Stream Restoration Incorporated
A PA Non-Profit Organization 501(c)(3)
434 Spring Street Ext., Mars, PA 16046
PH: 724-776-0161 FX: 724-776-0166 sri@streamrestorationinc.org
www.streamrestorationinc.org

Date: September 17, 2012

To: Donna Carnahan, Central Office Advisor, Bureau of Conservation and Restoration
PA Department of Environmental Protection
400 Market Street, PO Box 8555, Harrisburg, PA 17105

Elias Heferle, Regional Office Advisor, Bureau of Mining Programs
PA Department of Environmental Protection
Knox District Office, White Memorial Building, Knox, PA 16232

Re: **Final Report with Attachments**
McIntire Passive Treatment System
PADEP USEPA Section 319(h) Nonpoint Source Management Grant Program
Project #2832E/2915; Document #: 4100049700
Blacks Creek Subwatershed, Slippery Rock Creek Watershed (Ohio River Basin)
Marion Township, Butler County
902 McIntire FR & Project Summary trans.doc

A copy of the Final Report with Attachments is enclosed and is also being forwarded electronically to each recipient, as per Grant Agreement Sec. II.C. Also note that the bid documents for the project are available at http://www.biomost.com/pub/McIntirePTS/.

On the following page of this transmittal is an itemized list of enclosed documents.

Please note that some of the items listed in the Final Report Guidelines are included in the Attachments. Also note that the Financial Report Final Application for Reimbursement is being submitted under separate cover.

If you have any questions or comments, please do not hesitate to contact our office.

Please accept our sincerest appreciation for the opportunity to so dramatically improve the environment.

From: Stream Restoration Incorporated

By: Cody A. Neely, EIT Timothy P. Danehy, QEP Clifford F. Denholm, IV, Env. Sci.

Shaun L. Busler, GISP Ryan M. Mahony, Env. Sci. Bryan J. Page, Env. Chem. Margaret H. Dunn, PG

Sent: Priority Mail 03103480000107873572 (Carnahan); 03100480000107873565 (Heferle)
Email docarnahan@pa.gov; eheferle@pa.gov

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Growing our Economy
Growing our Communities
Growing Greener

2009
FINAL REPORT GUIDELINES

As your project comes to a close, the time is right to reflect on the planning, implementation, operation and maintenance, and evaluation of your project. Your final report should include a narrative description of your project, financial documentation, goals and accomplishments worksheets, photographs, and in some cases, detailed technical reports. Your final report should be organized as follows:

☒ **A. Technical Report – (4 or 5 pages)**

- ☒ 1. Narrative Description of Project (please include brief answers to the following questions):
  - ☒ a. What was the project supposed to accomplish?
  - ☒ b. What you actually did and how it differs from your plan?
  - ☒ c. What were your successes and reasons for your success?
  - ☒ d. What problems were encountered and how you dealt with them?
  - ☒ e. How your work contributed to solution of original problems?
  - ☒ f. What else needs to be done?
  - ☒ g. What are your plans for disseminating results of your work?
  - ☒ h. How well did your spending align with your budget request?
- ☒ 2. Summary in 50 words or less suitable for sharing with the public
- ☒ 3. Goals and Accomplishments Worksheets
- ☒ 4. Photographs (Digital are preferred)
- ☒ 5. Detailed Technical Reports where applicable (e.g., assessments, data, rehabilitation plans, stream channel designs, watershed protection and restoration plans) - (Filed at Regional Office or with Project Advisor)
- ☒ 6. Operation, Maintenance, and Replacement Plans

☒ **B. Financial Report – Final Application for Reimbursement Following Standard Procedures**

For additional copies of forms, please go to www.depweb.state.pa.us/growinggreener, click on "Help for Recipients."

☐ **C. Pennsylvania Stream ReLeaf – Project Data Sheet (if required)**

Complete and submit to:

DEP – Bureau of Watershed Management
P.O. Box 8555
Harrisburg, PA 17105-8555
Attn: Stream ReLeaf Program

FINAL REPORT

The elements requested in the 1000-FM-OA0056 Rev. 2/2009 PA DEP Final Report Guidelines are addressed item-by-item. The PA DEP Guidelines are in bold with the response in plain type.

A. Technical Report - (4 or 5 pages)

(Note that due to the size and complexity of the project, the Technical Report has exceeded 5 pages. Upon request of the PADEP, the Technical Report will be decreased in length.)

1. Narrative Description of Project **(please include brief answers to the following questions):**

a. What was the project supposed to accomplish?

The purpose of this project was to develop design drawings and specifications, to acquire all necessary permits and approvals, and to install a passive system to successfully treat the "worst" (priority 1) discharge from old coal mining activities in the Blacks Creek Watershed. The highly acidic, metal-bearing, mine discharge emanates from a former treatment basin **(TB1)** remaining from an old surface mining operation where refuse and fines from a coal preparation plant were placed in the backfill. Our approach included complementing previous land reclamation efforts at the site, which included the backfilling and revegetation of sludge drying beds and the installation of a low permeability "cap" through the PADEP in 2006. Other goals included working with the landowner, local government, and the Oak Ridge Pointing Dog Club in order to implement the project with limited impact to land use and to be consistent with existing comprehensive planning as described in the grant application. The conceptual passive system design submitted with the proposal, which was approved for funding through the Non-Point Source Implementation Program by letter dated 2/20/09, included the following components:

Oxidation Precipitation Channel 1 **(OPC1)** *(~25'W x ~350' L)* with step-aerator →
[to intercept AMD from existing Treatment Basin 1 (use discontinued ca. 1994 by coal company); to aid in removal of iron at low pH]

Automatic-Flushing Vertical Flow Pond **(AFVFP)** *[900 T AASHTO #1 limestone (*90% $CaCO_3$*)]* with solar-powered SmartDrain →
(to generate alkalinity & raise the pH to ~4 in order to aid in forming ferric and aluminum solids)

Settling Pond *(~10,000 sq. ft.)* →
(to allow for settling and storage of metal solids and debris)

Oxidation Precipitation Channel 2 **(OPC2)** *(~25'W x ~400' L)* →
(to allow for precipitation, and storage of metal solids and debris)

Vertical Flow Pond **(VFP)** *[1400 T limestone aggregate (90% $CaCO_3$) mixed with spent mushroom compost and single-shredded wood chips]* →
(to produce net alkaline conditions through limestone dissolution, sulfate reduction, and anaerobic decomposition; to form metal sulfides and retain remaining aluminum)

Wetland *(1/4 acre)* →
(to aerate water; to aid in forming and retaining iron solids at circumneutral pH)

Horizontal Flow Limestone Bed 1 & 2 **(HFLB1 & HFLB2)** *[1000 T AASHTO #1 limestone (90% $CaCO_3$)]* →
(to aid in forming and retaining manganese solids)

b. What you actually did and how it differs from your plan?

Due to the overwhelming generosity of the participants a much more robust passive system than proposed in the grant application Scope of Work was installed.

Component	Upgrade	Improved Function
Treatment Basin 1 **(TB1)** (existing)	**100% upgrade, as no previous improvements proposed** (drained, removed sludge, rebuilt embankment)	Improved sludge storage capacity, embankment stabilization
OPC	**300% increase in length** (750'L OPC1 & 2 increased to 3,000' L)	Additional iron removal potential at low pH
AFVFP w/SmartDrain	**11% increase in hi-cal limestone** (900T increased to 1000T)	Additional ability to increase retention time & generate alkalinity
Settling Pond	**130% increase in surface area** (10,000 sq. ft. increased to 23,000 sq. ft.)	Increased aeration, settling time, storage
Jennings VFP **(JVFP)**	**7% increase in hi-cal limestone** (1,400T increased to 1,500T limestone; with 556 CY each spent mushroom compost & wood chips)	Additional ability to increase retention time & generate alkalinity
Wetlands A, B, C & Sloped	**707% increase in surface area** (10,900 sq. ft. increased to 88,000 sq. ft.)	Additional aeration & retention time; increased solids storage; wildlife habitat
HFLB1 & HFLB2	**200% increase in hi-cal limestone** (1,000T increased to 3,000T)	Additional ability to form and to store manganese solids
Sediment Basin 1 **(SB1)** (existing)	**100% upgrade, as no previous improvements proposed** (reconstructed primary & secondary spillways)	Provided dilution and additional treatment

Dimensions/quantities rounded and approximate

Notably, all upgrades are expected to aid in increasing the longevity of the passive treatment system and in decreasing maintenance needs.

Please understand that this would not have been possible without the unwavering commitment, generosity, and support of **Quality Aggregates Inc**., the construction contract awardee.

Prior to installation of the passive system, a PAG-02 NPDES Permit for Stormwater which included other plans, permits and notifications, was successfully completed and approved (PAG-02 0010-10-020; 1/6/11). Furthermore, due to the partnership effort with the Butler County Conservation District, review fees were decreased to that level applicable during the grant request. Other donated efforts included synoptic sampling for elemental analysis at specific locations, studies by Westminster College students, and the temporary deployment of continuous data loggers for uninterrupted measurements through St. Francis University.

c. What were your successes and reasons for your success?

Project successes include expansion and implementation of the passive treatment system on time and within budget and the dramatic improvement of UNT15 and Blacks Creek. This would not have been possible without the partnership effort that included **landowners Dennis Tiche and Linda Furst; PADEP; Quality Aggregates Inc.; HARSCO Minerals; Butler County Conservation District; Oak Ridge Pointing Dog Club; BioMost, Inc.; and Stream Restoration Inc.**

d. What problems were encountered and how you dealt with them?

During construction, the main problem at the site was leakage from the passive treatment system. Leakage was observed in several components and **Mineral CSA (co-product approved by the PADEP) was generously donated by HARSCO Minerals to address the issue. Mineral CSA was used to line the OPC, AFVFP, SP and HFLBs by Quality Aggregates Inc., at no additional cost to the grant. This operation successfully eliminated noticeable leakage in these components.**

e. How your work contributed to solution of original problems?

The current effort has greatly contributed to the solution of the original problem which was the substantial degradation of an unnamed tributary **(UNT15)** and Blacks Creek by old surface coal mining activities. The dramatic improvement is demonstrated by comparing water monitoring data before and after the installation of the passive treatment system.

