



August 29, 2023

Mr. W. Matthew Gadd, Project Manager  
WV Department of Environmental Protection  
Office of Environmental Remediation  
131A Peninsula Street  
Wheeling, WV 26003

**Subject: Human Health and Ecological Risk Assessment Report – Revision 1**  
White Park, Parcel A - Southside Trail  
VRP #22015  
City of Morgantown, Monongalia County, West Virginia

Dear Mr. Gadd:

On behalf of The City of Morgantown, West Virginia, enclosed is the revised *site-specific* Human Health and Ecological Risk Assessment Report (RAR) for Parcel A - Southside Trail, of the White Park Property, located in the City of Morgantown, Monongalia County, West Virginia. Site-specific standards for trail use were used, as well as the published *de minimis* residential and industrial soil risk-based concentrations. Comments from the West Virginia Department of Environmental Protection (WVDEP) Comment Letter, dated August 3, 2023, are addressed below in the order they were received:

1. 5.1.1 Pathways of Ecological Exposure, Page 5-1: The Report states, “There are no valued terrestrial, wetland, or aquatic habitats within the site.” WVDEP agrees that the aquatic and wetland habitats in the area are off-site, but there are several acres of terrestrial habitat on site. As such, this habitat should be evaluated for being “valued” based on the presence/absence of valued species, such as federally threatened and endangered species, which would require biological surveys. Please provide evidence of the presence/absence of valued species. In the absence of such surveys, the surface soil results can be screened against the USEPA Region 4 Ecological Risk Assessment Supplemental Guidance Soil Screening Levels (see comment #6 below for more details).

*Response to Comment 1: [Please note the following text has been added to Section 5.1]. An Endangered Species Act Project Review was conducted using the USFWS IPaC. The review revealed there are no critical habitats at the Site. However, potential habitat for two species of federally endangered bats (Indiana bat and Northern Long-eared bat), one species of proposed endangered bat (Tricolored bat) and one candidate species (Monarch Butterfly) exists.*

*Only the Indiana bat and Northern Long-eared bat were further evaluated based on value as federally endangered species. It is commonly known that the Indiana bat spends summer months living throughout the eastern US. During winter, they cluster and hibernate in caves. There are no caves onsite; therefore, only roosting during summer months is a potential concern.*

*In 2016 and in 2019, the Morgantown Utility Board (MUB) contacted the DNR and USFWS for technical assistance in preparation of the planned water and sewer line project in the Southside project area. Both the USFWS and the DNR concluded the project would not impact either species. The Site is not within the species’ hibernacula or summer roosting habitat. These clearance letters are provided in Appendix C, Checklist*

*to Determine the Applicable Ecological Standard. Therefore, it can be concluded with reasonable assuredness that soil concentrations would not present an unacceptable risk to these valued species. USEPA Region 4 Soil Screening Levels were not applied.*

2. 6.2 Toxicity Values, Page 6-1: It is correct that toxicity values are already built into the WV De Minimis Standards and relevant benchmarks. However, there is still uncertainty within these toxicity values, such as uncertainty extrapolation from animal to humans, sensitive populations, etc. These sources of uncertainty should be discussed.

*Response to Comment 2: Section 6.2 has been updated with information pertaining to the sources of uncertainties related to the toxicity values.*

3. Table 4: WVDEP is not sure about the progeny of the data in this table. The footnotes include a comment that “EPC = calculated exposure point concentration, 95% UCL” but EPC is not mentioned anywhere in the table. There were numerous other soil samples that had exceedances of either Arsenic and at least one of the various PAHs that are not included in this table. Is this table supposed to represent the results of the hotspots that require remediation? Please clarify the significance of this data.

*Response to Comment 3: To eliminate confusion, the footnote reference to EPC has been removed from Table 4. The origin of Table 4, Summary of Recreational Soil COCs, is explained in Section 4.1.3.*

4. Appendix A: The information in this appendix only has the RSL inputs for the Recreator Screening Levels, not the output which include the calculated benchmarks. Please include the output for proper screening analysis review.

*Response to Comment 4: Appendix A has been formatted to include the outputs.*

5. Appendix B: This appendix is not necessary since it references a WVDEP – provided document. It can simply be stated in the text that the relevant VISL benchmarks were taken from the WV De Minimis and Relevant Benchmarks spreadsheet available on the OER webpage and be sure to cite the effective date of the spreadsheet. However, you can keep this table in the document if you desire, since it technically has the correct information.

*Response to Comment 5: Appendix B has been removed. The reference and effective date are cited in Section 3.3.4. Please note this has resulted in the renumbering of the appendices.*

6. Appendix D: The answer to Question 3.2 of whether any site related contaminants have been detected above natural background concentrations in environmental media from terrestrial habitat is “yes” (i.e., Arsenic and PAHs). The follow up question (3.4) on contaminants presenting an ecological risk over and above local conditions would be “unknown” or “yes”. WVDEP recommends attaching an IPaC output from the USFWS for this site, which will include two species of federally endangered bats (Indiana bat and northern long-eared bat), one species of proposed endangered bat (tricolored bat) and one candidate species (Monarch Butterfly). A discussion on the possible presence of these species should be included in the text of Section 5.0. Additionally, given the use of the site as a park, WVDEP recommends screening the surface soil results against the USEPA Region 4 Soil Screening Levels (lowest value for plants, invertebrates, mammals, and avian receptors), including the 95% UCLs of the sample results remaining after hotspot removal, if necessary. Please feel free to contact the OER

Environmental Toxicologist, Dr. Ross Brittain, if you have any questions about how to perform this screening analysis.

*Response to Comment 6: Appendix D (now Appendix C) question 3.2 and 3.4 have been revised as suggested, as well as questions 4 and 5, and the text in Section 5.1. The pathway is incomplete due to a lack of value species. USEPA Region 4 Soil Screening Levels were not applied.*

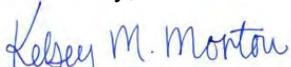
7. Appendix E, RAR Conceptual Site Model: Since the subsurface soil Arsenic concentrations only exceeded the Residential De Minimis Standard and that was the only exceedance in subsurface soils, the Construction/Utility Worker exposures to subsurface soils are de minimis and do not need to be highlighted green.

*Response to Comment 7: Appendix E (now Appendix D) has been revised to unhighlight the subsurface Construction/Utility Worker pathway.*

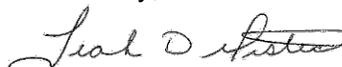
Environmental Standards, Inc., has prepared this revised RAR to comply with the rules and guidelines of the *Voluntary Remediation and Redevelopment Act*, W. Va. Code §22-22-1 *et. seq.*; the *Voluntary Remediation and Redevelopment Rule*, Title 60 Series 3; and the *Voluntary Remediation Program Guidance Manual*, December 2022.

We appreciate your assistance on this project. If you have any questions or need additional information, please feel free to contact us.

Sincerely,

  
Kelsey M. Morton  
Staff Geoscientist II

Sincerely,

  
Leah D. Mistick, LRS  
Senior Geoscientist

Sincerely,

  
Lydia M. Work, LRS  
Principal Chemist/Director of Operations

KMM/LDM/LMW:tn

Encl.

cc: VRP Main File, WVDEP Headquarters – .pdf via electronic mail to [DEPOERFileCopy@wv.gov](mailto:DEPOERFileCopy@wv.gov)  
Vanessa Reaves, Special Projects Coordinator, City of Morgantown  
Dan Kirk, Shell Oil Products US, [Dan.kirk@shell.com](mailto:Dan.kirk@shell.com)  
Jeff Bullen, Shell Oil Products US, [Jeff.bullen@shell.com](mailto:Jeff.bullen@shell.com)

**HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT REPORT**

**WHITE PARK**

**PARCEL A - SOUTHSIDE TRAIL**

**MORGANTOWN, MONONGALIA COUNTY, WEST VIRGINIA**

**VRP #22015**

July 6, 2023

Revision: August 29, 2023

Submitted to:

**WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL REMEDIATION**

Mr. W. Matthew Gadd  
WV Department of Environmental Protection  
Office of Environmental Remediation  
131A Peninsula Street  
Wheeling, WV 26003

Prepared for:

**CITY OF MORGANTOWN, WEST VIRGINIA**

389 Spruce Street  
Morgantown, WV 26505

Prepared by:

**ENVIRONMENTAL STANDARDS, INC.**

Ms. Lydia M. Work, LRS No. 148  
2501 Chapline Street, PO Box 6562  
Wheeling, WV 26003  
304-552-1442  
LWork@Montrose-env.com

Project No. 20229822

© 2023 Environmental Standards, Inc. – All Rights Reserved

## TABLE OF CONTENTS

	<b>PAGE</b>
<b>TABLE OF CONTENTS .....</b>	<b>1</b>
<b>ACRONYM GLOSSARY .....</b>	<b>1</b>
<b>1.0 INTRODUCTION.....</b>	<b>1-1</b>
<b>2.0 SITE DESCRIPTION AND HISTORY .....</b>	<b>2-1</b>
2.1 Site Location and Description .....	2-1
2.2 General History and Land Use.....	2-1
2.3 Site Geology and Hydrogeology .....	2-2
2.4 Previous Site Investigations.....	2-2
2.4.1 1980s and 1990s.....	2-2
2.4.2 2010 Site Inspection and Soil Removal.....	2-3
2.4.3 2018 Site Inspection Reassessment.....	2-4
2.4.4 2019 MUB Phase II ESA and Soil Removal.....	2-4
<b>3.0 SITE ASSESSMENT AND IDENTIFICATION OF CONTAMINANTS OF CONCERN..</b>	<b>3-1</b>
3.1 Objectives .....	3-1
3.2 Site Assessment Data Included in the Risk Assessment.....	3-1
3.3 Chemicals of Concern.....	3-2
3.3.1 COCs in Surface Soil .....	3-3
3.3.2 COCs in Subsurface Soil.....	3-4
3.3.3 COCs in Groundwater .....	3-4
3.3.4 COCs in Vapor Intrusion .....	3-4
3.3.5 Summary of COCs .....	3-4
<b>4.0 HUMAN HEALTH EXPOSURE AND RISK ASSESSMENT .....</b>	<b>4-1</b>
4.1 Exposure Assessment .....	4-1
4.1.1 Incomplete Exposure Pathways.....	4-1
4.1.2 Complete Exposure Pathways .....	4-2
4.1.3 Pathways Evaluated Qualitatively .....	4-2
4.1.3.1 Calculating Upper Confidence Limits for Exposure Point Concentrations .....	4-2
4.1.3.2 Arsenic Surface Soil Outlier Test.....	4-3
4.1.3.3 Arsenic Upper Confidence Limit (UCL) Surface Soil EPC Calculation .....	4-3
4.1.3.4 BaP Surface Soil Outlier Test .....	4-3
4.1.3.5 BaP UCL Surface Soil EPC Calculation .....	4-3
4.1.4 Pathways Evaluated Quantitatively .....	4-4
4.2 Toxicity Assessment .....	4-4
4.3 Risk Characterization.....	4-4
<b>5.0 ECOLOGICAL RISK ASSESSMENT .....</b>	<b>5-1</b>
5.1 <i>De minimis</i> Ecological Screening Evaluation.....	5-1
5.1.1 Pathways of Ecological Exposure .....	5-1
5.1.2 <i>De minimis</i> Ecological Screening Evaluation Conclusions.....	5-2
<b>6.0 UNCERTAINTY ANALYSIS .....</b>	<b>6-1</b>
6.1 Data and Exposure Point Concentrations.....	6-1
6.2 Toxicity Values.....	6-1
6.3 Chemical Interactions .....	6-1
6.4 Exposure Factors.....	6-1
<b>7.0 Conceptual Site Model (CSM) .....</b>	<b>7-1</b>
7.1 Sources of Contamination and Receiving Media .....	7-1
7.2 Receptors.....	7-1
7.3 Migration Pathways.....	7-1
7.4 Exposure Points and Exposure Routes .....	7-2
7.4.1 Residential Exposure .....	7-2

7.4.2	Recreational (Trail) Exposure.....	7-2
7.4.3	Worker, Visitor/Trespasser Exposure.....	7-2
7.4.4	Construction/Utility Worker Exposure.....	7-2
7.5	Potentially Complete Pathways .....	7-3
7.6	Presumptive Remedies.....	7-3
<b>8.0</b>	<b>CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>8-1</b>
8.1	Summary.....	8-1
8.2	Conclusions .....	8-1
8.3	Recommendations .....	8-1
<b>9.0</b>	<b>REFERENCES.....</b>	<b>9-1</b>

## FIGURES

Figure 1	Site Topographic Map
Figure 2	Site Location
Figure 3	Areas of Concern Map
Figure 4	2022 Phase II ESA Sample Location Map
Figure 5	Arsenic Surface Soil Exceedances
Figure 6	Benzo(a)pyrene Surface Soil Exceedances
Figure 7	2022 SSAR Sample Locations

## TABLES

Table 1A	Phase II ESA Surface Soil Analytical Results Summary
Table 1B	Phase II ESA Subsurface Soil Analytical Results Summary
Table 2	SSAR Surface Soil Analytical Results Summary
Table 3	2022 SSAR SPLP Data - Groundwater Impact Determinant
Table 4	Summary of Recreational Soil COCs.

## APPENDICES

Appendix A	US EPA Regional Screening Level Calculation Outputs
Appendix B	USA EPA ProUCL Calculation Outputs
Appendix C	Checklist to Determine the Applicable Ecological Standard
Appendix D	Conceptual Site Model

## ACRONYM GLOSSARY

AST	Aboveground Storage Tank
bgs	Below Ground Surface
BOPARC	Morgantown Board of Park and Recreation Commissioners
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
CSR	Code of State Regulations
EPC	Exposure point concentrations
ERC	Environmental Resources and Consulting, LLC.
ESA	Environmental Site Assessment
HRS	Hazard Ranking System
LRS	Licensed Remediation Specialist
mg/kg	milligram per kilogram
MUB	Morgantown Utility Board
OER	Office of Environmental Remediation
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
QC	Quality Control
RAR	Risk Assessment Report
RBC	Risk-based Concentration
RCRA	Resource Conservation and Recovery Act
ROW	Right of Way
RSL	US EPA Regional Screening Level
SAWP	Site Assessment Work Plan
SB	Subsurface Soil
SCS	Soil Conservation Service
SI	Site Inspection
SIM	Selective Ion Monitoring
SIR	Site Inspection Report
SPLP	Synthetic Precipitation Leaching Procedure
SS	Surface Soil
SSAR	Supplemental Site Assessment Report
SVOC	Semivolatile Organic Compound
UCL	upper confidence limit
µg/kg	microgram per kilogram
USDA	U.S. Department of Agriculture
US EPA	United States Environmental Protection Agency
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
VRA	Voluntary Remediation Agreement
VRP	Voluntary Remediation Program
VERRA	West Virginia Voluntary Remediation and Redevelopment Act
WMS	Waste Management Section
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Department of Natural Resources

## **1.0 INTRODUCTION**

The City of Morgantown (City) entered White Park into the West Virginia Voluntary Remediation Program (VRP), subdivided as Parcel A – Southside Trail, and Parcel B – Upland Area. The City is the owner of White Park.

White Park lies at the northern end of an approximately 700-acre area that was operated as a crude oil tank farm by Standard Oil, Eureka Pipeline Company, and South Penn Oil Company, from the late 1800s to the 1950s. Environmental investigations and remediations have occurred at White Park since the late 1980s, including sampling of groundwater, soil vapor, surface soils, and subsurface soils, as well as surface water and sediment in the Cobun Creek reservoir.

White Park is currently a 170-acre municipal park including athletic playing fields, an indoor ice rink, and more than 17 miles of hiking and biking trails. The VRP White Park site also includes land south of Greenbag Road, identified as the Morgantown Utility Board (MUB) campus.

The Parcel A - Southside Trail Parcel (Site or Property) is an approximate 22.5-acre area that lies east and south of the Cobun Creek reservoir, within the boundaries of White Park. Based on available historical documents, six large aboveground storage tanks (ASTs) were historically located within the boundary of Parcel A.

A Limited Phase II Environmental Site Assessment (ESA) was completed in 2022 at the Southside Trail Parcel by the City in advance of planned recreational trail development. The Phase II ESA was limited in that it focused on surface soil along the planned trail pathway and subsurface soils being identified by the City as potential borrow material for trail construction. Groundwater was not investigated. The Phase II ESA confirmed contaminants of concern (COCs) in soil and a decision was made by the City to enter White Park into the West Virginia Voluntary Remediation Program (VRP). The White Park property as presented in the VRP includes Parcel A – Southside Trail, and Parcel B - Upland Area. Cobun Creek and the reservoir are not included in the VRP boundaries. The City has contracted with Environmental Standards, Inc. (Environmental Standards) to provide Licensed Remediation Specialist (LRS) services as they relate to the VRP.

A pre-VRP Application site visit was conducted on April 12, 2022, with the City, the West Virginia Department of Environmental Protection (WVDEP), and Environmental Standards. The lack of groundwater data was discussed, and it was agreed that soil sampling followed by laboratory analysis via synthetic precipitation leaching procedure (SPLP), as an alternative to groundwater monitoring samples, was appropriate.

The VRP Application was approved by the WVDEP, Office of Environmental Remediation (OER) on August 3, 2022. The Application included data from all available historical environmental investigations, including the above-mentioned 2022 Phase II ESA. The Site was assigned VRP identification number 22015. The Voluntary Remediation Agreement (VRA) was subsequently executed on October 24, 2022. Ms. Lydia Work, Environmental Standards Principal Chemist/Director of Operations, is the LRS for the Site. She holds LRS certification number 148.

A Site Assessment Work Plan (SAWP) was developed by Environmental Standards and verbally approved by the WVDEP in November 2022, with a delayed formal approval letter being dated January 17, 2023. The objective of the SAWP was to collect additional data to address the groundwater data gap as discussed during the April 2022 pre-application Site visit.

The data was summarized in a Supplemental Site Assessment Report (SSAR) that was approved by the WVDEP on April 12, 2023. The analytical data were determined to meet the data quality objectives of the project and could be used to characterize the Site, as well as to prepare a human health and ecological risk assessment.

Environmental Standards has prepared this *Human Health and Ecological Risk Assessment Report* (RAR) under authority of the VRRRA found in the WV Code of State Regulations (CSR), Title 60, Series 3 entitled the Voluntary Remediation and Redevelopment Rule.

This RAR presents an analysis of the Site under future residential, industrial, and/or recreational usage using human health *de minimis* risk-based standards, site-specific recreational trail user standards, and a *de minimis* ecological screening evaluation. The risk assessment provides an understanding of the nature of constituents present, the possible pathways of human and ecological exposure, and the degree to which such exposure may pose a potential for adverse effects.



## 2.0 SITE DESCRIPTION AND HISTORY

### 2.1 Site Location and Description

The Parcel A - Southside Trail Site is located within the City of Morgantown, Monongalia County, West Virginia. The location of the Property is depicted in Figure 1, Site Topographic Map and in Figure 2, Site Location Map. The size of the Site is approximately 22.5 acres.

White Park Parcel A Southside Trail spans across three contiguous parcels owned by the City (31-09-048A-0006-0000, 31-09-048A-0007-0000, and 31-09-0048-0041-0000).

The Southside Trail is a proposed 6,000-foot corridor of recreational walking and/or biking trail and a proposed skills area. The proposed trail corridor runs along the southern and eastern sides of Cobun Creek Reservoir, which serves as a supplemental potable water supply for the City. The Site is currently unoccupied and wooded, with a variable grade.

Municipality	Morgantown
County	Monongalia
Parcel IDs	31-09-048A-0006-0000, 31-09-048A-0007-0000, and 31-09-0048-0041-0000
Size	22.47 acres
Property Owner(s)	City of Morgantown
# of Buildings	None
Additional Improvements and Site Features	Site is intersected by sewer and water lines; access to public services (water, sewage, electric)

### 2.2 General History and Land Use

The 170-acre White Park Property, including the 22.5-acre Site, was part of the 700-acre Morgantown Tank Farm. The tank farm was developed in the late 19<sup>th</sup> century and operated as such throughout the first half of the 20<sup>th</sup> century. Although largely abandoned by the late 1940s, a handful of ASTs existed and may have been used for other purposes until the early 1970s. There are no ASTs currently on White Park. However, the locations of the historical ASTs are discernable by raised earthen berms located throughout White Park. Tank numbers T-37, T-38, T-39, T-40, T-43, and T-44 were located within the boundaries of the Site (Parcel A). Please refer to Figure 3, Areas of Concern, for the location of these tanks and their earthen berm secondary containment rings.

In 1958, the Morgantown Sanitary Board, now known as Morgantown Utility Board (MUB), constructed a dam to form the Cobun Creek Reservoir. In 1966, the Morgantown Sanitary Board made a right of way agreement with Eureka Pipeline Company and installed/upgraded a 10" concrete force main sewer line running through the Southside Trail Parcel (see Figure 4). In 1973, the City of Morgantown acquired the Property and began developing a diverse park system.

The current land-use adjacent to the Site is as follows:

- **North** – Cobun Creek Reservoir, hiking/biking trails
- **East** – Mississippi Street, White Park baseball fields

- **South** – Commercial properties and Greenbag Road
- **West** – Donn Knotts Boulevard

The surrounding area has been developed commercially, industrially, and residentially since the 1800s. During the late 19<sup>th</sup> and early 20<sup>th</sup> Century, when the Property was Morgantown Tank Farm, it was surrounded by over 600 acres of additional tank farm under the same ownership. There are no indications of other off-site uses that may impact the Site.

### 2.3 Site Geology and Hydrogeology

The area of the Site where the trail is proposed lies at an elevation of approximately 950 to 1000 feet above mean sea level. The topography of the project area has a hilly and variable gradient, generally sloping towards the Cobun Creek Reservoir. Regionally, the slope trends west towards the Monongahela River.

The Appalachian Plateaus physiographic province underlies all of Monongalia County, including the White Park Property. Bedrock in the region is characteristically flat to gently folded shale, siltstone, and sandstone. The uppermost geology is the Conemaugh Group of the Pennsylvania Series, which consists of non-marine cyclic sequences of red and grey shale, siltstone, and sandstone; thin seams of limestone and coal are also present. Bedrock is observed to be very shallow at the Site, in some locations less than two feet from the surface.

According to the U.S. Department of Agriculture's (USDA's) Soil Conservation Service (SCS) (<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>), primary soils in the vicinity of Property consist of Clarksburg silt loams, with minor contributions of Culleoka-Westmorland silt loams, Lobdell silt loams, and Urban Land. Clarksburg silt loams are moderately well drained and are derived from fine-loamy colluvium from shale, sandstone, and limestone parent material. Urban land is largely introduced material. In the case of the Site, introduced material was observed in relation to the location of former ASTs and from utility improvements (the water and sewer line that transects the Site).

Surface water is generally absorbed by the vegetative cover of the project area and park, with any runoff directed towards Cobun Creek and its associated Cobun Creek Reservoir, which discharges into the Monongahela River approximately 0.25-miles downstream of the Site. Under natural, unconfined aquifer conditions, shallow groundwater beneath the project area would reasonably be expected to flow towards the reservoir and Monongahela River. Based on a review of the online National Wetlands Inventory (<https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>), there are no wetlands located within the Site boundaries; Cobun Creek Reservoir is designated as a 12.17-acre freshwater pond and Cobun Creek incoming from the east is classified as a riverine habitat.

### 2.4 Previous Site Investigations

The WVDEP and the City provided copies of reports documenting historical investigations and remediation between the late 1980s and 2019. These investigations, and their findings, are summarized below.

#### 2.4.1 1980s and 1990s

The Site was listed as a potentially hazardous waste site in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) in August 1988

following an inspection and preliminary sampling investigation conducted by the West Virginia Department of Natural Resources, Waste Management Section (WVDNR WMS). During the inspection, a tar-like substance with a petroleum odor was observed in a former berm area near the South Middle School, and additional tar-like deposits were observed along a small tributary stream that flowed into Cobun Creek.

A preliminary assessment (PA) was performed in March 1989 by WVDNR WMS, and a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site investigation was recommended. In April 1989, WVDNR WMS personnel inspected the Site. No testing data was available for review in the WVDNR WMS project file.

In 1998, reclamation work was completed by the Eureka Pipeline Company at three berm areas near the public athletic fields with exposed hydrocarbon residues. These were identified as tank locations T-44, T-68, and T-74. A portion of T-44 is within the boundary of Parcel A (see Figure 3). Subsequently, the WVDEP OER determined further assessment was warranted to determine potential risk associated with the Site and if the Site should undergo further investigation under CERCLA.

#### 2.4.2 2010 Site Inspection and Soil Removal

A preliminary Hazard Ranking System (HRS) Site Score was calculated for the White Park CERCLIS site. Based on the preliminary HRS Site Score and knowledge the Cobun Creek Reservoir was potentially impacted by contaminants from the former tank farm, the US EPA and WVDEP, OER determined that a site inspection (SI) was warranted to assess potential risk associated with the Site and determine if the Site should undergo further action under CERCLA. An SI was performed under a pre-remedial cooperative agreement between the WVDEP and the US EPA Region 3 in 2010. Field sampling activities included 13 surface soil, 7 subsurface soil, 2 reservoir surface water, and 2 reservoir sediment samples. The samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs) of which polycyclic aromatic hydrocarbons (PAHs) are a subset, Resource Conservation and Recovery Act (RCRA) Metals, and polychlorinated biphenyls (PCBs).

The greatest concentration of noted contaminants were collected around observed free-product near former tank number 40 (T-40, refer to Figure 3). The Cobun Creek Reservoir was approximately 100 feet downgradient of the T-40 contamination. A portion of the footprint (tank foundation and secondary containment berm) of T-40 is within the boundary of the Site.

The following conclusions were stated in the SI Report (Triad Engineering, Inc. [Triad], 2010):

- Contamination to Site soils from historical land use (tank farm) exists.
- Recreational visitors are being exposed to surface soil concentrations above residential soil RBCs.
- The risk of a release to Cobun Creek Reservoir via overland flow exists.

The following were recommended for consideration:

- Removal of the area of observed free-product in the bermed area of T-40.
- If not already in place, groundwater and future land use be restricted through a land use covenant or deed restriction.

Eureka Pipe Line Company subsequently removed approximately 1,300 cubic yards of soil from the diked area of former T-40 and transported the impacted soils off site. Approximately 1,900

cubic yards of off-site backfill was imported from a virgin source approximately 1 mile south the Site. It was a hillside/hill cut at the southern terminus of Distributor Drive (MUB office located on intersection of Greenbag Road and Distributor Drive). Prior to importing the backfill to the Site, two characterization samples were collected and analyzed to determine that soils met WVDEP residential soil RBCs.

#### 2.4.3 2018 Site Inspection Reassessment

In 2018, a site inspection reassessment (SIR) was performed under a pre-remedial cooperative agreement between the WVDEP and the US EPA Region 3. The SIR was performed to qualitatively assess potential risk associated with the White Park CERCLIS Site and to determine whether the Site may be eligible for further investigation under CERCLA. Field sampling activities included collection of 11 surface soil, 5 subsurface soil, 5 surface water, 8 sediment samples, and 4 soil vapor samples. The media was analyzed for VOCs, SVOCs, PAHs, metals, and PCBs.

Elevated concentrations of metals were detected in surface water and sediment. Metals and PAH were detected in soil at concentrations greater than their respective RBCs for residential soil. The greatest concentrations of the above-noted contaminants were collected in the surface impoundment areas of former tank numbers T-30, T-50, T-60, T-61, T-62, and T-74 (Figure 3, all outside the bounds of the Parcel A-Southside Trail Site). Based on the assessment activities, additional remedial activities were deemed warranted to protect human health and the environment from the previously identified on-site contaminants. Therefore, it was recommended to enter the Site into the West Virginia VRP to evaluate human health and ecological receptors and remedial options for the Site.

#### 2.4.4 2019 MUB Phase II ESA and Soil Removal

A Limited Phase II ESA of subsurface soils was completed by MUB in June 2019 in the location of a proposed waterline. This waterline transects the Site running northeast to southwest, south of the reservoir. A total of 43 subsurface soil samples were collected and analyzed for metals, VOCs, and SVOCs/PAHs. It was reported that low-level PAHs and metals were identified in the subsurface soil of the proposed waterline.

MUB coordinated with the WVDEP and during construction of the waterline the area was monitored by an environmental professional employed by Triad. The findings revealed evidence of contamination in subsurface soils. A strong petroleum odor and soil staining was documented near the former T-40 location, south of the reservoir dam, which was presumably the same location remediated by Eureka Pipe Line Company in 2010. Triad documented that as excavation progressed northeast along the proposed waterline, evidence of petroleum contamination became less evident. Soils with identified contamination, as determined by field screening with a photoionization detector (PID), were over-excavated and stored on Site. The stockpiles were sampled and characterized as non-hazardous. Based on interviews with City personnel, the excavated soils were transported to a local disposal facility. It is not recorded in the documents provided what material was used to backfill the waterline trench during construction.

### **3.0 SITE ASSESSMENT AND IDENTIFICATION OF CONTAMINANTS OF CONCERN**

#### **3.1 Objectives**

An analyte or compound detected in at least one sample in any given medium at the Site above its respective risk-based concentration (RBC) is considered a contaminant of concern (COC). This section identifies the COPCs detected in environmental media at the Site as COCs by applying *de minimis* comparison values as outlined in WVDEP’s VRP Guidance Manual and statistical evaluation, as applicable.

#### **3.2 Site Assessment Data Included in the Risk Assessment**

This risk assessment includes surface soil and subsurface soil samples collected as part of the site assessment investigations undertaken by the City in 2022 and 2023. A tabulated summary of the field samples, including quality control (QC) samples, is provided below.

<b>Media</b>	<b>Samples</b>	<b>Field Duplicates</b>
<b>Surface Soil</b>	69	4
<b>Subsurface Soil</b>	4	0
<b>Soil via SPLP</b>	5	1

Environmental Standards performed data validation of selected samples, and the analytical data were determined to meet the data quality objectives of the project and could be used to characterize the Site, as well as to prepare a human health and ecological risk assessment. The data is summarized in more detail below:

#### **2022 Phase II ESA**

The Phase II ESA investigation included the collection of:

- 65 surface soil samples, defined as 0-2 feet below ground surface (bgs), along the proposed trail corridor, and
- Four subsurface soil samples (>2 feet bgs) in areas of potential borrow material.

Please refer to Figure 4, 2022 Phase II ESA Sample Location Map. Analytical testing included RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and zinc), PAHs, and naphthalene by VOC analysis at select locations.

#### **2023 Supplemental Site Assessment**

The investigation included the collection of:

- Four surface soil samples; three in the proposed “Skills Area”, and one at a proposed cross-over trail, near the confluence of former AST locations T-37, T-38, and T-43, and
- Five subsurface soil samples collected at known AST locations across the Site that were submitted for SPLP laboratory analysis.

Please refer to Figure 5, SSAR Sample Location Map, for the location of each sample, by media. Analytical testing included RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, and zinc), and PAHs.

### 3.3 Chemicals of Concern

This section identifies the COPCs detected in environmental media at Parcel A, Southside Trail, as COCs either by 1) applying comparison values (*de minimis*, recreational, *etc.*), and/or 2) statistical evaluation as outlined in WVDEP VRP Guidance Manual, as applicable.

This risk assessment includes all samples collected and data reported and summarized above, as compared to the RBCs described below.

#### **Human Health *de minimis* Risk-Based Standards**

The WVDEP has provided *de minimis* human health screening levels for soil and groundwater media contaminants (Table 60-9, revised December 2021). The soil screening levels are provided for residential or industrial/commercial (*i.e.*, non-residential) land use. COPCs in groundwater (via SPLP of subsurface soil samples) and soil have been screened against the following:

- Soil human health *de minimis* values for residential land use.
- Soil human health *de minimis* values for commercial/industrial land use.
- Human health *de minimis* values for groundwater use.

The SPLP soil leachate (an aqueous) data are directly compared to the groundwater *de minimis* RBC as a conservative approximation of migration to groundwater potential.

In addition, the WV VRP allows for screening of metals against published natural background levels. The maximum (90<sup>th</sup> percentile) published natural background concentration becomes the *de minimis* RBC. These values are derived from the VRP Guidance Manual, (Table 60-9, revised December 2021).

#### **Recreator Regional Soil Screening Levels**

As the planned use of the Site is a recreational trail, site-specific recreational standards for soil would best represent the potential risk to human exposure. Data provided by Morgantown Board of Park and Recreation Commissioners (BOPARC) was used to determine the applied exposure frequency and times.

The following BOPARC provided exposure scenarios were used in the generation of the site-specific trail user recreator Regional Screening Level (RSLs) utilizing the US EPA regional screening level generator tool, [https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\\_search](https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search):

- Exposure frequency to a recreator of 114 days a year, estimated based on seasonal use between the months of March and November, averaging 3 days a week.
- Exposure time to a recreator of 2 hours a day, estimated based on non-commuter use of the trail and average length of time using the trail per daily visit.
- Hazard quotient not to exceed 1.0, set by the WVDEP.
- Cumulative cancer risk of  $1 \times 10^{-6}$ , set by WVDEP.
- Attenuation Factor (AF)= 0.4 (Age 0-6) and 0.12 (Age 16-26)

The site specific and *de minimis* recreator RSL outputs are provided in Appendix A.

### Vapor Intrusion Screening Levels

SPLP leachate samples are screened against the US EPA VISLs (obtained from the WVDEP “De Minimis and Relevant Benchmarks” table, updated February 2023) for the ability of volatile chemicals to migrate from groundwater through soils into future occupied structures at concentrations that present a potential risk to residents or indoor workers.

#### 3.3.1 COCs in Surface Soil

To determine the nature and extent of contamination in surface soil, laboratory analytical data was compared to the WV VRP human health residential soil *de minimis* values, human health industrial soil *de minimis* values, site specific and *de minimis* recreator exposure levels for a trail user, and the published maximum natural background soil concentration of arsenic in West Virginia.

The surface soil results are summarized on Table 1A (Phase II ESA data) and Table 2 (SSAR data).

Laboratory analytical results indicate that the following are above their applicable RBCs (for industrial, recreational trail, or residential use) at one or more locations:

- Industrial –arsenic and benzo[a]pyrene
- Site Specific Recreational Trail – arsenic and PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene)
- Residential –arsenic and PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene)

The following locations exceeded the site-specific recreator RBCs:

- Surface soil location SS-29 is an area of concern for arsenic. The West Virginia background RBC for arsenic is 13.1 mg/kg. The source of the arsenic is unknown. The location is immediately outside the tank T-37 berm and within the identified municipal waterline right-of-way.
- Surface soil locations SS-02-121422 and SS-03-121422, both within the proposed “Skills Area” and both with a reported arsenic concentration of 13 mg/kg, are considered areas of concern. The maximum published background concentration for arsenic is 13.1 mg/kg; therefore, any result reported below 13.1 mg/kg arsenic would not be considered a COC. However, the laboratory reported arsenic to only two significant figures; therefore, to be conservative, any arsenic result reported as 13 mg/kg, is considered above the standard.
- Surface soil locations SS-01, SS-17, SS-19, SS-23, SS-25, SS-35, SS-47, SS-48, SS-50, SS-51, SS-58, SS-60, and SS-04-121422 are areas of concern for PAHs. Benzo(a)pyrene (BaP), a PAH, is considered a marker COC since it is a common petroleum contaminant and was detected at each location of concern. The PAH exceedance locations are directly attributable to former AST locations.
- BaP also exceeded its respective RBC in the proposed cross-over trail (near the confluence of former AST locations T-37, T-38, and T-43) and within the proposed “Skills Area”.

Please refer to Figures 4 and 5 for the surface soil sample locations.

### 3.3.2 COCs in Subsurface Soil

To determine the nature and extent of contamination in subsurface soil, laboratory analytical data was compared to the WV VRP human health residential soil *de minimis* values, human health industrial soil *de minimis* values, site specific and *de minimis* recreator exposure levels for a trail user, and the published maximum natural background soil concentration of arsenic in West Virginia. The subsurface soil results are summarized in Table 1B.

- Arsenic exceeded the residential soil RBC and recreator RSL in subsurface soil at location SS-03 at 6-8' bgs. Location SS-03 (6-8) is within a former AST location, T-39.

No other metals or PAHs were detected above any soil RBCs in subsurface soils at the Site. Industrial soil RBCs were not exceeded in any subsurface soil location.

### 3.3.3 COCs in Groundwater

SPLP leachate analysis was performed on five soil samples to estimate the adsorption-desorption potential of contaminants in soil that may impact groundwater at the Site. Environmental Standards compared the SPLP leachate laboratory analytical data to the WV VRP groundwater *de minimis* RBC values (Table 60-9, revised December 2021). The SPLP results are summarized in Table 3.

Laboratory analytical results indicate that the concentrations of metals and PAHs evaluated in the SPLP leachate samples are below their respective groundwater *de minimis* values. Therefore, metals and PAHs are not likely to migrate to groundwater and are eliminated as COCs in groundwater.

### 3.3.4 COCs in Vapor Intrusion

To assess the potential vapor pathways, the SPLP laboratory analytical results for PAHs prone to volatilization (BaP, naphthalene, and mercury) were compared to the US EPA VISL Calculator, Resident and Commercial Vapor Intrusion Screening Levels on the WVDEP-generated "De Minimis and Relevant Benchmarks Table", current as of February 1, 2023. The VISL groundwater calculations as compared to the SPLP leachate concentrations are summarized in Table 3.

Input parameters utilized for the comparison were:

- Hazard quotient not to exceed 1.0
- Cumulative cancer risks of  $1 \times 10^{-6}$  (resident) and  $1 \times 10^{-5}$  (commercial)
- Temperature of 13 degrees Celsius

BaP, naphthalene, and mercury were not detected at concentrations greater than their respective resident or commercial VISLs. Therefore, there are no vapor intrusion COCs for the Site.

### 3.3.5 Summary of COCs

There are no COCs in the groundwater or vapor intrusion pathways.

Arsenic and PAHs (benzo[a]anthracene, BaP, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) are COCs in surface soil for recreational trail and residential use.

Arsenic and BaP are surface soil COCs for an industrial use scenario.

Arsenic is a COC in subsurface soil, but only for a resident or recreator receptor.



## **4.0 HUMAN HEALTH EXPOSURE AND RISK ASSESSMENT**

This exposure assessment discusses the mechanisms by which humans and ecological receptors might contact the COCs on the Site.

An exposure pathway describes the course that a constituent takes from its environmental source to a human receptor. An exposure pathway includes the following elements: (1) a COC released from a source, (2) an exposure medium, (3) a point of potential contact for the receptor with the exposure medium, and (4) an exposure route at the contact point (e.g., ingestion, dermal contact, or inhalation). An exposure pathway is considered complete when all elements are present.

Once constituents are released into an environmental medium, they may migrate from one medium to another. Complete exposure pathways are those that involve receptor contact with an environmental medium that contains Site-associated COCs.

### **4.1 Exposure Assessment**

Based on the results of this assessment, several potentially complete exposure pathways exist at the Site. For purposes of this risk assessment, recreational receptors, outdoor workers, indoor workers, trespassers, and visitors are considered unlikely to come in direct contact with subsurface soils. Therefore, direct contact in subsurface soil would not be a complete exposure pathway for these populations.

The human health exposure pathways for the Site, separated into incomplete and complete, are identified below.

#### **4.1.1 Incomplete Exposure Pathways**

**Groundwater- Dermal contact, ingestion, inhalation (all human receptors)** - No COPCs were detected at concentrations more than the West Virginia groundwater *de minimis* RBCs in the SPLP leachate, therefore, groundwater is an incomplete pathway for the Site for all potential receptors.

**Subsurface Soil - Dermal contact, ingestion, inhalation (resident, recreator, indoor/outdoor worker, visitor, trespasser)** - Residents, recreators, indoor/outdoor workers, visitors, and trespasser are unlikely to be exposed to direct contact with subsurface soils. Therefore, subsurface soil exposure (via ingestion, inhalation, or dermal contact) for these receptors is an incomplete pathway.

**Vapor Intrusion (indoor and ambient air, all receptors)** - No COPCs were detected at concentration more than the VISL standards, severing the potential vapor pathway.

**Surface Water/ Sediments – Direct contact, ingestion**-There are no surface water or sediments on the subject Property. Therefore, on-site direct contact, ingestion, or inhalation with surface water and sediments are incomplete exposure pathways.

In regard to off-site impacts, the SIR completed by the WVDEP (Triad, 2020) included surface water quality samples from Cobun Creek and Reservoir, the adjacent waterways. Only metals, which were determined to be indicative of known upstream abandoned mine lands impacts, were detected. Furthermore, based on the data collected on the Site, including soil leachability,

site-related contaminants are not likely to be migrating to aquatic habitats. Therefore, it is reasonable to conclude the Site is not contributing to exceedances of surface water quality standards in adjacent water bodies.

#### 4.1.2 Complete Exposure Pathways

**Surface Soil – Dermal contact, ingestion, inhalation (future resident):** Ingestion, inhalation, and dermal contact with COCs in surface soil are complete exposure pathways for a future resident. Arsenic, BaP, benzo(a)anthracene, benzo(k)fluoranthene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, were identified as COCs in surface soil above the residential *de minimis* values.

**Surface Soil – Dermal contact, ingestion, and inhalation (trail recreator):** Ingestion, inhalation, and dermal contact with COCs in surface soil are complete exposure pathways for a trail recreator. Arsenic, BaP, benzo(a)anthracene, benzo(k)fluoranthene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, were identified as COCs in surface soil above the recreational site-specific values.

**Surface Soil – Dermal contact, ingestion, and inhalation (worker, trespasser, or visitor):** Ingestion, inhalation, and dermal contact with COCs in surface soil are complete exposure pathways for a future industrial user. Arsenic and BaP were identified as COCs in surface soil above the industrial *de minimis* values in sample location SS-29 (arsenic) and SS-25 (BaP).

