                                                | N/A                                                  | 74                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 86  |                                |
| 5        | 16-20 | Kalimon John                       | Forest, Pasture/Hay,<br>Wetlands                      | Reach 5 -<br>Extent 13    | 2.5                                                         | --                                                | N/A                                                  | 104                                                               | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 118 |                                |
|          |       | Hill Thomas                        | Forest, Pasture/Hay                                   | Reach 5 -<br>Extent 13    | 0.5                                                         | --                                                | N/A                                                  | 104                                                               | 49                                                      | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 165 |                                |
|          |       | South River Farms LLC              | Pasture/Hay                                           | Reach 5 -<br>Extent 14-15 | 1.2                                                         | --                                                | N/A                                                  | 104                                                               | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 116 |                                |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer

Human Health Risk Assessment Report, Area of Concern (AOC) 4

Former DuPont Waynesboro Plant

Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                         | Floodplain<br>Soil Map ID | Hypothetical Future Subsistence Farmer (Child)              |                                                   |                                                      |                                                                   |                                                         |                                                                         |                                                                              |                                                                                 |                                                                                      |                                                                 |                                                                                      |                                                                               |                                                                             |                                                                        |                                |
|----------|-------|-----------------------------|----------------------------------|---------------------------|-------------------------------------------------------------|---------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------|
|          |       |                             |                                  |                           | Hazard from<br>Surface Soil<br>(Ing, Der, Inh) <sup>2</sup> | Hazard from<br>Subsurface Soil<br>(Ing, Der, Inh) | Hazard from<br>South River<br>Sediment<br>(Ing, Der) | Hazard from<br>South River<br>Fish Ingestion,<br>90 <sup>th</sup> | Floodplain<br>Area Pond Fish<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Mallard), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Wood Duck),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Canada<br>Goose), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Waterfowl<br>(Weighted-<br>Species), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Game (Deer),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock<br>(Beef, Dairy)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Muscle)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Eggs)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Garden Crops<br>(Ing), 90 <sup>th</sup> | Total Hazard<br>A <sup>3</sup> |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay              | Reach 6 -<br>Extent 18    | 0.3                                                         | --                                                | 0.1                                                  | 66                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 78                             |
|          |       | Swope Francis               | Forest, Pasture/Hay,<br>Wetlands | Reach 6 -<br>Extent 19    | 0.5                                                         | --                                                | 0.1                                                  | 66                                                                | N/A                                                     | 18                                                                      | 3.1                                                                          | 1.0                                                                             | 7.4                                                                                  | 0.03                                                            | 0.6                                                                                  | 0.2                                                                           | 1.4                                                                         | 1.8                                                                    | 78                             |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
Reach 4 Surrogate results apply to the following properties: Gochenour, Johnston, William Shaver, Edward Shaver and Reinmiller  
Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup>        | Land Use                                              | Floodplain<br>Soil Map ID | Hypothetical Future Subsistence Farmer (Child)                          |                                                                                       |                                                                                        |                                                                                       |                                                                              |                                                                                |                                       |                                       |
|----------|-------|------------------------------------|-------------------------------------------------------|---------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|
|          |       |                                    |                                                       |                           | Hazard from<br>Ingestion of<br>Game (Deer -<br>Liver), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Liver) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Kidney) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Heart) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Liver)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Gizzard)<br>(Ing), 90 <sup>th</sup> | Total Hazard<br><i>B</i> <sup>3</sup> | Total<br>Hazard<br>(A+B) <sup>3</sup> |
| 2        | 2-5   | Meadows, Eugene & Mary             | Forest                                                | Reach 2 -<br>Extent 3     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 190                                   |
|          |       | Wood, L E Jr                       | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 3     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 127                                   |
|          |       | Argenbright, Harold or Deborah     | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 127                                   |
|          |       | Shifflett, Floyd                   | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 167                                   |
|          |       | McDaniel, Lloyd or Dreama          | Pasture/Hay/<br>Forest                                | Reach 2 -<br>Extent 2     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 128                                   |
|          |       | Holsinger Farms LLC                | Pasture/Hay/<br>Forest                                | Holsinger                 | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 127                                   |
|          |       | Reach 2 Surrogate                  | Pasture/Hay                                           | Reach 2 -<br>Extent 2-3   | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 127                                   |
| 3        | 5-10  | Schlappi                           | Pasture/Hay/Forest                                    | Reach 3 -<br>Extent 1     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 241                                   |
|          |       | Hatton Jerry or Mary               | Cultivated Crops,<br>Pature/Hay                       | Reach 3 -<br>Extent 1     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 234                                   |
|          |       | Holloway Howard or Edith           | Cultivated Crops,<br>Forest,Pature/Hay,W<br>etlands   | Reach 3 -<br>Extent 2     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 234                                   |
|          |       | Yount Joseph                       | Forest                                                | Yount                     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 318                                   |
|          |       |                                    | Cultivated Crops,<br>Pasture/Hay                      | Yount                     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 318                                   |
|          |       | Wertman Charles F or Delores K     | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 5     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 296                                   |
|          |       | Reach 3 Surrogate                  | Forest, Pasture/Hay                                   | Reach 3 -<br>Extent 1 - 2 | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 234                                   |
| 4        | 10-16 | Shifflett Roger or Sharon          | Cultivated Crops,<br>Pasture/Hay                      | Reach 4 -<br>Extent 6     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 143                                   |
|          |       | Patterson Crawford S               | Pasture/Hay                                           | Reach 4 -<br>Extent 8     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 142                                   |
|          |       | Freed Carl (Parcel-Wide)           | Forest, Pasture/Hay                                   | Freed/Harris              | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 140                                   |
|          |       | Freed Carl (Forested Portion)      | Forest                                                | Freed/Harris              | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 141                                   |
|          |       | Thompson Guy                       | Cultivated Crops,<br>Pasture/Hay,<br>Forest, Wetlands | Reach 4 -<br>Extent 9     | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 140                                   |
|          |       | Thumps Up LLC                      | Forest, Pasture/Hay,<br>Wetlands                      | Thumps Up                 | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 141                                   |
|          |       | Custard William and Amanda Trustee | Forest, Pasture/Hay                                   | Reach 4 -<br>Extent 11    | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 141                                   |
| 5        | 16-20 | Kalimon John                       | Forest, Pasture/Hay,<br>Wetlands                      | Reach 5 -<br>Extent 13    | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 172                                   |
|          |       | Hill Thomas                        | Forest, Pasture/Hay                                   | Reach 5 -<br>Extent 13    | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 219                                   |
|          |       | South River Farms LLC              | Pasture/Hay                                           | Reach 5 -<br>Extent 14-15 | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                                    | 171                                   |

Table 6-11 - Summary of Risk Characterization Calculations, Hypothetical Future Subsistence Farmer  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

| Reach ID | RRM   | Property Owner <sup>1</sup> | Land Use                         | Floodplain<br>Soil Map ID | Hypothetical Future Subsistence Farmer (Child)                          |                                                                                       |                                                                                        |                                                                                       |                                                                              |                                                                                |                                |                                       |
|----------|-------|-----------------------------|----------------------------------|---------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------|---------------------------------------|
|          |       |                             |                                  |                           | Hazard from<br>Ingestion of<br>Game (Deer -<br>Liver), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Liver) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Kidney) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Livestock (Beef<br>- Heart) (Ing),<br>90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Liver)<br>(Ing), 90 <sup>th</sup> | Hazard from<br>Ingestion of<br>Poultry<br>(Gizzard)<br>(Ing), 90 <sup>th</sup> | Total Hazard<br>B <sup>3</sup> | Total<br>Hazard<br>(A+B) <sup>3</sup> |
| 6        | 20-25 | Groah William J             | Forest, Pasture/Hay              | Reach 6 -<br>Extent 18    | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                             | 132                                   |
|          |       | Swope Francis               | Forest, Pasture/Hay,<br>Wetlands | Reach 6 -<br>Extent 19    | 0.1                                                                     | 10                                                                                    | 18                                                                                     | 0.2                                                                                   | 19                                                                           | 6.6                                                                            | 54                             | 133                                   |

**Footnotes:**  
1 - Property identified for further evaluation in Tables 4-11 through 4-15 using decision logic presented in Section 3.2.5 (i.e., concentration in soil greater than SL of 17 mg/kg). Property owner boundaries are designated by a brown outline in the extent maps. Result for surrogate presented herein applies to individual properties detailed in Table 4-17.  
Reach 2 Surrogate results apply to the following properties: Smith, Brand and Lam  
Reach 3 Surrogate results apply to the following properties: McDonough and Meadows  
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Results from Custard property to be applied as a surrogate to the Brandon property  
2 - Hazard shown is total hazard across all routes (ingestion, dermal and inhalation) for the pathway. Individual pathway calculations are provided in Appendix H.  
3 - Total hazard is the sum of hazards across all exposure pathways. Sum uses weighted-species hazard rather than individual waterfowl hazards.

**Notes:**  
HI - Hazard index for noncancer effects. HI should not exceed 1.0 for groups of chemicals that affect the same target organ (VADEQ, 2011).  
HI values are rounded to one significant figure. Hazard indices less than 0.000001 shown as 0.00.  
Ing, Der, Inh - Ingestion, Dermal Contact and Inhalation  
90th -Intake calculated using the 90th percentile ingestion rate  
mean - Intake calculated using the mean ingestion rate

|     |                                                                |
|-----|----------------------------------------------------------------|
| 2   | Exceeds acceptable levels                                      |
| N/A | No COPCs identified and/or pathway incomplete                  |
| --  | Not Available, subsurface soil samples have not been collected |

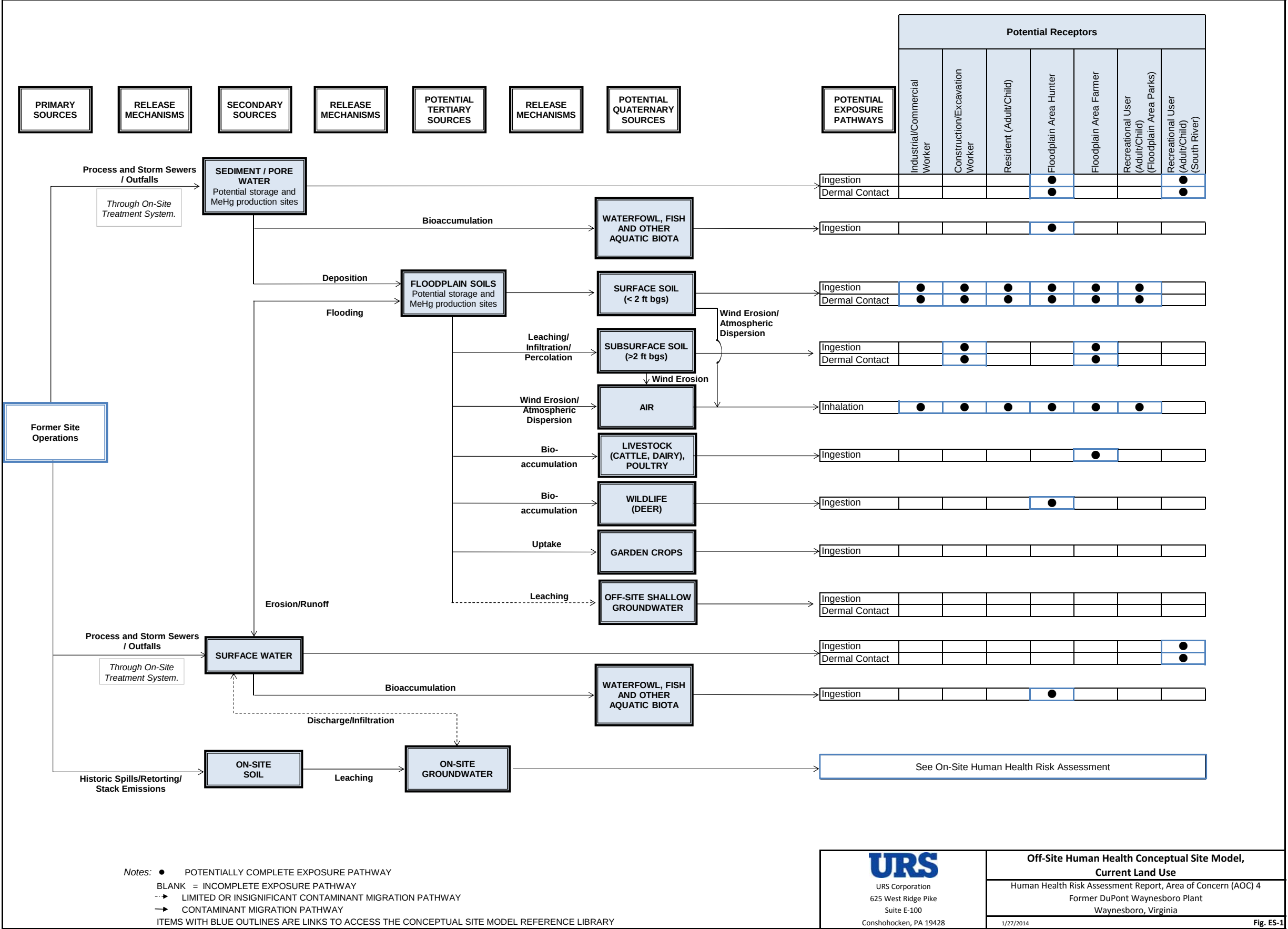
Table 8-1 - Corrective Measure Study Recommendations - AOC 4 Floodplain Soil Areas Identified for Further Evaluation  
Human Health Risk Assessment Report, Area of Concern (AOC) 4  
Former DuPont Waynesboro Plant  
Waynesboro, Virginia