Table 1: Blacks Creek Before and After Implementation of the McIntire Passive Treatment System

Blacks Creek: Above UNT15 at 906-42 / Below UNT15 at BC2

	Date	Flow	pH	Alk	Acd	TFe	DFe	TMn	DMn	TAl	DAl	SO_4
Before	*05/04/10*	NM	7.1	62	-55	1.1	0.4	0.8	0.8	0.1	<0.04	166
		NM	6.7	38	-24	1.7	0.4	2.9	2.8	1.9	0.3	204
After	*03/29/12*	100	7.4	81	-56	0.9	0.4	0.9	0.9	0.1	<0.04	171
		200	7.5	84	-67	0.8	0.3	1.0	0.9	<0.04	<0.04	179
	04/27/12	100	7.4	74	-63	1.1	0.6	1.1	1.0	0.1	0.1	174
		130	7.5	81	-66	1.0	0.5	1.0	0.9	<0.04	<0.04	215
	05/24/12	100	7.8	98	-79	1.6	1.0	1.2	1.1	0.2	<0.04	183
		150	7.1	96	-80	1.0	0.2	0.9	0.9	<0.04	<0.04	232

Flow in gpm; all concentrations in mg/L; laboratory measurements of water quality; NM – not measured; Ref. www.datashed.org; Note that the "Before" sampling event was after completion of the BC16 Remediation Project (1/2009) in order to more specifically identify the impacts of the AMD addressed by the McIntire PTS.

Based on monitoring before construction of the McIntire PTS, Blacks Creek was significantly degraded by UNT15 which is fed by TB1. Comparing the upstream with the downstream data on 5/4/10, the degradation resulted in a decrease in alkalinity of 39% and an increase in total iron, manganese, and aluminum by 55%, 263%, and 1800%, respectively. Interestingly, the dissolved iron did not show an increase, indicating that the iron contribution to Blacks Creek was predominantly particulates. Also, only about 16% of the total aluminum appears to be in the dissolved form, or in other words, about 84% of the total aluminum appears to be particulates.

In contrast, after the McIntire PTS construction, **all downstream metal concentrations have not been elevated but have been decreased or essentially unchanged due to the influence of the McIntire PTS. In fact, if the improvements in the water quality can be sustained and other AMD sources addressed, Blacks Creek may be eligible for removal from the impaired waters list** as the downstream point (BC2) currently meets the Applicable Water Quality Criteria of pH 6.0-9.0; 30-day value Total Recoverable Fe, Mn, and Al of 1.50 mg/L, 1.00 mg/L, and 0.75 mg/L, respectively. [PADEP, 10/20/04 (EPA-apprv.1/19/05), Final Blacks Creek Watershed TMDL, Butler Co., For AMD Affected Segments.]

Table 2: UNT15 Before and After Implementation of the McIntire Passive Treatment System
(average values)

Samp. Pt.	Description	Flow	pH	Alk	Acd	TFe	DFe	TMn	DMn	TAl	DAl	SO_4
TB1 Raw AMD	(1996-2012) n=13-16	24	2.9	--	754	218	194	69	63	42	36	1964
RS2 UNT15 above SB1	Pre-McIntire PTS; TB1 enters UNT15 (2001-2009) n=4-8	36	2.8	0	458	61	54	43	42	25	25	1368
	Post-McIntire PTS; TB1 no longer enters UNT15 (2012) n=2	13	6.0	13	6	<1	<1	8	8	1	<1	705
SB1 UNT15 McIntire PTS final effluent	Pre-McIntire PTS (2001-2010) n=5	38	2.8	0	242	22	20	34	31	22	21	860
	Post-McIntire PTS (2012) n=3	13	6.3	82	-67	<1	<1	4	3	<1	<1	485
BC4 UNT15 at mouth; below McIntire & BC16 PTS	Pre-McIntire & Pre-BC16 PTS (1996-2007) n=7-9	116	4.3	34	42	21	14	15	14	5	2	551
	Pre-McIntire & Post-BC16 PTS (2009-2010) n=2-4	82	4.6	25	7	2	1	8	8	4	3	410
	Post-McIntire PTS (2012) n=3	95	7.6	96	-77	<1	<1	1	1	<1	<1	321

All concentrations in mg/L; laboratory measurements; Ref. www.datashed.org; Additional sample analyses for SB1 conducted prior to the installation of the McIntire PTS available at www.datashed.org

TB1: TB1 is a discharge from a former treatment basin installed during the active mining operation. Discharges MC1, MC2, and MC3 were treated with caustic until 1994. Treating the discharge from TB1 prior to entering UNT15 is the focus of the McIntire PTS.

RS2: The TB1 discharge entered UNT15 above monitoring point RS2 prior to installation of the McIntire PTS and was primarily responsible for heavily impacting UNT15. By capturing and conveying the TB1 discharge to the passive system, the impact on UNT15 has been essentially eliminated, allowing for a dramatic improvement in water quality at RS2. Note, however, that prior to passive system implementation, there was an apparent decrease in iron by ~70% which is assumed to be associated with dilution and with the formation of iron precipitates at low pH. (Compare with the ~30% decrease in manganese concentration, which indicates dilution.)

SB1: SB1 was a sediment basin installed during the active mining operation. Before installation of the passive system, TB1 was conveyed in UNT15 to SB1. Note in the above table the impact of TB1 on the SB1 effluent quality. (Earlier sampling, available at www.datashed.org, further confirms that SB1 was severely impacted by AMD for more than 15 years.) After implementation of the passive system, however, the SB1 effluent quality has dramatically improved to be net alkaline and, as related to metal concentrations, with essentially no iron and aluminum and about 90% less manganese. This dramatic improvement is thought to be associated with the same factors previously noted for the positive change in UNT15, which include the improvement due to passive treatment, leakage noted from the currently unlined passive components, and the influence of other site drainage. (See further discussion.)

BC4: As can be seen from the above table, UNT15 from the headwaters to the mouth at BC4 (~1 mile) was impacted by TB1. After construction of the BC16 passive system which was placed online 1/2009, acidity, iron, and manganese were notably decreased. Please note, however, the strikingly impressive improvement upon implementation of the McIntire PTS with UNT15 becoming net alkaline with essentially no metals. This improvement is thought to be in response to the same factors as with the SB1 effluent. [Note that UNT15 is identified on the 2010 PA Integrated Water Quality Monitoring and Assessment Report as being 0.63 miles in length and impacted by AMD (HUC 05030105; ID 126216190).]

f. What else needs to be done?

The main and on-going problem at the site is leakage from the passive treatment system, particularly noticeable during low-flow conditions. As previously noted, leakage does not appear to be occurring in the OPC, AFVFP, SP, or HFLBs, which have been lined with Mineral CSA.

Table 3: Treatment of AMD by the McIntire Passive Treatment System

Date	Component	Flow	pH	Alk	Acd	TFe	DFe	TMn	DMn	TAl	DAl	SO_4
03/29/12	TB1 (raw)	NM	2.9	0	739	133	127	66	65	54	49	1707
	OPC	NM	3.0	0	516	58	55	61	57	50	47	1459
	SP	43	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	JVFP	24	7.3	153	-67	4	4	45	43	0	0	1225
	HFLB	30	7.4	224	-185	<1	<1	2	2	<1	<1	612
	SB1	38	7.6	87	-69	<1	<1	4	4	<1	<1	433
04/27/12	TB1 (raw)	NM	2.9	0	632	164	163	66	65	48	47	1707
	OPC	NM	2.9	0	426	43	39	63	56	38	38	1705
	SP	30	3.1	0	359	33	32	57	52	46	42	1717
	JVFP	18	7.0	173	-73	7	7	69	61	<1	<1	1466
	HFLB	1	7.6	72	-58	1	<1	<1	<1	1	<1	167
	SB1	31	7.5	77	-65	<1	<1	3	3	<1	<1	536
05/24/12	TB1 (raw)	NM	2.9	0	652	167	149	72	71	51	51	1730
	OPC	NM	3.0	0	412	20	19	66	65	46	40	2008
	SP	17	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
	JVFP	0										
	HFLB	0										
	SB1	0										

Flow in gpm; all concentrations in mg/L; laboratory measurements of water quality; Note that the AFVFP was in flow-through mode for sampling events 3/29/12, 4/27/12, and 5/24/12; therefore, the flow measurements are not "pulsed" due to AFVFP flushing. The flow rate for the TB1 and OPC effluent is measured at the SP outlet, which is the JVFP influent. Ref. www.datashed.org

On all sampling dates, comparison of the JVFP influent (measured at the SP outlet) and effluent flow rate shows that the JVFP is leaking. Testing, by manipulating the water level within the JVFP, has indicated that the loss appears to occur about 1 foot below the approximate surface of the treatment media. As the earthfill embankment was constructed in lifts that were compacted by roller, leakage is thought to be occurring along the cut slope. To further support that leakage is attributed to the cut slope, no leakage was observed at the immediate toe of the earthfill embankments. In addition,

pooled water was observed on the substrate during construction after a precipitation event indicating to a degree that the leakage is not occurring in the bottom of the JVFP. In addition on 4/27/12, sections of the constructed wetlands were dry, indicating leakage from the created wetlands. The minimal HFLB effluent flow, with substantially lower sulfates, appears to be representative of seepage probably associated with the perched/semi-perched water table within the backfill. Also note on 5/24/12, which was a naturally dry, low-flow, period, no water was observed discharging from either the JVFP or SB1. (SB1 receives flow from other sources including UNT15.) At least a portion of the water leaking from the JVFP and created wetlands appears to issuing from the proximity of the probable low wall associated with the former mining operation. This seepage is intercepted by SB1.

The Slippery Rock Watershed Coalition and Stream Restoration Inc. (non-profit) are working to obtain the necessary funding to address the post-construction leakage. To date, the opportunity to again have Mineral CSA donated by project partner HARSCO Minerals appears to be feasible. A very rough estimate to line the sides (in particular the cut slope) of the JVFP and to line the bottom and the sides of the ~2-acre created wetlands is $40,000. Through an existing account held by Stream Restoration Inc. for Operation, Maintenance, and Rehabilitation of passive treatment systems in the Slippery Rock Creek Watershed, $5,000 has already been allocated to the effort, which is the current estimate for lining the JVFP cut-slope.

g. What are your plans for disseminating results of your work?

Outreach efforts relating to the innovative restoration efforts are ongoing.

