Monastery Run Improvement Project
Saint Vincent College
Unity Township, Westmoreland County

Operation, Maintenance and Replacement Plan

This is the Operation, Maintenance and Replacement (OM&R) plan for the Monastery Run Improvement Project located in the Four Mile Run Watershed, part of Loyalhanna Creek Watershed, in Unity Township, Westmoreland County, Pennsylvania. The AMD Treatment identified in this plan is as follows:

SITE OVERVIEW

The Monastery Run Improvement Project (MRIP) is a 20 acre passive wetland treatment system built in 1997 and 1998. It collects and treats water from numerous deep mine discharges. The MRIP consists of 3 constructed wetland systems – Wetland #1 with four ponds, Wetland #2 with 3 ponds and Wetland #3 with 5 ponds and 4 mesocosms for research. All the wetlands have some sort of connectivity to allow for overflows and excessive water volume. The MRIP consists of aerobic wetlands with polishing ponds; the water chemistry of the mine water is alkaline with the exception of Wetland #1, which at times, can produce some acidity.

MINE DISCHARGE:

The discharges located within the MRIP originate from the Pittsburgh Coal seam under the project area. The water is hydraulically connected to a very large mine pool located in the Latrobe Syncline. The majority of the mine workings located throughout the syncline are flooded. The mine has numerous upwellings that will be expanded upon in the appropriate wetland category. The chemistry of the discharges has changed significantly over the years. During the Scarlift report, the discharges were acidic, but are now alkaline.

- **Wetland #1**
  - Wetland #1 is treating 10 net alkaline discharges.

- **Wetland #2**
  - Wetland #2 is treating all of the wetland #1 water, as well as seeps from the Wetland #2 area and some "Bubbler" water. (see below)

- **Wetland #3**
  - Wetland #3 is treating the discharge from the "Bubbler", which is a borehole next to the wetlands. The original bore hole drilled in the 1970's had an average flow of approximately 300-500 GPM and was approximately 3-5 feet from the stream and about 1600 feet from the wetland systems. The borehole was redrilled in 2001 about 20 feet from the Eastern end of Wetland #3. The "Bubbler" has a head of at least 16 feet. With such a large head pressure, a portion of the "Bubbler" can be discharged into the first pond in Wetland #2.

RECEIVING STREAM:

The Wetland #2 & #3 treated mine water is discharged into Four Mile Run, which also receives AMD from several mine water seeps that are not accessible for treatment and therefore enter the stream untreated. Most of these seeps exist during high flows and pollute the stream (Four

Mile Run) from Wetland #1 to Monastery Run. Wetland #2 is discharged into the stream above the Cement Bridge near the Wetland Parking Lot between Wetlands #2 and #3.

Wetland #3 is discharged into the stream just above the metal footbridge leading to the Saint Vincent Lake.

Four Mile Run does have a TMDL completed for it, and it is included in the Monastery Run TMDL.
Prior to the installation of the Monastery Run Improvement Project, Four Mile Run was a heavily polluted stream with the chemistry data immediately prior to construction of the wetland systems available at:
http://facweb.stvincent.edu/eec/MRIP/DataCompiled.htm.

All sampling points for Saint Vincent Analysis are indicated on the map at:
http://facweb.stvincent.edu/eec/MRIP/Stream_Map.htm

Other data is available in the Scarlift Report.

TREATMENT SYSTEMS
Wetland #1, Wetland #2, Wetland #3 and Mesocosms

Wetland #1 – Project NO. AMD 65(2533)102.1

Wetland #1, consisting of 8.5 acres was completed in November 1998. It is located along the north side of Four Mile Run consists and was designed by the PA Department of Environmental Protection in cooperation with the landowner, Wimmer Corporation. Wetland #1 construction involved excavating an existing wetland area created by 10 net alkaline discharges and replacing it with a man made wetland capable of increasing retention time and aeration.

This AMD treatment system consists of an up-flow limestone pond and three aerobic wetland cells with diversion channels that force the water to flow in a serpentine pattern through the ponds. The water flows from one cell to the next via concrete flow control structures. These structures contain removable stop logs to control flow and the top stop log is equipped with a rectangular weir, which allows for the necessary aeration and flow measurements.

In 1999 and 2001, Wetland #1 and Wetland #2 were connected together via an inverted siphon that carries the effluent from Wetland #1 under Four Mile Run and discharges it into Wetland #2.

After being discharged from Wetland #2 into Four Mile Run, the treated mine water is conveyed to Monastery Run and eventually the Loyalhanna Creek

Note: It has been observed the first pond may dry up in November/December, the cause is unknown, but is thought to be the effects of a dry summer. The flow usually resumes by

January/February. It should also be noted that when the flow resumes, the water has produced a little acidity, but overall the water has remained net alkaline.

FUNDING
Funding for Wetland #1 was provided by PA Department of Environmental Protection at a total cost of $538,329.91.

RESPONSIBLE PARTIES
The PA DEP completes major repairs to the system, while Saint Vincent College is responsible for mowing and general maintenance.

ENTRANCE TO THE SYSTEM
The site is located in Unity Township adjacent to Saint Vincent College just off Route 30 or Route 981 along Beatty County Road. From Route 30, turn onto Saint Vincent Drive, continue past Saint Vincent College and make a left at the Y onto Beatty Road, turn Right onto Auction Barn Road.

Vehicle access is located off Beatty County Road on Auction Barn Road after crossing the bridge, make a right towards the Sewage Treatment Plant. The wetland system is on the right.

The system is accessible by footpath from Wetland #2 located west of Wetland #2.

VISITOR SAFETY
Visitors should be cautioned of safety hazards due to uneven terrain and muskrat holes on walking paths. Unexpected flows and rain can cause the ponds to overflow into the overflow ditches.