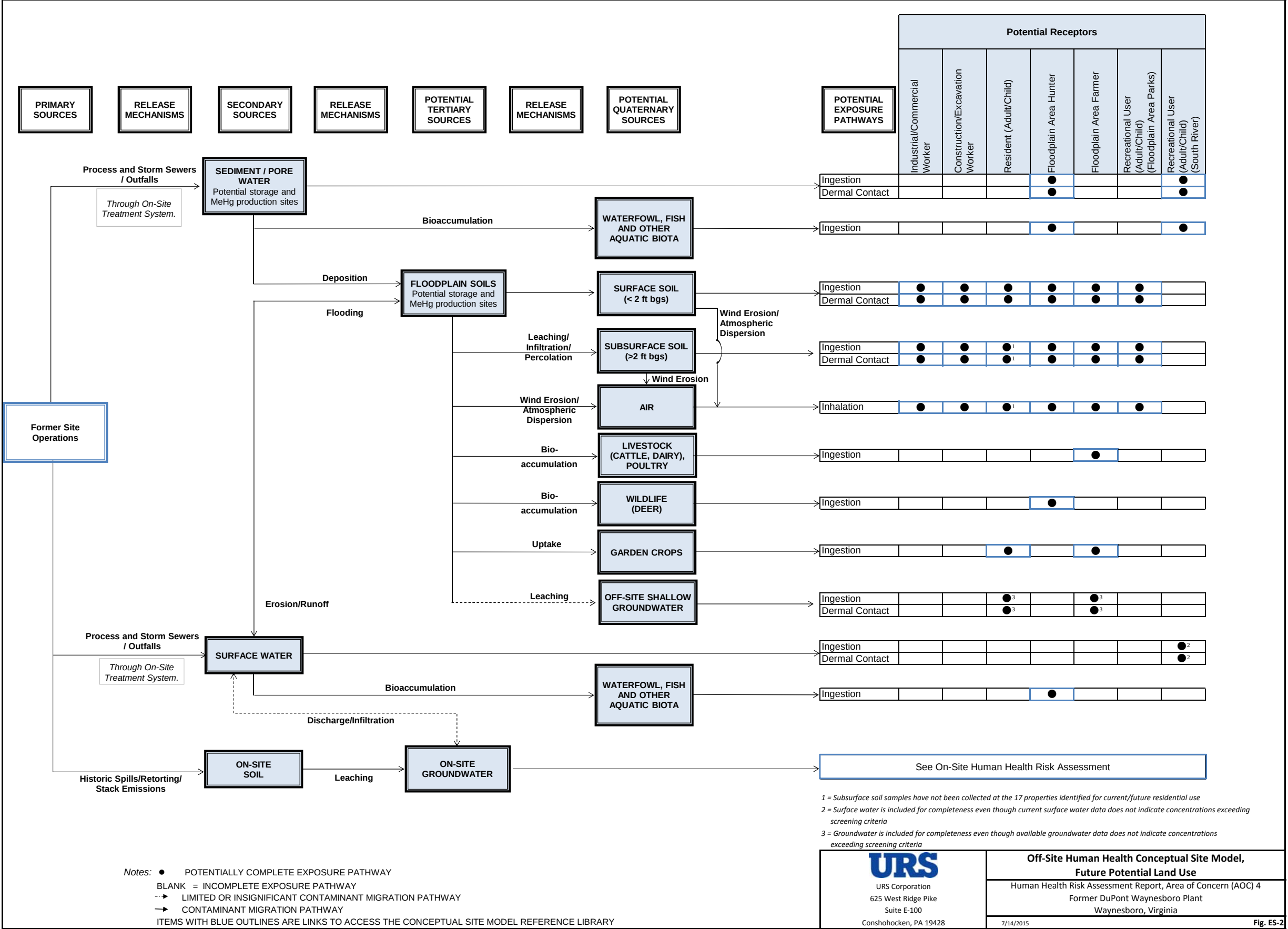
| Reach ID | RRM   | RRM Description | Parcel                                 | Land Use                           | Current/Future Potential Receptors  |                                       |                                                                  |                                            |
|----------|-------|-----------------|----------------------------------------|------------------------------------|-------------------------------------|---------------------------------------|------------------------------------------------------------------|--------------------------------------------|
|          |       |                 |                                        |                                    | Industrial/<br>Commercial<br>Worker | Construction/<br>Excavation<br>Worker | Recreational User<br>(Floodplain Area<br>Parks)<br>(Adult/Child) | Floodplain Area<br>Farmer<br>(Adult/Child) |
| 1        | 0.5-2 | 0.2-0.3         | City of Waynesboro - Constitution Park | Park                               |                                     |                                       | ✓                                                                |                                            |
|          |       | 1-1.3           | City of Waynesboro - North Park        | Park                               |                                     |                                       | ✓                                                                |                                            |
|          |       | 1.4-1.8         | Americast Inc (Allied Ready Mix)       | Forest (Oxbow) / Former Motorcross |                                     | ✓                                     |                                                                  |                                            |
|          |       |                 |                                        | Forest (Oxbow)                     | ✓                                   | ✓                                     |                                                                  |                                            |
| 2        | 2-5   | 2.4-2.5         | Smith                                  | Pasture/Hay                        |                                     |                                       |                                                                  | ✓                                          |
|          |       | 2.7-3.0         | Wood, L E Jr                           | Pasture/Hay/Forest                 |                                     |                                       |                                                                  | ✓                                          |
|          |       | 3.1-4.3         | Shifflett, Floyd                       | Pasture/Hay/Forest                 |                                     |                                       |                                                                  | ✓                                          |
|          |       | 4.3-4.4         | Brand                                  | Pasture/Hay                        |                                     |                                       |                                                                  | ✓                                          |
|          |       | 3.8-4.7         | McDaniel, Lloyd or Dreama              | Pasture/Hay/Forest                 |                                     |                                       |                                                                  | ✓                                          |
|          |       | 4.7             | Lam                                    | Pasture/Hay                        |                                     |                                       |                                                                  | ✓                                          |
| 3        | 5-10  | 5.4             | McDonough                              | Forest                             |                                     |                                       |                                                                  | ✓                                          |
|          |       | 6.7-6.9         | Meadows                                | Forest                             |                                     |                                       |                                                                  | ✓                                          |
|          |       | 8-9             | Yount Joseph                           | Forest                             |                                     |                                       |                                                                  | ✓                                          |
| 4        | 10-16 | 10.4-11         | Shifflett Roger or Sharon              | Cultivated Crops, Pasture/Hay      |                                     |                                       |                                                                  | ✓                                          |
|          |       | 12.4            | Patterson Crawford S                   | Pasture/Hay                        |                                     |                                       |                                                                  | ✓                                          |
|          |       | 13              | Freed Carl                             | Forested Portion                   |                                     |                                       |                                                                  | ✓                                          |
|          |       | 15.1            | Custard William and Amanda Trustee     | Forest, Pasture/Hay                |                                     |                                       |                                                                  | ✓                                          |
|          |       | 15.4            | Brandon East                           | Forest, Pasture/Hay                |                                     |                                       |                                                                  | ✓                                          |
| 5        | 16-20 | 16.9            | Kalimon John                           | Forest, Pasture/Hay, Wetlands      |                                     |                                       |                                                                  | ✓                                          |
|          |       | 19.1            | South River Farms LLC                  | Pasture/Hay                        |                                     |                                       |                                                                  | ✓                                          |
| 6        | 20-25 | -               | None identified                        |                                    |                                     |                                       |                                                                  |                                            |