**Subsurface Soil – Dermal contact, ingestion, and inhalation (construction/utility worker):** Ingestion, inhalation, and dermal contact with COCs in surface and subsurface soil are complete exposure pathways for a future construction worker or utility worker. Arsenic was identified as a COC in subsurface soil above the industrial *de minimis* value in sample location SS-03 at 6-8' bgs.

#### 4.1.3 Pathways Evaluated Qualitatively

All pathways were evaluated qualitatively via comparison of exposure estimates with benchmark values. Please refer to Section 3.3. Further evaluation is provided below.

##### 4.1.3.1 Calculating Upper Confidence Limits for Exposure Point Concentrations

An element of the risk assessment process is the estimation of the concentration of a chemical in the environment. This concentration, commonly termed the exposure point concentration (EPC), is a conservative estimate of the average chemical concentration in an environmental medium. The EPC can be determined for each individual exposure unit (in this case the White Park Southside trail) within a site. An exposure unit is the area throughout which a receptor moves and encounters an environmental medium for the duration of the exposure.

Unless there is site-specific evidence to the contrary, an individual receptor (*i.e.*, a trail user) is assumed to be equally exposed to media within all portions of the trail over the time frame of the risk assessment. US EPA recommends using the average concentration to represent a reasonable estimate of the concentration likely to be contacted over time and because of the uncertainty associated with estimating the true average concentration at a site, the 95 percent upper confidence limit (UCL) of the arithmetic mean should be used. (OSWER 9285.6-10, December 2002).

#### 4.1.3.2 Arsenic Surface Soil Outlier Test

In the case of this risk assessment, outliers are concentrations in the data set that are not representative of the set as a whole, usually because they are very high concentrations relative to the rest of the data. It is common that a few very high concentration values may correspond to hot spots of contamination.

To determine these outliers, and therefore potential hot spots with a focus on risk to the recreator trail user, Environmental Standards used US EPA's ProUCL software version 5.1 to conduct an outlier test to identify statistical outliers within the surface soil arsenic data set. The ProUCL outputs are provided in Appendix B. The outlier test identified one statistical outlier, arsenic at a concentration of 144 mg/kg, at surface soil sample location, SS-29.

The arsenic at location SS-29 cannot be considered indicative of natural conditions. The location is just outside a former tank secondary containment earthen embankment near the confluence of Cobun Creek with the reservoir. This area corresponds with an area that was over excavated by MUB in 2019 as part of a waterline installation project (see Section 2.4.4) The source of the arsenic at this location is unknown. Please refer to Figure 6, Arsenic Surface Soil Exceedance Map, for the location of SS-29 area of concern.

#### 4.1.3.3 Arsenic Upper Confidence Limit (UCL) Surface Soil EPC Calculation

The SS-29 arsenic concentration data point was then removed from the surface soil data set, and ProUCL was used to calculate a 95% UCL for arsenic to derive an arsenic EPC in surface soil. The ProUCL outputs are provided in Appendix B. The 95% UCL was calculated at 11.06 mg/kg for arsenic, which is less than the maximum natural background RBC of 13.1 mg/kg.

Therefore, apart from location SS-29, arsenic is not a COC in surface soil for a recreator at the Site. Please refer to Table 4 for a summary of the recreational COCs by media and chemical.

#### 4.1.3.4 BaP Surface Soil Outlier Test

As discussed previously, BaP is a marker compound for impacted soil at the Site. To determine BaP outliers, and therefore hot spots, Environmental Standards used US EPA's ProUCL (software version 5.1) to conduct an outlier test to identify statistical outliers within the surface soil BaP data set. The outlier test identified six surface soil locations that were statistical outliers. Those locations are SS-23, SS-25, SS-47, SS-48, SS-50, and SS-60.

Therefore, surface soil sample locations SS-23, SS-25, SS-47, SS-48, SS-50, and SS-60 have been identified as potential hot spots for BaP.

All other PAH compound exceedances to the site-specific recreator RBC correspond with these same locations and were therefore not evaluated for EPCs. These locations directly correspond with former tank locations. Please refer to Figure 7, Benzo[a]pyrene Surface Soil Exceedance Map, for the location of these areas of concern.

#### 4.1.3.5 BaP UCL Surface Soil EPC Calculation

The SS-23, SS-25, SS-47, SS-48, SS-50, and SS-60 (and its field duplicate) BaP concentration

data points were then removed from the surface soil data set, and ProUCL was used to calculate a 95% UCL for BaP to derive an EPC in surface soil. The ProUCL outputs are provided in Appendix B. The 95% UCL was calculated at 134.6 µg/kg for BaP, which is less than the site-specific recreator RBC of 285 µg/kg.

Therefore, apart from areas of concern SS-23, SS-25, SS-47, SS-48, SS-50, and SS-60, BaP is not a COC in surface soil for a recreator at the Site. Please refer to Table 4 for a summary of the COCs, by media.

#### 4.1.4 Pathways Evaluated Quantitatively

No pathways were evaluated quantitatively (such as laboratory animal models or epidemiological studies).

#### 4.2 Toxicity Assessment

A toxicity assessment 1) evaluates the potential for substances of potential concern to cause adverse health effects in exposed persons and 2) defines the relationship between the extent of exposure to a hazardous substance and the likelihood and severity of any adverse health effects. Standard procedures for a toxicity assessment include identifying toxicity values for carcinogenic and noncarcinogenic effects and summarizing other relevant toxicity information.

Based on the risk assessment, a toxicity assessment is not needed for the White Park Site.

#### 4.3 Risk Characterization

Risk characterization is the final step of the baseline human health risk assessment process. Cancer and noncancer health risks are estimated, assuming long-term exposure to chemicals detected at the Site. The risk characterization methods described in US EPA guidance (US EPA, 1989) are used to calculate upper-bound excess lifetime cancer risks for potential carcinogens and hazard indices for chemicals with non-cancer health effects.

Based on the risk assessment, a risk characterization is not needed for the White Park, Parcel A Southside Trail Site.

## 5.0 ECOLOGICAL RISK ASSESSMENT

### 5.1 De minimis Ecological Screening Evaluation

A *de minimis* Ecological Screening Evaluation is an evaluation of the nature and extent of contaminants of the Site that may impact potential ecological receptors of concern. The evaluation should determine if potential exposure pathways are completed. If complete exposure pathways are not present between contaminants and ecological receptors of concern, no significant risk to ecological receptors is assumed.

#### 5.1.1 Pathways of Ecological Exposure

This section presents a screening-level ecological evaluation for the Site. The evaluation is consistent with the WVDEP guidelines for conducting a *de minimis* Ecological Screening Evaluation which consists of the following steps:

- Determination of potentially complete exposure pathways;
- Identifying readily apparent harm;
- Identifying contamination associated with ecological habitats; and
- Identifying potential ecological habitats and receptors of concern.

These steps are evaluated with the use of the “Checklist to Determine the Applicable Ecological Standard”, which is provided in the WVDEP VRP Guidance Manual. The completed checklist is included as Appendix C.

The pathways of ecological exposure to be considered are soil, groundwater, and surface water. An exposure pathway is defined as a physical association between an ecological receptor of concern and a Site-related contaminant. Both aquatic and terrestrial receptors were considered. Depth to groundwater is such that there are no potentially complete pathways for ecological receptors to contact groundwater. There are no valued terrestrial, wetland, or aquatic habitats within the Site.

According to Step 1 of the Checklist, there is a surface water body (*i.e.*, lotic or lentic habitat) on or adjacent to the Site. Those surface water bodies are Cobun Creek and the Cobun Creek reservoir adjacent to the Site.

In completing Step 2, the risk was evaluated in terms of “readily apparent harm” or is the “site contributing to exceedances of surface water quality standards”; no such evidence was apparent. In 2018, a Site Inspection Reassessment was completed by the WVDEP (Triad, 2020), that included surface water quality samples. Metals, indicative of known upstream abandoned mine lands impacts, and not petroleum storage, were detected. Furthermore, based on the soil data collected, including soil leachability, site-related contaminants are not likely to be migrating to aquatic habitats. Therefore, it is reasonable to conclude the Site is not contributing to exceedances of surface water quality standards.

In Step 3, site-related contaminants were evaluated in terms of the risk to ecological habitat. As discussed above, there are no site-related contaminants currently or likely to be migrating to aquatic habitat (*e.g.*, lotic, lentic, or wetland habitat). However, site-related contaminants have been detected above natural background concentrations in soil/terrestrial habitat and the related

releases of contaminants have not been stopped. Therefore, Step 4 of the Checklist was required.

In Step 4, an Endangered Species Act Project Review was conducted using the USFWS IPaC. The review revealed there are no critical habitats at the Site. However, potential habitat for two species of federally endangered bats (Indiana bat and Northern Long-eared bat), one species of proposed endangered bat (Tricolored bat) and one candidate species (Monarch Butterfly) exists.

Only the Indiana bat and Northern Long-eared bat were further evaluated based on value as federally endangered species. It is commonly known that the Indiana bat spends summer months living throughout the eastern US. During winter, they cluster and hibernate in caves. There are no caves onsite; therefore, only roosting during summer months is a potential concern.

In 2016 and in 2019, the Morgantown Utility Board (MUB) contacted the DNR and USFWS for technical assistance in preparation of the planned water and sewer line project in the Southside project area. Both the USFWS and the DNR concluded the project would not impact either species. The Site is not within the species' hibernacula or summer roosting habitat. These clearance letters are provided in Appendix C. Therefore, it can be concluded with reasonable assuredness that soil concentrations would not present an unacceptable risk to these valued species.

#### 5.1.2 *De minimis* Ecological Screening Evaluation Conclusions

The ecological screening evaluation consisted of an assessment of the physical and ecological characteristics of the Site and the nature and extent of contamination to determine if there are complete exposure pathways to ecological receptors of concern from the Site.

The screening evaluation indicated that there are potentially valued aquatic habitats adjacent to the Site. However, the screening concluded site-related contaminants are not likely to be migrating to these aquatic habitats. The screening evaluation also confirmed that there are no valued terrestrial habitats on the Site. Therefore, a complete exposure pathway does not exist for potential ecological receptors of concern. Therefore, the ecological evaluation is complete, and the Site has passed the *de minimis* Ecological Screening Evaluation.

Lastly, it can be concluded that there are sufficient samples to complete the ecological screening evaluation.

## 6.0 UNCERTAINTY ANALYSIS

### 6.1 Data and Exposure Point Concentrations

Historical operations of the Site are well known and documented. However, uncertainties and risk are associated with selection of COCs and any exposure assessment. Assumptions made in the exposure assessment were based on the data derived during Site assessment activity.

Site characterization is based on a limited number of sample locations and some variability between data points is expected. The challenge to the investigator is to position sample locations appropriately so that the maximum amount of information can be obtained for a reasonable level of effort and expense.

Sample positions were not selected randomly. Surface soil samples were collected along the proposed trail to be constructed by the City, with many locations along or near former AST locations. Subsurface soil sample locations were collected from areas of the Site identified by the City for potential use as borrow material and therefore most likely to be exposed to either future workers or recreators of the Site. These sample locations were appropriate to obtain data needed to complete the risk assessment.

### 6.2 Toxicity Values

Based on the risk assessment, a toxicity assessment and evaluation of toxicity values was not considered for the White Park Site. This is because toxicity values are incorporated into the published WV *de minimis* RBCs and relevant benchmarks following the WVDEP tiers of priority for toxicity values (*i.e.*, IRIS, PPRTV and other sources).

While acceptable to use, these built in toxicity standards inherently have uncertainties. Typical sources of these uncertainties include, but are not limited to, 1) using dose-response information from short-term exposure studies to infer long-term exposures and vice-versa, 2) using information from animal studies to predict effects in humans, 3) using data from homogenous populations to predict effects in general populations with wide ranges of sensitivities, 4) the potential for synergistic and antagonistic interactions among contaminants associated with the Site, 5) using dose-response information from effects at high doses to predict health effects that may occur following low-level exposure, and 6) underestimating low level-dose exposures to high levels within the environment.

### 6.3 Chemical Interactions

A *de minimis* evaluation, including the site-specific recreator exposures, was deemed appropriate for the Site. Therefore, chemical interactions are not considered for the White Park Site. It is important to note that synergistic and antagonistic chemical interactions may occur, but it is not possible for current toxicological methods to determine the nature of these interactions in complex mixtures. The potential for these interactions adds some uncertainty to the *de minimis* risk assessment process.

### 6.4 Exposure Factors

It is believed that uncertainties associated with the effectiveness of the selected COCs and exposure assessments have been minimized. The work was supervised and approved by the

WVDEP, and 90% of the data were reviewed and validated for usability according to the requirements of the WV VRP. The exposure assessments accounted for all reasonable receptors, dependent upon the potential future use. These included future residential users, recreational users, indoor workers, outdoor workers, construction workers, and visitors/trespassers.

Lastly, default exposure parameters were used to establish the *de minimis* standards and benchmarks applied and these default exposure parameters conservatively use 90<sup>th</sup> percentile, maximum, or 95% UCL estimates to protect as many receptors as possible.



## **7.0 CONCEPTUAL SITE MODEL (CSM)**

Appendix D presents the updated human health CSM, which identifies the human and ecological receptors, potential exposure pathways, and whether each pathway is complete. The CSM incorporates the 2022 Phase II ESA data (submitted with the VRP Application) and the 2022 supplemental site assessment data, collected under the VRP. The CSM summarizes each potential contaminant source, COC, release mechanism, media, exposure pathway, and receptor.

### **7.1 Sources of Contamination and Receiving Media**

The following media and routes were considered for potential exposure:

- Soil – Dermal contact, ingestion, and inhalation
- Groundwater – Dermal contact, ingestion, and volatilization
- Vapor – Volatilization and inhalation
- Surface water/Sediments – Dermal contact, ingestion, and inhalation

Sources of contamination are from historical operations on the Site, specifically its use as a crude oil tank farm, and the associated ASTs. Contamination of soil would have likely occurred from routine Site operations, such as filling and material transport, as well as from unintentional releases.

### **7.2 Receptors**

The potential human receptors at the Site were evaluated in the context of their potential exposure pathways. While the proposed land use for the Site is recreational, the following potential receptors were considered:

- Resident
- Recreator (of a Trail)
- Outdoor Worker
- Indoor Worker
- Construction/Utility Worker
- Visitors and Trespassers

The resident is assumed to be typical full-time resident, adult and/or child, who would be present at the Site on a long-term, daily basis. The recreational user is assumed to be an individual who would be present at the Site on a regular basis, engaging in recreational activities (e.g., hiking and biking activities with potentially frequent ground surface contact). The outdoor worker may be involved in a long-term or short-term project at the Site that does not involve excavation of soils. A construction/utility worker may be involved in a short-term construction or excavation project at the Site. Indoor workers, trespassers or visitors on the Site are potential receptors for infrequent exposure to COCs in surface soil.

### **7.3 Migration Pathways**

The dermal contact, ingestion, inhalation, and volatilization pathways were all evaluated in the context of potential users and uses.

## 7.4 Exposure Points and Exposure Routes

For purposes of the evaluation of exposure scenarios discussed herein, recreational receptors, outdoor workers, indoor workers, trespassers, residents, and visitors are considered unlikely to come in direct contact with subsurface soils. Therefore, direct contact in subsurface soil would not be a complete exposure pathway for these populations.

Based on the results of this assessment, several potentially complete exposure pathways exist at the Site, as summarized below.

### 7.4.1 Residential Exposure

The following COCs were detected at concentrations more than their respective residential surface soil *de minimis* RBCs in one or more surface soil samples (see Table 4), making the residential pathway via dermal contact, ingestion, or inhalation potentially complete:

Arsenic	Benzo(a)anthracene
BaP	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Dibenz(a,h)anthracene
Indeno[1,2,3-cd] pyrene	

### 7.4.2 Recreational (Trail) Exposure

The following COCs were detected at concentrations more than their respective recreational *de minimis* RBCs in one or more surface soil samples, making the recreational pathway via dermal contact, ingestion, or inhalation potentially complete:

Arsenic	Benzo(a)anthracene
Benzo(a)pyrene	Benzo(b)fluoranthene
Benzo(k)fluoranthene	Dibenz(a,h)anthracene
Indeno[1,2,3-cd]pyrene	

### 7.4.3 Worker, Visitor/Trespasser Exposure

Arsenic (in surface soil sample location SS-29) and BaP (at SS-25) were detected at concentrations more than their industrial soil *de minimis* RBCs, making the surface soil pathway via dermal contact, ingestion, or inhalation potentially complete for the outdoor worker, construction/utility worker, visitor, and trespasser populations at surface soil locations SS-29 and SS-25.

### 7.4.4 Construction/Utility Worker Exposure

Arsenic in subsurface soil sample location SS-03 at 6-8' bgs was detected at a concentration more than its industrial soil *de minimis* RBC, making the subsurface soil pathway via dermal contact, ingestion, or inhalation potentially complete for the construction/utility work within the area of SS-03.

SS-03 is associated with an area within the footprint of a former AST. It can be assumed that other subsurface soil associated with former AST locations may present a complete exposure pathway to construction/utility workers within the Site.

## 7.5 Potentially Complete Pathways

As demonstrated by the CSM (Appendix D), there are potentially complete exposure pathways at the Site. They are:

- (1) future workers, residents, and recreators to arsenic and PAHs in the surface soil within defined areas of the Site; and
- (2) future construction/utility workers to arsenic in the subsurface soil associated with former AST location, T-39.

## 7.6 Presumptive Remedies

Presumptive remedies were not considered in this risk assessment.



## **8.0 CONCLUSIONS AND RECOMMENDATIONS**

### **8.1 Summary**

The future use of the Site is planned to be recreational; specifically, a hiking and biking trail. This RAR presented an analysis of Site under future residential, recreational, and non-residential conditions using human health *de minimis* risk-based standards, site specific recreator standards, and a *de minimis* ecological screening evaluation. The risk assessment provides an understanding of the nature of the constituents present, the possible pathways of human and ecological exposure, and the degree to which such exposure may pose a potential for adverse effects.

This human health and ecological risk assessment addressed the potential for adverse effects related to exposure to constituents associated with soil and groundwater from the Site. The receptors considered for remedial action include residents, indoor workers, recreators, outdoor workers, construction/utility workers, trespassers, visitors, and ecological receptors.

### **8.2 Conclusions**

Constituents associated with groundwater (SPLP), potential vapor, surface soil, and subsurface soil were evaluated and included in the assessment. COCs were identified for surface soil and subsurface soil based on a comparison of the analytical data to risk-based comparison values from WVDEP and US EPA.

There are no COCs or complete pathways for any potential future use to the groundwater or to occupied structures (vapor intrusion) or workers (ambient vapors).

Arsenic, benzo(a)anthracene, BaP, benzo(b)fluoranthene, dibenz[a,h]anthracene, benzo(k)anthracene, indeno[1,2,3-cd]pyrene are COCs in surface soil for a residential or recreational use scenario in limited areas.

Arsenic is a COC in surface soil for a future industrial use scenario at one location, northwest of the secondary containment berm of former AST, T-37.

BaP is a COC in surface soil for a future industrial use scenario at one location, the northern edge secondary containment berm of former AST, T-43.

Arsenic is a COC for subsurface soil, but only for a construction worker/utility worker use scenario. To be conservative, all former AST locations are considered potentially complete pathways to a future construction/utility worker.

There are no potentially complete ecological exposure pathways identified.

A visual representation of the above is provided in the RAR CSM in Appendix E.

### **8.3 Recommendations**

Based on the results of this human health and ecological risk assessment, remedial action is warranted for the White Park Parcel A- Southside Trail Site. The following is recommended:

- Restriction of the Site to non-residential use via a land use covenant (LUC).

- Based on the results for the potential receptors, restricting access to impacted soils, removal of impacted soils, or a surface covering of the impacted soils in the identified hot spots is warranted to prevent direct contact and sever the remaining soil exposure pathways. If a cover is selected as the remedy, the cover would be maintained and disturbance of the cover would warrant health and safety protocols, and repairs. If soil removal is selected as a remedy, the removal should be performed under the guidance of a Soil Management Plan (SMP).
- For the construction/utility worker, the results suggest that requiring worker training and protective clothing is warranted for activities undertaken in defined areas of concern (potential subsurface soil contact in former AST locations). Furthermore, excavation, surface exposure, and/or removal of subsurface soils from these areas of concern within the Site should be performed under the guidance of a SMP.
- A Remedial Action Work Plan should be developed to address the above potentially complete exposure pathways and submitted to the WVDEP for review and approval.



## **9.0 REFERENCES**

Site Assessment Work Plan, VRP Project #22015, White Park Southside Trail, December 2022.

Environmental Standards, Inc., Phase II Environmental Site Assessment Report, White Park Southside Trail Property, May 31, 2022.

Malcom-Pirnie, Inc., White Park Soil Excavation Activities letter report, January 31, 2011.

Triad Engineering, Inc., Executive Summary Report, White Park, CERCLIS WVD988766168, October 2004.

Triad Engineering, Inc., Phase II Environmental Site Assessment, White Park, September 16, 2019.

Triad Engineering, Inc., Site Inspection Reassessment, White Park CERCLIS Site, December 2009.

Triad Engineering, Inc., Site Inspection Reassessment, White Park CERCLIS Site, July 2020.

US EPA Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, OSWER 9285.6-10, December 2003.

US EPA Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (SW-846).

US EPA VISL Calculator. [https://epa-visl.ornl.gov/cgi-bin/visl\\_search](https://epa-visl.ornl.gov/cgi-bin/visl_search).

West Virginia Department of Environmental Protection, Quality Assurance Program Plan for the West Virginia Department of Environmental Protection Division of Land Restoration Office of Environmental Remediation, Revision 1, March 16, 2022.

West Virginia Department of Natural Resources, Preliminary Assessment, White Park, March 30, 1989.

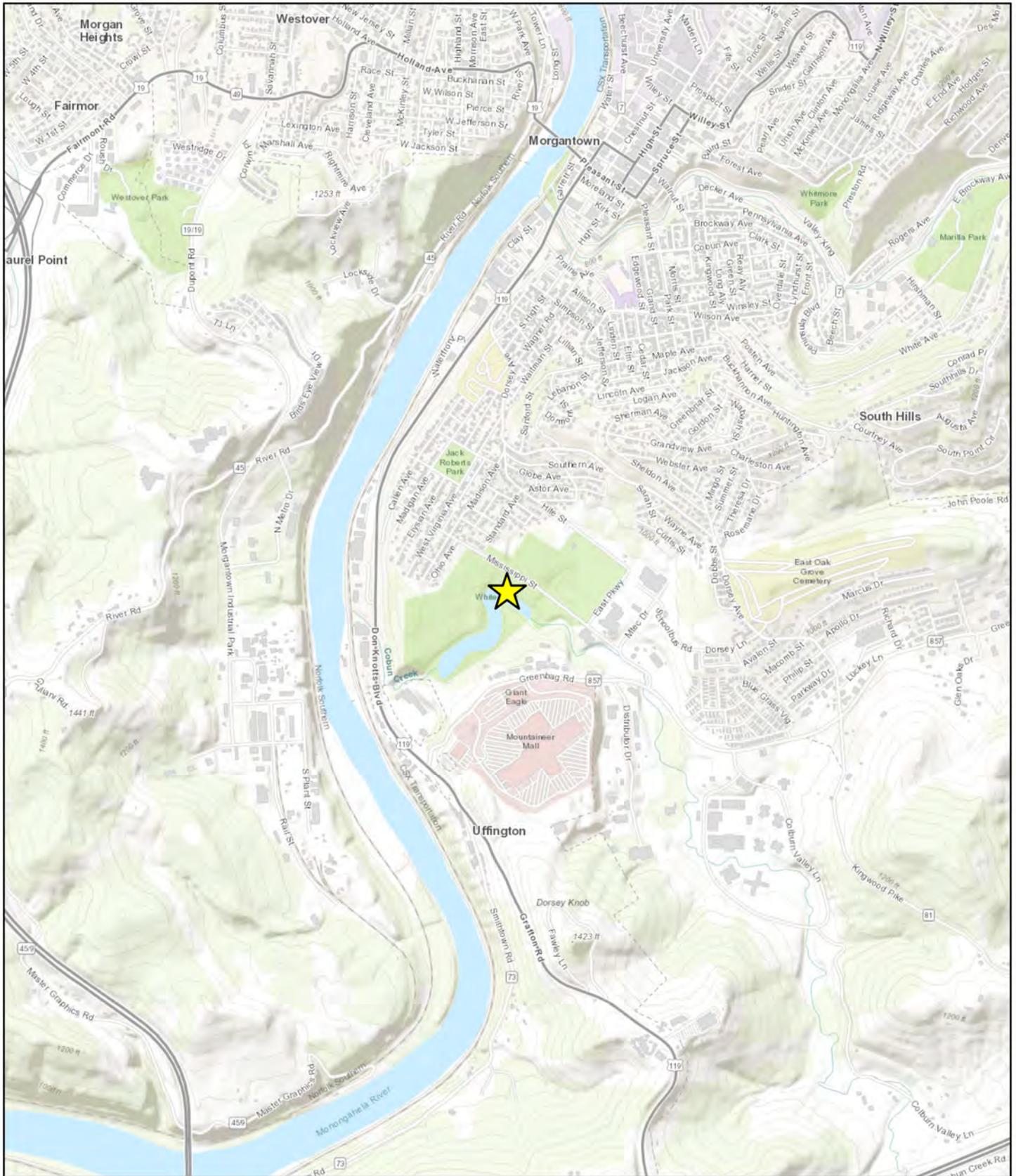
West Virginia Department of Natural Resources, Site Visit Summary Report, White Park, May 4, 1989.

West Virginia Voluntary Remediation and Redevelopment Rule, March 2018.

West Virginia Voluntary Remediation and Redevelopment Act Guidance Manual, December 2022.

**FIGURES**





West Virginia GIS, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA, USDA

 SITE LOCATION

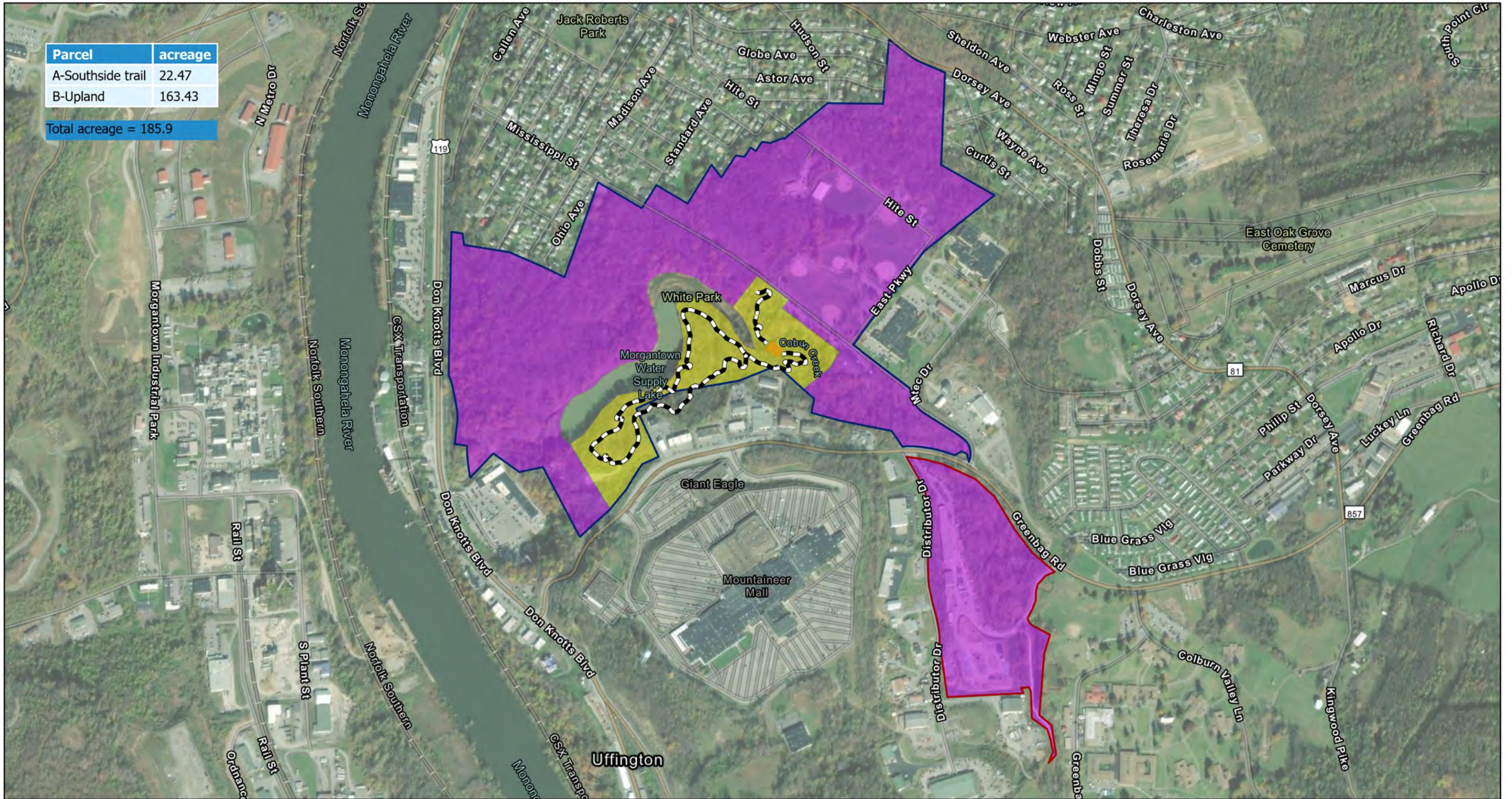


0 0.25 0.5 1  
MILES

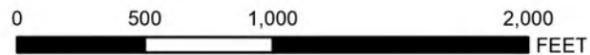
CREATION DATE: JANUARY 10, 2022		PROJECT NO: 20219527.A		<b>FIGURE 1:</b> <b>SITE TOPOGRAPHIC MAP</b>  WHITE PARK - MISSISSIPPI STREET MORGANTOWN, MONINGALIA COUNTY, WV
DRAWN BY: BPD		APPRVD BY: LM		
CHK'D BY: MNW		REVISION: 0		



Parcel	acreage
A-Southside trail	22.47
B-Upland	163.43
Total acreage = 185.9	

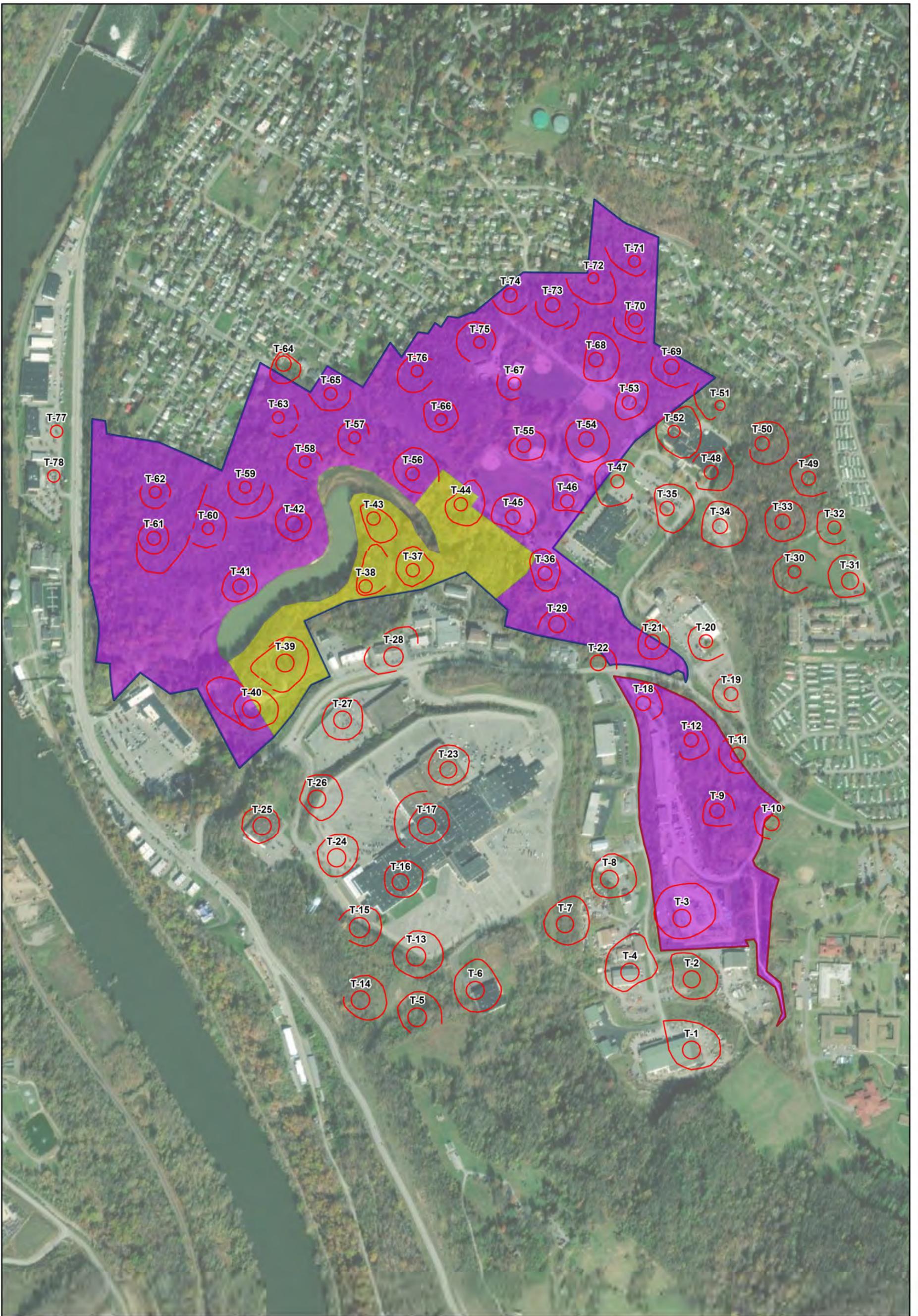


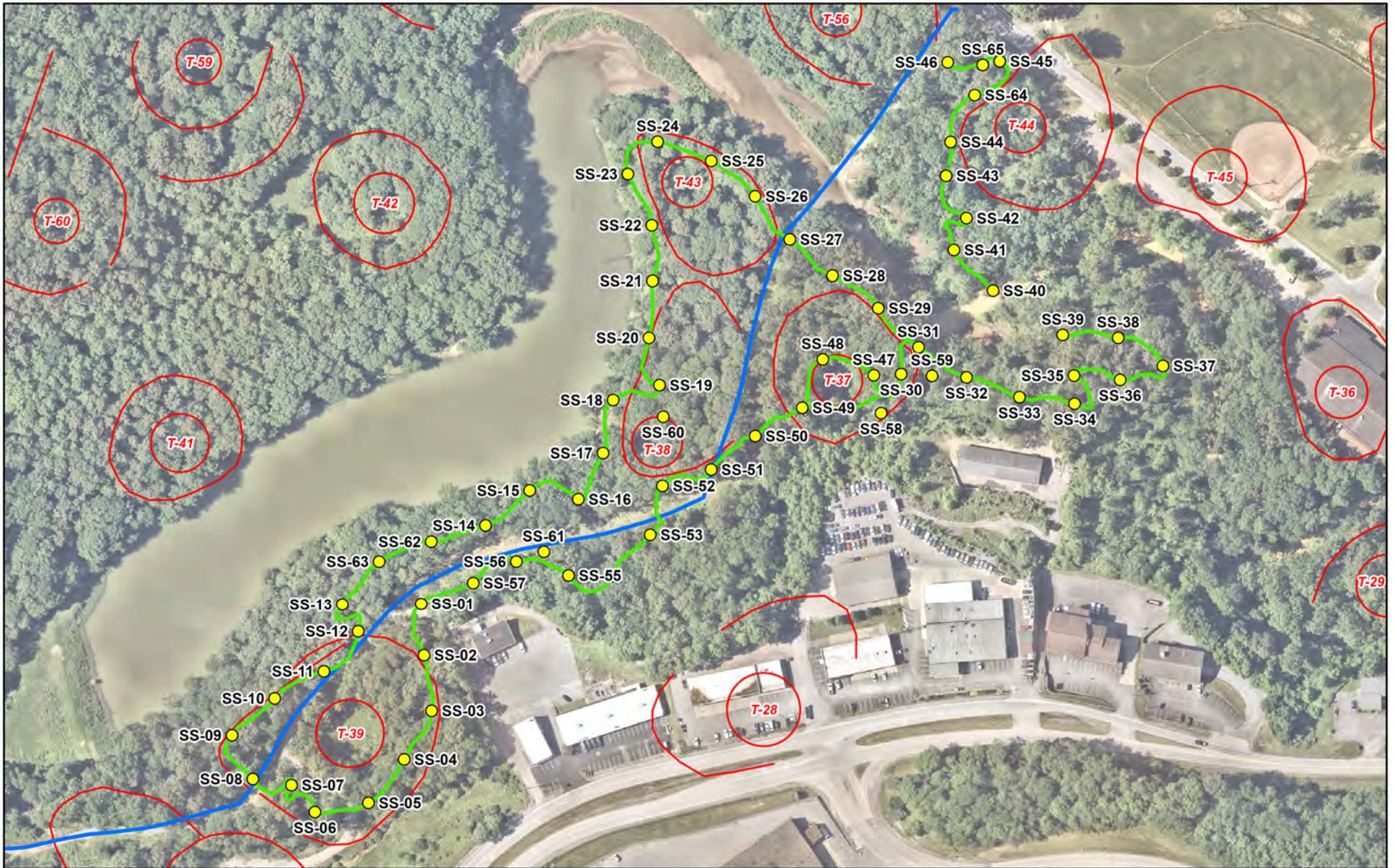
-  SOUTHSIDE TRAIL
-  BRIDGE
-  A-SOUTHSIDE TRAIL
-  B-UPLAND
-  MUB CAMPUS
-  WHITE PARK



Esri Community Maps Contributors, WVU Facilities, West Virginia GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Maxar

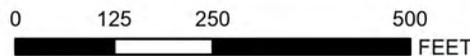
CREATION DATE: DECEMBER 5, 2022	PROJECT NO: 20229836.A	<b>FIGURE 2: SITE LOCATION, AERIAL PHOTOGRAPH</b>  WHITE PARK - MISSISSIPPI STREET MORGANTOWN, MONINGALIA COUNTY, WV
DRAWN BY: MNW	APPRVD BY: LMW	
CHEKD BY: LM	REVISION: 0	



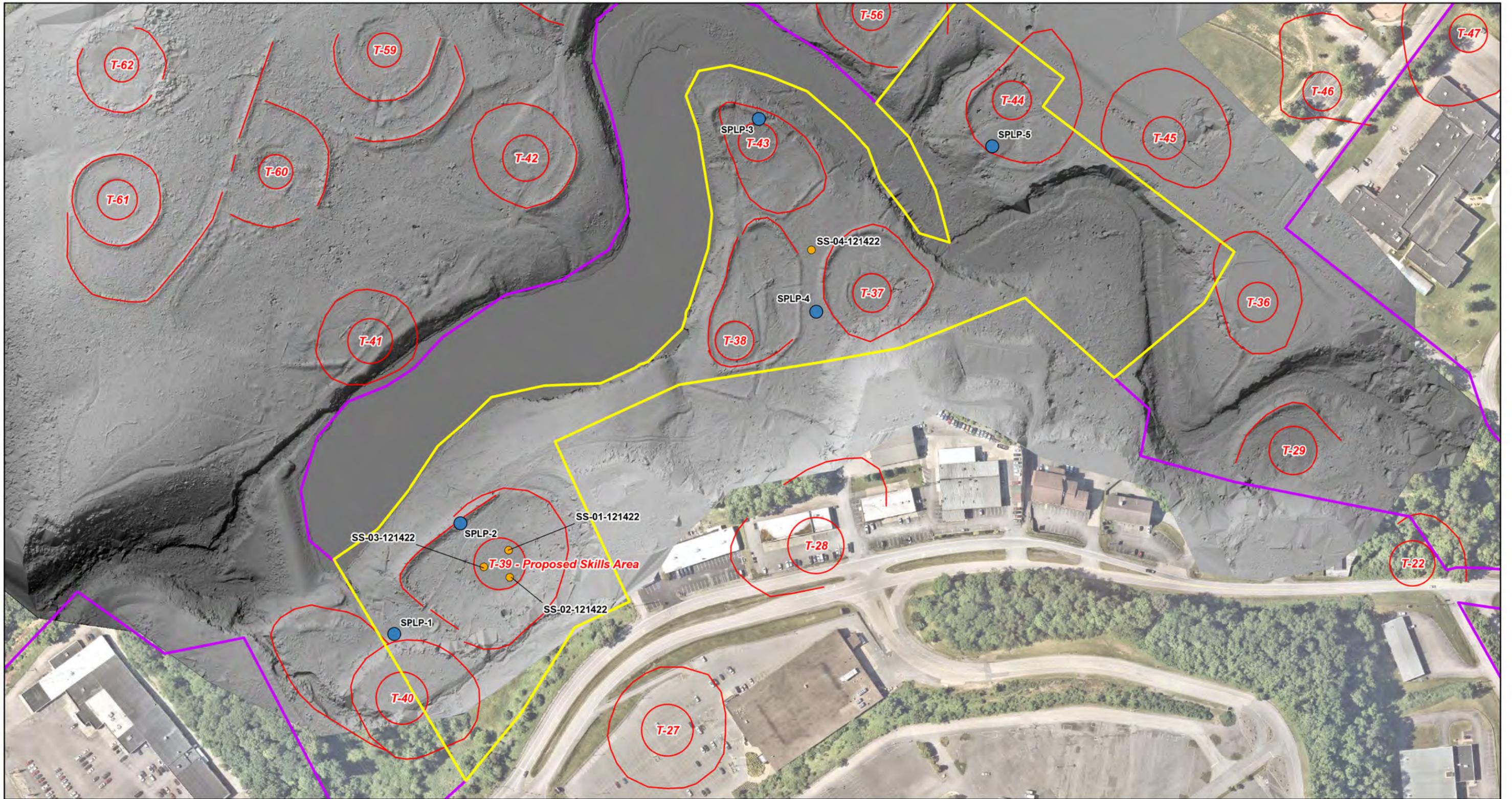


Nearmap, 2022.

