Gouglersville Fire Co. Environs (RP_04)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.274692	-76.019762

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	3.91		
Pervious	8.10		
Total	12.01	596.20	7,160

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.060	0.19	27.3%	1,953.5	1,953.5

BMP Summary

The runoff from the Gouglersville Fire Company, the playground and adjacent parking lot, and likely a portion of the residential area across Mohns Hill Road, all appears to flow along a shallow grass swale which runs immediately adjacent to the playground. Adding a more purposeful vegetated swale along this flow path, leading to a rain garden or other infiltration practice, will add water quality treatment to this site. Calculations shown are for a shallow water quality swale and rain garden, though given probable soil composition, deeper and larger infiltration practices are likely also possible. Given the lack of opportunity for an underdrain in the system, a soil boring would be advised if planning for a deeper infiltration practice like an infiltration trench or dry well.

Governor Mifflin Middle School (RP_05)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.304255	-75.964050

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	1.68		
Pervious	1.44		
Total	3.11	628.98	1,958

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.029	0.21	30%	583.1	583.1

BMP Summary

A few retrofit opportunities were identified at the Governor Mifflin Middle School, although the most significant for sediment reduction potential is on the Governor Mifflin High School grounds. The drainage area provided by Great Valley Consultants called "Gov Mifflin M.S. – Waverly," or a portion thereof, drains to a culvert pipe that outfalls in a wide grass swale adjacent to the baseball fields in front of the high school across S Waverly Street. Given probable B soils and ample room before the footbridge (beyond which the swale appears to be used as warm-up and practice space), a rain garden or other non-underdrain infiltration practice could be constructed.

Other on-site retrofits at the middle school include rain gardens, though the probable soil composition (based on Web Soil Survey) suggests shallow rain gardens with ample vegetation is advisable. Rain gardens would be highly visible, and could be fed by a rainwater harvesting system, effectively increasing the ponding and detention capacity of otherwise limited practices. While the rain gardens themselves may not detain much water, a rainwater cistern set to drain into the rain gardens very slowly over 48 hours increases their effective capacities.

The site is otherwise very flat, and therefore natural drainage patterns are very difficult to take advantage of.

The National Land Cover Dataset (NLCD) impervious cover layer used to calculate impervious cover within the drainage area was at a 30-meter resolution. In some cases, such as for this site, the low-resolution data resulted in inaccurate impervious cover percentages used to calculate load reductions per the Chesapeake Bay Retrofit Curves. Note that the impervious cover percentage of this drainage area is believed to be at least slightly higher than is reflected by the numbers above, which would in turn affect the performance efficiency of the BMP.

Grace Fellowship Church Basin (RP_06)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.297748	-75.996836

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	2.39		
Pervious	2.95		
Total	5.34	614.60	3,280

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.149	0.75	63.5%	2,083.6	2,083.6

BMP Summary

This dry detention pond has a small amount of wetland vegetation growing at the outlet structure. There is little to no head to make any significant modifications to the outlet structure; the overflow grate is 35 inches above the low-elevation orifice invert, and there is little discernable drop from the outlet pipe upper end to the invert of the outfall. However, the low-elevation orifice is eight (8) inches in diameter, which likely only controls effluent rate for very intense storm flows. This orifice could be partially blocked, or changed to something like a perforated standpipe to create an extended detention condition for 24-48 hours, provided hydraulic calculations indicate there are no safety issues posed for the adjacent roadway, Old Lancaster Pike. Additional options include adding small check dams of stone or filter socks along the primary inlet channel to slow the water from the inlet pipes next to the parking lot and pre-settle some of the sediment, excavate a little from the basin floor (which is sloped, and therefore not detaining any more water than is "grabbed" by the vegetation at the outlet), and purposely planting additional vegetation in the basin floor.

Highlands Basin 1 (RP_07)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.311457	-75.976172

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	6.41		
Pervious	17.38		
Total	23.80	577.58	13,744

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.459	0.86	71.5%	9,829.2	9,829.2

BMP Summary

The Highlands primary detention basin is vast, quite flat, and potential for easy retrofit. The low-elevation outlet is an 18" diameter pipe with a trash rack which likely does little to nothing to control flow rates except for intense, prolonged flows. Given the large surface area and six (6) foot high overflow, there is available head to detain or retain runoff in this basin without causing issues for adjacent properties. The overflow weir is quite wide and robustly constructed, further supporting retrofit efforts. The easiest retrofit is simply amending the outlet by blocking the outlet pipe, adding staged orifices in a cover plate to create extended detention by greatly reducing the size of the low-flow orifice, or retention by blocking the bottom of the pipe and raising the elevation of the invert of the low-flow orifice by 12 inches. More involved retrofits include constructing a filtration practice such as a bioretention within the detention basin.

The long swale that extends from the outlet of the detention basin is both a potential location for an underdrain for a newly-constructed filtration practice, or an additional location for a water quality practice; a water quality swale, either vegetated, dry, or potentially wet depending on soil exploration results, would provide additional treatment for the primary drainage area, and potentially some treatment for an additional 11 acres of development. That additional 11 acres appears to have been developed between 2008 and 2010, so it is possible the stormwater controls for that new cul-de-sac are already at a high enough standard that additional treatment is not worth the cost. The additional treatment a water quality swale might provide for the primary drainage area of 23.8 acres is an additional 900 pounds of sediment per year, approximately.

The National Land Cover Dataset (NLCD) impervious cover layer used to calculate impervious cover within the drainage area was at a 30-meter resolution. In some cases, such as for this site, the low-resolution data resulted in inaccurate impervious cover percentages used to calculate load reductions per the Chesapeake Bay Retrofit Curves. Note that the impervious cover percentage of this drainage area is believed to be at least slightly higher than is reflected by the numbers above, which would in turn affect the performance efficiency of the BMP.

Highlands Basin 2 (RP_08)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.310866	-75.973386

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	1.17		
Pervious	7.28		
Total	8.45	557.59	4,712

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.142	1.45	81.1%	3,823.2	3,823.2

BMP Summary

A dry detention basin on the east end of the Highlands development appears to treat runoff from approximately 8.5 acres. This basin could also have the low-elevation orifice modified or raised to create extended detention or some retention. Overflow is at approximately six (6) feet elevation. Low-flow orifice is four (4) inches in diameter. Overflow grate in outlet structure is at approximately 40 inches. The outlet structure, however, is being undercut by scour, and is at least leaning, if not sinking. The outlet structure is canted at least five degrees, and the supporting soil is visibly eroding. The outlet structure likely needs to be repaired or replaced regardless of whether retrofit is done, so retrofit is simply a matter of coordination, rather than additional cost, though a change in design may have regulatory constraints associated with it.

