

Memorandum

To	Michael Liberati, DuPont CRG	Page	1 of 4
CC	Nancy Grosso, DuPont CRG Ceil Mancini, AECOM		
Subject	Fall 2018 Short-term Monitoring Field Summary Memo Former DuPont Waynesboro Site, Area of Concern 4		
From	Andrew Miano, AECOM Joshua Collins, AECOM		
Date	January 24, 2019		

This technical memorandum summarizes the Fall 2018 Short-term Monitoring (STM) sampling effort for Area of Concern (AOC) 4 of the former DuPont Waynesboro site. Data collected as part of the Spring 2018 STM are also included for comparison purposes. STM data will be used to evaluate the effectiveness of the remedy over a short, two to ten year period, within a limited spatial extent, adjacent to a particular Bank Management Area (BMA). This sampling effort completes the second year of post-remediation monitoring at the Constitution Park BMA and the first year of post-remediation sampling at the City Shops BMA. Additional attachments to this memorandum include:

- Table 1 – Plan Summary
- Tables 2-7 – Data Summaries
- Figure 1 – Station Overview Map
- Figure 2 – Sediment Grain Size Distribution

APPROACH

The Fall 2018 STM field effort was conducted in accordance with the Final AOC 4 Short-term Monitoring Plan (URS Corporation, 2015) and modifications (AECOM, 2015 and 2016). Table 1 provides an overview of the monitoring plan design, including performance objectives, metrics, success criteria, and adaptive management outcomes; additional details are provided in the Monitoring Plan and associated appendices (URS Corporation, 2015).

The Fall 2018 STM program included assessment of baseline, pre-remediation and post remediation conditions as identified below and shown in Figure 1:

Post Remediation BMAs

- Constitution Park (STM-01)
- City Shops (STM-07)

Baseline Pre-remediation BMAs

- Shiloh Baptist Church (STM-03)
- North Park (STM-05)

Active remediation at the Allied Ready Mix BMA (STM-08) precluded sampling at this station. Post-remediation monitoring will begin at this station in the Spring of 2019.

SCOPE

The following activities were conducted as part of the Fall 2018 STM program (Table 1):

- Bulk sediment, pore water, and epilithic periphyton samples were collected for Total Mercury (THg) and Methylmercury (MeHg) analysis at the four BMAs described above during the week of October 8th;
- Riparian vegetation plots were monitored; aquatic and riparian habitats were also assessed using a modified Rapid Bio-assessment protocol (RBP; Barbour et al., 1999);
- Seeded and caged *Corbicula fluminea* (Asiatic clam, *Corbicula*) were deployed the week of September 3rd and retrieved for THg and MeHg analysis the week of October 8th, after a 5-week exposure period;
- Benthic community samples were collected at RRM 0.5, 1.0, 1.5, and 2.0 the week of October 22nd; and
- Areas of improvised river access and large woody debris (LWD) features observed at STM-01, STM-03, STM-05, and STM-07 during the Fall 2018 field activities were documented (Figure 1).

DATA SUMMARY

This section provides a brief summary of data collected during the Spring and Fall STM events. Mercury concentrations differed spatially and temporally among the media sampled, and will be discussed in more detail in the 2018 Annual Short-term Monitoring Report that is currently in preparation and will be provided to VDEQ in February, 2019. Some of the more readily observable relationships are summarized in the bullets below; complete data summary tables are presented by media type in Tables 2 through 6.

Sediment

- Sediment concentrations for IHg were generally similar between Spring and Fall for the majority of samples collected, while MeHg concentrations were slightly lower in the fall compared to the spring (Table 2); and
- Near-bank sediments at non-remediated BMAs continue to be influenced by elevated THg concentrations in adjacent bank soil.

Filtered Pore Water

- Filtered pore water concentrations for IHg and MeHg were generally similar between Spring and Fall seasons for the majority of samples collected at remediated BMAs (STM-01 and STM-07) and the non-remediated Shiloh Baptist Church BMA (STM-03); MeHg and IHg concentrations in filtered pore water at the North Park BMA (STM-05) were generally higher in the Fall compared to the Spring; and
- Filtered pore water concentrations for IHg and MeHg at STM-05 were generally higher compared to concentrations at all other stations sampled (Table 3).

Periphyton

- Concentrations of IHg were generally higher in the Fall than the Spring at each BMA, while concentrations of MeHg were similar between both seasons (Table 4).

Transplanted Corbicula

- All three replicate samples of near-bank seeded clams were lost during high flows at the Shiloh Baptist Church (STM-03), and City Shops (STM-07) BMAs; only one sample could be retrieved at the North Park BMA (STM-05);

- IHg and MeHg concentrations in transplanted *Corbicula* were generally similar among samples collected at all four STM stations in 2018, being higher in near -bank samples (Table 5); and
- IHg and MeHg tissue concentrations were generally higher in seeded compared to caged, transplanted *Corbicula* (Table 5).

Riparian Vegetation

- Riparian vegetation species in all strata, at all four STM stations monitored were similar in the Spring and Fall; and
- Invasive plant species including Japanese Knotweed (*Fallopia japonica*) and multiflora rose (*Rosa multiflora*) were present at all STM stations with the exception of STM-05 (Table 6).
- Japanese knotweed cover at the Constitution Park BMA has been reduced to 15-25% cover compared to 35-40% during the Spring assessment. Herbicide applications will continue in 2019 with the goal of further reducing the knotweed population to allow planting of native vegetation.

Ancillary Habitat/Public Access Assessments:

- Average stream canopy cover was generally limited at all stations, ranging from a mean of 16% to 46% (Table 7);
- Sediment grain size distribution for most stations was similar, and consisted primarily of sand/fines, coarse gravel, and small to medium cobble (Figure 2);
- Fall benthic community samples are being processed; once available, data will be assessed in the Annual 2018 STM Report; improvised access and LWD features were stable and consistent with 2017 observations; and
- A piece of installed LWD was dislodged and shifted downstream and is currently parallel with another piece of installed LWD at the City Shops BMA. Currently, two pieces of installed LWD have been displaced from this location; they will continue to be monitored and corrective actions will be implemented if warranted during low water conditions later this year.