- 2022 PHASE II SOIL SAMPLE - PROPOSED AND SAMPLED
- PROPOSED TRAIL
- APPROXIMATE HISTORICAL TANK AND SECONDARY CONTAINMENT
- APPROXIMATE MUB UNDERGROUND UTILITY LINES (WATER AND SEWER)

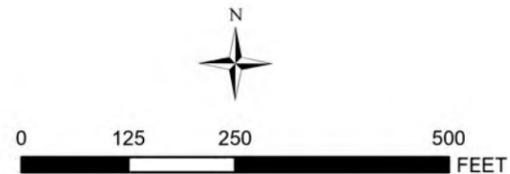


CREATION DATE: FEBRUARY 8, 2023		PROJECT NO: 20219527.A		<b>FIGURE 4: 2022 PHASE II SAMPLE LOCATION MAP</b>  WHITE PARK - MISSISSIPPI STREET MORGANTOWN, MONINGALIA COUNTY, WV
		DRAWN BY: MNW	APPR'VD BY: LM	
		CHEK'D BY: MNW	REVISION: 0	

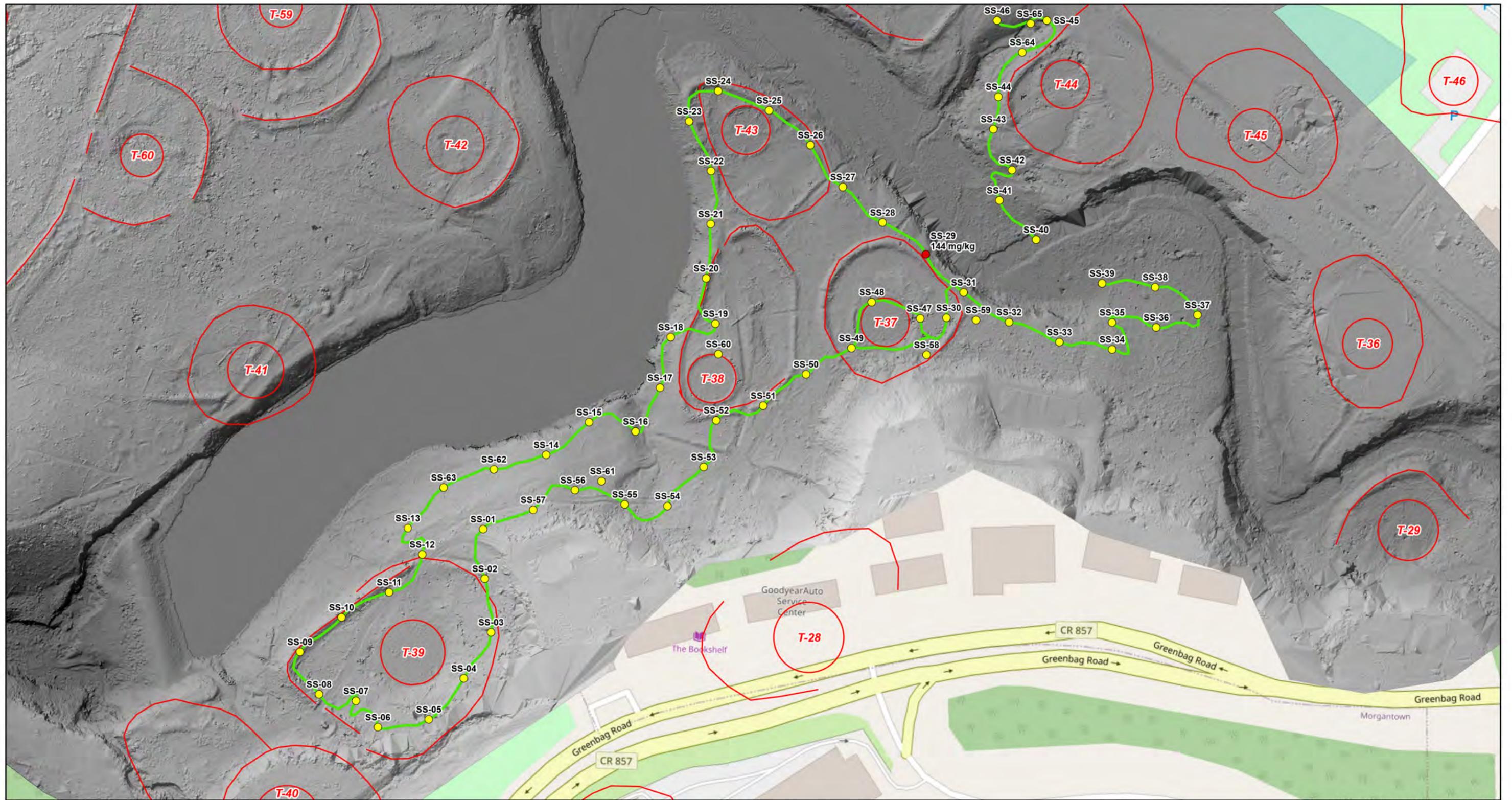


Nearmap, 2022.

- ▭ A-SOUTHSIDE TRAIL
- ▭ B-UPLAND
- APPROXIMATE HISTORICAL TANK AND SECONDARY CONTAINMENT
- SPLP SOIL SAMPLE LOCATIONS
- DECEMBER 2022 SURFACE SOIL SAMPLES



CREATION DATE: FEBRUARY 8, 2023	PROJECT NO: 20229836.A	<b>FIGURE 5:</b> <b>2022 SSAR SAMPLE LOCATIONS</b>
ENVIRONMENTAL STANDARDS	DRAWN BY: MNW CHECKD BY: LM	
WHITE PARK - MISSISSIPPI STREET MORGANTOWN, MONINGALIA COUNTY, WV		

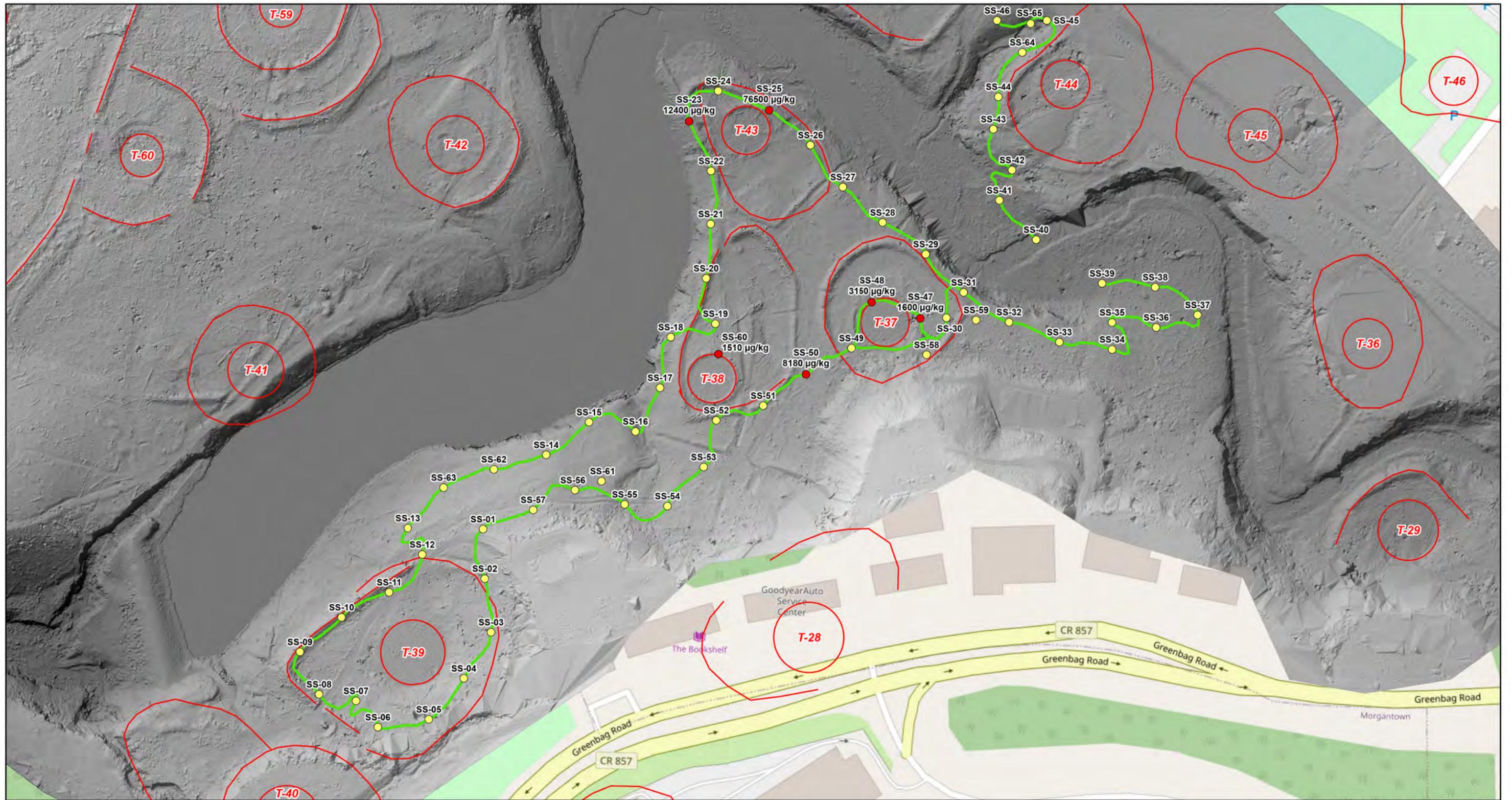


© OpenStreetMap (and) contributors, CC-BY-SA

- PROPOSED TRAIL
- APPROXIMATE HISTORICAL TANK AND SECONDARY CONTAINMENT
- SURFACE SOIL SAMPLE - EXCEEDS BOTH ARSENIC RECREATIONAL RBC AND IS A UCL OUTLIER
- SURFACE SOIL SAMPLE

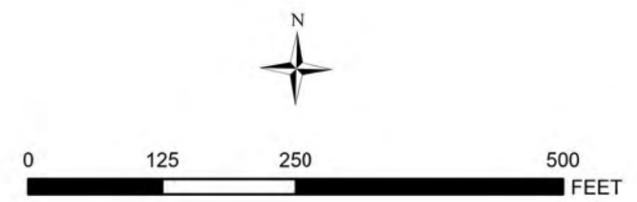


CREATION DATE: FEBRUARY 8, 2023	PROJECT NO: 20219527.A	<b>FIGURE 6: ARSENIC SURFACE SOIL EXCEEDANCES</b>  WHITE PARK - MISSISSIPPI STREET MORGANTOWN, MONINGALIA COUNTY, WV
	DRAWN BY: MNW CHECKD BY: LM	



© OpenStreetMap (and) contributors, CC-BY-SA

- PROPOSED TRAIL
- APPROXIMATE HISTORICAL TANK AND SECONDARY CONTAINMENT
- SURFACE SOIL SAMPLE - EXCEEDS BOTH BENZO(A)PYRENE RECREATIONAL RBC AND IS A UCL OUTLIER
- SURFACE SOIL SAMPLE



CREATION DATE: FEBRUARY 8, 2023	PROJECT NO: 20219527.A	<b>FIGURE 7: BENZO(A)PYRENE SURFACE SOIL EXCEEDANCES</b>  WHITE PARK - MISSISSIPPI STREET MORGANTOWN, MONINGALIA COUNTY, WV
	DRAWN BY: MNW CHECKD BY: LM	

**TABLES**



**Table 1A. 2022 Surface Soil Phase II ESA Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC		SS-01 (0-2)	SS-01 (0-2) DUP	SS-02 (0-2)	SS-03 (0-2)	SS-04 (0-2)	SS-05 (0-2)	SS-06 (0-2)	SS-07 (0-2)	SS-08 (0-2)	SS-09 (0-2)	SS-10 (0-2)	SS-11 (0-2)		
				Date:	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022
				Units	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result
<b>RCRA Metals</b>																		
<b>Arsenic**</b>	<b>30</b>	<b>13.1</b>	<b>13.1</b>	mg/kg	11.2	6.4 J	12.2	12.4	8.5	10.0	11.6	<b>14.5</b>	10.5	9.3	6.8	12.9		
Barium	220000	47900	15000	mg/kg	80.8	58.7	87.8	100	141	118	242	190	130	163	108	90.0		
Cadmium	530	20.2	37	mg/kg	<0.13	<0.19	<0.15	<0.15	<0.15	<0.15	<0.15	<0.14	<0.16	<0.15	0.52 J	<0.15		
Chromium (RBCr)	1000000	--	120000	mg/kg	12.7	8.4	29.0	31.1	27.0	30.9	40.2	30.1	25.7	30.2	19.6	28.1		
Lead (RBCr)	800	--	400	mg/kg	5.3 J	20.7	18.4	30.9	20.1	25.8	14.5	16.3	79.8	25.1	21.5	21.9		
Mercury	3.1	400	3.1	mg/kg	0.023J	0.021J	0.035J	0.036J	0.034J	0.072J	0.077J	0.062J	0.070J	0.076J	0.053J	0.057J		
Selenium	5800	1200	390	mg/kg	3.3 J	2.1 J	3.0 J	3.1 J	2.0 J	1.7 J	2.8 J	2.5 J	2.8 J	2.7 J	1.9 J	1.9 J		
Silver	5800	1200	390	mg/kg	4.3	4.5	12.3	22.0	17.2	18.0	18.9	18.1	17.6	19.5	12.5	18.4		
Zinc	23000	72000	350000	mg/kg	43.4J	54.8	53.3	48.0	58.1	53.6	78.5	73.7	69.9	64.3	71.6	51.1		
<b>PAHs</b>																		
Acenaphthene	47000000	8910000	4100000	ug/kg	<6.7	<9.2	<0.73	<0.74	<0.72	<0.75	<0.77	<0.70	<7.9	<0.74	<0.74	<0.74		
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	<5.3	<7.3	<0.58	<0.59	<0.57	<0.59	<0.61	<0.55	<6.2	<0.59	<0.59	<0.59		
Anthracene	350000000	44600000	23000000	ug/kg	54.4 J	9.5 J	<0.73	<0.74	<0.72	<0.75	<0.77	<0.70	<7.9	<0.74	<0.74	<0.74		
<b>Benzo[a]anthracene</b>	320000	<b>2840</b>	<b>1500</b>	ug/kg	125	38.0 J	<0.95	2.2 J	<0.94	<0.97	1.4 J	<0.91	47.8 J	1.5 J	<0.96	<0.96		
<b>Benzo[a]pyrene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	<b>116</b>	29.3 J	<0.51	1.2 J	<0.50	<0.52	<0.53	<0.48	52.8 J	0.61 J	<0.51	<0.51		
<b>Benzo[b]fluoranthene</b>	210000	<b>2850</b>	<b>1100</b>	ug/kg	213	58.5 J	<0.97	2.3 J	<0.96	<0.99	<1.0	<0.93	103	<0.98	4.2 J	<0.98		
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	70.1 J	20.0 J	<1.2	<1.2	<1.2	<1.2	<1.3	<1.2	28.9 J	<1.2	<1.2	<1.2		
<b>Benzo[k]fluoranthene</b>	2100000	<b>28500</b>	<b>11000</b>	ug/kg	210	57.7 J	<1.4	2.3 J	<1.3	<1.4	<1.4	<1.3	101	<1.4	4.1 J	<1.4		
Chrysene	21000000	285000	110000	ug/kg	135	38.1 J	<0.42	1.4 J	<0.41	<0.43	0.81 J	<0.40	54.0 J	<0.42	<0.42	<0.42		
<b>Dibenz[a,h]anthracene</b>	21000	<b>285</b>	<b>110</b>	ug/kg	19.7 J	<22.5	<1.8	<1.8	<1.8	<1.8	<1.9	<1.7	<19.3	<1.8	<1.8	<1.8		
Fluoranthene	30000000	5940000	2400000	ug/kg	273	96.1 J	<0.61	3.0 J	<0.60	<0.63	<0.64	<0.59	77.9 J	1.4 J	2.6 J	<0.62		
Fluorene	37000000	5940000	2900000	ug/kg	<6.8	<9.4	<0.75	<0.76	<0.74	<0.77	<0.79	<0.72	<8.0	<0.76	<0.76	<0.76		
<b>Indeno[1,2,3-cd]pyrene</b>	210000	<b>2850</b>	<b>1100</b>	ug/kg	58.4 J	<19.3	<1.5	<1.6	<1.5	<1.6	<1.6	<1.5	27.4 J	<1.6	<1.6	<1.6		
Naphthalene*	110000	9770	2400	ug/kg	<14.3	<19.7	<1.6	<1.6	2.9 J	<1.6	<1.6	<1.5	32.1 J / <0.98	<1.6	1.9 J	<1.6		
Phenanthrene (RBCr)	35000000	--	23000000	ug/kg	89.1	56.8 J	<0.71	2.1 J	<0.70	<0.73	1.3 J	<0.68	47.0 J	1.6 J	2.6 J	<0.72		
Pyrene	34000000	4460000	2300000	ug/kg	212	80.0 J	<0.91	2.4 J	<0.90	<0.93	<0.95	<0.87	66.6 J	1.1 J	2.3 J	<0.92		
<b>Moisture Content</b>																		
Percent Moisture	--	--	--	%	9.4	35.0	19.5	19.3	16.5	19.2	22.4	15.3	23.8	19.8	19.7	18.9		

**Notes:**

de minimis RBC = Risk-based concentration WV VRP residential and industrial soil de minimis values (Table 60-9, revised December 2021)

Site Specific RSL = Risk-based concentration for a recreator (trail user) using US EPA Regional Screening Level (RSL) calculator on April 20, 2023 for HQ=1, Cancer Risk 1x10<sup>-6</sup>, exposure frequency=114 days/yr, exposure time=2.0 hr/day, AF= 0.4 (Age 0-6) 0.12 (Age 16-26).

RBCr = In the absence of a recreator RBC, the residential soil RBC is used, as defined in the West Virginia Voluntary Remediation and Redevelopment Act Table 60-3B De Minimis, December 2021.

\*\*Arsenic soil RBC is the maximum published background concentration (VRP Guidance Manual, Table 3-3: Background Concentrations of Elements in WV Soils).

\* = Naphthalene reported as Method 8270 SIM/Method 8260.

< - Indicates analyte was not detected above Laboratory Method Detection Limit

J - indicates estimated result. The result is between the detection limit and the reporting limit, or did not meet data quality objectives.

" ---" - No standard available

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

NA= Not analyzed

Highlighted and bold results - Result is above the Standard.

**Table 1A. 2022 Surface Soil Phase II ESA Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC		SS-12 (0-2)	SS-13 (0-2)	SS-14 (0-2)	SS-15 (0-2)	SS-16 (0-2)	SS-17 (0-2)	SS-18 (0-2)	SS-19 (0-2)	SS-20 (0-2)	SS- 21 (0-2)	SS-22- (0-2)	SS-23 (0-2)		
				Date:	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/21/2022
				Units	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result									
<b>RCRA Metals</b>																		
<b>Arsenic**</b>	<b>30</b>	<b>13.1</b>	<b>13.1</b>	mg/kg	<b>20.3</b>	<b>26.7</b>	<b>16.0</b>	6.6 J	6.9	8.6	<b>26.5</b>	9.9	12.0	<b>14.5</b>	9.8	<b>18.6</b>		
Barium	220000	47900	15000	mg/kg	75.3	70.0	37.4	122	94.0	29.7	54.6	38.2	39.9	56.4	107	101		
Cadmium	530	20.2	37	mg/kg	<0.14	<0.15	<0.14	<0.17	<0.15	<0.15	<0.16	<0.16	<0.15	0.47 J	0.51 J	0.25 J		
Chromium (RBCr)	1000000	--	120000	mg/kg	21.5	26.8	19.5	21.5	25.9	21.7	37.3	17.1	31.3	23.7	25.9	20.6		
Lead (RBCr)	800	--	400	mg/kg	18.4	15.2	11.8	17.0	16.7	7.6	34.5	26.0	18.5	15.4	30.7	62.2		
Mercury	3.1	400	3.1	mg/kg	0.058J	0.039J	0.020J	0.031J	0.046J	0.024J	0.060J	0.077J	0.054J	0.054J	0.082J	0.077J		
Selenium	5800	1200	390	mg/kg	2.3 J	2.7 J	<1.2	<1.5	2.9 J	1.8 J	3.3 J	2.1 J	2.7 J	<1.4	<1.5	1.4 J		
Silver	5800	1200	390	mg/kg	20.5	28.2	16.5	8.6	24.0	19.5	27.5	12.7	22.0	<0.55	<0.59	<0.52		
Zinc	23000	72000	350000	mg/kg	77.2	116	48.2	55.8	61.7	47.1	72.0	42.5	46.6	57.9	115.0	107.0		
<b>PAHs</b>																		
Acenaphthene	47000000	8910000	4100000	ug/kg	<7.1	<0.72	<0.68	<0.83	5.2 J	4.8 J	<0.77	9.9 J	<0.75	<0.74	2.2 J	96.5		
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	<5.6	<0.57	<0.54	<0.65	<0.59	31.7	1.9 J	42.5 J	8.1 J	<0.59	13.2	1190		
Anthracene	350000000	44600000	23000000	ug/kg	141	<0.72	<0.69	<0.83	9.8	76.5	2.1 J	78.3 J	10.3	1.7 J	22.5	3850		
<b>Benzo[a]anthracene</b>	320000	<b>2840</b>	<b>1500</b>	ug/kg	232	<0.93	<0.89	<1.1	18.0	448	11.5	344	67.6	8.5	112	<b>11200</b>		
<b>Benzo[a]pyrene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	<b>180</b>	<0.50	<0.47	<0.57	21.3	<b>353</b>	9.1	<b>295</b>	58.8	6.3 J	85.6	<b>12400</b>		
<b>Benzo[b]fluoranthene</b>	210000	<b>2850</b>	<b>1100</b>	ug/kg	318	<0.95	<0.91	<1.1	40.0	675	23.4	675	138	15.0	232	<b>23100</b>		
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	83.6	<1.2	<1.1	<1.4	11.3	192	3.1 J	87.9	17.3	1.7 J	26.3	3550		
<b>Benzo[k]fluoranthene</b>	2100000	<b>28500</b>	<b>11000</b>	ug/kg	314	<1.3	<1.3	<1.5	39.5	665	23.1	666	136	14.8	229	<b>23100</b>		
Chrysene	21000000	285000	110000	ug/kg	218	<0.41	<0.39	<0.47	19.6	431	12.2	362	71.9	8.4	124	10700		
<b>Dibenz[a,h]anthracene</b>	21000	<b>285</b>	<b>110</b>	ug/kg	26.3 J	<1.8	<1.7	<2.0	3.4 J	71.2	<1.9	36.5 J	7.1 J	<1.8	11.7	<b>1900</b>		
Fluoranthene	30000000	5940000	2400000	ug/kg	599	<0.60	<0.57	<0.69	49.0	874	22.8	831	152	17.0	254	24900		
Fluorene	37000000	5940000	2900000	ug/kg	<7.2	<0.74	<0.70	<0.84	6.2 J	12.0	<0.79	25.4 J	<0.77	<0.76	5.6 J	261		
<b>Indeno[1,2,3-cd]pyrene</b>	210000	<b>2850</b>	<b>1100</b>	ug/kg	83.6	<1.5	<1.4	<1.7	11.1	210	3.7 J	105	19.8	2.1 J	31.1	<b>4370</b>		
Naphthalene*	110000	9770	2400	ug/kg	<15.1	<1.5	<1.5 / <1.4	<1.8	6.0 J	8.2	<1.6 / <1.3	22.9 J	6.6 J	5.2 J / <2.0	33.3	100		
Phenanthrene (RBCr)	35000000	--	23000000	ug/kg	221	<0.70	<0.67	<0.80	36.5	350	7.7 J	467	53.3	9.2	135	15200		
Pyrene	34000000	4460000	2300000	ug/kg	449	<0.89	<0.85	<1.0	37.7	655	18.4	632	115	13.0	185	17400		
<b>Moisture Content</b>																		
Percent Moisture	--	--	--	%	16.9	17.3	14.0	27.6	21.0	17.4	22.4	23.3	20.6	20.6	28.9	18.1		

**Table 1A. 2022 Surface Soil Phase II ESA Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC	Date:	SS-24(0-2)	SS-25 (0-2)	SS-26 (0-2)	SS-27 (0-2)	SS-28 (0-2)	SS-28 (0-2) FD	SS-29 (0-2)	SS-30 (0-2)	SS-31 (0-2)	SS-32 (0-2)	SS-33 (0-2)	SS-34 (0-2)		
					1/21/2022	1/21/2022	1/21/2022	1/21/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022
					Units	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result
<b>RCRA Metals</b>																		
<b>Arsenic**</b>	<b>30</b>	<b>13.1</b>	<b>13.1</b>	mg/kg	8.8	8.1	3.2 J	8.1	10.3	9.1	<b>144</b>	7.4	11.2	0.10	6.8	8.9		
Barium	220000	47900	15000	mg/kg	46.2	51.6	78.6	54.3	49.6	48.7	163	113	65.2	0.76	129	95.7		
Cadmium	530	20.2	37	mg/kg	0.15 J	<0.18	<0.13	0.20 J	<0.15	<0.15	0.45 J	<0.16	<0.14	<0.0016	<0.15	0.18 J		
Chromium (RBCr)	1000000	--	120000	mg/kg	16.4	13.6	14.6	18.5	21.9	20.7	21.9	17.4	22.6	0.18	15.8	15.2		
Lead (RBCr)	800	--	400	mg/kg	18.9	278	9.5	10.4	12.0	10.6	143	17.8	14.9	0.19	18.4	33.8		
Mercury	3.1	400	3.1	mg/kg	0.061J	0.14J	0.020J	0.047J	0.053J	0.047J	1.5	0.047J	0.050J	0.056J	0.048J	0.10J		
Selenium	5800	1200	390	mg/kg	<1.3	<1.6	<1.2	<1.2	<1.3	<1.3	<1.8	<1.4	<1.3	<0.014	<1.3	2.6 J		
Silver	5800	1200	390	mg/kg	<0.50	<0.63	<0.47	<0.47	<0.52	<0.53	<0.71	<0.56	<0.51	<0.0057	<0.52	<0.60		
Zinc	23000	72000	350000	mg/kg	50.4	57.0	45.6	60.0	47.4	47.4	132	47.5	44.7	0.45	52.2	59.0		
<b>PAHs</b>																		
Acenaphthene	47000000	8910000	4100000	ug/kg	<7.0	1760	<0.65	2.4 J	<0.72	<0.72	<10	<0.76	<0.72	<0.78	<0.74	11.2 J		
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	30.5 J	10200	3.8 J	1.1 J	<0.57	<0.57	<7.9	<0.60	<0.57	<0.62	<0.59	28.3 J		
Anthracene	350000000	44600000	23000000	ug/kg	55.6 J	33200	8.0	15.6	<0.72	1.2 J	19.9 J	<0.76	<0.72	2.7 J	<0.74	89.4		
<b>Benzo[a]anthracene</b>	<b>320000</b>	<b>2840</b>	<b>1500</b>	ug/kg	340	<b>112000</b>	37.5	50.3	2.1 J	6.7 J	101 J	<0.99	1.3 J	13.1	<0.96	336		
<b>Benzo[a]pyrene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	<b>267</b>	<b>76500</b>	28.0	69.8	1.1 J	6.0 J	86.6 J	<0.53	0.60 J	13.1	<0.51	<b>276</b>		
<b>Benzo[b]fluoranthene</b>	<b>210000</b>	<b>2850</b>	<b>1100</b>	ug/kg	611	<b>161000</b>	70.5	149	2.6 J	16.2	255	<1.0	<0.95	33.8	2.4 J	581		
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	84.0	38500	7.2 J	21.6	<1.2	1.8 J	25.8 J	<1.3	<1.2	3.7 J	<1.2	116		
<b>Benzo[k]fluoranthene</b>	<b>2100000</b>	<b>28500</b>	<b>11000</b>	ug/kg	602	<b>161000</b>	69.5	147	2.6 J	16.0	252	<1.4	<1.3	33.4	2.4 J	582		
Chrysene	21000000	285000	110000	ug/kg	324	103000	35.0	53.3	<0.41	8.8	168	<0.44	<0.41	16.6	<0.42	325		
<b>Dibenz[a,h]anthracene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	35.7 J	<b>16700</b>	3.2 J	6.9 J	<1.8	<1.8	<24.5	<1.9	<1.8	<1.9	<1.8	42.0 J		
Fluoranthene	30000000	5940000	2400000	ug/kg	703	250000	85.6	121	3.6 J	17.2	219	<0.64	<0.60	30.6	1.7 J	802		
Fluorene	37000000	5940000	2900000	ug/kg	<7.1	2060	<0.67	5.0 J	<0.74	<0.74	<10.2	<0.78	<0.73	<0.80	<0.76	29.4 J		
<b>Indeno[1,2,3-cd]pyrene</b>	<b>210000</b>	<b>2850</b>	<b>1100</b>	ug/kg	98.0	<b>44800</b>	9.1	22.5	<1.5	2.0 J	30.5 J	<1.6	<1.5	4.0 J	<1.6	126		
Naphthalene*	110000	9770	2400	ug/kg	<14.9	998	3.7 J	2.3 J	<1.5	8.7	66.7 J	<1.6	<1.5 / <1.0	17.0	<1.6	37.7 J		
Phenanthrene (RBCr)	350000000	--	23000000	ug/kg	279	164000	42.5	52.7	<0.70	12.4	127	0.84 J	1.1 J	22.3	0.98 J	452		
Pyrene	34000000	4460000	2300000	ug/kg	533	175000	60.4	99.4	2.6 J	12.3	171	<0.95	1.1 J	25.0	1.4 J	599		
<b>Moisture Content</b>																		
Percent Moisture	--	--	--	%	14.7	31.7	7.5	11.7	17.3	18.4	41.1	21.6	17.0	23.6	19.2	30.1		

**Table 1A. 2022 Surface Soil Phase II ESA Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC		SS-35 (0-2)	SS-36 (0-2)	SS-37 (0-2)	SS-38 (0-2)	SS-39 (0-2)	SS-40 (0-2)	SS-41 (0-2)	SS-42 (0-2)	SS-43 (0-2)	SS-44 (0-2)	SS-45 (0-2)	SS-46 (0-2)		
				Date:	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022	1/24/2022
				Units	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result
<b>RCRA Metals</b>																		
<b>Arsenic**</b>	<b>30</b>	<b>13.1</b>	<b>13.1</b>	mg/kg	0.075	6.9	7.8	6.9 J	5.9 J	7.4	8.5	5.7	5.5 J	3.9 J	8.2	5.7 J		
Barium	220000	47900	15000	mg/kg	0.85	112	101	114	54.7	51.9	65.9	59.8	43.8	42.9	111	55.0		
Cadmium	530	20.2	37	mg/kg	<0.0015	<0.15	<0.14	0.25 J	<0.15	<0.14	<0.14	0.26 J	<0.15	<0.14	<0.15	<0.15		
Chromium (RBCr)	1000000	--	120000	mg/kg	0.19	17.2	19.1	16.0	16.9	13.8	20.5	19.2	21.0	18.0	25.5	15.7		
Lead (RBCr)	800	--	400	mg/kg	0.14	22.2	12.1	38.1	11.4	13.9	12.1	27.8	16.4	17.4	22.0	13.2		
Mercury	3.1	400	3.1	mg/kg	0.047J	0.031J	0.045J	0.071J	0.046J	0.047J	<0.011	0.062J	0.051J	0.049J	0.076J	0.068J		
Selenium	5800	1200	390	mg/kg	<0.013	3.0 J	<1.3	<1.5	<1.3	<1.3	<1.2	<1.2	<1.3	<1.3	1.3J	<1.3		
Silver	5800	1200	390	mg/kg	<0.0052	<0.54	<0.51	<0.61	<0.52	<0.50	<0.50	<0.46	<0.51	<0.50	<0.52	<0.54		
Zinc	23000	72000	350000	mg/kg	0.49	46.7	41.5	56.3	45.4	48.2	63.1	73.0	56.4	49.7	72.5	46.4		
<b>PAHs</b>																		
Acenaphthene	47000000	8910000	4100000	ug/kg	8.8	<0.76	<0.70	<0.82	<0.74	<7.1	<0.68	<3.3	<0.71	<0.69	15.7 J	<3.6		
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	36.9	<0.60	<0.55	<0.65	<0.58	<5.6	<0.54	<2.6	<0.56	<0.55	16.9 J	15.0 J		
Anthracene	350000000	44600000	23000000	ug/kg	78.0	<0.76	<0.70	1.9 J	<0.74	<7.1	0.90 J	6.1 J	<0.71	<0.69	84.6	18.5 J		
<b>Benzo[a]anthracene</b>	<b>320000</b>	<b>2840</b>	<b>1500</b>	ug/kg	419	5.1 J	1.5 J	8.8 J	<0.96	<9.2	5.4 J	36.2 J	<0.92	<0.90	259	118		
<b>Benzo[a]pyrene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	<b>395</b>	4.9 J	<0.48	8.4 J	<0.51	<4.9	4.5 J	31.9 J	<0.49	<0.48	<b>236</b>	105		
<b>Benzo[b]fluoranthene</b>	<b>210000</b>	<b>2850</b>	<b>1100</b>	ug/kg	792	10.4	2.6 J	21.4	<0.98	<9.4	11.1	86.6	<0.94	<0.92	544	277		
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	143	2.6 J	<1.2	4.3 J	<1.2	<11.8	<1.1	<5.5	<1.2	<1.2	60.4 J	32.7 J		
<b>Benzo[k]fluoranthene</b>	<b>2100000</b>	<b>28500</b>	<b>11000</b>	ug/kg	793	10.4	2.6 J	21.5	<1.4	<13.1	11.2	86.8	<1.3	<1.3	545	277		
Chrysene	21000000	285000	110000	ug/kg	413	5.4 J	<0.40	10.7	<0.42	<4.0	5.8 J	43.4	<0.40	<0.40	274	127		
<b>Dibenz[a,h]anthracene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	55.9	<1.9	<1.7	<2.0	<1.8	<17.4	<1.7	<8.1	<1.7	<1.7	<17.8	<9.0		
Fluoranthene	30000000	5940000	2400000	ug/kg	854	9.7	2.5 J	20.4	<0.62	20.3 J	11.1	82.5	1.1 J	1.4 J	539	273		
Fluorene	37000000	5940000	2900000	ug/kg	16.4	<0.78	<0.72	<0.84	<0.75	<7.2	<0.70	<3.4	<0.72	<0.71	24.1 J	<3.7		
<b>Indeno[1,2,3-cd]pyrene</b>	<b>210000</b>	<b>2850</b>	<b>1100</b>	ug/kg	161	2.1 J	<1.5	4.1 J	<1.6	<14.9	<1.4	<7.0	<1.5	<1.5	71.1 J	39.0 J		
Naphthalene*	110000	9770	2400	ug/kg	18.1	3.0 J	1.8 J / <1.0	6.4 J	<1.6	<15.1	6.8 J / <1.5	21.0 J	<1.5	1.6 J / <1.1	74.0 J	27.9 J		
Phenanthrene (RBCr)	35000000	--	23000000	ug/kg	336	5.6 J	1.5 J	14.9	1.2 J	17.7 J	7.3 J	53.3	0.90 J	2.0 J	479	123		
Pyrene	34000000	4460000	2300000	ug/kg	689	7.8 J	2.0 J	17.1	<0.92	16.9 J	9.3	65.4	<0.88	1.2 J	454	226		
<b>Moisture Content</b>																		
Percent Moisture	--	--	--	%	16.9	20.7	13.5	28.2	19.8	15.7	14.1	9.3	15.8	13.1	19.0	19.2		

**Table 1A. 2022 Surface Soil Phase II ESA Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC		SS-47 (0-2)	SS-48 (0-2)	SS-49 (0-2)	SS-50 (0-2)	SS-51 (0-2)	SS-52 (0-2)	SS-53 (0-2)	SS-54 (0-2)	SS-55 (0-2)	SS-56 (0-2)	SS-57 (0-2)	SS-58 (0-2)		
				Date:	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022
				Units	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result
<b>RCRA Metals</b>																		
<b>Arsenic**</b>	<b>30</b>	<b>13.1</b>	<b>13.1</b>	mg/kg	10.0	9.0	9.4	4.0 J	<b>22.0</b>	5.0 J	6.3 J	6.7 J	7.2 J	8.7 J	9.0	9.6		
Barium	220000	47900	15000	mg/kg	31.6	69.3	59.9	59.5	62.3	54.9	91.9	102	138	155	73.1	92.9		
Cadmium	530	20.2	37	mg/kg	<0.19	0.26 J	<0.22	0.24 J	<0.25	<0.17	0.23 J	0.37 J	0.31 J	0.32 J	<0.19	<0.19		
Chromium (RBCr)	1000000	--	120000	mg/kg	16.2	16.4	20.3	9.7	35.9	11.5	16.3	13.8	23.3	27.4	18.1	22.3		
Lead (RBCr)	800	--	400	mg/kg	84.5	41.4	31.5	15.6	32.9	17.4	28.0	20.7	24.9	31.0	39.9	43.7		
Mercury	3.1	400	3.1	mg/kg	0.12 J	0.072 J	0.096 J	0.076 J	0.19 J	0.087	0.14 J	0.093 J	0.096 J	0.084 J	0.11 J	0.090 J		
Selenium	5800	1200	390	mg/kg	1.7 J	2.2 J	2.3 J	2.2 J	3.6 J	<1.5	3.8 J	1.8 J	2.9 J	3.0 J	1.9 J	2.0 J		
Silver	5800	1200	390	mg/kg	<0.67	<0.69	<0.78	<0.65	<0.88	<0.59	<0.75	<0.66	<0.80	<0.74	<0.67	<0.68		
Zinc	23000	72000	350000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		
<b>PAHs</b>																		
Acenaphthene	47000000	8910000	4100000	ug/kg	53.1 J	51.2 J	<5.4	259	8.4 J	<4.1	<5.2	<4.6	<5.5	<5.2	<4.7	34.8 J		
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	165	201	<4.2	<7.1	42.2 J	<3.2	<4.1	<3.6	<4.4	<4.1	<3.7	68.7 J		
Anthracene	350000000	44600000	23000000	ug/kg	520	819	39.6 J	2190	93.2	5.3 J	9.9 J	8.9 J	16.3 J	13.0 J	5.4 J	383		
<b>Benzo[a]anthracene</b>	<b>320000</b>	<b>2840</b>	<b>1500</b>	ug/kg	<b>2450</b>	<b>4520</b>	219	<b>8760</b>	467	36.1 J	73.0	58.0	97.9	87.5	44.7 J	<b>1610</b>		
<b>Benzo[a]pyrene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	<b>1600</b>	<b>3150</b>	<b>146</b>	<b>8180</b>	<b>313</b>	26.7 J	67.8	46.0 J	76.2	65.1	36.3	<b>1100</b>		
<b>Benzo[b]fluoranthene</b>	<b>210000</b>	<b>2850</b>	<b>1100</b>	ug/kg	<b>3690</b>	<b>6530</b>	308	<b>13900</b>	677	70.4	169	103	167	161	103	<b>2350</b>		
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	1000	2020	83.0	5600	172	<6.8	43.6 J	30.2 J	<9.2	<8.7	25.0 J	560		
<b>Benzo[k]fluoranthene</b>	<b>2100000</b>	<b>28500</b>	<b>11000</b>	ug/kg	3720	6580	311	<b>14000</b>	683	71.0	171	104	168	163	104	2370		
Chrysene	21000000	285000	110000	ug/kg	2540	4650	220	8510	471	45.6	108	68.7	108	99.1	72.9	1600		
<b>Dibenz[a,h]anthracene</b>	<b>21000</b>	<b>285</b>	<b>110</b>	ug/kg	<b>359</b>	<b>720</b>	27.7 J	<b>1450</b>	61.7 J	<10	<12.7	<11.2	<13.5	<12.8	<11.5	<b>189</b>		
Fluoranthene	30000000	5940000	2400000	ug/kg	5890	10000	459	18600	1000	87.2	181	127	210	192	122	3720		
Fluorene	37000000	5940000	2900000	ug/kg	86.5 J	88.8 J	<5.5	387	19.5 J	<4.2	<5.3	<4.7	<5.6	<5.3	10.2 J	58.7 J		
<b>Indeno[1,2,3-cd]pyrene</b>	<b>210000</b>	<b>2850</b>	<b>1100</b>	ug/kg	1010	<b>2070</b>	81.9	<b>5220</b>	180	<8.6	43.0 J	25.3 J	42.2 J	39.5 J	22.8 J	608		
Naphthalene*	110000	9770	2400	ug/kg	327	121	45.2 J	79.8 J	58.9 J	81.7	70.0	29.7 J	46.4 J	30.7 J/<1.7	141	64.1 J		
Phenanthrene (RBCr)	35000000	--	23000000	ug/kg	3980	4940	259	4140	510	68.3	114	71.2	133	103	118	2430		
Pyrene	34000000	4460000	2300000	ug/kg	4270	7490	349	15900	745	64.7	139	99.6	168	147	86.5	2740		
<b>Moisture Content</b>																		
Percent Moisture	--	--	--	%	34.9	38.7	43.7	34.6	51.2	26.5	42.8	36.0	46.7	42.8	36.5	37.5		

