Section A

1. Collector Name: Matthew Johnson

3. Stream/Site Name: North Fork Hughes River; 44-45

4. LLID (dnr use):

5. Date (MM/DD/YYYY): 09/27/2016

6. Project: North Fork Hughes River Monitoring

9. Permitee ID:2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation Moderate or heavy rain shower Light rain shower Light rain Moderate rain Heavy rain None Sky Conditions 0 25 50 75 100% cloud cover Air temp (°C)	Precipitation ☐ Moderate or heavy rain shower ☐ Light rain shower ☐ Light rain ☐ Moderate rain ☐ Heavy rain ☐ None Sky Conditions 0 25 50 75 100% cloud cover Air temp (°C)	Has there been a heavy rain in the last 7 days? Yes/No

Section C			
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	🛛 Trash
	Pipeline crossing	Channelized	Island
	□ Ford	Bridge (pillars in stream)	Other
	Pipeline (parallel	Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	Beaver Dam
	U Woody debris	D Other	

Section D		
Aquatic	Indicate the dominant types and record the dominant species present.	
	Rooted emergent C Rooted floating Floating algae None	
-	C Rooted submergent Free floating Attached algae Moss	
	Dominant species Carex sp. on bars	
	Percent of the reach with aquatic vegetation 5 % (in terms of area)	

Section E					_					
Watershed Features	Human Influence/Wate Features (within survey reach)	ershe	əd	P=>10m from shore, C=within 10m, B=on the bank, D=dominant land use (check no more than two)						
		P	С	В	D		P	С	В	D
	Wall/Rip rap					Railroad (Active)				
	Railroad (rails to trails)	<u> </u>				Railroad (Inactive)				
	Buildings	1				Landfill/trash				
	Pavement					Park/Lawn	R	R	R	R
	Road	1				Row Crops			1	
	Pasture			1		Feed lots				
	Logging operations	1				Mining activity				

Watershe	d		P	C	I B	D		P	C	В	C
Features		Forest				L	Commercial/Industrial		۲	Ľ	-
(Cont.)		Old field		<u> </u> =−	+		Hay field	1	<u> </u>	┝──┦	
· · · · · · · · · · · · · · · · · · ·		Residential		-	<del>†</del>		Other	+			
		.ocal Watershed Er	osion (	pert	ains	to		<u>.</u>			
		and use, not failing									
		∃ None									
		Moderate									
	[	Heavy									
		•					-				
Section F											
Water [	Temper	rature (°C)21					Water Odors None				
Quality	Conduc	tivity uS/cm			Nor	mal/	None 🛛 Sewage				
	Dissolv	ed Oxygen mg/L		L	Pet	roleu	im Li Chemica	l			
	рН				Fisl	ıy	Other Turbidity (visual)	_			_
		ty (mg/L)					Turbidity (visual)	I			
	Secchi	depth (m.mm)			Cle	ar	Slightly turbid	ОΤ	urbio	ł	
	Meters	used:			Ора	aque	Stained		)ther		_
I.							Water Surface Oil	S			
	Hach K	it used Yes/No					🗆 Sheen 🔳 None				
			r Lab		Glo	bs	Flecks  Other_				
		s Yes/No		_							
	Flow at	nearest USGS gaug	ging st	atior	n /cfi	e)					
	Gaugin	g station:									
		g station:									
Section G	;										
Section G Sediment		Odors					Deposits		Sar		
Section G		Odors lormal ■ None		wag	e (		Deposits ludge		Sar	nd	
Section G Sediment		Odors lormal ■ None etroleum □ Che	□ Se emical	ewage	e (		Deposits udge				
Section G Sediment		Odors Iormal ■ None Petroleum □ Che naerobic (methane)	□ Se emical	ewage	e (		Deposits ludge				
Section G Sediment		Odors lormal ■ None letroleum □ Che naerobic (methane) 0ther	□ Se emical	wage	e l	I SI I R I P	Deposits ludge				
Section G Sediment		Odors lormal ■ None etroleum □ Che naerobic (methane) other strate Type (rank tor	□ Se emical	wage	e (	⊐ SI ⊐ R ⊐ Pi dom	Deposits ludge				•
Section G Sediment		Odors lormal ■ None etroleum □ Che naerobic (methane) other strate Type (rank tor	□ Se emical	wage	e (	⊐ SI ⊐ R ⊐ Pi dom	Deposits ludge				•
Section G Sediment Substrate	3 2 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Odors lormal ■ None etroleum □ Che naerobic (methane) other strate Type (rank top edrockBoulder	□ Se emical	wage	e (	⊐ SI ⊐ R ⊐ Pi dom	Deposits ludge		3_Sil	l/clay	•
Section G Sediment Substrate Section H Streamba	5 4 5 6 7 7 7 7 7 7 7 7 7 7 7 7 7	Odors lormal ■ None etroleum □ Che naerobic (methane) other strate Type (rank top edrockBoulder	□ Se emical p three, 	, 1 be	e (	⊐ SI ⊐ R ⊐ Pi dom	Deposits ludge	Pre	3_Sil	l/clay	•
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors lormal ■ None etroleum □ Che naerobic (methane) other strate Type (rank top edrockBoulder	D Se emical o three, 	, 1 be cobbl	e ( l le	⊐ SI ⊐ R ⊐ Pi dom	Deposits ludge	Presonly)	3_Sili	t/clay	/
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors lormal ■ None letroleum □ Che naerobic (methane) other strate Type (rank top edrockBoulder Cano ■ Mostly Open	D Se emical o three, 	, 1 be cobbl	e               	⊐ SI ⊐ R ⊐ Pi dom	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	/ g
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors lormal ■ None letroleum □ Che naerobic (methane) other strate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded	D Se emical o three, 	, 1 be Cobbl ver Shad	e ( l le led	⊐ SI ⊐ R ⊐ Pi dom	Deposits ludge	Presonly) eft D	3_Sil	t/clay ?	/ g
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors lormal None letroleum Che naerobic (methane) other strate Type (rank top edrock Boulder Cano Mostly Open Mostly Shaded Riparian Zone (10)	D Se emical o three, 	, 1 be Cobbl ver Shad	e ( l le led	⊐ SI ⊐ R ⊐ Pi dom	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors lormal None letroleum Che naerobic (methane) other strate Type (rank top edrock Boulder Cano Mostly Open Mostly Shaded Riparian Zone (10 intact	D Seemical	, 1 be Cobble Ver Shad None rs) fi	e ( le led eully	□ S □ R □ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	/ g
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors Iormal None Ietroleum Che Inaerobic (methane) Ither	D Seemical	, 1 be cobbl ver Shad None rs) fu	e ( le led eully	□ S □ R □ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	/ g
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors lormal ■ None etroleum □ Che naerobic (methane) other strate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded Riparian Zone (10 intact Right Descending Bank	D Seemical	, 1 be cobbl ver Shad None rs) fi t Des	e ( le led eully	□ S □ R □ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	
Section G Sediment Substrate Substrate Substrate Substrate Substrate Substrate	S D N D F D A Sub B 1 ank and Zone	Odors Iormal None Ietroleum Che Inaerobic (methane) Ither	D Seemical	, 1 be cobbl ver Shad None rs) fu	e ( le led eully	□ S □ R □ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	/ g
Section G Sediment Substrate Substrate Streamba Riparian Characte		Odors lormal ■ None etroleum □ Che naerobic (methane) otherstrate Type (rank top edrockBoulder strate Type (rank top edrockCano ■ Mostly Open □ Mostly Open □ Mostly Shaded Riparian Zone (10 intact Right Descending Bank Yes/No	D seemical	ver Shad None rs) fi t Des nk	e ( led eully scen	□ S □ R □ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L	Presonly) eft D	3_Sil	t/clay ?	
Section G Sediment Substrate Substrate Streamba Riparian Characte	G H C Sub B C Sub B C Sub Sub Sub Sub Sub Sub Sub Sub	Odors lormal None letroleum Che naerobic (methane) other strate Type (rank top edrock Boulder Cano Mostly Open Mostly Shaded Riparian Zone (10 intact Right Descending Bank Yes/No	D seemical	, 1 be Cobble Ver Shad None rs) fi t Des hk	e ( le le ully scen	□ Si □ R □ P; _1 	Deposits ludge	Presonly) eft D	3_Sil	t/clay ?	
Section G Sediment Substrate Substrate Streamba Riparian Characte	A A B C Sub Sub B A C Sub B A C Sub C Sub C Sub C Sub C Sub C Sub C Sub C C Sub C C Sub C C Sub C C C Sub C C C Sub C C C Sub C C C C Sub C C C C C C C C C C C C C	Odors lormal ■ None etroleum □ Che naerobic (methane) otherstrate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded Riparian Zone (10 intact Right Descending Bank Yes/No	D seemical	, 1 be Cobbb /er Shad None rs) fi t Dess nk s/No	e l leing le ully scen	☐ Si ☐ R ☐ Pi dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L Bank Yes/No B	Presonly) eft D	3_Sil	t/clay ?	
Section G Sediment Substrate Substrate Streamba Riparian Characte Notes: 23m wette 5-15' ban	A D A C A A A A A A A A A A A A A A A A	Odors lormal ■ None etroleum □ Che naerobic (methane) other	D meter	ver Shad None rs) fi t Des	e ( le led aully scen	☐ S ☐ R ☐ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L Bank Yes/No B	Presonly) eft D	3_Sil	t/clay ?	/
Section G Sediment Substrate Substrate Streamba Riparian Characte Notes: 23m wette 5-15' ban	A D A C A A A A A A A A A A A A A A A A	Odors lormal ■ None etroleum □ Che naerobic (methane) otherstrate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded Riparian Zone (10 intact Right Descending Bank Yes/No	D seemical	ver Shad None rs) fi t Des	e ( le led aully scen	☐ S ☐ R ☐ P dom _1	Deposits udge Leaf Litter elict Shells Other aper/fiber Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach of Right Descending L Bank Yes/No B	Presonly) eft D	3_Sil	t/clay ?	/

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Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



 Looking north (downstream) at the 44-45 Site in the North Fork Hughes River in Ritchie County, West Virginia.



