

APPENDIX F

Detailed Problem Area Forms

DETAILED PROBLEM AREA #1

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA50	Lower Southampton	UNT Poquessing Creek	1, 2, 3

Description: This problem area was reported by the Philadelphia Water Department. The subject channel is located in Lower Southampton Township at the outfall of a large commercial/industrial area. The reach stability was reported as actively degrading and the bank erosion was classified as high. The upstream drainage area is highly impervious with limited stormwater management facilities. This is resulting in high flow rates that are causing significant erosion in the downstream channel where the problem area is located.

DETAILED PROBLEM AREA #1

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA50	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Lower Southampton	Checked By/Date:	PAD / 6-28-2011
Type of Problem(s)	Erosion		



The banks of this tributary are experiencing severe erosion. As evident from the pictures above, the channel has been eroded approximately 10-12 feet below the normal channel depth.

Potential Solutions

- 1) Stream Stabilization: This would help to limit erosion and decrease sediment transport downstream.
- 2) Regional Basin (RB) #1 (Infiltration, Detention) (BMP 6.8.2): This storage area would be constructed in the wooded area downstream of the commercial area. An embankment would be constructed near the downstream end of the wooded area and would provide storage in the undisturbed upstream area. This would require limited clearing of vegetation as construction would only occur in the area immediately surrounding the proposed embankment. This storage area has the potential to significantly reduce flow rates for both small and large storms, which would help mitigate severe erosion that is occurring in the downstream channel.
- 3) Basin Retrofit-Increased Storage, Add/Adjust Control Structure: Increased storage capacity and adding/adjusting the outlet structure to better control release rates.
- 4) Bioretention/Rain Gardens (BMP 6.4.5): Convert small pockets of open space within the commercial area to bioretention/rain garden type BMPs.

Regional Basin Modeling Results

Drainage Area	RB #1 - 18.38 acres		
Potential Storage	RB #1 - 5.44 acre-ft		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	63.62	11.35	-52.27
50-Year	135.11	65.11	-70.00

