POLLUTANT REDUCTION PLAN

for Bobby Run Watershed

for the City of Hermitage MS4 Notice of Intent

City of Hermitage
Mercer County, Pennsylvania

Prepared for:
City of Hermitage
800 North Hermitage Road
Hermitage, PA 16148

July 14, 2017

Bobby Run Watershed Pollutant Reduction Plan
City of Hermitage

Table of Contents

Bobby Run Watershed Pollutant Reduction Plan
City of Hermitage

I. GENERAL PLAN INFORMATION

A. General Information

The City of Hermitage, Mercer County, PA is required to comply with and obtain NPDES permit coverage for discharges of stormwater from their municipal separate storm sewer system (MS4) due to their location within an Urbanized Area as defined by the 2010 Census data. A map showing the City of Hermitage municipal boundaries, as well as the Urbanized Area boundaries, can be found in **Appendix A – Figures**. The City of Hermitage has current coverage for their MS4 under the "2013 PAG-13 General Permit" with NPDES Permit No. PAG138333. Updates to the MS4 program were published in the Pennsylvania Bulletin June 4, 2016, which require MS4s to apply for coverage under the "2018 PAG-13 General Permit". As part of the "2018 PAG-13 General Permit" requirements, the City of Hermitage must develop and implement a Pollutant Reduction Plan. The requirement for a Pollutant Reduction Plan for the City of Hermitage is because the City has stormwater outfalls that discharge to Bobby Run, a local surface water listed as impaired for "Appendix E – Nutrients" as identified in PaDEP's MS4 Requirements Table. A copy of the MS4 Requirements Table for the City of Hermitage can be found in **Appendix B – MS4 Requirements Table**. This document provides all necessary components for the Pollutant Reduction Plan as defined by PaDEP in the Pollutant Reduction Plan (PRP) Instructions, 3800-PM-BCW0100k (5/2016).

B. Plan Preparer's Qualifications

This plan was supervised by Ms. Emily Muzzarelli, P.E., of WallacePancher Group. Ms. Muzzarelli has 5+ years' experience in managing municipal and non-municipal MS4 programs and has attended the MS4/PRP Workshop sponsored and given by PaDEP.

II. POLLUTANT REDUCTION PLAN REQUIREMENTS

A. Public Participation

As required, the City of Hermitage has made the complete Pollutant Reduction Plan available for public review and comment. **Appendix C – Public**

Participation Documentation includes: (1) a copy of the public notice describing the Pollutant Reduction Plan, where to view the plan, and the length of time comments will be received; (2) all written comments received from the public on the Pollutant Reduction Plan during the public review period and public meetings; and (3) a record of consideration for each comment received within the public comment period and if any changes to the plan were made as a result of any comments.

B. Pollutant Reduction Plan Map

Bobby Run is the only watershed within the City of Hermitage's MS4 boundaries that requires a Pollutant Reduction Plan to be developed due to its impairment for "Appendix E – Nutrients" as listed in the MS4 Requirements Table. A map has been created for the Pollutant Reduction Plan per the requirements. The map focuses on the combined sewershed for outfalls that discharge to Bobby Run. A copy of the map can be found in **Appendix D – Pollutant Reduction Plan Map**.

The Pollutant Reduction Plan Map was created using an iterative, refining process. First, the Bobby Run watershed was overlain on the outfall map created as part of the NOI for the "2018 PAG-13 General Permit" to show which outfalls discharge to Bobby Run. Next, individual outfalls located within or adjacent to the Bobby Run watershed were delineated to create individual storm sewersheds for each outfall. The sewersheds were then field reviewed to confirm flow direction. Refer to **Appendix D – Pollutant Reduction Plan Map** for the sewershed mapping.

The planning area was then determined by summing the sewershed areas (i.e. acreage). Sewershed areas located outside the municipal boundary were removed from the planning area. The planning area was used to determine pollutant loading and required minimum reduction.

The Pollutant Reduction Plan (PRP) Map uses aerial imagery to show existing land uses. The PRP Map also shows the boundaries for the Urbanized Area, City of Hermitage, the individual storm sewersheds, and the planning area. The PRP Map also shows location for the structural BMP that is proposed to be implemented to achieve the required pollutant load reductions. This BMP will be discussed in Section E - Required Pollutant Reduction and Selected BMPs below. Impervious and pervious areas are not identified on the PRP Map at this time, as pollutant loading has been calculated using the PaDEP Simplified Method, as

described in the Pollutant Reduction Plan Instructions, Section II.D. Refer to Section D – Existing Pollutant Loading for more information.

The total combined storm sewershed area is 613.78 acres. Of this, 0.36 acres falls outside of the municipal boundary and would not contribute to the planning area. The total planning area is 613.42 acres and is subject to the "Appendix E – Nutrients" reduction requirements. The sewersheds were delineated using existing contour mapping. As sewershed mapping is completed per Minimum Control Measure #3 of the MS4 NOI, the planning area and individual storm sewersheds may be further refined. Refer to **Appendix E – Existing Pollutant Loading and Required Reductions Calculations**.

C. Pollutants of Concern

The Bobby Run watershed is the only watershed within the City of Hermitage's MS4 boundaries that requires a Pollutant Reduction Plan be developed due to its impairment for "Appendix E – Nutrients", as listed in the MS4 Requirements Table. Therefore, based on Section I.B of the Pollutant Reduction Plan Instructions, a minimum reduction of 5% of Total Phosphorus (TP) is required. A copy of the MS4 Requirements Table for the City of Hermitage can be found in **Appendix B – MS4 Requirements Table**.

D. Existing Pollutant Loading

The existing pollutant loading was determined using the "PaDEP Simplified Method", as explained in the Pollutant Reduction Plan Instructions Section II.D. The calculations for Existing Pollutant Loading and Required Reductions can be found in **Appendix E – Existing Pollutant Loading and Required Reductions Calculations**. The date of existing loading determination is July 10, 2017. The City of Hermitage is not considering any previously installed structural BMPs.

Calculations utilized the "Developed Land Loading Rates for PA Counties" as found in Attachment B of the Pollutant Reduction Plan Instructions for the land use/cover based loading rates. This table can also be found in **Appendix E – Existing Pollutant Loading and Required Reductions Calculations**. Mercer County falls under the "All Other Counties" category due to Mercer County not being within the Chesapeake Bay Watershed. Therefore, the Total Phosphorus (TP) loading is 2.28 lbs/acre/year for impervious developed areas and 0.84 lbs/acre/year for pervious developed areas. These developed areas are for land area that fall within the Urbanized Area. For land area outside of the Urbanized

Area, an undeveloped land loading rate of 0.33 lbs/acre/yr was utilized per Attachment B referenced above.