The National Land Cover Dataset (NLCD) impervious cover layer used to calculate impervious cover within the drainage area was at a 30-meter resolution. In some cases, such as for this site, the low-resolution data resulted in inaccurate impervious cover percentages used to calculate load reductions per the Chesapeake Bay Retrofit Curves. Note that the impervious cover percentage of this drainage area is believed to be at least slightly higher than is reflected by the numbers above, which would in turn affect the performance efficiency of the BMP.

Hilgert/Frederick Avenue Basin (RP_09)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.304479	-75.993774

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	0.96		
Pervious	6.60		
Total	7.56	342.57	2,590

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.030	0.37	43.5%	1,126.5	1,126.5

BMP Summary

The dry detention basin at Hilgert and Frederick Avenues was, at the time of the site visit in late May, 2017, almost devoid of vegetation or turf cover in the basin floor. The cause(s) is unknown. The outlet structure is also overgrown with climbing vegetation, which will interfere with the capacity of the BMP to prevent overtopping of the berm, should a severe storm occur. Both of these vegetation issues should be addressed – remove vegetation from the outlet structure, and add vegetation to the basin floor.

Retrofitting potential is limited due to site constraints and steep slopes, but the overflow grate is 90 inches above the low-elevation orifice invert, leaving a lot of room for small water quality retrofits. A simple retrofit would be to add a standpipe to the existing four (4) inch orifice, and begin perforations one foot up from the bottom, to create 12" of retention (or detention if soils don't infiltrate at all), and then some extended detention for larger runoff events. As mentioned before, vegetation should be added, but planting native, hydrophilic vegetation instead of turfgrass will add to the treatment capability of the basin.

The National Land Cover Dataset (NLCD) impervious cover layer used to calculate impervious cover within the drainage area was at a 30-meter resolution. In some cases, such as for this site, the low-resolution data resulted in inaccurate impervious cover percentages used to calculate load reductions per the Chesapeake Bay Retrofit Curves. This site is one of few that was significantly off. As such, the impervious cover percentage of this drainage area was estimated using satellite imagery, rather than calculated using GIS analysis. This change reduces the [inches per impervious acre] ratio provided by the proposed BMP, and therefore reduces the efficiency or performance ability of the BMP, thus providing less pollutant removal.

Hilgert/Gerald Avenue Basin (RP_10)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.302391	-75.992691

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	0.03		
Pervious	22.88		
Total	22.91	369.71	8,469

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.115	0.54	58.6%	4,961.6	4,961.6

BMP Summary

The detention basin on Hilgert Avenue near Gerald Avenue is in very good condition, but the inlet is immediately adjacent to the outlet causing a short-circuit flow path for runoff. Recommendation is to excavate from the long sides of the basin floor, and use in-situ soil to build a berm longitudinally down the middle of the basin to force a long flow path from the inlet to the outlet. Also, the 6-inch low-elevation orifice does little to attenuate flows except in larger storms. Blocking this orifice and adding one higher up, or adding a turned-up perforated standpipe will create some extended detention and/or retention in this basin. Soils likely allow for some infiltration. The 1.5-2.0 feet of drop from the inlet pipe to the outlet should allow the long flow path, and some detention or retention, without significant modification.

The National Land Cover Dataset (NLCD) impervious cover layer used to calculate impervious cover within the drainage area was at a 30-meter resolution. In some cases, such as for this site, the low-resolution data resulted in inaccurate impervious cover percentages used to calculate load reductions per the Chesapeake Bay Retrofit Curves. This site is one of few that was significantly off. As such, the impervious cover percentage of this drainage area was estimated using satellite imagery, rather than calculated using GIS analysis. This change reduces the [inches per impervious acre] ratio provided by the proposed BMP, and therefore reduces the efficiency or performance ability of the BMP, thus providing less pollutant removal.

Joseph's Way Basin (RP_11)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.294466	-76.002951

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	2.03		
Pervious	7.09		
Total	9.12	548.74	5,004

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.064	0.38	47.3%	2,364.9	2,364.9

BMP Summary

The dry detention pond on Joseph's Way needs some minor maintenance, and could receive a simple retrofit at the same time. The two inlet pipes have very short flow paths to the outlet, though this is not an easily remediable situation. There is significant sediment accumulation at both inlet pipes, and in front of and covering the lowest orifice in the outlet structure. The sediment blocking the inlet pipes should be removed. The low-elevation orifice of the outlet structure is almost completely clogged, but this essentially made it a low-flow orifice by natural formation, which is accidentally good. However, the orifice directly above that one is eight (8) inches in diameter, which does little to attenuate flow rates except in more intense storms. We recommend either:

- Clearing the lowest orifice, and either partially blocking or adding a perforated standpipe to the next orifice up
- Leaving the low-elevation orifice blocked, blocking the second orifice, adding a third orifice a foot or two above the second one with a perforated standpipe connected to it
- Possibly excavating some soil from the basin floor to create a berm separating the inlets from the outlet structure to cause a little retention and take advantage of the probable B soils
- Since there is about 3-feet of drop from the inlets to the outlet, this basin could be converted to a surface sand filter by creating a retaining wall or berm around the outlet structure as the overflow, and adding sand to the basin floor. In this case, it would be good to add stilling pools beneath the inlet pipes.

Mohnton Playground (RP_12)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.288389	-75.977751

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	0.09		
Pervious	0.00		
Total	0.09	859.20	79

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.018	2.40	84.6%	66.7	66.7

BMP Summary

The Mohnton Playground offers an opportunity for exposure and education, but very little in the way of pollutant removal, apart from the stream restoration potential described in the summary for Site STR_03. Educational practices, which would add amenity value as well, include combination rainwater harvesting cisterns and rain gardens at the pavilion structures. These pavilion structures do not currently have rain gutters, which would be a nice upgrade, and allow for rainwater harvesting. The rainwater harvesting cisterns could act as additional ponding for shallow rain garden practices if set to slowly draw down over 24-48 hours when full.

The runoff from the end of Walnut Street appears to flow north through a curb cut into a grassy area at the southwest corner of the playground area. One other retrofit option is a rain garden in this location, provided electric or other utility lines are not a constraint.

Any vegetation for rain gardens in this area would have to be carefully selected for shade tolerance, given the excellent tree cover for the playground area.