SPONSORS
Bureau of Abandoned Mine Reclamation (BAMR), Cambria Office, Ebensburg District, DEP and Saint Vincent College

PA DEP - Primary responsibilities are providing technical support, major repairs and helping in maintenance of any items which require considerable time and dollar amount or are beyond the capability of the College to accomplish at that time and replacement of structures.

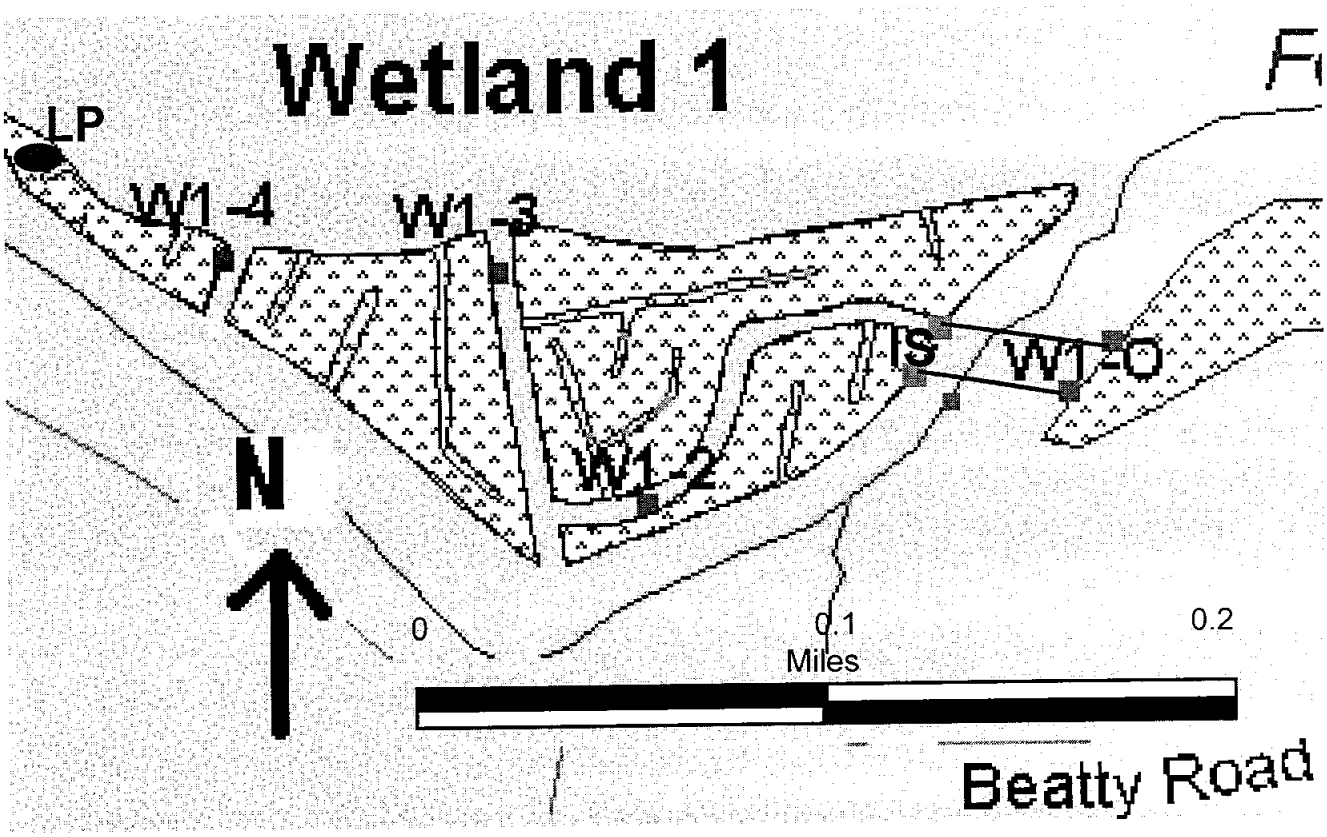
Saint Vincent College – General maintenance, minor repairs, water sample collections and monitoring.

PA DEP is responsible for the operations and maintenance of all structures so this AMD treatment system continues to function smoothly. This system was designed for a 25-year life span with minimal operation and maintenance input. However, in order for these structures to perform to their design capability, periodic inspection and maintenance is required to maximize performance.

SYSTEM COMPONENTS

- LP - Limestone Pond
    - The incoming mine water at times has some acidity, and the Limestone pond will assist in neutralizing the acid early in treatment.

- W1-4(W1-C)- FCS - Flow Control Structure with Rock Apron - (4 ft Rectangular Weir)
  - 4 Ft Rectangular Weir controlling water from Cell 1 to Cell 2
- W13 (W1-B) - FCS - Flow Control Structure with Rock Apron - (4 ft Rectangular Weir)
  - 4 Ft Rectangular Weir controlling water from Cell 2 to Cell 3
- W12 (W1-A)- FCS - Flow Control Structure with Rock Apron – (4 ft Rectangular Weir)
  - 4 Ft Rectangular Weir controlling water from Cell 3 to Cell 4
- W1Out - FCS - Flow Control Structure with Rock Apron & Inverted Siphon Transfer To Wetland #2
  - 4 Ft Rectangular Weir with pipe at exit conveying water from Wetland #1 Cell 4 to Wetland #2 Cell 1.
- IS – Inverted Siphon Transfer pipes to Wetland #2
  - An underwater inverted siphon with pipe conveying water from Wetland #1-Cell 4 to Wetland #2-Cell 1.



SYSTEM SYNOPSIS

Wetland #1 was designed for a flow of 689 GPM flow rates and an iron level of 67.9 mg/L. Flows have reached as high as 3000 GPM in past years.