2. Looking south (upstream) at the 44-45 Site in the North Fork Hughes River in Ritchie County, West Virginia.

#### **Mussel Survey Summary Data Sheet**

1b. Surveyor(s) (Last Name, First, MI)       1c. Company: Enviroscience inc.         Johnson, M.         Mathlas, P.         Abramczyk, D.         3. Stream Name:       North Fork Hughes River         4. Site Name:       45-46         5. Date: MM/DD/YYYY       9/27/2016         6. Project:       North Fork Hughes River Monitoring         Section B: Survey Method       Section C: Survey Time         1       Waterscope         1       Source (min)         246       I         1       Total Effort (min)         246       I         1       Qualitative	Section A							4/29/2016	
Johnson, M. Abramczyk, D. 3. Stream Name: North Fork Hughes River 4. Site Name: 45-46 5. Date: MMU/DD/YYY 9/27/2016 5. Date: MMU/DD/YYY 9/27/2016 5. Date: MMU/DD/YYY 9/27/2016 5. Date: MMU/DD/YYY 9/27/2016 Section B: Survey Method 1 Waterscope & & Area 1 ScUBA ISSA 1 ScUBA ISSA 1 Sorkel Total Area (m <sup>2</sup> )5.175 1 Other Section E Area Total Number Fresh Weathered Species ADI USB LB DSB Other Live Dead Dead A plicata1 1 1				<u>n</u>				2016.106	
Abramczyk, D.           3. Stream Name:         North Fork Hughes River           4. Site Name:         45-46           5. Date:         MiNDD/YYY           9/27/2016         Section B: Survey Method           Section B: Survey Method         Section C: Survey Time           Section B: Survey Method         Section C: Survey Time           1         Waterscope         & Area           1         Social Area (m²)         5,175           1         Other         I           1         Other         I           Section E         Area         Total Area (m²)           5         5         I           9         I         Use           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9         I         1           9		ame, Firs	st, MI)			1c. Com	pany: Envirosc	ience inc.	J
Abramczyk, D.         3. Stream Name:       45-46         45. Date:       Morth Fork Hughes River         4. Site Name:       45-46         5. Date:       Morth Fork Hughes River Monitoring         Section B: Survey Method       Section C: Survey Time         Section B: Survey Method       Section C: Survey Time         1       South Fork Hughes River (min)         248       1         3       Stotkal         1       Other         1       Qualitative with excavation         1       Other         1       Qualitative         Section E       Area         5       5         4.1       1         2       2         2. cardium (M)       2         2. cardium (M)       1         3. colstata       1         1       1		<del></del>							
A. Stream Name:       North Fork Hughes River         4. Site Name:       45-46         5. Date:       MM/DD/YYYY         9/27/2016		<u> </u>							,
4. Site Name:       45-46         5. Date:       MM/DD/YYY         9/27/2016       North Fork Hughes River Monitoring         Section B:       Survey Method         1       Waterscope         1       Scutos B: Survey Method         1       Section C:         1       Survey Method         1       Section B:         1       Survey Method         1       Scutos B:         1       Survey Method         1       Scutos B:         1       Survey Method         1       Scutos B:         1       Otal Effort (min)         245       1         1       Qualitative with excavation         1       Qualitative         Section E       Area         5       5         1       Qualitative         Section M(M)       2         2       2         1       1         1       1         2       2         2       2         2       2         2       2         2       1         1       1         2       2<								· · · · · ·	
S. Date: MM/DD/YYYY       9/27/2016         Section B: Survey Method       I         I Waterscope       Section C: Survey Ime       Section D: Surveys Conducted         I SCUBA /SSA       Total Effort (min)       246         I Other       Total Effort (min)       246         I Other       Total Area (m <sup>2</sup> )       I Transects         I Other       Total Area (m <sup>2</sup> )       5,175         I Other       I Qualitative with excavation         Section E       Area       Total Area (m <sup>2</sup> )         Section E       Area       Total Area (m <sup>2</sup> )       I Qualitative with excavation         Section E       Area       Total Number       Fresh       Dead         ADI USB       LB       DSB       Other       Live       Dead         Allus       2       2	3. Stream Name:	North F	ork Hugh	es River				,	
Approject:         North Fork Hughes River Monitoring           Section B: Survey Method         Section C: Survey Time         Section D: Surveys Conducted           1         Waterscope         & Area         1         Transects           1         Social Effort (min)         246         1         Cells           1         Other         246         1         Cells           1         Other         246         1         Callative           Section E         Anio (m²)         5,175         1         Quantitative with excavation           Section E         Anio (m²)         5,175         1         Quantitative           Section E         Anio (m²)         2         2         1           P. alatus         1         1         1         Dead         Dead           L. cardium (M)         2         2         2         1         1           L. siliquoidea (M)         1         1         1         1         1           L. costata         1         1         1         1         1         1           E         Glasta         2         2         1         1         1         1           L costata         1	4. Site Name:	45-46							
Section B: Survey Method       Section C: Survey Time & Area       Section D: Surveys Conducted         1       Waterscope       Total Effort (min)       248       1       Transects         1       Study ASSA       Total Effort (min)       248       1       Calls         1       Other       Total Effort (min)       248       1       Qualitative         Section E       Andi       Area       Total Number       Fresh       Weathered         Section M(M)       2       2	5. Date: MM/DD/YYYY	9/27/201	16						
I       Waterscope       & Area       I       Transects         I       SCUBA /SSA       Total Effort (min)       246       I       Cells       I       Cells       I       Cuantitative with excavation         I       Other       Total Area (m <sup>3</sup> )       5,175       I       Quantitative       Dead       Dead       Dead         Section E       ADI       USB       LB       DSB       Other       Live       Dead       Dead       Dead         A. plicata       I       I       I       I       I       I       I       I       III       IIII       IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	6. Project:	North F	ork Hugh	es River	Monitorir	ıg			
I       SCUBA /SSA       Total Effort (min)      246       I       Cells         I       Other       Total Area (m <sup>2</sup> )      5175       I       Quantitative with excavation         I       Other       Area        Total Number       Fresh       Weathered         Section E       Area        Total Number       Fresh       Weathered         Applicata       I       1       1       I       Image: Section (M)       Image: Secti	Section B: Survey N	lethod	Section	C: Surv	ey Time	Section I	D: Surveys Con	ducted	
1       SCUBA/SSA       Total Effort (min)      246       !       Cells         1       Other       Total Area (m <sup>2</sup> )      5,175       !       Quantitative with excavation         1       Other       Area        Total Number       Fresh       Weathered         Species       ADI       USB       LB       DSB       Other       Live       Dead       Dead         P. alatus       1	1 Waterscope				& Area	I	Transects		
I       Snorkel       Total Area (m <sup>2</sup> )       5,175       I       Quantitative with excavation qualitative         Section E       Area       Total Area (m <sup>2</sup> )       Total Number       Fresh       Weathered         Species       ADI       USB       LB       DSB       Other       Live       Dead       Dead         A. plicata       1	1 SCUBA/SSA		Total Eff	ort (min)	246	1	Cells		
I       Qualitative         Section E       Area       Total Number       Fresh       Weathered         Aplicata       I       1       1       Image: Constraint of the section of the sect	Snorkel						Quantitative with	excavation	
Species         ADI         USB         LB         DSB         Other         Live         Dead         Dead           A. plicata         1						· · · ·	Qualitative		
Species         ADI         USB         LB         DSB         Other         Live         Dead         Dead           A. plicata         1	Section E	1		Area			Total Number	Fresh	Weathered
A. plicata       1       1       1         P. alatus       2       2		ADI	USB	_	DSB				
P. alatus       2       2         L. cardium (M)       2       2         L. siliquoidea (M)       5       5         L. siliquoidea (M)       1       1         L. siliquoidea (F)       4       4         Q. verrucosa (M)       1       1         L. costata       1       1         F. flava       1       1         E. dilatata       2       2         P. grandis       1       1         Image: State Stat									
L. cardium (M)       2       2         L. siliquoidea (M)       5       5         L. siliquoidea (F)       4       4         Q. verrucosa (M)       1       1         L. costata       1       1         F. flava       1       1         E. dilatata       2       2         P. grandis       1       1         Image: Search Effort (min)       246       5         Search Area (m²)       5       5									
L. siliquoidea (M)       5       5         L. siliquoidea (F)       4       4         Q. verrucosa (M)       1       1         L. costata       1       1         F. flava       1       1         E. dilatata       2       2         P. grandis       1       1         Image: Search Effort (min)       246       1				<u> </u>					
I. siliquoidea (F)       4       4         Q. verucosa (M)       1       1         L. costata       1       1         F. flava       1       1         E. dilatata       2       2         P. grandis       1       1         Image: Search Effort (min)       246       1		<u> </u>				<u> </u>			
Q. vertucosa (M)       1       1       1         L. costata       1       1       1         F. flava       1       1       1         E. dilatata       2       2			+		·				
A. constata       1       1       1         F. flava       1       1       1         E. dilatata       2       2			┼						
F. flava       1       1       1         E. dilatata       2       2       2         P. grandis       1       1       1         Image: Search Effort (min)       246       1       1         Search Area (m <sup>2</sup> )       246       1       1									
E. dilatata E. dil		╂───				-			·
P. grandis       1       1       1         Image: Search Effort (min)       Image: Search Area (m <sup>2</sup> )       Image: Search Area (m <sup>2</sup> )								<u>.</u>	
Search Area (m <sup>2</sup> ) 5,175	P. granuis		+				<b></b>	·	
Search Area (m <sup>2</sup> ) 5,175			+			<u> </u>			
Search Area (m <sup>2</sup> ) 5,175		╉────					· · ·		·
Search Area (m <sup>2</sup> ) 5,175		╉────		┨					┢━━━━━
Search Area (m <sup>2</sup> ) 5,175									
Search Area (m <sup>2</sup> ) 5,175									
Search Area (m <sup>2</sup> ) 5,175			1						
Search Area (m <sup>2</sup> ) 5,175									
Search Area (m <sup>2</sup> ) 5,175		+		<u> </u>					1
Search Area (m <sup>2</sup> ) 5,175					<u> </u>				
Search Area (m <sup>2</sup> ) 5,175					<u> </u>	<u> </u>			1
Search Area (m <sup>2</sup> ) 5,175				1		<u>├</u> ───		<u> </u>	1
Search Area (m <sup>2</sup> ) 5,175		1	1						1
Search Area (m <sup>2</sup> ) 5,175		1	╀						1
Search Area (m <sup>2</sup> ) 5,175		1							1
Search Area (m <sup>2</sup> ) 5,175	Search Effort (min)					246		<u> </u>	
		1		1					1
NOTES				1		<u>, , , , , , , , , , , , , , , , , , , </u>			† <del></del> -
	NOTES			I	<u>.</u>	<u>.</u>		1	
									6 <del></del>

Section A

1. Collector Name: Matthew Johnson

3. Stream/Site Name: North Fork Hughes River; 45-46

4. LLID (dnr use):

5. Date (MM/DD/YYYY): 09/27/2016

6. Project: North Fork Hughes River Monitoring

9. Permitee ID:2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	•
	Light rain	Light rain	
	Moderate rain	Moderate rain	
	Heavy rain	Heavy rain	
		D None	
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C			
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	🗆 Trash
	Pipeline crossing	Channelized	Island
	□ Ford	Bridge (pillars in stream)	Other
	D Pipeline (parallel	Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	Beaver Dam
	Woody debris	Other Man-made wier	····

Section D Aquatic	Indicate the dominant t	ypes and record the	don	ninant species p	resent.
Vegetation		<ul> <li>Rooted floating</li> <li>Free floating</li> </ul>		Floating algae Attached algae	□ None □ Moss
	Percent of the reach w	ith aquatic vegetation	<u>۱</u>	% (in terms	of area)

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

		-												-	
Watershe		-				<u>c</u>	B	D	•		<u>  P</u>	C	В		
Features			prest			L	L_	L		cial/Industria	<u>  </u>				
(Cont.)			d field		1_				Hay field						
			esidential				Ļ,	Ļ	Other		1				
		lar	Local Watershed Erosion (pertains to and use, not failing stream banks) I None												
			Moderate												
			Heavy												
Section F														_	
Water	Temp	perat	ture (°C)2 ivity uS/cm _	21					Water O			_			
Quality	Cond	lucti	vity uS/cm_				Nor	mal/	None	Sewage					
· ·	Disso	olved	d Oxygen m	g/L			Pet	roleu	m		al				
	pH _			J	-		Fish	าง		Other					
			 (mg/L)						Turbi	Other idity (visual	)				
	Secc	hi de	epth (m.mm)	)			Cle	ar	📕 Sligi	htly turbid	́пт	urbio	ł		
			sed:							ned					
						_				Surface Oi					
	Hach	Kit	used Yes/	No			Slic	k		n 🔳 None					
			mpie Collec												
					ap		{-10								
		isis -	Yes/No		aD		Glo	03				-			
			Yes/No earest USG												
	Flow	at n	earest USG	S gaugin	ig sta	atior	ı (cf:	s)							
	Flow	at n		S gaugin	ig sta	atior	ı (cf:	s)							
Section (	Flow Gaug	at n	earest USG	S gaugin	ig sta	atior	ı (cf:	s)							
Section (	Flow Gaug G	at n	earest USG station:	S gaugin	ig sta	atior	ı (cf:	s)							
Sedimen	Flow Gaug G	at n jing	earest USG station: Od	S gaugin	ig sta		) (cf:	s)		Deposits					
	Flow Gaug G t/ e	at n jing	earest USG: station: Od rmal ■ N	S gaugin	lg sta	wage	e (cf:	s)  ⊐SI	udge	Deposits Leaf Litter	· □	San			
Sedimen	Flow Gaug G t/ e	at n jing Noi	earest USG: station: Od rmal ■ N troleum [	S gaugin	ig sta	wage	e (cf:	s)	udge elict Shells	Deposits Leaf Litter	· 🗆	Sar	ıd		
Sedimen	Flow Gaug G t/ e	at n jing Noi Pet	earest USGS station: Od rmal ■ N troleum [ aerobic (meti	S gaugin	ig sta	wage	e (cf:	s)	udge elict Shells	Deposits Leaf Litter	· 🗆	Sar	ıd		
Sedimen	Flow Gaug G t/ e	at n jing Noi Pet Ana Oth	earest USG: station: Od rmal ■ N troleum [ aerobic (meth ner	S gaugin lors lone Chemi hane)	ig sta	wage	e (cf:	s) 	udge elict Shells aper/fiber	Deposits Leaf Litter	· 🗆	Sar	ıd		
Sedimen	Flow Gaug G t/ e	at n jing Noi Pet Ana Oth	earest USG station:Od rmal ■ N troleum [ aerobic (meti her trate Type (ra	S gaugin	ig sta	wage	e (cf:	s) SI Ri Pi	udge elict Shells aper/fiber inant)	Deposits Leaf Litter Other		San	d		
Sedimen Substrat	Flow Gaug C t/ e C S	at n jing Noi Pet Ana Oth	earest USG: station: Od rmal ■ N troleum [ aerobic (meth ner	S gaugin	ig sta	wage	e (cf:	s) SI Ri Pi	udge elict Shells aper/fiber inant)	Deposits Leaf Litter Other		San	d		
Sedimen	Flow Gaug 3 t/ e S S H	at n jing Noi Pet Ana Oth ubst Bed	earest USG station:Od rmal ■ N troleum [ aerobic (meti her trate Type (ra	S gaugin	ig sta	wage	e (cf:	s) SI Ri Pi	udge elict Shells aper/fiber inant) Gravel	Deposits Leaf Litter Other		San Silt/	nd clay		
Sedimen Substrate Section I Streamb	Flow Gaug C t/ e C S S H ank a	at n jing Noi Pet Ana Oth ubst Bed	earest USGS station: Od rmal ■ N troleum [ aerobic (meth her trate Type (ra drockBo	S gaugin	ig sta	ation wage	e (cf:	s) SI Ri Pi	udge elict Shells aper/fiber inant) Gravel Stream E (within su	Deposits Leaf Litter Dother Other 3_Sand Bank Failure	e Presonly)	San Silt/	id clay ?		
Sedimen Substrate	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	earest USGS station: Od rmal ■ N troleum [ aerobic (meth her trate Type (ra drockBo	S gaugin	I Serical	atior wage 1 be Cobb	e (cf:	s) SI Ri Pi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	earest USGS station: Od rmal ■ N troleum [ aerobic (mether trate Type (ra drockBo	S gaugin	g sta ] Ser ical ∩ree, 2 0 Cov	1 be Cobb	ed	s) SI Ri Pi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	Dearest USGS station:Od rmal ■ N troleum [ aerobic (mether trate Type (ra drockG drockG D Mostly O ■ Mostly S	S gaugin	ag sta ] Ser ical ∩rree, 2 ( Cov	ation wwage 1 be Cobb	ed	s) SI Ri Pi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other 3_Sand Bank Failure	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	earest USGS station: Od rmal ■ N troleum [ aerobic (meth her trate Type (ra drock drock Mostly O ■ Mostly Si Riparian Zo	S gaugin	ag sta ] Ser ical ∩rree, 2 ( Cov	ation wwage 1 be Cobb	ed	s) SI Ri Pi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether ber trate Type (ra drockB drockB Mostly O ■ Mostly Si Riparian Zo intact	S gaugin	g sta ] See ical Cov □ S □ N neter	1 be Coble er Shad None s) fu	ed	s) SI Ri  domi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether trate Type (ra drockB drockB Mostly O ■ Mostly S Riparian Zo intact Right Desce	S gaugin	ag sta ] See ical Cov □ Se □ N Cov	1 be Cobb Shad Shad Shad Shad	ed	s) SI Ri  domi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether trate Type (ra drock drock Mostly O ■ Mostly SI Riparian Zo intact Right Desce Bank	S gaugin	ag sta ] See ical Cov □ Se □ Cov □ Se □ Se □ See □ See	1 be Cobb er Shad None s) fu Des	ed	s) SI Ri  domi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Zone	at n jing Noi Pet Ana Oth ubst Bed	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether trate Type (ra drockB drockB Mostly O ■ Mostly S Riparian Zo intact Right Desce	S gaugin	ag sta ] See ical Cov □ Se □ Cov □ Se □ Se □ See □ See	1 be Cobb Shad Shad Shad Shad	ed	s) SI Ri  domi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Sedimen Substrate Section I Streamb Riparian	Flow Gaug Cl e Cl S S H ank at Z One erizati	at n jing Nori Pet Ana Oth Bed	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether trate Type (ra drock drock Mostly O ■ Mostly SI Riparian Zo intact Right Desce Bank	S gaugin	g sta ] Ser ical □ Ser ical □ Cov □ S □ N neter Ban Yes	1 be Cobl er Shad None s) fu Des k	ed	s)     domi 	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De	Deposits Leaf Litter Dother Other Sank Failure Scending	e Presonly)	San Silt/ sent	nd clay ?		
Section I Streamb Riparian Characte	Flow Gaug C C C C C C C C C C C C C C C C C C C	at n jing Noi Pet Ana Oth Bed	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether aerobic (mether) aerobic (mether aerobic (mether) aerobic (	S gaugin	g sta ] Sec ical ∩ree,  Cov □ { □ } Neter Ban Yes	1 be Cobi er Shad None s) fu Dessik /No	ed	s) SI Ri  domi  domi	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De Bank Yes	Deposits Leaf Litter Other Other 3_Sand Bank Failure urvey reach scending L s/No E	e Presonly)	San Silt/ sent	nd clay ?		
Section I Substrate Section I Streamba Riparian Characte Notes: 23m wett 3 - 15' ba	Flow Gaug Clow Clow Clow Clow Clow Clow Clow Clow	at n jing Noi Pet Ana Oth Bed on on dth_	earest USG: station: Od rmal ■ N troleum [ aerobic (meth her	S gaugin	g sta ] Sec ical ∩ree, _2 ( Cov □ § □ N neter Ban Yes	1 be Cobb er Shad None s) fu Des k	ed	s) SI Ri Pri domi  ding	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De Bank Yes	Deposits Leaf Litter Lother Other Contemporation Deposits Leaf Litter Deposits Contemporation Deposits Contemporation Deposits De	e Presonly)	San Silt/ sent	nd clay ?		
Section I Substrate Section I Streamba Riparian Characte Notes: 23m wett 3 - 15' ba	Flow Gaug Clow Clow Clow Clow Clow Clow Clow Clow	at n jing Noi Pet Ana Oth Bed on on dth_	earest USG: station: Od rmal ■ N troleum [ aerobic (meth her	S gaugin	g sta ] Sec ical ∩ree, _2 ( Cov □ § □ N neter Ban Yes	1 be Cobb er Shad None s) fu Des k /No	ed	s) SI Ri Pri domi  ding	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De Bank Yes	Deposits Leaf Litter Lother Other Contemporation Deposits Leaf Litter Deposits Contemporation Deposits Contemporation Deposits De	e Presonly)	San Silt/ sent	nd clay ?		
Section I Substrate Section I Streamba Riparian Characte Notes: 23m wett 3 - 15' ba	Flow Gaug Clow Clow Clow Clow Clow Clow Clow Clow	at n jing Noi Pet Ana Oth Bed on on dth_	Dearest USGS station: Od rmal ■ N troleum [ aerobic (mether aerobic (mether crate Type (rate aerobic (mether aerobic (mether) aerobic (mether aerobic (mether) aerobic	S gaugin	g sta ] Sec ical ∩ree, _2 ( Cov □ § □ N neter Ban Yes	1 be Cobb er Shad None s) fu Des k /No	ed	s) SI Ri Pri domi  ding	udge elict Shells aper/fiber inant) Gravel Stream E (within su Right De Bank Yes	Deposits Leaf Litter Lother Other Contemporation Deposits Leaf Litter Deposits Contemporation Deposits Contemporation Deposits De	e Presonly)	San Silt/ sent	nd clay ?		

Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



1. Looking north (downstream) at the 45-46 Site in the North Fork Hughes River in Ritchie County, West Virginia.



 Looking south (upstream) at the 45-46 Site in the North Fork Hughes River in Ritchie County, West Virginia.

#### **Mussel Survey Summary Data Sheet**

Section A					<u></u>		4/29/2016	
1. Collector Name:			n		2. Perm	it ID:	2016.106	
1b. Surveyor(s) (Last N	lame, Firs	st, MI)			1c. Com	pany: Envirosc	ience inc.	,
Johnson, M. Mathias, P.								
Abramczyk, D.						<del>,</del>		
Walters, S.								
3. Stream Name:		ork Hugh	es River					
4. Site Name:	30-31							
5. Date: MM/DD/YYYY	9/27/201	6						
6. Project:	North Fe	ork Hugh	es River	Monitorir	ng			
Section B: Survey N	lethod	Section	C: Surv	ey Time	Section	D: Surveys Con	ducted	
! Waterscope				& Area		Transects		
! SCUBA /SSA		Total Eff	ort (min)		1	Cells		
1 Snorkel		Total Are	ea (m²)	5	1	Quantitative with	n excavation	
! Other					1	Qualitative		
Section E		E	Area			Total Number	Fresh	Weathered
Species	ADI	USB	LB	DSB	Other	Live	Dead	Dead
A. plicata					1			
F. flava					2			
L. fragilis					1			
		T						
						i		
Search Effort (min)								
Search Area (m <sup>2</sup> )					5			
NOTES	5m = 2	20 0.25m	<sup>2</sup> quadr	ats				

Section A

- 1. Collector Name: Matthew Johnson
- 3. Stream/Site Name: North Fork Hughes River; 36-37

4. LLID (dnr use):

5. Date (MM/DD/YYYY): 09/29/2016

6. Project: North Fork Hughes River Monitoring 9. Permitee ID:2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	🗖 Light rain	Light rain	
	D Moderate rain	Moderate rain	
	Heavy rain	Heavy rain	
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C			
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	🛛 Trash
	Pipeline crossing	Channelized	Island
	G Ford	Bridge (pillars in stream)	Other
	D Pipeline (parallel	Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	Beaver Dam
	Woody debris	Other	

Section D	
Aquatic	Indicate the dominant types and record the dominant species present.
Vegetation	Rooted emergent     Rooted floating     Floating algae     None
-	Rooted submergent  Free floating  Attached algae  Moss
	Dominant speciesHydrilla
	Percent of the reach with aquatic vegetation30% (in terms of area)

Section E										
Watershed Features	Human Influence/Wate Features (within survey reach)	rshe	bd			P=>10m from shore, C=with bank, D=dominant land us than two)				
		P	С	В	D		Ρ	C	B	D
	Wall/Rip rap				1	Railroad (Active)	Τ			
	Railroad (rails to trails)					Railroad (Inactive)				
	Buildings				1	Landfill/trash				
	Pavement					Park/Lawn				
	Road	1				Row Crops				
	Pasture					Feed lots				
	Logging operations				İ_	Mining activity				

Watershe	i							10		0	
Features		Forest		C		DX	Commercial/Industrial		C	В	
(Cont.)	ł	Old field		x		<u> </u>	Hay field		-		
(oone)	ŀ	Residential		┝			Other				
		Local Watershed E	irosion (	nort:	aine	to	Other				
		land use, not failin									
			ig stream			,					
		Moderate									
		□ Heavy									
Section F	:								_		
Water	Tempo	erature (°C) 20					Water Odors None Sewage				
Quality	Condu	ictivity uS/cm			Nor	mal/	None 🛛 Sewage				
-	Dissol	ved Oxygen mg/L_		<u> </u>	reu	roieu		1			
	pH				Fist	ıy	Other Turbidity (visual)				
	Turbic	lity (mg/L)				-	Turbidity (visual)				
	Secch	i depth (m.mm)			Clea	ar	Slightly turbid		urbio	ł	
	Meters	s used:			Opa	aque	Stained		ther		_
<u> </u>							Water Surface Oil	5			
	Hach	Kit used Yes/No			Slic	k	🛛 Sheen 🔳 None				
			ior Lab		Glo	bs	□ Flecks □ Other_				
		sis Yes/No									
		at nearest USGS ga	uging st	ation	ı (cf:	5)					
	Gaugi	ng station:		_	_						
0											
											_
Section C		Odors		<i></i>			Denosite		_		_
Sediment	t/						Deposits		Sar		
Sediment	t/ e 🗆	Normal 🔳 None	🗆 Se	wage	= [		udge 🛛 Leaf Litter		Sar	ıd	
Sediment	t/	Normal 📕 None Petroleum 🛛 Cl	□ Se nemical	_	0	⊐ R	udge 🗇 Leaf Litter elict Shells 🗇 Other				
		Normal ■ None Petroleum □ Cl Anaerobic (methane	□ Se nemical	_	0	⊐ R	udge 🛛 Leaf Litter				
Sediment		Normal INone Petroleum IC Anaerobic (methane Other	□ Se nemical )	-	(	] R ] P	udge 🛛 Leaf Litter elict Shells 🔲 Other aper/fiber 🗆 Other				•
Sediment	t/ # 0 0 0 Su	Normal None Petroleum CI Anaerobic (methane Other bstrate Type (rank t	□ Se nemical ) op three,	1 be	) ) eing (	] R ] Pa domi	udge				
Sediment	t/ # 0 0 0 Su	Normal None Petroleum CI Anaerobic (methane Other bstrate Type (rank t	□ Se nemical ) op three,	1 be	) ) eing (	] R ] Pa domi	udge 🛛 Leaf Litter elict Shells 🔲 Other aper/fiber 🗆 Other				
Sediment	t/ # 0 0 0 Su	Normal None Petroleum CI Anaerobic (methane Other bstrate Type (rank t	□ Se nemical ) op three,	1 be	) ) eing (	] R ] Pa domi	udge D Leaf Litter elict Shells D Other aper/fiber D Other inant) Gravel _2_Sand	3	_Silt	/clay	
Sediment Substrate	t/ = □ □ Su -1	Normal None Petroleum CI Anaerobic (methane Other bstrate Type (rank t BedrockBoulde	□ Se nemical ) op three,	1 be	) ) eing (	] R ] Pa domi	udge	3	_Silt	/clay	•
Sediment Substrate Section H Streamba Riparian	t/ e	Normal None Petroleum CI Anaerobic (methane Other bstrate Type (rank t BedrockBoulde	□ Se nemical ) op three, erC	1 be cobbl	[ eing ( e	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other Gravel 2_Sand Stream Bank Failure (within survey reach o	3 Pres	_Sill	t/clay	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, er opy Cov	1 be cobbl	[ eing ( e	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, er opy Cov	1 be cobbl	eing (	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	3 Pres	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal None Petroleum CI Anaerobic (methane Other bstrate Type (rank t BedrockBoulde	□ Se nemical ) op three, erC opy Cov □ { d t	1 be cobbl er Shad	ed	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	Se     hermical     )     op three,     r     opy Cov     d     d     10 meter	1 be obbi	ed Illy	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	Se     hermical     )     op three,     r     opy Cov     d     d     10 meter	1 be cobbl er Shad	ed Illy	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	Se nemical op three, r opy Cov d 10 meter Ban	1 be obbi er Shad None s) fu Des	ed Illy	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian	t/ e	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	Se nemical op three, r opy Cov d 10 meter Ban	1 be obbl er Shad None s) fu	ed Illy	□ R □ P domi	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section I Streamba Riparian Characte	t/ e Su Su <u>f</u> ank and Zone erizatio	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, erC opy Cov □ S d □ I 10 meter Ban Yes	1 be cobbl er Shad None s) fu Des k	ed elling	B R	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section I Streamba Riparian Characte	t/ e Su Su <u>f</u> ank and Zone erizatio	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, erC opy Cov □ S d □ I 10 meter Ban Yes	1 be cobbl er Shad None s) fu Des k	ed elling	B R	udge  Leaf Litter elict Shells  Other aper/fiber  Other (mant) Gravel 2_Sand Stream Bank Failure (within survey reach o Right Descending Lo	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian Characte	t/ e D Su Su <u>f</u> ank and Zone rizatio	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, erC opy Cov □ S d □ I 10 meter Ban Yes	1 be cobbl er Shad None s) fu Des k /No	ed ellly	C Ring	udge □ Leaf Litter elict Shells □ Other aper/fiber □ Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach o Right Descending Lo Bank Yes/No B	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Section H Streamba Riparian Characte Notes: 18m wette	t/ e Su Su Su <u>f</u> ank and Zone erizatio	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, erC opy Cov □ { d □ t 10 meter Ban Yes	1 be cobbl er Shad None s) fu Des k /No	ed Billy	R R	udge       Leaf Litter         elict Shells       Other         aper/fiber       Other         inant)	Pres nly) eft D	sent	/clay ?	/
Sediment Substrate Substrate Section H Streamba Riparian Characte Notes: 18m wette 1-6' bank	t/ e B Su Su Su t ank and Zone erizatio	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, er opy Cov □ S d □ I 10 meter Ban Yes	1 be cobbl er Shad <u>None</u> s) fu Des k /No	ed ellly ccent	☐ R ☐ P: domi _1	udge □ Leaf Litter elict Shells □ Other aper/fiber □ Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach o Right Descending La Bank Yes/No B	Pres nly) eft D	sent	/clay ?	/
Section H Substrate Section H Streamba Riparian Characte Notes: 18m wette 1-6' bank	t/ e B Su Su Su t ank and Zone erizatio	Normal ■ None Petroleum □ Cl Anaerobic (methane Other	□ Se nemical ) op three, er opy Cov □ S d □ I 10 meter Ban Yes	1 be cobbl er Shad <u>None</u> s) fu Des k /No	ed ellly ccent	☐ R ☐ P: domi _1	udge □ Leaf Litter elict Shells □ Other aper/fiber □ Other inant) Gravel _2_Sand Stream Bank Failure (within survey reach o Right Descending La Bank Yes/No B	Pres nly) eft D	sent	/clay ?	/

Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



1. Looking southwest (downstream) at the 30-31 Site in the North Fork Hughes River in Ritchie County, West Virginia.

Section A 1. Collector Name:	Matthey	M. Johnson	n		2 Perm	nit ID:	4/29/2016 2016.106	
1b. Surveyor(s) (Last Na	ame, Firs	st. MI)	] li 		1c. Com	ipany: Envirosc	lience Inc.	•
Johnson, M.								•
Mathias, P.								-
Abramczyk, D.							<u> </u>	-
3. Stream Name:	North F	ork Hugh	es River					•
4. Site Name:	33						_	
5. Date: MM/DD/YYYY	9/27/201	16					-	
6. Project:	North F	ork Hugh						
Section B: Survey M	ethod	Section	C: Surv	ey Time	Section	D: Surveys Con	Iducted	
! Waterscope				& Area		Transects		
! SCUBA /SSA		Total Eff	ort (min)		1	Cells		
I Snorkel		Total Are	ort (min) ea (m²)	5	1	Quantitative with	excavation	
! Other						Qualitative		
Section E			Area			Total Number	Fresh	Weather
Species	ADI	USB	LB	DSB	Other	Live	Dead	Dead
L. cardium (M)	<b> </b>	<b></b>			1	1		
O. subrotunda					1	1		L
	<b> </b>	<b></b>						<b> </b>
	<b> </b>	<b>_</b>						<b> </b>
	<b> </b>	<b></b>						
	<b> </b>	<b></b>						
			[					
		<b></b>						<b> </b>
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		╊────┤	<b> </b>					<b> </b>
	<b> </b>	╉────┤	<b> </b>				<b></b>	<b> </b>
		╉────┤						
Course Effect (min)		╉────┤	<b> </b>					
Search Effort (min)	<b> </b>	<b></b>	<b> </b>					<b></b>
Search Area (m <sup>2</sup> )		<b> </b>	<b> </b>		5			<b> </b>
					. ,	,	4	

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(front) WVDNR RBP Apr 2015

Section A

- 1. Collector Name: Matthew Johnson
- 3. Stream/Site Name: North Fork Hughes River; 44-45

4. LLID (dnr use): 5. Date (MM/DD/YYYY): 09/27/2016

6. Project: North Fork Hughes River Monitoring

9. Permitee ID: 2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	🛛 Light rain	Light rain	
	Moderate rain	Moderate rain	
	Heavy rain	Heavy rain	
	None None	D None	
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C	<u>,,</u> ,,,,,,		
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	Trash
	Pipeline crossing	Channelized	🗆 Island
	□ Ford	Bridge (pillars in stream)	Other
	D Pipeline (parallel	Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover	·	
	Debris Dam	Blow Down	Beaver Dam
	Woody debris	Other	

Section D				
Aquatic	Indicate the dominant ty	pes and record the	dominant species p	resent.
Vegetation	Rooted emergent	Rooted floating	Floating algae	None
•		□ Free floating □	□ Attached algae	Moss
		Carex sp. on bars_		
	Percent of the reach wit	h aquatic vegetation	n5% (in term	s of area)

Section E												
Watershed Features	Human Influence/Wate Features (within survey reach)	rshe	ed				0m from shore, C=within 10m, B=on the D=dominant land use (check no mo two)					
		Ρ	C	B	D		Ρ	C	B	D		
	Wall/Rip rap					Railroad (Active)						
	Railroad (rails to trails)		Γ			Railroad (Inactive)						
	Buildings		1			Landfill/trash						
	Pavement					Park/Lawn	R	R	R	R		
	Road	1			<u> </u>	Row Crops	1					
	Pasture		1			Feed lots	1					
	Logging operations		1			Mining activity						

Watersh Features			P	С	В	D		Р	C	B	D
Features Forest				_		L	Commercial/Industrial		-	<u> </u>	0
(Cont.)	-	Old field		<u> </u>	╞╾╴		Hay field		-		
. ,	F	Residential			<u> </u>		Other				
Local Watershed Eros				pert	ains	to		1			
		land use, not failing st									
		□ None	•••••								
		Moderate									
		D Heavy									
Section											
Water	Tempe	rature (°C)21 ctivity uS/cm					Water Odors				
Quality	Condu	ctivity uS/cm			Nor	mal/	None Sewage Im Chemical Other Turbidity (visual)				
_	Dissol	ved Oxygen mg/L			Pet	roleu	im 🛛 Chemical				
	pH		_		Fist	Ŋ	Other				
	Turbid	ity (mg/L)				•	Turbidity (visual)				_
	Secch	i depth (m.mm)			Clea	ar	Slightly turbid		urbio	ł	
	Meters	used:			Opa	que	□ Stained [	<b>」</b> 0	ther		
Hach Kit used Yes/No Water Sample Collected for analysis Yes/No					•	•	Water Surface Oils				
					Slic	k	🗆 Sheen 🔳 None				
					Glo	bs	□ Flecks □ Other				
	analys	is Yes/No									
		t nearest USGS gaugin	ig sta	ation	ı (cf:	s)					
	Gaugi	ng station:									
											_
Section											
Sedimen		Odors			_	-	Deposits	_	-		
Substrat		Normal 🔳 None 🗆	I Ser	wage	) (	<u> </u>	udge 🛛 Leaf Litter	Ш	San	d	
		Petroleum 🛛 Chemi	cal				elict Shells LI Other				
							aper/fiber LI Other				
	12'	Anaerobic (methane)			L			_			
		Other									
	Sul	Other ostrate Type (rank top th	ıree,	1 be	ing (	domi	nant)				_
	Sul	Other	ıree,	1 be	ing (	domi	nant)				Ĺ
	Sul	Other ostrate Type (rank top th	ıree,	1 be	ing (	domi	nant)				/
Section	Sul	Other ostrate Type (rank top the sedrockBoulder	ıree,	1 be	ing (	domi	nant) Gravel _2_Sand	_3	Silt	/clay	/
Streamb	Sul Sul H ank and	Other Ostrate Type (rank top th BedrockBoulder BedrockBoulder	ree, C	1 be obbl	ing (	domi	nant) _Gravel _2_Sand Stream Bank Failure I	_3 Pres	Silt	/clay	
Streamb Riparian	H ank and Zone	Other ostrate Type (rank top th BedrockBoulder I Canopy	Cov	1 be obbl	e 	domi	nant) Gravel 2_Sand Stream Bank Failure I (within survey reach on	_3 Pres	_Silt	/clay ?	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder I Canopy D ■ Mostly Open	Cov	1 be obbl er	ed	domi	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder Canopy Canopy Mostly Open Mostly Shaded	Cov	1 be obbl er Shad	e e ed	domi	nant) Gravel 2_Sand Stream Bank Failure I (within survey reach on	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder Canopy Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m	Cov	1 be obbl er Shad	e e ed	domi	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact	Cov	1 be obbl er Shad lone s) fu	ed	domi _1_	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending	Cov Cov Cov Cov Cov	1 be obbl er Shad lone s) fu Des	ed	domi _1_	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank	Cov Cov Cov Cov Cov Left Ban	1 be obbl er Shad lone s) fu Des k	ed	domi _1_	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian	H ank and Zone	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending	Cov Cov Cov Cov Cov	1 be obbl er Shad lone s) fu Des k	ed	domi _1_	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian Characte	H ank and Zone erizatio	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Cov Cov Cov Cov Cov Cov Cov	1 be obbl er Shad lone s) fu Des k /No	e e ed illy cent	domi _1_	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian Characte Notes:	H Bank and Zone Prization	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Left Ban Yes	1 be obbl er Shad None s) fu Des k	ed ed cenc	domi _1	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le Bank Yes/No Ba	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian Characte Notes: 23m wet	H Pank and Zone Prization	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Cov Cov Cov Cov Cov Cov Cov	1 be obbl er Shad lone s) fu Des k	ed illy cenc	domi _1	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le Bank Yes/No Ba	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian Characte Notes: 23m wett 5-15' bar	H Pank and Zone Prization	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Left Ban Yes	1 be obbl er Shad None s) fu Des k	ed el ed el	domi	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le Bank Yes/No Ba	_3 Pres	_Silt	/clay ? ndin	9
Streamb Riparian Characte Notes: 23m wett 5-15' bar	H Pank and Zone Prization	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Left Ban Yes	1 be obbl er Shad None s) fu Des k	ed el ed cenc	domi	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le Bank Yes/No Ba	_3 Pres	_Silt	/clay ? ndin	9
Streamb Riparian Characte Notes: 23m wett 5-15' bar	H Pank and Zone Prization	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Left Ban Yes	1 be obbl er Shad None s) fu Des k	ed el ed cenc	domi	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le Bank Yes/No Ba	_3 Pres	_Silt	/clay ? ndin	
Streamb Riparian Characte Notes: 23m wett 5-15' bar	H Pank and Zone Prization	Other Destrate Type (rank top the BedrockBoulder Canopy ■ Mostly Open □ Mostly Shaded Riparian Zone (10 m intact Right Descending Bank Yes/No	Cov Cov Cov Left Ban Yes	1 be obbl er Shad None s) fu Des k	ed el ed cenc	domi	nant) Gravel _2_Sand Stream Bank Failure I (within survey reach on Right Descending Le Bank Yes/No Ba	_3 Pres	_Silt	/clay ? ndin	9

#### Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



1. Looking north (downstream) at the 33 Site in the North Fork Hughes River in Ritchie County, West Virginia.



 Looking south (upstream) at the 33 Site in the North Fork Hughes River in Ritchie County, West Virginia.

	R	Aussel S	Survey	Summa	ry Data	Sheet		
Section A 1. Collector Name:	Matthey	v Johnso	n		2 Perm		4/29/2016 2016.106	
1b. Surveyor(s) (Last I					1c. Com	pany: Enviroso		•
Johnson, M.								, -
Mathias, P. Abramczyk, D.								•
								•
3. Stream Name:	North F	ork Hugh	es River					•
4. Site Name:	34-43						-	
5. Date: MM/DD/YYYY		6					-	
6. Project:		ork Hugh	es River	Monitori	na —		-	
Section B: Survey						D: Surveys Co	nducted	
! Waterscope				& Area	1	Transects		
I SCUBA/SSA		Total Eff	ort (min)		1	Cells		
I Snorkel		Total Are	ea (m²)	10		Quantitative with	h excavation	
! Other					1	Qualitative		
0			<b>A</b> 110 G			Tadal Number	Freak	
Section E			Area		Other	Total Number	Fresh	Weathered
Species	ADI	USB	LB	DSB	Other	Live	Dead	Dead
L. cardium (M) E. dilatata				<u> </u>	1 2			
E. dilatata F. flava					<u> </u>			<b></b>
1°. Ilava	-			<u> </u>	<b></b>			
		+	<u> </u>					
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Coarob Effort (min)	_							<u> </u>
Search Effort (min)				┼───	10			<u> </u>
Search Area (m <sup>2</sup> )					<u>  ''</u>	<b> </b>	<u> </u>	
NOTES	10m -	40 0.25	n <sup>2</sup> auac	l	<u>I</u>	I	<u> </u>	<u> </u>
	10111 -	-10 0.20	in quat					
							<u></u>	

(front) WVDNR RBP Apr 2015

Section A

- 1. Collector Name: Matthew Johnson
- 3. Stream/Site Name: North Fork Hughes River; 44-45

4. LLID (dnr use):

5. Date (MM/DD/YYYY): 09/27/2016 6. Project: North Fork Hughes River Monitoring 9. Permitee ID: 2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	Light rain	Light rain	
	Moderate rain	Moderate rain	
	🗖 Heavy rain	Heavy rain	
	None None		
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C			
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	🛛 Trash
	Pipeline crossing	Channelized	Island
	□ Ford	Bridge (pillars in stream)	Other
	Pipeline (parallel	Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	Beaver Dam
	Woody debris	Other	

Section D					
Aquatic	Indicate the dominant ty	ypes and record the	don	ninant species p	resent.
Vegetation	Rooted emergent	Rooted floating		Floating algae	□ None
_	Rooted submergent	Free floating		Attached algae	Moss
	Dominant species	Carex sp. on bars			
	Percent of the reach with	th aquatic vegetation		5% (in term	s of area)