An existing storm drain pipe outfall is corroding at the end at Wyomissing Creek (at the north end of the park), and this will need to be lined or replaced at some point.

Museum Road/Margaret St. Asphalt Triangle (RP_13)

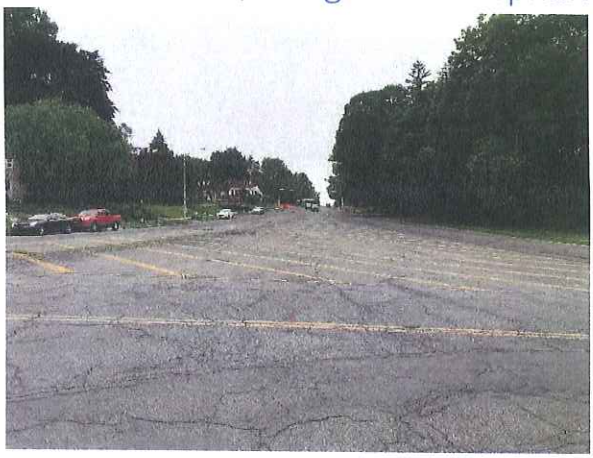

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.324481	-75.952524

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	0.35		
Pervious	0.00		
Total	0.35	859.20	302

Table 3. Sediment Removal/Reduction

Land Use	Loading Rate
High-Density Mixed	859.20 lbs/ac/yr
Turfgrass	150.67 lbs/ac/yr
Load Reduction = (0.35 x (859.20-150.67))	**248.9 lbs/year**

BMP Summary

The only feasible practice identified for the asphalt triangle on Museum Road at Margaret Street is impervious cover removal. Demolishing this asphalt, and constructing a turfgrass-covered traffic island would reduce the heat island effect, improve the appearance of this intersection, and reduce the loading rate of the area affected. The load reduction was derived by multiplying the 0.35 impervious acres by the difference in loading rates between High Density Mixed Urban land use and Turfgrass land use. Note that this practice has a very low return on investment if the sole purpose is for pollutant removal credit, and cost is a major driver.

The site visit did reveal one potential retrofit opportunity at the School of Health Sciences just downhill from this triangle. See School of Health Sciences, Site RP_20.

PennDOT Lancaster 1 (RP_14)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.313335	-75.997663

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	2.10		
Pervious	3.91		
Total	6.00	612.32	3,677

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) (**Retrofits Only**)]
0.236	1.35	80.1%	2,946.0	2,946.0

BMP Summary

There are no existing BMPs at this location. A riprap-lined channel directs flow from a culvert pipe to the southern end of the site. Water quality improvement options include a dry swale and excavated basin for a filtration practice. Excavating a small basin, and using the spoil to build the retaining berm, can provide some retention. Removing the riprap-lined channel and creating a more sinuous channel with check dams and perhaps amended soils, will also add to the retention capacity.

PennDOT Lancaster 2 (RP_15)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.312238	-75.997866

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	1.42		
Pervious	1.69		
Total	3.11	669.49	2,084

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.247	2.09	84.1%	1,753.1	1,753.1

BMP Summary

This depression is not a detention basin, but merely a runoff guide. The depression has a yard inlet at the low point, leading into a storm drain system. There is opportunity to create a filtration or infiltration practice here, such as a surface sand filter or shallow retention and infiltration basin.

PennDOT Ramp CB Basin 1 (RP_16)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.327156	-75.980468

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	1.31		
Pervious	3.36		
Total	4.67	610.95	2,853

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.230	2.10	84.1%	2,400.3	2,400.3

BMP Summary

This basin offers no existing retention or detention, but does have a yard inlet with plenty of available head for retrofit opportunities. The drainage area is relatively small, so an inexpensive and easy retrofit is suggested. A surface sand filter around the existing inlet with a riser structure over the existing yard inlet is a simple, yet effective, filtration practice. Soil Survey suggests HSG B soils.

PennDOT Ramp CB Basin 2 (RP_17)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.327444	-75.978436

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	1.29		
Pervious	2.05		
Total	3.34	422.37	1,409

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.143	1.34	80.0%	1,127.1	1,127.1

BMP Summary

Similar to PennDOT Ramp CB Basin 1 (RP_16), this basin offers no existing retention or detention. A surface sand filter around the existing inlet with a riser structure over the existing yard inlet is a simple, yet effective, filtration practice. Soil Survey suggests HSG B soils.

PennDOT Ramp DC Basin (RP_19)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.337392	-75.965966

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	63.36		
Pervious	32.49		
Total	95.85	797.71	76,463

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.907	0.17	25.6%	19,578.4	19,578.4

BMP Summary

This basin, like PennDOT Ramp DB Basin (RP_18), was designed to provide quantity control in extreme storm events. There is a concrete channel around the edge of the basin allowing runoff from the inlets – including the runoff received from the DB Basin – to completely bypass the basin floor, which is between 6 inches and two feet higher than these channels. This basin's outlet also has a partially clogged perforated metal plate over it, causing a bit of standing water behind it with some hydrophilic vegetation now established.

The recommendations are to remove the channels from inlets to outlet, excavate within the basin floor, spoil excavated soil on site in compacted and vegetated mounds, or berms to force long flow paths from the inlets. Lowering the basin floor to, or below, the inlet inverts will allow for detention and some infiltration of smaller storms, and reduce runoff. The drainage areas for these basins are very large, and the potential sediment removal benefit quite high for a simple on-site earth-moving project. A more robust outlet structure to detain the 1- to 2-year storm for 24 hours, but allow high-rate flows to pass, would offer significant cost effectiveness in retrofitting. This may involve simply rebuilding the existing, damaged outlet structure. Shallow grades within the basin, including over the berms, and simple turfgrass (highway mix) vegetation won't require additional maintenance beyond that for the existing basin, but will achieve significant water quality benefits.

The Berkshire Blvd – Walmart (RP_01) is within the greater drainage area delineated for this basin. The drainage area calculations for this basin exclude those for the shopping center. If the Berkshire Blvd basin effluent does in fact drain to this basin, it may be necessary to account for the pollutant concentration effects of any BMPs implemented there to get precise pollutant removal effects of this proposed BMP.

School of Health Sciences (RP_20)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.325009	-75.951803

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	1.99		
Pervious	6.24		
Total	8.23	655.36	5,393

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.155	0.93	68.5%	3,696.2	3,696.2

BMP Summary

When assessing the Museum Road asphalt triangle (RP_13), a large swath of managed turf downhill of the asphalt triangle was observed. If the School of Health Sciences (SHS) and the property management would be amenable to this idea, it is possible that the storm drain inlets on either side of Museum Road and Old Wyomissing Road could be redirected to outfall to the top of this slope at the southwest portion of the SHS property. A swale-and-rain-garden practice could be built here with a series of berms to create ponding and provide a water quality benefit, as well as reduce the amount of mowing and lawn maintenance required by SHS property management.