Using PaDEP's "Statewide MS4 Land Cover Estimates" table, the City of Hermitage has an Urbanized Area Percentage of 28% for impervious and an Urbanized Area Percentage of 72% for pervious areas. The City of Hermitage has an Outside of Urbanized Area Percentage of 16% for impervious and an Urbanized Area Percentage of 84% for pervious areas. This table can be found in **Appendix E – Existing Pollutant Loading and Required Reductions Calculations**. These values were used to estimate the impervious and pervious land cover for the individual sewersheds. As mapping is refined (as explained in Section B – Pollutant Reduction Plan Map), individual sewersheds will have impervious and pervious areas calculated as opposed to using these generalized land cover estimates.

Table 1 provides a summary of the existing pollutant loading for the Pollutant Reduction Plan Planning Area for the Bobby Run Watershed for the City of Hermitage.

Table 1 – Existing Pollutant Loading Summary Table

Land Type	Area (acres)	Loading Rate (lbs/acre/yr)	Pollutant Load (lbs/yr)
UA Impervious	150.53	2.28	343.21
UA Pervious	387.08	0.84	325.15
Outside UA Impervious	12.13	0.33	4.00
Outside UA Pervious	63.68	0.33	21.01
Total	613.42	-	693.37

The Existing Pollutant Loading for TP within the Planning Area for the Bobby Run Watershed is equal to 693.37 lbs/year.

E. Required Pollutant Reduction and Selected BMPs

The Pollutant Reduction Plan Instructions require a minimum reduction of 5% of Total Phosphorus for waters impaired for "Appendix E – Nutrients". Based on the Existing Loading Calculations from Section D above, this would equate to a reduction requirement of 34.67 lbs/yr within the Planning Area for the City of Hermitage. Complete calculations for required reductions can be found in **Appendix E – Existing Pollutant Loading and Required Reductions Calculations**.

The City of Hermitage has chosen to install new BMPs to obtain minimum required reduction rates within five (5) years of PaDEP's approval of coverage under the "2018 PAG-13 General Permit". For new BMPs, effectiveness values were obtained from the PaDEP "BMP Effectiveness Values" table. A copy of the PaDEP "BMP Effectiveness Values" table can be found in **Appendix F – Proposed BMPs and Effectiveness Calculations.** Table 2 provides a summary of the selected BMP, anticipated schedule for design and construction, and the TP removed by the BMP.

Table 2 – Selected BMPs for Total Phosphorus Removal

Proposed BMP	Anticipated Design Date	Anticipated Construction Date	TP Removal (lbs/yr)
Bobby Run Stream Restoration at Longview Road	Summer 2019	Summer 2020	40.8

The proposed location of the selected BMP can be seen in **Appendix D – Pollutant Reduction Plan Map**. The selected BMP is proposed to be designed and installed over the five-year term of the permit to meet the TP reduction requirement. The details and calculations for load reductions performed by the selected BMP is included in **Appendix F – Proposed BMPs and Effectiveness Calculations**.

F. Funding Mechanisms

The City of Hermitage will fund wholly, or in conjunction with grant funding, the design, construction, and Operation and Maintenance of the selected BMP. The cost for design and construction is shown in Table 3 below. Operation and Maintenance will be discussed in Section G below.

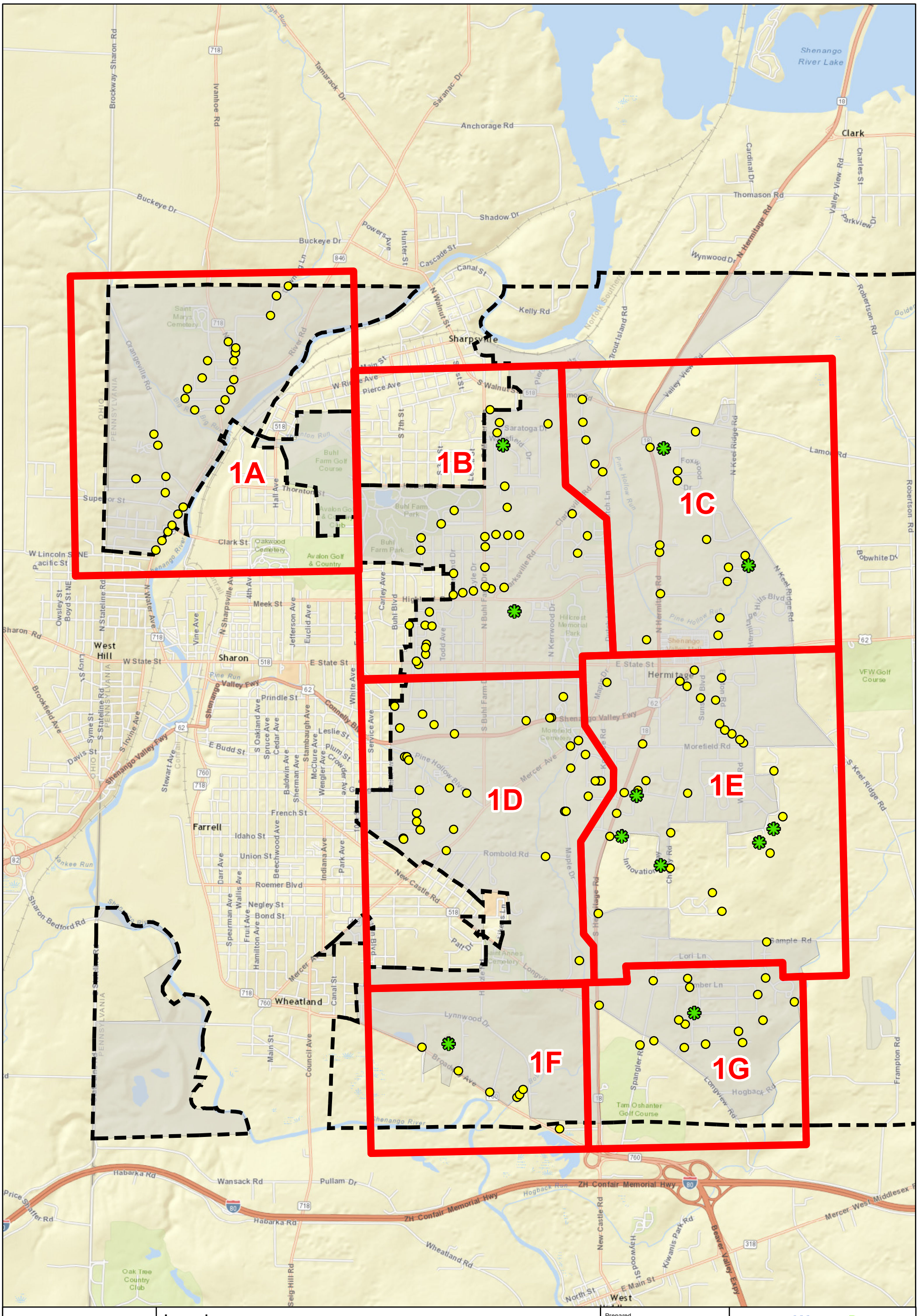
Table 3 –BMP Funding Mechanism

Proposed BMP	Sponsor(s)/ Partner(s)	Anticipated Funding Source	Design and Construction Cost	Status
Bobby Run Stream Restoration at Longview Road	City of Hermitage	City of Hermitage Budget	$180,000	Not Started

G. Operation and Maintenance Responsibilities

The Operations and Maintenance (O&M) summary identifies responsible parties for O&M, general activities involved with O&M, and frequency required for O&M. The details of the O&M Plan are presented in **Appendix F – Proposed BMPs and Effectiveness Calculations**.