**Table 1A. 2022 Surface Soil Phase II ESA Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC		SS-59 (0-2)	SS-60 (0-2)	SS-60-FD (0-2)	SS-61 (0-2)	SS-62 (0-2)	SS-63 (0-2)	SS-64 (0-2)	SS-65 (0-2)
				Date:	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022	3/8/2022
				Units	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	
<b>RCRA Metals</b>												
Arsenic**	30	13.1	13.1	mg/kg	16.6	16.2	13.5	11.2	14.8	17.1	7.6 J	4.6 J
Barium	220000	47900	15000	mg/kg	215	46.5	43.9	245	47.4	128	61.2	66.5
Cadmium	530	20.2	37	mg/kg	0.44 J	<0.19	<0.19	<0.16	<0.17	0.24J	<0.20	<0.17
Chromium (RBCr)	1000000	--	120000	mg/kg	40.6	21.0	19.7	29.6	23.0	29.9	18.1	14.2
Lead (RBCr)	800	--	400	mg/kg	62.3	60.7	58.3	24.1	38.3	34.0	47.0	21.7
Mercury	3.1	400	3.1	mg/kg	0.11 J	0.11 J	0.10 J	0.78 J	0.075 J	0.93 J	0.091 J	0.053 J
Selenium	5800	1200	390	mg/kg	4.5 J	2.7 J	3.1 J	3.1 J	2.8 J	3.1 J	2.4 J	<1.5
Silver	5800	1200	390	mg/kg	<0.70	<0.65	<0.66	<0.56	<0.58	<0.62	<0.69	<0.59
Zinc	23000	72000	350000	mg/kg	NA	NA	NA	NA	NA	NA	NA	NA
<b>PAHs</b>												
Acenaphthene	47000000	8910000	4100000	ug/kg	<4.9	<44.7	122 J	<3.9	<4.0	<4.3	<4.9	<4.2
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	<3.8	311 J	362 J	<3.1	7.8 J	4.5 J	<3.8	<3.3
Anthracene	350000000	44600000	23000000	ug/kg	7.4 J	397 J	1060	<3.9	6.8 J	8.0 J	12.0 J	12.6 J
Benzo[a]anthracene	320000	2840	1500	ug/kg	42.2 J	2210	3480	<5.1	36.3 J	81.2	71.1	72.5
Benzo[a]pyrene	21000	285	110	ug/kg	37.7 J	1510	2210	<2.7	25.1 J	99.5	63.0	59.1
Benzo[b]fluoranthene	210000	2850	1100	ug/kg	88.8	4180	5660	8.6 J	88.5	270	165	164
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	<8.1	771	1050	<6.6	<6.7	66.5	29.8 J	29.1 J
Benzo[k]fluoranthene	2100000	28500	11000	ug/kg	89.6	4220	5710	8.7 J	89.3	272	166	166
Chrysene	21000000	285000	110000	ug/kg	56.5	2490	3730	<2.2	62.7	135	103	117
Dibenz[a,h]anthracene	21000	285	110	ug/kg	<11.9	303 J	419 J	<9.7	<9.9	14.8 J	<11.9	<10.2
Fluoranthene	30000000	5940000	2400000	ug/kg	94.2	4560	8140	<3.3	131	183	175	174
Fluorene	37000000	5940000	2900000	ug/kg	<5.0	<45.8	270 J	<4.0	<4.1	<4.4	21.4 J	17.0 J
Indeno[1,2,3-cd]pyrene	210000	2850	1100	ug/kg	<10.2	856	1160	<8.3	<8.5	62.8	28.9 J	28.6 J
Naphthalene*	110000	9770	2400	ug/kg	45.4 J	273 J	315 J	<8.4	152	68.9	101	110/ <1.5
Phenanthrene (RBCr)	35000000	--	23000000	ug/kg	70.9	2200	6310	<3.8	131	90.0	150	164
Pyrene	34000000	4460000	2300000	ug/kg	76.1	3460	5940	<4.9	79.2	142	139	137
<b>Moisture Content</b>												
Percent Moisture	--	--	--	%	37.8	33.7	34.9	23.9	27.5	30.8	38.5	27.8

**Table 1B. 2022 Subsurface Soil Phase II ESA Soil Data**  
**White Park, Parcel A - Southside Trail**  
**VRP# 22015**  
**Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC		SS-03 (6-8)	SS-11 (4-6)	SS-15 (4-6)	SS-30 (4-6)
				Date:	1/21/2022	1/21/2022	1/21/2022	1/24/2022
				Units	Dry Result	Dry Result	Dry Result	Dry Result
<b>RCRA Metals</b>								
Arsenic**	30	<b>13.1</b>	<b>13.1</b>	mg/kg	<b>14.1</b>	10.6	9.5	10
Barium	220000	47900	15000	mg/kg	210	115	104	67.1
Cadmium	530	20.2	37	mg/kg	<0.14	<0.14	<0.15	<0.14
Chromium (RBCr)	1000000	--	120000	mg/kg	36.8	26.9	31.5	19.2
Lead (RBCr)	800	--	400	mg/kg	31.6	18.5	26.8	18.8
Mercury	3.1	400	3.1	mg/kg	0.062J	0.046J	0.058J	0.049J
Selenium	5800	1200	390	mg/kg	2.6 J	3.7 J	4.7 J	<1.3
Silver	5800	1200	390	mg/kg	25.8	18.2	31.8	<0.51
Zinc	23000	72000	350000	mg/kg	57.9	50.7	84.6	49.9
<b>PAHs</b>								
Acenaphthene	47000000	8910000	4100000	ug/kg	<0.70	<0.68	<0.74	<0.70
Acenaphthylene (RBCr)	51000000	--	4200000	ug/kg	<0.55	<0.53	<0.58	<0.56
Anthracene	350000000	44600000	23000000	ug/kg	<0.70	<0.68	<0.74	1.6 J
<b>Benzo[a]anthracene</b>	320000	2840	1500	ug/kg	1.4 J	<0.88	<0.96	8.1
<b>Benzo[a]pyrene</b>	21000	285	110	ug/kg	0.49 J	<0.47	<0.51	7.1 J
<b>Benzo[b]fluoranthene</b>	210000	2850	1100	ug/kg	1.8 J	<0.89	<0.98	18.2
Benzo[g,h,i]perylene (RBCr)	23000000	--	1800000	ug/kg	<1.2	<1.1	<1.2	1.9 J
<b>Benzo[k]fluoranthene</b>	2100000	28500	11000	ug/kg	1.7 J	<1.3	<1.4	18.0
Chrysene	21000000	285000	110000	ug/kg	0.77 J	<0.39	<0.42	8.2
<b>Dibenz[a,h]anthracene</b>	21000	285	110	ug/kg	<1.7	<1.7	<1.8	<1.7
Fluoranthene	30000000	5940000	2400000	ug/kg	1.1 J	<0.57	<0.62	18.4
Fluorene	37000000	5940000	2900000	ug/kg	<0.71	<0.69	<0.75	<0.72
<b>Indeno[1,2,3-cd]pyrene</b>	210000	2850	1100	ug/kg	<1.5	<1.4	<1.6	2.2 J
Naphthalene*	110000	9770	2400	ug/kg	<1.5 / <1.1	<1.4	<1.6	3.4 J / <1.1
Phenanthrene (RBCr)	350000000	--	23000000	ug/kg	<0.68	0.74 J	<0.72	10.9
Pyrene	34000000	4460000	2300000	ug/kg	1.0 J	<0.84	<0.92	14.2
<b>Moisture Content</b>								
Percent Moisture	--	--	--	%	15.6	11.5	19.8	15.1

**Notes:**

de minimis RBC = Risk-based concentration WV VRP residential and industrial soil de minimis values (Table 60-9, revised December 2021)

Site Specific RSL = Risk-based concentration for a recreator (trail user) using US EPA Regional Screening Level (RSL) calculator on April 20, 2023 for HQ=1, Cancer Risk 1x10<sup>-6</sup> exposure frequency=114 days/yr, exposure time=2.0 hr/day, AF= 0.4 (Age 0-6) 0.12 (Age 16-26).

RBCr = In the absence of a recreator RBC, the residential soil RBC is used, as defined in the West Virginia Voluntary Remediation and Redevelopment Act Table 60-3B De Minimis, December 20

\*\*Arsenic soil RBC is the maximum published background concentration (VRP Guidance Manual, Table 3-3: Background Concentrations of Elements in WV Soils).

\* = Naphthalene reported as Method 8270 SIM/Method 8260.

< - Indicates analyte was not detected above Laboratory Method Detection Limit

J - indicates estimated result. The result is between the detection limit and the reporting limit, or did not meet data quality objectives.

" ---" - No standard available

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

NA= Not analyzed

Highlighted and bold results - Result is above the Standard.

**Table 2. 2022 SAR Surface Soil Data  
White Park, Parcel A - Southside Trail  
VRP# 22015  
Morgantown, Monongalia County, West Virginia**

Analyte Name	de minimis Industrial RBC	Site Specific Recreator Trail User RSL	de minimis Residential RBC	USEPA Eco Region 4 Soil Screen Levels	Units	SS-01-121422 (0-2)	SS-02-121422 (0-2)	SS-03-121422 (0-2)	SS-03-121422 - DUP (0-2)	SS-04-121422 (0-2)	
						Date:	12/14/2022	12/14/2022	12/14/2022	12/14/2022	12/14/2022
							Proposed Skills Area	Proposed Skills Area	Proposed Skills Area	Proposed Skills Area	Crossover Trail
<b>RCRA Metals</b>											
Arsenic**	30	<b>13.1</b>	<b>13.1</b>	6.8	mg/kg	8.9	<b>13</b>	<b>13</b>	<b>17</b>	7.4	
Barium	220000	47900	15000	110	mg/kg	130	150	140	130	83	
Cadmium	530	21.9	37	0.36	mg/kg	0.077 J	0.43	0.17	0.21	0.099 J	
Chromium	1000000	120000	120000	26	mg/kg	24	29	32	29	18	
Lead (RBCr)	800	400	400	11	mg/kg	18	53	110	100	17	
Mercury	3.1	400	3.1	0.031	mg/kg	0.062 J	0.098	0.11	0.085	0.052 J	
Selenium	5800	1200	390	0.52	mg/kg	0.34 J	0.34 J	0.43 J	0.37 J	0.47	
Silver	5800	1200	390	4.2	mg/kg	<0.044	<0.044	<0.060	<0.045	<0.044	
<b>PAHs</b>											
Acenaphthene	47000000	11000000	4100000	380	ug/kg	<0.83	21	5.9	41	17	
Acenaphthylene (RBCr)	51000000	4246000	4200000	340	ug/kg	<0.42	1.7 J	1.1 J	1.7 J	11	
Anthracene	350000000	55100000	23000000	1.5	ug/kg	<0.83	48	16	160	120	
Benzo[a]anthracene	320000	3520	1500	730	ug/kg	<0.83	76	40	240	390	
<b>Benzo[a]pyrene</b>	21000	<b>353</b>	<b>110</b>	130	ug/kg	<0.83	58	35	<b>190</b>	<b>400</b>	
Benzo[b]fluoranthene	210000	3530	1100	2700	ug/kg	0.87 J	70	44	210	620	
Benzo[g,h,i]perylene (RBCr)	23000000	1793000	1800000	70	ug/kg	0.89 J	29	22	91	340	
Benzo[k]fluoranthene	2100000	35300	11000	130	ug/kg	<0.83	27	16	94	200	
Chrysene	21000000	353000	110000	3100	ug/kg	0.51	70	39	200	350	
Dibenz[a,h]anthracene	21000	353	110	60	ug/kg	<0.83	9.7	7.4	34	84	
Fluoranthene	30000000	7340000	2400000	10000	ug/kg	<0.83	150	76	600	1100	
Fluorene	37000000	7340000	2900000	3700	ug/kg	<0.83	23	5.7	30	26	
Indeno[1,2,3-cd]pyrene	210000	3530	1100	80	ug/kg	0.84 J	45	32	140	440	
Naphthalene	110000	11900	2400	160	ug/kg	<1.7	38	10	3.6 J	7.1	
Phenanthrene (RBCr)	350000000	23464000	23000000	5500	ug/kg	<1.2	150	55	370	300	
Pyrene	34000000	5510000	2300000	10000	ug/kg	<0.83	120	59	360	750	
<b>Moisture Content</b>											
Percent Moisture	--		--		%	20.2	25.0	33.0	23.1	26.9	

**Notes:**

de minimis RBC = Risk-based concentration WV VRP residential and industrial soil de minimis values (Table 60-9, revised December 2021)

2023 Site Specific RSL = Risk-based concentration for a recreator (trail user) using US EPA Regional Screening Level (RSL) calculator on April 20, 2023 for HQ=1, Cancer Risk 1x10<sup>-6</sup> exposure frequency=114 days/yr, exposure time=2.0 hr/day, AF= 0.4 (Age 0-6) 0.12 (Age 16-26).

RSL = Regional screening level for a recreator (rail trail user) using USEPA Regional Screening Level (RSL) generator on Feb 13, 2022 for HQ=1, Cancer Risk 1x10<sup>-6</sup> EF=250 days/yr, ET=4.0 hr/day.

Trail Use RBC = RBC - Risk-based concentration for a recreator (rail trail user) using USEPA Regional Screening Level (RSL) generator on Jan 5, 2023 for HQ=1, Cancer Risk 1x10<sup>-6</sup>, EF=250 days/yr, ET=4.0 hr/day.

Park User RLS = RBC for a recreator (park user, fishing, or boating) using USEPA Regional Screening Level (RSL) generator on Jan 5, 2023 for HQ=1, Cancer Risk 1x10<sup>-6</sup>, EF=52 days/yr, ET=3 hr/day, EV=1 event/day.

USEPA Region 4 Soil Screen Levels = lowest value for plants, invertebrates, mammals, and avian receptors

RBCr = In the absence of a recreator RSL, the residential soil risk-based concentration (RBC) is used, as defined in the West Virginia Voluntary Remediation and Redevelopment Act Table 60-9 De Minimis, December 2021.

\*\*Arsenic soil RSL is the maximum published background concentration (VRP Guidance Manual, Table 3-3: Background Concentrations of Elements in WV Soils).

RCRA =Resource Conservation and Recovery Act

PAHs = polycyclic aromatic hydrocarbons

< - Indicates analyte was not detected above Laboratory Method Detection Limit

J - indicates estimated result. The result is between the detection limit and the reporting limit, or did not meet data quality objectives.

" ---" - No standard available

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

Highlighted and bold results - Result is above the standard.

**Table 3. 2022 SSAR SPLP Data - Groundwater Impact Determinant  
White Park, Parcel A - Southside Trail  
VRP# 22015  
Morgantown, Monongalia County, West Virginia**

Analyte Name	Groundwater RBC	VISL Commercial RBC	VISL Resident RBC		SPLP-1 (10-13.5)	SPLP-1-DUP (10-13.5)	SPLP-2 (10-15)	SPLP-3 (0.5-1)	SPLP-4 (3-4)	SPLP-5 (5-9.5)
				Date:	12/14/2022	12/14/2022	12/14/2022	12/14/2022	12/14/2022	12/14/2022
				Units	AST T-40	AST T-40	AST T-39	AST T-43	between ASTs T-36 and T-37	downgradient of AST T-56
<b>RCRA Metals</b>										
Arsenic	10	--	--	ug/L	<6.8	<6.8	<6.8	<6.8	<6.8	<6.8
Barium	2000	--	--	ug/L	13 J	8.2 J	14 J	29	15 J	73
Cadmium	5	--	--	ug/L	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Chromium	22000	--	--	ug/L	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3
Lead	15	--	--	ug/L	<0.71	<0.71	<0.71	8	<0.71	<0.71
Mercury	2	10.6	2.52	ug/L	<0.079	<0.079	<0.079 UJ	<0.079	<0.079	<0.079
Selenium	50	--	--	ug/L	<2.8	<2.8	<2.8	<2.8	<2.8	<2.8
Silver	94	--	--	ug/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Zinc	6000	--	--	ug/L	<40	<40	<40	<40	<40	<40
<b>PAHs</b>										
Acenaphthene	240	--	--	ug/L	0.055	0.023	0.011 J	0.020 J	0.061 J	0.046 J
Acenaphthylene	240	--	--	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Anthracene	1800	--	--	ug/L	0.031 J	0.031 J	<0.011	<0.017	<0.011	<0.014
Benzo[a]anthracene	0.03	--	176	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Benzo[a]pyrene	0.2	--	--	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Benzo[b]fluoranthene	0.25	--	--	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Benzo[g,h,i]perylene	600	--	--	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Benzo[k]fluoranthene	2.5	--	--	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Chrysene	25	--	--	ug/L	<0.011	<0.011	<0.011	<0.017	<0.011	<0.014
Dibenz[a,h]anthracene	0.025	--	--	ug/L	<0.022	<0.022	<0.023	<0.035	<0.021	<0.028
Fluoranthene	800	--	--	ug/L	0.051 J	<0.011	<0.011	<0.017	<0.011	<0.014
Fluorene	150	--	--	ug/L	0.17 B	0.044 J B	0.059 B	0.056 J B	0.058 B	0.20 B
Indeno[1,2,3-cd]pyrene	0.25	--	--	ug/L	<0.022	<0.023	<0.023	<0.035	<0.021	<0.028
Naphthalene	0.12	477	10.9	ug/L	0.34 B	<0.034	0.11 B	0.18 B	0.11 B	<0.042
Phenanthrene	1700	--	--	ug/L	0.44 B	<0.034	<0.034	<0.052	<0.032	<0.042
Pyrene	79	--	--	ug/L	0.026 J B	<0.011	0.012 J B	<0.017	<0.011	<0.014

**Notes:**

Groundwater RBC = WV groundwater de minimis standard as defined in the West Virginia Voluntary Remediation and Redevelopment Act Table 60-9 De Minimis, December 2021.

USEPA Vapor Intrusion Screening Level (VISL) derived on September 19, 2022. Hazard quotient not to exceed 1.0, Cumulative cancer risk of 1x10<sup>-6</sup> (resident) and 1x10<sup>-5</sup> (commercial), temperature of 13 degrees Celsius.

RCRA = Resource Conservation and Recovery Act

PAHs = polycyclic aromatic hydrocarbons

< - Indicates analyte was not detected above Laboratory Method Detection Limit

" --" - No standard available

ug/L - micrograms per liter

Highlighted and bold results - Result is above the standard.

B = Compound was found in the blank and sample.

J - indicates estimated result. The result is between the detection limit and the reporting limit, or did not meet data quality objectives.

**Table 4. Summary of Recreational Soil COCs  
White Park, Parcel A - Southside Trail  
VRP# 22015  
Morgantown, Monongalia County, West Virginia**

<b>SUBSURFACE SOIL</b>		
<b>Analyte Name</b>		<b>SS-03 (6-8) Western edge secondary containment berm of T-39</b>
	<b>Date:</b>	<b>1/21/2022</b>
	<b>Units</b>	Dry Result
<b>Metals</b>		
Arsenic	mg/kg	14.1

<b>SURFACE SOIL</b>									
<b>Analyte Name</b>		<b>SS-29 (0-2) NW of secondary containment berm of T-37</b>	<b>SS-23 (0-2) Northern edge secondary containment berm of T-43</b>	<b>SS-25 (0-2) Northern edge secondary containment berm of T-43</b>	<b>SS-47 (0-2) within secondary containment of T-37</b>	<b>SS-48 (0-2) within secondary containment of T-37</b>	<b>SS-50 (0-2) outside secondary containment of T-38</b>	<b>SS-60 (0-2) within secondary containment of T-38</b>	<b>SS-60-FD (0-2) within secondary containment of T-38</b>
	<b>Date:</b>	<b>1/24/2022</b>	<b>1/21/2022</b>	<b>1/21/2022</b>	<b>3/8/2022</b>	<b>3/8/2022</b>	<b>3/8/2022</b>	<b>3/8/2022</b>	<b>3/8/2022</b>
	<b>Units</b>	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result	Dry Result
<b>Metals</b>									
Arsenic	mg/kg	144	na	na	na	na	na	na	na
<b>PAHs</b>									
Benzo[a]anthracene	ug/kg	11200	11200	112000	2450	4520	8760	2210	3480
Benzo[a]pyrene	ug/kg	12400	12400	76500	1600	3150	8180	1510	2210
Benzo[b]fluoranthene	ug/kg	23100	23100	161000	3690	6530	13900	4180	5660
Benzo[k]fluoranthene	ug/kg	23100	23100	161000	na	na	na	na	na
Dibenz[a,h]anthracene	ug/kg	1900	1900	16700	359	720	1450	303 J	419 J
Indeno[1,2,3-cd]pyrene	ug/kg	4370	4370	44800	na	2070	5220	na	na

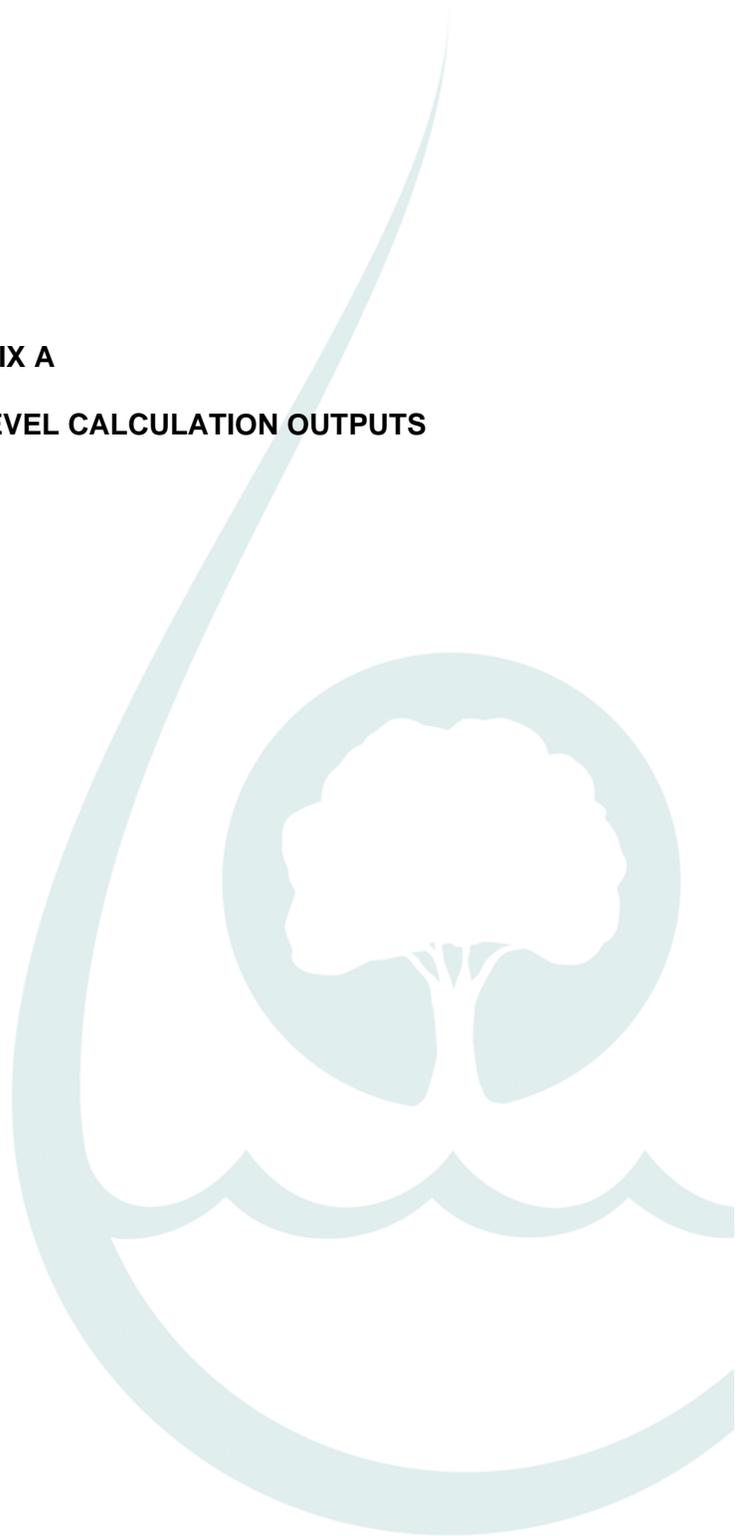
**Notes:**

mg/kg - milligrams per kilogram

ug/kg - micrograms per kilogram

na - Result is below the standard.

**APPENDIX A**  
**US EPA REGIONAL SCREENING LEVEL CALCULATION OUTPUTS**



Variable	Recreator Soil Default Value	Site-Specific Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - mass limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - mass limit)	18.4385	18.4385
City (PEF Climate Zone) Selection	Default	Default
City (VF Climate Zone) Selection	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - mass limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U <sub>m</sub> /U <sub>t</sub> ) unitless	0.194	0.194
n (total soil porosity) L <sub>pore</sub> /L <sub>soil</sub>	0.43396	0.43396
p <sub>b</sub> (dry soil bulk density) g/cm <sup>3</sup>	1.5	1.5
p <sub>b</sub> (dry soil bulk density - mass limit) g/cm <sup>3</sup>	1.5	1.5
PEF (particulate emission factor) m <sup>3</sup> /kg	1359344438	1359344438
p <sub>s</sub> (soil particle density) g/cm <sup>3</sup>	2.65	2.65
Q/C <sub>wind</sub> (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )	93.77	93.77
Q/C <sub>vol</sub> (g/m <sup>2</sup> -s per kg/m <sup>3</sup> )	68.18	68.18
Q/C <sub>vol</sub> (g/m <sup>2</sup> -s per kg/m <sup>3</sup> - mass limit)	68.18	68.18
A <sub>s</sub> (PEF acres)	0.5	0.5
A <sub>s</sub> (VF acres)	0.5	0.5
A <sub>s</sub> (VF mass-limit acres)	0.5	0.5
AF <sub>0-2</sub> (skin adherence factor) mg/cm <sup>2</sup>	0	0.4
AF <sub>2-6</sub> (skin adherence factor) mg/cm <sup>2</sup>	0	0.4
AF <sub>6-16</sub> (skin adherence factor) mg/cm <sup>2</sup>	0	0.12
AF <sub>16-30</sub> (skin adherence factor) mg/cm <sup>2</sup>	0	0.12
AF <sub>rec-a</sub> (skin adherence factor - adult) mg/cm <sup>2</sup>	0	0.12
AF <sub>rec-c</sub> (skin adherence factor - child) mg/cm <sup>2</sup>	0	0.4
AT <sub>rec</sub> (averaging time)	365	365
BW <sub>0-2</sub> (body weight) kg	15	15
BW <sub>2-6</sub> (body weight) kg	15	15
BW <sub>6-16</sub> (body weight) kg	80	80
BW <sub>16-30</sub> (body weight) kg	80	80
BW <sub>rec-a</sub> (body weight - adult) kg	80	80
BW <sub>rec-c</sub> (body weight - child) kg	15	15
DFS <sub>rec-adj</sub> (age-adjusted soil dermal factor) mg/kg	0	63912.96
DFSM <sub>rec-adj</sub> (mutagenic age-adjusted soil dermal factor) mg/kg	0	272104.32
ED <sub>rec</sub> (exposure duration - recreator) years	26	26
ED <sub>0-2</sub> (exposure duration) year	2	2
ED <sub>2-6</sub> (exposure duration) year	4	4
ED <sub>6-16</sub> (exposure duration) year	10	10
ED <sub>16-30</sub> (exposure duration) year	10	10
ED <sub>rec-c</sub> (exposure duration - child) years	6	6
EF <sub>rec</sub> (exposure frequency) days/year	0	114
EF <sub>0-2</sub> (exposure frequency) days/year	0	114
EF <sub>2-6</sub> (exposure frequency) days/year	0	114
EF <sub>6-16</sub> (exposure frequency) days/year	0	114
EF <sub>16-30</sub> (exposure frequency) days/year	0	114
EF <sub>rec-a</sub> (exposure frequency - adult) days/year	0	114
EF <sub>rec-c</sub> (exposure frequency - child) days/year	0	114
ET <sub>rec</sub> (exposure time - recreator) hours/day	0	2
ET <sub>0-2</sub> (exposure time) hours/day	0	2
ET <sub>2-6</sub> (exposure time) hours/day	0	2
ET <sub>6-16</sub> (exposure time) hours/day	0	2
ET <sub>16-30</sub> (exposure time) hours/day	0	2
ET <sub>rec-a</sub> (adult exposure time) hours/day	0	2
ET <sub>rec-c</sub> (child exposure time) hours/day	0	2
THQ (target hazard quotient) unitless	0.1	1
IFS <sub>rec-adj</sub> (age-adjusted soil ingestion factor) mg/kg	0	11970
IFSM <sub>rec-adj</sub> (mutagenic age-adjusted soil ingestion factor) mg/kg	0	54340
IRS <sub>0-2</sub> (soil intake rate) mg/day	200	200
IRS <sub>2-6</sub> (soil intake rate) mg/day	200	200
IRS <sub>6-16</sub> (soil intake rate) mg/day	100	100
IRS <sub>16-30</sub> (soil intake rate) mg/day	100	100
IRS <sub>rec-a</sub> (soil intake rate - adult) mg/day	100	100
IRS <sub>rec-c</sub> (soil intake rate - child) mg/day	200	200
LT (lifetime - recreator) years	70	70
SA <sub>0-2</sub> (skin surface area) cm <sup>2</sup> /day	2373	2373
SA <sub>2-6</sub> (skin surface area) cm <sup>2</sup> /day	2373	2373
SA <sub>6-16</sub> (skin surface area) cm <sup>2</sup> /day	6032	6032
SA <sub>16-30</sub> (skin surface area) cm <sup>2</sup> /day	6032	6032
SA <sub>rec-a</sub> (skin surface area - adult) cm <sup>2</sup> /day	6032	6032
SA <sub>rec-c</sub> (skin surface area - child) cm <sup>2</sup> /day	2373	2373
TR (target risk) unitless	0.000001	0.000001
T <sub>w</sub> (groundwater temperature) Celsius	25	25
Theta <sub>a</sub> (air-filled soil porosity) L <sub>air</sub> /L <sub>soil</sub>	0.28396	0.28396
Theta <sub>w</sub> (water-filled soil porosity) L <sub>water</sub> /L <sub>soil</sub>	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) yr	26	26
U <sub>m</sub> (mean annual wind speed) m/s	4.69	4.69
U <sub>t</sub> (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

**Site-specific  
Recreator Risk-Based Regional Screening Levels (RSL) for Soil**

**Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; D**

Chemical	CAS Number	Screening Level (mg/kg)
Acenaphthene	83-32-9	8.91E+03 nc
Acenaphthylene	208-96-8	
Acephate	30560-19-1	4.89E+01 nc
Acetaldehyde	75-07-0	4.10E+02 ca
Acetochlor	34256-82-1	3.26E+03 nc
Acetone	67-64-1	2.16E+05 nc sat max
Acetone Cyanohydrin	75-86-5	1.04E+08 nc max
Acetonitrile	75-05-8	2.99E+04 nc
Acetophenone	98-86-2	2.40E+04 nc sat
Acetylaminofluorene, 2-	53-96-3	3.66E-01 ca
Acifluorfen	50594-66-6	
Acridine	260-94-6	
Acrolein	107-02-8	5.09E+00 nc
Acrylamide	79-06-1	6.27E-01 ca
Acrylic Acid	79-10-7	7.28E+02 nc
Acrylonitrile	107-13-1	2.95E+00 ca
Adiponitrile	111-69-3	3.13E+08 nc max
Alachlor	15972-60-8	2.48E+01 ca
Aldicarb	116-06-3	1.63E+02 nc
Aldicarb Sulfone	1646-88-4	1.63E+02 nc
Aldicarb sulfoxide	1646-87-3	
Aldrin	309-00-2	1.25E-01 ca
Alizarin Red Compounds	NA	
Allyl Alcohol	107-18-6	1.15E+02 nc
Allyl Chloride	107-05-1	2.15E+01 ca
Aluminum	7429-90-5	2.40E+05 nc max
Aluminum Phosphide	20859-73-8	9.61E+01 nc
Aluminum metaphosphate	13776-88-0	
Ametryn	834-12-8	1.47E+03 nc
Amino-4-chlorobenzotrifluoride, 3-	121-50-6	
Aminoazobenzene, p-	60-09-3	
Aminobiphenyl, 4-	92-67-1	6.63E-02 ca
Aminophenol, m-	591-27-5	1.30E+04 nc
Aminophenol, o-	95-55-6	6.51E+02 nc
Aminophenol, p-	123-30-8	3.26E+03 nc
Aminopyridine, 4-	504-24-5	
Amitraz	33089-61-1	4.07E+02 nc
Ammonium Perchlorate	7790-98-9	1.68E+02 nc

Ammonium Picrate	131-74-8	3.26E+02 nc
Ammonium Sulfamate	7773-06-0	4.80E+04 nc
Ammonium perfluoro-2-methyl-3-oxahexanoate	62037-80-3	4.89E-01 nc
Ammonium perfluorobutanoate	10495-86-0	1.63E+02 nc
Ammonium perfluorohexanoate	21615-47-4	1.20E+02 nc
Ammonium polyphosphate	68333-79-9	
Amyl Alcohol, tert-	75-85-4	3.02E+03 nc
Aniline	62-53-3	2.44E+02 ca
Anilinobenzothiazole	1843-21-6	
Anthracene	120-12-7	4.46E+04 nc
Anthraquinone, 9,10-	84-65-1	3.48E+01 ca

Antimony (metallic)	7440-36-0	9.61E+01 nc
Antimony Pentoxide	1314-60-9	1.20E+02 nc
Antimony Potassium Tartrate	11071-15-1	
Antimony Tetroxide	1332-81-6	9.61E+01 nc
Antimony Trichloride	10025-91-9	
Antimony Trioxide	1309-64-4	1.04E+07 nc max
Aroclor 1016	12674-11-2	1.01E+01 nc
Aroclor 1221	11104-28-2	6.01E-01 ca
Aroclor 1232	11141-16-5	5.93E-01 ca
Aroclor 1242	53469-21-9	6.07E-01 ca
Aroclor 1248	12672-29-6	6.07E-01 ca
Aroclor 1254	11097-69-1	6.08E-01 ca
Aroclor 1260	11096-82-5	6.09E-01 ca
Aroclor 5460	11126-42-4	8.66E+01 nc
Arsenic Salts	NA	
Arsenic, Inorganic	7440-38-2	1.87E+00 ca
Arsine	7784-42-1	8.40E-01 nc
Asulam	3337-71-1	5.86E+04 nc
Atrazine	1912-24-9	6.05E+00 ca
Auramine	492-80-8	1.58E+00 ca
Avermectin B1	65195-55-3	6.51E+01 nc
Azinphos-methyl	86-50-0	4.89E+02 nc
Azobenzene	103-33-3	1.92E+01 ca
Azodicarbonamide	123-77-3	1.13E+05 nc max
Barium	7440-39-3	4.79E+04 nc
Barium Cyanide	542-62-1	
Benfluralin	1861-40-1	1.20E+03 nc
Benomyl	17804-35-2	8.14E+03 nc
Bensulfuron-methyl	83055-99-6	3.26E+04 nc
Bentazon	25057-89-0	4.89E+03 nc
Benz[a]anthracene	56-55-3	2.84E+00 ca
Benzaldehyde	100-52-7	5.34E+02 ca
Benzene	71-43-2	2.12E+01 ca
Benzene, Ethyldimethyl	29224-55-3	
Benzene, Ethylmethyl	25550-14-5	
Benzene, Methylpropenyl	768-00-3	
Benzene, Methylpropyl	28729-54-6	
Benzene, Trimethyl	25551-13-7	
Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	1.39E+01 ca
Benzenethiol	108-98-5	2.40E+02 nc
Benzidine	92-87-5	1.36E-03 ca
Benzo(e)pyrene	192-97-2	1.47E+01 nc
Benzo(j)fluoranthene	205-82-3	1.05E+00 ca
Benzo[a]pyrene	50-32-8	2.85E-01 ca

Benzo[b]fluoranthene	205-99-2	2.85E+00 ca
Benzo[g,h,i]perylene	191-24-2	
Benzo[k]fluoranthene	207-08-9	2.85E+01 ca
Benzo[fluoranthenes, total	56832-73-6	
Benzo[fluorene, 2,3-	243-17-4	
Benzoic Acid	65-85-0	6.51E+05 nc max

Benzoic acid, 4-hydroxy-, methyl ester	99-76-3	
Benzothiazole	95-16-9	
Benzotrichloride	98-07-7	1.64E-01 ca
Benzyl Alcohol	100-51-6	1.63E+04 nc
Benzyl Chloride	100-44-7	1.02E+01 ca
Beryllium and compounds	7440-41-7	4.80E+02 nc
Bifenox	42576-02-3	1.47E+03 nc
Biphenthrin	82657-04-3	2.44E+03 nc
Biphenyl, 1,1'-	92-52-4	2.67E+02 ca
Bis(2-chloro-1-methylethyl) ether	108-60-1	9.61E+03 nc sat
Bis(2-chloroethoxy)methane	111-91-1	4.89E+02 nc
Bis(2-chloroethyl)ether	111-44-4	1.69E+00 ca
Bis(2-ethylhexyl)phthalate	117-81-7	9.94E+01 ca
Bis(Octanoyloxy)Di-N-Butyl Stannane	4731-77-5	
Bis(chloromethyl)ether	542-88-1	2.37E-03 ca
Bis(oleoyloxy)dibutyl tin	13323-62-1	
Bisphenol A	80-05-7	8.14E+03 nc
Boron And Borates Only	7440-42-8	4.80E+04 nc
Boron Trichloride	10294-34-5	4.80E+05 nc max
Boron Trifluoride	7637-07-2	9.61E+03 nc
Bromacil	314-40-9	
Bromate	15541-45-4	3.05E+00 ca
Bromine	7726-95-6	
Bromo-2-chloroethane, 1-	107-04-0	8.71E+00 nc
Bromo-3-fluorobenzene, 1-	1073-06-9	7.20E+01 nc
Bromo-4-Ethylbenzene, 1-	1585-07-5	
Bromo-4-fluorobenzene, 1-	460-00-4	7.20E+01 nc
Bromoacetic acid	79-08-3	2.77E+02 nc
Bromoacetophenone, 3-	2142-63-4	
Bromobenzene	108-86-1	1.75E+03 nc sat
Bromochloromethane	74-97-5	5.51E+03 nc sat
Bromodichloromethane	75-27-4	8.39E+00 ca
Bromodiphenyl Ether, p-	101-55-3	
Bromoform	75-25-2	2.08E+02 ca
Bromomethane	74-83-9	1.49E+02 nc
Bromophenol, p-	106-41-2	
Bromophenyl-phenyl phthalate, 4-	NA	
Bromophos	2104-96-3	1.20E+03 nc
Bromopropane, 1-	106-94-5	5.99E+01 ca
Bromopyridine, 2-	109-04-6	
Bromotrichloromethane	75-62-7	
Bromoxynil	1689-84-5	1.35E+01 ca
Bromoxynil Octanoate	1689-99-2	2.07E+01 ca
Butadiene, 1,3-	106-99-0	1.62E+00 ca
Butanediol, 2,3-	513-85-9	
Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6	
Butanol	35296-72-1	
Butanol, N-	71-36-3	2.40E+04 nc sat
Butanone-2, 4-chloro-4,4-difluoro	1515-16-8	
Butyl Alcohol, t-	75-65-0	4.27E+03 ca

Butyl Benzyl Phthalate	85-68-7	7.32E+02 ca
Butyl Formate, tert-	762-75-4	
Butyl acrylate, n-	141-32-2	
Butyl alcohol, sec-	78-92-2	4.73E+05 nc sat max
Butylacetate	123-86-4	
Butylate	2008-41-5	1.20E+04 nc
Butylated hydroxyanisole	25013-16-5	6.96E+03 ca
Butylated hydroxytoluene	128-37-0	3.87E+02 ca
Butylbenzene, n-	104-51-8	1.20E+04 nc sat
Butylbenzene, sec-	135-98-8	2.40E+04 nc sat
Butylbenzene, tert-	98-06-6	2.40E+04 nc sat
Butylchloride, t-	507-20-0	
Butylphthalyl Butylglycolate	85-70-1	1.63E+05 nc max
Butyltin	78763-54-9	
Cacodylic Acid	75-60-5	3.26E+03 nc
Cadmium (Diet)	7440-43-9	2.02E+01 nc
Calcium	7440-70-2	
Calcium Cyanide	592-01-8	2.40E+02 nc
Calcium hydroxide phosphate	12167-74-7	
Calcium pyrophosphate	7790-76-3	
Caprolactam	105-60-2	8.14E+04 nc
Captafol	2425-06-1	9.28E+00 ca
Captan	133-06-2	6.05E+02 ca
Carbaryl	63-25-2	1.63E+04 nc
Carbazole	86-74-8	
Carbofuran	1563-66-2	8.14E+02 nc
Carbon Disulfide	75-15-0	1.36E+04 nc sat
Carbon Tetrachloride	56-23-5	1.40E+01 ca
Carbonyl Sulfide	463-58-1	2.48E+03 nc
Carbosulfan	55285-14-8	1.63E+03 nc
Carboxin	5234-68-4	1.63E+04 nc
Catechol	120-80-9	
Ceric oxide	1306-38-3	4.70E+07 nc max
Cerium, Stable	7440-45-1	
Chloral	75-87-6	
Chloral Hydrate	302-17-0	2.40E+04 nc
Chloramben	133-90-4	2.44E+03 nc
Chloramine	127-65-1	
Chloramines, Organic	NA	
Chloranil	118-75-2	3.45E+00 ca
Chlorate (ClO <sub>3</sub> ) as	14866-68-3	
Chlordane (alpha)	5103-71-9	1.01E+02 nc
Chlordane (gamma)	5103-74-2	1.01E+02 nc
Chlordane (technical mixture)	12789-03-6	5.01E+00 ca
Chlordecone (Kepone)	143-50-0	1.39E-01 ca
Chlorfenvinphos	470-90-6	1.14E+02 nc

Chloride	16887-00-6	
Chlorimuron, Ethyl-	90982-32-4	1.47E+04 nc
Chlorinated Hydrocarbons (total)	NA	
Chlorine	7782-50-5	6.80E+00 nc