The drainage area to this proposed practice (storm drain inlets in curb/gutter on roadsides) would include the area of the asphalt triangle at the intersection of Museum Rd., Margaret St., and Old Wyomissing Rd. If a practice is implemented at the SHS, the asphalt triangle impervious cover removal would not be recommended to be done in conjunction, as the cost:benefit ratio is very high. The drainage area estimate for this practice includes the impervious area of the asphalt triangle, since we recommend only one of these practices be built.

Sturbridge Drive Basin (RP_22)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.316623	-75.981398

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	4.03		
Pervious	19.99		
Total	24.02	633.65	15,219

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.505	1.50	76.1%	11,575.0	11,575.0

BMP Summary

The Sturbridge Drive basin is very large and shallow. Similar to the Stanford Avenue Dam, a series of berms using in-situ soils, or a series of check dams and some minor grading, will offer great benefit for the cost. The pollutant removal numbers provided assume a wide water quality swale with check dams, and a widened pool behind a berm at the end before the dam, with an average of one foot of ponding through those areas.

Summit Heights Outfall Plunge Pool (NR_03)

Table 1. Background Information

BMP Type	Latitude	Longitude
None	40.282477	-75.997344

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	6.37		
Pervious	19.88		
Total	26.24	585.88	15,375

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.000	0.00	0.0%	0.0	0.0

BMP Summary

This is a very constrained site, partly because of the thorough tree cover. After investigation and discussion, stream restoration for prevented did not seem like a viable and defensible option. The erosion beneath the outfall pipe on the south side of the access road off Rudloff Lane is significant, and requires repair before it damages the utility station. However, it does not meet the qualifying conditions of stream restoration to be greater than 100 linear feet or meet the definition of a stream.

The erosion north of the access road is also significant, and has eroded away enough soil to almost form an unintentional basin. A dedicated detention facility could be constructed at this location with a bit of clearing to control flow rates coming from the upland drainage area. The water currently runs full rate through large pipes which do almost nothing to attenuate flow. An extended detention facility at this location would help prevent bank and soil loss beneath the outfall pipe. It is also possible that a Contech, or other similar device, could be installed to mechanically separate sediment and provide a water quality benefit to an important infrastructure-protection project.

Thomas Drive Basin (RP_23)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.304333	-75.981528

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	4.15		
Pervious	8.97		
Total	13.12	641.42	8,416

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.145	0.42	47.0%	3,953.8	3,953.8

BMP Summary

This basin contains (2) 8-inch orifices at the basin floor, and the next orifice up is a triangular opening just below the overflow. Without further hydraulic and hydrologic calculations, it cannot be definitively determined if the low-elevation orifices could be raised without risk to the adjacent roadway. However, there are no visual indicators that the water level in this basin ever rises to a concerning level. There are two recommendations, pending safety computations: 1) replace the low-elevation orifices with a staged-discharge outlet modification to add 24-48 hours of detention for the one inch storm; and 2) add some native, hydrophilic vegetation to the basin to aid in pollutant capture and processing.

This basin most likely outfalls to the unnamed HQ designated use tributary of the Wyomissing Creek which runs alongside Thomas Drive and J.D. Byrider.

Wyomissing Hills Elementary (RP_24)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.336131	-75.978580

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	4.33		
Pervious	13.46		
Total	17.79	632.52	11,254

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.092	0.25	35.4%	3,982.8	3,982.8

BMP Summary

A vegetated swale along the northwest edge of the school grounds would simultaneously treat runoff from the western portion of the property, and convey it to a rain garden or bioretention near Daleview Road. Runoff from the existing storm drain network may be able to be redirected to this surface BMP. A rain garden, bioretention, or potentially a surface sand filter, could be constructed near the end of Daleview Road, where there are two yard inlets next to each other.

There is currently a small detention basin with a robust overflow weir in front of the school next to the parking lot. This provides little to no detention, and no water quality treatment. This, too, could be converted into a rain garden, as much for educational as water quality benefit.

Wyomissing Junior/Senior High School (RP_25)

Table 1. Background Information

BMP Type	Latitude	Longitude
Dry detention basin	40.323555	-75.971344

Table 2. Sediment Load to the BMP

	Drainage Area (ac)	Land Use Loading Rate (lb/acre/yr)	Sediment Loading to BMP (lb/yr)
Impervious	2.19		
Pervious	1.14		
Total	3.34	633.66	2,114

Table 3. Existing Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)
0.000	0.00	0.0%	0.0

Table 4. Proposed Condition Calculations

Volume Treated (ac-ft)	Inches per Impervious Acre	Percent Reduction	Sediment Load Reduced by BMP (lb/yr)	Retrofit Final Sediment Load Reduced [Proposed Load – Existing Load Reduced (lb/yr) **(Retrofits Only)**]
0.009	0.05	7.8%	164.2	164.2

BMP Summary

The stormwater basin at the Wyomissing Junior/Senior High School (WHS) has been used to install an art exhibit. As such, retrofit in this basin would probably threaten its existing use. Even if retrofit, it would not provide very significant sediment reductions.

Other options exist for retrofits at the high school. Similar to the Governor Mifflin Middle School (RP_05), rainwater harvesting cisterns coupled with rain gardens could provide both water quality treatment in otherwise unused space (managed turf), and educational opportunity due to exposure. The northeast and southwest corners of the building areas are ideally suited for this due to the traffic patterns and associated exposure. There is ample space along the northeast and east side of the campus.

It is important to note that these options have their value in education, not pollutant reduction. Even though they may be inexpensive practices, the pollutant removal potential is quite low.