PATH FORWARD

The 2018 Annual STM Report is currently in development; it will provide a data evaluation and summary of findings of the 2018 STM program. An assessment of the effectiveness of the completed Constitution Park and City Shops interim measures in the context of the established success criteria will also be provided, as well as a comparison with the framework of the Pilot Bank Study.

Consistent with the adaptive management framework for AOC 4, the elements of the STM may be revised based on documented progress towards the achievement of success criteria, contingency actions, and emerging decision analysis options (URS, 2015). More specifically, monitoring data that do not contribute to remedial decision-making may be reduced or eliminated from the STM program with the concurrence of the VDEQ.

REFERENCES

- AECOM. 2016. Memorandum to DuPont – AOC 4 Short-term Monitoring 2016 Monitoring Locations. DuPont Former Waynesboro Site, Area of Concern 4. Dated May 9, 2016.
- AECOM. 2015. Memorandum to DuPont – Short-term Monitoring Plan – Revised Habitat Metrics. DuPont Former Waynesboro Site, Area of Concern 4.
- Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. USEPA 841-B-99-002. USEPA Office of Water, Washington, D.C.
- USACE. 2007. Norfolk District and Virginia Department of Environmental Quality (VADEQ). Unified Stream Methodology for use in Virginia. January 2007.
- URS Corporation. 2015. Final AOC 4 Short-term Monitoring Plan - Relative River Mile 0-2 of the South River, Virginia. DuPont Former Waynesboro Site, Area of Concern 4.

Tables

Table 1
Short-term Monitoring Plan Summary
2018 Short-term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4

Short-Term Remedial Action Objectives				Monitoring Plan Designs			Adaptive Management Outcomes	
General Objective	Performance Objective	Measurable Metric	Preliminary Success Criteria	General Station Locations	Monitoring Frequency (post construction)	Analytical Parameters	Contingency Actions	Decision Analysis
Reduce Mercury Transport and Exposure	Increase in Bank Stability	Topography	Maintenance of Post-Construction Bank Condition	BMA Evaluated Holistically	Twice Annually for First 3 Years; Post-storm	Continuous Bank Angle / Grade	Structural and/or Vegetative Stabilization	Refine Effectiveness Estimates
		Vegetation	>80% Cover; <10% Invasives	Vegetation Plots at Each BMA	Twice Annually for First 3 Years; Post-storm	Cover and Species Composition	Additional Vegetation Enhancement	Refine Effectiveness Estimates
		Design and Implementation	Landowner Approvals and Permits	BMA Properties	NA	NA	NA	Refine Implementation Estimates
	Reduce Mercury Loading from Bank	Surface Sediment	>75% Mercury Concentration Reduction	Transects Spaced ~100-200' at each BMA	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
		Pore Water	>75% Mercury Concentration Reduction	Transects Spaced ~100-200' at each BMA	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
		Periphyton	>75% Mercury Concentration Reduction	Downstream of Representative BMAs (Near-shore)	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
		Asiatic Clam Sampling	>75% Mercury Concentration Reduction	Downstream of Representative BMAs (Near-shore)	Twice Annually for First 3 Years	IHg and MeHg Concentrations	NA	Refine Effectiveness Estimates
	Reduce In-Channel Mercury Exposure	Periphyton	>50% Mercury Concentration Reduction	Downstream of Representative BMAs (Channel)	Annually for First 10 Years	IHg and MeHg Concentrations	NA	Refine CSM
		Asiatic Clam Sampling	>50% Mercury Concentration Reduction	Downstream of Representative BMAs (Channel)	Annually for First 10 Years	IHg and MeHg Concentrations	NA	Refine CSM
Maintain or Improve Riparian and Aquatic Habitat	Improve Bank Vegetation	Vegetation	>80% Cover; <10% Invasives	Vegetation Plots at Each BMA	Twice Annually for First 3 Years	Cover and Species Composition	Additional Vegetation Enhancement	Refine Effectiveness Estimates
	Improve In-Stream Habitat	Rapid Bioassessment Protocols	Visual Stream Classification	Each BMA Assessed Independently	Quarterly for the First Year and Semi Annually (Q1/Q3) for years 2-10 ¹	Rapid Bioassessment Protocol Scores	NA	Refine Effectiveness Estimates
	Maintain Detrital Input/Stream Shading	Canopy Cover	Achievement of Baseline Canopy Coverage	Transects Spaced ~100-200' at each BMA	Annually for First 3 Years	Percent Canopy Coverage (Spherical Densiometer)	Additional Vegetation Enhancement	Refine Effectiveness Estimates
	Maintain Stream Substrate Condition	Wolman Pebble Counts	Maintenance / Improvement of Baseline Conditions	Transects Spaced ~100-200' at each BMA	Annually for First 3 Years	Particle Size Analysis	Structural and/or Vegetative Stabilization	Refine Effectiveness Estimates
	Maintain In-stream Habitat Features	# of In-stream Habitat Features	Maintenance / Improvement of Baseline Conditions	Each BMA Assessed Independently	Twice Annually for First 3 Years	# of In-stream Habitat Features	Structural Stabilization	Refine Effectiveness Estimates
	Habitat Function and Ecological Value	EPW & USM	Maintenance / Improvement of Baseline Conditions	Each BMA Assessed Independently	Annually for first 3 Years	USM Methodology & EPW Non-tidal Stream - Fish FCI	Structural and/or Vegetative Stabilization	Refine Effectiveness Estimates
Maintain or Improve Benthic Community	Maintenance of Benthic Community	Benthic Invertebrate Metrics	Maintenance / Improvement of Baseline Conditions	Four Locations Within the Interim Measures Area (RRM 0.5, RRM 1.0, RRM 1.5, RRM 2.0)	Twice Annually for First 3 Years	300 Organism Sub-count	NA	Refine Effectiveness Estimates
River Access / Aesthetics	Provide Stable River Access Points	Stable Access Points	Maintenance / Improvement of Baseline Conditions	Each BMA Assessed Independently	Twice Annually for First 3 Years	# of Stable and Improvised Access Points	Structural Stabilization	Refine Effectiveness Estimates