Appendix A – Figures



Source Data:
1. Streams. PASDA. 2015.
2. Roads. TIGER. 2015.

Projection: Lambert Conformal Conic
Datum: NAD83
Coordinate System:
PA State Plane North (Feet)

Date: May 17,2017

1 inch = 3,000 feet

Feet
0 3,000

Legend

- Outfalls
- Detention Basin
- Municipal Boundaries
- Page Layout
- Urbanized Area

Prepared For:

City of Hermitage
800 North Hermitage Road
Hermitage, PA 16148

WallacePancher Group | Engineering & Environmental

160 TECHNOLOGY DRIVE, STE.102
CANONSBURG, PA 15317
ENGINEERING AND ENVIRONMENTAL CONSULTING

Project:

City of Hermitage
MS4 Notice of Intent
Mercer County, PA

Figure

1

Drawn: LAS
Checked: ESM
Reviewed:
Project No.: 20905

Appendix B – MS4 Requirements Table

MS4 Name	NPDES ID	Individual Permit Required?	Reason	Impaired Downstream Waters or Applicable TMDL Name	Requirement(s)	Other Cause(s) of Impairment
Mercer County						
CLARK BORO		No		Shenango River Lake (Res)	Appendix A-pH (5)	
				Shenango River	Appendix C-PCB (4a)	
FARRELL CITY	PAI138307	Yes	IP	Shenango River	Appendix C-PCB (4a)	
HERMITAGE CITY	PAG138333	No		Pine Run		Flow Alterations, Other Habitat Alterations (4c)
				Shenango River Lake (Res)	Appendix A-pH (5)	
				Bobby Run	Appendix E-Nutrients (5)	Other Habitat Alterations (4c)
				Shenango River	Appendix C-PCB (4a)	
SHARON CITY	PAI138308	Yes	IP	Pine Run		Flow Alterations, Other Habitat Alterations (4c)
				Shenango River	Appendix C-PCB (4a)	
SHARPSVILLE BORO	PAG138310	No		Shenango River	Appendix C-PCB (4a)	
SHENANGO TWP	PAG138304*	No		Shenango River	Appendix C-PCB (4a)	
SOUTH PYMATUNING TWP	PAG138302*	No		Shenango River Lake (Res)	Appendix A-pH (5)	
				Shenango River	Appendix C-PCB (4a)	
WEST MIDDLESEX BORO	PAG138303*	No		Shenango River	Appendix C-PCB (4a)	
WHEATLAND BORO	PAG138314*	No		Shenango River	Appendix C-PCB (4a)	

Appendix C – Public Participation Documentation

The public notice, list of public comments received, and consideration for each comment received will be added to Appendix C at the completion of the public review and comment period.

Appendix D – Pollutant Reduction Plan Map

SHEET 02

303-OFS
329-OFCB
300-OFS
300-OFS
329-OFCB
301-OFCB/
302-OFS
BOBBY RUN
302-OFS
303-OFS
301-OFCB
311-OFS
328-OFCB
402
311-OFS
335-OFS
328-OFCB
335-OFS
402
312-OFS
312-OFS
310-OFS
406
310-OFS
406
407
420
309-OFS
403
407
309-OFS
404
403
420
404
405
405
324-OFS
324-OFS
423
423
330-OFS
330-OFS
434-OFS
434-OFS
424
424
435
425
435
425
325-OFS/
326-OFS/
327-OFS
325-OFS
326-OFS
327-OFS