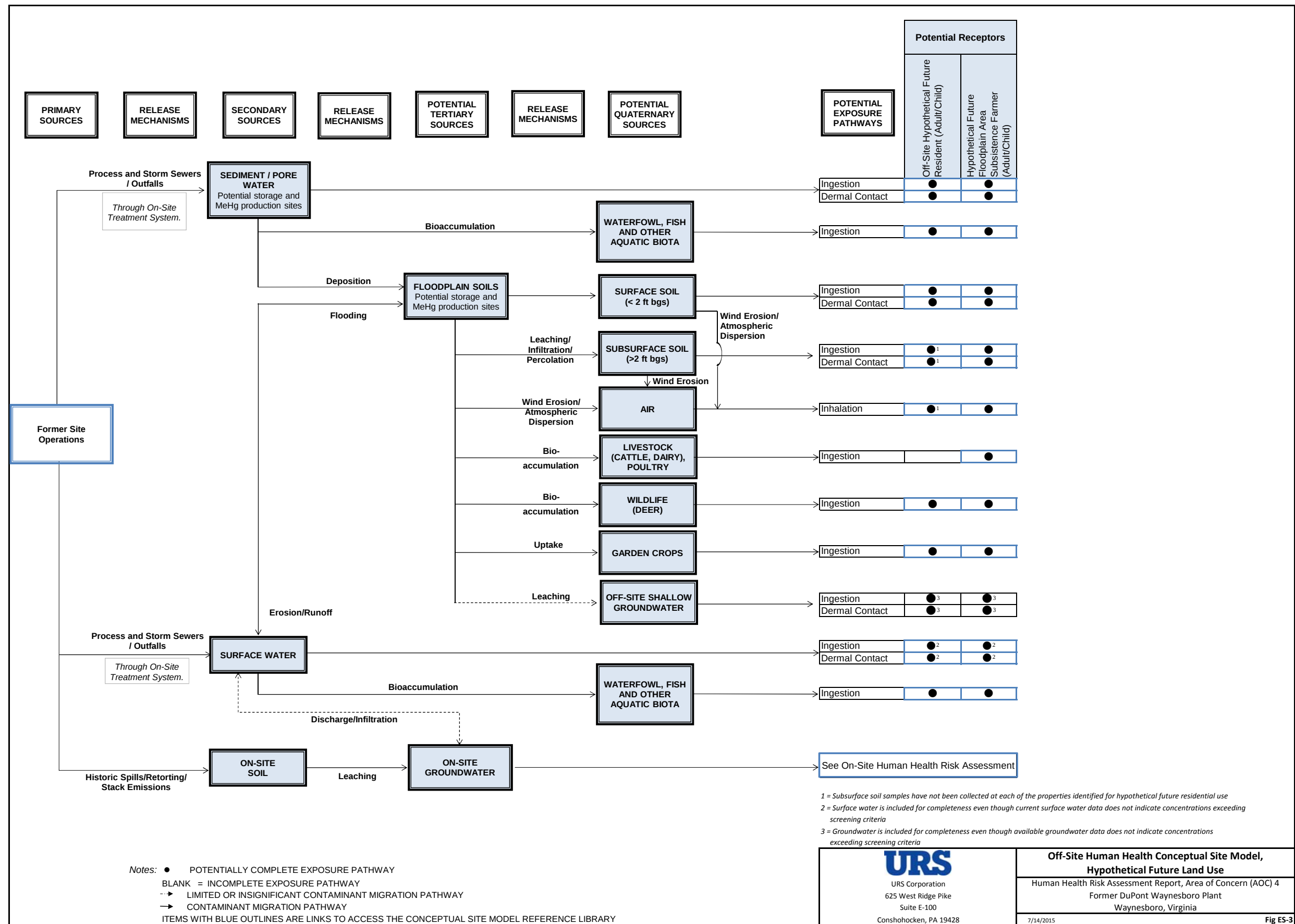
RRM - Relative River Mile

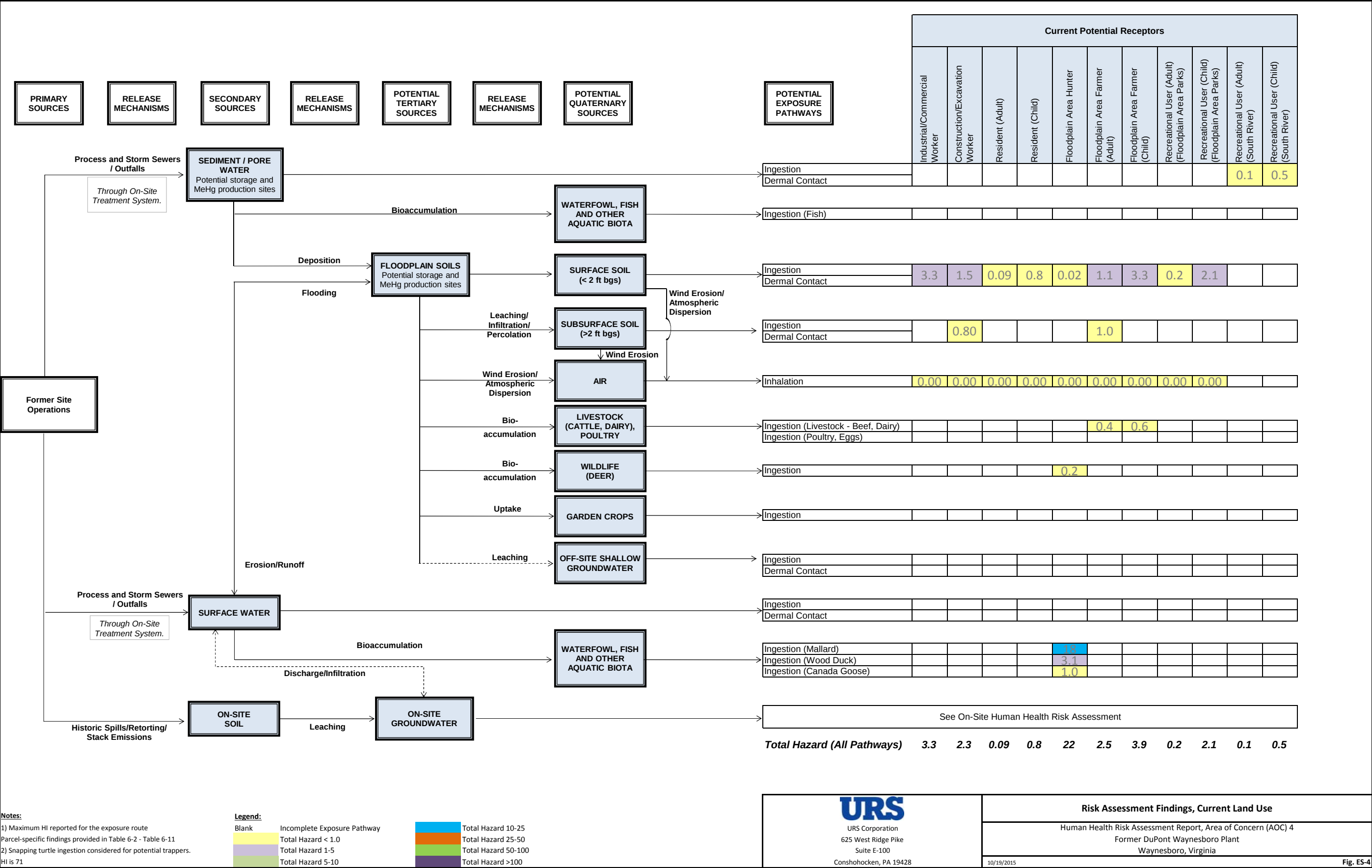
**Notes:**  
Properties and associated receptors with Total Hazard > 1.0 for direct floodplain soil exposure pathways (Ing, Der, Inh) identified in Tables 6-2 through 6-4, 6-8 and 6-9; and, Figures 8-1 and 8-2