Notes:

EPW, Evaluation for Planned Wetlands

FCI, Functional Capacity Index

USM, Unified Stream Methodology

RRM, Relative River Mile

NA, Not applicable

IHg, Inorganic mercury

MeHg, Methylmercury

CSM, Conceptual Site Model

BMA, Bank Management Area

Ancillary habitat/ public access metrics

1, baseline (pre-construction) monitoring will occur semi annually

Table 2
Bulk Sediment Data Summary
2018 Short-term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4

Sample Replicate ¹	IHg (mg/kg, dw)		MeHg (µg/kg, dw)	
	June	October	June	October
Constitution Park (STM-01)				
A	0.04	0.14	0.74	1.16
B	0.19	0.04	1.09	0.12
C	0.33	0.25	1.77	0.64
D	1.81	1.80	5.17	4.76
E	0.36	0.12	0.73	1.13
Shiloh Baptist Church (STM-03)				
A	0.21	0.47	2.14	1.54
B	1.21	0.82	7.59	1.40
C	11.32	12.28	11.71	13.93
D	1.19	1.45	2.26	1.08
E	16.59	7.30	7.54	6.10
F	25.86	2.34	26.65	8.83
G	10.58	1.44	14.73	3.46
H	43.33	6.82	46.69	3.71
I	4.95	4.20	9.38	5.54
J	2.72	11.03	9.02	11.52
North Park (STM-05)				
A	6.88	7.86	8.75	7.99
B	1.66	27.20	3.22	11.00
C	24.71	17.57	31.91	11.39
D	2.11	5.68	5.88	12.07
E	19.25	94.40	79.34	33.73
F	78.11	141.56	57.48	40.26
G	155.64	186.67	146.77	90.15
H	19.69	46.63	13.78	18.67
I	55.93	6.39	27.25	4.82
J	89.36	26.99	31.37	7.55
City Shops (STM-07)				
A	2.63	59.02	2.57	15.77
B	13.36	9.51	19.92	7.07
C	10.81	10.17	8.40	2.72
D	27.18	16.35	40.83	8.87
E	3.87	1.88	10.42	7.60
F	1.36	3.88	1.84	16.05
G	2.03	0.68	6.70	2.34
H	2.11	1.00	13.08	3.64
I	1.46	0.69	16.57	2.45
J	1.30	1.31	4.17	4.29
K	0.35	1.30	1.26	5.62

Notes:

1, Per STM station, sample replicates increase alphabetically with distance downstream

IHg, Inorganic mercury

MeHg, Methylmercury

dw, Dry weight

--, Not sampled

Table 3
 Filtered Pore Water Data Summary
 2018 Short-term Monitoring Annual Field Summary Memo
 Former DuPont Waynesboro Site, Area of Concern 4

Sample Replicate ¹	FIHg (ng/L)		FMeHg (ng/L)	
	June	October	June	October
<i>Constitution Park (STM-01)</i>				
A	3.41	1.30	2.88	0.59
B	36.17	9.04	0.15	9.03
C	12.51	3.34	19.63	1.31
D	14.74	18.80	1.42	1.93
E	10.57	3.54	0.11	2.09
<i>Shiloh Baptist Church (STM-03)</i>				
A	2.52	2.61	0.82	0.55
B	2.53	2.10	0.51	0.17
C	9.58	3.94	4.25	2.01
D	5.97	5.39	0.83	0.54
E	5.62	6.10	0.28	0.24
F	24.85	10.07	2.84	0.58
G	9.40	1.29	1.49	0.18
H	35.33	21.39	1.41	0.63
I	13.31	18.31	5.84	0.35
J	4.65	58.08	2.61	0.34
<i>North Park (STM-05)</i>				
A	6.71	166.74	0.47	104.18
B	6.06	1.88	2.03	0.49
C	7.24	7.68	1.12	1.64
D	2.49	3.12	0.32	0.36
E	10.06	36.14	1.64	16.97
F	27.86	43.43	3.95	8.85
G	32.84	12.47	1.08	0.48
H	4.49	13.97	0.45	19.34
I	29.06	62.61	2.92	0.15
J	21.10	42.18	0.51	9.48
<i>City Shops (STM-07)</i>				
A	7.33	37.80	0.28	0.87
B	6.81	4.58	2.04	0.35
C	4.72	10.85	0.04	2.19
D	3.81	2.20	0.09	<0.02
E	14.51	7.15	1.45	19.09
F	11.73	5.40	4.58	8.69
G	24.15	12.77	1.79	4.93
H	10.35	6.46	2.39	2.44
I	13.77	3.01	19.58	5.34
J	1.16	1.50	0.66	1.91
K	61.28	3.87	10.44	7.10

Notes:

- 1, Per STM station, sample replicates increase alphabetically with distance downstream
- FIHg, Inorganic mercury (filtered fraction)
- FMeHg, Methylmercury (filtered fraction)

Table 4
 Periphyton Data Summary
 2018 Short-term Monitoring Annual Field Summary Memo
 Former DuPont Waynesboro Site, Area of Concern 4