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

Watersh					C	÷	D		P	C	В	] [
Features	5		orest		L	L	L	Commercial/Industrial				L
(Cont.)			ld field	_		<u> </u>		Hay field				<u> </u> _
			esidential			<u> </u>	ليسيا	Other	<u> </u>			
		la	ocal Watershed Ero ind use, not failing s None									
			Moderate									
		_	Heavy									
			Theavy					· · · · · · · · · · · · · · · · · · ·	·			
Section I	F							······································				
Water	Ter	mpera	ture (°C) 21					Water Odors				
Quality	Co	nduct	iture (°C)21 ivity uS/cm			Nor						
	Dis	solve	d Oxvaen ma/L			Pet	roleu	None	1			
	рH					Fist	IV.					
	Tui	rbidity	/ (mg/L)					Turbidity (visual)				_
	Sec	cchi d	epth (m.mm)			Cle	ar	Slightly turbid	ЦΤ	urbio	1	
	Me	ters u	sed:			Opa	aque	□ Stained		ther		
						•	•	Water Surface Oils	5			
			used Yes/No					🗆 Sheen 🔳 None				
	Wa	iter Sa	ample Collected for	Lab		Glo	bs	Flecks     Other_				
			Yes/No									
			nearest USGS gaug	ing sta	atior	1 (Cf:	5}					
	<b>^</b> _											
	Ga	uging	station:									
Section (		uging	station:									
	G	uging										
Section ( Sedimen Substrat	G it/		Odors					Deposits		San	d	
	G nt/ te		Odors ermal ■ None		wage			Deposits udge □ Leaf Litter elict Shells □ Other				
Sedimen	G nt/ te		Odors ermal ■ None		wage			Deposits udge □ Leaf Litter elict Shells □ Other				
Sedimen	G nt/ te	No   Pe   An	Odors ermal ■ None		wage			Deposits udge				
Sedimen	G nt/ te	No  Pe  An  Ot	Odors ormal ■ None troleum □ Cher aerobic (methane) her	□ Se nical	wage	e (	] SI ] R ] P	Deposits ludge □ Leaf Litter elict Shells □ Other _ aper/fiber □ Other _				
Sedimen	G nt/ te	No  Pe  An  Ot  Subs	Odors ormal ■ None troleum □ Cher aerobic (methane) her trate Type (rank top	D Sennical	wage 1 be	e ( ( eing (	] SI ] R ] P domi	Deposits ludge □ Leaf Litter elict Shells □ Other _ aper/fiber □ Other _				•
Sedimen	G nt/ te	No  Pe  An  Ot  Subs	Odors ormal ■ None troleum □ Cher aerobic (methane) her trate Type (rank top	D Sennical	wage 1 be	e ( ( eing (	] SI ] R ] P domi	Deposits ludge				•
Sedimen Substrat	G ht/ te	No  Pe  An  Ot  Subs  Bee	Odors ormal ■ None troleum □ Cher aerobic (methane) her trate Type (rank top	D Sennical	wage 1 be	e ( ( eing (	] SI ] R ] P domi	Deposits ludge	_3	_Silt	/clay	•
Sedimen Substrat Section I Streamb	G nt/ te H eank	□ No □ Pe □ An □ Ot Subs Bee	Odors ormal ■ None troleum □ Cher aerobic (methane) her trate Type (rank top drockBoulder	□ Se nical three, C	wage 1 be	e ( [ eing (	] SI ] R ] P domi	Deposits ludge	3 Pres	_Silt	/clay	•
Sedimen Substrat Section I Streamb Riparian	G nt/ te H Bank	I No Pe An Subs Bee and	Odors ormal ■ None troleum □ Cher aerobic (methane) her trate Type (rank top drockBoulder Canop	□ Se nical three, C y Cov	1 be	e ( [ eing	] SI ] R ] P domi	Deposits udge Leaf Litter elict Shells Other _ aper/fiber Other _ inant) Gravel _2_Sand Stream Bank Failure (within survey reach or	3 Pres	_Silt	/clay	Y
Sedimen Substrat Section I Streamb Riparian	G nt/ te H Bank	I No Pe An Subs Bee and	Odors ormal ■ None stroleum □ Cher aerobic (methane) her trate Type (rank top drockBoulder Canop ■ Mostly Open	□ Se nical three, C y Cov	1 be obbl	e { ling ( e ed	] SI ] R ] P domi	Deposits udge Leaf Litter elict Shells Other_ aper/fiber Other_ inant) Gravel _2_Sand Stream Bank Failure (within survey reach or Right Descending Le	3 Pres nly)	_Silt	/clay ?	Y
Sedimen Substrat Section I Streamb Riparian	G nt/ te H Bank	I No Pe An Subs Bee and	Odors ermal ■ None etroleum □ Cher aerobic (methane) her trate Type (rank top drockBoulder Canop ■ Mostly Open □ Mostly Shaded	□ Se nical three, C y Cov	1 be obbl	e ( l e ed	] SI ] R ] P domi	Deposits udge Leaf Litter elict Shells Other _ aper/fiber Other _ inant) Gravel _2_Sand Stream Bank Failure (within survey reach or	3 Pres nly)	_Silt	/clay ?	Y
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Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



1. Looking northwest (downstream) at the 34-43 Site in the North Fork Hughes River in Ritchie County, West Virginia.



 Looking southeast (upstream) at the 34-43 Site in the North Fork Hughes River in Ritchie County, West Virginia.

Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



 Looking east (upstream) at the 34-43 Site in the North Fork Hughes River in Ritchie County, West Virginia.



 Looking southwest (downstream) at the 34-43 Site in the North Fork Hughes River in Ritchie County, West Virginia.

2

Section A 1. Collector Name:	Matthev	v Johnsoi	n		2. Perm		4/29/2016 2016.106	
1b. Surveyor(s) (Last N						pany: Envirosc		
Johnson, M.								•
Mathias, P. Abramczyk, D.				·····				
								•
3. Stream Name:	North F	ork Hugh	es River					•
4. Site Name:	35							
5. Date: MM/DD/YYYY	9/27/201	6						
6. Project:	North F	ork Hugh						
Section B: Survey N	Nethod	Section	C: Surv		Section	D: Surveys Con	ducted	
! Waterscope				& Area	1	Transects		
I SCUBA/SSA		Total Eff	ort (min)			Cells		
I Snorkel		Total Are	ea (m²)	5	1	Quantitative with	excavation	
! Other					I	Qualitative		
Section E		1	Area	<u> </u>		Total Number	Fresh	Weathere
Species	ADI	USB	LB	DSB	Other	Live	Dead	Dead
N/A	-	-	•	•				
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(front) WVDNR RBP Apr 2015

Section A

- 1. Collector Name: Matthew Johnson
- 3. Stream/Site Name: North Fork Hughes River; 44-45

4. LLID (dnr use): 5. Date (MM/DD/YYYY): 09/27/2016

6. Project: North Fork Hughes River Monitoring 9. Permitee ID: 2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	Light rain	Light rain	
	Moderate rain	Moderate rain	
	D Heavy rain	Heavy rain	
	None None	D None	
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C			
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	Trash
	Pipeline crossing	Channelized	Island
	G Ford	Bridge (pillars in stream)	Other
	Pipeline (parallel	D Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	🗖 Beaver Dam
	Woody debris	□ <u>Other</u>	

Section D					
Aquatic	Indicate the dominant	types and record the	don	ninant species p	resent.
Vegetation	Rooted emergent	Rooted floating		Floating algae	
-	Rooted submergent	Free floating		Attached algae	Moss
	Dominant species	_Carex sp. on bars_			
	Percent of the reach wi	ith aquatic vegetation	n	_5% (in term	s of area)

Section E										
Watershed Features	Human Influence/Wate 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	С	B	D		P	С	В	D
	Wall/Rip rap				<u> </u>	Railroad (Active)				
	Railroad (rails to trails)					Railroad (Inactive)				
	Buildings		Γ			Landfill/trash				
	Pavement		1			Park/Lawn	R	R	R	R
	Road	1	1			Row Crops				
	Pasture		<b>[</b>			Feed lots		1		
	Logging operations		Γ			Mining activity				

Watershe	od				I C		I D		P		Ð	r
Features			orest			B		Commercial/Industrial		C	B	<u> </u>
(Cont.)	,		Id field	┥┶	╞┺─	┝┺╌	╘	Hay field	-			
			esidential		├──			Other	-			
			ocal Watershed Ero	sion (	nert	l	10	Oulei	I			
			nd use, not failing s									
			None	ni Gun		111.3	,					
		1	Moderate									
			Heavy									
					<u> </u>							
Section F	F		· · · · · · · · · · · · · · · · ·									
Water	Ten	npera	iture (°C)21 ivity uS/cm					Water Odors				
Quality	Con	iduct	ivity uS/cm			Nor	mal/	None 🛛 Sewage				
_	Diss	solve	d Oxygen mg/L			Pet	rolei	ım 🛛 Chemical				
1	pН					Fish	ıy	Other				_
	Tur	bidity	/ (mg/L)				•	U Other Turbidity (visual)				_
	Sec	chi d	epth (m.mm)	-		Clea	ar	Slightly turbid [	л т	urbic	i	
	Met	ters u	sed:			Ора	aque	Stained [	<b>_</b> 0	ther		
						-		Water Surface Oils	;			
			used Yes/No					🗆 Sheen 🔳 None				
	Wat	ter Sa	ample Collected for	Lab		Glo	bs	Flecks Other_				_
			Yes/No									
			nearest USGS gaugi	-								
	Gai		etation									
	Out	Iging	station:			_					_	
Reation (		Iging				_						
Section C	G	lging										
Sedimen	G t/		Odors					Deposits		San		
	G t/ e [		Odors ormal ■ None		wage			Deposits ludge				
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Appendix A Digital Images Recorded from the Quantitative Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



 Looking west (downstream) at the 35 Site in the North Fork Hughes River in Ritchie County, West Virginia.



2. Looking east (upstream) at the 35 Site in the North Fork Hughes River in Ritchie County, West Virginia.

Appendix B Relocation Area Monitoring







Sasemap courtery of Google.

1. Collector Name: 1b. Surveyor(s) (Last N Johnson, M.		v Johnsol st, MI)			2. Permi 1c. com	pany: Envirosc	2016.106 lience Inc.	
Mathias, P.								
Abramczyk, D.						·····		
Walters, S. 3. Stream Name:	North E	ork Hugh	as River					
		ion Area					•	
5. Date: MM/DD/YYYY			*!				•	
6. Project:		ork Hugh	es River	Monitorir	a		•	
Section B: Survey N						D: Surveys Cor	nducted	
1 Waterscope				& Area		Transects		
I SCUBA/SSA		Total Eff	ort (min)	50		Cells		
! Snorkel		Total Are		1,020		Quantitative with	n excavation	
! Other					1	Qualitative		
Section E	<b>T</b>	<u> </u>	Area			Total Number	Fresh	Weathered
Species	ADI	USB		DSB	Other	Live	Dead	Dead
N/A					0			
	<b></b>							
		L						
	<u> </u>	<u> </u>		<b> </b>				
			·	<u> </u>				
		┟────		<u> </u>				
· <u>·</u> ·····						<u> </u>		
	<u> </u>					. <u></u> .		
	1	1						
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<u></u>	<b></b>	ļ		<u> </u>				
	<b> </b>							
				<u> </u>				<u>.                                    </u>
	<u> </u>	<u> </u>	<u> </u>					
Search Effort (min)	1	1	1	1	50		<b> </b>	
Search Area (m <sup>2</sup> )					1,020			
	L							
NOTES								

#### **Mussel Survey Summary Data Sheet**

(front) WVDNR RBP Apr 2015

Section A

1. Collector Name: Matthew Johnson

3. Stream/Site Name: North Fork Hughes River; Relocation Area #1

4. LLID (dnr use):

5. Date (MM/DD/YYYY): 09/29/2016

6. Project: North Fork Hughes River Monitoring

9. Permitee ID: 2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	Light rain	Light rain	
	Moderate rain	Moderate rain	
	Heavy rain	Heavy rain	
	None None		
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C	_		
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	Trash
	D Pipeline crossing	Channelized	island
	Ford	Bridge (pillars in stream)	Other
	D Pipeline (parallel	Bridge (no pillars in	U Wall/Dike/Revet-
:	to stream)	stream)	ment/Riprap
	In Stream Cover		
	🗆 Debris Dam	Blow Down	Beaver Dam
	Woody debris	Other	

Section D										
Aquatic	Indicate the dominant types and record the dominant species present.									
Vegetation	Rooted emergent Rooted floating Floating algae None									
	□ Rooted submergent □ Free floating □ Attached algae □ Moss									
	Dominant species Water willow									
	Percent of the reach with aquatic vegetation5% (in terms of area)									

Section E						H. 1				
Watershed Features	Human Influence/Wate 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	С	В	D		P	С	В	D
	Wall/Rip rap					Railroad (Active)		1		
	Railroad (rails to trails)	1				Railroad (Inactive)		<u> </u>		
	Buildings	1				Landfill/trash				
	Pavement					Park/Lawn				
	Road					Row Crops				
	Pasture	1		1		Feed lots				
	Logging operations					Mining activity				