SHEET 02
SHEET 02
SHEET 03
SHEET 03

BOBBY RUN STREAM
600' LF RESTORATION AT
LONGVIEW ROAD

BOBBY RUN

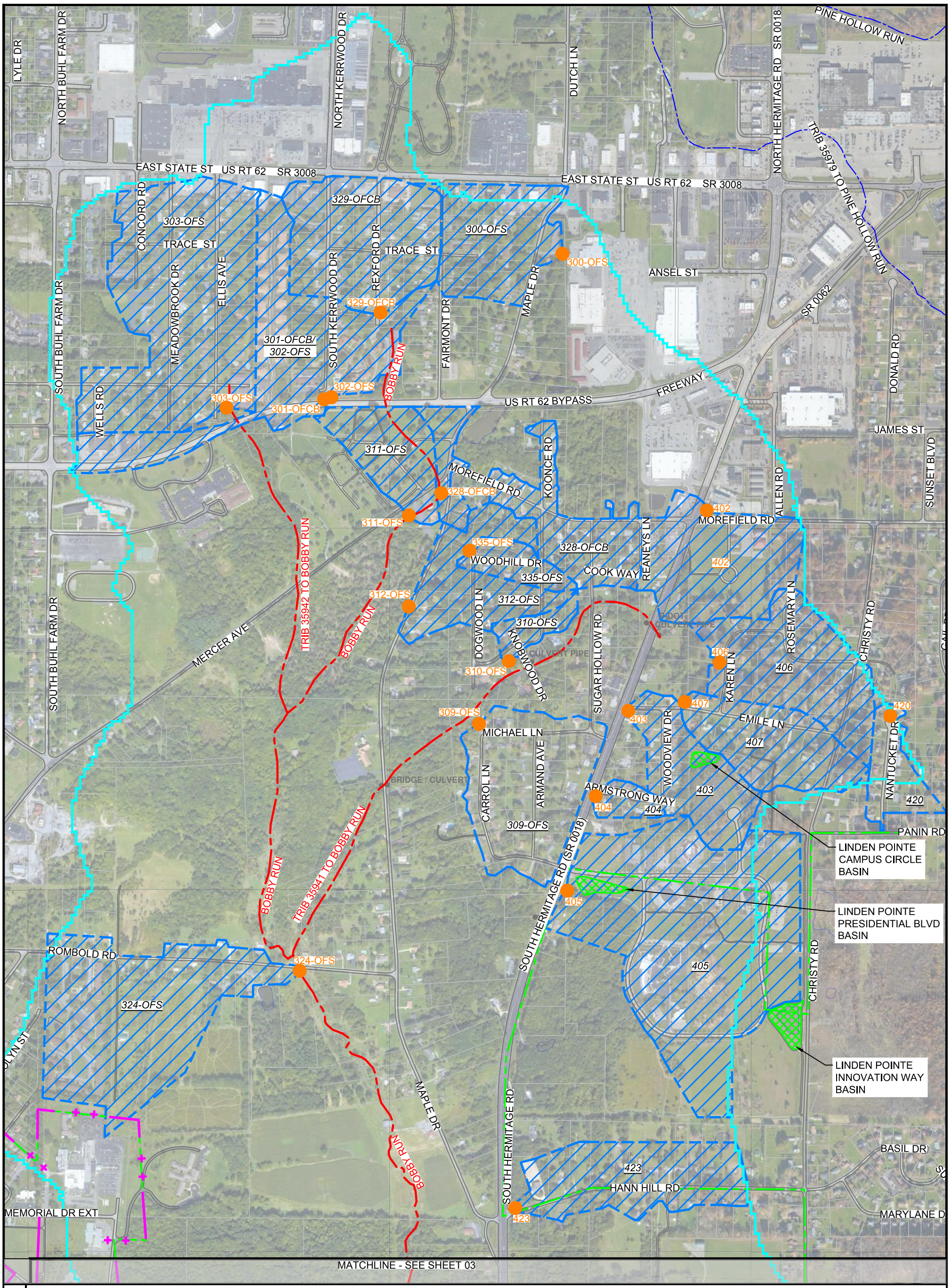
LEGEND

- EXISTING PROPERTY LINE
- MUNICIPAL BOUNDARY
- 2010 URBANIZED AREA
- BOBBY RUN WATERSHED
- EXISTING ROAD
- EXISTING UNIMPAIRED STREAM
- EXISTING IMPAIRED STREAM
- MS4 SEWERSHED BOUNDARY
- MS4 SEWERSHED BOUNDARY
- 425 IMPAIRED MS4 OUTFALL
- 436 UNIMPAIRED MS4 OUTFALL
- EXISTING DETENTION BASIN
- PROPOSED BMP

0 1500 3000

SCALE: 1" = 1500'

SHEET NO. 01	DATE: 07-10-17 DRAWN: MAC CHECKED: ESM PROJ. NO.: 20905	PROJECT: CITY OF HERMITAGE MS4 PERMIT RENEWAL POLLUTANT REDUCTION PLAN - OVERALL MAP	WALLACEPANCHER GROUP 1085 S. Hermitage Rd. Hermitage, PA 16148 Phone: (724) 981-0155 Engineering and Environmental Professionals www.wallacepancher.com PREPARED FOR: THE CITY OF HERMITAGE 800 NORTH HERMITAGE ROAD HERMITAGE, PA 16148



LEGEND

- EXISTING PROPERTY LINE
- MUNICIPAL BOUNDARY
- 2010 URBANIZED AREA
- BOBBY RUN WATERSHED
- EXISTING ROAD
- EXISTING UNIMPAIRED STREAM
- EXISTING IMPAIRED STREAM
- MS4 SEWERSHED BOUNDARY
- MS4 SEWERSHED BOUNDARY
- 425 IMPAIRED MS4 OUTFALL
- 436 UNIMPAIRED MS4 OUTFALL
- EXISTING DETENTION BASIN
- PROPOSED BMP

0 750 1500

SCALE: 1" = 750'

SHEET NO. 02	DATE: 07-10-17	PROJECT: CITY OF HERMITAGE MS4 PERMIT RENEWAL	WALLACEPANCHER GROUP 1085 S. Hermitage Rd. Hermitage, PA 16148 Phone: (724) 981-0155 Engineering and Environmental Professionals www.wallacepancher.com
	DRAWN: MAC		
	CHECKED: ESM		
		POLLUTANT REDUCTION PLAN - NORTHERN BOBBY RUN WATERSHED	PREPARED FOR: THE CITY OF HERMITAGE 800 NORTH HERMITAGE ROAD HERMITAGE, PA 16148
	PROJ. NO.: 20905		

MATCHLINE - SEE SHEET 02

LIKENS LN
HOELZLE RD
KRIVOSH RD
330-OFS
PARKDALE AVE
BOBBY RUN
LONGVIEW RD
BOBBY RUN STREAM
600' LF RESTORATION AT
LONGVIEW ROAD
424
HERMITAGE ROAD
LAKEWOOD DR
424
SPANGLER RD
TWELVE OAKS DR
SAMPLE RD
LORI LN
434-OFS
SILVER RIDGE CT
434-OFS
TIMBER LN
BONNY LN
TIFFANY LN
BONNY LANE
BASIN
FRAN LN
LEE RUN RD
435
425
435
425
TAMARA TRL
BOBBY RUN
SOUTH HERMITAGE ROAD
KIRILA RD
325-OFS/
326-OFS/
327-OFS
325-OFS
326-OFS
327-OFS
LYNNWOOD DR
BOBBY RUN
BROADWAY AVE (SR 60)
BOBBY RUN TIES INTO THE
SHENANGO RIVER
TRIB 35932 TO HOGBACK RUN
TRIB 35931 TO HOGBACK RUN
SHENANGO RIVER
INTERSTATE 80
INTERSTATE 80
SHENANGO RIVER
HOGBACK RUN
HOGBACK RUN

LEGEND

- EXISTING PROPERTY LINE
- MUNICIPAL BOUNDARY
- 2010 URBANIZED AREA
- BOBBY RUN WATERSHED
- EXISTING ROAD
- EXISTING UNIMPAIRED STREAM
- EXISTING IMPAIRED STREAM
- MS4 SEWERSHED BOUNDARY
- MS4 SEWERSHED BOUNDARY
- 425 IMPAIRED MS4 OUTFALL
- 436 UNIMPAIRED MS4 OUTFALL
- EXISTING DETENTION BASIN
- PROPOSED BMP

0 750 1500

SCALE: 1" = 750'

SHEET NO. 03	DATE: 07-10-17	PROJECT: CITY OF HERMITAGE MS4 PERMIT RENEWAL	WALLACEPANCHER GROUP 1085 S. Hermitage Rd. Hermitage, PA 16148 Phone: (724) 981-0155 Engineering and Environmental Professionals www.wallacepancher.com
	DRAWN: MAC		
	CHECKED: ESM		
		POLLUTANT REDUCTION PLAN - SOUTHERN BOBBY RUN WATERSHED	PREPARED FOR: THE CITY OF HERMITAGE 800 NORTH HERMITAGE ROAD HERMITAGE, PA 16148
	PROJ. NO.: 20905		