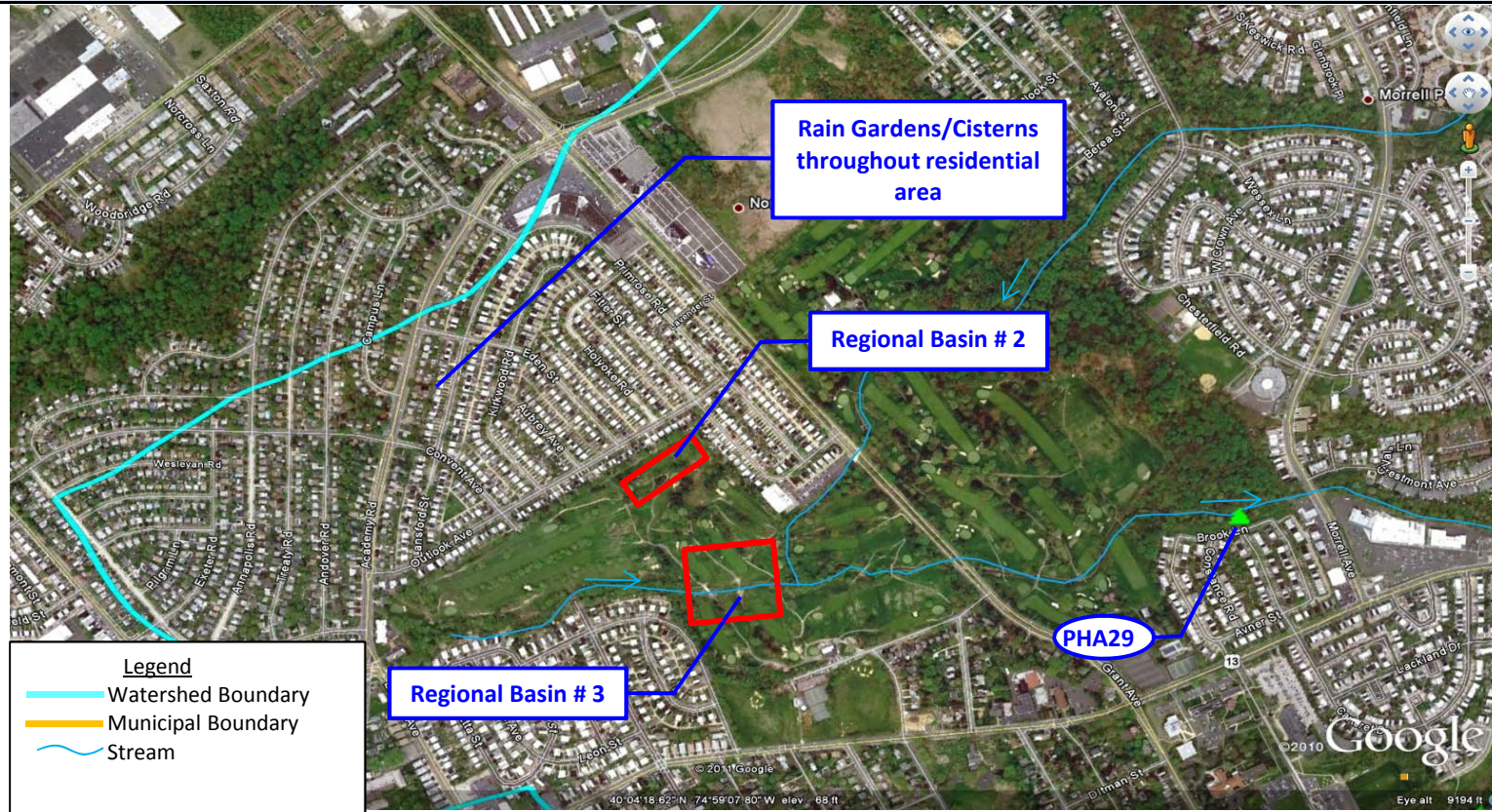
Cost Estimate

1) N/A*	3) \$30,000
2) \$481,000	4) \$20,000/ Bioretention-Rain Garden

*Insufficient information available to determine cost estimate

DETAILED PROBLEM AREA #2

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA29	Philadelphia	Byberry Creek	1, 3

Description: This problem area was reported by the Philadelphia Water Department. The problem area is located on Byberry Creek west of Morrell Ave. and north of Brook Lane. The reach was reported to be actively degrading and the bank erosion was classified as high. Very few SWM controls exist within the area surrounding the location of the problem area. Upstream portions of this watershed are highly developed with both residential and commercial development. Flooding problem areas upstream and downstream are another indicator that this area is experiencing high flows.

DETAILED PROBLEM AREA #2

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA29	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Philadelphia	Checked By/Date:	PAD / 6-28-2011
Type of Problem(s)	Erosion		



Stream banks erosion measuring approximately 3' to 4' was observed within this section of Byberry Creek. This is causing bank undercutting which is exposing the roots systems of the trees that will eventually lead to uprooting. This process will be continually repeated, until upstream flows are controlled and/or reduced, or the streambanks are stabilized.

Potential Solutions

- 1) Rain Gardens/Cisterns (BMP 6.4.5): Implementing rain gardens and cisterns in the upstream residential areas could have a significant effect on runoff rates and volumes from smaller storm events. Residents could reuse the captured runoff for water lawns, gardens, and other vegetated landscaping.
- 2) Regional Basin (RB) #2 (Detention, Infiltration)(BMP 6.8.2): This area is an unused portion of a golf course that could be used to detain water. The golf course could even use the detained water for irrigation.
- 3) RB #3 (Detention, Infiltration)(BMP 6.8.2) : This storage area would consist of a berm and outlet structure across the stream on the golf course that would be used as a cart path. During large events, parts of the course could flood. This is justifiable because the course would be unplayable.