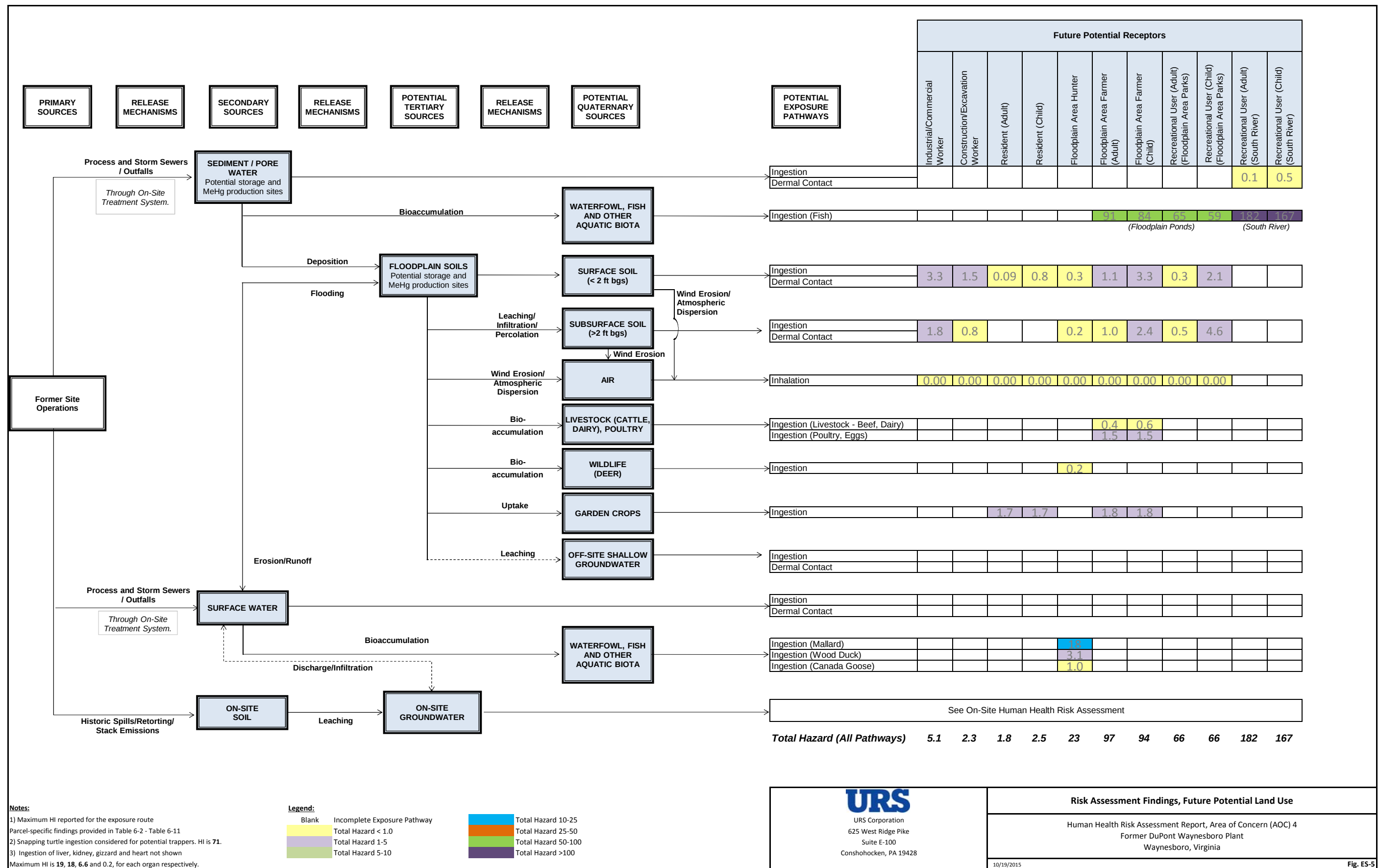
## Figures

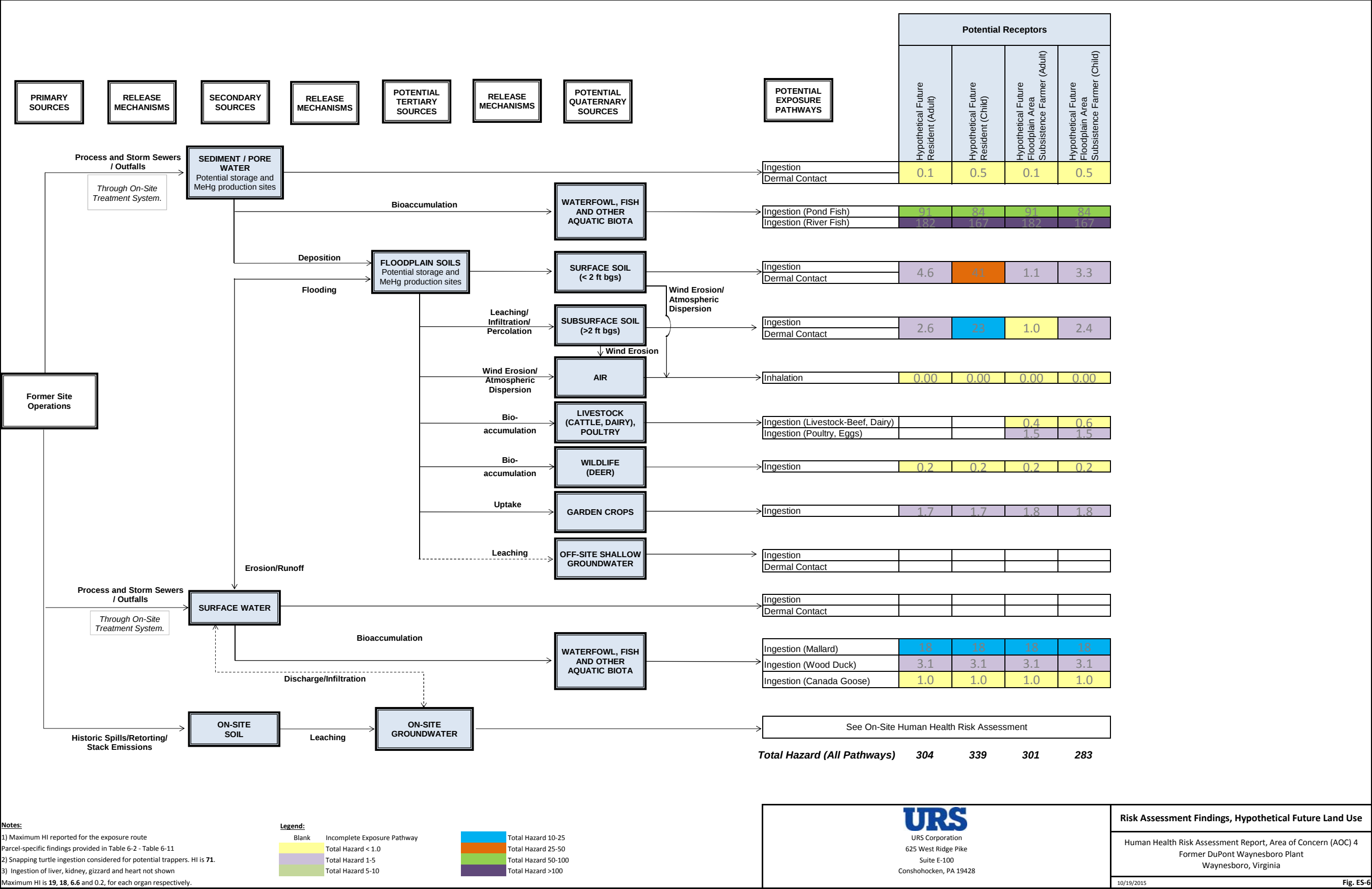


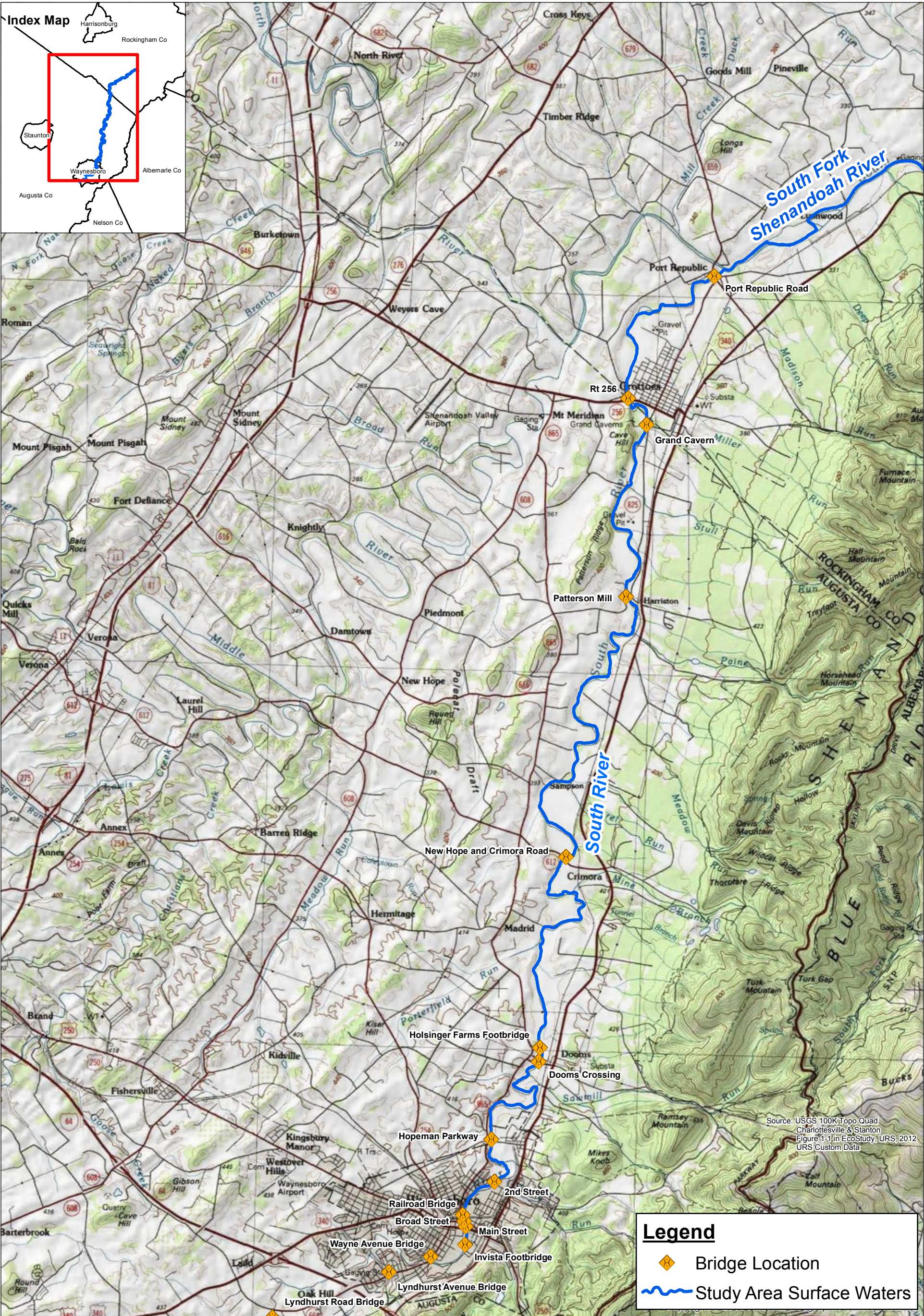








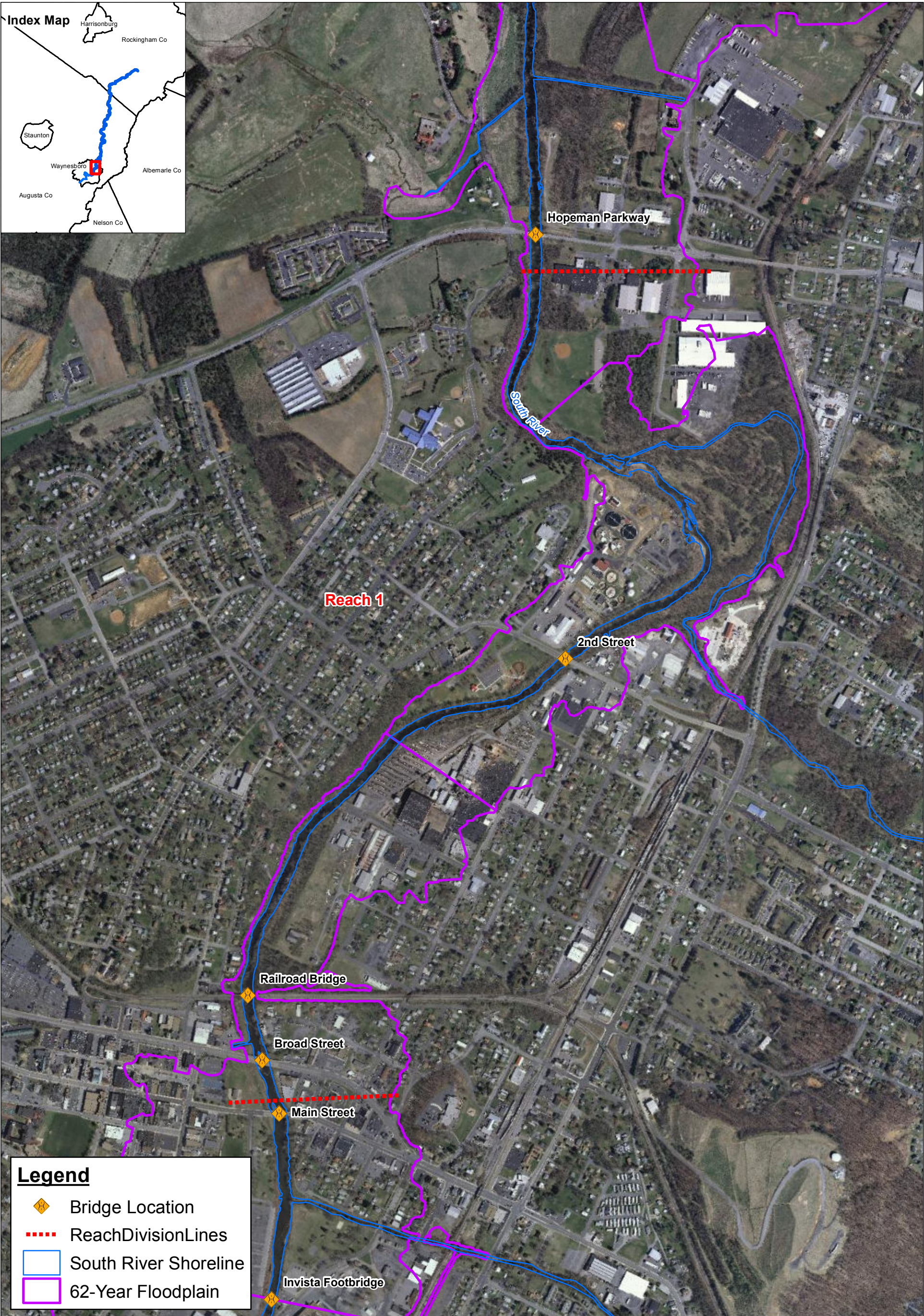
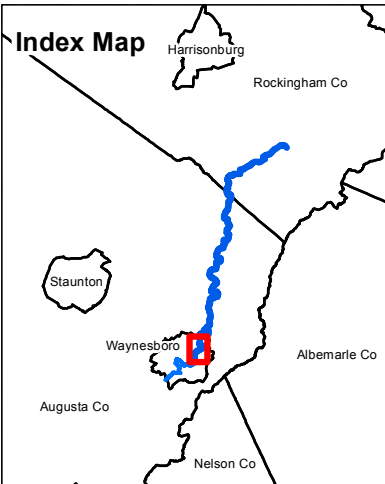




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SOUTH RIVER PROJECT  
PROJECT NO. 18986307

0 0.5 1 2 3 Miles

Figure 1-1  
Human Health Risk Assessment  
Former DuPont Waynesboro Plant  
Area of Concern (AOC) 4  
South River and a Segment of the  
South Fork Shenandoah River, Va



**Legend**

- Bridge Location
- ReachDivisionLines
- South River Shoreline
- 62-Year Floodplain



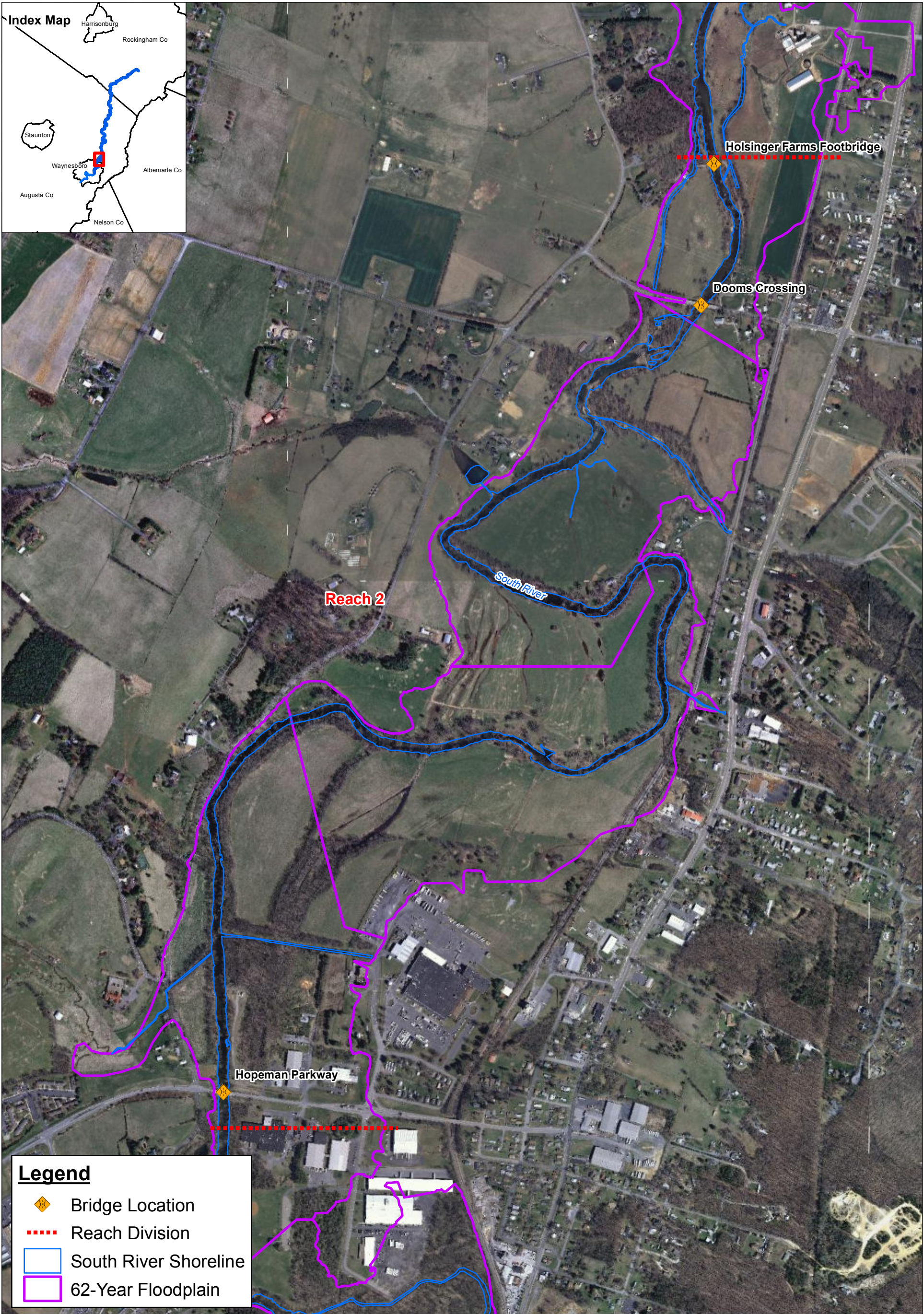
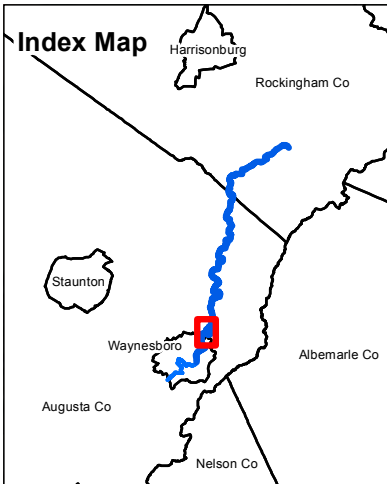
Source:  
VBMP Most Recent Imagery  
URS Custom Data