Sample Replicate	Sample Environment	IHg (µg/kg, ww)		MeHg (µg/kg, ww)	
		June	October	June	October
Constitution Park (STM-01)					
A	Mid-Channel	126.50	—	2.20	—
B		85.07	—	2.31	—
C		514.23	—	2.16	—
A	Near Bank	90.65	285.83	1.41	2.25
B		94.03	141.13	1.25	1.73
C		92.42	212.63	1.30	1.66
Shiloh Baptist Church (STM-03)					
A	Mid-Channel	42.56	—	1.31	—
B		24.79	—	1.11	—
C		40.26	—	1.55	—
A	Near Bank	190.54	614.24	1.94	1.63
B		299.98	1146.27	1.82	1.77
C		337.87	480.35	3.13	1.74
North Park (STM-05)					
A	Mid-Channel	65.31	—	1.20	—
B		67.69	—	0.88	—
C		83.72	—	1.07	—
A	Near Bank	563.04	1119.32	2.08	2.86
B		201.86	1122.27	2.37	2.76
C		260.81	1346.09	2.04	2.38
City Shops (STM-07)					
A	Mid-Channel	100.68	—	2.08	—
B		215.99	—	2.37	—
C		136.47	—	2.48	—
A	Near Bank	362.22	814.71	3.91	3.63
B		349.77	1119.71	4.17	3.21
C		1011.37	1425.36	4.33	3.88

Notes:

IHg, Inorganic mercury
 MeHg, Methylmercury
 ww, Wet weight
 --, Not sampled

Table 5
Transplanted *Corbicula* Data Summary
2018 Short-term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4

Sample Replicate	Sample Environment	IHg (µg/kg, ww)		MeHg (µg/kg, ww)	
		June	October	June	October
Constitution Park (STM-01)					
A	Mid-Channel Caged	15.32	--	5.57	--
B		17.10	--	5.77	--
C		13.85	--	7.90	--
A	Near Bank Caged	53.09	15.88	52.42	6.92
B		12.34	14.07	8.84	7.63
C		12.96	12.82	9.07	8.95
A	Near-Bank Seeded	19.31	20.03	13.43	15.28
B		15.62	20.40	13.78	16.80
C		17.07	17.52	13.85	18.39
Shiloh Baptist Church (STM-03)					
A	Mid-Channel Caged	10.98	--	4.10	--
B		10.33	--	4.08	--
C		12.26	--	5.46	--
A	Near Bank Caged	21.81	16.84	7.31	5.34
B		19.83	15.34	9.69	4.99
C		17.87	16.83	8.51	5.19
A	Near Bank Seeded	27.70	NR	23.46	NR
B		25.05	NR	24.16	NR
C		27.08	NR	19.91	NR
North Park (STM-05)					
A	Mid-Channel Caged	10.64	--	5.13	--
B		18.00	--	4.46	--
C		11.98	--	4.67	--
A	Near Bank Caged	21.87	20.96	15.98	4.95
B		20.72	18.30	13.09	5.98
C		24.08	17.69	16.02	5.82
A	Near Bank Seeded	NR	36.64	NR	12.04
B		NR	NR	NR	NR
C		NR	NR	NR	NR
City Shops (STM-07)					
A	Mid-Channel Caged	16.48	--	6.77	--
B		16.77	--	6.36	--
C		13.17	--	6.23	--
A	Near Bank Caged	23.25	17.01	13.11	4.65
B		21.97	14.46	13.80	3.59
C		32.88	15.48	19.06	5.49
A	Near Bank Seeded	24.26	NR	22.24	NR
B		21.79	NR	24.52	NR
C		21.25	NR	19.64	NR

Notes:

IHg, Inorganic mercury
MeHg, Methylmercury
ww, Wet weight
--, Not sampled
NR, Not recovered

Table 6
Riparian Vegetation Plot Data Summary
2018 Short-term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4

Vegetative Species		Absolute % Cover ¹	
Scientific Name	Common Name	Spring 2018	Fall 2018
Constitution Park (STM-01)			
Tree/Vine Stratum			
<i>Robinia pseudoacacia</i>	Black Locust	0-30	0-30
<i>Convolvulus arvensis</i>	Field Bindweed	0-2	0-2
Sapling/Shrub Stratum			
<i>Acer rubrum</i>	Red Maple	10-15	10-15
<i>Cornus amomum</i>	Silky Dogwood	0-5	0-5
<i>Platanus occidentalis</i>	Sycamore	0-15	0-15
<i>Alnus incana</i>	Speckled Alder	0-5	0-5
<i>Physocarpus opulifolius</i>	Atlantic Ninebark	5	5-10
<i>Rosa multiflora</i>	Multiflora Rose	0	0-2
Herbaceous Stratum			
<i>Fallopia japonica</i>	Japanese Knotweed	35-40	15-25
<i>Cyperus esculentus</i>	Yellow Nutsedge	2	2
<i>Elymus riparius</i>	Riverbank Wildrye	0-2	0-5
<i>Tridens flavus</i>	Purple top grass	0	0-5
<i>Daucus carota</i>	Queen Anne's Lace	0-2	0
<i>Plantago major</i>	Common plantain	0-1	0
<i>Festuca rubra</i>	Red fescue	0	0-2
Shiloh Baptist Church (STM-03)			
Tree/Vine Stratum			
<i>Juglans nigra</i>	Black Walnut	0-60	0-60
<i>Acer saccharinum</i>	Silver Maple	0-65	0-65
<i>Acer negundc</i>	Box Elder	0-25	0-25
<i>Lonicera japonica</i>	Japanese Honeysuckle	5-10	5-10
<i>Platanus occidentalis</i>	American Sycamore	0	0-10
<i>Clematis terniflora</i>	Sweet Autumn Virginibower	5-20	5-20
<i>Vitis sp.</i>	Grape Vine	0-15	0-10
<i>Toxicodendron radicans</i>	Poison Ivy	0-15	0-15
Sapling/Shrub Stratum			
<i>Lonicera tatarica</i>	Tartarian Honeysuckle	10-50	10-70
<i>Ailanthus altissima</i>	Tree of Heaven	0-30	0-30
<i>Acer negundc</i>	Box Elder Maple	0-10	0-10
Herbaceous Stratum			
<i>Fallopia japonica</i>	Japanese Knotweed	0-80	0-80
<i>Glechoma hederacea</i>	Ground Ivy	5-10	5-10
<i>Hedera helix</i>	Common Ivy	0-40	0-25
<i>Toxicodendron radicans</i>	Poison Ivy	0-5	0-5
<i>Phytolacca americana</i>	Pokeweed	0-2	0
<i>Smilax hispida</i>	Green Briar	0-30	0
<i>Rosa multiflora</i>	Multiflora Rose	0-15	0-15
North Park (STM-05)			
Tree/Vine Stratum			
<i>Juglans nigra</i>	Black Walnut	60-70	25-60
<i>Robinia pseudoacacia</i>	Black Locust	0-10	0-30
<i>Platanus occidentalis</i>	American Sycamore	0-20	0-15
<i>Quercus montana</i>	Chestnut Oak	0	0-10
<i>Catalpa speciosa</i>	Northern Catalpa	0-10	0-20
<i>Vitis vulpina</i>	Grape Vine	5-10	5-10
<i>Parthenocissus quinquefolia</i>	Virginia Creeper	0-1	0-10
<i>Ampelopsis brevipedunculata</i>	Porcelain Berry	0	0-5
<i>Toxicodendron radicans</i>	Poison Ivy	0-35	0-35
<i>Clematis terniflora</i>	Sweet Autumn Virginibower	0-10	0-10
Sapling/Shrub Stratum			
<i>Lonicera tatarica</i>	Tartarian Honeysuckle	70-90	70-90
<i>Rosa multiflora</i>	Multiflora Rose	15	10-15
<i>Albizia julibrissin</i>	Persian Silk Tree	0-2	0-2
<i>Juglans nigra</i>	Black Walnut	0-30	0-25
<i>Lindera benzoin</i>	Northern Spicebush	0	0-10
<i>Ailanthus altissima</i>	Tree of Heaven	0	0-2
Herbaceous Stratum			
<i>Acer rubrum</i>	Red Maple	0-2	0
<i>Elaeagnus umbellata</i>	Autumn Olive	0	0-20
<i>Lindera benzoin</i>	Northern Spicebush	0-4	0
<i>Albizia julibrissin</i>	Persian Silk Tree	0	0-1
<i>Glechoma hederacea</i>	Ground Ivy	0-10	0-10
<i>Toxicodendron radicans</i>	Poison Ivy	0-5	0-5
<i>Rubus idaeus</i>	Red Raspberry	5	5
<i>Lonicera tatarica</i>	Tartarian Honeysuckle	0-3	0-3
goldenrod sp.	Goldenrod	0-2	0-3
<i>Acer platanoides</i>	Norway Maple	0-2	0-2
<i>Cyperus esculentus</i>	Yellow Nutsedge	0-2	0-2
City Shops (STM-07)			
Tree/Vine Stratum			
<i>Juglans nigra</i>	Black Walnut	0-10	0-5
<i>Acer negundc</i>	Box Elder Maple	0-75	0-60
<i>Vitis vulpina</i>	Grape Vine	0	0-10