Chlorine Dioxide	10049-04-4	7.20E+03 nc
Chlorite	14998-27-7	
Chlorite (Sodium Salt)	7758-19-2	7.20E+03 nc
Chloro-1,1-difluoroethane, 1-	75-68-3	1.98E+06 nc sat max
Chloro-1,3-butadiene, 2- (Chloroprene)	126-99-8	3.72E-01 ca
Chloro-2-methylaniline HCl, 4-	3165-93-3	3.03E+00 ca
Chloro-2-methylaniline, 4-	95-69-2	1.39E+01 ca
Chloro-2-methylphenol, 4-	1570-64-5	
Chloro-4-methylphenol	35421-08-0	
Chloro-6-fluorophenol, 2-	2040-90-6	
Chloroacetaldehyde, 2-	107-20-0	7.91E+00 ca
Chloroacetamide	79-07-2	
Chloroacetic Acid	79-11-8	5.70E+02 nc
Chloroacetophenone, 2-	532-27-4	1.57E+06 nc max
Chloroaniline	27134-26-5	
Chloroaniline, 3-	108-42-9	
Chloroaniline, p-	106-47-8	6.96E+00 ca
Chlorobenzene	108-90-7	3.46E+03 nc sat
Chlorobenzene sulfonic acid, p-	98-66-8	1.63E+04 nc
Chlorobenzilate	510-15-6	1.27E+01 ca
Chlorobenzoic Acid, 2-	118-91-2	
Chlorobenzoic Acid, p-	74-11-3	4.89E+03 nc
Chlorobenzotrifluoride, 3-nitro-4-	121-17-5	
Chlorobenzotrifluoride, 4-	98-56-6	8.13E+01 ca
Chlorobiphenyl, p-	2051-62-9	
Chlorobutane, 1-	109-69-3	9.61E+03 nc sat
Chlorobutane, 2-	78-86-4	
Chlorocyclopentadiene	41851-50-7	
Chlorodibromoethane	73506-94-2	
Chlorodifluoromethane	75-45-6	1.80E+06 nc sat max
Chloroethanol, 2-	107-07-3	4.80E+03 nc
Chloroethylvinyl ether, 2-	110-75-8	
Chloroform	67-66-3	1.01E+01 ca
Chloromethane	74-87-3	4.07E+03 nc sat
Chloromethyl Methyl Ether	107-30-2	4.21E-01 ca
Chloronaphthalene, Beta-	91-58-7	1.19E+04 nc
Chloronaphthalene, alpha-	90-13-1	
Chloronitrobenzene, o-	88-73-3	4.64E+00 ca
Chloronitrobenzene, p-	100-00-5	2.32E+01 ca
Chlorooctadecane, 1-	3386-33-2	
Chlorophenol, 2-	95-57-8	1.20E+03 nc
Chlorophenol, 3-	108-43-0	
Chlorophenol, 4-	106-48-9	
Chlorophenyl Methyl Sulfide, p-	123-09-1	
Chlorophenyl Methyl Sulfoxide	934-73-6	
Chlorophenyl phenyl ether, 4-	7005-72-3	
Chloropicrin	76-06-2	7.19E+01 nc
Chloropropane, 2-	75-29-6	
Chlorothalonil	1897-45-6	8.19E+01 ca
Chlorotoluene, o-	95-49-8	4.80E+03 nc sat

Chlorotoluene, p-	106-43-4	4.80E+03 nc sat
Chlorozotocin	54749-90-5	5.80E-03 ca
Chlorpropham	101-21-3	8.14E+02 nc
Chlorpyrifos	2921-88-2	1.63E+02 nc
Chlorpyrifos Methyl	5598-13-0	1.63E+03 nc
Chlorsulfuron	64902-72-3	8.14E+03 nc
Chlorthal-dimethyl	1861-32-1	1.63E+03 nc
Chlorthiophos	60238-56-4	1.30E+02 nc
Chromium(III), Insoluble Salts	16065-83-1	3.60E+05 nc max
Chromium(VI)	18540-29-9	9.39E-01 ca
Chromium, Total	7440-47-3	
Chrysene	218-01-9	2.85E+02 ca
Clofentezine	74115-24-5	2.12E+03 nc
Cobalt	7440-48-4	7.20E+01 nc
Complex Mixtures of Aliphatic and Aromatic Hydrocarbons	NA	
Copper	7440-50-8	9.61E+03 nc
Copper Cyanide	544-92-3	1.20E+03 nc
Coronene	191-07-1	
Creosote	8001-58-9	
Cresol, m-	108-39-4	8.14E+03 nc
Cresol, o-	95-48-7	8.14E+03 nc
Cresol, p-	106-44-5	3.26E+03 nc
Cresol, p-chloro-m-	59-50-7	1.63E+04 nc
Cresols	1319-77-3	1.63E+04 nc
Crotonaldehyde	4170-30-3	
Crotonaldehyde, trans-	123-73-9	1.12E+00 ca
Cumene	98-82-8	1.92E+04 nc sat
Cupferron	135-20-6	6.33E+00 ca
Cyanazine	21725-46-2	1.66E+00 ca
Cyanide (CN-)	57-12-5	1.32E+02 nc
Cyanogen	460-19-5	2.40E+02 nc
Cyanogen Bromide	506-68-3	2.16E+04 nc
Cyanogen Chloride	506-77-4	1.20E+04 nc
Cyclohexane	110-82-7	2.40E+05 nc sat max
Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	6.96E+01 ca
Cyclohexanone	108-94-1	5.80E+05 nc sat max
Cyclohexene	110-83-8	1.18E+03 nc sat
Cyclohexylamine	108-91-8	4.80E+04 nc
Cyclopentadiene	542-92-7	
Cyfluthrin	68359-37-5	4.07E+03 nc
Cyhalothrin	68085-85-8	
Cypermethrin	52315-07-8	
Cyromazine	66215-27-8	8.14E+04 nc
DDD, o,p'-	53-19-0	
DDD, p,p'- (DDD)	72-54-8	5.80E+00 ca
DDE, p,p'-	72-55-9	6.26E+00 ca
DDT	50-29-3	5.41E+00 ca
DDT, o,p'-	789-02-6	
DDT/DDE/DDD (total)	NA	

Dalapon	75-99-0	4.89E+03 nc
---------	---------	-------------

Daminozide	1596-84-5	7.73E+01 ca
Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6' (BDE-209)	1163-19-5	1.14E+03 nc
Decane	124-18-5	
Decanol, n-	112-30-1	
Deltamethrin	52918-63-5	
Demeton	8065-48-3	6.51E+00 nc
Di(2-ethylhexyl)adipate	103-23-1	1.16E+03 ca
Di-n-butyltin bis(2-ethylhexanoate)	2781-10-4	
Di-n-butyltin bis(methyl maleate)	15546-11-9	
Di-n-butyltin bis(n-butyl maleate)	15546-16-4	
Di-n-butyltin dilaurate	77-58-7	
Di-n-butyltin distearate	5847-55-2	
Di-n-hexylphthalate	84-75-3	
Diallate	2303-16-4	2.28E+01 ca
Diammonium phosphate	7783-28-0	
Diazinon	333-41-5	1.14E+02 nc
Dibenz[a,h]anthracene	53-70-3	2.85E-01 ca
Dibenzo(a,e)pyrene	192-65-4	1.05E-01 ca
Dibenzofuran	132-64-9	2.40E+02 nc
Dibenzothiophene	132-65-0	
Dibromo-3-chloropropane, 1,2-	96-12-8	1.49E-01 ca
Dibromoacetic acid	631-64-1	5.57E+00 ca
Dibromobenzene, 1,3-	108-36-1	9.61E+01 nc
Dibromobenzene, 1,4-	106-37-6	2.40E+03 nc
Dibromochloromethane	124-48-1	2.54E+01 ca
Dibromodichloromethane	594-18-3	
Dibromodiphenyl Ether, p,p'-	2050-47-7	
Dibromoethane, 1,2-	106-93-4	6.22E-01 ca
Dibromomethane (Methylene Bromide)	74-95-3	8.68E+02 nc
Dibutoxy di-n-butyltin	3349-36-8	
Dibutyl Phthalate	84-74-2	1.63E+04 nc
Dibutylbis((1-oxoisooctyl)oxy)stannane	85702-74-5	
Dibutylbis(octadeca-9(Z),12(Z),15(Z)-trienoyloxy)stannane	95873-60-2	
Dibutylbis(octadeca-9(Z),12(Z)-dienoyloxy)stannane	85391-79-3	
Dibutylbis(palmitoyloxy)stannane	13323-63-2	
Dibutyltin Compounds	NA	4.89E+01 nc
Dibutyltin diacetate	1067-33-0	
Dibutyltin dichloride	683-18-1	
Dibutyltin oxide	818-08-6	
Dicalcium phosphate	7757-93-9	
Dicamba	1918-00-9	4.89E+03 nc
Dichloramine	3400-09-7	
Dichloro-2-butene, 1,4-	764-41-0	7.90E-02 ca
Dichloro-2-butene, cis-1,4-	1476-11-5	2.74E-01 ca
Dichloro-2-butene, trans-1,4-	110-57-6	2.74E-01 ca
Dichloroacetic Acid	79-43-6	2.78E+01 ca
Dichloroaniline, 2,4-	554-00-7	
Dichloroaniline, 3,4-	95-76-1	
Dichlorobenzene	25321-22-6	
Dichlorobenzene, 1,2-	95-50-1	1.74E+04 nc sat

Dichlorobenzene, 1,3-	541-73-1	
Dichlorobenzene, 1,4-	106-46-7	7.87E+01 ca
Dichlorobenzidine, 3,3'-	91-94-1	3.09E+00 ca
Dichlorobenzophenone, 4,4'-	90-98-2	1.47E+03 nc
Dichlorobenzotrifluoride, 3,4-	328-84-7	
Dichlorodifluoromethane	75-71-8	3.03E+03 nc sat
Dichlorodiisopropyl ether, 2,2'-	39638-32-9	
Dichloroethane, 1,1-	75-34-3	9.91E+01 ca
Dichloroethane, 1,2-	107-06-2	1.02E+01 ca
Dichloroethylene, 1,1-	75-35-4	5.11E+03 nc sat
Dichloroethylene, cis-1,2-	156-59-2	4.27E+02 nc
Dichloroethylene, trans-1,2-	156-60-5	1.72E+03 nc
Dichlorophenol, 2,3-	576-24-9	
Dichlorophenol, 2,4-	120-83-2	4.89E+02 nc
Dichlorophenol, 2,5-	583-78-8	
Dichlorophenol, 2,6-	87-65-0	
Dichlorophenol, 3,4-	95-77-2	
Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	1.94E+03 nc
Dichloropropane, 1,2-	78-87-5	3.73E+01 ca
Dichloropropane, 1,3-	142-28-9	4.80E+03 nc sat
Dichloropropane, 2,2-	594-20-7	
Dichloropropanol, 2,3-	616-23-9	4.89E+02 nc
Dichloropropene, 1,1-	563-58-6	
Dichloropropene, 1,3-	542-75-6	1.73E+01 ca
Dichloropropene, 2,3-	78-88-6	
Dichloropropene, cis-1,3-	10061-01-5	
Dichloropropene, trans-1,3-	10061-02-6	
Dichlorvos	62-73-7	4.80E+00 ca
Dicrotophos	141-66-2	4.89E+00 nc
Dicyclohexylamine	101-83-7	
Dicyclopentadiene	77-73-6	4.73E+01 nc
Dieldrin	60-57-1	8.70E-02 ca
Diepoxybutane	1464-53-5	
Diethanolamine	111-42-2	3.26E+02 nc
Diethyl Phthalate	84-66-2	1.30E+05 nc max
Diethyl sulfate	64-67-5	
Diethyl-meta-Toluamide, N,N (DEET)	134-62-3	
Diethyl-p-nitrophenylphosphate	311-45-5	
Diethylene Glycol Dinitrate (DEGDN)	693-21-0	
Diethylene Glycol Monobutyl Ether	112-34-5	4.88E+03 nc
Diethylene Glycol Monoethyl Ether	111-90-0	9.76E+03 nc
Diethylene-glycol	111-46-6	
Diethylformamide	617-84-5	2.40E+02 nc
Diethylphosphorodithioate	298-06-6	
Diethylstilbestrol	56-53-1	3.98E-03 ca
Difenzoquat	43222-48-6	1.35E+04 nc
Diflubenzuron	35367-38-5	3.26E+03 nc
Difluoroethane, 1,1-	75-37-6	1.76E+06 nc sat max
Difluoropropane, 2,2-	420-45-1	8.74E+05 nc sat max
Dihydrosafrole	94-58-6	4.62E+01 ca

Diisopropyl Ether	108-20-3	8.22E+04 nc sat
Diisopropyl Methylphosphonate	1445-75-6	1.92E+04 nc sat
Dimagnesium phosphate	7782-75-4	
Dimethipin	55290-64-7	3.55E+03 nc
Dimethoate	60-51-5	3.58E+02 nc
Dimethoxybenzidine, 3,3'-	119-90-4	8.69E-01 ca
Dimethyl Sulfate	77-78-1	
Dimethyl Sulfide	75-18-3	
Dimethyl methylphosphonate	756-79-6	8.19E+02 ca
Dimethylamino azobenzene [p-]	60-11-7	3.03E-01 ca
Dimethylaniline HCl, 2,4-	21436-96-4	2.40E+00 ca
Dimethylaniline, 2,4-	95-68-1	6.96E+00 ca
Dimethylaniline, N,N-	121-69-7	7.91E+01 ca
Dimethylbenz(a)anthracene, 7,12-	57-97-6	1.14E-03 ca
Dimethylbenzidine, 3,3'-	119-93-7	1.27E-01 ca
Dimethylcyclohexylamine, n,n-	98-94-2	
Dimethylethyl Lead	107584-40-7	
Dimethylformamide	68-12-2	2.06E+04 nc
Dimethylhydrazine, 1,1-	57-14-7	1.95E+00 nc
Dimethylhydrazine, 1,2-	540-73-8	3.75E-03 ca
Dimethylmercury	593-74-8	
Dimethylphenethylamine	122-09-8	
Dimethylphenol, 2,4-	105-67-9	3.26E+03 nc
Dimethylphenol, 2,6-	576-26-1	9.77E+01 nc
Dimethylphenol, 3,4-	95-65-8	1.63E+02 nc
Dimethylphthalate	131-11-3	
Dimethylterephthalate	120-61-6	2.40E+04 nc
Dimethylvinylchloride	513-37-1	2.27E+01 ca
Dinitro-o-cresol, 4,6-	534-52-1	1.30E+01 nc
Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	3.26E+02 nc
Dinitroaniline, 3,5-	618-87-1	6.51E+01 nc
Dinitrobenzene, 1,2-	528-29-0	1.63E+01 nc
Dinitrobenzene, 1,3-	99-65-0	1.63E+01 nc
Dinitrobenzene, 1,4-	100-25-4	1.63E+01 nc
Dinitrophenol, 2,4-	51-28-5	3.26E+02 nc
Dinitrophenols	25550-58-7	
Dinitrosopentamethylenetetramine, N,N-	101-25-7	
Dinitrotoluene Mixture, 2,4/2,6-	NA	2.05E+00 ca
Dinitrotoluene, 2,3-	602-01-7	
Dinitrotoluene, 2,4-	121-14-2	4.46E+00 ca
Dinitrotoluene, 2,5-	619-15-8	
Dinitrotoluene, 2,6-	606-20-2	9.31E-01 ca
Dinitrotoluene, 2-Amino-4,6-	35572-78-2	2.33E+01 nc
Dinitrotoluene, 3,4-	610-39-9	
Dinitrotoluene, 3,5-	618-85-9	
Dinitrotoluene, 4-Amino-2,6-	19406-51-0	2.30E+01 nc
Dinitrotoluene, Technical grade	25321-14-6	3.09E+00 ca

Dinoseb	88-85-7	1.63E+02 nc
Dioxane, 1,4-	123-91-1	2.08E+01 ca
Diphenamid	957-51-7	4.89E+03 nc

Diphenyl Ether	101-84-8	1.24E+03 nc
Diphenyl Sulfone	127-63-9	1.30E+02 nc
Diphenylamine	122-39-4	1.63E+04 nc
Diphenylhydrazine, 1,2-	122-66-7	1.74E+00 ca
Dipotassium phosphate	7758-11-4	2.40E+05 nc max
Diquat	2764-72-9	3.58E+02 nc
Direct Black 38	1937-37-7	1.88E-01 ca
Direct Blue 6	2602-46-2	1.88E-01 ca
Direct Brown 95	16071-86-6	2.08E-01 ca
Direct Sky Blue	2610-05-1	
Disodium phosphate	7558-79-4	2.40E+05 nc max
Disulfoton	298-04-4	6.51E+00 nc
Dithiane, 1,4-	505-29-3	2.40E+03 nc
Diundecyl Phthalate	3648-20-2	
Diuron	330-54-1	3.26E+02 nc
Dodine	2439-10-3	3.26E+03 nc
EPTC	759-94-4	1.20E+04 nc
Endosulfan	115-29-7	1.44E+03 nc
Endosulfan I	959-98-8	
Endosulfan II	33213-65-9	
Endosulfan Sulfate	1031-07-8	9.77E+02 nc
Endothall	145-73-3	3.26E+03 nc
Endrin	72-20-8	4.89E+01 nc
Endrin aldehyde	7421-93-4	
Endrin ketone	53494-70-5	
Epichlorohydrin	106-89-8	1.90E+02 ca
Epoxybutane, 1,2-	106-88-7	5.88E+03 nc
Ethanol	64-17-5	
Ethanol, 2-(2-methoxyethoxy)-	111-77-3	6.51E+03 nc
Ethephon	16672-87-0	8.14E+02 nc
Ethion	563-12-2	8.14E+01 nc
Ethoxy Propanol	52125-53-8	
Ethoxyethanol Acetate, 2-	111-15-9	2.05E+04 nc
Ethoxyethanol, 2-	110-80-5	1.89E+04 nc
Ethyl Acetate	141-78-6	2.04E+04 nc sat
Ethyl Acrylate	140-88-5	7.43E+02 nc
Ethyl Chloride	75-00-3	1.99E+05 nc sat max
Ethyl Ether	60-29-7	4.80E+04 nc sat
Ethyl Methacrylate	97-63-2	6.65E+04 nc sat
Ethyl Tertiary Butyl Ether (ETBE)	637-92-3	4.74E+03 ca sat
Ethyl methane sulfonate	62-50-0	
Ethyl-p-nitrophenyl Phosphonate	2104-64-5	1.63E+00 nc
Ethylbenzene	100-41-4	1.06E+02 ca
Ethylene Cyanohydrin	109-78-4	1.14E+04 nc
Ethylene Diamine	107-15-3	2.16E+04 nc
Ethylene Glycol	107-21-1	1.30E+05 nc max
Ethylene Glycol Monobutyl Ether	111-76-2	1.63E+04 nc
Ethylene Oxide	75-21-8	7.22E-02 ca

Ethylene Thiourea	96-45-7	1.30E+01 nc
Ethyleneimine	151-56-4	2.62E-02 ca

Ethylhexyl acrylate, 2-	103-11-7	
Ethylphenol, 4-	123-07-9	
Ethylphthalyl Ethyl Glycolate	84-72-0	4.89E+05 nc max
Famphur	52-85-7	
Fenamiphos	22224-92-6	4.07E+01 nc
Fenpropathrin	39515-41-8	4.07E+03 nc
Fenvalerate	51630-58-1	4.07E+03 nc
Fluometuron	2164-17-2	2.12E+03 nc
Fluoranthene	206-44-0	5.94E+03 nc
Fluorene	86-73-7	5.94E+03 nc
Fluoride	16984-48-8	9.61E+03 nc
Fluorine (Soluble Fluoride)	7782-41-4	1.44E+04 nc
Fluorobenzene	462-06-6	
Fluorobiphenyl, 2-	321-60-8	
Fluorophenol, 2-	367-12-4	
Fluridone	59756-60-4	1.30E+04 nc
Flurprimidol	56425-91-3	6.51E+03 nc
Flusilazole	85509-19-9	3.26E+02 nc
Flutolanil	66332-96-5	8.14E+04 nc
Fluvalinate	69409-94-5	1.63E+03 nc
Folpet	133-07-3	1.47E+04 nc
Fomesafen	72178-02-0	1.63E+03 nc
Fonofos	944-22-9	3.26E+02 nc
Formaldehyde	50-00-0	8.73E+01 ca
Formic Acid	64-18-6	1.07E+03 nc
Fosetyl-AL	39148-24-8	4.07E+05 nc max
Fuel Oil Number 2	68476-30-2	
Furan	110-00-9	2.40E+02 nc
Furazolidone	67-45-8	3.66E-01 ca
Furfural	98-01-1	7.15E+02 nc
Furium	531-82-8	9.28E-01 ca
Furmecyclox	60568-05-0	4.64E+01 ca
Gadolinium	7440-54-2	
Gallium	7440-55-3	
Germanium	7440-56-4	
Glufosinate, Ammonium	77182-82-2	9.77E+02 nc
Glutaraldehyde	111-30-8	1.62E+04 nc
Glycerol	56-81-5	
Glycidaldehyde	765-34-4	9.33E+01 nc
Glyphosate	1071-83-6	1.63E+04 nc
Guanidine	113-00-8	2.40E+03 nc
Guanidine Chloride	50-01-1	3.26E+03 nc
Guanidine Nitrate	506-93-4	4.89E+03 nc
Haloacetic acids	NA	
Haloxyfop, Methyl	69806-40-2	8.14E+00 nc
Heptachlor	76-44-8	4.69E-01 ca
Heptachlor Epoxide	1024-57-3	2.33E-01 ca
Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	3.13E-01 ca
Heptachlorodibenzofuran, 1,2,3,4,6,7,8-	67562-39-4	1.41E-03 ca

Heptanal, n-	111-71-7	9.00E+02 nc sat
--------------	----------	-----------------

Heptane, N-	142-82-5	7.17E+01 nc sat
Heptanol, n-	111-70-6	
Hexabromobenzene	87-82-1	4.80E+02 nc
Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2	3.26E+01 nc
Hexachlorobenzene	118-74-1	1.23E+00 ca
Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	3.13E-01 ca
Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	3.12E-01 ca
Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	3.12E-01 ca
Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	3.13E-04 ca
Hexachlorobutadiene	87-68-3	1.78E+01 ca sat
Hexachlorocyclohexane, Alpha-	319-84-6	2.21E-01 ca
Hexachlorocyclohexane, Beta-	319-85-7	7.73E-01 ca
Hexachlorocyclohexane, Delta-	319-86-8	
Hexachlorocyclohexane, Epsilon	6108-10-7	
Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	1.60E+00 ca
Hexachlorocyclohexane, Technical	608-73-1	7.73E-01 ca
Hexachlorocyclopentadiene	77-47-4	6.26E+01 nc sat
Hexachlorodibenzo-p-dioxin, 1,2,3,4,7,8-	39227-28-6	1.42E-04 ca
Hexachlorodibenzo-p-dioxin, Mixture	34465-46-8	2.97E-04 ca
Hexachlorodibenzofuran, 1,2,3,4,7,8-	70648-26-9	1.41E-04 ca
Hexachloroethane	67-72-1	3.12E+01 ca
Hexachlorophene	70-30-4	4.89E+01 nc
Hexachloropropene	1888-71-7	
Hexadecanoic Acid	57-10-3	
Hexafluoropropylene oxide dimer acid (HFPO-DA)	13252-13-6	7.20E-01 nc
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	2.47E+01 ca
Hexamethylene Diisocyanate, 1,6-	822-06-0	1.15E+02 nc
Hexamethylene diisocyanate biuret	4035-89-6	2.09E+07 nc max
Hexamethylene diisocyanate isocyanurate	3779-63-3	2.09E+07 nc max
Hexamethylphosphoramide	680-31-9	6.51E+01 nc
Hexane, Commercial	NA	4.29E+02 ca sat
Hexane, N-	110-54-3	2.23E+04 nc sat
Hexanedioic Acid	124-04-9	3.26E+05 nc max
Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexanol)	104-76-7	2.25E+02 ca
Hexanol, n-	111-27-3	
Hexanone, 2-	591-78-6	1.11E+03 nc
Hexazinone	51235-04-2	5.37E+03 nc
Hexythiazox	78587-05-0	4.07E+03 nc
HpCDD, 1,2,3,4,6,7,8,-	35822-46-9	1.41E-03 ca
HpCDF, 1,2,3,4,7,8,9-	55673-89-7	1.41E-03 ca
HxCDD, 1,2,3,6,7,8-	57653-85-7	1.42E-04 ca
HxCDD, 1,2,3,7,8,9-	19408-74-3	1.42E-04 ca
HxCDF, 1,2,3,6,7,8-	57117-44-9	1.41E-04 ca
HxCDF, 1,2,3,7,8,9-	72918-21-9	1.42E-04 ca
HxCDF, 2,3,4,6,7,8-	60851-34-5	1.42E-04 ca
Hydramethylnon	67485-29-4	2.77E+03 nc
Hydrazine	302-01-2	4.69E-01 ca
Hydrazine Sulfate	10034-93-2	7.11E-01 ca
Hydrogen Chloride	7647-01-0	1.04E+09 nc max
Hydrogen Cyanide	74-90-8	1.32E+02 nc

Hydrogen Fluoride	7664-39-3	9.61E+03 nc
Hydrogen Selenide	7783-07-5	
Hydrogen Sulfate	12143-45-2	
Hydrogen Sulfide	7783-06-4	1.04E+08 nc max
Hydroquinone	123-31-9	2.32E+01 ca
Imazalil	35554-44-0	2.28E+01 ca
Imazaquin	81335-37-7	4.07E+04 nc
Imazethapyr	81335-77-5	4.07E+05 nc max
Indeno[1,2,3-cd]pyrene	193-39-5	2.85E+00 ca
Indium	7440-74-6	
Iodide	20461-54-5	
Iodine	7553-56-2	2.40E+03 nc
Iodomethane	74-88-4	
Iodopropynyl Butylcarbamate (IPBC)	55406-53-6	
Iprodione	36734-19-7	6.51E+03 nc
Iron	7439-89-6	1.68E+05 nc max
Iron Sulfide	11126-12-8	
Isobutyl Alcohol	78-83-1	6.18E+04 nc sat
Isodrin	465-73-6	
Isophorone	78-59-1	1.46E+03 ca
Isopropalin	33820-53-0	3.60E+03 nc
Isopropanol	67-63-0	1.48E+05 nc sat max
Isopropyl Methyl Phosphonic Acid	1832-54-8	1.63E+04 nc
Isopropyltoluene, p-	99-87-6	
Isosafrole	120-58-1	
Isoxaben	82558-50-7	8.14E+03 nc
JP-4	50815-00-4	
JP-5	NA	
JP-7	NA	1.57E+10 nc max
JP-8	NA	
Kerosene	8008-20-6	
Lactofen	77501-63-4	1.30E+03 nc
Lactonitrile	78-97-7	3.26E+01 nc
Lanthanum	7439-91-0	1.20E+01 nc
Lanthanum Acetate Hydrate	100587-90-4	3.39E+00 nc
Lanthanum Chloride Heptahydrate	10025-84-0	4.49E+00 nc
Lanthanum Chloride, Anhydrous	10099-58-8	6.80E+00 nc
Lanthanum Nitrate Hexahydrate	10277-43-7	3.84E+00 nc
Lead Alkyls	NA	
Lead Phosphate	7446-27-7	2.51E+02 ca
Lead acetate	301-04-2	6.63E+00 ca
Lead and Compounds	7439-92-1	
Lead subacetate	1335-32-6	3.66E+01 ca
Lewisite	541-25-3	1.20E+00 nc
Linuron	330-55-2	1.25E+03 nc
Lithium	7439-93-2	4.80E+02 nc
Lithium Perchlorate	7791-03-9	1.68E+02 nc
Lutetium	7439-94-3	
MCPA	94-74-6	8.14E+01 nc
MCPB	94-81-5	7.17E+03 nc

MCPP	93-65-2	1.63E+02 nc
Magnesium	7439-95-4	
Malathion	121-75-5	3.26E+03 nc
Maleic Anhydride	108-31-6	1.63E+04 nc
Maleic Hydrazide	123-33-1	8.14E+04 nc
Malononitrile	109-77-3	1.63E+01 nc
Mancozeb	8018-01-7	4.89E+03 nc
Maneb	12427-38-2	8.14E+02 nc
Manganese (Non-diet)	7439-96-5	5.75E+03 nc
Mechlorethamine	51-75-2	
Mephosfolan	950-10-7	1.47E+01 nc
Mepiquat Chloride	24307-26-4	4.89E+03 nc
Mercaptobenzothiazole, 2-	149-30-4	1.27E+02 ca
Mercuric Chloride	7487-94-7	7.20E+01 nc
Mercury (elemental)	7439-97-6	4.00E+02 nc sat
Merphos	150-50-5	7.20E+00 nc
Metalaxyl	57837-19-1	9.77E+03 nc
Methacrylonitrile	126-98-7	2.39E+01 nc
Methamidophos	10265-92-6	8.14E+00 nc
Methanol	67-56-1	4.70E+05 nc sat max
Methapyrilene	91-80-5	
Methodathion	950-37-8	2.44E+02 nc
Methomyl	16752-77-5	4.07E+03 nc
Methoxy-5-nitroaniline, 2-	99-59-2	2.84E+01 ca
Methoxychlor	72-43-5	8.14E+02 nc
Methoxyethanol Acetate, 2-	110-49-6	1.37E+03 nc
Methoxyethanol, 2-	109-86-4	1.15E+03 nc
Methyl Acetate	79-20-9	2.40E+05 nc sat max
Methyl Acrylate	96-33-3	5.36E+03 nc
Methyl Ethyl Ketone (2-Butanone)	78-93-3	1.36E+05 nc sat max
Methyl Hydrazine	60-34-4	5.22E+00 ca
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	1.22E+06 nc sat max
Methyl Isocyanate	624-83-9	1.70E+02 nc
Methyl Mercaptan	74-93-1	
Methyl Mercury	22967-92-6	2.40E+01 nc
Methyl Methacrylate	80-62-6	1.13E+05 nc sat max
Methyl Parathion	298-00-0	4.07E+01 nc
Methyl Phosphonic Acid	993-13-5	9.77E+03 nc
Methyl Styrene (Mixed Isomers)	25013-15-4	1.39E+03 nc sat
Methyl dicyclohexylamine, n-	7560-83-0	
Methyl methanesulfonate	66-27-3	1.41E+01 ca
Methyl tert-Butyl Ether (MTBE)	1634-04-4	7.37E+02 ca
Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2	4.89E+01 nc
Methyl-2-Pentanol, 4-	108-11-2	1.98E+06 nc sat max
Methyl-5-Nitroaniline, 2-	99-55-8	1.55E+02 ca
Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	1.68E-01 ca
Methylaniline Hydrochloride, 2-	636-21-5	1.07E+01 ca
Methylarsonic acid	124-58-3	1.63E+03 nc
Methylaziridine, 2-	75-55-8	
Methylbenzene,1,4-diamine monohydrochloride, 2-	74612-12-7	3.26E+01 nc

Methylbenzene-1,4-diamine sulfate, 2-	615-50-9	1.39E+01 ca
Methylcholanthrene, 3-	56-49-5	1.42E-02 ca
Methylcyclohexane	108-87-2	
Methylcyclohexylamine, n-	100-60-7	
Methylcyclopentane	96-37-7	
Methylene Chloride	75-09-2	2.29E+02 ca
Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	3.13E+00 ca
Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	3.03E+01 ca
Methylenebisbenzenamine, 4,4'-	101-77-9	8.70E-01 ca
Methylenediphenyl Diisocyanate	101-68-8	3.13E+07 nc max
Methylisothiocyanate	556-61-6	
Methylnaphthalene	1321-94-4	
Methylnaphthalene, 1-	90-12-0	4.34E+01 ca
Methylnaphthalene, 2-	91-57-6	5.94E+02 nc
Methylstyrene, Alpha-	98-83-9	1.68E+04 nc sat
Methyltriethyl Lead	1762-28-3	
Metolachlor	51218-45-2	2.44E+04 nc
Metribuzin	21087-64-9	4.07E+03 nc
Metsulfuron-methyl	74223-64-6	4.07E+04 nc
Midrange Aliphatic Hydrocarbon Streams	NA	2.40E+01 ca sat
Mineral oils	8012-95-1	7.20E+05 nc sat max
Mirex	2385-85-5	1.18E-01 ca
Molinate	2212-67-1	3.26E+02 nc
Molybdenum	7439-98-7	1.20E+03 nc
Monoaluminum phosphate	13530-50-2	
Monoammonium phosphate	7722-76-1	
Monobutyltin Compounds	NA	
Monocalcium phosphate	7758-23-8	
Monochloramine	10599-90-3	2.40E+04 nc
Monochlorobutanes	25154-42-1	
Monocyclic aromatic hydrocarbons (total)	NA	
Monomagnesium phosphate	7757-86-0	
Monomethylaniline	100-61-8	3.26E+02 nc
Monopotassium phosphate	7778-77-0	2.40E+05 nc max
Monosodium phosphate	7558-80-7	2.40E+05 nc max
Myclobutanil	88671-89-0	4.07E+03 nc
N,N'-Diphenyl-1,4-benzenediamine	74-31-7	4.89E+01 nc
N-Methyl dithiocarbamate	137-42-8	
Naled	300-76-5	4.80E+02 nc
Naphtha, High Flash Aromatic (HFAN)	64742-95-6	7.20E+03 nc
Naphthalene	91-20-3	9.77E+00 ca
Naphthol, 2-	135-19-3	
Naphthoquinone, 1,4-	130-15-4	
Naphthylamine, 1-	134-32-7	
Naphthylamine, 2-	91-59-8	7.73E-01 ca
Napropamide	15299-99-7	1.95E+04 nc
Neodymium Chloride (Stable, Nonradioactive)	10024-93-8	
Niagara Blue 4B	2429-74-5	
Nickel Acetate	373-02-4	1.79E+03 nc
Nickel Carbonate	3333-67-3	1.79E+03 nc

Nickel Carbonyl	13463-39-3	2.63E+03 nc
Nickel Hydroxide	12054-48-7	2.63E+03 nc
Nickel Oxide	1313-99-1	2.63E+03 nc
Nickel Refinery Dust	NA	2.63E+03 nc
Nickel Soluble Salts	7440-02-0	4.80E+03 nc
Nickel Subsulfide	12035-72-2	1.26E+00 ca
Nickelocene	1271-28-9	1.53E+00 ca
Nicotinonitrile	100-54-9	
Niobium	7440-03-1	
Nitrate (measured as nitrogen)	14797-55-8	3.84E+05 nc max
Nitrate + Nitrite (measured as nitrogen)	NA	
Nitric Acid	7697-37-2	
Nitric Oxide	10102-43-9	
Nitrite (measured as nitrogen)	14797-65-0	2.40E+04 nc
Nitroaniline, 2-	88-74-4	1.63E+03 nc
Nitroaniline, 3-	99-09-2	
Nitroaniline, 4-	100-01-6	6.96E+01 ca
Nitrobenzene	98-95-3	1.89E+02 ca
Nitrobiphenyl, 4-	92-93-3	
Nitrocellulose	9004-70-0	4.89E+08 nc max
Nitrodiphenylamine, 2-	119-75-5	
Nitrofurantoin	67-20-9	1.14E+04 nc
Nitrofurazone	59-87-0	1.07E+00 ca
Nitrogen Dioxide	10102-44-0	
Nitroglycerin	55-63-0	1.63E+01 nc
Nitroguanidine	556-88-7	1.63E+04 nc
Nitromethane	75-52-5	1.99E+02 ca
Nitrophenol, 2-	88-75-5	
Nitrophenol, 2-amino-4-	99-57-0	
Nitrophenol, 3-	554-84-7	
Nitrophenol, 4-	100-02-7	
Nitrophenol, 4-amino-2-	119-34-6	
Nitropropane, 2-	79-46-9	2.34E+00 ca
Nitropyrene, 4-	57835-92-4	1.05E+00 ca
Nitroquinoline-1-oxide, 4-	56-57-5	
Nitroso-N-ethylurea, N-	759-73-9	1.16E-02 ca
Nitroso-N-methylurea, N-	684-93-5	2.61E-03 ca
Nitroso-di-N-butylamine, N-	924-16-3	3.86E-01 ca
Nitroso-di-N-propylamine, N-	621-64-7	1.99E-01 ca
Nitrosodiethanolamine, N-	1116-54-7	4.97E-01 ca
Nitrosodiethylamine, N-	55-18-5	2.09E-03 ca
Nitrosodimethylamine, N-	62-75-9	8.85E-03 ca
Nitrosodiphenylamine, N-	86-30-6	2.84E+02 ca
Nitrosomethylethylamine, N-	10595-95-6	9.25E-02 ca
Nitrosomethylvinylamine, N-	4549-40-0	
Nitrosomorpholine [N-]	59-89-2	2.08E-01 ca
Nitrosopiperidine [N-]	100-75-4	1.48E-01 ca
Nitrosopyrrolidine, N-	930-55-2	6.63E-01 ca
Nitrotoluene, 4-Amino-2-	119-32-4	
Nitrotoluene, m-	99-08-1	1.63E+01 nc

Nitrotoluene, o-	88-72-2	9.70E+00 ca
Nitrotoluene, p-	99-99-0	8.70E+01 ca
Nonachlor, trans-	39765-80-5	
Nonane, n-	111-84-2	6.61E+01 nc sat
Nonanol, n-	143-08-8	
Nonylphenol	25154-52-3	
Norflurazon	27314-13-2	2.44E+02 nc
OCDD	3268-87-9	4.72E-02 ca
OCDF	39001-02-0	4.72E-02 ca
Octabromodiphenyl Ether	32536-52-0	4.89E+02 nc
Octachlorostyrene	29082-74-4	
Octadecanoic Acid	57-11-4	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	1.17E+04 nc
Octahydrotrimethylmethylethylphenanthrenol	511-15-9	
Octamethylpyrophosphoramidate	152-16-9	3.26E+02 nc
Octanol, n-	111-87-5	
Octanone, 2-	111-13-7	
Octanone, 3-	106-68-3	
Octyl Phthalate, di-N-	117-84-0	1.63E+03 nc
Oleic acid	112-80-1	
Oleum	8014-95-7	
Oryzalin	19044-88-3	1.79E+02 ca
Oxadiazon	19666-30-9	8.14E+02 nc
Oxamyl	23135-22-0	4.07E+03 nc
Oxychlorane	27304-13-8	
Oxyfluorfen	42874-03-3	1.90E+01 ca
Ozone	10028-15-6	
Paclobutrazol	76738-62-0	2.12E+03 nc
Paraquat Dichloride	1910-42-5	7.33E+02 nc
Parathion	56-38-2	9.77E+02 nc
PeCDF, 1,2,3,7,8-	57117-41-6	4.72E-04 ca
PeCDF, 2,3,4,7,8-	57117-31-4	4.72E-05 ca
Pebulate	1114-71-2	1.20E+04 nc
Pendimethalin	40487-42-1	4.89E+04 nc
Pentabromodiphenyl Ether	32534-81-9	4.80E+02 nc sat
Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9	1.63E+01 nc
Pentachloroaniline	527-20-8	
Pentachlorobenzene	608-93-5	1.92E+02 nc
Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	3.12E-01 ca
Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	3.11E-01 ca
Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	3.11E-01 ca
Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	3.12E-01 ca
Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	9.35E-05 ca
Pentachlorocyclopentadiene	25329-35-5	
Pentachlorodibenzo-p-dioxin, 1,2,3,7,8-	40321-76-4	1.42E-05 ca
Pentachloroethane	76-01-7	2.37E+01 ca
Pentachloronitrobenzene	82-68-8	8.21E+00 ca
Pentachlorophenol	87-86-5	2.29E+00 ca
Pentaerythritol tetranitrate (PETN)	78-11-5	3.24E+02 ca
Pentamethyl dipropylenetriamine	3855-32-1	

Pentamethylphosphoramidate (PMPA)	10159-46-3	1.63E+01 nc
Pentane, n-	109-66-0	2.99E+04 nc sat
Pentyl Alcohol, N-	71-41-0	
Perchlorate and Perchlorate Salts	14797-73-0	1.68E+02 nc
Perfluorobutanesulfonate	45187-15-3	4.89E+01 nc
Perfluorobutanesulfonic acid (PFBS)	375-73-5	4.89E+01 nc
Perfluorobutanoate	45048-62-2	2.40E+02 nc
Perfluorobutanoic acid (PFBA)	375-22-4	2.40E+02 nc
Perfluorohexanesulfonate	108427-53-8	3.26E+00 nc
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	3.26E+00 nc
Perfluorohexanoate	92612-52-7	1.20E+02 nc
Perfluorohexanoic acid (PFHxA)	307-24-4	8.14E+01 nc
Perfluorononanoate	72007-68-2	4.89E-01 nc
Perfluorononanoic acid (PFNA)	375-95-1	4.89E-01 nc
Perfluorooctanesulfonate	45298-90-6	3.26E-01 nc
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	3.26E-01 nc
Perfluorooctanoate	45285-51-6	4.89E-01 nc
Perfluorooctanoic acid (PFOA)	335-67-1	4.89E-01 nc
Permethrin	52645-53-1	8.14E+03 nc
Perylene	198-55-0	1.34E+01 nc
Pesticides (total)	NA	
Phenacetin	62-44-2	6.33E+02 ca
Phenanthrene	85-01-8	
Phenmedipham	13684-63-4	3.91E+04 nc
Phenol	108-95-2	4.89E+04 nc
Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1	6.51E+02 nc
Phenothiazine	92-84-2	8.14E+01 nc
Phenyl Isothiocyanate	103-72-0	4.80E+01 nc
Phenylenediamine, m-	108-45-2	9.77E+02 nc
Phenylenediamine, o-	95-54-5	1.16E+01 ca
Phenylenediamine, p-	106-50-3	1.63E+02 nc
Phenylmercuric Acetate	62-38-4	1.30E+01 nc
Phenylphenol, 2-	90-43-7	7.17E+02 ca
Phorate	298-02-2	3.26E+01 nc
Phosgene	75-44-5	1.13E+01 nc
Phosmet	732-11-6	3.26E+03 nc
Phosphine	7803-51-2	7.20E+01 nc
Phosphoric Acid	7664-38-2	2.40E+05 nc max
Phosphorus pentoxide	1314-56-3	
Phosphorus, White	7723-14-0	4.80E+00 nc
Phthalates (total)	NA	
Phthalic Acid, m-	121-91-5	
Phthalic Acid, o-	88-99-3	
Phthalic Acid, p-	100-21-0	8.14E+04 nc
Phthalic Anhydride	85-44-9	3.26E+05 nc max
Picloram	1918-02-1	1.14E+04 nc
Picoline, 2-	109-06-8	
Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	1.63E+01 nc
Picric Acid (2,4,6-Trinitrophenol)	88-89-1	3.26E+02 nc
Piperidine	110-89-4	