- Oak Ridge Pointing Dog Club - improvement in water quality visually observed during field trials
- Westminster College Students - 4/12 & 9/12 student monitoring with oral presentations at a monthly Slippery Rock Watershed Coalition **(SRWC)** meeting and the annual Westminster College/SRWC Student Symposium (held in 12/12)
- American Society of Mining and Reclamation - Power point presentation -
  Neely, C. A., Denholm, C., Busler, S., Danehy, T., Page, B., Mahony, R., and Dunn, M., 6/2012, THE BEGINNING: Passive Treatment of a Highly Acidic Mine Drainage Discharge: *in proceedings of 2012* American Society of Mining and Reclamation, Tupelo, MS.
- *The Catalyst* - articles to be included in the SRWC monthly newsletter with over 1,000 readers
- www.datashed.org - all monitoring data with site schematic to be readily-accessible to the general public

h. How well did your spending align with your budget request?

Substantial time and resources were donated by the partners including BioMost, Inc. and Quality Aggregates Inc. for completion of this project. Nonetheless, additional funding is needed to seal leakage in the JVFP and created wetlands.

2. Summary in 50 words or less suitable for sharing with the public

The McIntire Passive Treatment System was installed through a public-private partnership effort to treat the “worst” discharge from an old coal mine within the 408-sq. mi. Slippery Rock Creek Watershed. With support from the landowners, Dennis Tiche and Linda Furst, funding from the PA Department of Environmental Protection, and

generous donations of time and resources from Quality Aggregates Inc., HARSCO Minerals, Butler County Conservation District, BioMost, Inc., local colleges, and volunteers, an innovative system which uses everything from compost and limestone to solar power was constructed. Although minor issues remain to be addressed, there has been a strikingly dramatic improvement in a highly-acidic, metal-bearing stream. Formerly a cause of degradation, now the stream improves Blacks Creek. In addition, an acidic pond that was essentially devoid of aquatic life now has water quality that is expected to sustain fish in the future.

3. **Goals and Accomplishments Worksheets** (See attached.)

4. **Photographs (Digital are preferred)** (See attached.)

5. **Detailed Technical Reports where applicable (e.g., assessments, data, rehabilitation plans, stream channel designs, watershed protection and restoration plans) - (Filed at Regional Office or with Project Advisor)**

Through an earlier, separate, grant from the PA DEP, the following Detailed Technical Report was completed prior to implementation of the McIntire Passive Treatment System. This report has been previously submitted to the PA DEP and is available online at www.datashed.org.

Slippery Rock Watershed Coalition, 1/2007, Blacks Creek Restoration Plan: *prepared by* BioMost, Inc. and Stream Restoration Inc. (non-profit); *funded through* US EPA and PA DEP 319 Program, 23pp with Appendices.

6. **Operation, Maintenance, and Replacement Plans**

Operation and maintenance of passive systems are critical in sustainability of long-term treatment. A comprehensive O&M Plan was completed in 2007 for all restoration projects within the Slippery Rock Watershed. The O&M Plan, which is available for viewing and downloading at www.datashed.org, was created to be easily updated and expanded as additional projects are implemented. The O&M Plan has been updated for the McIntire Passive Treatment System including a site inspection form and a site schematic. Future water monitoring for the TB1 discharge, individual passive treatment components, and UNT15 and Blacks Creek (upstream and downstream of the McIntire Passive Treatment System), are to be uploaded to the existing database in order to evaluate system performance and water quality improvements. (See attached.)

B. Financial Report - Final Application for Reimbursement Following Standard Procedures

The Final Application for Reimbursement is being submitted concurrently under separate cover.

C. Pennsylvania Stream ReLeaf – Project Data Sheet (if required) Complete and Submit to: DEP – Bureau of Conservation and Restoration, P.O. Box 8555, Harrisburg, PA 17105-8555, Attn: Stream ReLeaf Program

(not applicable)

Note: The McIntire Passive Treatment System was financed in part by a Federal Environmental Protection Agency Grant provided by the Pennsylvania Department of Environmental Protection. The views expressed herein are those of the authors and do not necessarily reflect the views of EPA, DEP, or any of its subagencies.

Comprehensive Timeline

Abbreviations: BioMost, Inc. (**BMI**); Butler County Conservation District **(BCCD)**; PADEP District Mining Office (**DMO**); US Environmental Protection Agency (**EPA**); Horizontal Flow Limestone Bed (**HFLB**); Auto Flush Vertical Flow Pond **(AFVFP)**; Oxidation Precipitation Channel **(OPC)**; Jennings Vertical Flow Pond **(JVFP)**; PA Department of Environmental Protection (**PA DEP**); Quality Aggregates Inc. (**QAI**); Stream Restoration Incorporated (**SRI**)

DATE	DESCRIPTION
02/02/00	Site investigation and water monitoring
02/07/00	Titration Results from Tiff Hilton in efforts to decide which pond effluent should be treated
02/10/00	Receive/compile various support letters and land owner support letter for the McIntire Efforts, for inclusion in grant proposal
02/11/00	Submitted to **PA DEP** Grants Center (1st round growing greener) – McIntire Site Proposal
05/02/00	**PA DEP** refusal of funding letter for McIntire Site Grant Proposal
08/11/00	Submitted to **PA DEP** Grants Center (2nd round growing greener) – McIntire Site Proposal
01/03/01	**PA DEP** refusal of funding letter for McIntire Site Grant Proposal
01/15/01	Site investigation and water monitoring
02/05/01	Site investigation and water monitoring
02/19/01	Site investigation and water monitoring
03/08/01	Receive/compile various support letters for McIntire Efforts, for inclusion in grant proposal
03/09/01	Submitted to **PA DEP** Grants Center (3rd round growing greener)– McIntire Mine Drainage Abatement Grant Proposal
08/03/01	**PA DEP** refusal of funding letter for McIntire Grant Proposal
12/19/02	Receive Results from **PA DEP** Bureau of Abandoned Mine Reclamation Terrain Conductivity Study (Joe Schueck, PG, PE) to identify local 'hot spots' on McIntire Site
2006	**QAI** placed 10,000 tons of waste lime to provide alkalinity to subsurface flow in areas identified by the Terrain Conductivity Study
04/13/07	Submitted to **PA DEP** Grants Center (growing greener) – McIntire Passive Treatment System Grant Proposal
08/15/07	Email from 2007 Growing Greener **PA DEP** Grants Center (Jacqueline Lincoln) requesting demonstrating a required funding match
08/15/07	Response to **PA DEP** Grants Center showing the 15% required funding match
03/05/07	**PA DEP** refusal of funding letter for McIntire Passive Treatment System Grant Proposal
05/16/08	Submitted to **PA DEP** Grants Center (growing greener) – McIntire Passive Treatment System Grant Proposal
02/20/09	**PA DEP** acceptance letter for Growing Greener Grant Proposal - McIntire Passive Treatment System, with funding coming through the **US EPA** section 319 program
04/02/09	Margaret Dunn & Cliff Denholm attend mandatory training session for grant recipients
04/28/09	Email contact with Donna Carnahan with regard to sampling points, Laboratory to be used, and QA/QC plan
04/29/09	Site Investigation and Water Monitoring
06/10/09	Letter sent to Oak Ridge Pointing Dog Club informing them that we have received funding for the grant and will be planning to install a passive treatment system in the near future with sampling and onsite investigations to take place

06/10/09	Completed state contract compliance form STD-21 for construction contracts over 100K
06/10/09	Receive original copy of executed grant agreement between **PA DEP** and **SRI** for McIntire Passive Treatment System Project
07/20/09	Submitted Growing Greener Quarterly Report to **PA DEP**
09/23/09	Site Investigation and Water Monitoring
10/15/09	Submitted Growing Greener Quarterly Report to **PA DEP**
01/11/10	Submitted Growing Greener Quarterly Report to **PA DEP**
01/20/10	Site Investigation, Water monitoring, and dye testing for passive treatment design
04/16/10	Submitted Growing Greener Quarterly Report to **PA DEP**
07/16/10	Submitted Growing Greener Quarterly Report to **PA DEP**
08/19/10	Site Investigation – locations of old oil and gas well relics, culverts etc
10/05/10	Submitted Growing Greener Quarterly Report to **PA DEP**
11/09/10	Site Investigation – road ditch and additional culvert location identified
11/12/10	Submitted Growing Greener Quarterly Report to **PA DEP**
11/12/10	E&S Plan (General NPDES Permit) completed and sent to **BCCD** for review
11/23/10	Meeting with Oak Ridge Pointing Dog Club at Jennings Environmental Education Center
12/17/10	Contractor Pre-Bid Site Visit – bid documents handed out
12/20/10	Received Butler County Conservation District General NPDES Permit Revision Letter
12/23/10	Submitted appropriate revisions to General NPDES Permit **BCCD**
01/06/11	Received General NPDES Permit Approval Letter from **BCCD**
01/11/11	Submitted Growing Greener Quarterly Report to **PA DEP**
01/14/11	Bid Opening by 4:00pm
01/18/11	Contractor Selection Announced & Notice to Proceed
03/02/11	Engineer Kevin Reichard makes pre-site visit
03/09/11	Cliff Denholm attends **US EPA** Section 319 Watershed Planning and Implementation Dialogue Meeting - State College, PA
03/21/11	Received 3 copies of proposed Amendment #1 to grant agreement between **PA DEP** and **SRI** for the McIntire Passive Treatment System project that will increase the budget to include 4 water monitoring events and data processing to Datashed
03/28/11	**SRI** completes and submits Amendment #1 & Grant Agreement Signature Page with updated simplified budget
04/06/11	Submitted Growing Greener Quarterly Report to **PA DEP**
05/11/11	Three Copies of grant agreement executed by **SRI** sent to Glenda Ferree
05/11/11	Received original executed copy of Amendment #1 to grant between **PA DEP** and **SRI** for the McIntire Passive Treatment System that increases the budget to include 4 water monitoring events and data processing to Datashed
06/21/11	Notify by email the Oak Ridge Pointing Dog Club of construction to begin in approximately a week, to schedule a pre-construction meeting for them
06/27/11	Email with Donna Carnahan stating grant expiration date is set for June 30th 2012
06/28/11	Construction Begins - Joe Puryear Construction Crew on site (lower side of the road)
06/29/11	Establish layout of **JVFP** with Joe Puryear Construction Crew – Brian via GPS
07/11/11	Communications with Oak Ridge Pointing Dog Club to set up a construction meeting