The first pond or cell contains the limestone pond. The original upwelling of mine water contains some acidity at certain times throughout the year. Upon building of the Wetland system, the bore hole was filled with limestone and a slotted pipe was placed in to allow the water to flow. In 2007 construction in the vicinity of the wetland system produced some changes to the system. It appears that the borehole at the Limestone Pond has ceased to flow and a new hole has appeared at the North West corner of the system at the very beginning of the wetland. The first pond allows for the removal of aluminum and then the iron through oxidation. As the water continues through the wetland system, it encounters several other bore holes with vast amounts of mine water entering the system throughout. The process continues to be oxidation of the iron (and aluminum if applicable) then the removal via settling or cattails.

Wetland #2

Wetland #2, located along the south side of Four Mile Run, was designed by USDA Natural Resources Conservation Service in cooperation with the landowner, Wimmer Corporation. It was constructed in the summer of 1998. Wetland #2 is a 7.5 acre passive treatment wetland system. Two large cells were built within an existing marsh, and additional splitter dike was installed in 2001 in the last cell to create 3 cells and to increase aeration and detention time.

Wetland #2 receives water from Wetland #1, upwellings and the "The Bubbler". Water is transferred from pond to pond through flow control structures from AgriDrain that allow water levels to be regulated through the use of removable stop logs.

Wetland #2 also has two overflow structures. An AgriDrain flow control box located on the northern side of cell #1 which allows water to exit to a riparian area next to the wetland. Also existing is an overflow pipe from Wetland #2-Cell 3 to Wetland #3-Cell 1 with a control valve. The treated water from Wetland #2 is then released into Four Mile Run.

FUNDING

The funding total for Wetland #2 was $161,959.00.

RESPONSIBLE PARTIES

The USDA-NRCS was the original responsible party, but they have not been provided funds since the 2006 budget to allow continued maintenance. Saint Vincent College has assumed minor maintenance for the system, but major repairs to the system are the responsibility of the LCMDC and maintenance funds are housed at the Loyalhanna Watershed Association, Ligonier, PA.

ENTRANCE TO THE SYSTEM

The site is located in Unity Township adjacent to Saint Vincent College just off Route 30 or Route 981 along Beatty County Road. From Route 30, turn onto Saint Vincent Drive, continue past Saint Vincent College and make a left at the Y and a right into the wetland parking area after passing the Saint Vincent Gristmill and Wetland #3. A gate to the parking area is locked at Dusk and unlocked at Dawn by Saint Vincent College Security Officers.

The system is also accessible by foot from Wetland #1 and Wetland #3.

VISITOR SAFETY
Visitors should be cautioned of safety hazards due to uneven terrain and muskrat holes on walking paths. Unexpected flows and rain can cause the ponds to overflow into the overflow ditches.

SPONSORS
USDA, Natural Resources Conservation Service (NRCS), Greensburg and Saint Vincent College/Wimmer Corporation

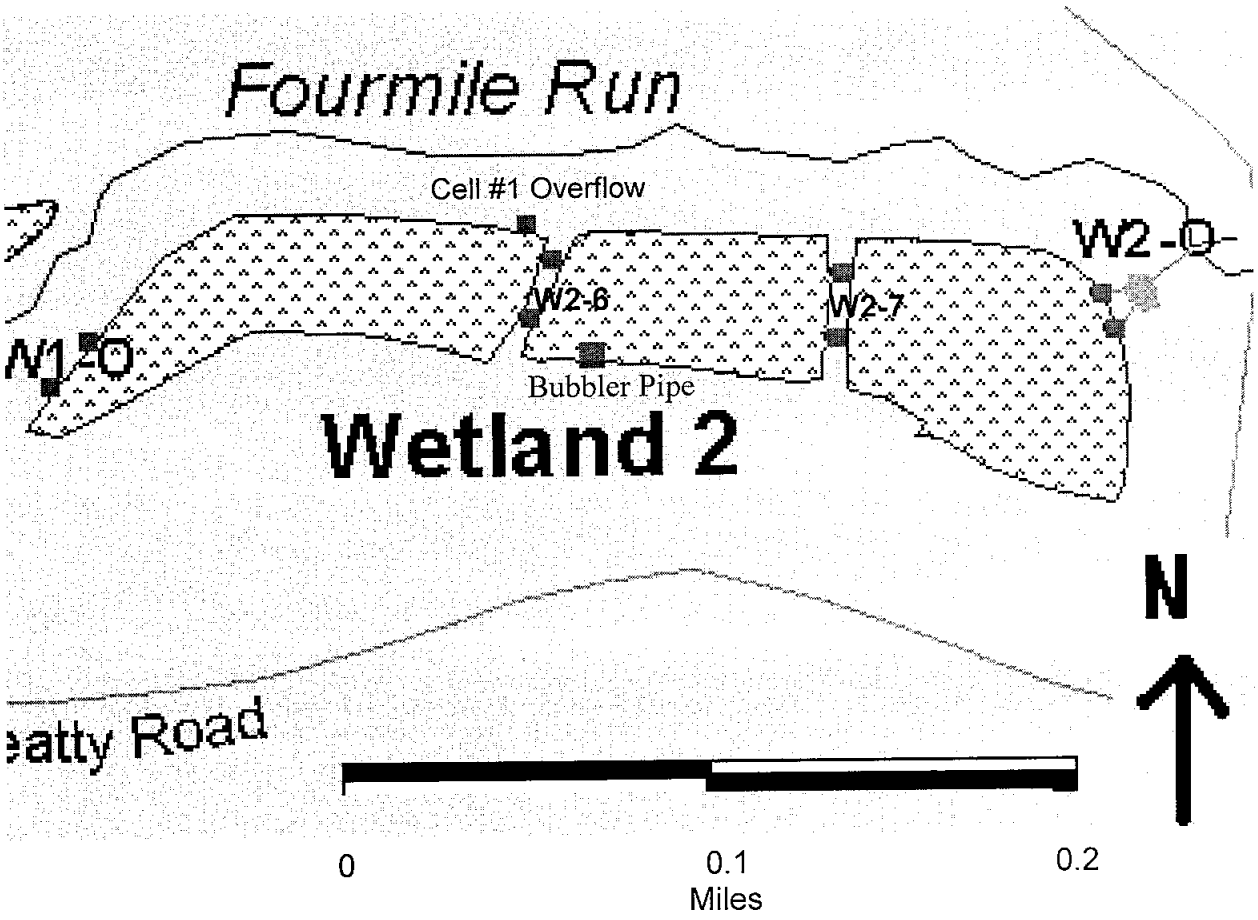
USDA-NRCS – In 2007, USDA-NRCS informed the MRIP that they will no longer be able to provide financial assistance and technical assistance for Watershed Operations.