Regional Basin Modeling Results

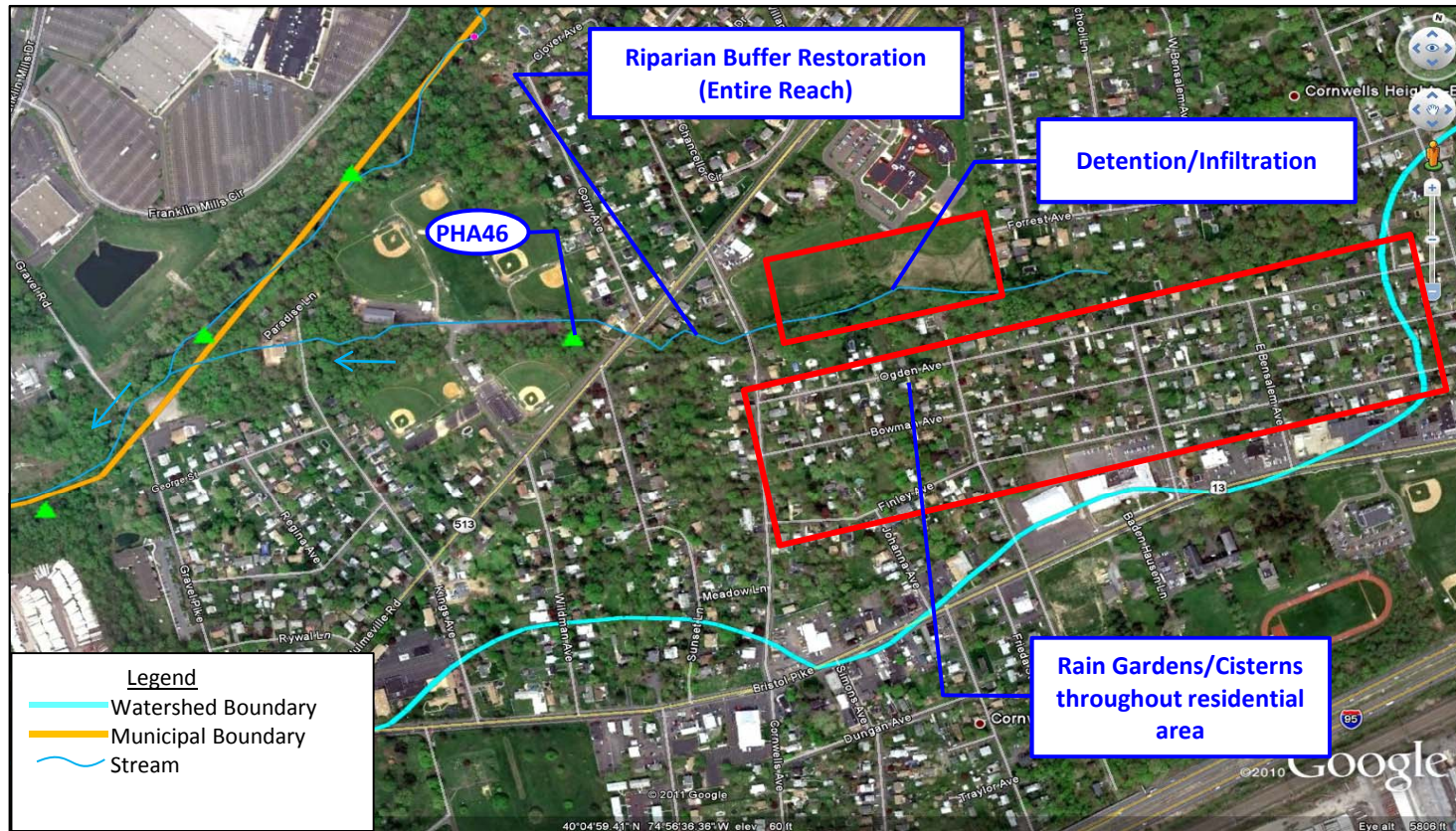
Drainage Area	RB #2 - 28.08 acres	RB #3 - 185.60 acres	
Potential Storage	RB #2 - 4 acre-ft	RB #3 - 26.6 acre-ft	
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
RB #2			
2-Year	98.42	7.59	-90.83
50-Year	206.35	95.73	-110.62
RB #3			
2-Year	1025.89	690.38	-335.51
50-Year	2114.71	1714.14	-400.57