07/11/11	Construction update Joe Puryear via phone
07/12/11	Submitted Growing Greener Quarterly Report to **PA DEP**
07/13/11	Schedule construction meeting for upper side of the road with Wayne Fuchs
06/29/11	Site Visit – location, position, and layout of lower treatment components by GPS
07/16/11	Meeting with landowners and dog club – outlining construction plan
07/16/11	Site Visit - Construction of **JVFP** progress observed
07/21/11	Onsite Pre-construction resolution meeting with Landowners and all involved parties
07/25/11	Site Visit – location, position and layout of upper treatment components by GPS
07/26/11	Site Visit – field change, mark new GPS location of **OPC** and **AFVFP** -landowner request
07/26/11	Site Visit – Construction above Porter Road Begins, Existing Sediment Pond drained and discharge arranged to bypass pond, **OPC** path made through wooded area
07/28/11	Site Visit – Examination of iron precipitates in existing sediment pond & mark GPS locations for settling pond layout
08/01/11	Wayne called about **AFVFP**, saw a problem zone that we recommended to be lined with onsite clay material
08/03/11	Site Visit – Construction progress, examination and begin recovery of iron precipitates from the existing sediment pond via **BMI** Interns
08/05/11	Phone Communication with Joe Puryear on mixing ratio for **JVFP** & construction update
08/08/11	Submitted Growing Greener Quarterly Report to **PA DEP**
08/08/11	PA Environment Digest (online) articles published showing iron recovery process at McIntire Site during the project implementation
08/10/11	Construction update over the phone with Wayne Fuchs
08/11/11	Site Visit – go over approach for partial iron recovery from existing sediment pond & Site construction update from both crews, **JVFP** underdrain installed and media being placed, Wetland construction underway, **AFVFP** & Settling pond started
08/25/11	Site Visit to go over **HFLB** construction with Joe Puryear and site wide construction update. **JVFP** completed, Wetland in progress; Settling Pond, **AFVFP**, and lower **OPC** segments in progress
09/02/11	Site Visit to access status of project, Eli Heferle Knox **DMO** present, address the 'leaky' pond issue experienced on the upper side of the road, Wetland Berm height needs to be increased, **Harsco** Mineral agrees to donate needed amount of Mineral CSA to project
09/09/11	Submitted Growing Greener Quarterly Report to **PA DEP**
09/13/11	Site Tour with Donna Carnahan and construction status update, **AFVFP** – siphon vault and drain piping in place; Wetland construction nearing completion; **HFLB** construction underway;
09/27/11	Site Visit - **BMI** siphon installation for **AFVFP** and site construction status update
10/14/11	Site Visit – Construction update large scale earthwork appears to be completed, pending final site inspection walk though. Limestone placement needs to be adjusted in **OPC**.
10/18/11	Site Visit – Observe site status construction nearly completed, small improvements still needed and Agri Drain Smart Drainage System still needs to be setup by **BMI** and final site walk though to be scheduled. Water is now flowing to the bottom side of the road, no discharge from **JVFP** to this point.
10/24/11	Submitted Growing Greener Quarterly Report to **PA DEP**
01/06/12	Site Visit – Visually check flows at **JVFP** and inspect the tools that will be needed to adjust the solar panel to face the proper orientation, photos taken of the site.

01/13/12	Site Visit – Check flow rate and pH at points where water is flowing, adjust solar panel orientation, photos taken of the site.
01/19/12	Submitted Growing Greener Quarterly Report to **PA DEP**
01/20/12	Site Visit – Site monitoring check flows and pH at points where water is flowing, photos taken of the site.
01/27/12	Site Visit – Site monitoring check flows and pH at points where water is flowing, photos taken of the site.
02/03/12	Site Visit – Site monitoring and **JVFP** examination of flow rate, check flows and pH at points where water is flowing, photos taken of the site.
02/10/12	Site Visit – Site monitoring and **JVFP** examination of flow rate and start of experiment, check flows and pH at points where water is flowing, photos taken of the site.
02/22/12	Site Visit – Site monitoring and **JVFP** examination of flow rate and continue experiment, check flows and pH at points where water is flowing, photos taken of the site.
03/07/12	Site Visit – Site monitoring and **JVFP** examination of flow rate and continue experiment, check flows and pH at points where water is flowing, photos taken of the site.
03/16/12	Site Visit – Site monitoring and **JVFP** examination of flow rate and continue experiment, check flows and pH at points where water is flowing, photos taken of the site.
03/22/12	Site Visit – Site monitoring and **JVFP** examination of flow rate and continue experiment, check flows and pH at points where water is flowing, photos taken of the site.
03/29/12	Water samples collected, flow data collected, photos taken of the site
04/06/12	Submitted Growing Greener Quarterly Report to **PA DEP**
04/13/12	Westminster College Sampling Event, photos taken of the site
04/24/12	Site Visit – Site monitoring, check flows and pH at points where water is flowing, photos taken of the site.
04/27/12	Water samples collected, flow data collected, photos taken of the site
07/13/12	Multi Parameter Data Logging and As-Built surveying began, completed 8/3/12

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Growing our Economy
Growing our Communities
Growing Greener

Growing Greener
Goals and Accomplishments Worksheets

Project Name McIntire Passive Treatment System

Project Number 2832E/2915 County Butler

This Report is *(choose one)*:

☐ Project Goals

☒ Project Accomplishments *(to be submitted with final report)*

Project Type *(check all that apply)*

☐ Organization of a Watershed Group *(fill out Sheet A*)*

Watershed Assessments and Development of Restoration and/or Protection Plan
(check all that apply and fill out sheet B)*

- ☐ AML/AMD
- ☐ Non-Point Source
- ☐ Assessment
- ☐ Development of Restoration Plan
- ☐ Development of Protection Plan

Implementation of Watershed Restoration and/or Protection Project
(check all that apply and fill out Sheets C, D, E, F, and G)*

- ☒ AML/AMD
- ☐ Oil and Gas
- ☐ Non-Point Source
- ☐ Restoration
- ☐ Protection

☐ Demonstration *(fill out Sheet H*)*

☐ Education/Outreach *(fill out Sheet I*)*

*Please fill out all the appropriate information on the sheets corresponding to your project type. Leave blank any sheets or information on the sheets that do not apply to your specific project. If you have any questions call the Grants Center at 717-705-5400.

Receiving Stream Unnamed Tributary #15 to Blacks Creek/Blacks Creek Watershed/Slippery Rock Creek Watershed, Marion Twp., Butler Co.
name/location

Receiving Stream Benefits

Upstream Quality (5/4/10) Before		Upstream Quality (5/4/10) After		Downstream Quality (5/24/12) Before		Downstream Quality (5/24/12) After	
Iron	1.1	1.6	mg/L	Iron	1.7	1.0	mg/L
pH	7.1	7.8	S.U.	pH	6.7	7.1	S.U.
Acid	-55	-79	mg/L as $CaCO_3$	Acid	-24	-80	mg/L as $CaCO_3$
Alk	62	98	mg/L as $CaCO_3$	Alk	38	96	mg/L as $CaCO_3$
Al	0.1	0.2	mg/L	Al	1.9	<0.04	mg/L
Mn	0.8	0.9	mg/L	Mn	1.0	0.9	Mg/L

AMD Treatment

☐ Anoxic Limestone Drain _____ tons Limestone(LS)

☒ "Jennings" Vertical Flow Pond **(JVFP)**

1,500 tons (LS) 1,122 CY organic matter

☒ Wetlands 2 aerobic acres

_____ anaerobic acres

☐ Diversion Wells _____ #

_____ total LS capacity

☒ Settling Ponds 1# 595,134 capacity (gal.)

☒ Limestone Channel 1,200 ft. OLC _____ ft. MOLC

☒ "Auto-Flushing" Vertical Flow Pond **(AFVFP)** 1,000 tons LS

☐ Reverse Alkalinity Producing Systems _____ #

☐ Bactericide Remediation _____ lbs/acre

☐ Beneficial Use of Dredged Material _____ tons

☒ Horizontal Flow LS Bed **(HFLB)** (Mn Removal) 3,000 tons

Total Treated Flow Rate

30 gpm average 43 gpm high

Predicted lifespan of system 25 years

Sludge Capacity 25 years

Contaminants removed/Contained by system (average)

Iron 63.2 ppd Al 21.6 ppd

Mn 26.5 ppd Acid 320.5 ppd

Excess Alkalinity added 40.3 ppd

pH change 3.0 influent 7.5 effluent

AML

☐ Openings Closed _____ #

☐ High Walls Removed _____ Feet

☐ Land Remined _____ Acres

☐ Wildlife Habitat Improved _____ Acres

☐ Trees Planted _____ #

☐ Sealing Mine Portals _____ #

_____ wet or dry seal

☒ Revegetation _____ acres

☐ Grout Injection _____ tons

☐ Mine Capping _____ acres

Oil and Gas

Wells Plugged _____ #

Total Flow Before _____ gpm

Total Flow After _____ gpm

Contaminants Removed/Prevented

Iron _____ (ppd) pounds per day

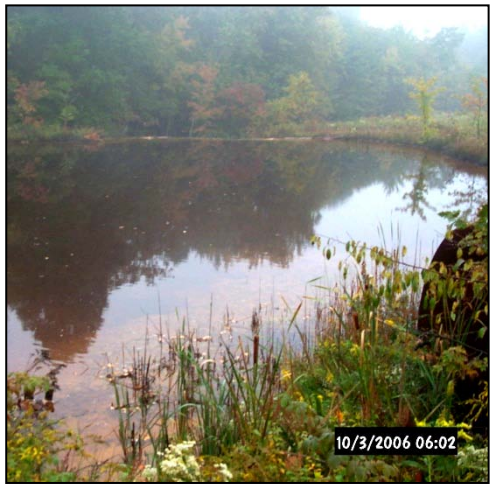
Acidity _____ (ppd)

Alkalinity _____ (ppd)

Wildlife Habitat Created _____ acres

Describe Activities to Date: The McIntire Passive Treatment System was installed to address the "worst" AMD not only in the Blacks Creek Watershed but also in the entire 408-sq. mi. Slippery Rock Creek Watershed. This project was made possible through a public-private partnership effort that included the landowners, Slippery Rock Watershed Coalition, PA Department of Environmental Protection, HARSCO Minerals, Butler County Conservation District, Quality Aggregates Inc., Oak Ridge Pointing Dog Club, BioMost, Inc., Stream Restoration Inc., and local students. Activities to date include the following: site history research and investigations, water monitoring, and the development of bid documents (design plans & specs.) and construction of an innovative passive treatment system that includes the following components: upgrade of a former Treatment Basin; 1,200-ft. Oxidation Precipitation Channel; Auto-Flush Vertical Flow Pond with solar-powered Agri-Drain Smart System and automatic siphon; Settling Pond; Jennings Vertical Flow Pond (mixed treatment media: limestone aggregate/spent mushroom compost/wood chips); 88,000 sq. ft. of aerobic wetlands; two, Horizontal Flow Limestone Beds; and upgrade of a former Sediment Basin. Student activities included recovery of low-pH iron material, multi-parameter continuous data logging of water quality, and other research.