				<b>T</b>								
Watershe	ed		P	C	B	D		P	C	B	1	
Features	;	Forest	R	R	R	R	Commercial/Industrial					
(Cont.)		Old field		L	L	L		<u> </u>			-	
		Residential	L				Other	1 -				
		Local Watershed E	Local Watershed Erosion (pertains to									
		land use, not failin	g strean	n ba	nks)	)						
		None										
		Moderate										
		Heavy			_							
					-							
Section F	<u> </u>	erature (°C)16 uctivity uS/cm									_	
Water	Temp	erature (°C)16		_			Water Odors					
Quality	Cond	uctivity uS/cm	•		Nor	mal/	None 🗆 Sewage					
	Disso	lved Oxygen mg/L_		<u> </u>	Pete	roleu	Im 🗌 Chemical					
	pH				Fish	ıy	Other Turbidity (visual)				_	
I Urbic		dity (mg/L)		_	01-							
	Secci	ni deptn (m.mm)			Clea	ar	Slightly turbid Stained			1		
	weter	s usea:		Ц	Opa	que			tner			
	Hach	Kit used Yes/No		-	Clie I	1.	Water Surface Oils	5				
			orlah	H	SIIC	K	□ Sheen □ None □ Flecks □ Other_					
	analy	sis Yes/No			GIO	DS						
		at nearest USGS gau	uaina et:	ation	ı (cfe	2)					-	
			iania au	auvi	1 (1616	~/						
	Gaug	ing station:			•							
	Gaug	ing station:		<u></u>	-				-			
Section (		ing station:										
	G	ing station: Odors					Deposits					
Section ( Sediment Substrate	G t/ e   ■	Odors Normai 🗆 None					udge 🛛 Leaf Litter					
Sedimen	G t/ e III	Odors Normal D None Petroleum D Ch	emical	-		] Re	udge					
Sedimen	G t/ e	Odors Normal D None Petroleum D Ch Anaerobic (methane)	emical	-		] Re						
Sedimen	G t/ e U U	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other	iemical	-	e [	] R ] Pa	udge 🛛 Leaf Litter elict Shells 🗍 Other _ aper/fiber 🗍 Other _					
Sedimen	G t/ e ■ □ □ Su	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other	emical	1 be	e C C	] R ] Pa	udge 🛛 Leaf Litter elict Shells 🗍 Other _ aper/fiber 🗍 Other _ inant)					
Sedimen	G t/ e ■ □ □ Su	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other	emical	1 be	e C C	] R ] Pa	udge 🛛 Leaf Litter elict Shells 🗍 Other _ aper/fiber 🗍 Other _					
Sedimen Substrate	G t/ e □ □ □ Su 1_	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other	emical	1 be	e C C	] R ] Pa	udge 🛛 Leaf Litter elict Shells 🗍 Other _ aper/fiber 🗍 Other _ inant)					
Sedimen Substrate	G t/ e D Su 1_	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other bstrate Type (rank to Bedrock Boulde	emical	1 be	e C C	] R ] Pa	udge		Silt/c	ay		
Sedimen Substrate Section H Streamba	G t/ e U Su Su H ank an	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulder	pemical	1 be Cobt	e C C	] Ro ] Pa Jomi	udge  Leaf Litter elict Shells  Other _ aper/fiber  Other _ inant) GravelSand Stream Bank Failure	Pres	Silt/c	ay		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal D None Petroleum D Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulded d Cance	pp three,	1 be Cobt	e [ [ bing cole	] Ro ] Pa Jomi	udge  Leaf Litter elict Shells  Other _ aper/fiber  Other _ inant) Gravel Sand Stream Bank Failure (within survey reach or	Pres	Silt/c	:lay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulder d Cano n ■ Mostly Open	p three, r _2_ opy Cov	1 be Cobt	ed	] Ro ] Pa Jomi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulder d Cano m ■ Mostly Open □ Mostly Shadeo	op three, r _2_ opy Cov	1 be Cobt er Shad	e [ [ [ [ ] [ ] [] [] [] [] [] [] [] [] []	] Ro ] Pa Jomi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov	1 be Cobt er Shad	e [ [ [ [ ] [ ] [] [] [] [] [] [] [] [] []	] Ro ] Pa Jomi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov l S d _ N 0 meter	1 be Cobt er Shad lone s) fu	e [ [ [ [ [ ] [] ] ] ] ] ] ] ] ] ] ] ] ]	] Ro ] Pa domi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov d _ N 0 meter	1 be Cobt er Shad Jone s) fu	e [ [ [ [ [ ] [] ] ] ] ] ] ] ] ] ] ] ] ]	] Ro ] Pa domi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov d _ N 0 meter g Left Ban	1 be <u>Cobt</u> er Shad <u>lone</u> s) fu Des k	e [ [ [ [ [ ] [] ] ] ] ] ] ] ] ] ] ] ] ]	] Ro ] Pa domi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian	G t/ e U Su Su 1_ H ank an Zone	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov d _ N 0 meter	1 be <u>Cobt</u> er Shad <u>lone</u> s) fu Des k	e [ [ [ [ [ ] [] ] ] ] ] ] ] ] ] ] ] ] ]	] Ro ] Pa domi	udge  Leaf Litter elict Shells  Other  aper/fiber  Other  Gravel  Sand Stream Bank Failure (within survey reach or Right Descending Le	Pres	Silt/c	clay ?		
Sedimen Substrate Section I Streamba Riparian Characte	G t/ e U Su Su 1_	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov 0 S 0 meter Ban Yes	1 be Cobt er Shad Jone s) fu Des k /No	ed	I Ro Pa	udge       Leaf Litter         elict Shells       Other_         aper/fiber       Other_         inant)       Gravel       Sand         Stream Bank Failure       (within survey reach or         Right Descending       Le         Bank Yes/No       Ba	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian Characte Notes:	G t/ e U U Su Su 1_ H ank an Zone prizatio	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulder d Cano m ■ Mostly Open □ Mostly Shadeo Riparian Zone (1 intact Right Descending Bank Yes/No	op three, r _2_ opy Cov 0 S 1 D N 0 meter Ban Yes	1 be Cobb er Shad None Shad None Shad None k /No	ed illy cenc	I Romi	udge  Leaf Litter elict Shells  Other_ aper/fiber  Other_ inant) Gravel Sand Stream Bank Failure (within survey reach or Right Descending Le Bank Yes/No Ba	Pres	Silt/c	clay ?		
Sedimen Substrate Section H Streamba Riparian Characte Notes: 12m wette	G t/ e U Su Su Su Su Su Su Su erizatio	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulder d d Canc m ■ Mostly Open □ Mostly Shaded Riparian Zone (1 intact Right Descending Bank Yes/No th	op three, r _2_ opy Cov 0 S 1 O meter Ban Yes.	1 be Cobb er Shad Jone s) fu Des k /No	ed	I Ro	udge       Leaf Litter         elict Shells       Other _         aper/fiber       Other _         inant)	Pres	Silt/c	clay ?		
Section H Substrate Section H Streamba Riparian Characte Notes: 12m wette 1-5' banks	G t/ e II Su Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su Su Su Su Su Su Su Su Su Su	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other	op three, r _2_ opy Cov 0 meter 3 Left Ban Yes	1 be Cobb er Shadd lone s) fu Des k (No	ed	I Romi	udge  Leaf Litter elict Shells  Other_ aper/fiber  Other_ inant) Gravel Sand Stream Bank Failure (within survey reach or Right Descending Le Bank Yes/No Ba	Pres	Silt/c	clay ?		
Section H Substrate Section H Streamba Riparian Characte Notes: 12m wette 1-5' banks	G t/ e II Su Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su 1_ Su Su Su Su Su Su Su Su Su Su	Odors Normal □ None Petroleum □ Ch Anaerobic (methane) Other bstrate Type (rank to BedrockBoulder d d Canc m ■ Mostly Open □ Mostly Shaded Riparian Zone (1 intact Right Descending Bank Yes/No th	op three, r _2_ opy Cov 0 meter 3 Left Ban Yes	1 be Cobb er Shadd lone s) fu Des k (No	ed	I Romi	udge  Leaf Litter elict Shells  Other_ aper/fiber  Other_ inant) Gravel Sand Stream Bank Failure (within survey reach or Right Descending Le Bank Yes/No Ba	Pres	Silt/c	clay ?		

Appendix B

Digital Images Recorded from the Relocation Area Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



1. Looking at the dominant substrate in the downstream portion of the Relocation Area #1 Site in the North Fork Hughes River in Ritchie County, West Virginia.



2. Looking southeast (upstream) at the upstream portion of the Relocation Area #1 Site in the North Fork Hughes River in Ritchie County, West Virginia.

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Section A 1. Collector Name:					2. Perm	it ID:	4/29/2016 2016.106	
1b. Surveyor(s) (Last N	ame, Firs	st, MI)			1c. com	pany: Envirosc	lence inc.	
Johnson, M Mathias, P.		<u> </u>						•
Abramczyk, D.								•
3. Stream Name:	North F	ork Hughe	es River					•
4. Site Name:		ion Area #						
5. Date: MM/DD/YYYY	9/27/201	6						
6. Project:	North F	ork Hughe	s River	Monitorir	g			
Section B: Survey N	lethod	Section	C: Surv	ey Time	Section	D: Surveys Con	ducted	
I Waterscope				& Area	1	Transects		
! SCUBA/SSA		Total Effo	ort (min)	155	1	Cells		
I Snorkel		Total Are	a (m²)	3,266	1	Quantitative with	excavation	
! Other					a 1. <b>1</b> . vož	Qualitative		
Section E			Area			Total Number	Fresh	Weather
Species	ADI	USB	LB	DSB	Other	Live	Dead	Dead
A. plicata	<u> </u>				4	4		
F. flava					2	2		
L. cardium (M)					1	1		
L. cardium (F)					2	2		
E. dilatata					1	1		
Q. verrucosa (M)					2	2		
Q. verrucosa (F)	ļ	ļ				2		ļ
P. grandis				. <u> </u>		1		<u> </u>
P. alatus		<u> </u>			1	1		<u> </u>
L. siliquoidea (M)		ļ			1	1		<u> </u>
L. siliquoidea (F)	<b> </b>				2	2		<b> </b>
	<u> </u>							
			<u></u>					
· · · · · ·								
	1							<b> </b>
······································								
······································	1						-	
	1							
Search Effort (min)					155			
Search Area (m <sup>2</sup> )					3,266			
NOTES	One F	flava wa	as tado	ed (959)				1

(front) WVDNR RBP Apr 2015

Section A

1. Collector Name: Matthew Johnson

3. Stream/Site Name: North Fork Hughes River; Relocation Area #2

4. LLID (dnr use):

5. Date (MM/DD/YYYY): 09/27/2016

6. Project: North Fork Hughes River Monitoring

9. Permitee ID: 2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	nditions Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	D Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	🗇 Light rain	Light rain	
	Moderate rain	Moderate rain	
	🛛 Heavy rain	🗖 Heavy rain	
	None None		
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C			
Stream	Human Influence		
Characterization	D Engineered Dam	Pipes(inlet/outlet)	🗇 Trash
	Pipeline crossing	Channelized	Island
	Ford	Bridge (pillars in stream)	Other
	D Pipeline (parallel	Bridge (no pillars in	U Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	Beaver Dam
	Woody debris	Other	

Section D											
Aquatic	Indicate the dominant types and record the dominant species present.										
Vegetation	Rooted emergent Rooted floating Floating algae None										
	□ Rooted submergent □ Free floating □ Attached algae □ Moss										
	Dominant species Water willow										
	Percent of the reach with aquatic vegetation5% (in terms of area)										

Section E										
Watershed Features	Human Influence/Wate 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		Ρ	С	В	D
	Wall/Rip rap					Railroad (Active)				
	Railroad (rails to trails)					Railroad (Inactive)				
	Buildings					Landfill/trash				
	Pavement					Park/Lawn	L	L	L	
	Road	1				Row Crops	Τ			
	Pasture					Feed lots				
	Logging operations				_	Mining activity				

		D	С	В	D		Ρ	С	В	D
Vatershed Features Forest			R	R	R	Commercial/Industrial	•		<b>-</b>	ピ
	Id field	┢╩	<u>⊢``</u> -	<u>_^</u>		Hay field				⊢
	esidential	╂───				Othre	<u> </u>			⊢
	ocal Watershed Erosi	ion /	ne+	laine	to					L
	ind use, not failing st									
		Call	i na	linə						
1										
	<u> </u>									
empera	ture (%) 19					Water Odors				
Conduct	ivity uS/cm			Nor						
)issolve	d Oxygen mg/l		Ē	Petr	nleu					
H	a exygen mg/2	-	ñ	Fiel	N					
المعالمة المعالمة الم	· (ma m /l )		_	1 101	· <b>y</b>	Turbidity (visual)				
Secchi d	enth (m mm)		п	Cle	ar	Slightly turbid	٦т	urhir	4	
Meters used:			ō	One	anne	$\square$ Stained [	ΞÒ	ther		
			-	Opt	que	Water Surface Oils	_			
lach Kit	used Yes/No		П	Slic	k					
		ab								
nalvsis	Yes/No		-	0.0						-
		g sta	ation	n (cf:	5)					
		0								
	troleum 🛛 Chemi	cal		0	JR	elict Shells 🛛 Other _				
	laerobic (methane)			[		aper/fiber 🛛 Other _				
Subs	trate Type (rank top th	ree,	1 be	eing (	domi	inant)				
Be	drock Boulder	_3_(	Cobb	ple	1	<u>Gravel 2 Sand</u>	_	Silt/c	clay	
	<b>A</b>	0						ient	(	
one		COV	er	a at						
zation	Mostly Open									ıg
						Bank res/NO Ba	INK )	res/i	NO	
		eter	sj tu	illy						
	intact	1 - 7	<b>D</b>		11					
	Right Descending		Des	cenc	ling					
Bank Ba			••							
	Yes/No	Yes	INO							_
d-width_										_
d-width_ s						- <u>.</u>				_
d-width_ s						- <u>.</u>				-
d-width_ s						- <u>.</u>				-
	empera conduct Dissolve Urbidity Secchi d Aeters u Hach Kit Vater Sa nalysis How at u Sauging	Dissolved Oxygen mg/L H Turbidity (mg/L) Secchi depth (m.mm) Meters used: Hach Kit used Yes/No Vater Sample Collected for L malysis Yes/No Flow at nearest USGS gaugin Sauging station: Odors Normal □ None □ Petroleum □ Chemi □ Petroleum □ Chemi □ Anaerobic (methane) □ Other Substrate Type (rank top th BedrockBoulder Normal □ Mostly Open □ Mostly Shaded	Moderate   Heavy   Femperature (°C)19 Conductivity uS/cm Dissolved Oxygen mg/L Dissolved Canopy Cov Dissolved Oxygen mg/L Mostly Open Mostly ShadedN	Moderate   Heavy   Femperature (°C)19 Conductivity uS/cm Dissolved Oxygen mg/L Dissolved I None Dissolved Oxygen mg/L Dissolved Oxygen m	■ Moderate         □ Heavy         conductivity uS/cm       ■ Non         Dissolved Oxygen mg/L       □ Petn         Dissolved Oxygen mg/L       □ Fish         oH       □ Fish         ourbidity (mg/L)       □ Cleaters         bH       □ Opation         bH	■ Moderate         □ Heavy         Cemperature (°C)19         Conductivity uS/cm       ■ Normal/         Dissolved Oxygen mg/L       □ Petroleu         □ Fishy       □ Clear         Secchi depth (m.mm)       □ Clear         Meters used:       □ Opaque         Hach Kit used Yes/No       □ Slick         Vater Sample Collected for Lab       □ Globs         Inalysis Yes/No       □ Slick         Sauging station:       □ Opaque         □ Anaerest USGS gauging station (cfs)       □ Sauging station:	■ Moderate         □ Heavy         Conductivity uS/cm       ■ Normal/None       Sewage         Dissolved Oxygen mg/L       □ Petroleum       □ Chemical         □ urbidity (mg/L)       □ Clear       ■ Slightly turbid       □         □ urbidity (mg/L)       □ Clear       ■ Slightly turbid       □         □ deters used:       □ Opaque       □ Stained       □         □ deters used:       □ Opaque       □ Stained       □         □ deters used:       □ Opaque       □ Slick       ■ Sheen       □ None         □ Atach Kit used Yes/No       □ Slick       ■ Shaded       □ Other_         □ nalysis Yes/No       □ Slick       ■ Shaded       □ Other_         □ anaerobic (methane)       □ Paper/fiber       □ Other_         □ Other	■ Moderate         □ Heavy         Conductivity uS/cm       ■ Normal/None □ Sewage         Dissolved Oxygen mg/L       □ Petroleum □ Chemical         H       □ Fishy □ Other_         Turbidity (mg/L)       □ Clear ■ Slightly turbid □ T         Seechi depth (m.mm)       □ Clear ■ Slightly turbid □ T         Meters used:       □ Opaque □ Stained □ O         Water Surface Oils       Water Surface Oils         Iach Kit used Yes/No       □ Slick ■ Sheen □ None         Vater Sample Collected for Lab □ Globs □ Flecks □ Other         Inalysis Yes/No         Flow at nearest USGS gauging station (cfs)         Sauging station:	■ Moderate         □ Heavy         Gemperature (°C) _19       Water Odors         Conductivity uS/cm       ■ Normal/None □ Sewage         Dissolved Oxygen mg/L       □ Petroleum □ Chemical         DH       □ Fishy □ Other         Turbidity (mg/L)       □ Clear ■ Slightly turbid □ Turbid         Neters used:       □ Opaque □ Stained □ Other          □ Opaque □ Stained □ Other         water Surface Oils       ■ Sheen □ None         Vater Sample Collected for Lab □ Globs □ Flecks □ Other         Inalysis Yes/No       □ Slick ■ Sheen □ None         Bormal □ None □ Sewage □ Sludge □ Leaf Litter □ Sam         □ Petroleum □ Chemical □ Relict Shells □ Other         □ Anaerobic (methane) □ Paper/fiber □ Other         □ Other       Substrate Type (rank top three, 1 being dominant)          Bedrock       Substrate Type (rank top three, 1 being dominant)	■ Moderate         □ Heavy         Gemperature (°C) _19       Water Odors         Conductivity uS/cm       ■ Normal/None       Sewage         Dissolved Oxygen mg/L       □ Petroleum       Chemical         Dissolved Oxygen mg/L       □ Petroleum       Chemical         Dissolved Oxygen mg/L       □ Petroleum       Chemical         □ Urbidity (mg/L)       □ Clear       Slightly turbid         □ Gace       □ Opaque       Stained         □ Acters used:       □ Opaque       Stained         Water Sample Collected for Lab       Globs       Flecks         Iach Kit used Yes/No       □ Slick       Sheen         water sample Collected for Lab       Globs