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**SOUTH RIVER PROJECT**  
**PROJECT NO. 18986307**

0 0.05 0.1 0.2 0.3  
Miles

**Figure 1-2**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4 - Reach 1**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**



**Legend**

- Bridge Location
- Reach Division
- South River Shoreline
- 62-Year Floodplain



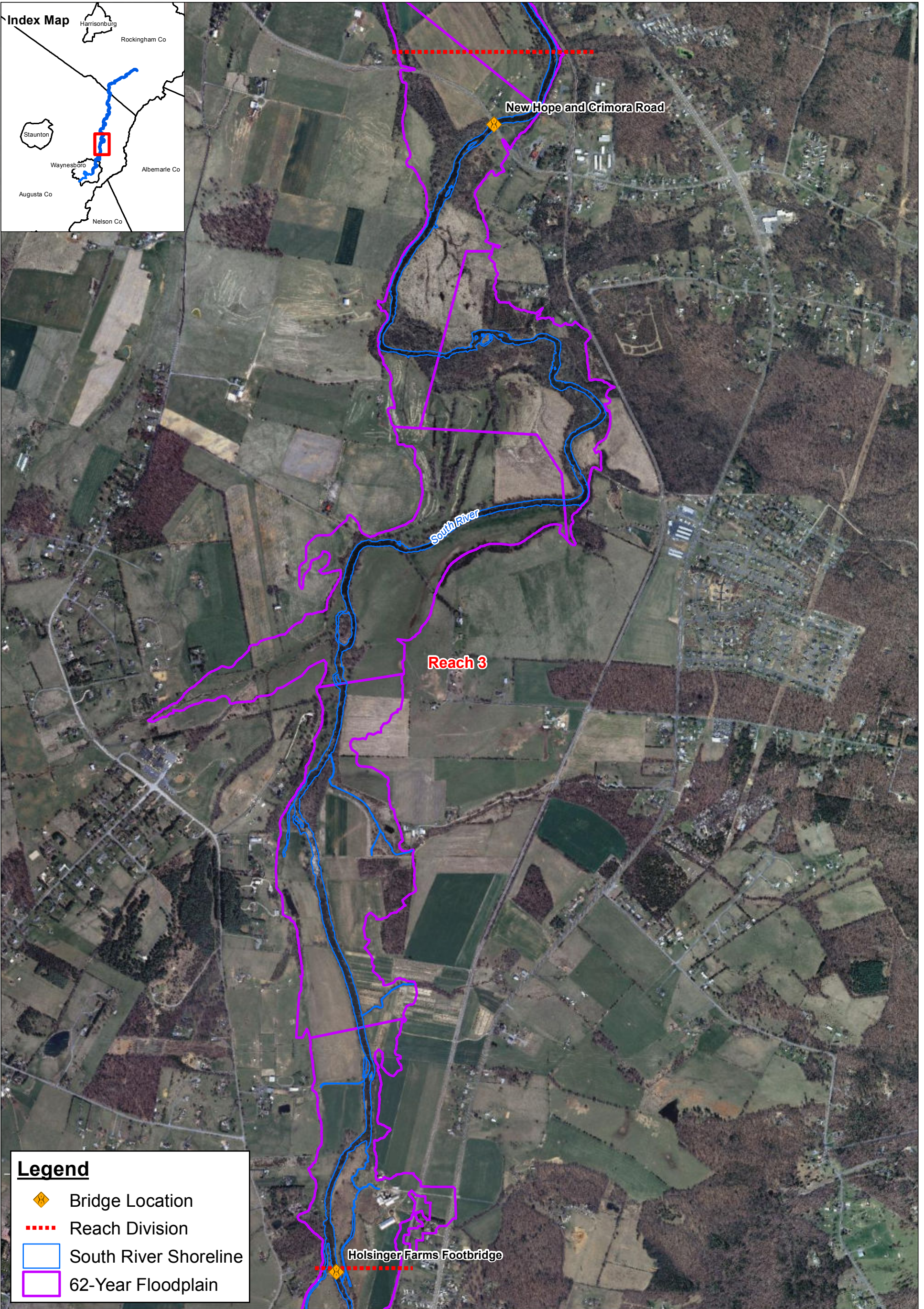
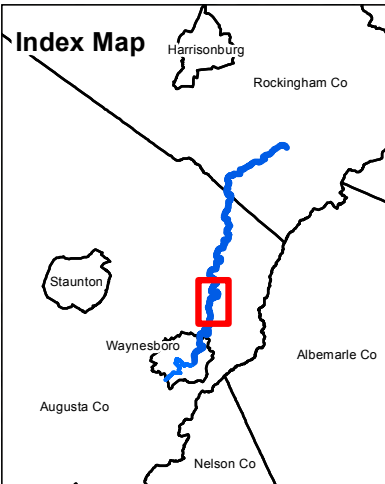
Source:  
VBMP Most Recent Imagery  
URS Custom Data



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**SOUTH RIVER PROJECT**  
**PROJECT NO. 18986307**

0 0.05 0.1 0.2 0.3  
Miles

**Figure 1-3**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4 - Reach 2**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**



**Legend**

- Bridge Location
- Reach Division
- South River Shoreline
- 62-Year Floodplain

**URS**

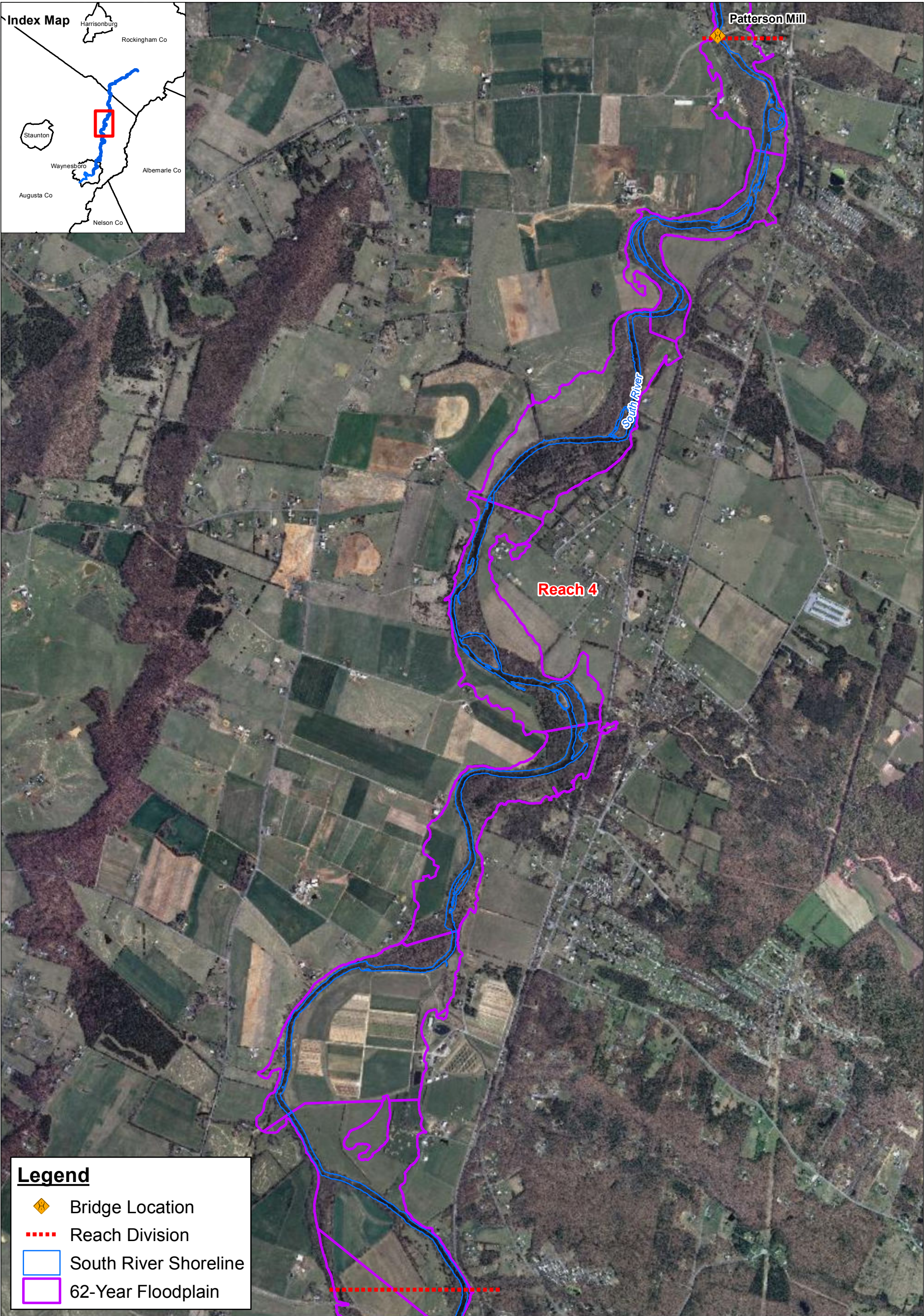
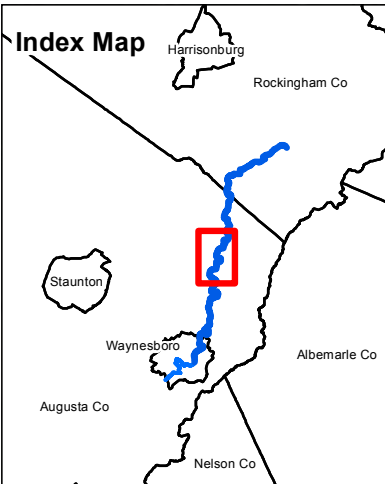
Source:  
VBMP Most Recent Imagery  
URS Custom Data



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0 0.1 0.2 0.4 0.6  
Miles

**Figure 1-4**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4 - Reach 3**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**