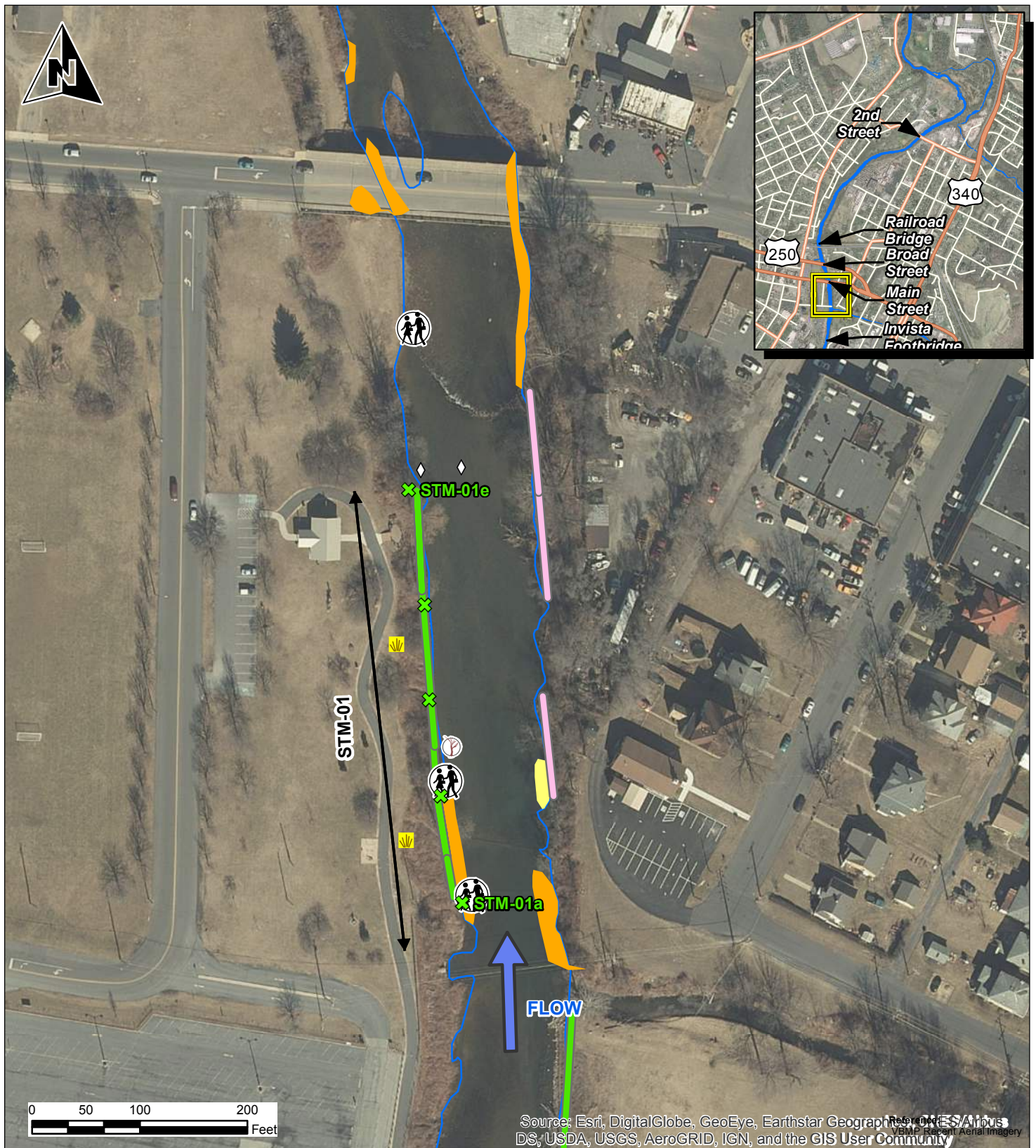
Table 7
Canopy Cover Data Summary
2018 Short-term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4