Appendix E – Existing Pollutant Loading and Required Reductions Calculations

City of Hermitage PRP - Bobby Run Sewershed Area Information

Sewershed/Outfall #	Total Sewershed Area		Area within Municipal Boundary		Area Outside Municipal Boundary (ac)
	Square Feet	Acres	Area in UA (ac)	Area outside UA (ac)	
300-OFS	875896.72	20.108	20.108	0.000	0.000
301-OFCB,302-OFS	1599647.22	36.723	36.723	0.000	0.000
303-OFS	2401212.31	55.124	55.124	0.000	0.000
309-OFS	1232090.40	28.285	28.285	0.000	0.000
310-OFS	164201.46	3.770	3.770	0.000	0.000
311-OFS	577217.42	13.251	13.251	0.000	0.000
312-OFS	743153.49	17.060	17.060	0.000	0.000
324-OFS	1937610.17	44.481	44.121	0.000	0.360
325-OFS,326-OFS,327-OFS	515010.10	11.823	11.785	0.038	0.000
328-OFCB	936723.06	21.504	21.504	0.000	0.000
329-OFCB	1241629.89	28.504	28.504	0.000	0.000
330-OFS	2018708.14	46.343	46.343	0.000	0.000
335-OFS	237349.07	5.449	5.449	0.000	0.000
402	1101699.94	25.292	25.292	0.000	0.000
403	723760.65	16.615	16.615	0.000	0.000
404	145164.29	3.333	3.333	0.000	0.000
405	3110775.26	71.414	23.179	48.234	0.000
406	1130761.49	25.959	25.959	0.000	0.000
407	786710.94	18.060	18.060	0.000	0.000
420	337255.69	7.742	7.742	0.000	0.000
423	1003873.04	23.046	6.754	16.292	0.000
424	1340416.01	30.772	25.246	5.525	0.000
425	619906.13	14.231	11.259	2.972	0.000
434-OFS	1188122.27	27.276	27.276	0.000	0.000
435	767556.94	17.621	14.869	2.752	0.000
TOTAL:	26736452.10	613.78	537.61	75.81	0.36

Planning Area Breakdown by Cover Type

*Area * Land Cover Percentage = Area of Land Cover*

Planning Area		Area of Land Cover (ac)
Planning Area Within UA (ac)	Impervious Land Cover (%)	
537.61	28	150.53
	Pervious Land Cover (%)	
	72	387.08
Planning Area Outside UA (ac)	Impervious Land Cover (%)	
75.81	16	12.13
	Pervious Land Cover (%)	
	84	63.68
TOTAL:		613.42

Existing Pollutant Loading and Required Reduction

*Area * Loading Rate = Pollutant Load*

Area and Cover Type	Area (ac)	Loading Rate (lb/ac/yr)	Pollutant Load (lb/yr)
UA Impervious	150.53	2.28	343.21
UA Pervious	387.08	0.84	325.15
Outside UA Impervious	12.13	0.33	4.00
Outside UA Pervious	63.68	0.33	21.01
TOTAL:			693.37
5% Reduction Requirement:			34.67

ATTACHMENT B

DEVELOPED LAND LOADING RATES FOR PA COUNTIES[1,2,3]

County	Category	Acres	TN lbs/acre/yr	TP lbs/acre/yr	TSS (Sediment) lbs/acre/yr
Adams	impervious developed	10,373.2	33.43	2.1	1,398.77
	pervious developed	44,028.6	22.99	0.8	207.67
Bedford	impervious developed	9,815.2	19.42	1.9	2,034.34
	pervious developed	19,425	17.97	0.68	301.22
Berks	impervious developed	1,292.4	36.81	2.26	1,925.79
	pervious developed	5,178.8	34.02	0.98	264.29
Blair	impervious developed	3,587.9	20.88	1.73	1,813.55
	pervious developed	9,177.5	18.9	0.62	267.34
Bradford	impervious developed	10,423	14.82	2.37	1,880.87
	pervious developed	23,709.7	13.05	0.85	272.25
Cambria	impervious developed	3,237.9	20.91	2.9	2,155.29
	pervious developed	8,455.4	19.86	1.12	325.3
Cameron	impervious developed	1,743.2	18.46	2.98	2,574.49
	pervious developed	1,334.5	19.41	1.21	379.36
Carbon	impervious developed	25.1	28.61	3.97	2,177.04
	pervious developed	54.2	30.37	2.04	323.36
Centre	impervious developed	7,828.2	19.21	2.32	1,771.63
	pervious developed	15,037.1	18.52	0.61	215.84
Chester	impervious developed	1,838.4	21.15	1.46	1,504.78
	pervious developed	10,439.8	14.09	0.36	185.12
Clearfield	impervious developed	9,638.5	17.54	2.78	1,902.9
	pervious developed	17,444.3	18.89	1.05	266.62
Clinton	impervious developed	7,238.5	18.02	2.80	1,856.91
	pervious developed	11,153.8	16.88	0.92	275.81
Columbia	impervious developed	7,343.1	21.21	3.08	1,929.18
	pervious developed	21,848.2	22.15	1.22	280.39
Cumberland	impervious developed	8,774.8	28.93	1.11	2,065.1
	pervious developed	26,908.6	23.29	0.34	306.95
Dauphin	impervious developed	3,482.4	28.59	1.07	1,999.14
	pervious developed	9,405.8	21.24	0.34	299.62
Elks	impervious developed	1,317.7	18.91	2.91	1,556.93
	pervious developed	1,250.1	19.32	1.19	239.85
Franklin	impervious developed	13,832.3	31.6	2.72	1,944.85
	pervious developed	49,908.6	24.37	0.76	308.31
Fulton	impervious developed	3,712.9	22.28	2.41	1,586.75
	pervious developed	4,462.3	18.75	0.91	236.54
Huntington	impervious developed	7,321.9	18.58	1.63	1,647.53
	pervious developed	11,375.4	17.8	0.61	260.15
Indiana	impervious developed	589	19.29	2.79	1,621.25
	pervious developed	972	20.1	1.16	220.68
Jefferson	impervious developed	21.4	18.07	2.76	1,369.63
	pervious developed	20.4	19.96	1.24	198.60
Juniata	impervious developed	3,770.2	22.58	1.69	1,903.96
	pervious developed	8,928.3	17.84	0.55	260.68
Lackawana	impervious developed	2,969.7	19.89	2.84	1,305.05
	pervious developed	7,783.9	17.51	0.76	132.98
Lancaster	impervious developed	4,918.7	38.53	1.55	1,480.43
	pervious developed	21,649.7	22.24	0.36	190.93
Lebanon	impervious developed	1,192.1	40.58	1.85	1,948.53
	pervious developed	5,150	27.11	0.4	269.81
Luzerne	impervious developed	5,857	20.43	3	1,648.22
	pervious developed	13,482.9	19.46	0.98	221.19
Lycoming	impervious developed	10,031.7	16.48	2.57	1,989.64
	pervious developed	19,995.5	16	0.84	277.38