**Legend**

- Bridge Location
- Reach Division
- South River Shoreline
- 62-Year Floodplain



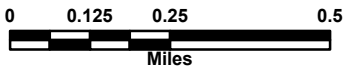
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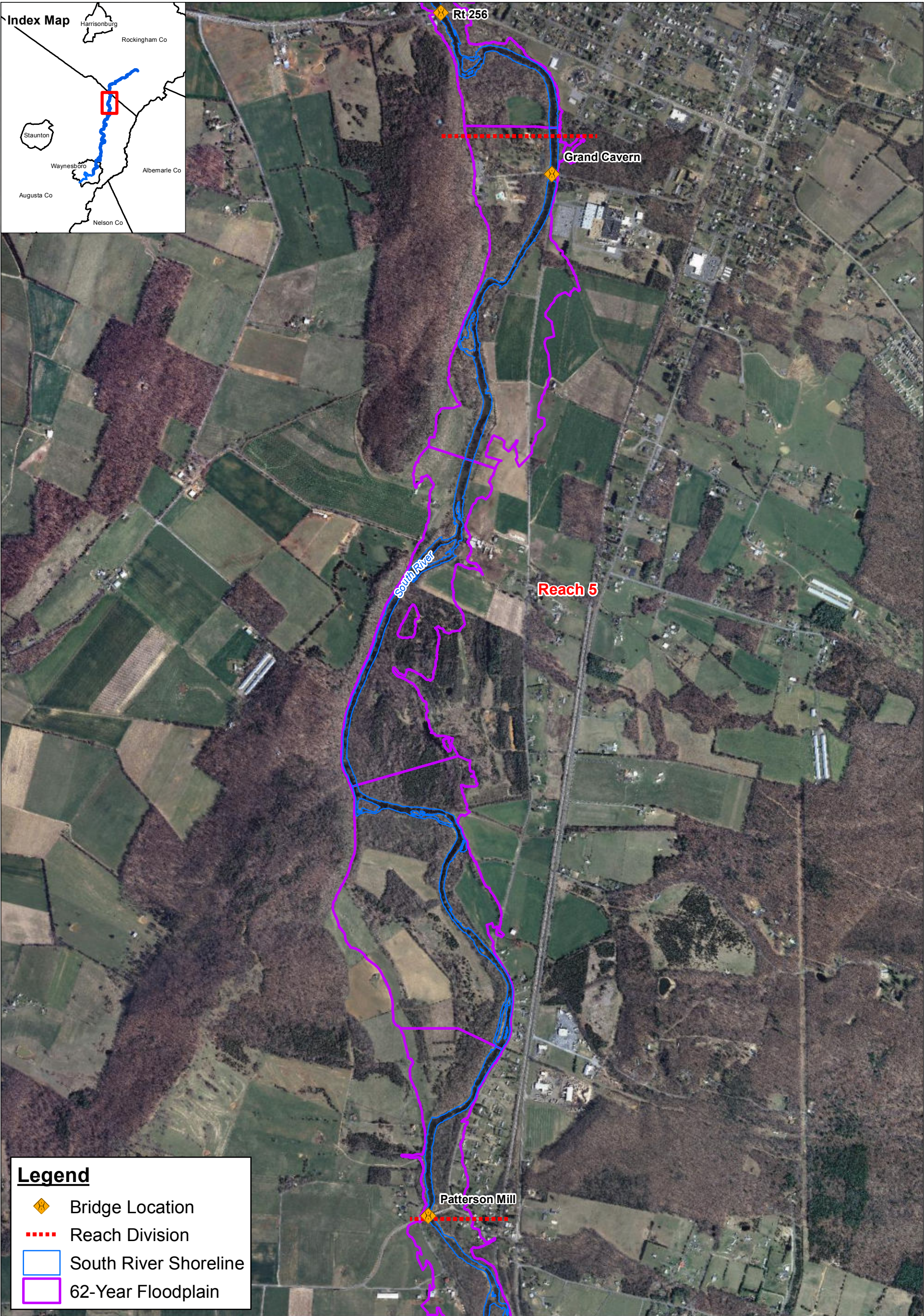
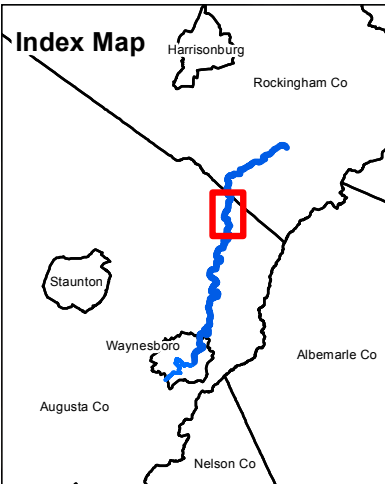
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PROJECT NO. 18986307



**Figure 1-5**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4 - Reach 4**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**



**Legend**

- Bridge Location
- Reach Division
- South River Shoreline
- 62-Year Floodplain



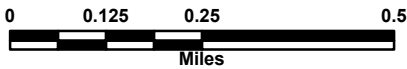
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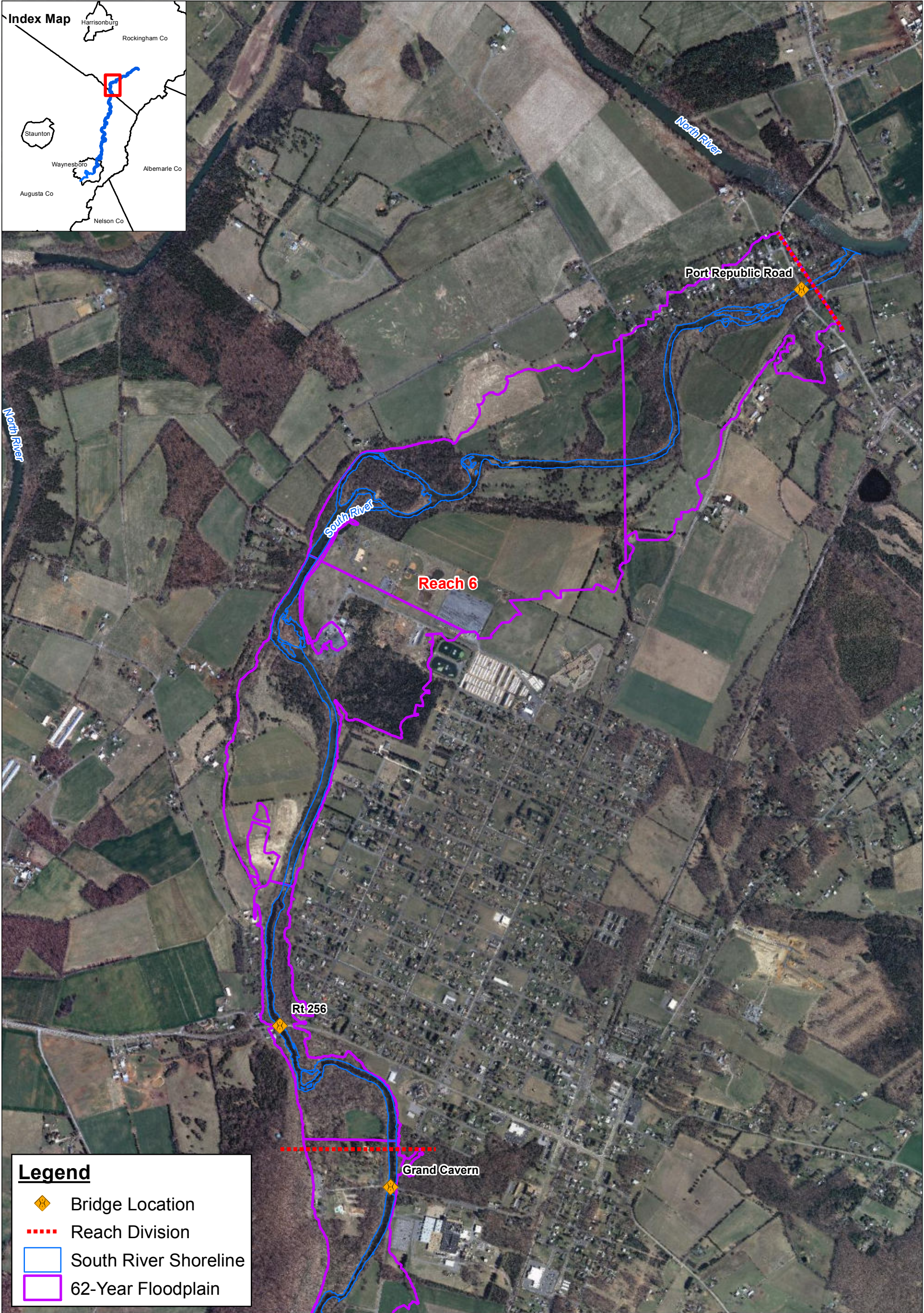
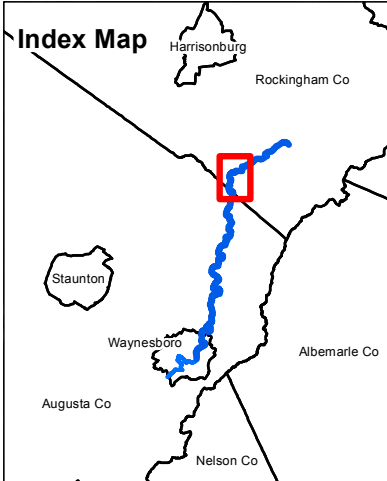
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**Figure 1-6**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4 - Reach 5**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**