Transect ID	Mean Densimeter Reading ¹	Mean Open Sky (%)	Overall Mean Open Sky (%)	Overall Mean Canopy Cover (%)
Constitution Park (STM-01)				
A	94	97.4	84	16
B	71	73.4		
C	79	82.3		
D	87	90.4		
E	71	74.2		
Shiloh Baptist Church (STM-03)				
A	74	76.6	60	40
B	75	77.9		
C	76	79.4		
D	31	31.8		
E	79	82.3		
F	62	64.6		
G	43	44.3		
H	37	38.5		
I	68	70.6		
J	36	37.0		
North Park (STM-05)				
A	45	46.9	55	45
B	29	29.9		
C	54	56.3		
D	45	46.6		
E	59	61.7		
F	81	84.4		
G	63	65.4		
H	48	50.0		
I	51	52.6		
J	52	53.9		
City Shops (STM-07)				
A	41	42.2	54	46
B	30	31		
C	43	44		
D	24	24.5		
E	61	63.8		
F	96	100.0		
G	96	100.0		
H	38	39.3		
I	37	38.0		
J	50	51.8		
K	52	54.2		

Notes:

1, Canopy cover is only sampled in the spring.

Figures



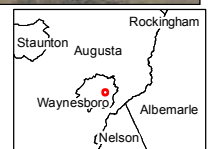
Legend

- ◇ Periphyton/Clam
- Benthic Community
- Vegetative Plots
- ✕ Sediment/PoreWater/Canopy/Pebble Count
- Large Woody Debris
- River Access

- ↔ Extent of Short-term Monitoring Location
- Clay and Silt Deposits
- Fine Sand Deposits
- ~ Shoreline

Bank Management Area

- Interim Measures Complete
- Non-Use BMAs
- Phase 1A Primary BMAs
- Phase 1A Secondary BMAs
- Phase 1B Primary BMAs
- Phase 1B Secondary BMAs



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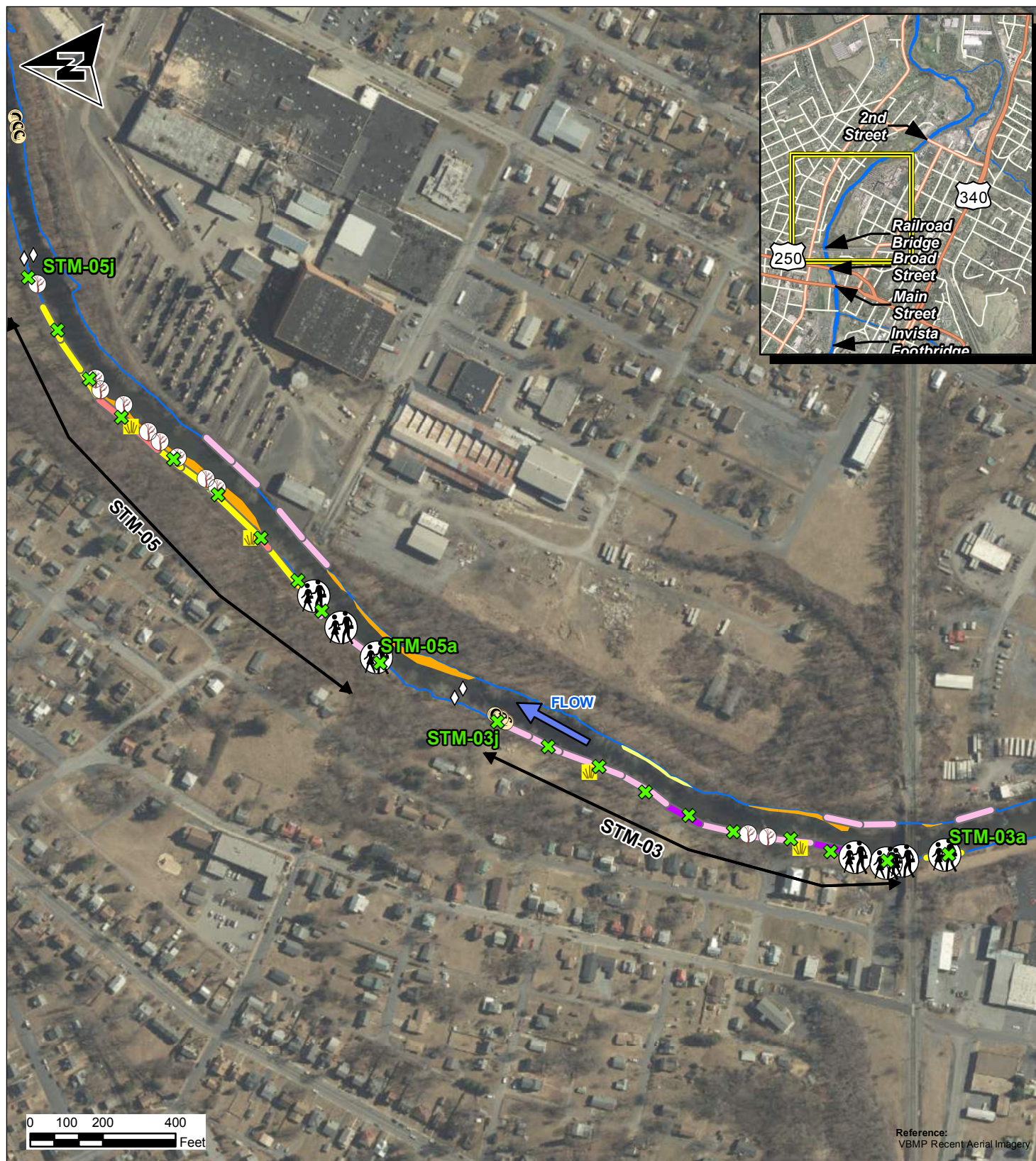
Job: 60532579