Pirimiphos, Methyl	29232-93-7	1.19E+02 nc
Polybrominated Biphenyls	36355-01-8	4.64E-02 ca
Polychlorinated Biphenyls (high risk)	1336-36-3	6.07E-01 ca
Polycyclic aromatic hydrocarbons (PAH), Total (high molecular weight)	NA	
Polycyclic aromatic hydrocarbons (PAH), Total (low molecular weight)	NA	
Polycyclic chlorinated hydrocarbons (total)	NA	
Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9	3.13E+07 nc max
Polyphosphoric acid	8017-16-1	2.40E+05 nc max
Potassium	7440-09-7	
Potassium Cyanide	151-50-8	4.80E+02 nc
Potassium Perchlorate	7778-74-7	1.68E+02 nc
Potassium Silver Cyanide	506-61-6	1.20E+03 nc
Potassium heptafluorobutanoate	2966-54-3	4.80E+02 nc
Potassium perfluorobutanesulfonate	29420-49-3	4.89E+01 nc
Potassium perfluorooctanesulfonate	2795-39-3	3.26E-01 nc
Potassium salts of inorganic phosphates	NA	1.63E+05 nc max
Potassium tripolyphosphate	13845-36-8	2.40E+05 nc max
Praseodymium	7440-10-0	
Praseodymium Chloride (Stable, Nonradioactive)	10361-79-2	
Prochloraz	67747-09-5	9.28E+00 ca
Profluralin	26399-36-0	1.44E+03 nc
Promethium	7440-12-2	
Prometon	1610-18-0	2.44E+03 nc
Prometryn	7287-19-6	6.51E+03 nc
Pronamide	23950-58-5	1.22E+04 nc
Propachlor	1918-16-7	2.12E+03 nc
Propanil	709-98-8	8.14E+02 nc
Propargite	2312-35-8	7.25E+00 ca
Propargyl Alcohol	107-19-7	4.80E+02 nc
Propazine	139-40-2	3.26E+03 nc
Propham	122-42-9	3.26E+03 nc
Propiconazole	60207-90-1	1.63E+04 nc
Propionaldehyde	123-38-6	2.75E+03 nc
Propionitrile	107-12-0	
Propionitrile, 3-(NN-dimethylamino)	1738-25-6	
Propyl Alcohol, n-	71-23-8	
Propyl benzene	103-65-1	2.20E+04 nc sat
Propylene	115-07-1	8.12E+04 nc sat
Propylene Glycol	57-55-6	3.26E+06 nc max
Propylene Glycol Dinitrate	6423-43-4	1.42E+07 nc max
Propylene Glycol Monoethyl Ether	1569-02-4	
Propylene Glycol Monomethyl Ether	107-98-2	1.64E+05 nc sat max
Propylene Oxide	75-56-9	8.63E+00 ca
Prussian Blue (Ferric Ferrocyanide)	14038-43-8	
Pyrazinyl phosphorothioate, O,O-diethyl O-2-	297-97-2	
Pyrene	129-00-0	4.46E+03 nc
Pyridine	110-86-1	2.40E+02 nc
Quinalphos	13593-03-8	8.14E+01 nc
Quinoline	91-22-5	4.64E-01 ca
Quizalofop-ethyl	76578-14-8	1.47E+03 nc

Resmethrin	10453-86-8	4.89E+03 nc
Resorcinol	108-46-3	
Ronnel	299-84-3	1.20E+04 nc
Rotenone	83-79-4	6.51E+02 nc
Rubidium	7440-17-7	
Rubidium Chloride	7791-11-9	
Rubidium Hydroxide	1310-82-3	
Rubidium Iodide	7790-29-6	
Safrole	94-59-7	1.42E+00 ca
Samarium Chloride (Stable, Nonradioactive)	10361-82-7	
Samarium Nitrate (Stable, Nonradioactive)	10361-83-8	
Scandium	7440-20-2	
Selenious Acid	7783-00-8	1.20E+03 nc
Selenite	14124-67-5	
Selenium	7782-49-2	1.20E+03 nc
Selenium Sulfide	7446-34-6	1.20E+03 nc
Selenourea	630-10-4	
Sethoxydim	74051-80-2	2.28E+04 nc
Silica (crystalline, respirable)	7631-86-9	1.57E+08 nc max
Silicon	7440-21-3	
Silver	7440-22-4	1.20E+03 nc
Silver Cyanide	506-64-9	2.40E+04 nc
Simazine	122-34-9	1.16E+01 ca
Sodium	7440-23-5	
Sodium Acifluorfen	62476-59-9	2.12E+03 nc
Sodium Azide	26628-22-8	9.61E+02 nc
Sodium Cyanide	143-33-9	2.40E+02 nc
Sodium Diethyldithiocarbamate	148-18-5	5.15E+00 ca
Sodium Fluoride	7681-49-4	1.20E+04 nc
Sodium Fluoroacetate	62-74-8	3.26E+00 nc
Sodium Hydroxide	1310-73-2	
Sodium Metavanadate	13718-26-8	2.40E+02 nc
Sodium Perchlorate	7601-89-0	1.68E+02 nc
Sodium Tungstate	13472-45-2	1.92E+02 nc
Sodium Tungstate Dihydrate	10213-10-2	1.92E+02 nc
Sodium acid pyrophosphate	7758-16-9	2.40E+05 nc max
Sodium aluminum phosphate (acidic)	7785-88-8	
Sodium aluminum phosphate (anhydrous)	10279-59-1	
Sodium aluminum phosphate (tetrahydrate)	10305-76-7	
Sodium hexametaphosphate	10124-56-8	2.40E+05 nc max
Sodium perfluorobutanoate	2218-54-4	2.40E+02 nc
Sodium perfluorohexanoate	2923-26-4	1.20E+02 nc
Sodium polyphosphate	68915-31-1	2.40E+05 nc max
Sodium salts of inorganic phosphates	NA	1.63E+05 nc max
Sodium trimetaphosphate	7785-84-4	2.40E+05 nc max
Sodium tripolyphosphate	7758-29-4	2.40E+05 nc max
Stearyl Acetate	822-23-1	
Stirofos (Tetrachlorovinphos)	961-11-5	5.80E+01 ca
Strontium, Stable	7440-24-6	1.44E+05 nc max
Strychnine	57-24-9	4.89E+01 nc

Styrene	100-42-5	4.24E+04 nc sat
Styrene-Acrylonitrile (SAN) Trimer (THNA isomer)	57964-39-3	4.89E+02 nc
Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6	4.89E+02 nc
Sulfate	14808-79-8	
Sulfite	14265-45-3	
Sulfolane	126-33-0	1.63E+02 nc
Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	1.30E+02 nc
Sulfur	7704-34-9	
Sulfur Dioxide	7446-09-5	
Sulfur Mustard	505-60-2	
Sulfur Trioxide	7446-11-9	5.22E+07 nc max
Sulfuric Acid	7664-93-9	5.22E+07 nc max
Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl ester	140-57-8	5.57E+01 ca
TCDD, 2,3,7,8-	1746-01-6	1.41E-05 ca
TCDF, 2,3,7,8-	51207-31-9	1.41E-04 ca
TCMTB	21564-17-0	4.89E+03 nc
Tebuthiuron	34014-18-1	1.14E+04 nc
Technetium	7440-26-8	
Tellurium	13494-80-9	
Temephos	3383-96-8	3.26E+03 nc
Terbacil	5902-51-2	2.12E+03 nc
Terbufos	13071-79-9	6.00E+00 nc
Terbutryn	886-50-0	1.63E+02 nc
Tert-Butyl Acetate	540-88-5	1.82E+02 ca
Test Chemical	NA	
Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1	1.63E+01 nc
Tetraethyl Lead	1920-90-7	
Tetrachloroaniline, 2,3,5,6-	3481-20-7	
Tetrachlorobenzene, 1,2,3,4-	634-66-2	
Tetrachlorobenzene, 1,2,4,5-	95-94-3	7.20E+00 nc
Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	9.40E-02 ca
Tetrachlorobiphenyl, 3,4,4',5'- (PCB 81)	70362-50-4	3.11E-02 ca
Tetrachloroethane, 1,1,1,2-	630-20-6	4.03E+01 ca
Tetrachloroethane, 1,1,2,2-	79-34-5	7.64E+00 ca
Tetrachloroethylene	127-18-4	4.87E+02 ca sat
Tetrachlorophenol, 2,3,4,5-	4901-51-3	
Tetrachlorophenol, 2,3,4,6-	58-90-2	4.89E+03 nc
Tetrachlorophenols (total)	25167-83-3	
Tetrachloroterephthalate, 2,3,5,6-	2136-79-0	
Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	1.33E-01 ca
Tetraethyl Dithiopyrophosphate	3689-24-5	8.14E+01 nc
Tetraethyl Lead	78-00-2	2.40E-02 nc
Tetrafluoroethane, 1,1,1,2-	811-97-2	3.75E+06 nc sat max
Tetrahydrofuran	109-99-9	1.75E+05 nc sat max
Tetrahydrothiophene	110-01-0	
Tetramethyl Lead	75-74-1	
Tetramethylcyclohexane	30501-43-0	
Tetramethylphosphoramidate, -N,N,N',N" (TMPA)	16853-36-4	1.63E+01 nc
Tetrapotassium phosphate	7320-34-5	2.40E+05 nc max

Tetrapropyl Lead	3440-75-3	
------------------	-----------	--

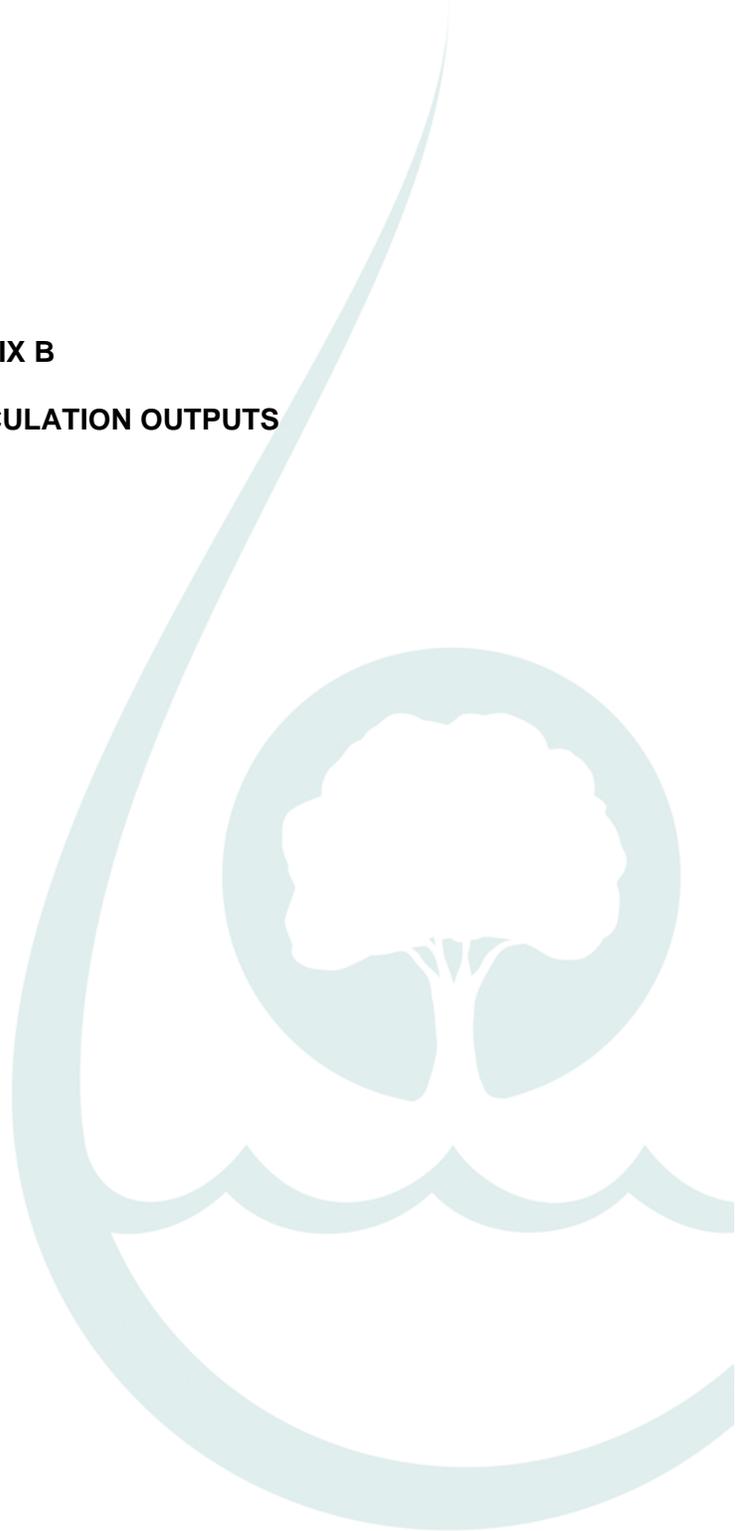
Tetrasodium pyrophosphate	7722-88-5	2.40E+05 nc max
Tetryl (Trinitrophenylmethylnitramine)	479-45-8	4.79E+02 nc
Thallic Oxide	1314-32-5	4.80E+00 nc
Thallium (I) Nitrate	10102-45-1	2.40E+00 nc
Thallium (Soluble Salts)	7440-28-0	2.40E+00 nc
Thallium Acetate	563-68-8	2.40E+00 nc
Thallium Carbonate	6533-73-9	3.26E+00 nc
Thallium Chloride	7791-12-0	2.40E+00 nc
Thallium Selenite	12039-52-0	2.40E+00 nc
Thallium Sulfate	7446-18-6	4.80E+00 nc
Thifensulfuron-methyl	79277-27-3	7.00E+03 nc
Thiobencarb	28249-77-6	1.63E+03 nc
Thiocyanates	NA	4.80E+01 nc
Thiocyanic Acid	463-56-9	4.80E+01 nc
Thiodiglycol	111-48-8	1.62E+04 nc
Thiofanox	39196-18-4	4.89E+01 nc
Thiophanate, Methyl	23564-05-8	1.20E+02 ca
Thiophene	110-02-1	
Thiram	137-26-8	2.44E+03 nc
Thorium	7440-29-1	
Thymol	89-83-8	
Tin	7440-31-5	1.44E+05 nc max
Titanium	7440-32-6	
Titanium Tetrachloride	7550-45-0	5.22E+06 nc max
Toluene	108-88-3	1.88E+04 nc sat
Toluene-2,4-diisocyanate	584-84-9	5.43E+01 ca
Toluene-2,5-diamine	95-70-5	7.73E+00 ca
Toluene-2,6-diisocyanate	91-08-7	5.42E+01 ca
Toluenediamine, 2,3-	2687-25-4	1.63E+01 nc
Toluenediamine, 3,4-	496-72-0	1.63E+01 nc
Toluic Acid, p-	99-94-5	8.14E+02 nc
Toluidine, o- (Methylaniline, 2-)	95-53-4	8.70E+01 ca
Toluidine, p-	106-49-0	4.64E+01 ca
Total Petroleum Hydrocarbons (Aliphatic High)	NA	7.20E+05 nc sat max
Total Petroleum Hydrocarbons (Aliphatic Low)	NA	1.15E+03 nc sat
Total Petroleum Hydrocarbons (Aliphatic Medium)	NA	1.50E+03 nc sat
Total Petroleum Hydrocarbons (Aromatic High)	NA	4.45E+01 nc
Total Petroleum Hydrocarbons (Aromatic Low)	NA	
Total Petroleum Hydrocarbons (Aromatic Medium)	NA	2.12E+03 nc sat
Toxaphene	8001-35-2	1.27E+00 ca
Toxaphene, Weathered	NA	4.89E+00 nc
Tralomethrin	66841-25-6	1.22E+03 nc
Tri-n-butyltin	688-73-3	7.20E+01 nc
Triacetin	102-76-1	1.30E+07 nc max
Triadimefon	43121-43-3	5.54E+03 nc
Triallate	2303-17-5	2.98E+01 ca
Trialuminum sodium tetra decahydrogenooctaoorthophosphate (dihydrate)	15136-87-5	
Triasulfuron	82097-50-5	1.63E+03 nc
Triaziquone	68-76-8	
Tribenuron-methyl	101200-48-0	1.30E+03 nc

Tribromobenzene, 1,2,4-	615-54-3	1.20E+03 nc
Tribromochloromethane	594-15-0	
Tribromodiphenyl Ether	49690-94-0	
Tribromophenol, 2,4,6-	118-79-6	1.47E+03 nc
Tribufos	78-48-8	3.26E+01 nc
Tributyl Phosphate	126-73-8	1.55E+02 ca
Tributyltin Compounds	NA	4.89E+01 nc
Tributyltin Oxide	56-35-9	4.89E+01 nc
Tributyltin chloride	1461-22-9	
Tributyltin fluoride	1983-10-4	
Tributyltin linoleate	24124-25-2	
Tributyltin methacrylate	2155-70-6	
Tributyltin naphthenate	85409-17-2	
Tricaine Methanesulfonate	886-86-2	
Tricalcium phosphate	7758-87-4	
Trichloramine	10025-85-1	
Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	2.39E+05 nc sat max
Trichloro-2'-hydroxydiphenylether	3380-34-5	
Trichloroacetic Acid	76-03-9	1.99E+01 ca
Trichloroaniline HCl, 2,4,6-	33663-50-2	4.80E+01 ca
Trichloroaniline, 2,4,5-	636-30-6	
Trichloroaniline, 2,4,6-	634-93-5	4.89E+00 nc
Trichlorobenzene	12002-48-1	
Trichlorobenzene, 1,2,3-	87-61-6	1.92E+02 nc
Trichlorobenzene, 1,2,4-	120-82-1	7.36E+01 ca
Trichloroethane, 1,1,1-	71-55-6	1.91E+05 nc sat max
Trichloroethane, 1,1,2-	79-00-5	2.08E+01 ca
Trichloroethylene	79-01-6	1.59E+01 ca
Trichlorofluoromethane	75-69-4	7.20E+04 nc sat
Trichlorophenol, 2,4,5-	95-95-4	1.63E+04 nc
Trichlorophenol, 2,4,6-	88-06-2	1.27E+02 ca
Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	1.63E+03 nc
Trichlorophenoxypropionic acid, -2,4,5	93-72-1	1.30E+03 nc
Trichloropropane, 1,1,2-	598-77-6	1.20E+03 nc
Trichloropropane, 1,2,3-	96-18-4	1.57E-02 ca
Trichloropropene, 1,2,3-	96-19-5	2.60E+01 nc
Trichlorotoluene, 2,3,6-	2077-46-5	
Trichlorotoluene, alpha 2,6-	2014-83-7	
Tricresyl Phosphate (TCP)	1330-78-5	3.26E+03 nc
Tridiphane	58138-08-2	4.89E+02 nc
Tridymite	15468-32-3	
Triethyl Lead	5224-23-7	
Triethyl phosphorothioate [O,O,O-]	126-68-1	
Triethylamine	121-44-8	4.25E+03 nc
Triethylene Glycol	112-27-6	3.26E+05 nc max
Trifluoroethane, 1,1,1-	420-46-2	5.47E+05 nc sat max
Trifluralin	1582-09-8	2.77E+02 ca

Trimagnesium phosphate	7757-87-1	
Trimethyl Lead	7442-13-9	
Trimethyl Phosphate	512-56-1	6.96E+01 ca

Trimethyl-4-Propenyl naphthalene, 1,2,3-	26137-53-1	
Trimethylbenzene, 1,2,3-	526-73-8	2.16E+03 nc sat
Trimethylbenzene, 1,2,4-	95-63-6	2.12E+03 nc sat
Trimethylbenzene, 1,3,5-	108-67-8	2.07E+03 nc sat
Trimethylethyl Lead	1762-26-1	
Trimethylpentane, 2,2,4-	540-84-1	
Trimethylpentene, 2,4,4-	25167-70-8	2.40E+03 nc sat
Trinitrobenzene, 1,3,5-	99-35-4	6.61E+03 nc
Trinitrotoluene, 2,4,6-	118-96-7	6.08E+01 ca
Triphenylphosphine Oxide	791-28-6	3.26E+03 nc
Tripotassium phosphate	7778-53-2	2.40E+05 nc max
Tripropyl Lead	6618-03-7	
Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8	3.26E+03 nc
Tris(1-chloro-2-propyl)phosphate	13674-84-5	1.63E+03 nc
Tris(2,3-dibromopropyl)phosphate	126-72-7	9.22E-01 ca
Tris(2-chloroethyl)phosphate	115-96-8	6.96E+01 ca
Tris(2-ethylhexyl)phosphate	78-42-2	4.35E+02 ca
Trisbutoxyethyl Phosphate	78-51-3	
Trisodium phosphate	7601-54-9	2.40E+05 nc max
Trithion	786-19-6	
Tungsten	7440-33-7	1.92E+02 nc
Uranium	7440-61-1	4.80E+01 nc
Urea	57-13-6	
Urethane	51-79-6	3.13E-01 ca
Vanadium Pentoxide	1314-62-1	2.15E+03 nc
Vanadium Sulfate	36907-42-3	
Vanadium and Compounds	7440-62-2	1.21E+03 nc
Vanadyl Sulfate	27774-13-6	
Vernolate	1929-77-7	2.40E+02 nc
Vinclozolin	50471-44-8	1.95E+02 nc
Vinyl Acetate	108-05-4	2.96E+04 nc sat
Vinyl Bromide	593-60-2	9.44E+00 ca
Vinyl Chloride	75-01-4	6.86E-02 ca
Warfarin	81-81-2	4.89E+01 nc
Xylene, m-	108-38-3	1.46E+04 nc sat
Xylene, o-	95-47-6	1.63E+04 nc sat
Xylene, p-	106-42-3	1.48E+04 nc sat
Xylenes	1330-20-7	1.51E+04 nc sat
Ytterbium	7440-64-4	
Yttrium	7440-65-5	
Zinc Cyanide	557-21-1	1.20E+04 nc
Zinc Phosphide	1314-84-7	7.20E+01 nc
Zinc and Compounds	7440-66-6	7.20E+04 nc
Zineb	12122-67-7	8.14E+03 nc
Zirconium	7440-67-7	1.92E+01 nc

**APPENDIX B**  
**USA EPA PROUCL CALCULATION OUTPUTS**



	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Uncensored Variables</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/19/2023 10:58:56 PM								
4	From File			arsenic proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for Arsenic</b>											
9												
10												
11	<b>Mean</b>			<b>11.9</b>								
12	<b>Standard Deviation</b>			<b>16.46</b>								
13	<b>Number of data</b>			<b>73</b>								
14	<b>Number of suspected outliers</b>			<b>1</b>								
15												
16				Potential	Obs.	Test	Critical	Critical				
17	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
18	1	11.9	16.35	144	31	8.079	3.275	3.635				
19												
20	For 5% Significance Level, there is 1 Potential Outlier											
21	Potential outliers is: 144											
22												
23	For 1% Significance Level, there is 1 Potential Outlier											
24	Potential outliers is: 144											
25												

	A	B	C	D	E	F	G	H	I	J	K	L				
1	<b>UCL Statistics for Uncensored Full Data Sets</b>															
2																
3	User Selected Options															
4	Date/Time of Computation		ProUCL 5.2 5/19/2023 11:01:07 PM													
5	From File		arsenic proucl.xls													
6	Full Precision		OFF													
7	Confidence Coefficient		95%													
8	Number of Bootstrap Operations		2000													
9																
10																
11	<b>Arsenic</b>															
12																
13	<b>General Statistics</b>															
14	Total Number of Observations				72				Number of Distinct Observations				57			
15									Number of Missing Observations				1			
16	Minimum				0.075				Mean				10.07			
17	Maximum				26.7				Median				8.95			
18	SD				5.068				Std. Error of Mean				0.597			
19	Coefficient of Variation				0.503				Skewness				1.152			
20																
21	<b>Normal GOF Test</b>															
22	Shapiro Wilk Test Statistic				0.917				<b>Shapiro Wilk GOF Test</b>							
23	1% Shapiro Wilk P Value				6.8132E-5				Data Not Normal at 1% Significance Level							
24	Lilliefors Test Statistic				0.144				<b>Lilliefors GOF Test</b>							
25	1% Lilliefors Critical Value				0.121				Data Not Normal at 1% Significance Level							
26	<b>Data Not Normal at 1% Significance Level</b>															
27																
28	<b>Assuming Normal Distribution</b>															
29	<b>95% Normal UCL</b>						<b>95% UCLs (Adjusted for Skewness)</b>									
30	95% Student's-t UCL				11.06				95% Adjusted-CLT UCL (Chen-1995)				11.14			
31									95% Modified-t UCL (Johnson-1978)				11.08			
32																
33	<b>Gamma GOF Test</b>															
34	A-D Test Statistic				2.437				<b>Anderson-Darling Gamma GOF Test</b>							
35	5% A-D Critical Value				0.759				Data Not Gamma Distributed at 5% Significance Level							
36	K-S Test Statistic				0.155				<b>Kolmogorov-Smirnov Gamma GOF Test</b>							
37	5% K-S Critical Value				0.106				Data Not Gamma Distributed at 5% Significance Level							
38	<b>Data Not Gamma Distributed at 5% Significance Level</b>															
39																
40	<b>Gamma Statistics</b>															
41	k hat (MLE)				2.69				k star (bias corrected MLE)				2.587			
42	Theta hat (MLE)				3.744				Theta star (bias corrected MLE)				3.892			
43	nu hat (MLE)				387.3				nu star (bias corrected)				372.5			
44	MLE Mean (bias corrected)				10.07				MLE Sd (bias corrected)				6.26			
45									Approximate Chi Square Value (0.05)				328.8			
46	Adjusted Level of Significance				0.0467				Adjusted Chi Square Value				328			
47																
48	<b>Assuming Gamma Distribution</b>															
49	95% Approximate Gamma UCL				11.41				95% Adjusted Gamma UCL				11.44			
50																
51	<b>Lognormal GOF Test</b>															
52	Shapiro Wilk Test Statistic				0.634				<b>Shapiro Wilk Lognormal GOF Test</b>							
53	10% Shapiro Wilk P Value				0				Data Not Lognormal at 10% Significance Level							
54	Lilliefors Test Statistic				0.227				<b>Lilliefors Lognormal GOF Test</b>							
55	10% Lilliefors Critical Value				0.0955				Data Not Lognormal at 10% Significance Level							
56	<b>Data Not Lognormal at 10% Significance Level</b>															
57																
58	<b>Lognormal Statistics</b>															
59	Minimum of Logged Data				-2.59				Mean of logged Data				2.112			
60	Maximum of Logged Data				3.285				SD of logged Data				0.887			
61																
62	<b>Assuming Lognormal Distribution</b>															
63	95% H-UCL				15.35				90% Chebyshev (MVUE) UCL				16.55			
64	95% Chebyshev (MVUE) UCL				18.54				97.5% Chebyshev (MVUE) UCL				21.31			
65	99% Chebyshev (MVUE) UCL				26.74											
66																
67	<b>Nonparametric Distribution Free UCL Statistics</b>															
68	<b>Data do not follow a Discernible Distribution</b>															
69																
70	<b>Nonparametric Distribution Free UCLs</b>															
71	95% CLT UCL				11.05				95% BCA Bootstrap UCL				11.1			
72	95% Standard Bootstrap UCL				11.09				95% Bootstrap-t UCL				11.23			
73	95% Hall's Bootstrap UCL				11.25				95% Percentile Bootstrap UCL				11.07			

	A	B	C	D	E	F	G	H	I	J	K	L
74			90% Chebyshev(Mean, Sd) UCL			11.86			95% Chebyshev(Mean, Sd) UCL			12.67
75			97.5% Chebyshev(Mean, Sd) UCL			13.8			99% Chebyshev(Mean, Sd) UCL			16.01
76												
77	<b>Suggested UCL to Use</b>											
78			95% Student's-t UCL			11.06						
79												
80	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
81	Recommendations are based upon data size, data distribution, and skewness using results from simulation studies.											
82	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
83												

	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/19/2023 11:10:33 PM								
4	From File			arsenic and BaP proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for 1 Outliers in BaP</b>											
9												
10												
11	<b>Total N</b>			<b>71</b>								
12	<b>Number NDs</b>			<b>19</b>								
13	<b>Number Detects</b>			<b>71</b>								
14	<b>Mean with NDs=DL/2</b>			<b>1564</b>								
15	<b>SD with NDs=DL/2</b>			<b>9197</b>								
16	<b>Number of data</b>			<b>71</b>								
17	<b>Number of suspected outliers</b>			<b>1</b>								
18	<b>NDs replaced with half value.</b>											
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	1564	9132	76500	26	8.206	3.265	3.625				
23												
24	For 5% Significance Level, there is 1 Potential Outlier											
25	Therefore, Observation 76500 is a Potential Statistical Outlier											
26												
27	For 1% Significance Level, there is 1 Potential Outlier											
28												

	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/19/2023 11:12:08 PM								
4	From File			arsenic and BaP proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for 1 Outliers in BaP</b>											
9												
10												
11	<b>Total N</b>			<b>70</b>								
12	<b>Number NDs</b>			<b>19</b>								
13	<b>Number Detects</b>			<b>70</b>								
14	<b>Mean with NDs=DL/2</b>			<b>493.6</b>								
15	<b>SD with NDs=DL/2</b>			<b>1808</b>								
16	<b>Number of data</b>			<b>70</b>								
17	<b>Number of suspected outliers</b>			<b>1</b>								
18	<b>NDs replaced with half value.</b>											
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	493.6	1795	12400	24	6.634	3.26	3.62				
23												
24	For 5% Significance Level, there is 1 Potential Outlier											
25	Therefore, Observation 12400 is a Potential Statistical Outlier											
26												
27	For 1% Significance Level, there is 1 Potential Outlier											
28												

	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/19/2023 11:13:07 PM								
4	From File			arsenic and BaP proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for 1 Outliers in BaP</b>											
9												
10												
11	<b>Total N</b>			<b>69</b>								
12	<b>Number NDs</b>			<b>19</b>								
13	<b>Number Detects</b>			<b>69</b>								
14	<b>Mean with NDs=DL/2</b>			<b>321.1</b>								
15	<b>SD with NDs=DL/2</b>			<b>1096</b>								
16	<b>Number of data</b>			<b>69</b>								
17	<b>Number of suspected outliers</b>			<b>1</b>								
18	<b>NDs replaced with half value.</b>											
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	321.1	1088	8180	49	7.224	3.254	3.614				
23												
24	For 5% Significance Level, there is 1 Potential Outlier											
25	Therefore, Observation 8180 is a Potential Statistical Outlier											
26												
27	For 1% Significance Level, there is 1 Potential Outlier											
28												

	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/19/2023 11:14:29 PM								
4	From File			arsenic and BaP proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for 1 Outliers in BaP</b>											
9												
10												
11	<b>Total N</b>		<b>68</b>									
12	<b>Number NDs</b>		<b>19</b>									
13	<b>Number Detects</b>		<b>68</b>									
14	<b>Mean with NDs=DL/2</b>		<b>205.5</b>									
15	<b>SD with NDs=DL/2</b>		<b>532.5</b>									
16	<b>Number of data</b>		<b>68</b>									
17	<b>Number of suspected outliers</b>		<b>1</b>									
18	<b>NDs replaced with half value.</b>											
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	205.5	528.5	3150	47	5.571	3.248	3.608				
23												
24	For 5% Significance Level, there is 1 Potential Outlier											
25	Therefore, Observation 3150 is a Potential Statistical Outlier											
26												
27	For 1% Significance Level, there is 1 Potential Outlier											
28												

	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/19/2023 11:15:24 PM								
4	From File			arsenic and BaP proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for 1 Outliers in BaP</b>											
9												
10												
11	<b>Total N</b>			<b>67</b>								
12	<b>Number NDs</b>			<b>19</b>								
13	<b>Number Detects</b>			<b>67</b>								
14	<b>Mean with NDs=DL/2</b>			<b>161.6</b>								
15	<b>SD with NDs=DL/2</b>			<b>393</b>								
16	<b>Number of data</b>			<b>67</b>								
17	<b>Number of suspected outliers</b>			<b>1</b>								
18	<b>NDs replaced with half value.</b>											
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	161.6	390.1	2210	58	5.251	3.242	3.602				
23												
24	For 5% Significance Level, there is 1 Potential Outlier											
25	Therefore, Observation 2210 is a Potential Statistical Outlier											
26												
27	For 1% Significance Level, there is 1 Potential Outlier											
28												

	A	B	C	D	E	F	G	H	I	J	K	L
1					<b>Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit</b>							
2	<b>User Selected Options</b>											
3	Date/Time of Computation			ProUCL 5.2 5/20/2023 10:24:56 AM								
4	From File			arsenic and BaP proucl.xls								
5	Full Precision			OFF								
6												
7												
8	<b>Rosner's Outlier Test for 1 Outliers in BaP</b>											
9												
10												
11	<b>Total N</b>			<b>65</b>								
12	<b>Number NDs</b>			<b>19</b>								
13	<b>Number Detects</b>			<b>65</b>								
14	<b>Mean with NDs=DL/2</b>			<b>109.3</b>								
15	<b>SD with NDs=DL/2</b>			<b>250.1</b>								
16	<b>Number of data</b>			<b>65</b>								
17	<b>Number of suspected outliers</b>			<b>1</b>								
18	<b>NDs replaced with half value.</b>											
19												
20				Potential	Obs.	Test	Critical	Critical				
21	#	Mean	sd	outlier	Number	value	value (5%)	value (1%)				
22	1	109.3	248.2	1600	46	6.006	3.23	3.59				
23												
24	For 5% Significance Level, there is 1 Potential Outlier											
25	Therefore, Observation 1600 is a Potential Statistical Outlier											
26												
27	For 1% Significance Level, there is 1 Potential Outlier											
28												

	A	B	C	D	E	F	G	H	I	J	K	L	
1	<b>UCL Statistics for Data Sets with Non-Detects</b>												
2													
3	User Selected Options												
4	Date/Time of Computation		ProUCL 5.2 5/20/2023 10:23:29 AM										
5	From File		arsenic and BaP proucl.xls										
6	Full Precision		OFF										
7	Confidence Coefficient		95%										
8	Number of Bootstrap Operations		2000										
9													
10	<b>BaP</b>												
11													
12	<b>General Statistics</b>												
13	Total Number of Observations				64				Number of Distinct Observations				55
14									Number of Missing Observations				9
15	Number of Detects				45				Number of Non-Detects				19
16	Number of Distinct Detects				45				Number of Distinct Non-Detects				11
17	Minimum Detect				0.6				Minimum Non-Detect				0.47
18	Maximum Detect				1100				Maximum Non-Detect				4.9
19	Variance Detects				35211				Percent Non-Detects				29.69%
20	Mean Detects				122.1				SD Detects				187.6
21	Median Detects				58.8				CV Detects				1.536
22	Skewness Detects				3.541				Kurtosis Detects				16.43
23	Mean of Logged Detects				3.741				SD of Logged Detects				1.787
24													
25	<b>Normal GOF Test on Detects Only</b>												
26	Shapiro Wilk Test Statistic				0.627				<b>Shapiro Wilk GOF Test</b>				
27	1% Shapiro Wilk Critical Value				0.926				Detected Data Not Normal at 1% Significance Level				
28	Lilliefors Test Statistic				0.259				<b>Lilliefors GOF Test</b>				
29	1% Lilliefors Critical Value				0.153				Detected Data Not Normal at 1% Significance Level				
30	<b>Detected Data Not Normal at 1% Significance Level</b>												
31													
32	<b>Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs</b>												
33	KM Mean		86.03		KM Standard Error of Mean				20.89				
34	90KM SD		165.2		95% KM (BCA) UCL				123.6				
35	95% KM (t) UCL		120.9		95% KM (Percentile Bootstrap) UCL				122				
36	95% KM (z) UCL		120.4		95% KM Bootstrap t UCL				140.7				
37	90% KM Chebyshev UCL		148.7		95% KM Chebyshev UCL				177.1				
38	97.5% KM Chebyshev UCL		216.5		99% KM Chebyshev UCL				293.8				
39													
40	<b>Gamma GOF Tests on Detected Observations Only</b>												
41	A-D Test Statistic				0.308				<b>Anderson-Darling GOF Test</b>				
42	5% A-D Critical Value				0.806				Detected data appear Gamma Distributed at 5% Significance Level				
43	K-S Test Statistic				0.087				<b>Kolmogorov-Smirnov GOF</b>				
44	5% K-S Critical Value				0.139				Detected data appear Gamma Distributed at 5% Significance Level				
45	<b>Detected data appear Gamma Distributed at 5% Significance Level</b>												
46													
47	<b>Gamma Statistics on Detected Data Only</b>												
48	k hat (MLE)		0.583		k star (bias corrected MLE)				0.559				
49	Theta hat (MLE)		209.4		Theta star (bias corrected MLE)				218.4				
50	nu hat (MLE)		52.49		nu star (bias corrected)				50.32				
51	Mean (detects)		122.1										
52													
53	<b>Gamma ROS Statistics using Imputed Non-Detects</b>												
54	GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs												
55	GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)												
56	For such situations, GROS method may yield incorrect values of UCLs and BTVs												
57	This is especially true when the sample size is small.												
58	For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates												
59	Minimum		0.01		Mean				85.88				
60	Maximum		1100		Median				25.9				
61	SD		166.6		CV				1.94				
62	k hat (MLE)		0.226		k star (bias corrected MLE)				0.226				
63	Theta hat (MLE)		379.6		Theta star (bias corrected MLE)				379.9				
64	nu hat (MLE)		28.96		nu star (bias corrected)				28.94				
65	Adjusted Level of Significance ( $\beta$ )				0.0463								
66	Approximate Chi Square Value (28.94, $\alpha$ )				17.66				Adjusted Chi Square Value (28.94, $\beta$ )				17.46
67	95% Gamma Approximate UCL				140.7				95% Gamma Adjusted UCL				142.4
68													
69	<b>Estimates of Gamma Parameters using KM Estimates</b>												
70	Mean (KM)		86.03		SD (KM)				165.2				
71	Variance (KM)		27297		SE of Mean (KM)				20.89				
72	k hat (KM)		0.271		k star (KM)				0.269				
73	nu hat (KM)		34.7		nu star (KM)				34.41				



**APPENDIX C**  
**CHECKLIST TO DETERMINE THE APPLICABLE ECOLOGICAL STANDARD**



# ATTACHMENT 2

## **Attachment 2: Checklist to Determine Applicable Remediation Standards**

---

The Checklist to Determine Applicable Remediation Standards must be completed for each VRP site and attached to the Risk Assessment Report. Part 1 (Ecological Standards) is used to determine the degree to which ecological risks need to be addressed. Part 2 (Human Health Standards) is used to determine if a site should use De Minimis, Uniform, or Site-Specific risk assessment to progress the site in the VRP.