Appendix B Digital Images Recorded from the Relocation Area Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



1. Looking southeast (downstream) at the Relocation Area #2 Site in the North Fork Hughes River in Ritchie County, West Virginia.



2. Looking southeast (upstream) at the Relocation Area #2 Site in the North Fork Hughes River in Ritchie County, West Virginia.

Appendix B Digital Images Recorded from the Relocation Area Freshwater Mussel Surveys for the Monitoring of the North Fork Hughes River, Ritchie County, West Virginia



 A single, tagged mussel (F. flava, Tag# Blue 959) was collected during relocation monitoring sampling. The piece of periostracum containing the tag broke off during handling. The detached piece was re-affixed to the shell.

# Appendix C

Bank Stabilization/Outlet Repair Project Monitoring




# Table 1. Species, Status, Numbers, and Rolative Abundance of Freshwater Mussels Collected during Transect Sampling from the Mussel Survey for the North Fork Hughes River Freshwater Mussel Monitoring In Ritchie County, WV, September 2016.

			Bes	t Condi	tion <sup>2</sup>			Length (r	nm)	s	lex
<b>9</b>	<b>6</b>	Federal WV				Relative frequency					<b>.</b> .
Species	Common Name	Status <sup>1</sup> Status <sup>1</sup>	USB	ADI	_DSB_	<u>(% total)</u>	Min	Max	Average	_Male	Female
Amblema plicata	Threeridge			21	2	13.0%	40	132	91.72	•	-
Elliptio dilatata	Spike	\$2/\$3		1		0.6%	79	79	79.00	•	•
Fusconaia flava	Wabash Pigtoe			7	1	4.5%	40	103	66.57	-	•
Lampsilis siliquoidea	Fatmucket			11	5	9.0%	56	129	100.94	9	7
Lasmigona costata	Flutedshell			5		2.8%	92	154	122.40	-	-
Leptodea fragilis	Fragilo Papershell	S2 (T)	1	35	10	26.0%	70	166	108.68	-	-
Potamilus alatus	Pink Heelspläter			8	2	5.6%	110	171	146.60	-	-
Pyganodon grandis	Giant Floater		2	40	8	28.2%	63	161	111.54	-	-
Quadrula pustulosa	Pimpleback				1	0.6%	72	72	72.00	-	-
Quadrula quadrula	Mapleleaf	S2 (T)		7	1	4.5%	32	111	80.38	-	-
Strophitus undulatus	Creeper	•••		1		0.6%	74	74	74.00	-	-
Tritogonia verrucosa	Pistolgrip	S2 (T)		5	1	3.4%	100	145	128.00	2	4
Truncilla truncata	Deertoe	S1 (E)		2	_	1.1%	44	50	47.00	. •	
Totat			3	143	31	100.0%					
No. of Species (Total Live + Dead)	:		2	12	9						

чC

<sup>1</sup> E = Endangered, SC = Special Concern. 1 = Throatened, S1(E) = WV Endangered, S2(T) = WV Threatened, EXTIR = Extrpated <sup>2</sup> FD=fresh dead shell, D=includes westhered dead and subfasili shets

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Table 2. Species, Status, Numbers, and Relative Abundance of Freshwater Mussels Collected duringQualitative Species Accumulation Curve sampling during the Mussel Survey for the North Fork HughesRiver Freshwater Mussel Monitoring in Ritchie County, WV, September 2016.

		Federal WV		Relative frequency
Species	Common Name	Status <sup>1</sup> Status <sup>1</sup>	Live	(% total)
Amblema plicata	Threeridge		45	17.4%
Epioblasma triquetra	Snuffbox	E	1	0.4%
Fusconaia flava	Wabash Pigtoe		19	7.4%
Lampsilis siliquoidea	Fatmucket		26	10.1%
Lasmigona costata	Flutedshell		3	1.2%
Lasmigona complanata	White Heelsplitter		1	0.4%
Leptodea fragilis	Fragile Papershell	S2 (T)	54	20.9%
Obliguaria reflexa	Threehomed Wartyback	•••	1	0.4%
Potamilus alatus	Pink Heelsplitter		9	3.5%
Pyganodon grandis	Giant Floater		73	28.3%
Quadrula pustulosa	Pimpleback		4	1.6%
Quadrula quadrula	Mapleleaf	S2 (T)	7	2.7%
Tritogonia verrucosa	Pistolgrip	S2 (T)	13	5.0%
Truncilla truncata	Deertoe	S1 (E)	2	0.8%
Total:			258	100.0%
No. of Species (Total Live + D	ead):		14	

<sup>1</sup> E = Endangered; SC = Special Concern; T = Threatened; S1(E) = WV Endangered; S2(T) = WV Threatened; EXTIR = Extirpated <sup>2</sup> FD=fresh dead shell, D=includes weathered dead and subfossil shells

	Transect No.	1 2 3	4	66	7	8	9.1	0 11	12	13	14.15	16 1	7 18	19	20 21	22	23 2	4 25	26	27	28 2	29 3	0 31	32	Gran	id To	tal
	0-5m																										
A. plicata																		1									1
L. stiquoidea				1									1	1								1					
L. fragilis												:	2		3												
P. grandis				1 1			1					2	1	2						1							ş
-	0-Sm Total			2 1.			1				1 Sec.	2	4	3.	) - 3	11.		: 1		1	i e	1		1			19
	5-10m																*****										
F. flava															2												2
L. fragilis									1		1		1		-				1								4
L. costata									•	1	•		•						•								4
P. alatus										•	1																2
									1																		
P. grandis																				1							1
Q. quadrula					. ,		1	1																			2
	5-10m Total	5					1	1	- 2	1	2		1.		2				1	1					÷.,		12
	10-15m																										
4. plicata					1		1	1	1				1	2						1	1						8
siliquoidea		1 1																	1								3
. fragilis		1 1			2		2	,	1		2			1			2			1							13
. costata		• •			-		-	-	•		1			•			-			•							1
P. alatus											'																
							1						1						_								2
?. grandis		1												1		1	1		2		1						7
2. pustulosa						1																					1
2. quadrula															1					1							2
. verrucosa																				1							1
	10-15m Total	2 3		1	3	1	1.3	) (	2	45	3		1 1	4	1	1	3		3	4	2						38
	15-20m												·														
. plicata					1								1		2 1		1	1									6
. flava					•			1					•		- '			-	1								3
. siliquoidea														1		4			•		1						3
			1													1				•	1						
. fragilis			1	1		1	1 1	1				1			1				1	2	1		1				13
. alatus																			1								1
. grandis					1		1	I				1		1	1 1				2				1				9
). quadrula									1	1					1 1												- 4
. undulatus																				1							1
. truncata												1			1												2
T. verrucosa												-			1				2								3
	15-20m Total		1	1	2	4	1 2	, 'a	. 1.	4		3	1	2	5.5			2	7	3	2		2				45
	20-25m				<b>.</b>				<u> </u>	_				4	. 0			· · · ·		<u> </u>	<u> </u>						
allanta	70-70III													~							_						
1. plicata														2							2						4
flava			1																	1							- 2
. freglis						1				1		1															3
costata								1						1	1												3
. alatus							1	1																			1
, grandis							2		2			1									3	1					g
. verrucosa							-		-			•									1	-					- 7
	20-25m Total		4.			4	2 1	11	2	1	· · ·	2.		3	. <b>.</b> 1		÷ ;	e .	• ,	4	- T	1				and the second s	23
	25-30m								<b>.</b>			-															
	20-3411																			~							
l. plicata															1 1					2							4
E. dilatata																			1								1
. flava												1															1
. siliquoldea		1		1			1	I						1					1			1					e
. fragilis							1	1	1	1					1		•	i				1					8
?. alatus		1					•	•	·	•			1		· 1			-		1	•	-					2
. grandis		•				1			1	1		1	1		1			2 1			2	<u>.</u>					44
						1			1	1			1		•			5 1		1	2	2	•				15
. verrucosa		1	. /						·· _	<u> </u>			. 20		<b>.</b>				-								_1
	25-30m Total	3		1		<u> </u>	1_1		_	2		2			3 2			1		_	-	4 .	<u> </u>	·			40
and Total			3 2	3. 2	2 6	4	7	7 (	59	5	5	9	6 4		11 1	2	3	52	13		4	6	3				177

Table 3. Total of Number Individuals Located Within Each Transect Segment for All Species from the Qualitative Survey





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<u>Figures 4a-i</u>. Length frequency histograms for species where a minimum of 3 individuals were collected during transect sampling as part of the freshwater mussel rip rap monitoring within the North Fork Hughes River in Ritchie County, WV.





<u>Figures 4a-i (continued)</u>. Length frequency histograms for species where a minimum of 3 individuals were collected during transect sampling as part of the freshwater mussel monitoring within the North Fork Hughes River in Ritchie County, WV.





## **Mussel Survey Summary Data Sheet**

Section A 1. Collector Name:		v Johnsor	1		2. Perm		4/29/2016 2016.106	
1b. Surveyor(s) (Last Na	me, Firs	t, MI)			1c. Com	pany: Envirosci	ence inc.	
Johnson, M.								
Mathias, P. Abramczyk, D.								
Walters, S.								
3. Stream Name:	North F	ork Hughe	s River				<u> </u>	
4. Site Name:		Bank Stal		Агеа		<del></del>		
5. Date: MM/DD/YYYY			mization					
6. Project:		ork Hughe	e Bivor f	Monitorin	~	·· ····		
Section B: Survey M	etnoa	Section	C: Surv	-	Section	D: Surveys Con	auctea	
I Waterscope				& Area	1	Transects		
I SCUBA/SSA		Total Effe	• • •	1840		Cells		
I Snorkel		Total Are	a (m <sup>-</sup> )	1840	and the second second	Quantitative with	excavation	
! Other						Qualitative		
Section E			Area			Total Number	Fresh	Weathered
Species	ADI	USB	LB	DSB	Other	Live	Dead	Dead
Amblema plicata	21			2	45	68		
Elliptio dilatata	1					1		
Fusconaia flava	7			1	19	27		
Lampsilis siliquoidea	11			5	26	42		
Lasmigona costata	5				2	7		
Leptodea fragilis	35	1		10	54	100		
	8	<u>├</u>		2	9	19		
Potamilus alatus				8	_			
Pyganodon grandis	40	2		_	73	123		
Quadrula pustulosa				1	4	5		-
Quadrula quadrula	7			1	7	15		
Strophitus undulatus	1					1		
Tritogonia verrucosa	5	<u> </u>		1	13	19		<u> </u>
Truncilla truncata	2			<u> </u>	2	4		
Lasmigona complanta				<u> </u>	1	1		
Obliquaria reflexa				[	1	1		
Epioblasma triquetra					1	1		
<u> </u>								
Search Effort (min)	600	90		250	900			
Search Area (m <sup>2</sup> )	600	90		250	900			

NOTES: ADI, USB, and DSB mussel data was collected along transects. Other data was collected during qualitative sampling between selected transects to produce species accumulation curves.