Prepared by: CDW

Checked by: AM

Date: 11/28/2018

Figure 1: Sheet 1 of 4
Short-Term Monitoring Stations Overview Map
2018 Short-Term Monitoring Annual Field Summary Memo
Former Dupont Waynesboro Site, Area of Concern 4
Waynesboro, Virginia



Legend

◇ Periphyton/Clam

○ Benthic Community

■ Vegetative Plots

✕ Sediment/PoreWater/
Canopy/Pebble Count

○ Large Woody Debris

○ River Access

↔ Extent of Short-term Monitoring
Location

■ Clay and Silt Deposits

■ Fine Sand Deposits

— Shoreline

Bank Management Area

— Non-Use BMAs

— Phase 1A Primary BMAs

— Phase 1A Secondary BMAs

— Phase 1B Primary BMAs

— Phase 1B Secondary BMAs

Reference:
VBMP Recent Aerial Imagery



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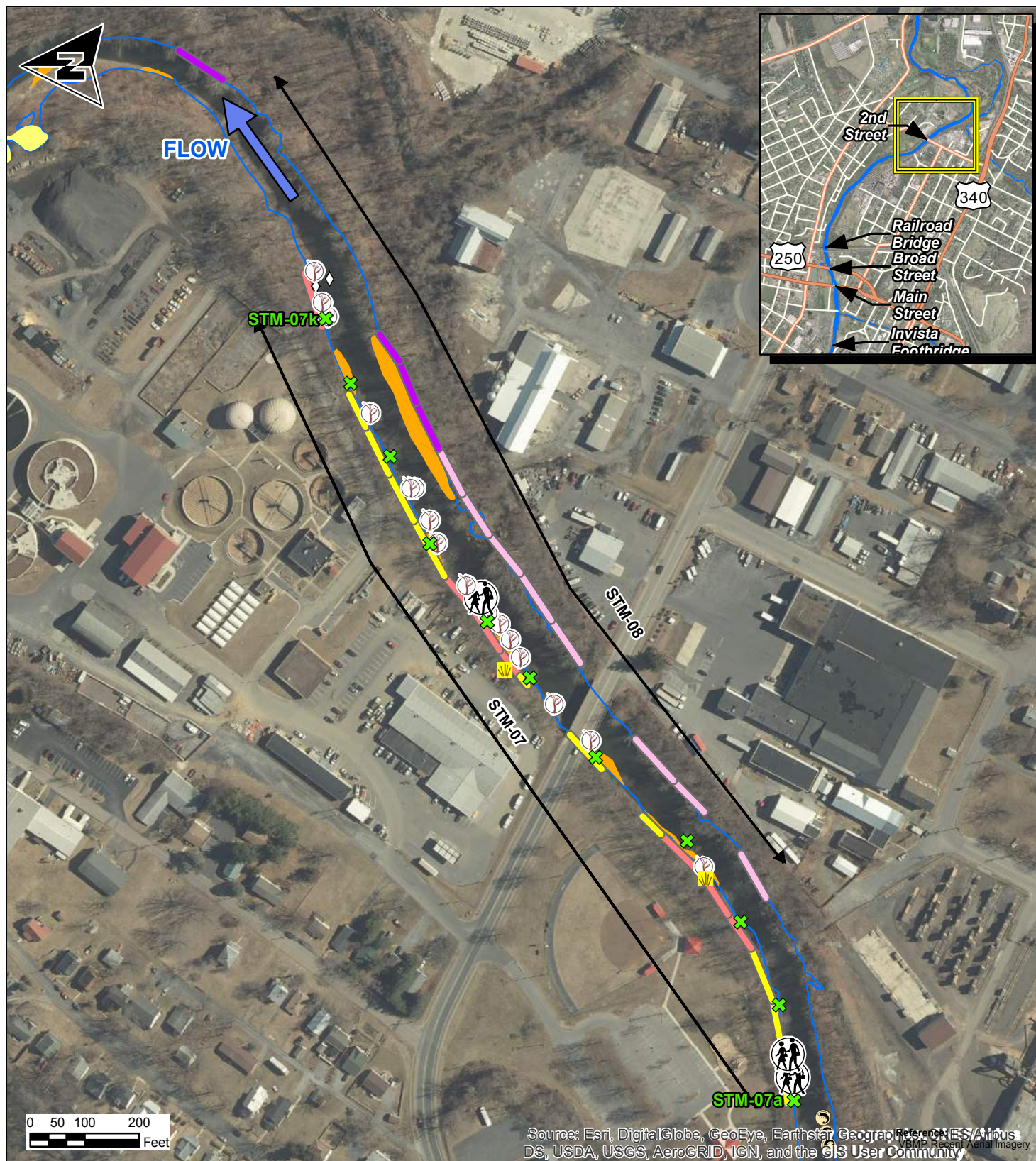
Job: 60532579

Prepared by: CDW

Checked by: AM

Date: 11/28/2018

Figure 1: Sheet 2 of 4
Short-Term Monitoring Stations Overview Map
2018 Short-Term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4
Waynesboro, Virginia

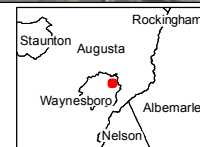


Legend

- | | | |
|-------------------|--|--|
| Periphyton/Clam | Sediment/PoreWater/Canopy/Pebble Count | Extent of Short-term Monitoring Location |
| Benthic Community | Large Woody Debris | Clay and Silt Deposits |
| Vegetative Plots | River Access | Fine Sand Deposits |
| | | Shoreline |