Saint Vincent College – General maintenance, minor repairs, water sample collections and monitoring.

LCMDC with assistance from Saint Vincent is responsible for the operations and maintenance of all structures to ensure this AMD treatment system continues to function smoothly. This system was designed for a 25-year life span with minimal operation and maintenance input. However, in order for these structures to perform to their design capability, periodic inspection and maintenance is required to maximize performance.

SYSTEM COMPONENTS

- W1-Out
  - 2 Large pipes conveying partially treated mine water from Wetland #1 to Wetland #2 via an inverted siphon.
- W2-3 - (2) FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 1 to Cell 2
- W2-7 - (2) FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 2 to Cell 3
- W2-6 - (2) FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 3 Output
- Bubbler – Alternative input of Bubbler water into Cell 1 or 2 of Wetland #2.
- Cell #1 Overflow - FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 1 to Riparian area for overflow situations. Usually extra stop logs are inserted.



SYSTEM SYNOPSIS

The first pond or cell receives all partially treated mine water from Wetland #1. The first pond contains 2 AgriDrain flow control structures at the eastern end of the cell and an overflow flow control structure along the northeast corner of the cell. Cell #2 receives water from Cell #1 and from the "Bubbler" which is always open to allow for pressure release. Cell #2 has 2 AgriDrain flow control structures also at the eastern end of the cell to flow into Cell #3. Cell #3 has 2 AgriDrain flow control structures at the north east end of the Cell which leads to the small basin at the output area.

Wetland #2 is connected to Wetland #3 a couple ways. The "Bubbler" feeds Wetland #2 with shut off valves, and Wetland #2 Cell #3 also has an overflow pipe leading into Cell #1 of Wetland #3.

The cells promote the removal of iron through oxidation and as the water continues through the wetland system, the process continues by allowing the iron oxide to settle or adhering to cattails.

Wetland #3

Wetland #3, situated on approximately 3.11 acres, is a five-celled aerobic wetland and 4 mesocosm cells. Wetland #3's water source is the "Bubbler" while the mesocosm's water source is both the "Bubbler" and the "Boy Scout Discharge" both located very close to the mesocosms. The wetland discharges into Four Mile Run while the mesocosms discharge into Cell #4 of Wetland #3. From Four Mile Run, the treated mine water is then conveyed to Monastery Run and eventually Loyalhanna Creek.

Bubbler Discharge History:

The coalmines in the region surrounding the Monastery Run project were in operation prior to 1889 through 1967. The water in the mined out Pittsburgh Coal seam under the project area is hydraulically connected to a very large mine pool located in the Latrobe Syncline. The Operation Scarlift report conducted in 1972 indicates that the water from the coal mines flanking Four Mile Run were approximately a pH of 3.0 and that the Bubbler existed at that time. The chemistry of the Bubbler water entering Wetland #3 is available online at http://facweb.stvincent.edu/eec/MRIP/wetlanddischargedata.htm. The Bubbler ID code is W3I. The data is also available at Saint Vincent College Environmental Education Center.

The system was constructed during the Summer of 1997 and began being utilized in August, 1997. Funding for Wetland #3 and Mesocosms was approximately $220,000 and major funding came from EPA 319 Grant through PA DEP to Saint Vincent College. Supplemental funding from Heinz Foundation, McKenna Foundation, and NRCS. Allegheny Power has supplied electric service to the mesocosms for both student and professional research.

The Loyalhanna Watershed Association houses a maintenance fund for emergencies with the Monastery Run Improvement Project. The monies are from the McKenna Foundation and income from the sale of Iron Oxide.

FUNDING

Funding for Wetland #3 was provided by EPA 319 Grant through PA DEP to Saint Vincent College. Supplemental funding from Heinz Foundation, McKenna Foundation, and NRCS. Total cost of $220,000.

RESPONSIBLE PARTIES

The Saint Vincent College completes minor repairs to the system, and mowing, and general maintenance.

ENTRANCE TO THE SYSTEM

The site is located in Unity Township adjacent to Saint Vincent College just off Route 30 or Route 981 along Beatty County Road. From Route 30, turn onto Saint Vincent Drive, continue past Saint Vincent College and make a left at the Y. Parking is available at the Saint Vincent Gristmill (locked gate, but passable on foot) or at the Wetland Parking lot between Wetland #2 and #3.

A secured access road to the wetland is available via a locked gate at the Gristmill. Keys and permission to access the road are available from the Saint Vincent College Security, Winnie Palmer Nature Reserve and Saint Vincent College Facilities Management.

VISITOR SAFETY

Visitors should be cautioned of safety hazards due to uneven terrain and muskrat holes on walking paths. Unexpected flows and rain can cause the ponds to overflow into the overflow ditches.

SPONSORS

Monastery Run Improvement Project (MRIP) and Saint Vincent College/Wimmer Corporation

Saint Vincent College – General maintenance, minor repairs, water sample collections and monitoring.

The LCMDC with the assistance of Saint Vincent College is responsible for the operations and maintenance of all structures so this AMD treatment system continues to function smoothly. This system was designed for a 25-year life span with minimal operation and maintenance input. However, in order for these structures to perform to their design capability, periodic inspection and maintenance is required to maximize performance.