# ATTACHMENT 2

## Checklist to Determine Applicable Remediation Standards Part 1: Ecological Standards

STEP 1: Determine Whether a De Minimis Ecological Screening Evaluation is Appropriate for the Site		
1.1	Are there any undeveloped terrestrial areas on or adjacent to the site (e.g., areas that are not under intensive landscape or agricultural control)?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1.2	Are there any potential wetlands (including vernal pools) on or adjacent to the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1.3	Are there any surface water bodies (i.e., lotic or lentic habitat) on or adjacent to the site?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1.4	Are there any terrestrial, wetland, or aquatic habitats off-site, but situated downstream, downwind, or downgradient from the site that may be affected by site-related stressors?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
1.5	Are there any projected land uses for the site that would result in undeveloped areas, wetland habitat, lotic habitat, or lentic habitat?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<p><i>If "Yes" to any: A complete exposure pathway may exist for potential ecological receptors of concern. Proceed to Step 2.</i>  <i>If "No" to all: No further ecological evaluation is required. File this completed form with the Risk Assessment Report.</i></p>		

STEP 2: Identify any Readily Apparent Harm or Exceedances of Surface Water Quality Standards		
2.1	Have there been any incidents where harm to wildlife attributable to contaminants originating from the site has been readily apparent?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p><i>If "Yes": Proceed to Question 2.2.</i>  <i>If "No": Skip to Question 2.3.</i></p>		
2.2	Has the cause of such harm been eliminated?	<input type="checkbox"/> Yes <input type="checkbox"/> No
<p><i>If "Yes": Briefly describe the action taken and complete the rest of the checklist.</i>  <i>If "No": Proceed directly to the remedy evaluation or, alternately, proceed with a determination of a Uniform or Site-Specific Ecological Standard, as described in the VRP Guidance Manual, prior to implementation of the remedy. File this form with the Risk Assessment Report.</i></p> <p><b>Action Taken:</b></p>		
2.3	Is the site contributing to exceedances of surface water quality standards established for the protection of aquatic life (see W. Va. Legislative Rule 47CSR2)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p><i>If "Yes": Proceed directly to the remedy evaluation or, alternately, proceed with a determination of a Uniform or Site-Specific Ecological Standard, as described in the VRP Guidance Manual, prior to implementation of the remedy.</i>  <i>If "No": Proceed to Step 3.</i></p>		

**In 2018, a Site Inspection Reassessment was completed (Triad Engineering, Inc., Site Inspection Reassessment, White Park CERCLIS Site, July 2020), that included surface water quality samples. Metals, indicative of known upstream abandoned mine lands impacts, and not petroleum storage, were detected.**

# ATTACHMENT 2

STEP 3: Identify Contamination Associated with Ecological Habitats		
3.1	Have the environmental media (e.g., soil, surface water, sediment, biota) associated with the ecological habitat(s) identified in Questions 1.2 through 1.5 been sampled and analyzed with regard to potential site-related contaminants of concern?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<i>If "Yes": Proceed to Question 3.2.                      If "No": Skip to Step 4.</i>		
3.2	Have any site-related contaminants been detected above natural background concentrations in environmental media collected from terrestrial habitat?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/> n/a
3.3	Have any site-related contaminants been detected above natural background concentrations in environmental media collected from wetland or aquatic habitats (lotic or lentic habitats)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/> n/a
<i>If "Yes" or "Unknown" to 3.2 and/or 3.3: Proceed to Question 3.4.                      If "No" or "n/a" to both 3.2 and 3.3: Skip to Question 3.6.</i>		
3.4	Are site-related contaminants presenting an ecological risk over and above "local" condition?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown
<i>If "Yes": Skip to Step 4.                      If "No" or "Unknown": Proceed to Question 3.5.</i>		
3.5	Have site-related releases of contaminants been stopped?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<i>If "Yes": Proceed to Question 3.6.                      If "No": Skip to Part 4.</i>		
3.6	Are site-related contaminants currently or likely to be migrating to aquatic habitat (e.g., lotic, lentic, or wetland habitat)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> n/a
<i>If "Yes": Proceed to Step 4.                      If "No" or "n/a": No further ecological evaluation is required. File this completed form with the Risk Assessment Report.</i>		

# ATTACHMENT 2

## STEP 4: Characterize the Potential Ecological Habitat

4.1	Describe the general land use in the immediate vicinity of the site.	
	<input checked="" type="checkbox"/> Commercial/Industrial <input type="checkbox"/> Residential <input type="checkbox"/> Rural/Agricultural <input checked="" type="checkbox"/> Rural/Undeveloped <input type="checkbox"/> Urban <input checked="" type="checkbox"/> Other: parks and trails	
4.2	For all affected areas that fulfill the descriptions in Step 1, answer the following and attach a site map identifying the potential ecological habitat.	
	<b>4.2.1 Outline characteristics for potential terrestrial habitats.</b>	
	Location:	Site soils
	Contiguous Area:	170 acres
	General Topography:	hilly and variable gradient
	Primary Soil Type:	Silt loams
	Predominant Vegetation Species:	
	<b>4.2.2 Outline characteristics for potential wetland habitats (e.g., vernal pools, marshes, etc.).</b>	
	Location:	
	Contiguous Area:	
	General Topography:	
	Primary Soil Type:	
	Predominant Vegetation Species:	
	<b>1.2.3 Outline characteristics for potential lotic habitats (e.g., flowing water habitat such as rivers and streams).</b>	
	Location:	
	Typical Width and Depth:	
	Typical Flow Rate:	
	Typical Gradient (m/km):	
	Type of River/Creek Bottom:	
	Types of Aquatic Vegetation Present:	
	Topography of the Riparian Zone:	
	Predominant Riparian Vegetation:	
	Human Utilization of Lotic Habitat:	
	Local Conditions:	
	<b>1.2.4 Outline characteristics for potential lentic habitats (e.g., standing water habitats such as lakes and ponds).</b>	
	Location:	Cobun Creek Reservoir
	Is the lentic habitat...?	<input type="checkbox"/> Natural <input checked="" type="checkbox"/> Man-made
	Area of Lentic Habitat	12.17 acre Freshwater Pond habitat
	Typical and Maximum Depth:	
	Description of Sources & Drainage:	
	Predominant Aquatic Vegetation:	
	Topography of Littoral Zone:	
	Predominant Littoral Zone Vegetation:	
	Human Utilization of Lentic Habitat:	Morgantown Water Supply
	Local Conditions:	

# ATTACHMENT 2

4.3	<p>Indicate if the site contains or is adjacent to any of the following types of valued terrestrial habitats:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Climax Community (e.g., old growth forest)</li> <li><input type="checkbox"/> Federal Wilderness Area (designated or administratively proposed)</li> <li><input type="checkbox"/> National or State Forest</li> <li><input type="checkbox"/> National or State Park</li> <li><input type="checkbox"/> National or State Wildlife Refuge</li> <li><input type="checkbox"/> National Preserve Area</li> <li><input type="checkbox"/> State designated natural area</li> <li><input type="checkbox"/> Federal land designated for protection of natural ecosystems</li> <li><input type="checkbox"/> Federal or State land designated for wildlife or game management</li> <li><input type="checkbox"/> Area utilized for breeding by large or dense aggregations of wildlife</li> <li><input type="checkbox"/> Feeding, breeding, nesting, cover, or wintering habitat for migratory birds</li> <li><input type="checkbox"/> Area important to the maintenance of unique biotic communities (e.g., high proportion of endemic species)</li> </ul> <p><i>Threatened or Endangered Species</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Critical habitat for federally designated threatened or endangered species</li> <li><input checked="" type="checkbox"/> Habitat known to be used or potentially used by Federal or State designated threatened or endangered species, or species in the State Wildlife Action Plan</li> </ul>	
4.4	<p>Indicate if the site contains or is adjacent to any of the following types of valued wetlands:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Area important to the maintenance of unique biotic communities (e.g., high proportion of endemic species)</li> <li><input type="checkbox"/> Area utilized for breeding by large or dense aggregations of wildlife</li> <li><input type="checkbox"/> Spawning or nursery areas critical to the maintenance of fish/shellfish species</li> <li><input type="checkbox"/> Feeding, breeding, nesting, cover, or wintering habitat for migratory waterfowl or other aquatic birds</li> <li><input type="checkbox"/> Area important to the maintenance of unique biotic communities (e.g., high proportion of endemic species)</li> </ul> <p><i>Threatened or Endangered Species</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Critical habitat for federally designated threatened or endangered species</li> <li><input type="checkbox"/> Habitat known to be used or potentially used by Federal or State designated threatened or endangered species, or species in the State Wildlife Action Plan</li> </ul>	
4.5	<p>Indicate if the site is within or adjacent to any of the following valued aquatic habitats:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Federal or State Fish Hatchery</li> <li><input type="checkbox"/> Federal or State designated Scenic or Wild River</li> <li><input type="checkbox"/> National River Reach designated as recreational</li> <li><input type="checkbox"/> Critical areas identified under the Clean Lakes Program</li> <li><input type="checkbox"/> Trout-stocked streams or wild trout streams with verified trout production</li> <li><input type="checkbox"/> Spawning or nursery areas critical the maintenance of fish/shellfish species</li> <li><input type="checkbox"/> Feeding, breeding, nesting, cover, or wintering habitat for migratory waterfowl or other aquatic birds</li> <li><input type="checkbox"/> Area important to the maintenance of unique biotic communities (e.g., high proportion of endemic species)</li> </ul> <p><i>Threatened or Endangered Species</i></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Critical habitat for federally designated threatened or endangered species</li> <li><input type="checkbox"/> Habitat known to be used or potentially used by Federal or State designated threatened or endangered species, or species in the State Wildlife Action Plan</li> </ul>	
4.6	<p>Have valued terrestrial, wetland, or aquatic habitats been identified within or adjacent to this site? (A list of agencies that can provide information that should assist in determining whether the site is located within or adjacent to the areas listed in 4.3, 4.4, and 4.5 is provided at the end of this checklist.)</p>	<p><input type="checkbox"/> Yes   <input checked="" type="checkbox"/> No</p>

**Per DNR and USFWS technical reviews, see attached letters.**

# ATTACHMENT 2

## STEP 5: Identify Any Potential Ecological Receptors of Concern

5.1	<u>Threatened and Endangered Species</u> Were any potential habitats within or adjacent to the site identified as critical habitat for federally designated threatened or endangered species listed in 50CFS17.95 or 17.96, or areas known to be used by federal or state designated threatened or endangered species?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p><b>If “Yes”, indicate which species*:</b></p> <p><i>Amphibians</i></p> <p><input type="checkbox"/> Cheat Mountain salamander (Plethodon nettingi)</p> <p><i>Birds</i></p> <p><input type="checkbox"/> Bald eagle (Haliaeetus leucocephalus)</p> <p><i>Clams</i></p> <p><input type="checkbox"/> Clubshell (Pleurobema clava)</p> <p><input type="checkbox"/> Fanshell (Cyprogenia stegaria)</p> <p><input type="checkbox"/> James spiny mussel (Pleurobeam collina)</p> <p><input type="checkbox"/> Northern riffleshell (Epioblasma torulosa rangiana)</p> <p><input type="checkbox"/> Pink mucket pearly mussel (Lampsilis abrupta)</p> <p><input type="checkbox"/> Tubercled blossom pearly mussel (Epioblasma torulosa torulosa)</p> <p><i>Flowering Plants</i></p> <p><input type="checkbox"/> Harperella (Ptilimnium nodosum)</p> <p><input type="checkbox"/> Northeastern bulrush (Scirpus ancistrochaetus)</p> <p><input type="checkbox"/> Running buffalo cover (Trifolium stoloniferum)</p> <p><input type="checkbox"/> Shale barren rock cress (Arabis perstellata)</p> <p><input type="checkbox"/> Small whorled pogonia (Isotria medeoloides)</p> <p><input type="checkbox"/> Virginia spiraea (Spiraea virginiana)</p> <p><i>Mammals</i></p> <p><input type="checkbox"/> Eastern cougar (Felis concolor cougar)</p> <p><input type="checkbox"/> Gray bat (Myotis grisescens)</p> <p><input type="checkbox"/> Indiana bat (Myotis sodalis)</p> <p><input type="checkbox"/> Virginia big-eared bat (Corynorhinus townsendii virginiaus)</p> <p><input type="checkbox"/> Virginia northern flying squirrel (Glaucomys sabrinus fuscus)</p> <p><i>Snails</i></p> <p><input type="checkbox"/> Flat-spined three-toothed land snail (Triodopsis platysayoides)</p>		
5.2	<u>Local Populations Providing Important Natural or Economic Resources, Functions, and Values</u> Were any valued terrestrial, wetland, or aquatic habitats listed in 4.3, 4.4, or 4.5 identified within or adjacent to the site?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<p><i>If “Yes” to 5.1 and/or 5.2 and/or surface water bodies are not in compliance with applicable water quality standards: The site does not pass the De Minimis ecological risk screening, since a complete exposure pathway may exist for potential ecological receptors of concern. Further evaluation of the site is required using either the Uniform Ecological Standard or the Site-Specific Ecological Standard.</i></p> <p><i>If “No” to 5.1 and 5.2 and surface water bodies are in compliance with applicable water quality standards: No further ecological evaluation is required. File this completed form with the Risk Assessment Report.</i></p>		

\*The list contains those federally designated threatened and endangered species that are indigenous to WV. WVDNR, Wildlife Resources Section should be consulted to ensure the list is correct. WV has not established a list of state designated threatened or endangered species; however, the WVDNR has developed a “[Species of Greatest Conservation Need](#)” list in the [State Wildlife Action Plan](#). Species listed in the in the State Wildlife Action Plan should also be considered in any Ecological Risk Assessment.

# ATTACHMENT 2

## Federal and State Agencies for Ecological Review Consultation

U.S. Department of Agricultural – Natural Resources and Conservation Service  
1550 Earl L. Core Road, Suite 200  
Morgantown, WV 26505  
304-284-7540  
<https://www.nrcs.usda.gov/wps/portal/nrcs/site/wv/home>

U.S. Fish and Wildlife Service – WV Field Office  
Ecological Services  
90 Vance Drive  
Elkins, WV 26241  
304-636-6586  
<https://www.fws.gov/northeast/ecologicalservices/index.html>

WV Division of Forestry  
7 Players Club Drive  
Charleston, WV 25311  
304-558-2788  
<https://wvforestry.com/>

WV Division of Natural Resources  
Building 74  
324 Fourth Avenue  
South Charleston, WV 25303  
304-558-2754  
<http://www.wvdnr.gov/>

WV Division of Natural Resources – Wildlife Resources Section  
Building 74  
324 Fourth Avenue  
South Charleston, WV 25303  
304-558-2771  
<http://www.wvdnr.gov/>

# ATTACHMENT 2

## Checklist to Determine Applicable Remediation Standards Part 2: Human Health Standards

### STEP 1: Determine Whether the De Minimis Standard is Appropriate for the Site

The De Minimis Standard applies to contaminants for which the primary exposure routes will be ingestion, dermal contact, and/or inhalation of soil or groundwater. For soil, the De Minimis Standard is either the risk-based concentration (RBC) (Table 60-3B of the Rule) or the natural background level of the contaminant, whichever is higher. The potential for vapor intrusion also needs to be screened by comparing site groundwater, soil gas, or indoor air concentrations to the relevant RBC in the USEPA Vapor Intrusion Screening Levels (VISL).

Evaluating a site based on the De Minimis Standard consists of aggregating site data and comparing either maximum concentrations detected, or the 95% upper confidence limit (UCL) concentration, known as the exposure point concentration (EPC), to establish RBCs. If site EPCs do not exceed the RBC or site-specific background, then no further evaluation or remediation of the site is required. Similarly, if the site EPCs do exceed the RBC or site-specific background but presumptive remedies can be shown to sever the potential exposure route, then no further evaluation is needed, and the Applicant can proceed to implementing the presumptive remedies. (Completing Worksheet 4-1 at the end of this checklist may aid in this process.)

The De Minimis approach is limited to particular compounds and is appropriate only for residential or industrial exposure scenarios. Below are several questions that will help to determine whether a site may be evaluated under the De Minimis Standard.

1.1	Have media representing all potentially complete pathways in the conceptual site model been sampled?	<input type="checkbox"/> Yes <input type="checkbox"/> No
1.2	Are there fewer than 10 chemicals present at the site?	<input type="checkbox"/> Yes <input type="checkbox"/> No
1.3	If any concentration of chemicals of potential concern exceed the RBC, are there presumptive remedies that can sever the exposure pathways and that are acceptable to the Applicant and impacted off-site property owners?	<input type="checkbox"/> Yes <input type="checkbox"/> No
1.4	Is the future use of the site expected to only be residential and/or industrial?	<input type="checkbox"/> Yes <input type="checkbox"/> No
1.5	Does Part 1 (Ecological Standards) of this checklist indicate that there are no ecological receptors of concern at the site (e.g., wetlands or endangered species)?	<input type="checkbox"/> Yes <input type="checkbox"/> No

*If "Yes" to all: The De Minimis Standard is likely appropriate for the site.*

*If "No" to any: The De Minimis Standard may not be appropriate for the site, and more site-specific characterization may be needed; however, the Applicant may consult with WVDEP to confirm the determination.*

*If "No" to all: The De Minimis Standard is not appropriate for the site. The Uniform Standard or Site-Specific Standard should be considered instead.*

# ATTACHMENT 2

## STEP 2: Determine Whether the Uniform Standard is Appropriate for the Site

The Uniform Standard is based on the use of WVDEP-approved methodologies to calculate remediation standards. Advantages to using the Uniform Standard include the fact that this methodology can be used to determine remediation standards for some contaminants and receptors not included under the De Minimis Standards or De Minimis Risk Assessment process (e.g., recreators and construction workers), and that, with adequate documentation, site-specific information can be incorporated into the calculations. The disadvantages of the approach defined under the Uniform Standard are that exposure scenarios and potential exposure pathways included in these calculations are limited to those available in the USEPA Regional Screening Levels methodology.

Note that if site-specific modeling will be used in determining EPCs for media at a site, a site-specific risk assessment should be used.

2.1	Is future use of the site potentially other than residential or industrial use?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.2	Do potentially impacted sediments exist at the site that you feel should not be held to residential or industrial soil cleanup standards?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.3	Do home vegetable gardens potentially exist in the vicinity of the site, and is homegrown produce potentially impacted by site-related chemicals?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.4	Are there any dairy farms or livestock grazing areas within the area of impact of the site?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.5	Is impacted groundwater or surface water used for irrigation or any use other than drinking water?	<input type="checkbox"/> Yes <input type="checkbox"/> No
2.6	Are construction/utility workers potentially exposed to contaminated groundwater in a trench?	<input type="checkbox"/> Yes <input type="checkbox"/> No

*If “Yes” to any: There are potential pathways for human exposure to site-related chemicals that are not addressed in the methodology provided for determining a Uniform Standard. Therefore, a Site-Specific Standard is more appropriate for the site.*

*If “No” to all: The Uniform Standard is likely appropriate for the site.*

# ATTACHMENT 2

## Worksheet 4-1

If EPCs for all site contaminants are less than the corresponding RBC values, no remediation is required. If the site EPC values exceed the RBC values, additional assessment or remediation of the site is required.

Worksheet 4-1: Compare Site Data to Chemical Specific De Minimis RBC Values					
<b>Soil</b> (mg/kg)	Contaminant	Max Concentration	UCL	RBCs	
				Residential	Industrial
<b>Groundwater</b> µg/L	Contaminant	Max Concentration	UCL	RBCs	
				Groundwater	VISL
<b>Soil Vapor</b> µg/m <sup>3</sup>	Contaminant	Max Concentration	UCL	RBCs	
				Residential	Industrial

UCL = 95% Upper Confidence Level  
RBC = Risk Based Concentrations provided in Table 60-3B of the Rule and in the USEPA Vapor Intrusion Screening Levels (VISL)



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

West Virginia Field Office  
694 Beverly Pike  
Elkins, West Virginia 26241



Contact Name: Cory Jones

Email Address or Fax Number: cjones@mub.org

FWS File # 2017-i-0144 **All future correspondence should clearly reference this FWS File #.**

Project Name & Location: Cobun Creek Reservoir #2 Raw Waterline Ext. Monongalia Co.

Date of Letter Request: 12/05/2016

This is in response to your letter requesting threatened and endangered species information in regard to the proposed project listed above. These comments are provided pursuant to the Endangered Species Act (ESA) (87 Stat. 884, as amended; 16 U. S. C. 1531 *et seq.*).

Two federally listed species could occur in the project area, the endangered Indiana bat (*Myotis sodalis*), and the threatened northern long-eared bat (NLEB) (*M. septentrionalis*).

The Indiana bat may use the project area for foraging and roosting between April 1 and November 15. Indiana bat summer foraging habitats are generally defined as riparian, bottomland, or upland forest, and old fields or pastures with scattered trees. Roosting/maternity habitat consists primarily of live or dead hardwood tree species which have exfoliating bark that provides space for bats to roost between the bark and the bole of the tree. Tree cavities, crevices, splits, or hollow portions of tree boles and limbs also provide roost sites. In West Virginia, the U.S. Fish and Wildlife Service (Service) considers all forested habitat containing trees greater than or equal to 5 inches in diameter at breast height (DBH) to be potentially suitable as summer roosting and foraging habitat for the Indiana bat. Similar to the Indiana bat, NLEB foraging habitat includes forested hillsides and ridges, and small ponds or streams. NLEB are typically associated with large tracts of mature, upland forests with more canopy cover than is preferred by Indiana bats. NLEB seem to be flexible in selecting roosts, choosing roost trees based on suitability to retain bark or provide cavities or crevices, and this species is known to use a wider variety of roost types than the Indiana bat. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat has also occasionally been found roosting in structures like barns and sheds.

Indiana bats and NLEB use caves or mine portals for winter hibernation between November 15 and March 31. These species also use the hibernacula and the areas around them for fall-swarming and spring-staging activity (August 15 to November 14 and April 1 to May 14, respectively). Some males have been known to stay close to the hibernacula during the summer

Updated February 1, 2016

and may use the hibernacula as a summer roosts. There may be other landscape features being used by NLEB during the winter that have yet to be documented.

The Service has reviewed the number of acres of potentially suitable foraging and roosting habitat on the West Virginia landscape available to each Indiana bat, versus the total acreage of forest. On that basis, we have determined that small projects, more than 10 miles from a known priority 1 or 2 Indiana bat hibernaculum, more than 5 miles from a known priority 3 or 4 Indiana bat hibernaculum, or more than 2.5 miles from any known maternity roost, or more than 5 miles from summer detection sites where no roosts were identified, that affect less than 17 acres of forested habitat, and will not affect any potential hibernacula, will have a very small chance of resulting in direct or indirect effects to the Indiana bat, and therefore these effects are considered discountable. **Please note that the Service may review and update this assessment at any time as new information becomes available.**

The Service does not anticipate that this project is likely to adversely affect the Indiana bat because your project: 1) will affect less than 17 acres of potential Indiana bat foraging or roosting habitat; 2) is not within any of the Indiana bat hibernacula or summer use buffers described above; and 3) will not affect any potential caves or mines that could be used as hibernacula for this species.

The NLEB may occur within the range of the proposed project, and may be affected by the proposed construction and operation of this project. Any take of NLEB occurring in conjunction with these activities that complies with the conservation measures (as outlined in the 4(d) rule), as necessary, is exempted from section 9 prohibitions by the 4(d) rule and does not require site specific incidental take authorization. Note that the 4(d) rule does not exempt take that may occur as a result of adverse effects to hibernacula and that no conservation measures are required as part of the 4(d) unless the proposed project: 1) involves tree removal within 0.25 miles of known NLEB hibernacula; or 2) cuts or destroys known, occupied maternity roost trees or any other trees within a 150-foot radius around known, occupied maternity tree during the pup season (June 1 to July 31). This proposed project is not located within any of these radii around known hibernacula or roost trees and will not affect any known NLEB hibernacula, therefore any take of NLEB associated with this project is exempted under the 4(d) rule and no conservation measures are required.

This letter provides technical assistance only and does not serve as a completed section 7 consultation document. If there is a federal nexus for the project (e.g., federal funding provided, federal permits required to construct), no tree clearing or any project construction activities on any portion of the parcel should occur until consultation under section 7 of the ESA, between the Service and the federal action agency, is completed. Section 7 consultation is not complete until the federal action agency submits a determination of effects to this office, the Service concurs with the federal action agency's determination, and the federal action agency agrees to limit tree clearing to under 17 acres as a mandatory condition for any permit decision rendered for this project. All measures must be implemented as proposed. If there is no federal nexus associated with this project, then no further coordination with this office is required.

Should project plans change or amendments be proposed that we have not considered in your proposed action, or if additional information on listed and proposed species becomes available, or if new species become listed or critical habitat is designated, this assessment may be reconsidered.

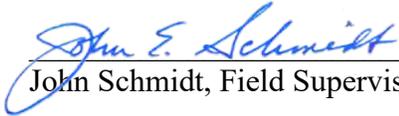
If you have any questions regarding these comments, please contact the biologist listed below at (304) 636-6586 or at the letterhead address.



12/13/2016

Biologist

Date



John Schmidt, Field Supervisor

12/22/2016

Date

# IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

## Location

Monongalia County, West Virginia



## Local office

West Virginia Ecological Services Field Office

☎ (304) 866-3858

📠 (304) 866-3852

6263 Appalachian Highway

3255 Appaichman Highway

Davis, WV 26260-8061

NOT FOR CONSULTATION

# Endangered species

**This resource list is for informational purposes only and does not constitute an analysis of project level impacts.**

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species<sup>1</sup> and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries<sup>2</sup>).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

- 
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

## Mammals

NAME	STATUS
<p><b>Indiana Bat</b> <i>Myotis sodalis</i></p> <p>Wherever found</p> <p>This species only needs to be considered if the following condition applies:</p> <ul style="list-style-type: none"> <li>All activities in this location should consider potential effects to this species. This project is not within a known-use area, but potentially occupied habitat may exist. Please contact the WVFO for additional consultation.</li> </ul> <p>There is <b>final</b> critical habitat for this species. Your location does not overlap the critical habitat.</p> <p><a href="https://ecos.fws.gov/ecp/species/5949">https://ecos.fws.gov/ecp/species/5949</a></p>	Endangered
<p><b>Northern Long-eared Bat</b> <i>Myotis septentrionalis</i></p> <p>Wherever found</p> <p>No critical habitat has been designated for this species.</p> <p><a href="https://ecos.fws.gov/ecp/species/9045">https://ecos.fws.gov/ecp/species/9045</a></p>	Endangered
<p><b>Tricolored Bat</b> <i>Perimyotis subflavus</i></p> <p>Wherever found</p> <p>No critical habitat has been designated for this species.</p> <p><a href="https://ecos.fws.gov/ecp/species/10515">https://ecos.fws.gov/ecp/species/10515</a></p>	Proposed Endangered

## Insects

NAME	STATUS
<p><b>Monarch Butterfly</b> <i>Danaus plexippus</i></p> <p>Wherever found</p> <p>No critical habitat has been designated for this species.</p> <p><a href="https://ecos.fws.gov/ecp/species/9743">https://ecos.fws.gov/ecp/species/9743</a></p>	Candidate

## Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

## Bald & Golden Eagles

There are no documented cases of eagles being present at this location. However, if you believe eagles may be using your site, please reach out to the local Fish and Wildlife Service office.

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds  
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds  
<https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>

Bald and Golden Eagle information is not available at this time

**What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?**

The potential for eagle presence is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply). To see a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

## What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

## What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the [Eagle Act](#) should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

# Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act<sup>1</sup> and the Bald and Golden Eagle Protection Act<sup>2</sup>.

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <https://www.fws.gov/program/migratory-birds/species>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>

## Migratory bird information is not available at this time

**Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.**

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

**What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?**

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

**What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?**

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

**How do I know if a bird is breeding, wintering or migrating in my area?**

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [RAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

## What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

## Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

## What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

## Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there,

and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

## Facilities

### National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

### Fish hatcheries

There are no fish hatcheries at this location.

### Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

## FRESHWATER POND

[PUBHh](#)

## RIVERINE

[R5UBH](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

**NOTE:** This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

**Data limitations**

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

**Data exclusions**

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

**Data precautions**

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.



# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

West Virginia Field Office  
90 Vance Drive  
Elkins, West Virginia 26241

Contact Name: James W. Fetty

Email Address or Fax Number: (304) 292-1526

FWS File # 2017-I-0144 **All future correspondence should clearly reference this FWS File #.**

Project: Morgantown Utility Board Cobun Creek Reservoir #2 Raw Waterline Extension, Monongalia Co.

Date of Letter Request: August 26, 2019

This is in response to your letter requesting threatened and endangered species information concerning the proposed modification to the project listed above. These comments are provided pursuant to the Endangered Species Act (ESA, 87 Stat. 884, as amended; 16 U. S. C. 1531 *et seq.*).

The U.S. Fish and Wildlife Service (Service) has determined that the Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) may occur within the proposed expansion area, and may be affected by the construction and operation of this project. In previous correspondence dated 12/22/2016, the Service provided technical assistance regarding potential effects to federally listed species. Based on your recent correspondence, the information provided does not change the Service's analysis of effects to federally listed species. Therefore, our previous technical assistance letter is still valid.

Should project plans change or amendments be proposed that we have not considered in your proposed action, or if additional information on listed and proposed species becomes available, or if new species become listed or critical habitat is designated, this determination may be reconsidered.

If you have any questions regarding these comments, please contact the biologist listed below at (304) 636-6586 or at the letterhead address.

Date: 10/10/2019

Biologist

Acting

Date: 10/16/2019

Field Supervisor



**DIVISION OF NATURAL RESOURCES**

**Wildlife Resources Section  
Elkins Operations Center  
738 Ward Rd., PO Box 67  
Elkins, WV 26241  
Telephone 304-637-0245  
Fax 304-637-0250**

**Stephen S. McDaniel  
Director**

September 12, 2019

Mr. James Fetty  
Morgantown Utility Board  
PO Box 852  
Morgantown, WV 26507-0852

Dear Mr. Fetty:

We have reviewed Natural Heritage Program files for information on rare, threatened and endangered (RTE) species and sensitive habitats for the area of the proposed revision to the Cobun Creek Reservoir #2 Raw Waterline Extension project in Morgantown, Monongalia County, WV.

We have no known records of any RTE species or sensitive habitats within the project area. Unless directional drilling is utilized, the crossings of Cobun Creek will require surveys for freshwater mussels. The Wildlife Resources Section knows of no surveys that have been conducted in the area for rare species or rare species habitat. Consequently, this response is based on information currently available and should not be considered a comprehensive survey of the area under review. This response is valid for two years.

The information provided above is the product of a database search and retrieval. This information does not satisfy other consultation or permitting requirements for disturbances to the natural resources of the state, and further consultation may be required. Additionally, any concurrence requirements for federally listed species must come from the US Fish and Wildlife Service.

Thank you for your inquiry, and should you have any questions please feel free to contact me at the above number, or [barbara.d.sargent@wv.gov](mailto:barbara.d.sargent@wv.gov). Enclosed please find an invoice.

Sincerely,

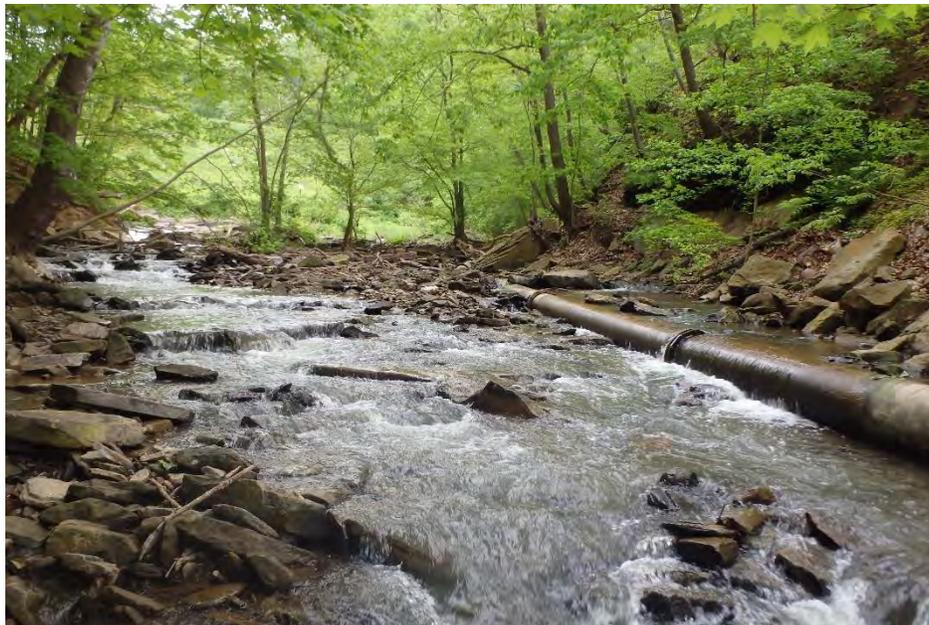
Barbara Sargent  
Environmental Resources Specialist  
Environmental Coordination  
Operations Unit

enclosure

Morgantown Utility Board  
Cobun Creek Reservoir #2 Waterline Extension Project  
Mussel Surveys

Cobun Creek Crossings  
Monongalia County, West Virginia

May 8, 2017



**Prepared By:**  
AllStar Ecology, LLC.  
1582 Meadowdale Road  
Fairmont, West Virginia 26554

**For:**  
Morgantown Utility Board  
278 Greenbag Road  
Morgantown, West Virginia 26501

## Table of Contents

<b>Executive Summary .....</b>	<b>1</b>
<b>Introduction .....</b>	<b>2</b>
Figure 1 – Mussel survey design and location map for Crossing #1 .....	3
Figure 2 – Mussel survey design and location map for Crossing #2 .....	4
<b>Methods .....</b>	<b>5</b>
Table 1 – Location coordinates for the ADI, DSB, and USB of each survey area.....	6
<b>Results .....</b>	<b>7</b>
Figure 3 – View upstream to the east from the USB of the Crossing #1 survey area .....	7
Figure 4 – USGS hydrograph for Deckers Creek during the surveys.....	9
Table 2 – Field collected water quality results for each survey area .....	10
Table 3 – Field observed habitat conditions and search effort for Crossing #1 .....	11
Table 4 – Field observed habitat conditions and search effort for Crossing #2 .....	11
<b>Discussion.....</b>	<b>12</b>
<b>Literature Cited .....</b>	<b>13</b>
Figure 5 – View to the south of the DSB at Crossing #1 .....	14
Figure 6 – View to the north of the ADI at Crossing #1 .....	15
Figure 7 – View to the east of the ADI and USB at Crossing #1 .....	16
Figure 8 – Photo of survey effort within the ADI at Crossing #1 .....	17
Figure 9 – Photo of representative substrates observed within each survey area.....	18
Figure 10 – View to the east of the DSB at Crossing #2 .....	19
Figure 11 – View to the east of the ADI and USB at Crossing #2 .....	20
Figure 12 – View to the east of the USB at Crossing #2 .....	21
APPENDIX A. WVDNR Protocol Forms for Project crossing locations .....	22
APPENDIX B. WVDNR Current Stream & Weather Conditions data forms for surveys .....	25
APPENDIX C. WVDNR Mussel Survey Summary Data Sheets for surveys.....	32
APPENDIX D. WVDNR Issued Scientific Collection Permit Addendum for Cobun Creek .....	35

## **Abbreviations and Acronyms Used Hereafter**

ADI – Area of Direct Impact

CFS – Cubic Feet per Second

DSB – Downstream Buffer

USB – Upstream Buffer

USGS – United States Geological Survey

WVDNR – West Virginia Division of Natural Resources

SZ – Salvage Zone

## **Executive Summary**

On May 4, 2017, two qualitative mussel surveys were conducted for the Cobun Creek Reservoir #2 Waterline Extension Project (Project) on Cobun Creek in Monongalia County, West Virginia. The survey areas (Crossing #1 and Crossing #2) on Cobun Creek are located within the Morgantown, West Virginia city limits (Figure 1 and Figure 2). Crossing #1 and Crossing #2 are each located on Cobun Creek approximately 300 meters (m) and 500 m upstream of the US Highway 119 Bridge over Cobun Creek, respectively. Cobun Creek (HUC# 050200030307) is a direct, perennial tributary of the Monongahela River (HUC# 05020003) which is a traditionally navigable waterway.

The mussel surveys on Cobun Creek followed the 2016 West Virginia Mussel Survey Protocols for All Projects on Group 1 Streams (Clayton *et al.* 2016). The area of direct impact (ADI) for each crossing location is approximately 40 m in length. A 25 m downstream buffer (DSB) and a 10 m upstream buffer (USB) were applied to each ADI (Figure 1 and Figure 2). Timed searches were performed within the ADI, DSB, and USB at each crossing location. Stream conditions at the time of the qualitative surveys on Cobun Creek allowed for each crossing location to be searched for freshwater mussels utilizing waterscopes.

No live freshwater mussels, fresh dead mussels, or relic freshwater mussel shells were found during the qualitative surveys at either crossing location for the Project on Cobun Creek in Monongalia County, West Virginia.

## Introduction

The Morgantown Utility Board (MUB) contracted AllStar Ecology, LLC. (AllStar) to conduct two qualitative mussel surveys for the Project on Cobun Creek in Monongalia County, West Virginia. The Project is required to better transport water from Cobun Creek Reservoir #2 to the MUB Water Treatment Plant. Multiple crossings are proposed on Cobun Creek; however, only two crossings (Crossing #1 and Crossing #2) have watershed drainage areas greater than 10 square miles and required a mussel survey be conducted (Janet Clayton, personal communication with MUB). Crossing #1 for the Project is located at 39.607947°, -79.968953° (Figure 1). Crossing #2 for the Project is located approximately 175 m upstream of Crossing #1 at 39.608747°, -79.967364° (Figure 2). The proposed path for the Project will follow Cobun Creek from the Cobun Creek Reservoir #2, along Greenbag Road, to the north around Cobun Creek Reservoir #1, through White Park in Morgantown until crossing Cobun Creek at Crossing #1 and Crossing #2, and finally crossing US Highway 119 to reach MUB's Morgantown Water Treatment Plant along the Monongahela River. The ADI for Crossing #1 and Crossing #2 are each 40 m long and approximately 5 m wide.

Cobun Creek in Monongalia County, West Virginia is identified by the West Virginia Division of Natural Resources (WVDNR) as a High Quality Water Group 1 Mussel Stream according to Appendix A of the 2016 West Virginia Mussel Survey Protocols (Clayton *et al.* 2016). Group 1 Mussel Streams are listed by the WVDNR as small to mid-sized streams known to support freshwater mussels and/or contain suitable habitat for freshwater mussels. Group 1 streams are not known to support federally endangered freshwater mussel species. Due to the instream activity associated with the Project, the WVDNR required mussel surveys be conducted in order to avoid possible impacts to the potential mussel populations in Cobun Creek at the Project crossing locations. The mussel surveys followed the 2016 West Virginia Mussel Survey Protocols for All Projects in Group 1 Streams (Clayton *et al.* 2016).

The qualitative mussel surveys for each crossing location were conducted on May 4, 2017, and were led by Sarah Veselka of AllStar (WVDNR Scientific Collection Permit Addendum #2017.086). At the time of each survey, cloud cover was approximately 60%. There had been an estimated 1.30 cumulative inches of rain within the seven days prior to the surveys for the Project; however, MUB was able to retain water in the upstream reservoirs and Cobun Creek was surveyed under seasonal average flow conditions. Stream conditions for each survey location allowed for visual sampling efforts via waterscopes, with visibility meeting the WVDNR requirement of 0.5 m (Clayton *et al.* 2016).



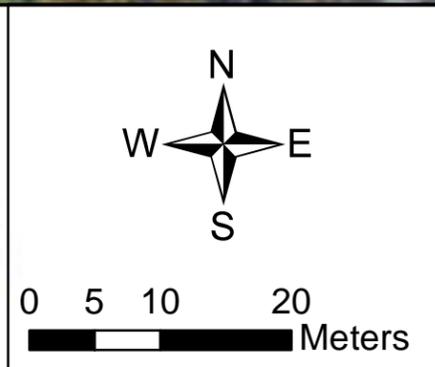
US Highway 119 (Don Knotts Blvd)

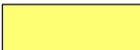
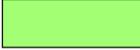
Cobun Creek

FLOW

University Toyota Car Dealership

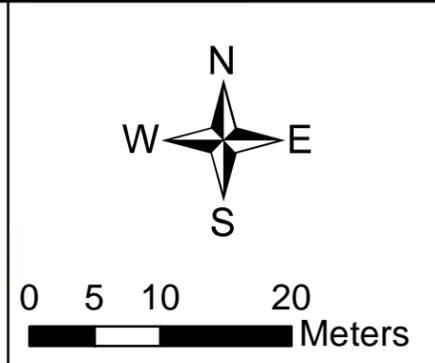
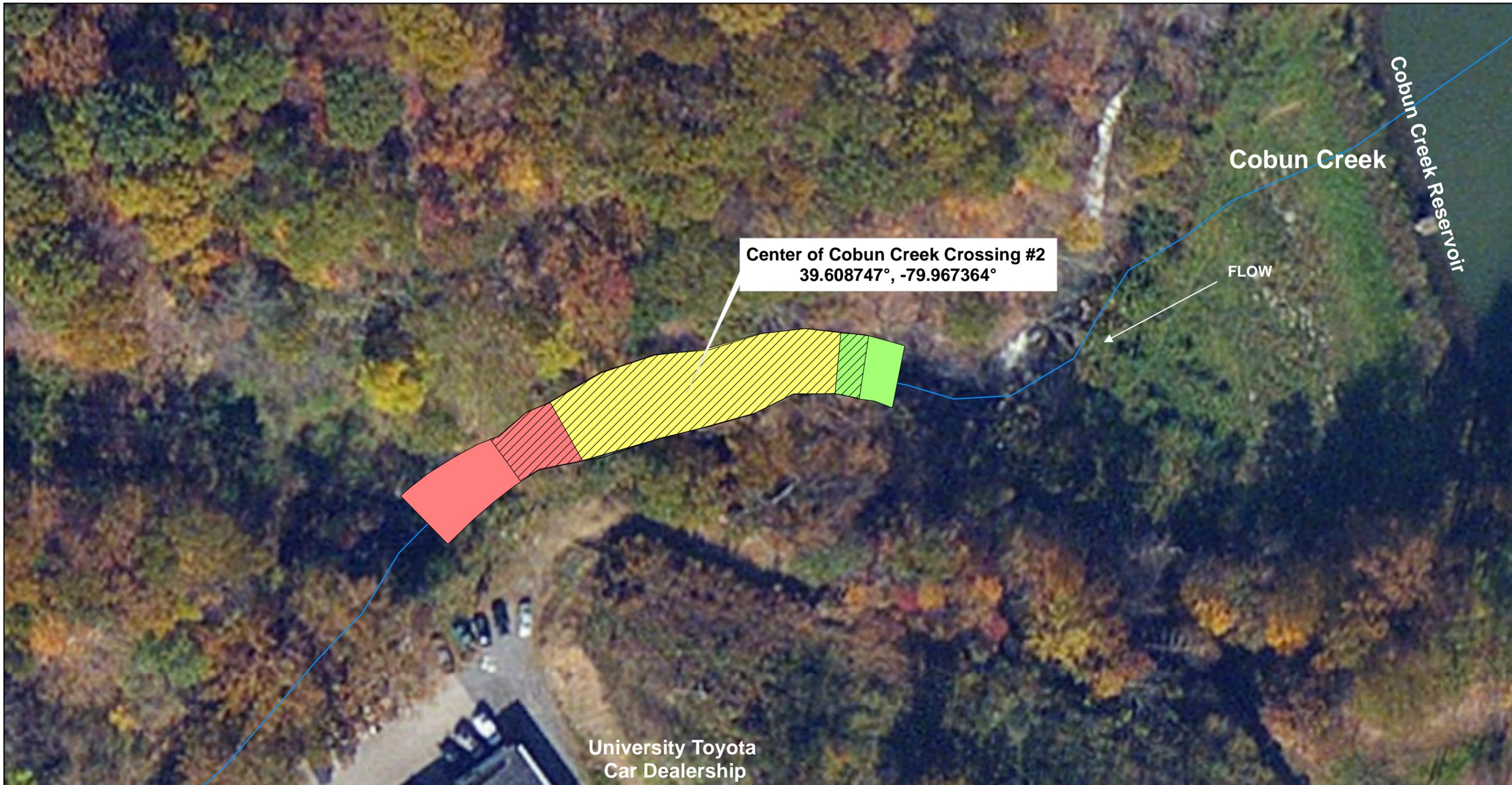
Center of Cobun Creek Crossing #1  
39.607947°, -79.968953°



-  Area of Direct Impact
-  Downstream Buffer
-  Upstream Buffer
-  Salvage Zone

**Morgantown Utility Board**

Figure 1  
Phase I Freshwater Mussel Survey Design Map  
Cobun Creek Reservoir #2 Waterline Extension  
Crossing #1  
Monongalia County, West Virginia



- Area of Direct Impact
- Downstream Buffer
- Upstream Buffer
- Salvage Zone

<b>Morgantown Utility Board</b>	
<p>Figure 2 Phase I Freshwater Mussel Survey Design Map Cobun Creek Reservoir #2 Waterline Extension Crossing #2 Monongalia County, West Virginia</p>	
Date: 3/22/2017	Page 4

## Methods

The qualitative mussel surveys on Cobun Creek at each crossing location followed the 2016 West Virginia Mussel Survey Protocols for All Projects on Group 1 Streams for survey design and execution (Clayton *et al.* 2016). The survey plan for the qualitative surveys are illustrated in the above attached maps (Figure 1 and Figure 2). Each ADI for the Project is approximately 40 m in length. A 25 m long DSB and a 10 m long USB were applied to each ADI based on requirements outlined in Table 3 of the 2016 West Virginia Mussel Survey Protocols (Clayton *et al.* 2016). Table 1 below lists the coordinates for the Project mussel survey areas.