Cost Estimate

1) \$1,000/residence	3) \$2,371,000
2) \$492,000	

DETAILED PROBLEM AREA #3

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA46	Bensalem	UNT Poquessing Creek	1, 2

Description: This problem area was reported by the Philadelphia Water Department. The problem area is located to the west of Hulmeville Rd. along a tributary to Poquessing Creek. The reach was reported to be actively degrading and the bank erosion was classified as high. The contributing drainage area consists mainly of residential developments with limited stormwater management controls. Development has diminished riparian buffers along the stream and contributes to the high flows and velocities that are causing streambank erosion.

DETAILED PROBLEM AREA #3

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA46	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Bensalem	Checked By/Date:	PAD / 6-28-2011
Type of Problem(s)	Erosion		



The tributary pictured above is receiving high volumes and rates of runoff from upstream residential areas. This is causing significant erosion of the stream banks. Bank erosion was estimated at approximately 3' to 4' high which is relatively high considering the small drainage area of this tributary.

Potential Solutions

- 1) Rain Gardens/Cisterns (BMP 6.4.5): Implementing rain gardens and cisterns in the residential areas could have a significant effect on runoff rates and volumes from smaller storm events.
- 2) Riparian Buffer Restoration (BMP6.7.1): The entire length of the UNT has very little or no riparian buffer. This would help to stabilize the streambanks, while at the same time increasing water quality through the use of natural filtering mechanisms and temperature reduction.
- 3) Storage/Infiltration Facility (BMP 6.4.2): This area provides an ideal location for the construction of a small berm and outlet structure across the stream. This would significantly reduce the erosive flows that the channel is currently experiencing.

This storage area could also be an overflow floodplain storage facility. This type of facility would have less impacts to the stream, but would only be activated during larger storm events when the stream exceeded its banks.