SYSTEM COMPONENTS

W3 – In - Bubbler Flow and Valves:

The Bubbler water flows along the eastern end the mesocosms and along the southern side of Wetland #3. The bubbler water can be input into the mesocosms with use of the valve. Along the southern side of the Wetland, the bubbler pipes contain valves at Cell #4, Cell #3 and Cell #1 and in Wetland #2 in Cell #2. The valve in Wetland #2 is always partially opened to allow excess flow to enter Wetland #2.

- W3 – In – Input of Mine Water into Cell #1 from Bubbler
- W3-2 - FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 1 to Cell 2
- W3-3 - FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 2 to Cell 3
- W3-4 - FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 3 to Cell 4
- W3-5 - FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 4 to Cell 5

- FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 1 to Cell 3
- FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 2 to Cell 5
- W3 Out - FCS - Flow Control Structure (AgriDrain)
  - Flow Control Box controlling water from Cell 5 to Four Mile Run

Cell #1 – Settling Pond

The bubbler water enters the southeast end of the pond, which is approximately 3-4 ft deep. The bubbler water has a valve at the input pipe which will allow the flow to be adjusted as needed. The bubbler water will also flow into Wetland #2 when the flow is turned down into Wetland #3. The purpose of the first pond is to allow the ferrous iron to react with oxygen to produce ferric iron, which will then precipitate as iron hydroxide. Approximately 90% of the iron precipitates out and remains in the first pond.

Cell #1 has the ability to flow into Cell #2 and Cell #3. NOTE: The flow control structure between Cell #1 and Cell #3 is closed unless the level of wetland water needs adjusted.

NOTE: Build up of iron sludge should be watched and areas in front of the flow control structures should be cleaned periodically.

Cell #2 – Settling Pond/Aerobic Wetland

Water enters Cell #2 near the northwest corner. Half of the Cell is deeper (2-3 Feet) than the other half (1 ½ - 2 feet deep) which has filled in with cattails.
The deeper portion serves as a settling pond while the shallow portion with cattails serves as an Aerobic Wetland.

Cell #2 has the ability to flow into Cell #3 and Cell #5. NOTE: The flow control structure between Cell #2 and Cell #5 is closed unless level of wetland water needs adjusted.

Cell #3 – Settling Pond/Aerobic Wetland

Water enters Cell #3 from Cell #2 at the northern end of the cell and can also enter from Cell #1 at the western end of the cell, although the flow control structure between Cell #1 and Cell #3 is closed unless the level of wetland water needs adjusted. A portion of the cell is deeper (2-3 Feet) to serve as a settling pond. The other half is shallower (1 ½ - 2 feet) and has filled in with cattails, serves as an Aerobic Wetland.

Cell #4 – Aerobic Wetland

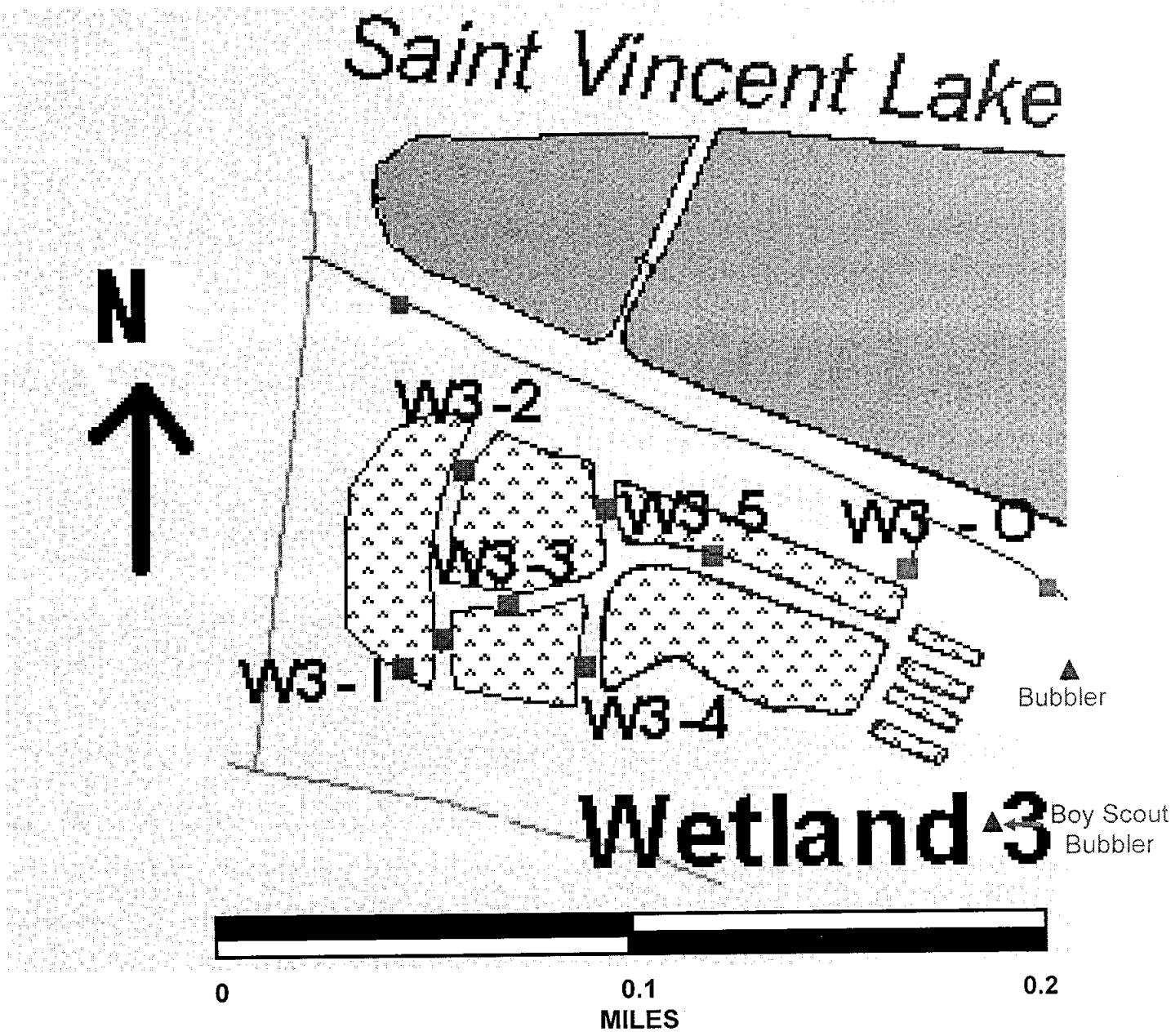
Water enters Cell #4 on the western end of the cell, the portion nearest the input from Cell #3 has filled in with cattails.