Appendix C – Cost Estimates

PROJECT: WYOMISSING CREEK WATERSHED COALITION TMDL PLAN
TITLE: TMDL BMP COST ESTIMATES
DATE: 07-24-17

ITEM NO.	DESCRIPTION	UNITS	TOTAL PLAN UNITS	ESTIMATED UNIT PRICE	CONTRACT AMOUNT
I. BMP-1	**STANFORD AVENUE DAM RETROFIT**				
A. DESIGN ENGINEERING & PERMITTING (W/ PERMIT FEES)		LS	1.00	$75,000.00	**$75,000.00**
B. LAND ACQUISITION COSTS		LS	0.00	$0.00	**$0.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$15,000.00	$15,000.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$25,000.00	$25,000.00
3.	BULK EXCAVATION	CY	9000.00	$5.00	$45,000.00
4.	PLANTING SOIL	CY	7000.00	$40.00	$280,000.00
5.	SEEDING AND LANDSCAPING	LS	1.00	$25,000.00	$25,000.00
6.	DEMO EXISTING LOW-FLOW CHANNEL	LS	1.00	$15,000.00	$15,000.00
7.	OUTLET STRUCTURE RETROFIT	LS	1.00	$10,000.00	$10,000.00
8.	MONITORING EQUIPMENT/SCADA	LS	1.00	$18,000.00	$18,000.00
9.	GEOTECHNICAL WORK	LS	1.00	$25,000.00	$25,000.00
	SUBTOTAL OF ITEM C.				**$443,000.00**
D. 10% CONTINGENCY					**$44,300.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$10,000.00	**$10,000.00**
	PROJECT TOTALS				**$572,300.00**
II. BMP-2	**HIGHBROOK CHANNEL**				
A. DESIGN ENGINEERING & PERMITTING		LS	1.00	$14,000.00	**$14,000.00**
B. LAND ACQUISITION COSTS		LS	1.00	$5,000.00	**$5,000.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$5,000.00	$5,000.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$6,000.00	$6,000.00
3.	BULK EXCAVATION	CY	300.00	$5.00	$1,500.00
4.	PLANTING SOIL	CY	100.00	$40.00	$4,000.00
5.	SEEDING AND LANDSCAPING	LS	1.00	$3,700.00	$3,700.00
6.	RIP RAP	CY	60.00	$150.00	$9,000.00
7.	PIPE LINING & STABILIZATION	LS	1.00	$8,500.00	$8,500.00
	SUBTOTAL OF ITEM C.				**$37,700.00**
D. 10% CONTINGENCY					**$3,770.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$5,400.00	**$5,400.00**
	PROJECT TOTALS				**$62,100.00**

III. BMP-3	**"BURGIS" NORTHRIDGE BASIN**				
A. DESIGN ENGINEERING & PERMITTING		LS	1.00	$26,000.00	**$26,000.00**
B. LAND ACQUISITION COSTS		LS	1.00	$12,000.00	**$12,000.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$6,500.00	$6,500.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$6,500.00	$6,500.00
3.	BULK EXCAVATION	CY	450.00	$5.00	$2,250.00
4.	PLANTING SOIL	CY	200.00	$40.00	$8,000.00
5.	SEEDING AND LANDSCAPING	LS	1.00	$4,500.00	$4,500.00
6.	RIP RAP	CY	90.00	$150.00	$13,500.00
7.	OUTLET STRUCTURE RETROFIT	LS	1.00	$6,800.00	$6,800.00
	SUBTOTAL OF ITEM C.				**$48,050.00**
D. 10% CONTINGENCY					**$4,805.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$4,600.00	**$4,600.00**
	PROJECT TOTALS				**$90,650.00**
IV. BMP-4	**FAIRMONT AVENUE STREAMBANK RESTORATION**				
A. DESIGN ENGINEERING & PERMITTING (W/ PERMIT FEES)		LS	1.00	$45,000.00	**$45,000.00**
B. LAND ACQUISITION COSTS		LS	1.00	$24,000.00	**$24,000.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$7,800.00	$7,800.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$12,000.00	$12,000.00
3.	BULK EXCAVATION	CY	1600.00	$12.00	$19,200.00
4.	PLANTING SOIL	CY	500.00	$40.00	$20,000.00
5.	SEEDING AND LANDSCAPING	LS	1.00	$35,000.00	$35,000.00
6.	STREAM BYPASSING	LS	1.00	$25,000.00	$25,000.00
7.	CULVERT REPLACEMENTS	EA	2.00	$12,500.00	$25,000.00
8.	FENCING	LF	2500.00	$30.00	$75,000.00
	SUBTOTAL OF ITEM C.				**$136,200.00**
D. 10% CONTINGENCY					**$13,620.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$7,000.00	**$7,000.00**
	PROJECT TOTALS				**$212,200.00**
V. BMP-5	**BERKSHIRE BOULEVARD BASIN RETROFIT**				
A. DESIGN ENGINEERING & PERMITTING		LS	1.00	$18,000.00	**$18,000.00**
B. LAND ACQUISITION COSTS		LS	1.00	$22,000.00	**$22,000.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$8,400.00	$8,400.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$9,000.00	$9,000.00
3.	BULK EXCAVATION	CY	4000.00	$6.50	$26,000.00
4.	PLANTING SOIL	CY	2700.00	$40.00	$108,000.00
5.	SEEDING AND LANDSCAPING	LS	1.00	$16,000.00	$16,000.00
6.	GEOTECHNICAL WORK	LS	1.00	$18,000.00	$18,000.00
7.	RIP RAP	CY	120.00	$150.00	$18,000.00
8.	OUTLET STRUCTURE RETROFIT	LS	1.00	$6,000.00	$6,000.00
	SUBTOTAL OF ITEM C.				**$209,400.00**
D. 10% CONTINGENCY					**$20,940.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$6,500.00	**$6,500.00**
	PROJECT TOTALS				**$255,900.00**