Statewide MS4 Land Cover Estimates

County	Municipality	UA % Impervious	UA % Pervious	Outside of UA % Impervious	Outside of UA % Pervious	UA Acres
Allegheny	GLEN OSBORNE BORO	13%	87%	13%	87%	354.1
York	GOLDSBORO BORO	30%	70%	28%	72%	249.0
Susquehanna	GREAT BEND BORO	44%	56%	40%	60%	178.2
Susquehanna	GREAT BEND TWP	37%	63%	2%	98%	390.0
Franklin	GREENCASTLE BORO	52%	48%	52%	48%	1,007.5
Erie	GREENE TWP	10%	90%	3%	97%	282.4
Franklin	GREENE TWP	25%	75%	9%	91%	7,998.1
Montgomery	GREEN LANE BORO	35%	65%	35%	65%	212.1
Westmoreland	GREENSBURG CITY	33%	67%	33%	67%	2,605.9
Allegheny	GREEN TREE BORO	42%	58%	42%	58%	1,318.0
Franklin	GUILFORD TWP	32%	68%	10%	90%	5,023.7
York	HALLAM BORO	42%	58%	35%	65%	342.4
Susquehanna	HALLSTEAD BORO	44%	56%	42%	58%	251.9
Berks	HAMBURG BORO	39%	61%	39%	61%	1,279.9
Adams	HAMILTON TWP	9%	91%	4%	96%	422.2
Franklin	HAMILTON TWP	24%	76%	6%	94%	3,370.1
Monroe	HAMILTON TWP	16%	84%	6%	94%	3,406.5
Cumberland	HAMPDEN TWP	40%	60%	36%	64%	9,885.5
Allegheny	HAMPTON TWP	20%	80%	19%	81%	9,826.7
Lehigh	HANOVER TWP	40%	60%	40%	60%	2,697.2
Luzerne	HANOVER TWP	25%	75%	14%	86%	6,048.8
Northampton	HANOVER TWP	37%	63%	35%	65%	4,018.6
Washington	HANOVER TWP	29%	71%	3%	97%	290.0
York	HANOVER BORO	61%	39%	61%	39%	2,368.9
Erie	HARBORCREEK TWP	28%	72%	11%	89%	5,516.0
Allegheny	HARMAR TWP	30%	70%	22%	78%	2,335.3
Beaver	HARMONY TWP	26%	74%	26%	74%	1,951.1
Butler	HARMONY BORO	29%	71%	28%	72%	249.4
Centre	HARRIS TWP	32%	68%	4%	96%	1,344.8
Dauphin	HARRISBURG CITY	41%	59%	41%	59%	7,473.4
Allegheny	HARRISON TWP	23%	77%	21%	79%	4,426.2
Luzerne	HARVEYS LAKE BORO	18%	82%	11%	89%	1,524.5
Montgomery	HATBORO BORO	67%	33%	67%	33%	909.9
Montgomery	HATFIELD BORO	52%	48%	52%	48%	410.3
Montgomery	HATFIELD TWP	41%	59%	41%	59%	6,376.5
Delaware	HAVERFORD TWP	39%	61%	39%	61%	6,372.1
Allegheny	HAYSVILLE BORO	9%	91%	9%	91%	147.4
Luzerne	HAZLE TWP	25%	75%	10%	90%	4,772.8
Luzerne	HAZLETON CITY	41%	59%	42%	58%	3,847.7
Allegheny	HEIDELBERG BORO	59%	41%	60%	40%	183.8
Berks	HEIDELBERG TWP	22%	78%	5%	95%	876.7
Lebanon	HEIDELBERG TWP	23%	77%	5%	95%	250.4
Lehigh	HEIDELBERG TWP	15%	85%	4%	96%	392.2
York	HEIDELBERG TWP	21%	79%	7%	93%	421.5
York	HELLAM TWP	24%	76%	6%	94%	1,365.3
Northampton	HELLERTOWN BORO	48%	52%	48%	52%	845.9
Columbia	HEMLOCK TWP	24%	76%	6%	94%	913.3
Westmoreland	HEMPFIELD TWP	17%	83%	11%	89%	20,777.6
Lycoming	HEPBURN TWP	17%	83%	4%	96%	332.2
Berks	HEREFORD TWP	35%	65%	4%	96%	251.9
Mercer	HERMITAGE CITY	28%	72%	16%	84%	8,105.8
Dauphin	HIGHSPIRE BORO	49%	51%	49%	51%	469.1
Bucks	HILLTOWN TWP	17%	83%	13%	87%	8,349.8
Blair	HOLLIDAYSBURG BORO	38%	62%	38%	62%	1,483.9

County	Category	Acres	TN lbs/acre/yr	TP lbs/acre/yr	TSS (Sediment) lbs/acre/yr
McKean	impervious developed	38.7	20.93	3.21	1,843.27
	pervious developed	5.3	22.58	1.45	249.26
Mifflin	impervious developed	5,560.2	21.83	1.79	1,979.13
	pervious developed	16,405.5	21.13	0.71	296.07
Montour	impervious developed	5,560.2	21.83	1.79	1,979.13
	pervious developed	16,405.5	21.13	0.71	296.07
Northumberland	impervious developed	8,687.3	25.73	1.54	2,197.08
	pervious developed	25,168.3	24.63	0.54	367.84
Perry	impervious developed	5,041.1	26.77	1.32	2,314.7
	pervious developed	9,977	23.94	0.51	343.16
Potter	impervious developed	2,936.3	16.95	2.75	1,728.34
	pervious developed	2,699.3	17.11	1.09	265.2
Schuylkill	impervious developed	5,638.7	30.49	1.56	1,921.08
	pervious developed	14,797.2	29.41	0.57	264.04
Snyder	impervious developed	4,934.2	28.6	1.11	2,068.16
	pervious developed	14,718.1	24.35	0.4	301.5
Somerset	impervious developed	1,013.6	25.13	2.79	1,845.7
	pervious developed	851.2	25.71	1.14	293.42
Sullivan	impervious developed	3,031.7	19.08	2.85	2,013.9
	pervious developed	3,943.4	21.55	1.31	301.58
Susquehanna	impervious developed	7,042.1	19.29	2.86	1,405.73
	pervious developed	14,749.7	20.77	1.21	203.85
Tioga	impervious developed	7,966.9	12.37	2.09	1,767.75
	pervious developed	18,090.3	12.22	0.76	261.94
Union	impervious developed	4,382.6	22.98	2.04	2,393.55
	pervious developed	14,065.3	20.88	0.69	343.81
Wayne	impervious developed	320.5	18.69	2.89	1,002.58
	pervious developed	509	21.14	1.31	158.48
Wyoming	impervious developed	3,634.4	16.03	2.53	2,022.32
	pervious developed	10,792.9	13.75	0.7	238.26
York	impervious developed	10,330.7	29.69	1.18	1,614.15
	pervious developed	40,374.8	18.73	0.29	220.4
All Other Counties	impervious developed	-	23.06	2.28	1,839
	pervious developed	-	20.72	0.84	264.96

Notes:

1 These land loading rate values may be used to derive existing pollutant loading estimates under DEP's simplified method for PRP development. MS4s may choose to develop estimates using other scientifically sound methods.