Before-During-After Construction of the McIntire Passive Treatment System

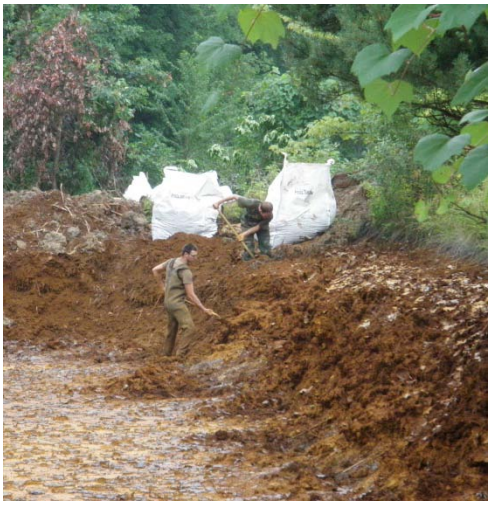







Pre-construction views of former Treatment Pond TB1 *(top row)* which receives discharges MC1, MC2, and MC3 from the old surface coal mine. The effluent of TB1 *(middle row)* forms the headwaters of UNT15. The natural formation of iron minerals at low pH, shown plugging old piping *(top-left)* and accumulating in TB1 and reconstructed UNT15 *(middle and bottom rows)* was utilized and enhanced as part of the McIntire Passive Treatment System.









Striking images of TB1 as it was drained to remove old piping and make improvements to the lower embankment while constructing a primary spillway. Unique iron formations were exposed when the existing treatment pond was drained after flowing unabated for over 17 years. The active treatment sludge *(middle-center)* remained unchanged, covered by only inches of iron precipitates. Iron deposits on the pond embankments and exposed surfaces, which were up to 3 feet thick, were recovered for further processing and potential reuse in pigment applications.





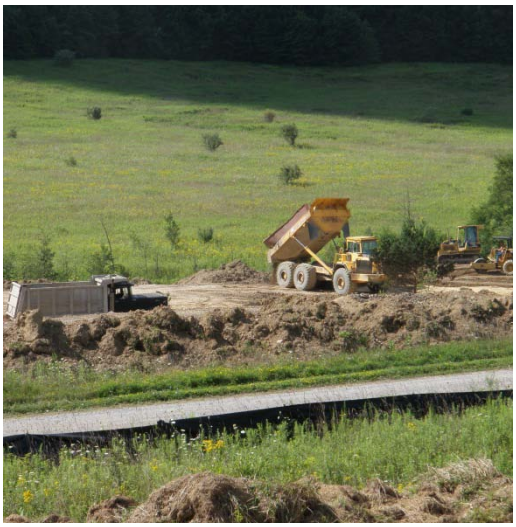




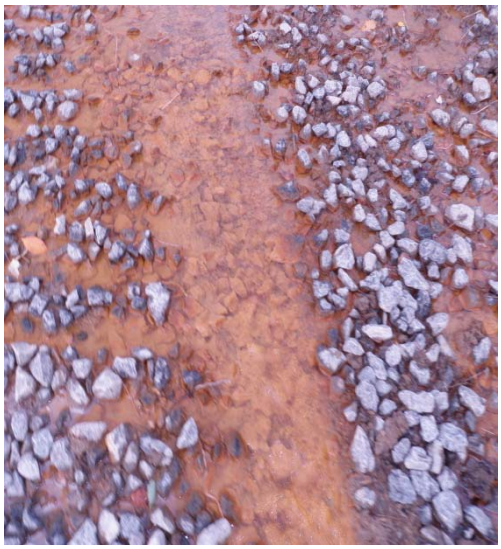
Construction photos from the treatment components north of Porter Road that were installed by Quality Aggregates Inc. employees under direction of Wayne Fuchs. The top and middle rows are scenes from the construction of the OPC, AVFVP, and Settling Pond. AFVFP siphon installation *(bottom row)* was performed by personnel from BioMost Inc., the designers of the system.






Construction photos of the treatment components south of Porter Road that were installed by employees of Quality Aggregates Inc. under direction of Joe Puryear. The top and middle rows are scenes from the construction of the JVFP and Wetland, while the bottom row shows the construction of the sloped wetlands and HFLBs. The former Sediment Basin *(bottom right)* was drained, as the outlet piping was replaced and emergency spillway was reinforced to restore hydraulic function.






Construction photos of the McIntire Passive Treatment System as the project nears completion. As seen in the middle and bottom rows revegetation efforts are underway. The system was filling with the mine drainage from TB1 *(top left)* and iron precipitates were forming in the OPC *(top middle)*. The limestone-filled Auto-Flush VFP *(top right)* with the AgriDrain "Smart Drainage System" *(middle left)* was prepared to be wired and programmed by BioMost Inc., the design company. The middle row depicts the surface of the JVFP treatment media *(center)* and the adjustable outlet pipes *(right)*. The bottom row has views of the created wetlands *(left and middle)* and the HFLB *(right)*.

Photos of the McIntire Passive Treatment System upon completion. As seen in the top left picture, wildlife including this Canada goose have begun to utilize the improved waters of SB1 (existing sediment basin). The system has been filled with mine drainage and flow has occurred throughout the system on various monitoring occasions. HFLB2 filled with water (t*op center*); Channel between the wetlands and HFLB1 conveying flow *(top right*); Baffle curtain installed in the Settling Pond *(middle left*); JVFP with water cap over the media *(middle center*); JVFP outlet risers discharging with the flow being conveyed via channel to Wetlands *(middle right*); hydrophytic plant species emerging from the wetlands *(bottom left & center*); OPC illustrating iron removal *(bottom right*).

DATA LOGGING SONDE ASSESSMENT (PRELIMINARY)

Sonde Deployment Plan Developed and Implemented by ---
KELSEA PALMER, Environmental Engineering Summer Intern, St. Francis University

The McIntire Passive Treatment System was monitored with five, unattended YSI Multi-Parameter sondes or, "data loggers" during two different monitoring events, lasting one week each. Calibration checks were completed before and after each deployment. During the first event, sondes were placed to monitor the water quality of the untreated AMD *(raw)*, OPC effluent *(OPC Outlet)*, AFVFP effluent *(Auto-Flusher Discharge)*, JVFP influent *(JVFP Inlet)*, and JVFP effluent *(Wetlands A Inlet)*. Four of the five sondes successfully recorded data from 7/10/2012 to 7/19/12. Due to improper programming before logging, the sonde located in the Settling Pond to monitor the AFVFP effluent, did not record. The sondes were then re-deployed on 7/27/2012 until 8/2/2012. During which, the locations of the sondes remained the same, except the sonde from the wetland inlet pool was used to replace the malfunctioning sonde at the AFVFP (SmartDrain) effluent. During the second monitoring event, data was successfully recorded by all four deployed sondes; however, the conductivity data recorded by the sonde at the SmartDrain effluent appeared invalid as the values are extremely low. It was determined that the problem was electrical in nature and invalid measurements were confirmed during the calibration check. The data trend, however, may correspond with true characteristics as peaks and valleys match other trends throughout the system.

Also completed during this assessment were field turbidity and alkalinity tests. The results of these tests can be compared with the trend of the logged data to confirm the characteristics of the system. These two tests were conducted at all data sonde sampling locations except for the alkalinity of the JVFP due to an error in processing.

Average Turbidity values for McIntire Treatment System
Average values; n = 4/location; performed on 7/20/2012 from 9:45 to 11:30AM

	Raw	OPC Outlet	Auto-Flusher Discharge (AFVFP)		JVFP Inlet	Wetland A Inlet
			Pre-Flush	*During Flush*		
Avg. Turbidity (NTU)	4.0	0.9	2.8	29.0	11.0	16.9

Field Alkalinity values for McIntire Treatment System
n = 1/location; performed 8/2/2012

	Raw	OPC Outlet	Auto Flusher Discharge (AFVFP)	JVFP Inlet
Alk. (mg/L as $CaCO_3$)	0	0	28	---

The following figures depict the results of selected sonde locations during the first deployment. The data for the second monitoring event was not available at the time of report preparation. Note the trends of the data are represented by individual graphs for each parameter and color coded for each location.