Timed searches were performed in the ADI, DSB, and USB for each survey area. Areas of heterogeneous habitat were surveyed at a rate of 0.2 min/m<sup>2</sup>. All survey areas were searched utilizing waterscopes. In addition, fallen leaves, woody debris, and the upper 5 cm of substrate were disturbed to effectively view any mussels which may be present.

Upon arriving at each survey location, turbidity was measured using a Hach Turbidimeter. In addition, Oakton Handheld probes were used to test pH, temperature (Temp), dissolved oxygen (DO), specific conductance (SpC), and total dissolved solids (TDS). Total search effort for Crossing #1 was approximately 105 minutes (52 minutes x 2 surveyors = 105 minutes of search effort) for the entire survey area (ADI, DSB, and USB). Total search effort for Crossing #2 was approximately 120 minutes (60 minutes x 2 surveyors = 120 minutes of search effort) for the entire survey area (ADI, DSB, and USB). Average depth and dominant substrate types were recorded for each survey area. Physical habitat data forms were completed in their entirety for each crossing location and used to note weather, habitat conditions observed, local land use, etc.

Table 1. Coordinates (decimal degrees) for the Project ADI and survey buffers on Cobun Creek in Monongalia County, West Virginia.

<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
Crossing #1 Upper Limit of USB	39.608053	-79.968660
Crossing #1 Upper Limit of ADI	39.607982	-79.968757
Crossing #1 Center of ADI	39.607947	-79.968953
Crossing #1 Lower Limit of ADI	39.608090	-79.969094
Crossing #1 Lower Limit of DSB	39.608319	-79.969170
Crossing #2 Upper Limit of USB	39.608778	-79.967122
Crossing #2 Upper Limit of ADI	39.608801	-79.967231
Crossing #2 Center of ADI	39.608747	-79.967364
Crossing #2 Lower Limit of ADI	39.608715	-79.967720
Crossing #2 Lower Limit of DSB	39.608585	-79.967966

## Results

The Group 1 freshwater mussel surveys for the Project on Cobun Creek were conducted May 4, 2017. The survey areas are each located on Cobun Creek upstream of the US Highway 119 Bridge (Don Knotts Boulevard) over Cobun Creek in Morgantown, West Virginia. Crossing #1 is located approximately 300 m upstream of the bridge, while Crossing #2 is located approximately 500 m upstream of the bridge.



Figure 3. A view upstream, to the east, from the USB of Crossing #1 survey area.

Cobun Creek within the survey areas is a moderate-to-high gradient, high quality perennial stream with commercial development and forest cover as the dominant land uses along the riparian corridors. Crossing #1 has primarily commercial development (river-left descending) and forest cover (river-right descending) throughout the survey area. Crossing #2 has primarily forest cover (both left and right descending) in the ADI and USB, with commercial development being dominant in the DSB on river-left (descending). Cloud cover was approximately 60% with intermittent sunshine during the surveys. The stream channel within the DSB of Crossing #1 was primarily run and shallow pool with shallow-slow as the dominant flow regime. The ADI and USB of Crossing #1 was primarily riffle with shallow-fast as the dominant flow regime. The lower extent of the DSB at Crossing #2 was primarily shallow pool with shallow-slow as the dominant flow regime; however, the remaining survey area at Crossing #2 (upper DSB, ADI, and entire USB) was comprised primarily of high gradient riffle habitat with shallow-fast as the dominant flow regime present.

The river-left (descending) bank at Crossing #1 was supported by rip-rap through a majority of the survey area. The river-right (descending) bank at Crossing #1 was sloping and intact. The stream banks (left and right descending) within the Crossing #2 survey area were steep and intact with the exception of approximately 15 m of the river-right (descending) bank within the USB which was failing. Thick green attached algae were observed as the dominant aquatic vegetation within the Crossing #1 survey area covering approximately 60% of substrates; primarily boulder and in-stream rip-rap. Brown attached algae were observed as the dominant aquatic vegetation within the Crossing #2 survey area covering approximately 60% of the substrates; primarily boulder and cobble. Two culvert outlets, one of which was a large (approximately 24 inch) black corrugated pipe, were present within the Crossing #1 survey area. In addition, rip-rap was extensive along the river-left (descending) bank, some woody debris was observed within the channel, the stream was likely historically channelized for the adjacent US Highway 119, and an

engineered dam was located approximately 250 m upstream of the center of the Crossing #1 survey area. Riparian vegetation at Crossing #1 was predominantly shrubs and intermittent trees consisting primarily of Japanese knotweed (*Fallopia japonica*) and American sycamore (*Platanus occidentalis*). Riparian vegetation at Crossing #2 was predominantly trees and shrubs consisting primarily of Japanese knotweed (*Fallopia japonica*), American sycamore (*Platanus occidentalis*), and various maple species (*Acer* spp.). Local watershed erosion was categorized as moderate at both survey areas.

Turbidity at the time of the qualitative survey at Crossing #1 was 10.1 NTU, which converts to approximately 0.55 m. Turbidity at the time of the qualitative survey at Crossing #2 was 10.4 which also converts to approximately 0.55 m. These values meet the minimum 0.5 m visibility requirement for conducting freshwater mussel surveys set by the WVDNR (Clayton *et al.* 2016). At the time of the surveys, the USGS gauge on Deckers Creek (#03062500), approximately 1.5 miles north of the survey areas, near the mouth of Deckers Creek at the Monongahela River in Morgantown, West Virginia, displayed a declining hydrograph with discharge above the historic median for the season (Figure 4). Through personal communication and coordination with MUB, flows downstream of the Cobun Creek Reservoir #1 in the mussel survey areas were controlled prior to and during the mussel surveys for reduced flow and better visibility.

All field gathered water chemistry parameters were within normal ranges for mid-order, high quality perennial streams (Table 2). The surface water within each survey area was odorless, clear with slight turbidity in deeper pools, and without surface oils. The sediment/substrates in and around each survey area were free of odors and surface oils. The top three dominant substrate types observed within the Crossing #1 survey area were boulders, cobble, and gravel, respectively. These inorganic substrates comprised approximately 50%, 30%, and 20% of the survey area, respectively, with remaining substrates consisting of sand. Average depth ranged from 4" in the USB to 1.5' in the DSB (Table 3). The top three dominant substrate types observed within the Crossing #2 survey area were cobble, gravel, and boulder, respectively. These inorganic substrates comprised approximately 60%, 30%, and 10% of the survey area, respectively, with remaining substrates consisting of sand. Average depth ranged from 4" in the ADI and USB to 1.5' in the DSB (Table 4).

Relic *Corbicula fluminea* (Asiatic clam) shells were observed throughout the Crossing #1 survey area, with a few live individuals observed within the DSB. A few relic *C. fluminea* shells were observed within the Crossing #2 DSB survey area only. No live mussels were found within either survey area during the qualitative surveys. In addition, no fresh dead mussels or relic shells were found within either survey area or along the banks of Cobun Creek. No federally rare or endangered species of freshwater mussels were found. Further, no state "imperiled" or "vulnerable" freshwater mussel species were found. Habitats within the survey areas were suboptimal for freshwater mussel colonization, with boulder substrates in abundance within each survey area.

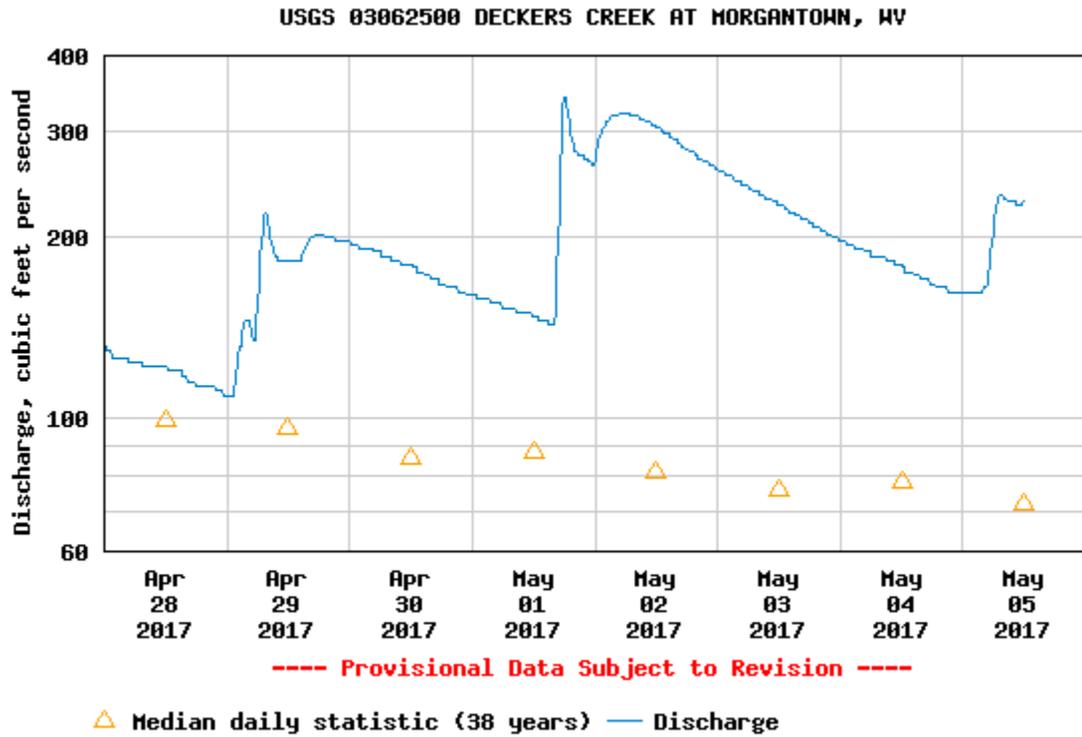


Figure 4. USGS hydrograph depicting discharge in cubic feet per second on Deckers Creek in Morgantown, West Virginia from April 28, 2017 to May 5, 2017. Mussel surveys for the Project on Cobun Creek were conducted on May 4, 2017.

Table 2. Field collected water chemistry parameters for Cobun Creek within the mussel survey areas using Oakton Handheld probes and a HACH Turbidimeter on May 4, 2017.

<b>Variable (Units)</b>	<b>Crossing #1</b>	<b>Crossing #2</b>
pH (S.U.)	6.95	6.75
Temp (°C)	14.8	14.8
DO (mg/L)	10.24	8.65
SpC (µS/cm)	151	146.4
TDS (mg/L)	79.07	76.74
Turbidity (NTU)	10.1	10.4

Table 3. Summary of survey effort, field observed average depths, and dominant substrate types by survey area at Crossing #1 on Cobun Creek in Monongalia County, West Virginia.

<b>Survey Area</b>	<b>Area (m<sup>2</sup>)</b>	<b>Total Search Effort (min)</b>	<b>Average Depth</b>	<b>Dominant / SubDominant Substrate Types (%)</b>
USB	25	10	4"	Cobble (50) / Gravel (30)
USB/SZ	25	10	4"	Cobble (50) / Gravel (30)
ADI	200	50	6"	Boulder (40) / Cobble (20)
DSB/SZ	50	15	1.5'	Boulder (40) / Cobble (30)
DSB	75	20	1.5'	Boulder (50) / Cobble (20)

Table 4. Summary of survey effort, field observed average depths, and dominant substrate types by survey area at Crossing #2 on Cobun Creek in Monongalia County, West Virginia.

<b>Survey Area</b>	<b>Area (m<sup>2</sup>)</b>	<b>Total Search Effort (min)</b>	<b>Average Depth</b>	<b>Dominant / SubDominant Substrate Types (%)</b>
USB	50	15	4"	Cobble (75) / Gravel (15)
USB/SZ	50	15	4"	Cobble (75) / Gravel (15)
ADI	200	55	4"	Cobble (60) / Gravel (30)
DSB/SZ	50	15	1.0'	Cobble (40) / Boulder (30)
DSB	75	20	1.5'	Cobble (40) / Boulder (30)

## **Discussion**

The two qualitative mussel surveys on Cobun Creek, conducted May 4, 2017, for the Cobun Creek Reservoir #2 Waterline Extension Project Group 1 crossings in Monongalia County, West Virginia yielded no living freshwater mussels, fresh dead mussels, or relic shells within the survey areas or along the banks of the survey areas. Substrates and flow regimes within the Project survey areas were suboptimal for freshwater mussel colonization due to the relative dominance of boulder and rip-rap substrates, especially within Crossing #1.

Based on the results of the qualitative mussel surveys, the proposed instream activities associated with the Cobun Creek Reservoir #2 Waterline Extension Project crossings will not have adverse effects on native freshwater mussel populations in Cobun Creek within Monongalia County, West Virginia.

### **Literature Cited**

Clayton, J.L., B. Douglas, P. Morrison, R. 2016. West Virginia Mussel Survey Protocols. West Virginia Division of Natural Resources, April 2016.



Figure 5. A view to the south of the DSB from the lower limit of the DSB at Crossing #1 on Cobun Creek, Monongalia County, West Virginia.



Figure 6. A view to the north of the lower half of the ADI at Crossing #1 on Cobun Creek, Monongalia County, West Virginia.



Figure 7. A view to the east of the upper half of the ADI and the USB at Crossing #1 on Cobun Creek, Monongalia County, West Virginia.



Figure 8. A photo of survey efforts within the ADI of Crossing #1 on Cobun Creek, Monongalia County, West Virginia.



Figure 9. A photo of typical substrates within the ADI and USB of Crossing #1 and the ADI, USB, and DSB of Crossing #2 on Cobun Creek, Monongalia County, West Virginia.



Figure 10. A view to the east of the entire DSB at Crossing #2 on Cobun Creek, Monongalia County, West Virginia.



Figure 11. A view to the east of the upstream half of the ADI at Crossing #2 on Cobun Creek, Monongalia County, West Virginia.



Figure 12. A view to the east of the upper half of the USB at Crossing #2 on Cobun Creek, Monongalia County, West Virginia.

**APPENDIX A. WVDNR Mussel Survey Protocol Forms for the Cobun Creek Reservoir #2  
Waterline Extension Crossings on Cobun Creek in Monongalia County, West Virginia.**

# Mussel Survey Scope of Work Summary Sheet 2016

Form Date: **4/29/2016**

Project Title: Cobun Creek Reservoir #2 Waterline Extension Crossing #1

Project Company: Morgantown Utility Board Date Submitted: 4/4/2017  
 Mussel Contractor: AllStar Ecology, LLC Date Revised: \_\_\_\_\_  
 Lead Malacologist: Sarah Veselka  
 Project Contractor: \_\_\_\_\_ (if Mussel Contractor sub-contracting)  
 Divers: if applicable \_\_\_\_\_ lead diver that can provide QA/QC survey effort  
 County: Monongalia Group (Circle One): 2 3 4  
 Stream: Cobun Creek Location Description: Cobun Creek immediately downstream of University Toyota and adjacent to US119

If Group 1 or 2, Receiving Stream: Monongahela River

**NOTE: Watershed Area < 10sq mi US of ADI, no survey needed, unless Group 2 (1/2)**

Project Type: Group 1 - All Projects (corresponds to Table 3, WV Mussel Survey Protocol)

ADI Length:	<u>40 m</u>	ADI Width:	<u>10 m</u>	Salvage area:	
US Buffer Length:	<u>10 m</u>	US Buffer Width:	<u>10 m</u>	US Buffer Length:	<u>5 m</u>
DS Buffer Length:	<u>25 m</u>	DS Buffer Width:	<u>10 m</u>	DS Buffer Length:	<u>10 m</u>
Lateral Buffer Length:	<u>NA</u>	Lateral Buffer Width:	<u>NA</u>	Lateral Buffer Width:	<u>NA</u>

Phase 1 Survey Method: Transect  Cells  Other  Timed Searches  
 # Transects/Length (m): \_\_\_\_\_ Cell Size (mxm): \_\_\_\_\_ Cell Search Effort (Min/m<sup>2</sup>)  
 \_\_\_\_\_ ADI: \_\_\_\_\_ 0.2 min/m<sup>2</sup> Minimum search effort for cells is 0.2min/m<sup>2</sup> if  
 \_\_\_\_\_ USB: \_\_\_\_\_ 0.2 min/m<sup>2</sup> no mussels are found or 0.5min/m<sup>2</sup> if any  
 \_\_\_\_\_ DSB: \_\_\_\_\_ 0.2 min/m<sup>2</sup> mussels are found  
 \_\_\_\_\_ Spacing Between Transects (M)

Coordinates (Decimal Degrees, NAD83)

Upstream End US Buffer:	Long.	<u>-79.968660</u>	Lat.	<u>39.608053</u>
Upstream End ADI:	Long.	<u>-79.968757</u>	Lat.	<u>39.607982</u>
ADI Center:	Long.	<u>-79.968953</u>	Lat.	<u>39.607947</u>
Downstream End ADI:	Long.	<u>-79.969094</u>	Lat.	<u>39.608090</u>
Downstream End DS Buffer:	Long.	<u>-79.969170</u>	Lat.	<u>39.608319</u>

Map: Show ADI, USB, DSB and survey layout

Did you provide? Justification must be provided in scope of work

Addressed Alternative Methods  Yes Provide Description in Scope  
 Addressed Alternative Sites  Yes Provide Description in Scope

Phase 2 Methods (Group 2):

# Quadrats excavated \_\_\_\_\_ Be sure to define area on Map/Diagram  
 Salvage area only

Request for Relocation:  Yes  No

Method:

(check one)  Cell Size (mxm): 10 m x 10 m Cell Search Effort (Min/m<sup>2</sup>) 1.0 min/m<sup>2</sup> (minimum)  
 Moving Transect:  
 Other: \_\_\_\_\_  
 Multiple passes are to be made through the area until less than 5 % of the number collected on the original pass are recovered on the final pass or less

# Mussel Survey Scope of Work Summary Sheet 2016

Form Date: **4/29/2016**

Project Title: Cobun Creek Reservoir #2 Waterline Extension Crossing #2

Project Company: Morgantown Utility Board Date Submitted: 4/4/2017  
 Mussel Contractor: AllStar Ecology, LLC Date Revised: \_\_\_\_\_  
 Lead Malacologist: Sarah Veselka  
 Project Contractor: \_\_\_\_\_ (if Mussel Contractor sub-contracting)  
 Divers: if applicable \_\_\_\_\_ lead diver that can provide QA/QC survey effort  
 County: Monongalia Group (Circle One): **1** 2 3 4  
 Stream: Cobun Creek Location Description: Cobun Creek immediately downstream of the Cobun Creek Reservoir in Morgantown

If Group 1 or 2, Receiving Stream: Monongahela River

**NOTE: Watershed Area < 10sq mi US of ADI, no survey needed, unless Group 2 (1/2)**

Project Type: Group 1 - All Projects (corresponds to Table 3, WV Mussel Survey Protocol)

ADI Length: <u>40 m</u>	ADI Width: <u>10 m</u>	Salvage area: _____
US Buffer Length: <u>10 m</u>	US Buffer Width: <u>10 m</u>	US Buffer Length: <u>5 m</u>
DS Buffer Length: <u>25 m</u>	DS Buffer Width: <u>10 m</u>	DS Buffer Length: <u>10 m</u>
Lateral Buffer Length: <u>NA</u>	Lateral Buffer Width: <u>NA</u>	Lateral Buffer Width: <u>NA</u>

Phase 1 Survey Method: Transect  Cells  Other  Timed Searches  
 # Transects/Length (m): \_\_\_\_\_ Cell Size (mxm): \_\_\_\_\_ Cell Search Effort (Min/m<sup>2</sup>)  
 \_\_\_\_\_ ADI: \_\_\_\_\_ 0.2 min/m<sup>2</sup> Minimum search effort for cells is 0.2min/m<sup>2</sup> if  
 \_\_\_\_\_ USB: \_\_\_\_\_ 0.2 min/m<sup>2</sup> no mussels are found or 0.5min/m<sup>2</sup> if any  
 \_\_\_\_\_ DSB: \_\_\_\_\_ 0.2 min/m<sup>2</sup> mussels are found  
 \_\_\_\_\_ Spacing Between Transects (M)

Coordinates (Decimal Degrees, NAD83)

Upstream End US Buffer:	Long. <u>-79.967122</u>	Lat. <u>39.608778</u>
Upstream End ADI:	Long. <u>-79.967231</u>	Lat. <u>39.608801</u>
ADI Center:	Long. <u>-79.967364</u>	Lat. <u>39.608747</u>
Downstream End ADI:	Long. <u>-79.967720</u>	Lat. <u>39.608715</u>
Downstream End DS Buffer:	Long. <u>-79.967966</u>	Lat. <u>39.608585</u>

Map: Show ADI, USB, DSB and survey layout

Did you provide? Justification must be provided in scope of work

Addressed Alternative Methods  Yes Provide Description in Scope  
 Addressed Alternative Sites  Yes Provide Description in Scope

Phase 2 Methods (Group 2):

# Quadrats excavated \_\_\_\_\_ Be sure to define area on Map/Diagram  
 Salvage area only

Request for Relocation:  Yes  No

Method:

(check one)  Cell Size (mxm): 10 m x 10 m Cell Search Effort (Min/m<sup>2</sup>) 1.0 min/m<sup>2</sup> (minimum)  
 Moving Transect:  
 Other: \_\_\_\_\_  
 Multiple passes are to be made through the area until less than 5 % of the number collected on the original pass are recovered on the final pass or less



**APPENDIX B. WVDNR Current Stream and Weather Conditions forms completed on  
May 4, 2017 for the Cobun Creek Reservoir #2 Waterline Extension Crossings on Cobun  
Creek in Monongalia County, West Virginia.**

### Current Stream and Weather Conditions

<b>Section A</b>	
1. Collector Name:	Sarah Venka
3. Stream/Site Name:	Coban Creek crossing #1
4. LLID (dnr use):	
5. Date (MM/DD/YYYY):	5/4/2017
6. Project:	Coban Creek Reservoir #2 Waterline Extension
9. Permittee ID:	2017.086

<b>Section B</b>			
Weather Conditions	Current Conditions	Past 24 Hours	Past Week
	<b>Precipitation</b> <input type="checkbox"/> Moderate or heavy rain shower <input type="checkbox"/> Light rain shower <input type="checkbox"/> Light rain <input type="checkbox"/> Moderate rain <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> None <b>Sky Conditions</b> 0 25 50 75 100% cloud cover ≈ 15 Air temp (°C)	<b>Precipitation</b> <input type="checkbox"/> Moderate or heavy rain shower <input type="checkbox"/> Light rain shower <input checked="" type="checkbox"/> Light rain <input type="checkbox"/> Moderate rain <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> None <b>Sky Conditions</b> 0 25 50 75 100% cloud cover ≈ 15 Air temp (°C)	Has there been a heavy rain in the last 7 days? <u>Yes</u> /No

<b>Section C</b>			
Stream Characterization	Human Influence	Pipes (inlet/outlet) - <u>upstream</u>	Other
	<input checked="" type="checkbox"/> Engineered Dam <input type="checkbox"/> Pipeline crossing <input type="checkbox"/> Ford <input type="checkbox"/> Pipeline (parallel to stream) <b>In Stream Cover</b> <input type="checkbox"/> Debris Dam <input checked="" type="checkbox"/> Woody debris	<input checked="" type="checkbox"/> Pipes (inlet/outlet) - <u>currents</u> <input checked="" type="checkbox"/> Channelized <input type="checkbox"/> Bridge (pillars in stream) <input type="checkbox"/> Bridge (no pillars in stream)	<input type="checkbox"/> Trash <input type="checkbox"/> Island <input type="checkbox"/> Other <input checked="" type="checkbox"/> Wall/Dike/Revetment/Riprap <input type="checkbox"/> Beaver Dam

<b>Section D</b>			
Aquatic Vegetation	Indicate the dominant types and record the dominant species present.		
	<input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent	<input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating	<input type="checkbox"/> Floating algae <input checked="" type="checkbox"/> Attached algae <input type="checkbox"/> None <input type="checkbox"/> Moss
Dominant species <u>green attached algae</u> Percent of the reach with aquatic vegetation <u>60</u> % (in terms of area)			

<b>Section E</b>										
Watershed Features	Human Influence/Watershed Features (within survey reach)				P=>10m from shore, C=within 10m, B=on the bank, D=dominant land use (check no more than two)					
		P	C	B	D		P	C	B	D
Wall/Rip rap				X		Railroad (Active)				
Railroad (rails to trails)						Railroad (Inactive)				
Buildings		X				Landfill/trash				
Pavement		X	X			Park/Lawn				
Road		X	X			Row Crops				
Pasture						Feed lots				
Logging operations						Mining activity				

Watershed Features (Cont.)		P	C	B	D		P	C	B	D
	Forest				<input checked="" type="checkbox"/>	Commercial/Industrial				<input checked="" type="checkbox"/>
	Old field					Hay field				
	Residential					Other				

**Local Watershed Erosion (pertains to land use, not failing stream banks)**

None  
 Moderate  
 Heavy

**Section F**

Water Quality	Temperature (°C) <u>14.8</u>	<b>Water Odors</b>	
	Conductivity uS/cm <u>157</u>	<input checked="" type="checkbox"/> Normal/None	<input type="checkbox"/> Sewage
TDS	Dissolved Oxygen mg/L <u>10.24</u>	<input type="checkbox"/> Petroleum	<input type="checkbox"/> Chemical
	pH <u>6.95</u>	<input type="checkbox"/> Fishy	<input type="checkbox"/> Other
	Turbidity (mg/L) <u>10.1 NTU</u>	<b>Turbidity (visual)</b>	
	Secchi depth (m-mm) <u>79.07 ppm</u>	<input checked="" type="checkbox"/> Clear	<input checked="" type="checkbox"/> Slightly turbid <u>deep pools</u>
	Meters used: <u>Oakton handheld</u>	<input type="checkbox"/> Opaque	<input type="checkbox"/> Stained <input type="checkbox"/> Other
	Hach Kit used <u>Yes/No</u>	<b>Water Surface Oils</b>	
	Water Sample Collected for Lab analysis <u>Yes/No</u>	<input type="checkbox"/> Slick	<input type="checkbox"/> Sheen <input checked="" type="checkbox"/> None
	Flow at nearest USGS gauging station (cfs) <u>~175 cfs</u>	<input type="checkbox"/> Globs	<input type="checkbox"/> Flecks <input type="checkbox"/> Other
	Gauging station: <u>Deekers Creek @ Morgantown, WV</u>		

**Section G**

Sediment/Substrate	<b>Odors</b>		<b>Deposits</b>	
	<input checked="" type="checkbox"/> Normal	<input type="checkbox"/> None	<input type="checkbox"/> Sewage	<input type="checkbox"/> Sludge
	<input type="checkbox"/> Petroleum	<input type="checkbox"/> Chemical	<input checked="" type="checkbox"/> Relict Shells	<input type="checkbox"/> Leaf Litter
	<input type="checkbox"/> Anaerobic (methane)	<input type="checkbox"/> Other	<input type="checkbox"/> Paper/fiber	<input checked="" type="checkbox"/> Sand
	<b>Substrate Type (rank top three, 1 being dominant)</b>			
	<u>1</u> Bedrock	<u>1</u> Boulder	<u>2</u> Cobble	<u>3</u> Gravel
				Sand
				Silt/clay

**Section H**

Streambank and Riparian Zone Characterization	<b>Canopy Cover</b>		<b>Stream Bank Failure Present?</b> (within survey reach only)	
	<input checked="" type="checkbox"/> Mostly Open	<input type="checkbox"/> Shaded	Right Descending Bank Yes/No <u>No</u>	Left Descending Bank Yes/No <u>No</u>
	<input type="checkbox"/> Mostly Shaded	<input type="checkbox"/> None		
	<b>Riparian Zone (10 meters) fully intact</b>			
	Right Descending Bank Yes/No <u>No</u>	Left Descending Bank Yes/No <u>No</u>		

Notes: live and relic corbicula present throughout survey area

rip rap extensure on river-left descending

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

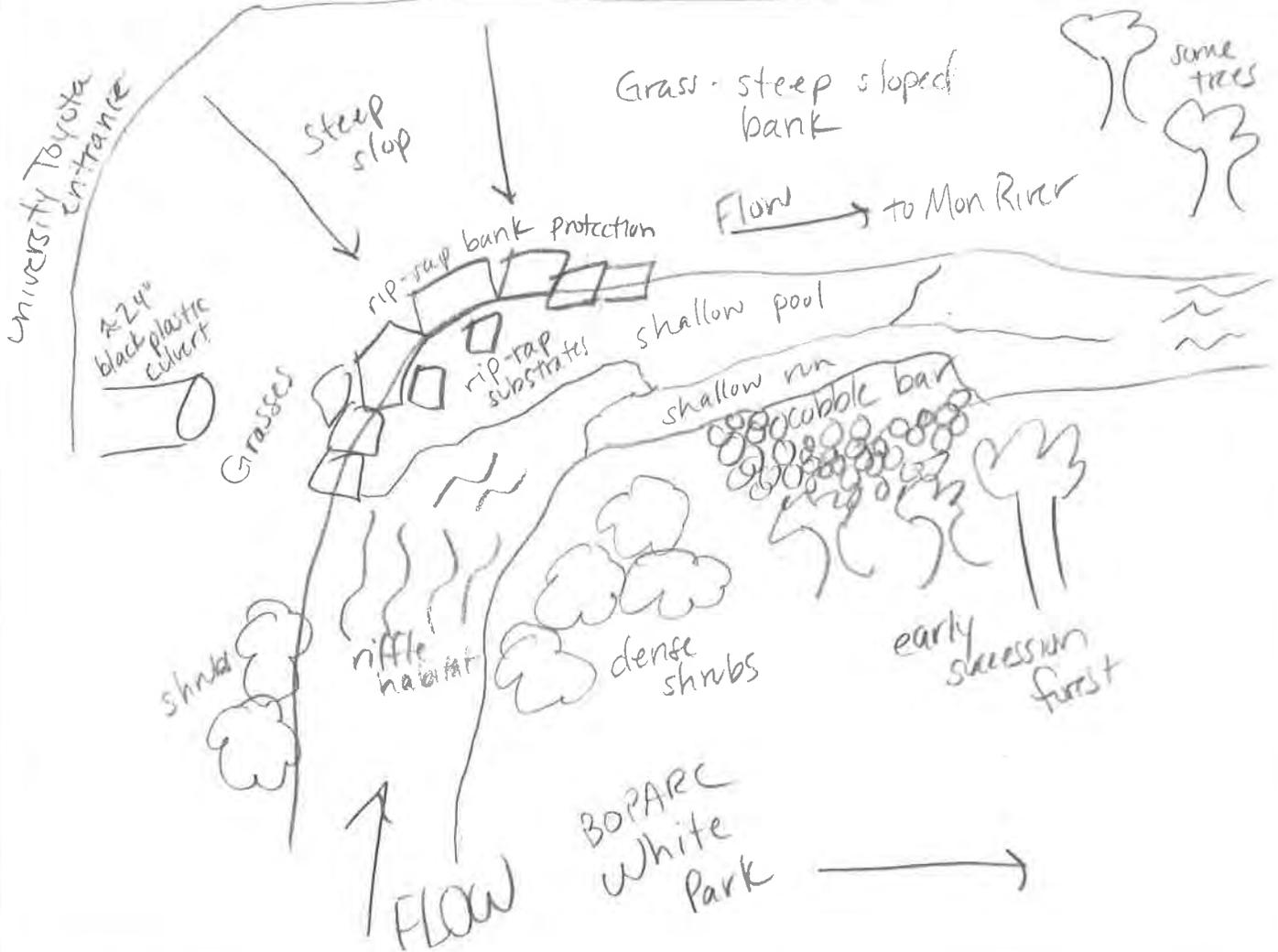
# Mussel Survey Data Sheet

## Section F: Sketch of Survey Reach

Crossing # 1



US Highway 119



### NOTES




Watershed Features (Cont.)		P	C	B	D		P	C	B	D
	Forest				<input checked="" type="checkbox"/>	Commercial/Industrial				<input checked="" type="checkbox"/>
	Old field					Hay field				
	Residential					Other				
<b>Local Watershed Erosion (pertains to land use, not failing stream banks)</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy										

<b>Section F</b>	
Water Quality	Temperature (°C) <u>14.8</u> Conductivity uS/cm <u>146.4</u> Dissolved Oxygen mg/L <u>8.65</u> pH <u>6.75</u> Turbidity (mg/L) <u>10.4 NTU</u> Secchi depth (m) <u>76.74 ppm</u> Meters used: <u>Oakton handheld</u>
	<b>Water Odors</b> <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ <b>Turbidity (visual)</b> <u>Deep pools</u> <input checked="" type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ <b>Water Surface Oils</b> <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input checked="" type="checkbox"/> None <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> Other _____ Hach Kit used <u>Yes/No</u> Water Sample Collected for Lab analysis <u>Yes/No</u> Flow at nearest USGS gauging station (cfs) <u>~175 cfs</u> Gauging station: <u>Decker Creek @ Margaret, W</u>

<b>Section G</b>	
Sediment/ Substrate	<b>Odors</b> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> None <input type="checkbox"/> Sewage <input type="checkbox"/> Sludge <input type="checkbox"/> Leaf Litter <input checked="" type="checkbox"/> Sand <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input checked="" type="checkbox"/> Relict Shells <input type="checkbox"/> Other _____ <input type="checkbox"/> Anaerobic (methane) <input type="checkbox"/> Paper/fiber <input type="checkbox"/> Other _____ <input type="checkbox"/> Other _____
	<b>Substrate Type</b> (rank top three, 1 being dominant) Bedrock <u>3</u> Boulder <u>1</u> Cobble <u>2</u> Gravel    Sand    Silt/clay

<b>Section H</b>	
Streambank and Riparian Zone Characterization	<b>Canopy Cover</b> <input type="checkbox"/> Mostly Open <input type="checkbox"/> Shaded <input checked="" type="checkbox"/> Mostly Shaded <input type="checkbox"/> None
	<b>Stream Bank Failure Present?</b> (within survey reach only) Right Descending Bank <u>Yes/No</u> Left Descending Bank <u>Yes/No</u> <b>Riparian Zone (10 meters) fully intact</b> Right Descending Bank <u>Yes/No</u> Left Descending Bank <u>Yes/No</u>

Notes: corbicula relic shells present in DSB only  
impoundment upstream of survey area

---



---



---



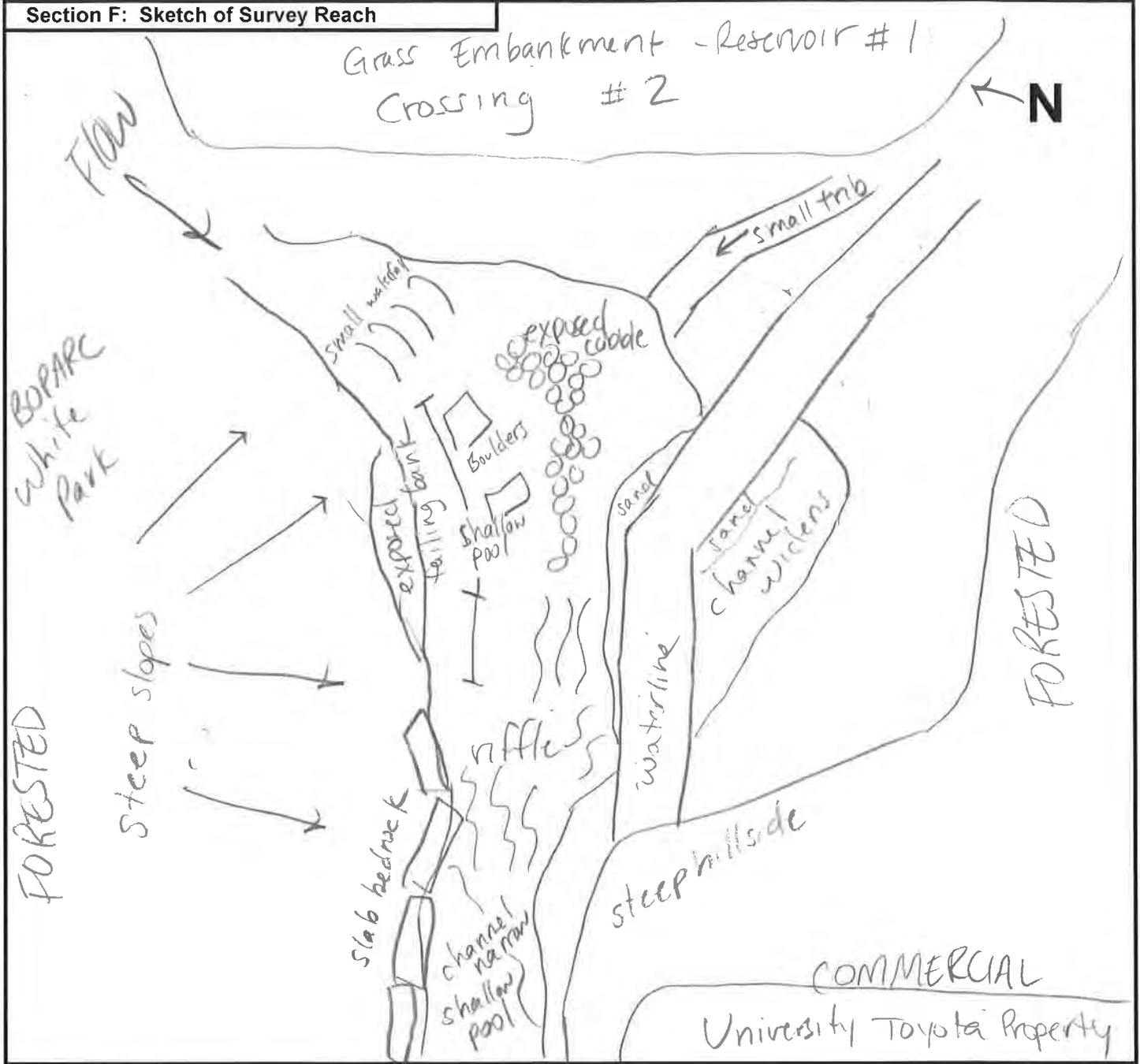
---



---

Mussel Survey Data Sheet

Section F: Sketch of Survey Reach



NOTES




**APPENDIX C. WVDNR Mussel Survey Data Sheet forms completed on May 4, 2017 for  
the Cobun Creek Reservoir #2 Waterline Extension Crossings on Cobun Creek in  
Monongalia County, West Virginia.**







**ALLSTAR ECOLOGY**  
Natural Resource Specialists

AllStar Ecology, LLC.

---

**APPENDIX D. WVDNR Issued Addendum to Scientific Collection Permit No. 2017-086 for the Mussel Surveys on Cobun Creek in Monongalia County, West Virginia.**



**DIVISION OF NATURAL RESOURCES**  
**Wildlife Resources Section**  
**Operations Center**  
**P.O. Box 67**  
**Elkins, West Virginia 26241-3235**  
**Telephone (304) 637-0245**  
**Fax (304) 637-0250**

**Jim Justice**  
*Governor*

**Stephen S. McDaniel**  
*Director*

**ADDENDUM TO SCIENTIFIC COLLECTING PERMIT NO. 2017.086**

Permittee: Sarah Veselka  
 Address: AllStar Ecology, LLC  
 1582 Meadowdale Road  
 Fairmont, WV 26554

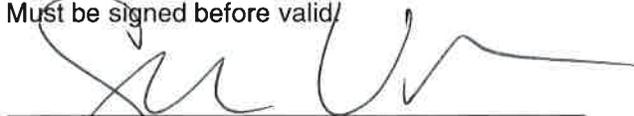
Expiration Date: October 1, 2017

THE FOLLOWING PROVISIONS ARE ADDED TO THIS PERMIT: Mussel surveys and relocations are permitted on Cobun Creek, Monongalia County (Morgantown Utility Board); and on Whetstone Creek, Marshall County (XCL Midstream Operating).

Mussel surveys are permitted Fish Creek, Marshall County. Written concurrence from the US Fish and Wildlife Service is required prior to survey (XCL Midstream Operating).

**THIS ADDENDUM MUST BE ATTACHED TO ORIGINAL PERMIT.**

Must be signed before valid/

  
 \_\_\_\_\_  
 Signature of permittee

  
 \_\_\_\_\_  
 Scientific Collecting Permit Coordinator

Date of issue 4/26/2017

**APPENDIX D**  
**CONCEPTUAL SITE MODEL (CSM)**