VI. BMP-6	**RAMP DB BASIN RETROFIT**				
A. DESIGN ENGINEERING & PERMITTING		LS	1.00	$24,000.00	**$24,000.00**
B. LAND ACQUISITION COSTS		LS	1.00	$32,000.00	**$32,000.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$9,200.00	$9,200.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$9,500.00	$9,500.00
3.	BULK EXCAVATION	CY	3800.00	$6.50	$24,700.00
4.	PLANTING SOIL	CY	2400.00	$40.00	$96,000.00
5.	SEEDING AND LANDSCAPING	LS	1.00	$13,000.00	$13,000.00
6.	DEMOLISH EXISTING FLOW CHANNELS	LS	1.00	$18,000.00	$18,000.00
7.	RIP RAP	CY	140.00	$150.00	$21,000.00
8.	OUTLET STRUCTURE RETROFIT	LS	1.00	$8,800.00	$8,800.00
	SUBTOTAL OF ITEM C.				**$200,200.00**
D. 10% CONTINGENCY					**$20,020.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$8,000.00	**$8,000.00**
	PROJECT TOTALS				**$264,200.00**
VII. BMP-7	**MISCELLANEOUS RAIN GARDENS - MUNICIPAL AND SCHOOL BUILDINGS AND FACILITIES**				
A. DESIGN ENGINEERING & PERMITTING		LS	1.00	$14,000.00	**$14,000.00**
B. LAND ACQUISITION COSTS (LEGAL COORDINATION ONLY)		LS	1.00	$8,000.00	**$8,000.00**
C. CONSTRUCTION					
1.	MOBILIZATION & DEMOBILIZATION	LS	1.00	$4,500.00	$4,500.00
2.	EROSION AND SEDIMENT CONTROLS	LS	1.00	$4,500.00	$4,500.00
3.	BULK EXCAVATION	CY	500.00	$6.50	$3,250.00
4.	PLANTING SOIL	CY	500.00	$40.00	$20,000.00
5.	SEEDING AND LANDSCAPING (MATERIALS ONLY)	LS	1.00	$8,000.00	$8,000.00
	SUBTOTAL OF ITEM C.				**$40,250.00**
D. 10% CONTINGENCY					**$4,025.00**
E. CONSTRUCTION PHASE ENGINEERING		LS	1.00	$3,000.00	**$3,000.00**
	PROJECT TOTALS				**$65,250.00**
GRAND TOTAL					**$1,522,600.00**

Appendix D – Draft Intermunicipal Agreement

WYOMISSING CREEK WATERSHED STORMWATER COALITION

FIRST RESTATEMENT OF COST-SHARING AND COOPERATION AGREEMENT

THIS AGREEMENT ("Agreement"), is made this _____ day of _____, 2017, by and among the municipalities identified below as the Participating Members located in Berks County, Pennsylvania of the Wyomissing Creek Watershed Stormwater Coalition (hereinafter, the "Coalition"), pursuant to the authority granted by the various municipal laws of the Commonwealth of Pennsylvania and respective Ordinances.

BACKGROUND

WHEREAS, areas within the following municipalities are located within the Wyomissing Creek Watershed:

The Township of Brecknock, a Township of the Second Class incorporated under the laws of the Commonwealth of Pennsylvania having an address of 889 Alleghenyville Road, Mohnton, Pennsylvania 19540;

The Township of Cumru, a Township of the First Class incorporated under the laws of the Commonwealth of Pennsylvania having an address of 1776 Welsh Road, Mohnton, Pennsylvania 19540;

The Borough of Mohnton, a municipal corporation incorporated as a Borough under the laws of the Commonwealth of Pennsylvania having an address of 21 O'Neil Street, Mohnton, Pennsylvania 19540;

The Borough of Shillington, a municipal corporation incorporated as a Borough under the laws of the Commonwealth of Pennsylvania having an address of Two East Lancaster Avenue, Shillington, Pennsylvania 19607;

The City of Reading, a City of the Third Class operating as a Home Rule Charter under the laws of the Commonwealth of Pennsylvania having an address of 815 Washington Street, Reading, Pennsylvania 19601;

The Township of Spring, a Township of the Second Class incorporated under the laws of the Commonwealth of Pennsylvania having an address of 2850 Windmill Road, Sinking Spring, Pennsylvania 19608;

The Borough of West Reading, a municipal corporation incorporated as a Borough under the laws of the Commonwealth of Pennsylvania having an address of 500 Chestnut Street, West Reading, Pennsylvania 19611;

The Borough of Wyomissing, a municipal corporation incorporated as a Borough under the laws of the Commonwealth of Pennsylvania having an address of 22 Reading Boulevard, Wyomissing, Pennsylvania 19610; and

WHEREAS, all of the aforesaid municipalities are subject to the National Pollutant Discharge Elimination System permitting for stormwater discharges from a regulated Small Municipal Separate Storm Sewer Systems Permit (MS4 permit) process administered by the Pennsylvania Department of Environmental Protection on behalf of the United States Environmental Protection Agency (EPA), which requires a significant reduction of the amount of sediment, and by proxy, the quantity and rate of stormwater discharged to the Wyomissing Creek to comply with the Wyomissing Creek TMDL (Total Maximum Daily Load); and

WHEREAS, MS4 permit regulations require TMDL implementation plans to be coordinated and complied with on a regional or watershed basis; and

WHEREAS, all of the Participating Members above are parties to a prior Cost-Sharing and Cooperation Agreement which formed the Coalition, provided for cost sharing and cooperation among the Participating Members in assessing the impact of the MS4 permit requirements on their communities and, as necessary, provided for the implementation of measures to comply with the MS4 Permit implementation plan, and which prior agreement was approved and adopted by ordinance of each of the Participating Members, effective in 2012 as to all Participating Members other than Brecknock Township, and effective as of October 1, 2013 as to Brecknock Township (hereinafter the "Founding Agreement"); and

WHEREAS, pursuant to the Pennsylvania Intergovernmental Cooperation Act, 53 Pa. C.S. §2301, *et seq.*, the governing body of two or more local governments may make agreements with other municipalities to jointly cooperate in performing governmental functions, powers, and responsibilities; and

WHEREAS, pursuant to the First Class Township Code, 53 P.S. § 56553, the Township of Cumru is authorized to enter into agreements with other municipal corporations to perform governmental powers, duties and functions; and

WHEREAS, pursuant to the Second Class Township Code, 53 P.S. §66507, the Townships of Brecknock and Spring are authorized to enter into agreements with other municipal corporations to perform governmental powers, duties and functions; and

WHEREAS, pursuant to the Borough Code, 8 Pa.C.S.A. §1202(24), the Boroughs of Mohnton, Shillington, West Reading and Wyomissing may enter into contracts with other municipalities to perform governmental powers, duties and functions; and

WHEREAS, pursuant to the Third Class City Code and Home Rule Charter, the City of Reading is authorized to enter into agreements with other municipal corporations to perform governmental powers, duties and functions; and

WHEREAS, upon review of the MS4 permit requirements for the upcoming 2018-2023 permitting cycle, the Participating Members have acknowledged that significant capital projects will be required to be completed to achieve MS4 compliance on a watershed basis, and that the scope and cost of achieving such compliance should no longer be shared equally among the Participating Members, but rather should be allocated based upon the proportionate amount of urbanized area (as defined in the MS4 regulations) within the Wyomissing Creek watershed that is contained within the geographic boundaries of each Participating Member's municipality, and the shared benefits to be received by each Participating Member; and

WHEREAS, the Participating Members wish to enter into this First Restatement of Cost-Sharing and Cooperation Agreement, in order to revise the allocation of the cost-sharing obligations among the Participating Members, and to revise the budgeting obligations of the Participating Members, in order to facilitate the proper financing of the activities of the Coalition; and

NOW, THEREFORE, in consideration of the above and with the intention to be legally bound hereby, the Participating Members agree as follows:

FORMATION OF COALITION

1. The Participating Members hereby acknowledge that the Founding Agreement had the effect of forming and establishing a Coalition titled "The Wyomissing Creek Watershed Stormwater Coalition", as authorized by the Pennsylvania Intergovernmental Cooperation Act, 53 Pa.C.S.§2301 et seq, (the "Act"), the applicable municipal codes of the Commonwealth of Pennsylvania and Ordinances duly enacted by the Participating Members, with such Coalition having the powers and duties as provided for in the Ordinances and the Founding Agreement, consistent with the authority of the Act and other applicable laws. Each Participating Member agrees and pledges continued good faith cooperation in the exercise of the powers, duties and functions of the Coalition to each other.