2 Acres and land loading rate values for named counties in the Chesapeake Bay watershed are derived from CAST. (The column for Acres represents acres within the Chesapeake Bay watershed). For MS4s located outside of the Chesapeake Bay watershed, the land loading rates for "All Other Counties" may be used to develop PRPs under Appendix E; these values are average values across the Chesapeake Bay watershed.

3 For land area outside of the urbanized area, undeveloped land loading rates may be used where appropriate. When using the simplified method, DEP recommends the following loading rates (for any county) for undeveloped land:

- TN – 10 lbs/acre/yr
- TP – 0.33 lbs/acre/yr
- TSS (Sediment) – 234.6 lbs/acre/yr

These values were derived by using the existing loads for each pollutant, according to the 2014 Chesapeake Bay Progress Run, and dividing by the number of acres for the unregulated stormwater subsector.

Appendix F – Proposed BMPs and Effectiveness Calculations

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CLEAN WATER

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)
STORMWATER DISCHARGES FROM
SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS
BMP EFFECTIVENESS VALUES

This table of BMP effectiveness values (i.e., pollutant removal efficiencies) is intended for use by MS4s that are developing and implementing Pollutant Reduction Plans and TMDL Plans to comply with NPDES permit requirements. The values used in this table generally consider pollutant reductions from both overland flow and reduced downstream erosion, and are based primarily on average values within the Chesapeake Assessment Scenario Tool (CAST) (www.casttool.org). Design considerations, operation and maintenance, and construction sequences should be as outlined in the Pennsylvania Stormwater BMP Manual, Chesapeake Bay Program guidance, or other technical sources. The Department of Environmental Protection (DEP) will update the information contained in this table as new information becomes available. Interested parties may submit information to DEP for consideration in updating this table to DEP's MS4 resource account, RA-EPPAMS4@pa.gov. Where an MS4 proposes a BMP not identified in this document or in Chesapeake Bay Program expert panel reports, other technical resources may be consulted for BMP effectiveness values. Note – TN = Total Nitrogen and TP = Total Phosphorus.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Wet Ponds and Wetlands	20%	45%	60%	A water impoundment structure that intercepts stormwater runoff then releases it to an open water system at a specified flow rate. These structures retain a permanent pool and usually have retention times sufficient to allow settlement of some portion of the intercepted sediments and attached nutrients/toxics. Until recently, these practices were designed specifically to meet water quantity, not water quality objectives. There is little or no vegetation living within the pooled area nor are outfalls directed through vegetated areas prior to open water release. Nitrogen reduction is minimal.
Dry Detention Basins and Hydrodynamic Structures	5%	10%	10%	Dry Detention Ponds are depressions or basins created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Hydrodynamic Structures are devices designed to improve quality of stormwater using features such as swirl concentrators, grit chambers, oil barriers, baffles, micropools, and absorbent pads that are designed to remove sediments, nutrients, metals, organic chemicals, or oil and grease from urban runoff.
Dry Extended Detention Basins	20%	20%	60%	Dry extended detention (ED) basins are depressions created by excavation or berm construction that temporarily store runoff and release it slowly via surface flow or groundwater infiltration following storms. Dry ED basins are designed to dry out between storm events, in contrast with wet ponds, which contain standing water permanently. As such, they are similar in construction and function to dry detention basins, except that the duration of detention of stormwater is designed to be longer, theoretically improving treatment effectiveness.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Infiltration Practices w/ Sand, Veg.	85%	85%	95%	A depression to form an infiltration basin where sediment is trapped and water infiltrates the soil. No underdrains are associated with infiltration basins and trenches, because by definition these systems provide complete infiltration. Design specifications require infiltration basins and trenches to be built in good soil, they are not constructed on poor soils, such as C and D soil types. Engineers are required to test the soil before approval to build is issued. To receive credit over the longer term, jurisdictions must conduct yearly inspections to determine if the basin or trench is still infiltrating runoff.
Filtering Practices	40%	60%	80%	Practices that capture and temporarily store runoff and pass it through a filter bed of either sand or an organic media. There are various sand filter designs, such as above ground, below ground, perimeter, etc. An organic media filter uses another medium besides sand to enhance pollutant removal for many compounds due to the increased cation exchange capacity achieved by increasing the organic matter. These systems require yearly inspection and maintenance to receive pollutant reduction credit.
Filter Strip Runoff Reduction	20%	54%	56%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.4 design ratio of filter strip length to impervious flow length is recommended for runoff reduction urban filter strips.
Filter Strip Stormwater Treatment	0%	0%	22%	Urban filter strips are stable areas with vegetated cover on flat or gently sloping land. Runoff entering the filter strip must be in the form of sheet-flow and must enter at a non-erosive rate for the site-specific soil conditions. A 0.2 design ratio of filter strip length to impervious flow length is recommended for stormwater treatment urban filter strips.
Bioretention – Raingarden (C/D soils w/ underdrain)	25%	45%	55%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in C or D soil.
Bioretention / Raingarden (A/B soils w/ underdrain)	70%	75%	80%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has an underdrain and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Bioretention / Raingarden (A/B soils w/o underdrain)	80%	85%	90%	An excavated pit backfilled with engineered media, topsoil, mulch, and vegetation. These are planting areas installed in shallow basins in which the storm water runoff is temporarily ponded and then treated by filtering through the bed components, and through biological and biochemical reactions within the soil matrix and around the root zones of the plants. This BMP has no underdrain and is in A or B soil.
Vegetated Open Channels (C/D Soils)	10%	10%	50%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in C or D soil.
Vegetated Open Channels (A/B Soils)	45%	45%	70%	Open channels are practices that convey stormwater runoff and provide treatment as the water is conveyed, includes bioswales. Runoff passes through either vegetation in the channel, subsoil matrix, and/or is infiltrated into the underlying soils. This BMP has no underdrain and is in A or B soil.
Bioswale	70%	75%	80%	With a bioswale, the load is reduced because, unlike other open channel designs, there is now treatment through the soil. A bioswale is designed to function as a bioretention area.
Permeable Pavement w/o Sand or Veg. (C/D Soils w/ underdrain)	10%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in C or D soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/ underdrain)	45%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/o Sand or Veg. (A/B Soils w/o underdrain)	75%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, no sand or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (A/B Soils w/ underdrain)	50%	50%	70%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in A or B soil.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Permeable Pavement w/ Sand or Veg. (A/B Soils w/o underdrain)	80%	80%	85%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has no underdrain, has sand and/or vegetation and is in A or B soil.
Permeable Pavement w/ Sand or Veg. (C/D Soils w/ underdrain)	20%	20%	55%	Pavement or pavers that reduce runoff volume and treat water quality through both infiltration and filtration mechanisms. Water filters through open voids in the pavement surface to a washed gravel subsurface storage reservoir, where it is then slowly infiltrated into the underlying soils or exits via an underdrain. This BMP has an underdrain, has sand and/or vegetation and is in C or D soil.
Stream Restoration	0.075 lbs/ft/yr	0.068 lbs/ft/yr	44.88 lbs/ft/yr	An annual mass nutrient and sediment reduction credit for qualifying stream restoration practices that prevent channel or bank erosion that otherwise would be delivered downstream from an actively enlarging or incising urban stream. Applies to 0 to 3rd order streams that are not tidally influenced. If one of the protocols is cited and pounds are reported, then the mass reduction is received for the protocol.
Forest Buffers	25%	50%	50%	An area of trees at least 35 feet wide on one side of a stream, usually accompanied by trees, shrubs and other vegetation that is adjacent to a body of water. The riparian area is managed to maintain the integrity of stream channels and shorelines, to reduce the impacts of upland sources of pollution by trapping, filtering, and converting sediments, nutrients, and other chemicals. (Note – the values represent pollutant load reductions from stormwater draining through buffers).
Tree Planting	10%	15%	20%	The BMP effectiveness values for tree planting are estimated by DEP. DEP estimates that 100 fully mature trees of mixed species (both deciduous and non-deciduous) provide pollutant load reductions for the equivalent of one acre (i.e., one mature tree = 0.01 acre). The BMP effectiveness values given are based on immature trees (seedlings or saplings); the effectiveness values are expected to increase as the trees mature. To determine the amount of pollutant load reduction that can credited for tree planting efforts: 1) multiply the number of trees planted by 0.01; 2) multiply the acreage determined in step 1 by the pollutant loading rate for the land prior to planting the trees (in lbs/acre/year); and 3) multiply the result of step 2 by the BMP effectiveness values given.
Street Sweeping	3%	3%	9%	Street sweeping must be conducted 25 times annually. Only count those streets that have been swept at least 25 times in a year. The acres associated with all streets that have been swept at least 25 times in a year would be eligible for pollutant reductions consistent with the given BMP effectiveness values.