Figure 1: Sonde Monitoring Data for pH *(7/10/12 to 7/19/12)*

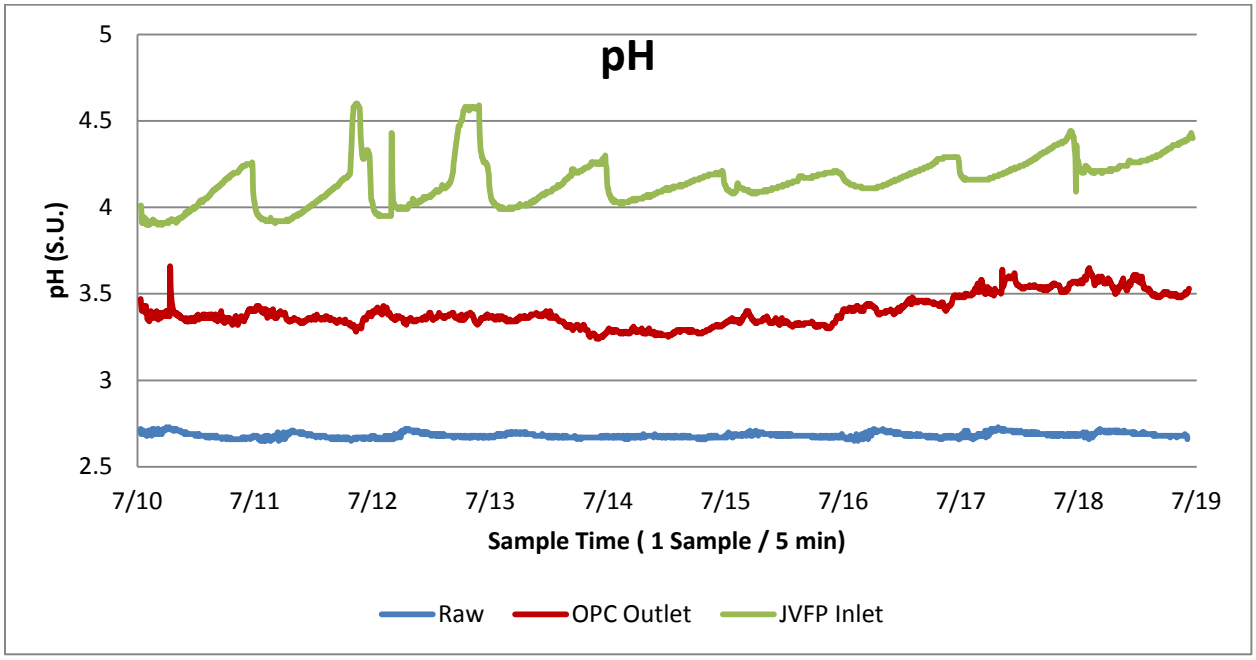


Figure 2: Sonde Monitoring Data for Specific Conductivity *(7/10/12 to 7/19/12)*

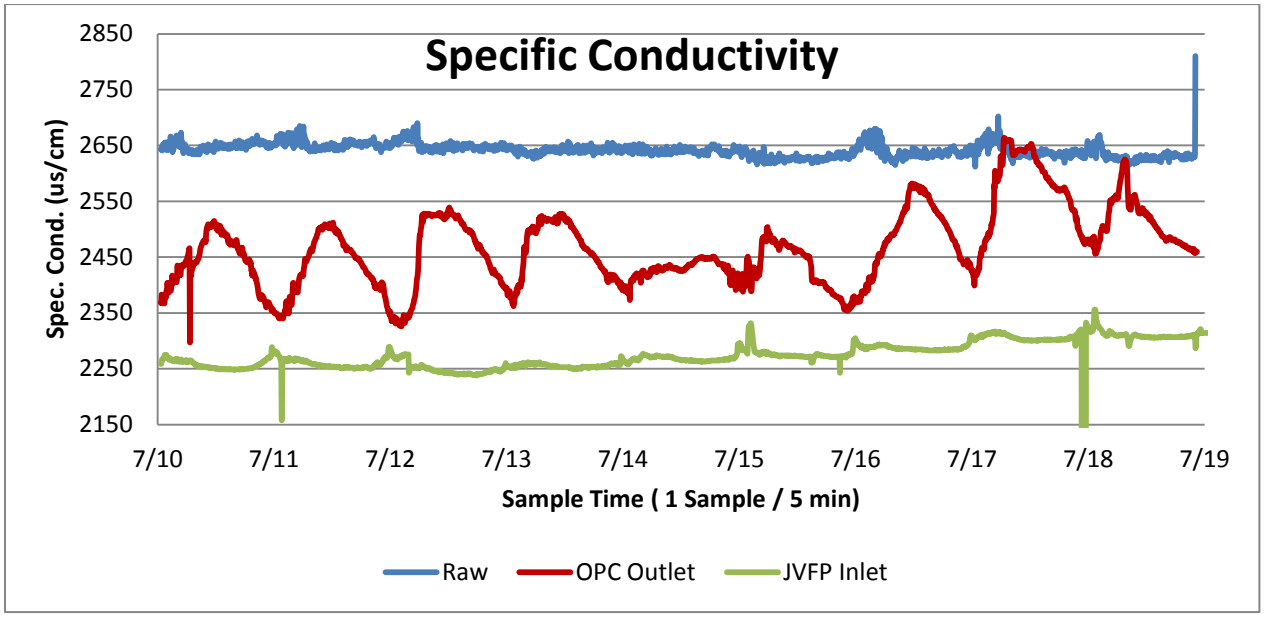


Figure 3: Sonde Monitoring Data for DO Percent Saturation *(7/10/12 to 7/19/12)*

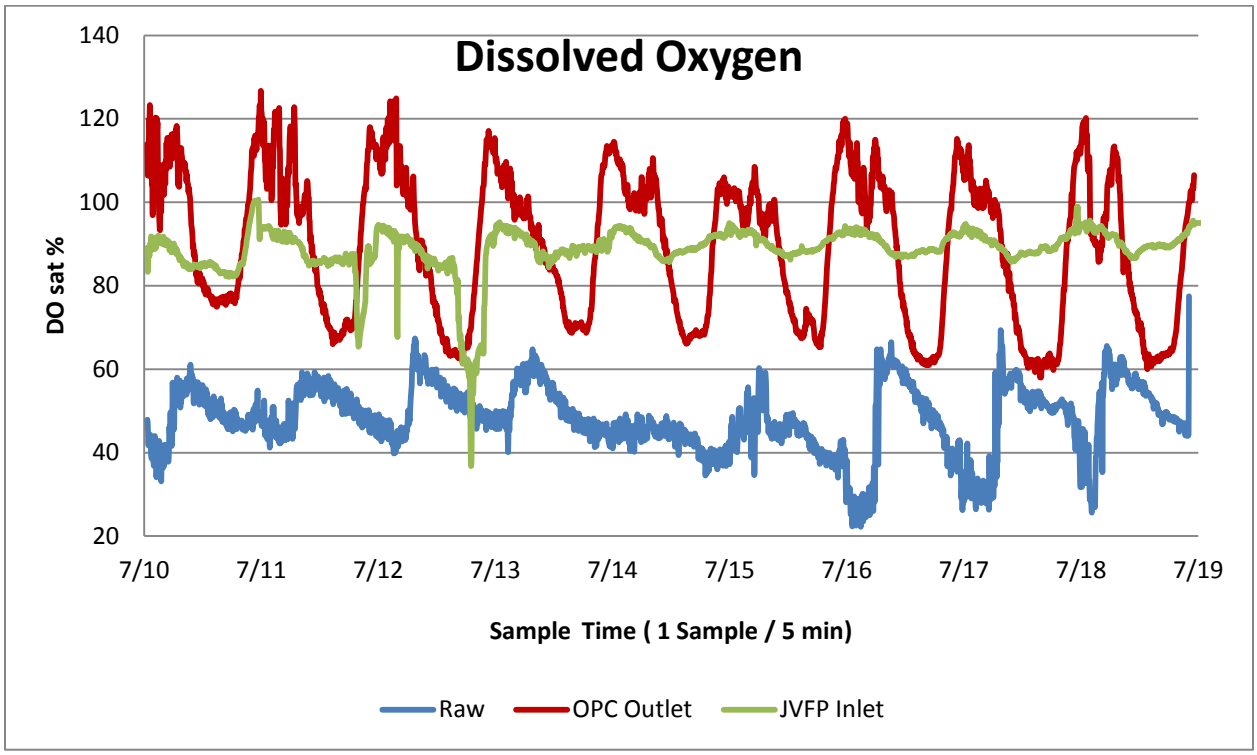
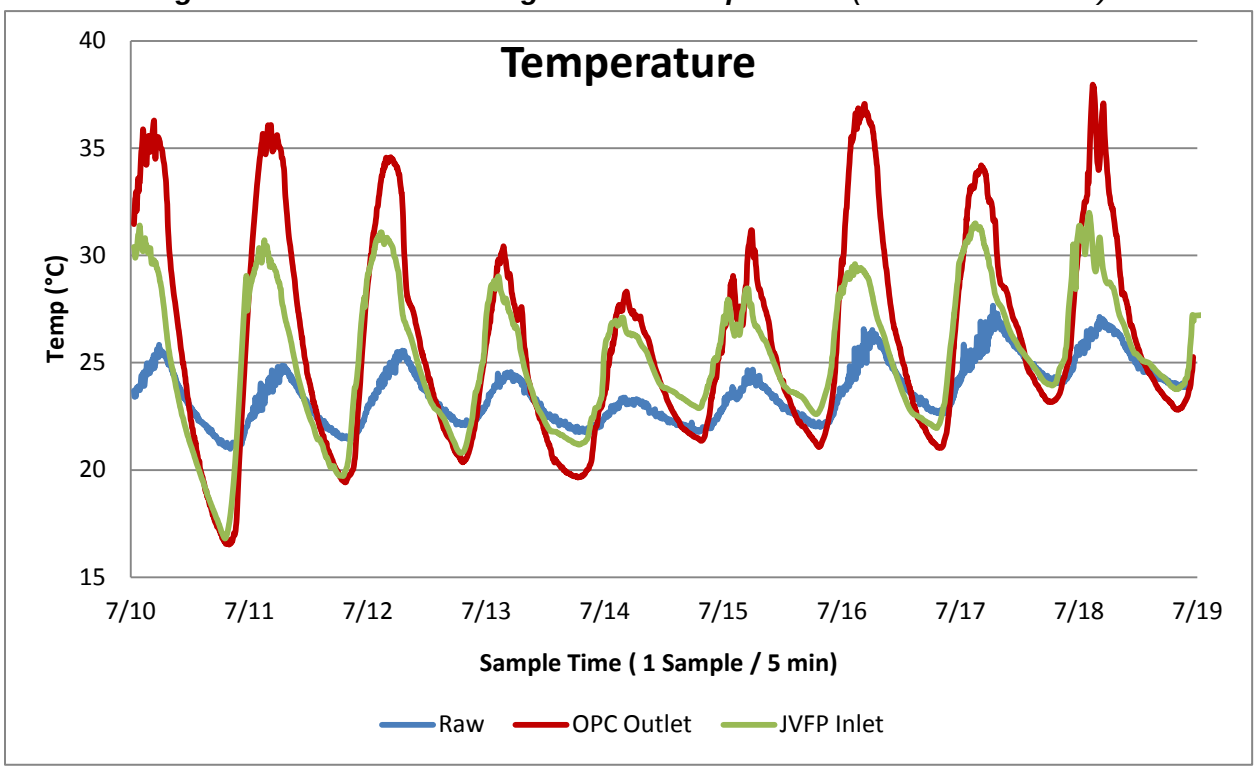


Figure 4: Sonde Monitoring Data for Temperature *(7/10/12 to 7/19/12)*



Some very general preliminary observations relating to the data collected are provided below.

pH

- Raw vs. OPC Outlet: Sustained, consistent, pH improvement at the OPC Outlet in comparison to raw water; pH improvement without alkalinity-generating component; consider sampling to evaluate conversion of ferrous to ferric;

- OPC Outlet vs. JVFP Inlet: Sustained, somewhat variable, pH improvement from limestone dissolution within the AFVFP *(OPC→AFVFP→SP→JVFP)*; note peaks appear to be in response to flushing events;

Specific Conductivity

- Raw vs. OPC Outlet: Significant decrease in specific conductivity at the OPC Outlet in comparison to raw water; potentially related to the formation of iron precipitates at low pH; fluctuations appear to be diurnal;

- OPC Outlet vs. JVFP Inlet: Significant decrease in specific conductivity at the JVFP Inlet in comparison to the OPC Outlet; AFVFP followed by SP encourages formation and removal of iron and aluminum solids; consider sampling to evaluate increased calcium concentration;

Dissolved Oxygen

- Raw vs. OPC Outlet: Significant, but variable, increase in the percent saturation of dissolved oxygen noted at the OPC Outlet in comparison to raw water; factors for consideration relating to noted supersaturation include photosynthesis and rapid heating due to OPC shallowness; fluctuations appear to be diurnal;

- OPC Outlet vs. JVFP Inlet: Fluctuations in dissolved oxygen saturation muted with passage through the AFVFP and the SP; factors for consideration relating to less pronounced fluctuations in dissolved oxygen saturation include depth of water, retention time, and inhibited photosynthesis; fluctuations appear to be diurnal;

Temperature

- Raw vs. OPC Outlet: Significant, but variable, increase in temperature due to shallowness and setting of the OPC; fluctuations appear to be diurnal;

- OPC Outlet vs. JVFP Inlet: Fluctuations in temperature mediated somewhat with passage through the AFVFP and the SP; factors for consideration include depth of water and retention time; fluctuations appear to be diurnal;

The impact of significant precipitation event(s) was not identified during the first monitoring event. Additional monitoring is recommended to reflect long-term performance of the various components and seasonal trends.

PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

9/2012

Inspection Date:		Project Name:	McIntire Passive Treatment System
Inspected by:		Municipality:	Marion Township
Organization:		County:	Butler State: PA
Time Start:	End:	Project Coordinates:	41° 10' 9.5'' Lat 79° 54' 28'' Long
Receiving Stream:	Unnamed trib	Subwatershed:	Blacks Creek Watershed: Slippery Rock Creek

Weather (circle one): Snow Heavy Rain Rain Light Rain Overcast Fair/Sunny Temp(°F): ≤32 33-40 41-50 51-60 60+

INSPECTION SUMMARY

A. Site Vegetation (Uplands and Associated Slopes)

Overall condition of vegetation on site: 0 1 2 3 4 5 (0=poor, 5=excellent, circle one) (See instructions.)

Is any reseeding required? Yes/No If yes, describe area size and identify location on Site Schematic: _____

_____

_____

B. Site Access and Parking

Is the access road & parking area passable for operation and monitoring? Yes/No?
Does the access road & parking area need maintenance? Yes/No?
Describe maintenance performed and remaining (Identify location on Site Schematic.): _____

_____

_____

C. Vandalism and "Housekeeping"

Is there litter around or in the passive system? Yes/No? If Yes, was the litter picked up? Yes/No?
Is there litter that may be considered hazardous or dangerous that requires special disposal? ? Yes/No?
Is there evidence of vandalism to the passive system? Yes/No?
Additional comments: _____

D. Ditches, Channels, Spillways

Channel Identification	Erosion Rills (Y/N)	Debris Present (Y/N)	Maintenance Performed (Y/N)	Maintenance Performed and Remaining (Indicate ditch by number i.e. 2b = AFVFP)
1. Diversion Ditch				
2. Spillways & Channels				
a. TB1				
b. AFVFP				
c. SP				
d. JVFP				
e. Wetland				
f. HFLB1				
g. HFLB2				
h. SB1				

E. Wildlife Utilization

Animals sighted or tracks observed _____
Invasive plants observed _____
Describe any damage caused to treatment system by wildlife (especially muskrats) and required maintenance:

F. Passive Treatment System Components

Component	Erosion Rills (Y/N)	Berms Stable (Y/N)	Vegetation Successful (Y/N)	Siltation Significant (Y/N)	Water Level Change (Y/N)	Valves Operable (Y/N)	Maintenance Performed and Remaining Indicate which component i.e. 902-OPC
TB1						*N/A*	
902-OPC						*N/A*	
902-AFVFP							
902-SP						*N/A*	
902-JVFP							
902-WL						*N/A*	
902-HFLB1							
902-HFLB2							
SB1						*N/A*	

Additional Comments (plugged pipes, plugged treatment media, broken pipes, etc:_____

_____

_____

_____

_____

G. VFPs – Use Bucket and Stopwatch method (Indicate no flow by entering "0" in Gallons Measured)

[A maximum of 4 pipes will be discharging for the JVFP. Each discharge pipe has been assigned a number. This pipe can be matched to the as-built using the layer and quadrant #]

902-JVFP				
Pipe #	pH	Alk.	Flow	
			gals.	sec.
1				
2				
3				
4				
Overflow				

Did the Auto-Flushing Vertical Flow Pond (AFVFP) flush while on site? Yes/No?
Was the AFVFP manually flushed? Yes/No?
Is Auto-flusher in flow through mode? Yes/No?
Has the solar power panel and/or control box been damaged? Yes/No?
Was Jennings Vertical Flow Pond (VFP1) flushed? Yes/No?
Are any of the pipes broken? Yes/No? Please identify _____
Additional Comments: _____

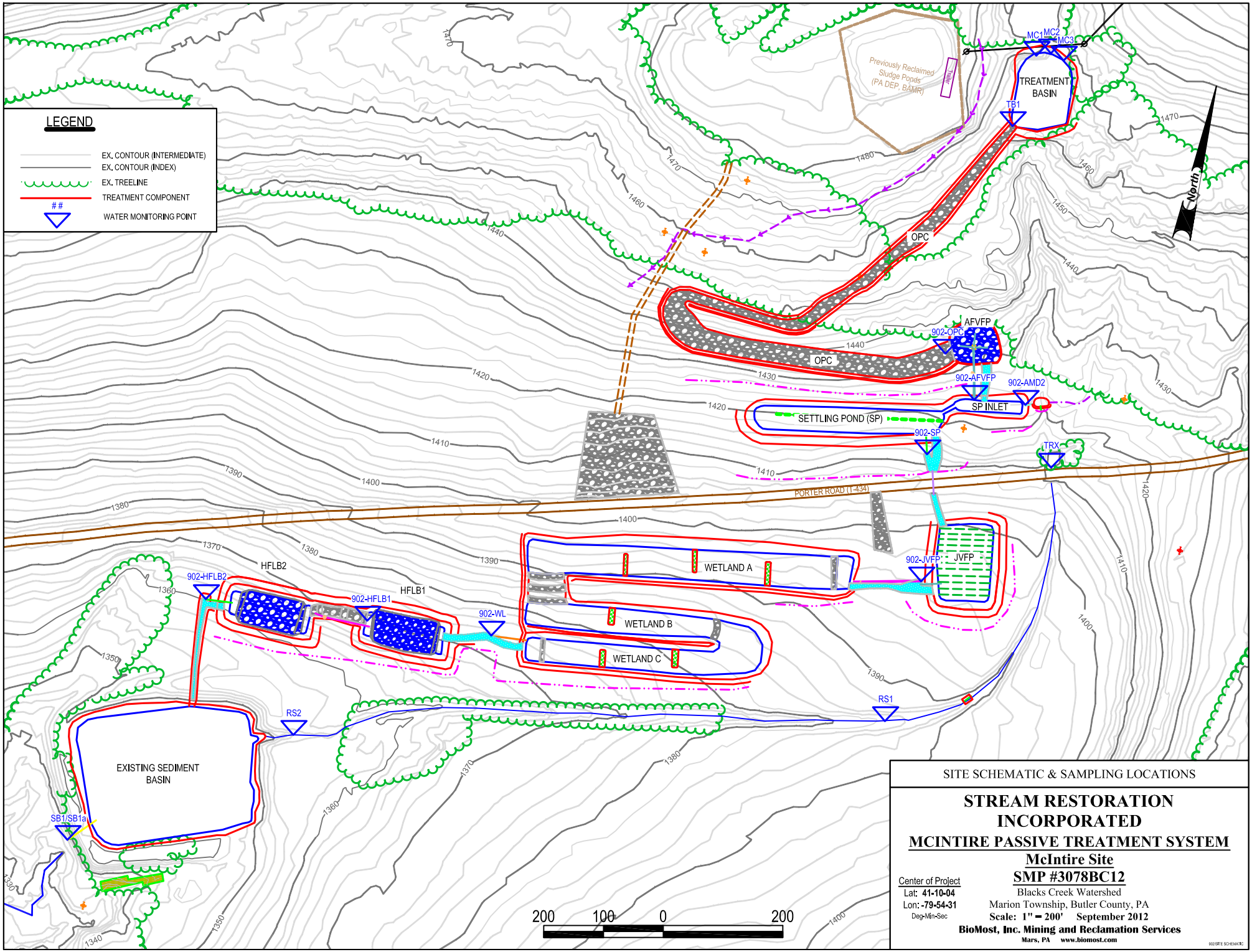
_____

_____

H. Field Water Monitoring and Sample Collection - Raw water sample locations as marked on plan. For passive components sample effluent.

☐ - Not monitored

Sampling Point	Flow		pH	Temp (°C)	ORP	Alkalinity (mg/L)	DO (mg/L)	Iron (mg/L)	Comments	Bottle #	Bottle # (total metals)	Bottle # (diss. metals)
	gals	sec.										
MC1 (6" pipe)												
MC2 (12" pipe)												
TB1												
902-OPC												
902-AFVFP												
902-AMD2												
902-SP												
902-JVFP												
902-WL												
902-HFLB1												
902-HFLB2												
RS2												
SB1												