PURPOSE AND AUTHORITY

2. The Purpose of the Coalition is to coordinate and share the costs of planning and implementation to comply with the Wyomissing Creek Watershed TMDL MS4 requirements pursuant to Pennsylvania Department of Environmental Protection and United States Environmental Protection Agency MS4 permitting regulations.

DEFINITION

3. PARTICIPATING MEMBERS - The following municipal units are the Participating Members of this Coalition: the Township of Brecknock, the Township of Cumru, the Borough of Mohnton, the City of Reading, the Borough of Shillington, the Township of Spring, the Borough of West Reading, and the Borough of Wyomissing.

MEMBERSHIP

4. Each of the Participating Members has become a member of the Coalition by adopting an Ordinance authorizing Coalition membership and approving the Founding Agreement. To remain a Participating Member, a municipality shall adopt an Ordinance authorizing and executing this First Restatement of Cost-Sharing and Cooperation Agreement, and comply with all requirements set forth in this Agreement.

5. In addition to the Participating Members, the Coalition can add an additional Participating Member upon a majority vote as described herein. A late entrance fee shall be determined by the Steering Committee based upon costs previously incurred at the time of joining.

ORGANIZATION

6. At the beginning of each permitting period, each Participating Member shall designate a Representative to serve as a member of the Steering Committee.

7. Each Participating Member may designate an alternate Representative to serve as a member of the Steering Committee in the absence of the Representative.

8. The Steering Committee shall select one of its members to serve as the Steering Committee's Chairperson.

9. The Steering Committee shall also select one of its members to serve as Vice Chairperson of the Committee.

10. The Representative on the Steering Committee of the municipality selected to collect Membership Fees and Assessments from each Participating Member shall serve as the Treasurer for the Steering Committee.

11. All Participating Members shall communicate through the Steering Committee.

MEMBERSHIP FEES AND CONTRIBUTIONS

12. Each Participating Member paid an initial membership fee at the time of execution of the Founding Agreement in the amount of $5,000 ("Membership Fee").

13. Through the date of this Agreement, each Participating Member has contributed an equal share based upon assessment by the Coalition.

14. Effective as of the commencement date of the 2018-2023 MS4 permit cycle, which date is anticipated to be on or about March 10, 2018 (the said commencement date hereinafter referred to as the "Effective Date", and the five (5) year period beginning on such Effective Date is referred to hereinafter as the "2018-2023 MS4 Permit Cycle"), each Participating Member shall financially contribute to the Coalition based upon the following table, with such

percentages of financial responsibility having been calculated based upon the acreage of Urbanized Area within the Wyomissing Creek watershed that is contained within the geographic boundaries of each Participating Member's municipality, and an estimate of the equally shared benefits to be received by each Participating Member, said percentages to be fixed as provided below, unless otherwise revised by written agreement of all Participating Members:

	Urbanized Area Acreage	Proposed Share of Financial Responsibility
Brecknock	259	6.3%
Cumru	1,706	20.0%
Mohnton	490	11.9%
Reading	275	6.7%
Shillington	434	10.5%
Spring	1,942	20.0%
West Reading	188	4.6%
Wyomissing	2,065	20.0%
TOTAL	7,359	100.0%

BUDGET

15. The fiscal year for purposes of the Coalition shall run for 365 days from the first calendar day of the 2018-2023 MS4 Permit Cycle, which is anticipated to be March 10, thereby resulting in a fiscal year of March 10 to March 9of the following calendar year.

16. The Participating Members acknowledge that the anticipated expenditures of the Coalition from the Effective Date through the end of the 2018-2023 MS4 Permit Cycle are $2,000,000. The Coalition's annual budget for each fiscal year beginning on the Effective Date and through the end of the 2018-2023 MS4 Permit Cycle shall be $400,000 for fees, costs and expenses, plus the amount of any budgeted but unexpended funds remaining from each of the Coalition's prior fiscal year budgets. The annual cap may be increased upon written notification to all Participating Members, with a detailed accounting of the expenditures incurred within the initial cap and the justification for the request of additional funding.

17. Each Participating Member shall prepare its own annual budget based upon its proportionate share of financial responsibility referenced in Paragraph 14 above, with the budget for any given fiscal year to be increased by the amount of any funds budgeted to Coalition activities during each prior fiscal year during the 2018-2023 MS4 Permit Cycle, but which funds were not expended. The sum of the total annual assessments of each Participating Member shall not exceed the annual budget for the Coalition, unless the initial cap is so increased.

18. The proposed budget for the Coalition shall be prepared by September 1 of the year prior to the proposed budget year and shall include a detailed accounting of all anticipated costs.

19. The proposed budget for the Coalition shall be presented to each Participating Member by its Representative prior to a vote on the final budget.

20. The final annual budget for the Coalition shall be approved by November 1 of the year prior to the proposed budget year.

21. Each Participating Member shall pay any contribution due within forty-five (45) days of notice of such assessment by the Coalition.

22. All fees, costs, and expenses associated with the Coalition shall be reviewed and managed by the Steering Committee.

23. The Treasurer shall maintain an account in the name of the Coalition to hold all Coalition funds, including Membership Fees and contribution assessments.

24. At the request of two (2) Participating Members, the Coalition shall be audited by a certified public accounting firm selected by the Steering Committee. All costs for such audit shall be paid by the requesting Participating Members.

25. Each Participating Member shall be responsible for its own out of pocket costs and solicitor fees attendant to their involvement with the Coalition.

MEETINGS

26. The Coalition shall hold regular meetings which shall take place monthly at such place and time as determined by the Steering Committee.