Bank Management Area

- | |
|-------------------------|
| Non-Use BMAs |
| Phase 1A Primary BMAs |
| Phase 1A Secondary BMAs |
| Phase 1B Primary BMAs |
| Phase 1B Secondary BMAs |



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Figure 1: Sheet 3 of 4
Short-Term Monitoring Stations Overview Map
2018 Short-Term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4
Waynesboro, Virginia



Legend

◇ Periphyton/Clam

○ Benthic Community

■ Vegetative Plots

✕ Sediment/PoreWater/
Canopy/Pebble Count

○ Large Woody Debris

⚓ River Access

↔ Extent of Short-term Monitoring
Location

■ Clay and Silt Deposits

■ Fine Sand Deposits

— Shoreline

Bank Management Area

— Non-Use BMAs

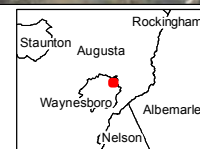
— Phase 1A Primary BMAs

— Phase 1A Secondary BMAs

— Phase 1B Primary BMAs

— Phase 1B Secondary BMAs

Reference:
VBMP Recent Aerial Imagery



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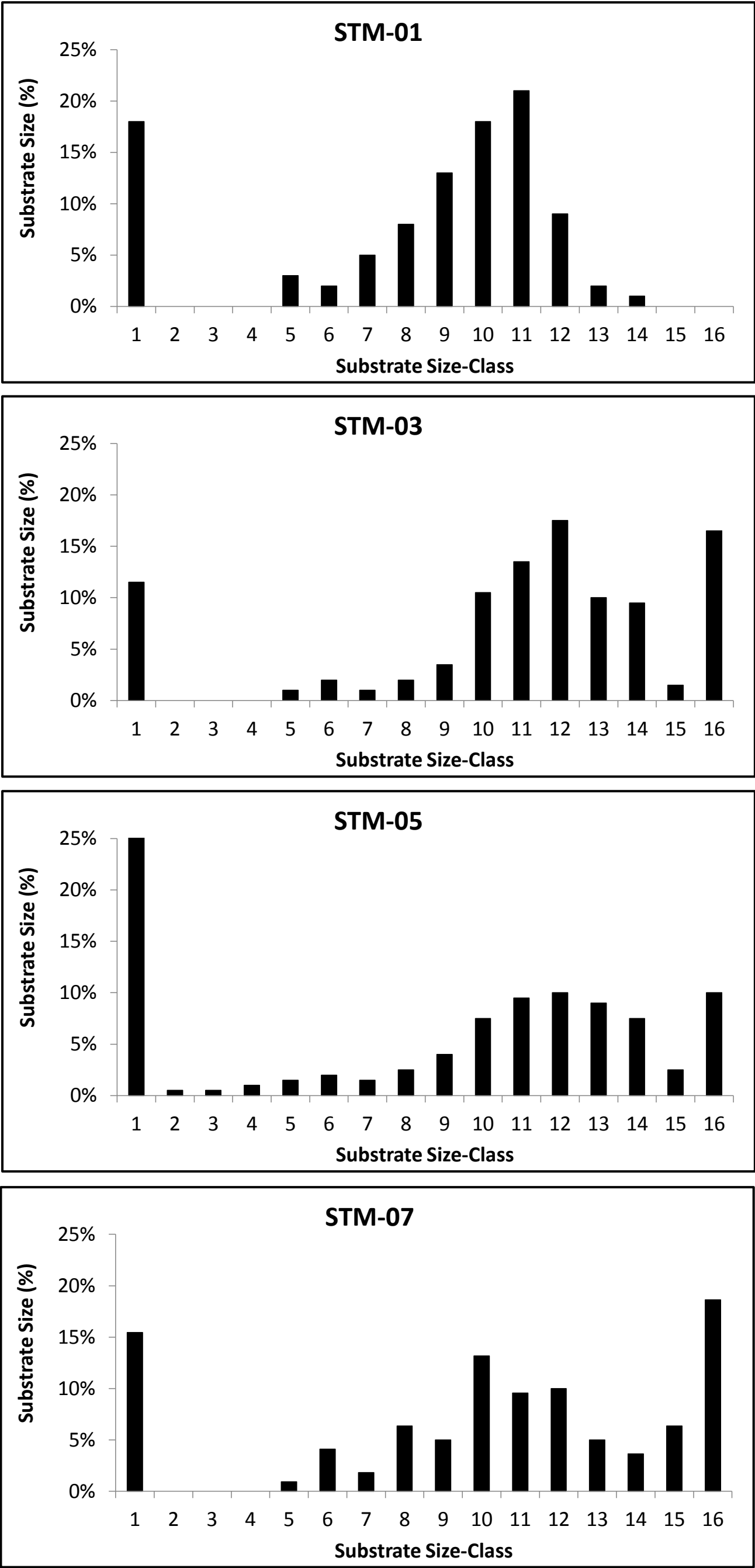
Prepared by: CDW

Checked by: AM

Date: 11/28/2018

Figure 1: Sheet 4 of 4
Short-Term Monitoring Stations Overview Map
2018 Short-Term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4
Waynesboro, Virginia

Figure 2
Sediment Grain Size Distribution
2018 Short-term Monitoring Annual Field Summary Memo
Former DuPont Waynesboro Site, Area of Concern 4



Substrate Size Class Descriptions		
Substrate Size-Class	Size Range (mm)	Description
1	0 - 2.0	Sand/Fines
2	2.0 - 2.8	Very Fine Gravel
3	2.8 - 4.0	Very Fine Gravel
4	4 - 5.6	Fine Gravel
5	5.6 - 8.0	Fine Gravel
6	8 - 11.0	Medium Gravel
7	11 - 16	Medium Gravel
8	16 - 22.6	Coarse Gravel
9	22.6 - 32	Coarse Gravel
10	32 - 45	Very Coarse Gravel
11	45 - 64	Very Coarse Gravel
12	64 - 90	Small Cobble
13	90 - 128	Medium Cobble
14	128 - 180	Large Cobble
15	180 - 300	Very Large Cobble
16	>300	Boulder/Bedrock