**Legend**

- Bridge Location
- Reach Division
- South River Shoreline
- 62-Year Floodplain



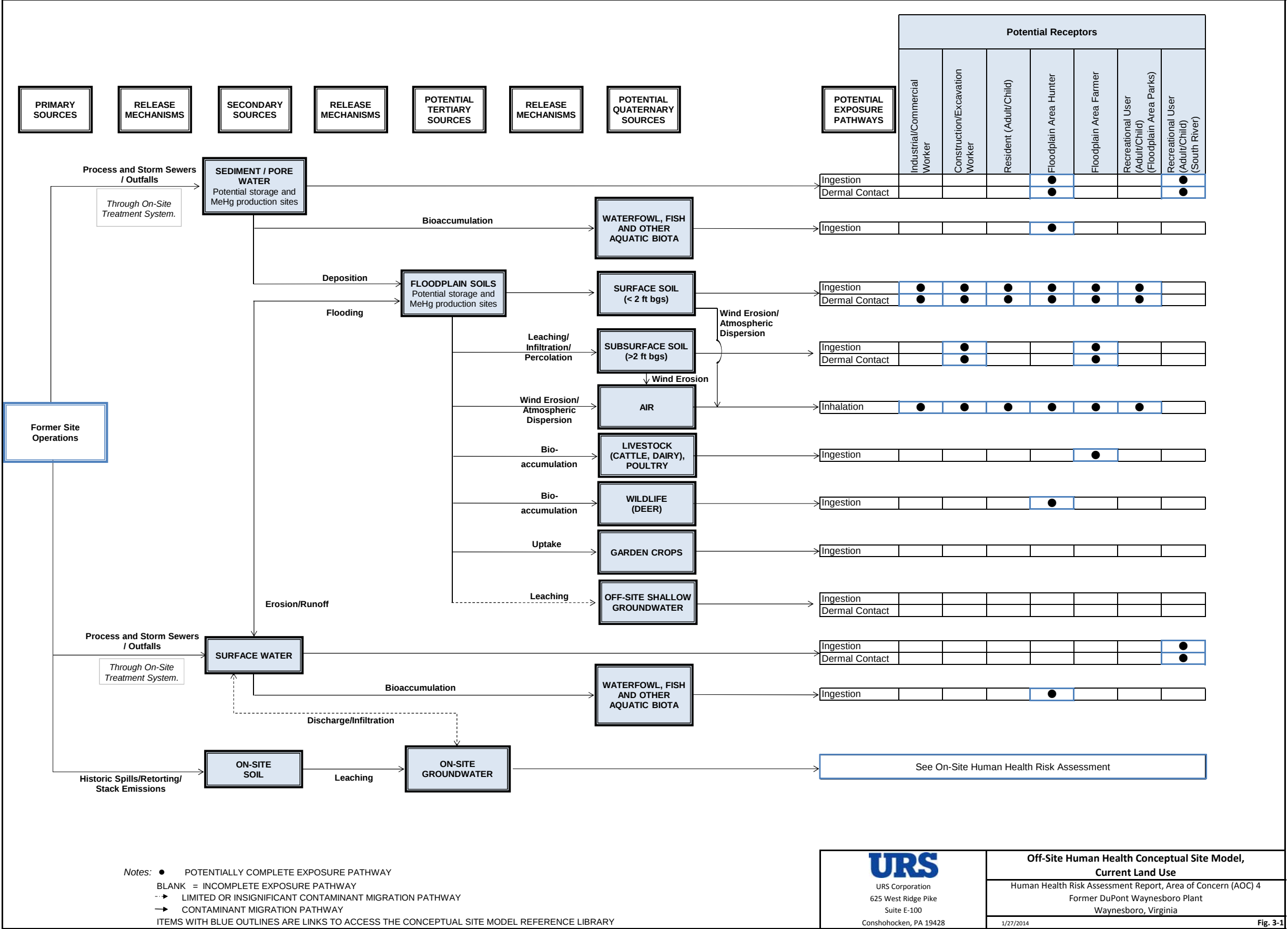
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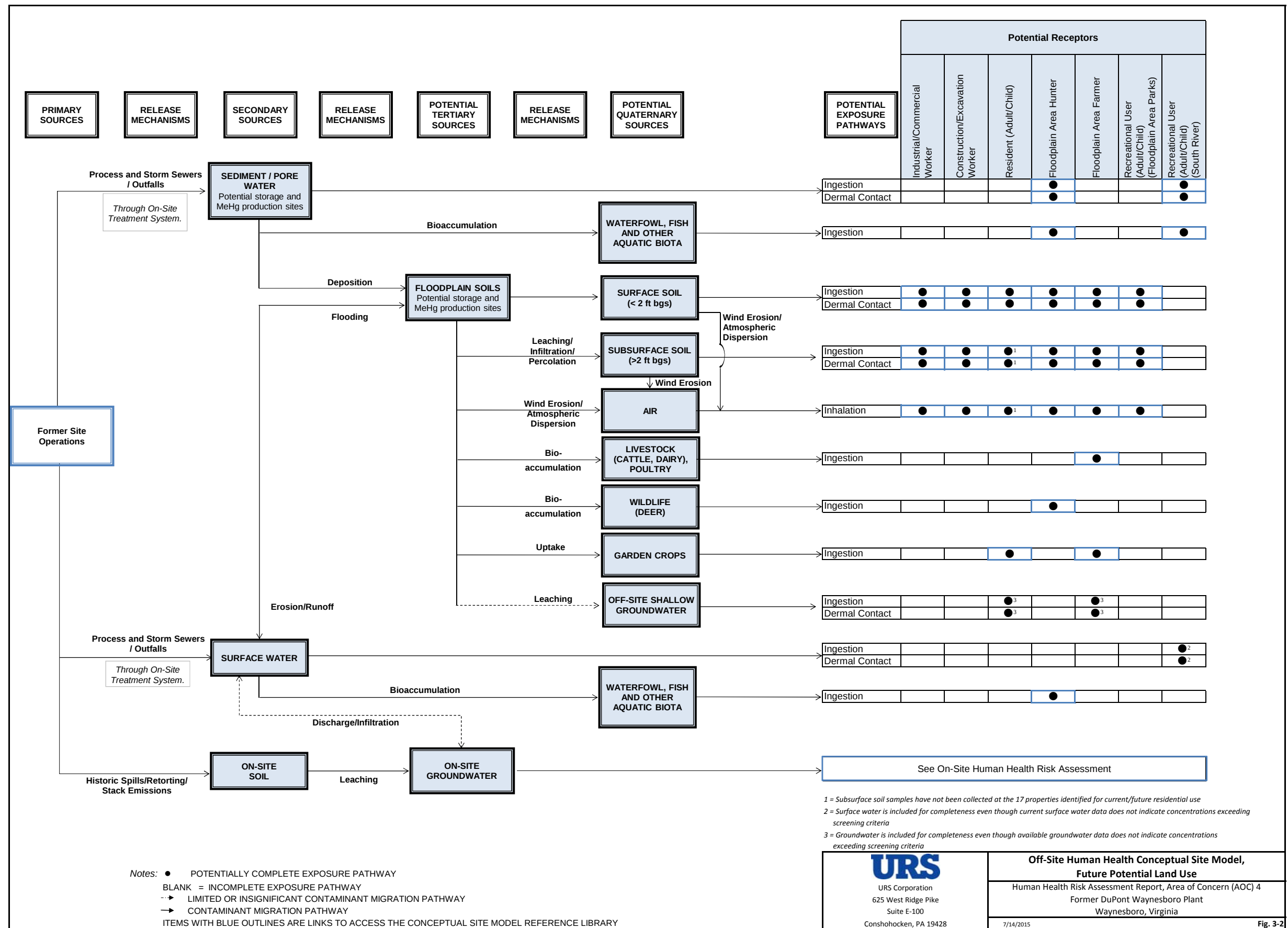


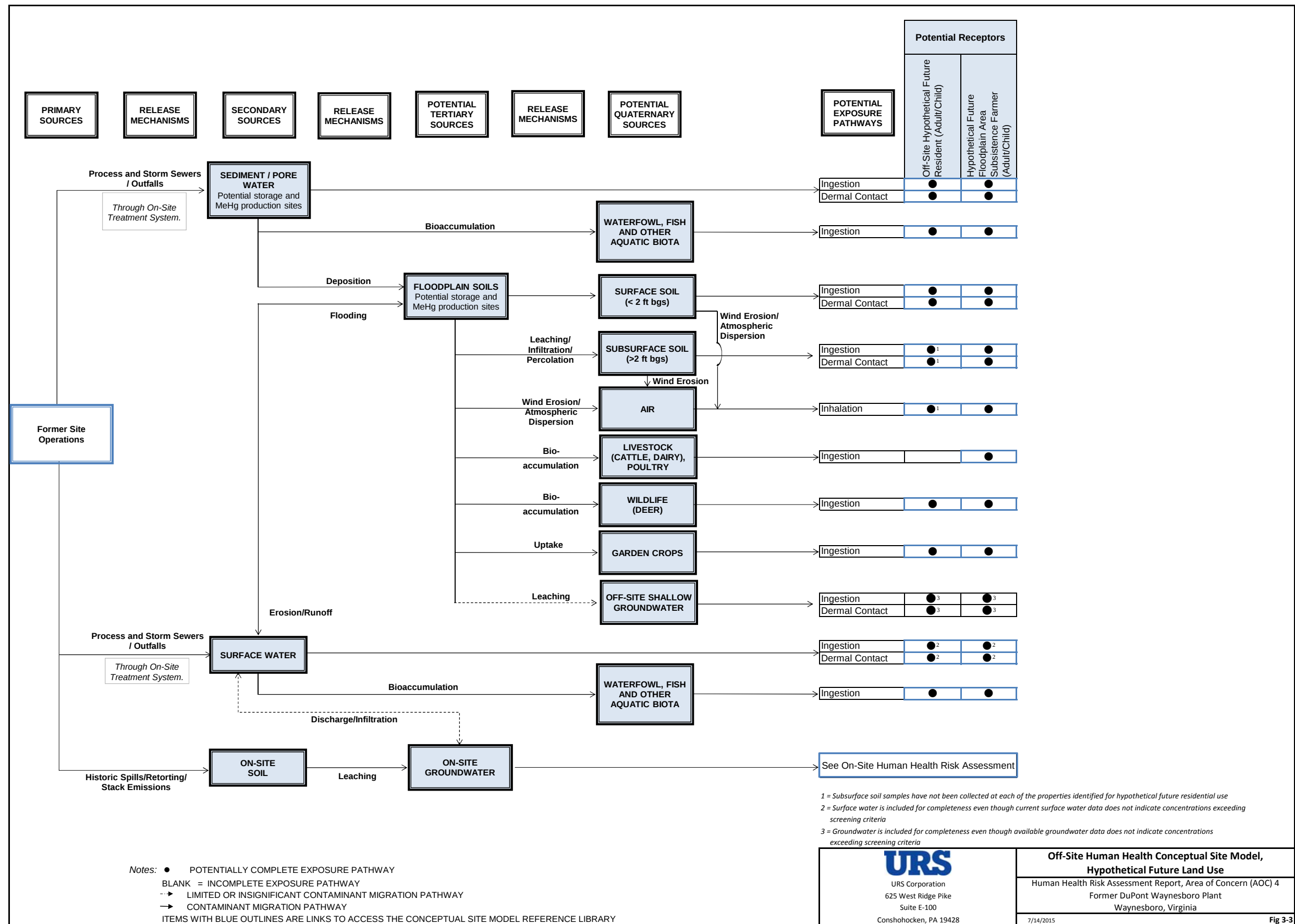
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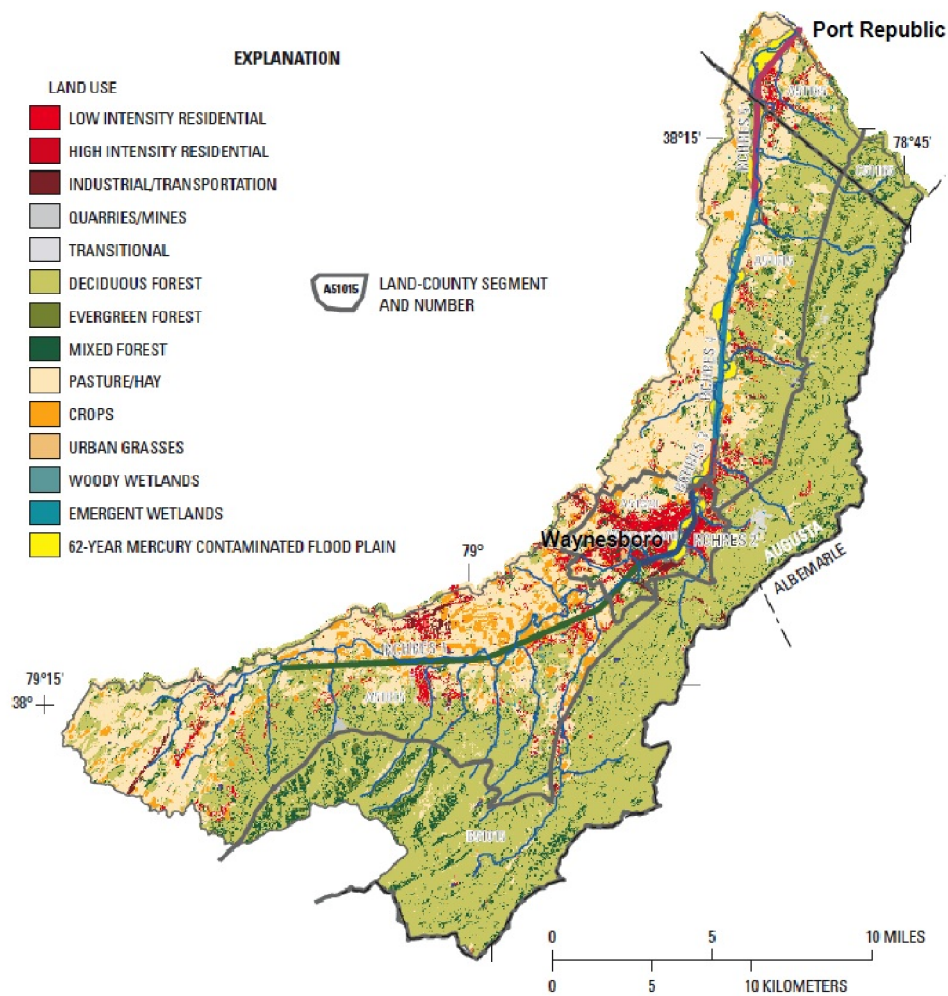
0 0.125 0.25 0.5  
Miles

**Figure 1-7**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4 - Reach 6**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**