27. Notice of meetings shall occur in accordance with the Sunshine Act of the Commonwealth of Pennsylvania.

28. All meetings must have a Quorum consisting of five (5) of the eight (8) members of the Steering Committee present as set forth herein to conduct Coalition business.

29. If a Quorum is not present at the start of the meeting, or available to remotely participate via teleconferencing or videoconferencing, the meeting shall be delayed or rescheduled.

30. A Secretary shall be selected by the Steering Committee who shall prepare minutes of meetings and maintain official records of the Coalition. The Secretary shall distribute approved minutes to each Participating Member on a monthly basis.

31. Any decision affecting the allocation of Coalition funds or directing the Coalition to perform any act that is either not contemplated in this Agreement, or exceeds the terms of this Agreement, shall require a majority vote of the Participating Members.

32. A majority vote for actions contemplated by this Agreement shall consist of a majority of the entire membership of the Steering Committee.

33. Representatives may vote by being present at or remotely participating in the meeting.

TERM

34. This Agreement shall continue in full force and effect, except as modified by mutual agreement of the parties or if terminated pursuant to paragraph 36 hereof.

NOTICE

35. Any notice given hereunder by any party to another party shall be in writing and shall be deemed given when delivered personally or five (5) days after being sent by certified mail, return receipt requested, as follows:

To the Participating Member:

Township of Brecknock
889 Alleghenyville Road
Mohnton, PA 19540

Township of Cumru
1775 Welsh Road
Mohnton, PA 19540

Borough of Mohnton
21 N. O'Neil Street
Mohnton, PA 19540

City of Reading
Managing Director's Office
815 Washington Street
Reading, PA 19601

Borough of Shillington
2 E. Lancaster Avenue
Shillington, PA 19607

Township of Spring
2850 Windmill Road
Sinking Spring, PA 19608

Borough of West Reading
500 Chestnut Street
West Reading, PA 19611

Copy to:

Hartman Valeriano Magovern & Lutz
1100 Berkshire Blvd, Suite 301
PO Box 5828
Wyomissing, PA 19610

Georgeadis Setley
Four Park Plaza
Second Floor
Wyomissing, PA 19610

Hoffert & Klonis
536 Court Street
Reading, PA 19603

City of Reading
Dept. of Law
815 Washington Street
Room 2-54
Reading, PA 19601

Hoffert & Klonis
536 Court Street
Reading, PA 19603

Kozloff Stoudt
2640 Westview Drive
Wyomissing, PA 19610

Barley Snyder
P.O. Box 942
Reading, PA 19603

Borough of Wyomissing
22 Reading Boulevard
Wyomissing, PA 19610

Hartman Valeriano Magovern & Lutz
1100 Berkshire Blvd, Suite 301
PO Box 5828
Wyomissing, PA 19610

TERMINATION

36. If at any time, a Participating Member wishes to end its participation in the Coalition and to terminate its rights and obligations under this Agreement, it shall give the Chairperson of the Steering Committee thirty (30) days written notice that it no longer wishes to participate.

37. In no event shall any funds already contributed to the Coalition be refunded to a Participating Member that seeks to end its participation in the Coalition, solely on the basis that it has ended its participation.

MISCELLANEOUS PROVISIONS

38. The services performed and expenditures incurred under this Agreement shall be deemed for public and governmental purposes, and all immunities from liabilities enjoyed by the Participating Members within their respective municipal boundaries shall extend to their participation in services outside their respective boundaries and within the geographical area served by the Coalition.

39. The invalidity, illegality or unconstitutionality of any portion of this Agreement shall not impair or affect the invalidity of this Agreement as a whole or any other part thereof.

40. This Agreement shall be binding upon the parties hereto and their respective successors and assigns.

41. This Agreement may be signed in counterparts or any number of duplicate originals, each of which shall be deemed an original, but all which together shall constitute one and the same instrument.

42. This Agreement shall be construed in accordance with the laws of the Commonwealth of Pennsylvania.

43. This Agreement represents the entire agreement between the parties hereto. Any amendment to this Agreement shall be in writing and must be signed by all parties hereto in order to be valid and enforceable.

44. This Agreement shall become effective on the date ("Effective Date") occurring five (5) days after the date of enactment of an authorizing ordinance by the last Participating Municipality to enact an authorizing Ordinance.

IN WITNESS WHEREOF, the Participating Municipalities have caused this Agreement to be duly executed as of the day and year above written.

Approved by Ordinance _____ of the Township of Brecknock, the ___ day of _____, 2017.

ATTEST:

_____
Signature

_____
Print Name

TOWNSHIP OF BRECKNOCK:

_____
Signature

_____
Print Name

_____
Chairman, Board of Supervisors

Approved by Ordinance _____ of the Township of Cumru, the ___ day of _____, 2017.

ATTEST:

_____
Signature

_____
Print Name

TOWNSHIP OF CUMRU:

_____
Signature

_____
Print Name

_____
President, Board of Commissioners

Approved by Ordinance _____ of the Borough of Mohnton the ___ day of _____, 2017.

ATTEST:

_____
Signature

_____
Print Name

BOROUGH OF MOHNTON:

_____
Signature

_____
Print Name

_____
President of Borough Council

_____
Mayor

Approved by Ordinance _____ of the Borough of Shillington the ___ day of _____, 2017.

ATTEST:

_____
Signature

_____
Print Name

BOROUGH OF SHILLINGTON:

_____
Signature

_____
Print Name

_____
President of Borough Council

_____
Mayor

Approved by Ordinance _____of the City of Reading the ___ day of _____, 2017.

ATTEST:

_____
Signature

_____
Print Name

_____
Title

CITY OF READING:

_____
Signature

_____
Print Name

_____
Title

_____
Signature

_____
Print Name

Mayor_____
Title

Approved by Ordinance _____of the Township of Spring the ___ day of _____, 2017.

ATTEST:

_____
Signature

_____
Print Name

TOWNSHIP OF SPRING:

_____
Signature

_____
Print Name

_____
Chairman of Board of Supervisors

Approved by Ordinance _____of the Borough of West Reading the ___ day of _____, 2017.

ATTEST: BOROUGH OF WEST READING:

_____ _____
Signature Signature

_____ _____
Print Name Print Name

_____
President of Borough Council

_____
Mayor

Approved by Ordinance _____of the Borough of Wyomissing the ___ day of _____, 2017.

ATTEST: BOROUGH OF WYOMISSING:

_____ _____
Signature Signature

_____ _____
Print Name Print Name

_____
President of Borough Council

_____
Mayor