The eastern end of Cell #4 receives all the water from the mesocosms (4 discharge pipes). The eastern end also contains an overflow pipe which will drain into the area to the north of the mesocosms.

Cell #5 – Aerobic Wetland

Water enters Cell #5 at the center of the southern side of the cell from Cell #4, and at the western end from Cell #2.

The water exits the wetland at the northeast corner of Cell #5.



SYSTEM SYNOPSIS

Wetland #3 was designed for a flow of 689 GPM flow rates and an iron level of 67.9 mg/L. Flows have reached as high as 3000 GPM in past years.

Emergency Spillways exist between cells in the wetland. Water enters the wetland in the southern end of Cell #1 and exits the system in the Northeast corner of Cell #5.
All 4 Mesocosms discharge into the eastern end of Cell #4.

The cells promote the removal of iron through oxidation in Cell #1, and as the water continues through the wetland system, the process continues by allowing the iron oxide to settle or adhere to the cattails.

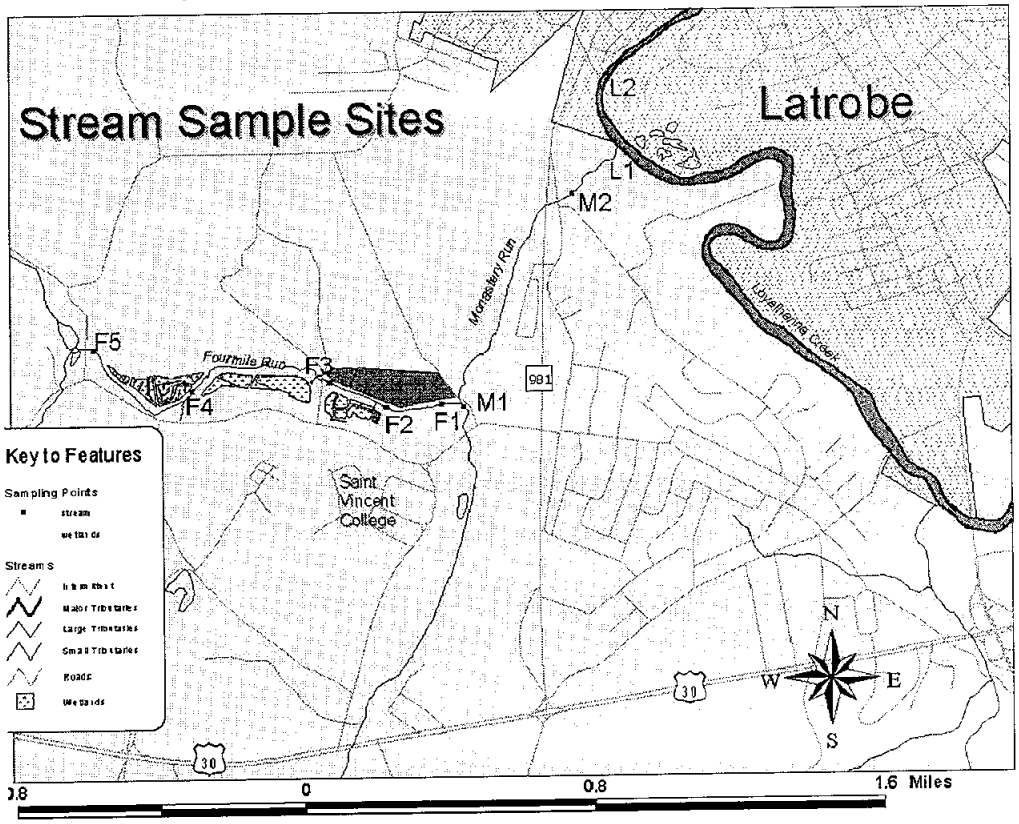
The Wetland system when originally built in 1997, achieved approximately 95% efficiency with total iron input levels of 90 mg/l and the yearly average total iron output levels of 2.2 mg/L. Recent years have seen more months with higher levels of total iron at the output as the ponds are beginning to reach their sludge capacity.

OPERATIONAL CHECKUPS

Water Sampling and flow measurements

Previous water sampling results can be found at http://facweb.stvincent.edu\eec\MRIP\wetlanddischargedata.htm .