## **Current Stream and Weather Conditions**

Section A

- 1. Collector Name: Matthew Johnson
- 3. Stream/Site Name: North Fork Hughes River; Stream Bank Stabilization Area
- 4. LLID (dnr use):
- 5. Date (MM/DD/YYYY): 09/28-299/2016
- 6. Project: North Fork Hughes River Monitoring
- 9. Permitee ID: 2016.106

Weather	Current Conditions	Past 24 Hours	Past Week
Conditions	Precipitation	Precipitation	Has there been a
	Moderate or heavy rain	Moderate or heavy rain	heavy rain in the last
	shower	shower	7 days? Yes/No
	Light rain shower	Light rain shower	
	D Light rain	Light rain	
	Moderate rain	Moderate rain	
	Heavy rain	Heavy rain	
	None None		
	Sky Conditions	Sky Conditions	
	0 25 50 75 100% cloud	0 25 50 75 100% cloud	
	cover	cover	
	Air temp (°C)	Air temp (°C)	

Section C	· .		
Stream	Human Influence		
Characterization	Engineered Dam	Pipes(inlet/outlet)	🛛 Trash
	D Pipeline crossing	Channelized	Island
	□ Ford	Bridge (pillars in stream)	Other_Dam Outfall
	D Pipeline (parallel	Bridge (no pillars in	Wall/Dike/Revet-
	to stream)	stream)	ment/Riprap
	In Stream Cover		
	Debris Dam	Blow Down	Beaver Dam
	Woody debris	<u>Other</u>	

Section D		
Aquatic	Indicate the dominant types and record the dominant species present.	
Vegetation	C Rooted emergent C Rooted floating C Floating algae None	•
	■ Rooted submergent □ Free floating □ Attached algae □ Moss	3
	Dominant species Hydrilla	_
	Percent of the reach with aquatic vegetation5% (in terms of area)	)

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

Watershed	a I		P	I C	I B	D		I P	С	В	D
Features		orest		<u>├</u>	<u>–</u>	-	Commercial/Industrial		Ť		
(Cont.)		olest	_ <u>+'`</u>				Hay field	1			
		tesidential			$\square$		Other	1			-
		ocal Watershed Erc	sion (	pert	ains	to			*		
		and use, not failing									
		] None				,					
		Moderate									
		] Heavy									
						_					
Section F											
Water 1	Temper	ature (°C) 20					Water Odors           None         Sewage           Im         Chemica				
Quality 0	Conduc	tivity uS/cm			Nor	mal/	None 🛛 Sewage				
· · ·   1	Dissolv	ed Oxygen mg/L			Pet	roleu	im 🛛 Chemica	li 👘			
I	рН				Fisl	hy	Other				_
		y (mg/L)				•	Other Turbidity (visual)	)			
		lepth (m.mm)			Cle	ar	Slightly turbid	ПΤ	urbi	d	
		used:			Ора	aque	□ Stained		)ther	·	
							Water Surface Oil	S			
ī	Hach Ki	t used Yes/No			Slic	:k	🗆 Sheen 🔳 None				
1	Water S	ample Collected for	r Lab		Glo	bs	□ Sheen ■ None □ Flecks □ Other_				
1	analysi	s Yes/No									_
		nearest USGS gaug	ging st	atio	n ínf						
	Gaugin	g station:									
		g station:									
Section G											
Section G Sediment		Odors					Deposits		Sau		
Section G		Odors ormal ■ None		wag	e		Deposits ludge		Sai	nd	
Section G Sediment	6 7 8 10 10 10 10	Odors ormal ■ None etroleum □ Che	□ Se	wag	e		Deposits ludge				
Section G Sediment	2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Odors ormal ■ None etroleum □ Che naerobic (methane)	□ Se	wag	e		Deposits ludge				
Section G Sediment		Odors ormal ■ None etroleum □ Che naerobic (methane) ther	□ Se emical	wag	e	D S D R D P	Deposits ludge □ Leaf Litter elict Shells □ Other aper/fiber □ Other				
Section G Sediment	2	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top	□ Se mical	ewage, 1 be	e	D S D R D P dom	Deposits ludge			<u> </u>	-
Section G Sediment	2	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top	□ Se mical	ewage, 1 be	e	D S D R D P dom	Deposits ludge □ Leaf Litter elict Shells □ Other aper/fiber □ Other			<u> </u>	-
Section G Sediment	3 7 9 1 1 1 1 1 1 1 1 1 1 1 1 1	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top	□ Se mical	ewage, 1 be	e	D S D R D P dom	Deposits ludge		_Silt/	clay	-
Section G Sediment Substrate	2 2 2 2 2 2 3 2 3 3 3 3 3 3 3 3 3 3 3 3	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top edrockBoulder	□ Se mical	ewage, 1 be	e	D S D R D P dom	Deposits ludge		_Silt/	clay	-
Section G Sediment Substrate Substrate Substrate	A A A A A A A A B A B A A A A A A A A A A A A A	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top edrockBoulder	Semical     Set	, 1 be Cob	e eing ble	S     R     R     P     dom    1	Deposits ludge	Pre pnly)	_Silt/	clay	-
Section G Sediment Substrate Substrate Substrate Substrate	A A A A A A A A B A B A A A A A A A A A A A A A	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top edrockBoulder	Semical     Set	, 1 be Cob	e eing ble	S     R     R     P     dom    1	Deposits ludge	Pre pnly)	_Silt/	clay	-
Section G Sediment Substrate Substrate Substrate Substrate	A A A A A A A A B A B A A A A A A A A A A A A A	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded	D Se mical o three 3	, 1 be Cob /er Shac	e eing ble ded	S     R     R     P     dom    1	Deposits ludge	Pre pnly)	_Silt/ sent	clay ?	-
Section G Sediment Substrate Substrate Substrate Substrate	A A A A A A A A B A B A A A A A A A A A A A A A	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top edrockBoulder Cano ■ Mostly Open	D Se mical o three 3	, 1 be Cob /er Shac	e eing ble ded	S     R     R     P     dom    1	Deposits ludge	Pre only)	_Silt/ sent	clay ?	-
Section G Sediment Substrate Substrate Substrate	A A A A A A A A B A B A A A A A A A A A A A A A	Odors ormal ■ None etroleum □ Che naerobic (methane) ther strate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded	D Se mical o three 3	, 1 be Cob /er Shac	e eing ble ded	S     R     R     P     dom    1	Deposits ludge	Pre only)	_Silt/ sent	clay ?	-
Section G Sediment Substrate Substrate Substrate	A A A A A A A A B A B A A A A A A A A A A A A A	Odors ormal None etroleum Che naerobic (methane) ther strate Type (rank top edrock Boulder Cano Mostly Open Mostly Shaded Riparian Zone (10	Semical three, 3 py Cov	, 1 be Cob /er Shac	e eing ble ded e ully	□ S □ R □ P dom 1	Deposits ludge	Pre only)	_Silt/ sent	clay ?	-
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Section G Sediment Substrate Substrate Streamba Riparian 2 Character Notes: 30m wetter	A B C C C C C C C C C C C C C C C C C C	Odors ormal ■ None etroleum □ Che naerobic (methane) therstrate Type (rank top edrockBoulder Cano ■ Mostly Open □ Mostly Shaded Riparian Zone (10 intact Right Descending Bank Yes/No	D Se mical b three, 	wag , 1 be <u>Cob</u> yer Shac None rs) fr t Des nk s/No	e ble ble ully scen	G S R P dom	Deposits ludge	Pre only)	_Silt/ sent	clay ?	-
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Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



1. Looking west (downstream) at the DS buffer area within the freshwater mussel monitoring site downstream of Hollow Lake on the North Fork Hughes River in Ritchie County, WV.



2. Looking east (upstream) at the DS buffer area and ADI within the freshwater mussel monitoring site downstream of Hollow Lake on the North Fork Hughes River in Ritchie County, WV.





Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.

3. Looking north (upstream) across the ADI within the freshwater mussel monitoring site downstream of Hollow Lake on the North Fork Hughes River in Ritchie County, WV.



4. Looking northeast (upstream) at the ADI within the freshwater mussel monitoring site downstream of Hollow Lake on the North Fork Hughes River in Ritchie County, WV.



#### Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



5. Looking west (downstream) at the ADI within the freshwater mussel monitoring site downstream of Hollow Lake on the North Fork Hughes River in Ritchie County, WV.



6. Looking east (upstream) at the ADI and US buffer area within the freshwater mussel monitoring site downstream of Hollow Lake on the North Fork Hughes River in Ritchie County, WV.



Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



7. ES biologists conducting species accumulation curve sampling between Transects 20-21 within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



8. The general location where a live Snuffbox (*E. triquetra*) was collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.





Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.

9. A representative Flutedshell (*L. costata*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



10. A representative Mapleleaf (Q. quadrula) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



#### Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



11. A representative Pink Heelsplitter (*P. alatus*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



12. A representative Fragile Papershell (*L. fragilis*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



13. A representative (Threehorn Wartyback) *O. reflexa* collected during qualitative, species accumulation curve sampling within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



14. A representative Snuffbox (*E. triquetra*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



15. A representative Spike (*E. dilatata*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



16. A representative Fatmucket (*L. siliquoidea*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



17. A representative Threeridge (A. plicata) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



18. A representative Deertoe (*T. truncata*) collected within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



Digital Images Recorded from the Freshwater Mussel Monitoring Survey in the North Fork Hughes River, Ritchie County, WV.



19. A representative White Heelsplitter (*L. complanata*) collected during qualitative species accumulation curve sampling within the freshwater mussel monitoring site in the North Fork Hughes River in Ritchie County, WV.



# Appendix D.

# WVDNR Scientific Collector Permit and Site-Specific Approval







#### 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

Earl Ray Tomblin Governor

NUMBER 2016.106

Robert A. Fala Director

#### SCIENTIFIC COLLECTING PERMIT

Under Authority Conferred by Chapter 20, Article 2, Section 50, Code of West Virginia, As Amended

#### Matt Johnson EnviroScience, Inc. 5070 Stow Road Stow, OH 44266

Is hereby permitted to collect specimens according to the attached application and the Special Provisions on the reverse side of this permit.

This permit is not transferable and expires on September 30, 2016.

A complete list of all specimens collected will be kept and reported to the Director of the Division of Natural Resources of West Virginia no later than 45 days after the expiration date of this permit.

#### PERMIT PROVISIONS

I understand that (1) The privileges granted under this permit are not transferable, and to allow anyone other than myself to use my permit is unlawful and will be considered cause for revocation of said permit; (2) A Federal Scientific Collection Permit issued by the U.S. Department of Interior must be obtained before any migratory birds, or their nests or eggs, are collected or held in captivity: (3) The Federal Permit does not extend the privileges of the permittee beyond those granted by the Division of Natural Rescurces; (4) Permission must be obtained from either the owner or the custodian of any fenced or posted land before entering same for the purpose of collecting scientific specimens; (5) It is unlawful to carry a revolver or pistol contrary to Article VII, Chapter 61, Code of West Virginia; (6) It is unlawful to collect specimens with a gun on a Sunday; (7) It is unlawful to sell, offer for sale, barter, or offer to barter any wild animals, wild birds, fish or frogs collected; (8) When traps or nets or other devices are used UNATTENDED while exercising the privileges of this permit; (9) It is unlawful to take or attempt to take any wild animals, wild birds, fish or frogs under said permit to take or attempt to take any wild animals, wild birds, fish or frogs under said permit except for scientific collecting Permit; (9) It is unlawful to take or attempt to take any wild animals, wild birds, fish or frogs under said permit except for scientific and propagation purposes; (10) A hunting or fishing license must be obtained before specimens may be taken for sport; (11) Only those species or classes of wild birds, wild animals, fish or frogs listed below, and in the numbers stated, may be lawfully taken under said permit; and (12) I am required by law to carry my Scientific Collecting Permit, on my person while exercising the privileges granted thereunder, and to exhibit the permit to anyone requesting to see the same.

Must be signed before valid.

Signature of permittee

Chief, Wildlife Resources, WVDNR

Date of issue 3-9-16





#### 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

Earl Ray Tomblin Governor Robert Fala Director

### ADDENDUM TO SCIENTIFIC COLLECTING PERMIT NO. 2016.106

Permittee:	Matt Johnson
Address:	EnviroScience, Inc.
	5070 Stow Road
	Stow, OH 44266

Expiration Date: September 30, 2016

THE FOLLOWING PROVISIONS ARE ADDED TO THIS PERMIT: Mussel surveys are permitted on the North Fork Hughes River in the vicinity of North Bend State Park, Ritchie County (North Bend Dam and the Bank Stabilization and Outlet Repair).

Concurrence from the US Fish and Wildlife Service is required prior to surveys.

THIS ADDENDUM MUST BE ATTACHED TO ORIGINAL PERMIT.

Must be signed before valid.

Signature of permittee

Scientific Collecting Permit Coordinator

Date of issue  $\frac{1}{2} \frac{1}{2} \frac{1}{2$ 

Dale Dunford

ćrom: Sent: To: Subject: Ryan Schwegman Wednesday, January 25, 2017 10:12 AM Dale Dunford FW: North Fork Hughes Monitoring

## Ryan Schwegman

EnviroScienceInc.com "Excellence in Any Environment"

From: Douglas, Barbara [mailto:barbara\_douglas@fws.gov] Sent: Tuesday, September 13, 2016 10:45 AM To: Ryan Schwegman <rschwegman@enviroscienceinc.com>; Sargent, Barbara D <Barbara.D.Sargent@wv.gov> Cc: Clayton, Janet L <Janet.L.Clayton@wv.gov>; Christina Parsons <ccmoore@potesta.com> Subject: Re: North Fork Hughes Monitoring

Hi Ryan - I have reviewed your proposed mussel monitoring plan dated August 30, 2016 for the North Fork Hughes River North Bend Dam Construction and Bank Stabilization and Outlet Repair Projects. The Service concurs that it complies with RPM/Terms and Conditions 4.1 and 4.2 of the Biological Opinion associated with this project. You have approval to proceed with the monitoring. Thanks for your efforts putting this together. Barb

On Tue, Aug 30, 2016 at 10:20 AM, Ryan Schwegman <rp>chwegman@enviroscienceinc.com> wrote:

Janet and Barb,

Attached is the updated plan. Page 6 was addressed and section "3.1.1 Monitoring Data Analysis" was added to describe how population change will be monitored.

Obviously the sooner we can get this approved the better! The gage in Cairo looks great at the moment and we would like to get this done while conditions are prime.

Thanks

Ryan Schwegman