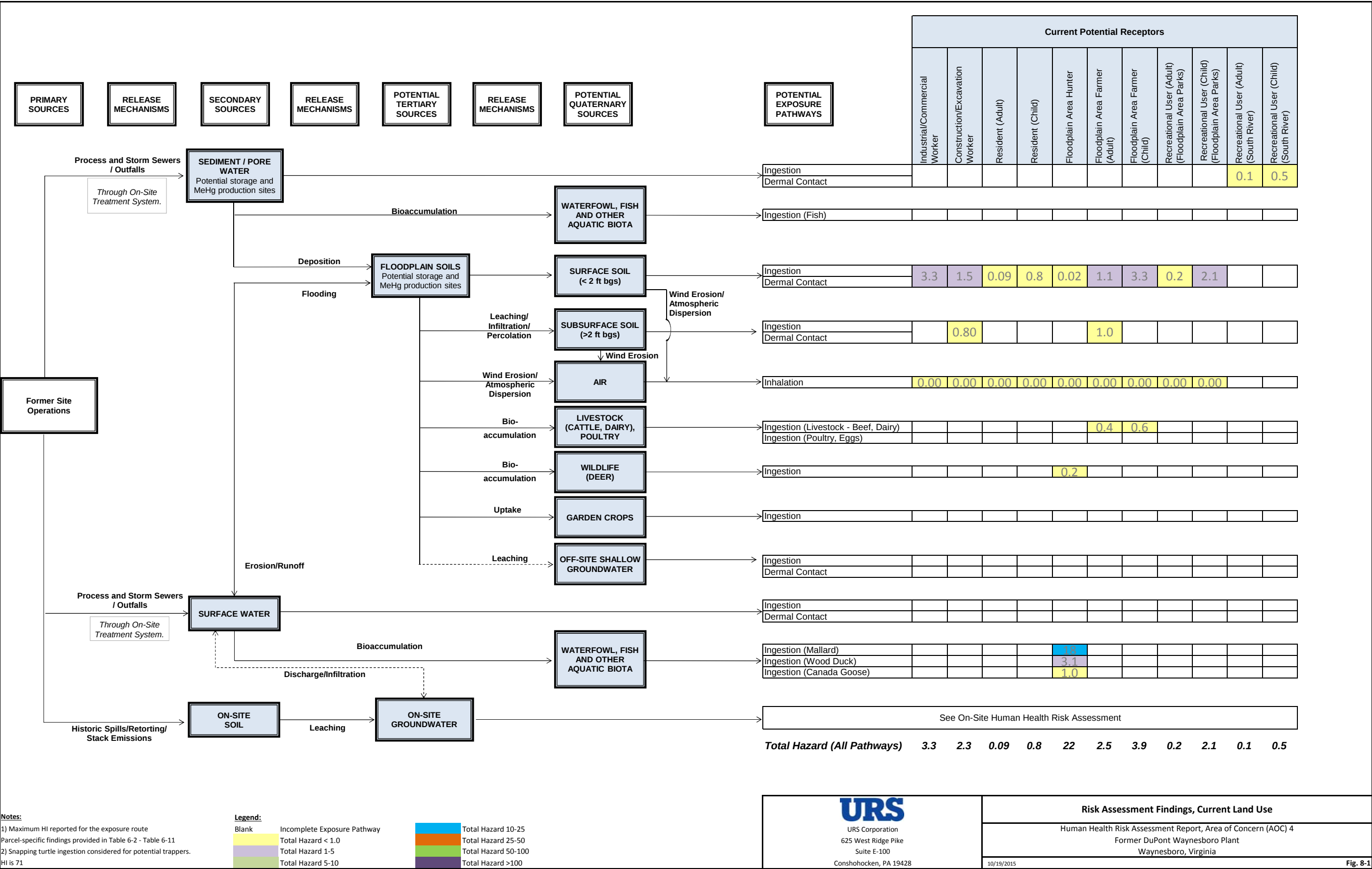


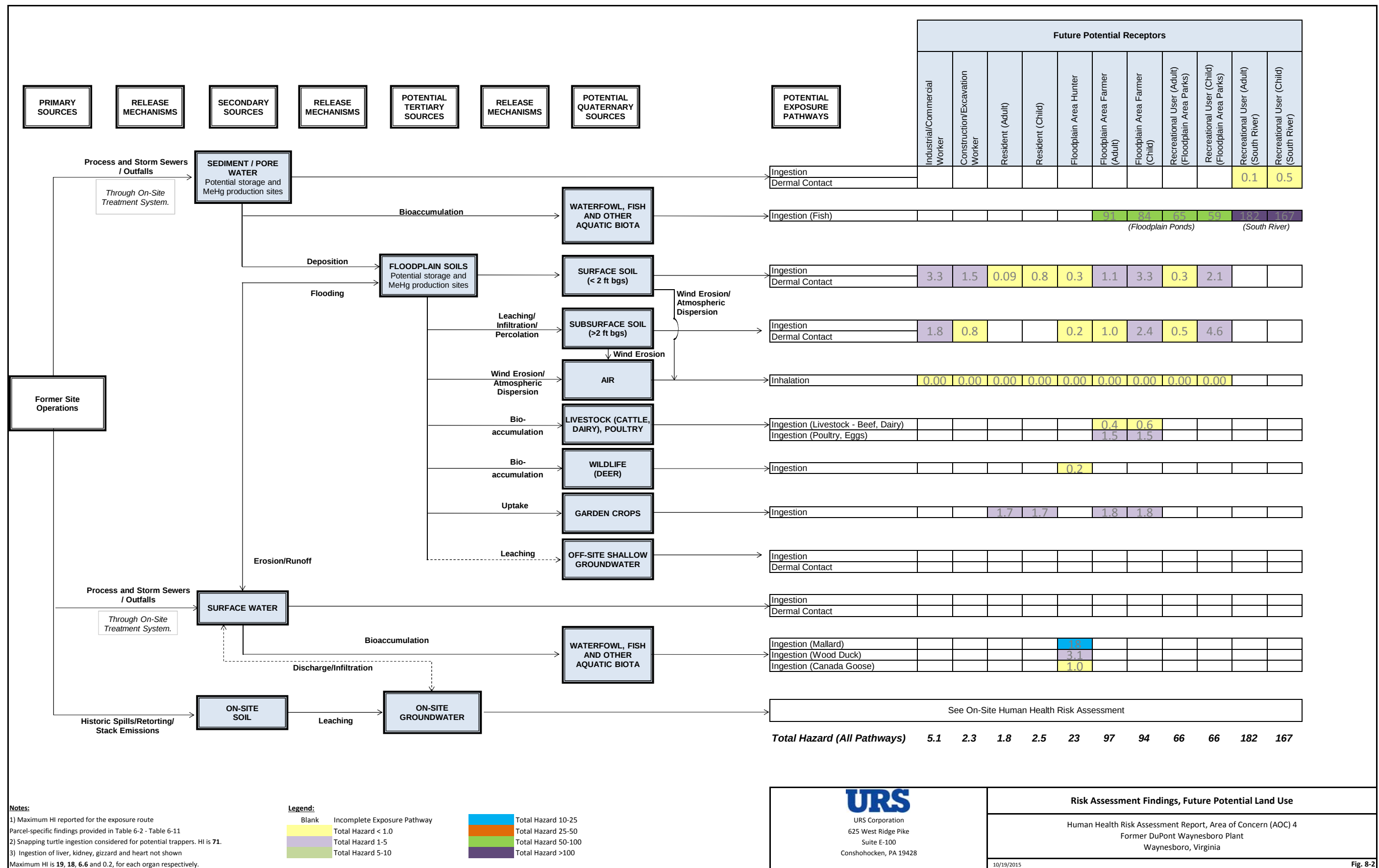
**E. I. du PONT de NEMOURS & COMPANY**

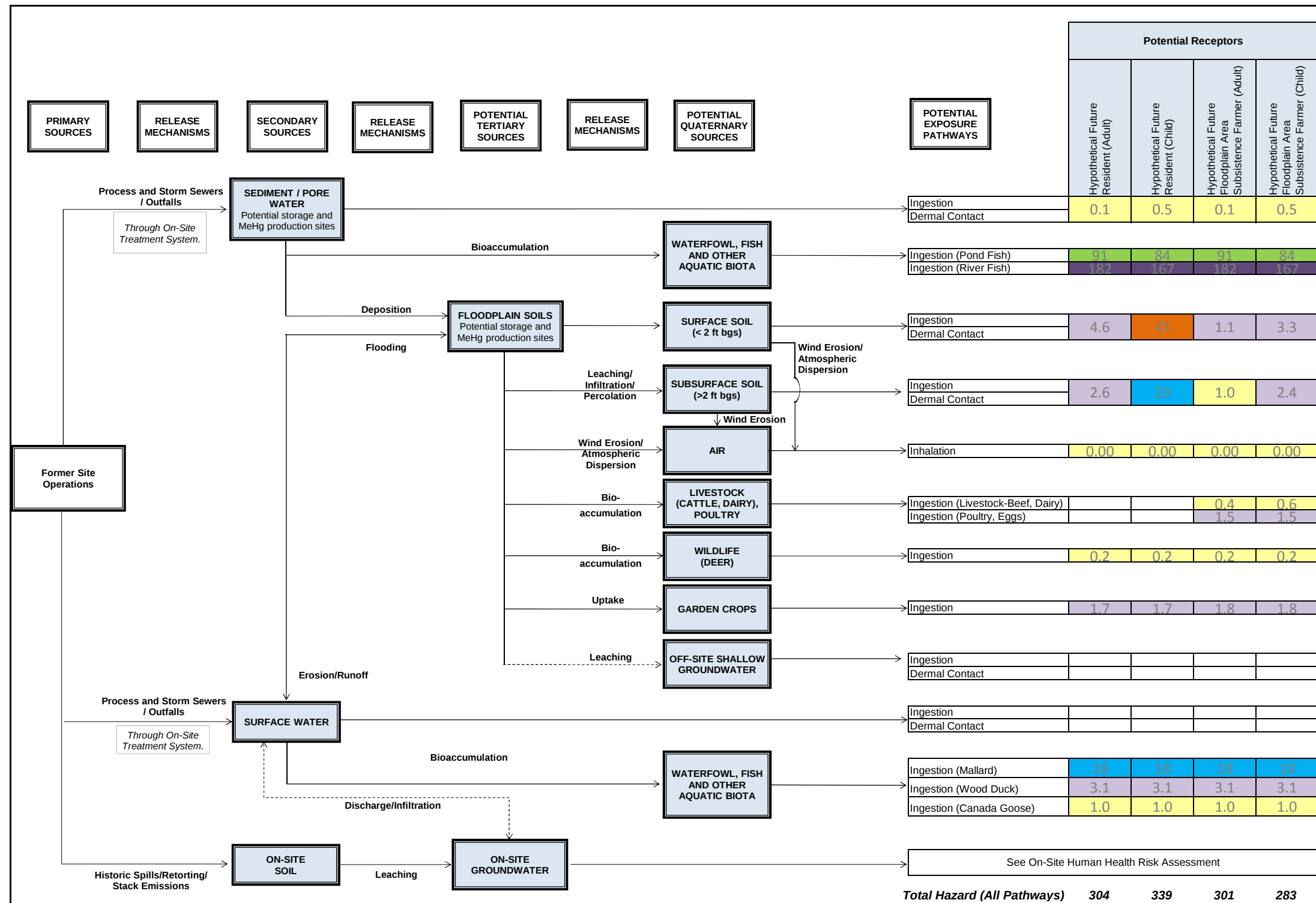
**SOUTH RIVER PROJECT**

**PROJECT NO. 18986019**

**Figure 3-4**  
**Surrounding Land Use in the South River Watershed**  
**Human Health Risk Assessment**  
**Former DuPont Waynesboro Plant**  
**Area of Concern (AOC) 4**  
**South River and a Segment of the**  
**South Fork Shenandoah River, Va**







**Legend:**

|       |                             |
|-------|-----------------------------|
| Blank | Incomplete Exposure Pathway |
|       | Total Hazard < 1.0          |
|       | Total Hazard 1-5            |
|       | Total Hazard 5-10           |