BMP Name	BMP Effectiveness Values			BMP Description
	TN	TP	Sediment	
Storm Sewer System Solids Removal	0.0027 for sediment, 0.0111 for organic matter	0.0006 for sediment, 0.0012 for organic matter	1 – TN and TP concentrations	This BMP (also referred to as "Storm Drain Cleaning") involves the collection or capture and proper disposal of solid material within the storm system to prevent discharge to surface waters. Examples include catch basins, stormwater inlet filter bags, end of pipe or outlet solids removal systems and related practices. Credit is authorized for this BMP only when proper maintenance practices are observed (i.e., inspection and removal of solids as recommended by the system manufacturer or other available guidelines). The entity using this BMP for pollutant removal credits must demonstrate that they have developed and are implementing a standard operating procedure for tracking the material removed from the sewer system. Locating such BMPs should consider the potential for backups onto roadways or other areas that can produce safety hazards. To determine pollutant reductions for this BMP, these steps must be taken: 1) Measure the weight of solid/organic material collected (lbs). Sum the total weight of material collected for an annual period. Note – do not include refuse, debris and floatables in the determination of total mass collected. 2) Convert the annual wet weight captured into annual dry weight (lbs) by using site-specific measurements (i.e., dry a sample of the wet material to find its weight) or by using default factors of 0.7 (material that is predominantly wet sediment) or 0.2 (material that is predominantly wet organic matter, e.g., leaf litter). 3) Multiply the annual dry weight of material collected by default or site-specific pollutant concentration factors. The default concentrations are shown in the BMP Effectiveness Values columns. Alternatively, the material may be sampled (at least annually) to determine site-specific pollutant concentrations. DEP will allow up to 50% of total pollutant reduction requirements to be met through this BMP. The drainage area treated by this BMP may be no greater than 0.5 acre unless it can be demonstrated that the specific system proposed is capable of treating stormwater from larger drainage areas. For planning purposes, the sediment removal efficiency specified by the manufacturer may be assumed, but no higher than 80%.

PRP BMP Selection

Bobby Run Stream Restoration at Longview Road

Project Summary & Details

The City of Hermitage is proposing to complete approximately 600 linear feet of stream restoration to Bobby Run. The stream restoration will address channel and bank erosion concerns that are currently being delivered downstream. The restoration project will provide Total Phosphorus removal from the Bobby Run watershed, which is impaired for nutrients. Restoration activities may include: installation of in-stream and bank structures (such as cross vanes, toewood structures, rootwad structures, tiered boulder walls), floodplain creation, and floodplain plantings.

Project Location

The proposed project is along Bobby Run in the area located on the upstream and downstream side of the SR 518 (Longview Road).

Latitude: 41.201977 N Longitude: -80.458334 W

Pollutant Load Reductions for Total Phosphorus

BMP Description	Length (ft)	Loading Reduction Rate (lb/ft/yr)*	Pollutant Reduction Obtained (lbs/yr)	Est. Design and Construction Cost
Bobby Run Stream Restoration at Longview Road	600	0.068	40.8	$180,000

** From BMP Effectiveness Values table, 3800-PM-BCW0100m*

Anticipated Schedule for Design and Construction

The City of Hermitage intends to begin the stream restoration design and permitting process in 2019. This allows time for the city to obtain funding for design. The anticipated construction start time is Summer of 2020.

Anticipated Project Funding

The City of Hermitage plans to use budgeting from Fiscal Years 2018 and 2019 to cover the cost of design. Subsequent years' budgeting will be used to cover construction costs. During the design phase, the City of Hermitage intends to apply for grants in aiding with covering the cost of construction.

Operation & Maintenance

The City of Hermitage will monitor the stream restoration project site per future approved mitigation and restoration plan requirements. Any operation and maintenance required as a result of monitoring or other notifications will be completed by the City of Hermitage.