Stream Sampling Locations

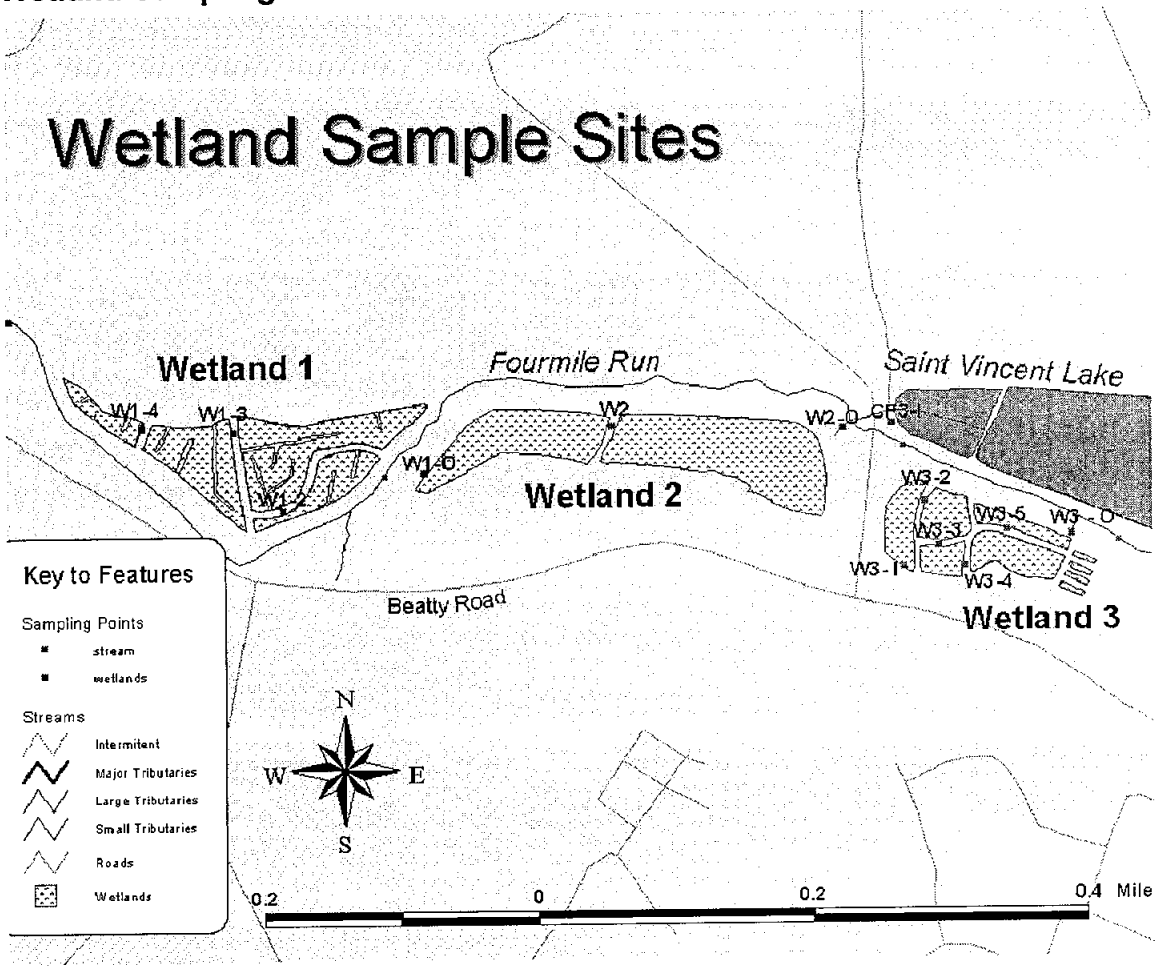


Stream Sampling Points

Sample Sites and Descriptions	Frequency
F1 – Four Mile Run Downstream at Saint Vincent Lake Spillway	B
F2 – Four Mile Run Downstream of Wetland 3 Output at Metal Footbridge to Saint Vincent Lake	B
F3 – Four Mile Run Downstream of Wetland 2 Output at Cement Bridge near Wetland Parking Lot	B
F4 – Four Mile Run Upstream of Wetland 1 Output at Cement Bridge leading to Wetland 1	B
F5 – Four Mile Run Upstream of Mine Drainage at Beatty Road Bridge	Q
M1 – Monastery Run Upstream of Mine Drainage Near Saint Vincent Lake across from GBC Factory	B
M2 – Monastery Run Downstream of Mine Drainage near Adelphoi Village	B
L1 – Loyalhanna Creek Upstream of Monastery Run, Near Legion Keener Park along Creekside Trail	B
L2 – Loyalhanna Creek Downstream of Monastery Run, Downstream of AV Pipe and Borehole, between railroad bridge and above Unity Discharge	B

Q indicates quarterly (March, June, September, and December)
B indicates 2 times per year (1 summer & 1 winter)

Wetland Sampling Locations



Wetland And Discharge Sampling Points

W1A (W12) – Wetland 1 Weir 3	4 ft Rectangular Weir Flow Measurement	Q
W1B (W13) – Wetland 1 Weir 2	4 ft Rectangular Weir Flow Measurement	Q
W1C (W14) – Wetland 1 Weir 1	4 ft Rectangular Weir Flow Measurement	Q
W1O (W10) – Wetland 1 Output to Wetland 2		Q
W23 – Wetland 2 Cell 1 to Cell 2		Q
W27 – Wetland 2 Cell 2 to Cell 3		B
W26 – Wetland 2 Output		Q
W3I – Wetland 3 Input		B
W32 – Wetland 3 Cell 1 to Cell 2		B
W33 – Wetland 3 Cell 2 to Cell 3		B
W34 – Wetland 3 Cell 3 to Cell 4		B
W35 – Wetland 3 Cell 4 to Cell 5		B
W30 – Wetland 3 Ouput		B
CF3 – Capture near F3 bridge at Saint Vincent Lake Basin		B

Q indicates quarterly (March, June, September, and December)
B indicates 2 times per year (1 summer & 1 winter)

Parameters

The following list indicates the parameters that are to be measured at each sampling location.

LABORATORY PARAMETERS

pH
Specific Conductance
Alkalinity
Acidity
Ferrous
Sulfates
Total Iron
Total Aluminum
Total Manganese

Sampling

Samples will be collected prior to any field data being collected. The raw bottle will be collected and the metals samples obtained from that bottle and preserved appropriately. The raw bottle will then be refilled. Field data shall be collected after samples have been preserved. Field data should include, pH, temperature, conductivity, dissolved oxygen, and flow.