SITE SCHEMATIC & SAMPLING LOCATIONS

STREAM RESTORATION INCORPORATED

MCINTIRE PASSIVE TREATMENT SYSTEM

McIntire Site

SMP #3078BC12

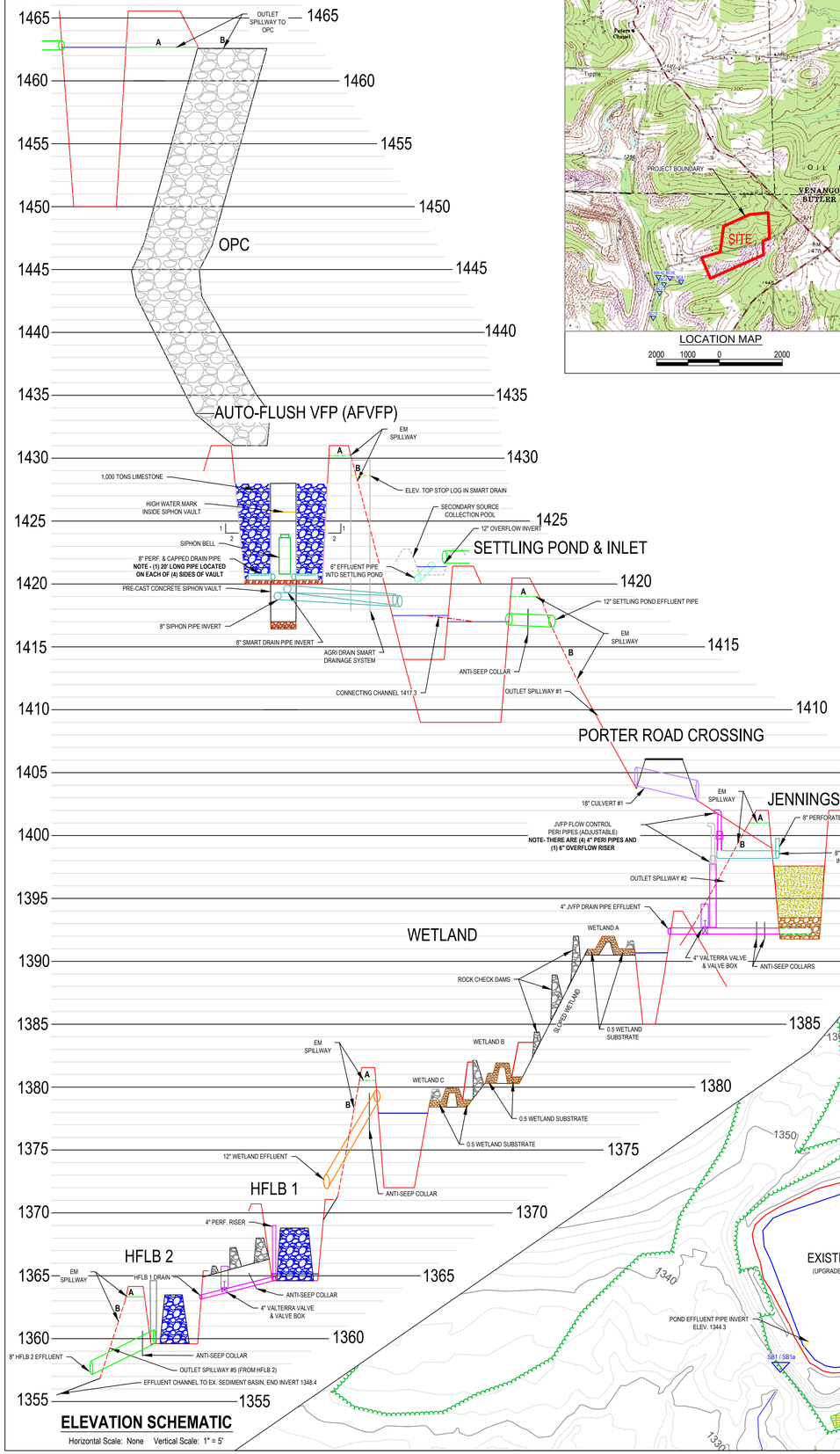
Center of Project
Lat: **41-10-04**
Lon: **-79-54-31**
Deg-Min-Sec

Blacks Creek Watershed
Marion Township, Butler County, PA
Scale: 1" = 200' September 2012

BioMost, Inc. Mining and Reclamation Services
Mars, PA www.biomost.com

803SITE SCHEMATIC

EXISTING TREATMENT BASIN



ELEVATION SCHEMATIC

Horizontal Scale: None Vertical Scale: 1" = 5'

LOCATION MAP

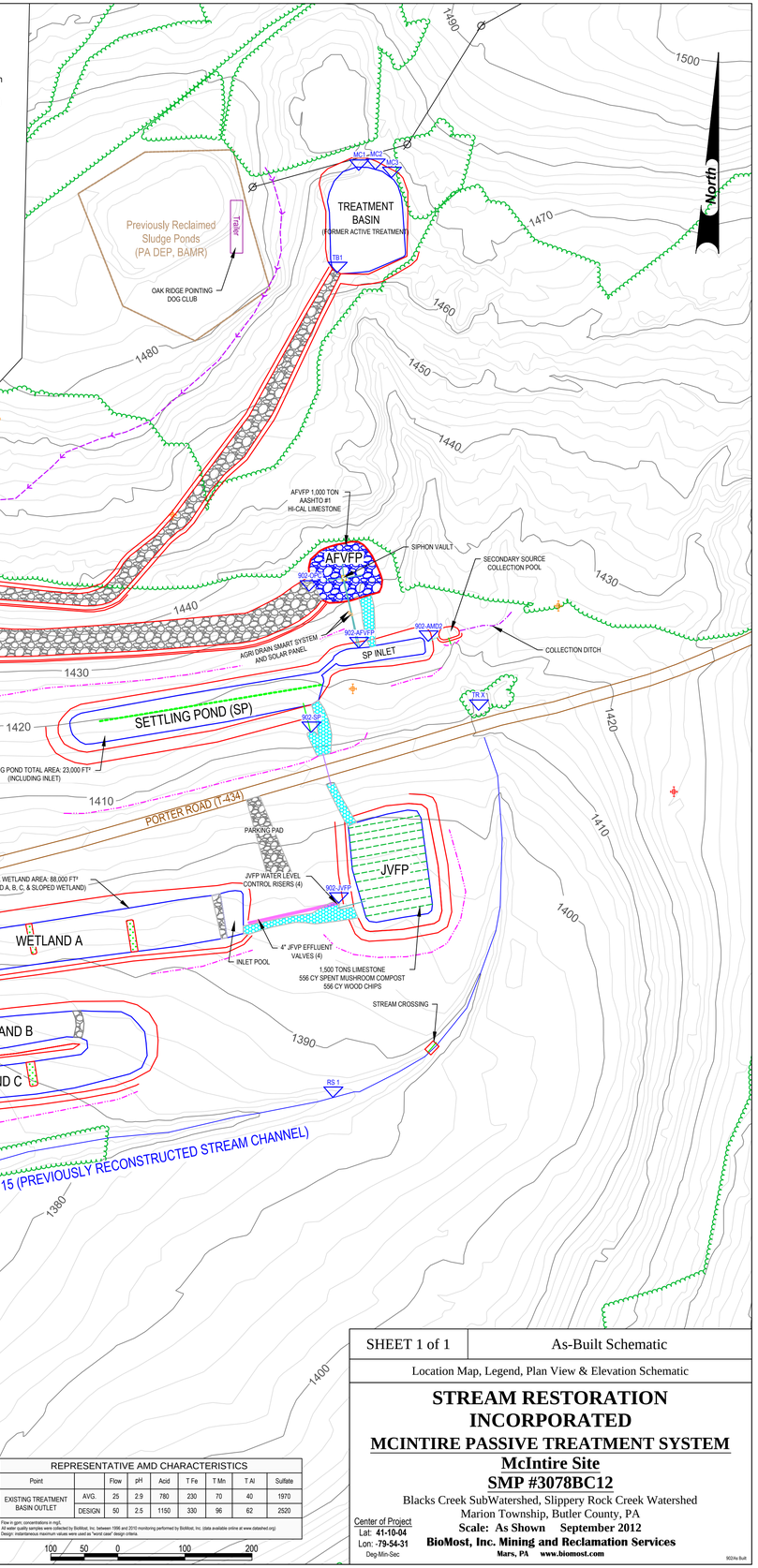
2000 1000 0 2000

LEGEND

- EX. CONTOUR (INTERMEDIATE)
- EX. CONTOUR (INDEX)
- EX. ROADS
- EX. DIRT ROAD
- EX. TREELINE
- TOE OF EMBANKMENT (APPX)
- WATER LEVEL
- DIVERSION DITCH
- COLLECTION DITCH
- TREATMENT COMPONENT
- BAFFLE CURTAIN
- 3" SCH 40 PVC PIPE
- 4" SDR35 PVC PERF. PIPE
- 4" SDR35 PVC PIPE
- 6" SCH40 PVC PIPE
- 8" SDR35 PVC PIPE
- 12" SDR35 PVC PIPE
- 12" TYPE S HDPE PIPE
- 18" TYPE S HDPE PIPE
- 24" TYPE S HDPE PIPE
- WETLAND DIRECTIONAL BARRIERS
- JVFP TREATMENT MEDIA
- AASHTO #57 AGGREGATE
- AASHTO #1 LIMESTONE CHANNEL LINING
- AASHTO #1 LIMESTONE TREATMENT MEDIUM
- R - 4 LIMESTONE
- E & S CONTROL GEO-TEXTILE
- ABANDONED OIL/GAS WELLS
- OPERATIONAL OIL/GAS WELLS
- ## WATER MONITORING POINT

NOTES:

1. As-built information from 07-13-12 field inspection by BioMost, Inc. using post-processed, submeter - rated GPS unit and laser level as well as design information. Information shown is a reasonable representation of actual field conditions. Base map contours derived from a 2006 bare-earth digital elevation model constructed from PAMAP LiDAR elevation points by PA DCNR, Bureau of Topographic and Geologic Survey [PA State Plane - North (US Survey Foot) NAD83 (Vertical datum - NAVD88)].
2. Water elevations may vary due to outlet spillway, weather and other factors.
3. All dimensions are in feet unless otherwise noted.
4. Emergency spillway segments A & B correspond to the flat section through the embankment (A) and the sloped section on the outslope of the pond embankment (B)



REPRESENTATIVE AMD CHARACTERISTICS

Point		Flow	pH	Acid	T Fe	T Mn	T Al	Sulfate
EXISTING TREATMENT BASIN OUTLET	AVG.	25	2.9	780	230	70	40	1970
	DESIGN	50	2.5	1150	330	96	62	2520

Flow in gpm; concentrations in mg/l
All water quality samples were collected by BioMost, Inc. between 1996 and 2010 monitoring performed by BioMost, Inc. (data available online at www.datasheet.org)
Design: instantaneous maximum values were used as "worst case" design criteria.

100 50 0 100 200

SHEET 1 of 1 | As-Built Schematic

Location Map, Legend, Plan View & Elevation Schematic

STREAM RESTORATION INCORPORATED

MCINTIRE PASSIVE TREATMENT SYSTEM

McIntire Site

SMP #3078BC12

Blacks Creek SubWatershed, Slippery Rock Creek Watershed
Marion Township, Butler County, PA

Center of Project
Lat: 41-10-04
Lon: -79-54-31
Deg-Min-Sec

Scale: As Shown September 2012

BioMost, Inc. Mining and Reclamation Services
Mars, PA www.biomost.com

903As Built