Field Sampling Procedure– Available in Sampling Room – Chemistry 101

Flow Measurements – Available in Sampling Room – Chemistry 101

MAINTENANCE ACTIVITIES

FLUSHING: Flow control structures will be flushed and pipes will be cleared of debris in the Fall and Spring of the year. On an as needed basis, structures will be flushed and debris cleared to restore the wetland to the appropriate water levels.
Flushing can be accomplished several ways.

- Going into the wetland pond and removing debris from the entrance or exit of the pipe.
- Removing all the boards to cause a surge of water through the box and therefore flushing the system.

FLOW CONTROL STRUCTURES: Flow control structures and stop logs will be examined for wear and tear, including degradation of the hooks. Stop Logs should be operated periodically (2 times per year at a minimum) to ensure they function properly.

DEBRIS/LITTER CONTROL: Water inlet areas for all structures/Flow Boxes should be free from sediment, leaves, and any other foreign objects.

MUSKRAT HOLES: Muskrat holes are a safety concern along the walking paths. At a minimum, Saint Vincent College Facilities Management team will fill holes with gravel or dirt

during the spring of each year.

MOWING: Saint Vincent College Facilities Management team will maintain the grounds including mowing, trimming (if necessary) and mulching paths as needed.

VALVES AND PIPING: Piping to and within the structure shall be maintained by cleaning precipitate from the pipes. Once per year, the valves from the bubbler pipe should be open at each entrance to the wetland system to flush the water and ensure proper function.

ACCESS ROAD, PARKING AREA AND PIPE GATES: The access road shall be maintained so that the site can be accesses for maintenance and monitoring. The parking area and gates shall be controlled by the Landowner, but should be locked so that unauthorized vehicular access to the site is controlled. The gate to the Wetland #2 and #3 parking area will be open from dawn to dusk (by Saint Vincent Security).

MONITORING: Samples will be taken at the sampling points indicated in the previous chart according to the schedule listed.

INSPECTION CHECKLIST: The inspection checklist shall be used during inspections. Inspections should be completed at least quarterly and after significant weather events.

LONG TERM MAINTENANCE

SLUDGE MANAGEMENT: Precipitate from the chemical reactions will fill the settling ponds. All ponds should be maintained by removing collected precipitate when the volume of the settling pond is reduced by one half. Accumulated precipitate can be disposed within the project area. In wetland #1, DEP/BAMR will not remove any iron oxide sludge without the approval of the College.

ACCESS ROAD: The access road and culverts under the roads shall be maintained so that the site can be easily accessed for maintenance and monitoring. The pipe culverts shall be kept free of any obstructions. The gates shall be kept locked to prohibit any unauthorized vehicular access.

Saint Vincent College Schedule of General Maintenance

Time of Year	Item	Person Responsible
Spring	Mulch Trails (Wetland 3 Path from Parking lot to Cell 1; Wetland 1 Forest Trail; Wetland 3 Discovery Trail (Scout trial) & Any others as indicated by WPRN)	SVC FMO
Spring-Summer-Fall	Mowing/Trimming	SVC FMO
Spring	Filling Muskrat Holes	SVC FMO

AS NEEDED	Repair Mesocosm Pipes	SVC FMO
Fall & Spring and AS NEEDED	Flush Flow Control Boxes	Beth Bollinger – WPNR & SVC FMO (if needed)

MRIP Inspection Form

Date: _____ **Time:** _____ **Inspector(s):** _____

Weather: _____

Reason for Inspection: Routine Quarterly or Weather Event _____

✓	Area/Item	What to Check
	Wetland 1	
	Site Access	Note any problems with site access.
	Rodent Activity	Note any activity by muskrats, beavers, geese…
	Vandalism	Note any damage or attempts
	W1A	Clear debris from weir and measure height at back of weir HEIGHT: _____
	W1B	Clear debris from weir and measure height at back of weir HEIGHT: _____
	W1C	Clear debris from weir and measure height at back of weir HEIGHT: _____
	W1Out (Wetland #1)	Clear debris from weir and measure height at back of weir, note overflow of water into stream. Indicate if there is any obstructions prohibiting flow into Wetland #2
	Other	Any other unusual observations of the site should be noted
	Wetland #2	
	Site Access	Note any problems with site access.
	Rodent Activity	Note any activity by muskrats, beavers, geese…
	Vandalism	Note any damage or attempts
	W1Out Siphon Pipes	Note if water if flowing properly and if there are anything restricting flow.
	W2-3 (2 Boxes)	Boxes are checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	W2-7 (2 Boxes)	Boxes are checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	W2-6 (2 Boxes)	Boxes are checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	Other	Any other unusual observations of the site should be noted
	Wetland #3	
	W3-In	Top of input pipe should be exposed about 4 inches
	W3-2	Box is checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	W3-3	Box is checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	W3-4	Box is checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	W3-5	Box is checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box.
	W3-Out	Box is checked for debris and flushed by removing all boards and replacing. Any debris is removed from the input and output pipe at the box. Flow Measurement is taken if possible.
	Cell 1 Dock	Check dock for tight screws and floating ability as well as rotted boards
	Cell 5 Dock	Check dock for tight screws, floating ability and rotted boards on the dock & steps
	Output steps	Check output steps for possible safety issues indicate if repairs are needed.
	Mesocosms	**If not being used by students for research:** open each valve to flush valve and be sure water is flowing into all mesocosms and the output pipes are intact and functioning properly. Report any repairs needed to the FMO Office.
	Site Access	Note any problems with site access.
	Rodent Activity	Note any activity by muskrats, beavers, geese…
	Vandalism	Note any damage or attempts
	Other	Any other unusual observations of the site should be noted

Date and Time	Action/Notes

Overall Notes