Regional Basin Modeling Results

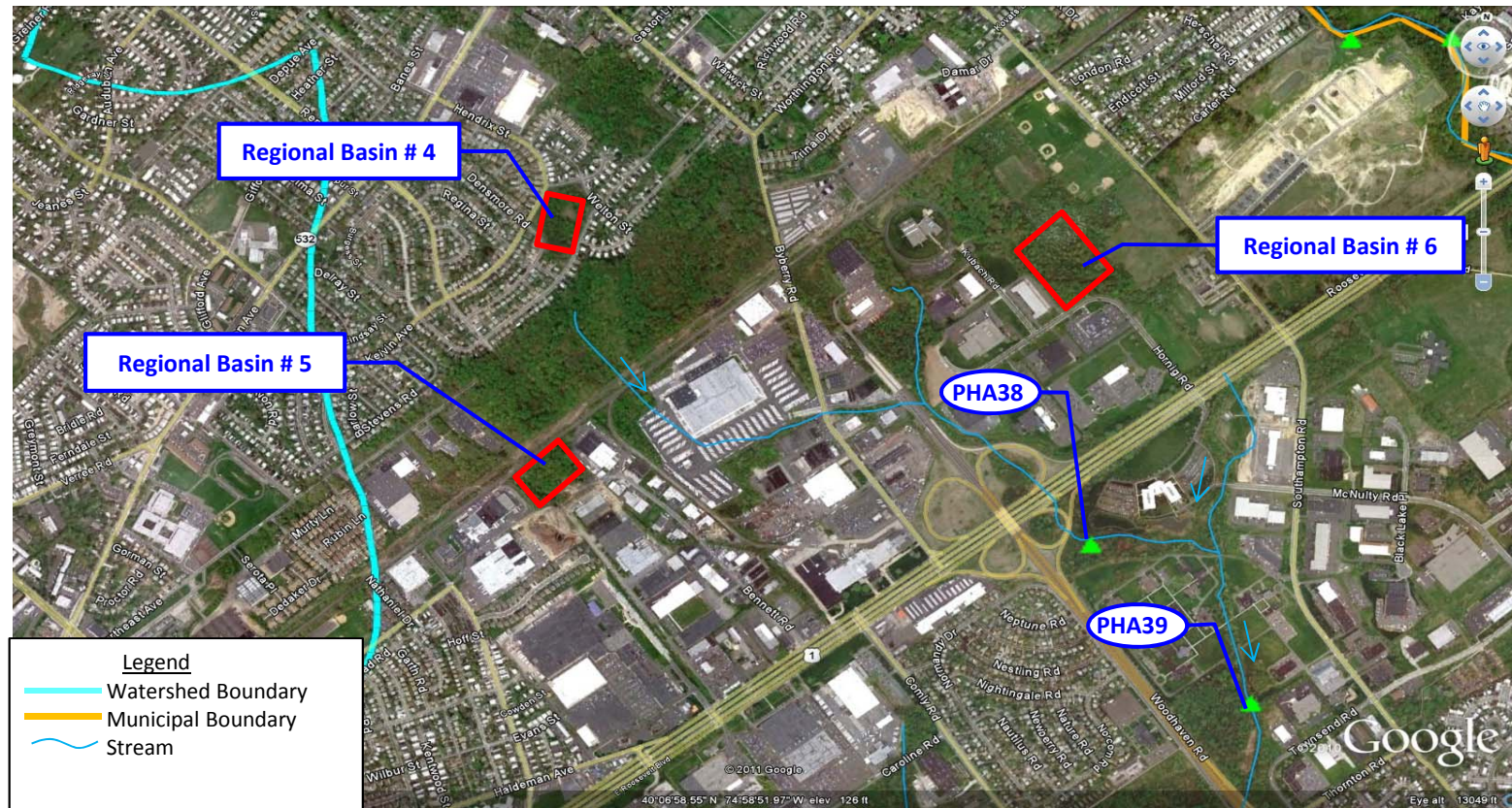
Drainage Area	N/A		
Potential Storage	N/A		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	N/A		
50-Year	N/A		

Cost Estimate

1) \$1,000/residence	3) \$133,500
2) \$4,300	

DETAILED PROBLEM AREA #4

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA38, PHA39	Philadelphia	Byberry Creek	1

Description: These problem areas were reported by the Philadelphia Water Department. The problem areas are located on Byberry Creek, southeast of the intersection of US-1/SR 0063. The reach was reported to be stable and bank erosion was classified as high. Development within the drainage consists of mainly residential and commercial areas. Several storage BMPs are located within the commercial areas; however, the stream is still experiencing high flow rates that are causing erosion. This emphasizes the need for additional volume reduction and detention within the contributing drainage area, especially within and immediately downstream of the residential areas where stormwater controls are limited.

DETAILED PROBLEM AREA #4

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA38 & PHA39	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Philadelphia	Checked By/Date:	PAD / 6-28-2011
Type of Problem(s)	Erosion		



Although the reach was reported as stable, substantial erosions was observed within this section of stream. Bank undercutting has exposed tree roots and is jeopardizing the stability of vegetation along the stream. This is diminishing the existing riparian buffer and increasing sediment loading.

Potential Solutions

- 1) Regional Basin (RB) #4 (Infiltration/Detention) (BMP 6.8.2): This storage area would be located in an open area within a large residential development. Ideally, this storage area would have an infiltration component, which would reduce peak flows and volumes while also increasing water quality.
- 2) RB #5 (Infiltration/Detention)(BMP 6.8.2): This storage area would be excavated on an empty lot between two industrial buildings downstream of a highly developed area.
- 3) RB #6 (Infiltration/Detention)(BMP 6.8.2): This storage area would consist of an embankment and outlet structure across the headwaters of a tributary within a wooded area downstream of the developed area. This should be constructed with minimal clearing of vegetation and will help to reduce peak rates and promote infiltration/filtration within the wooded area where ponding will occur.

Regional Basin Modeling Results

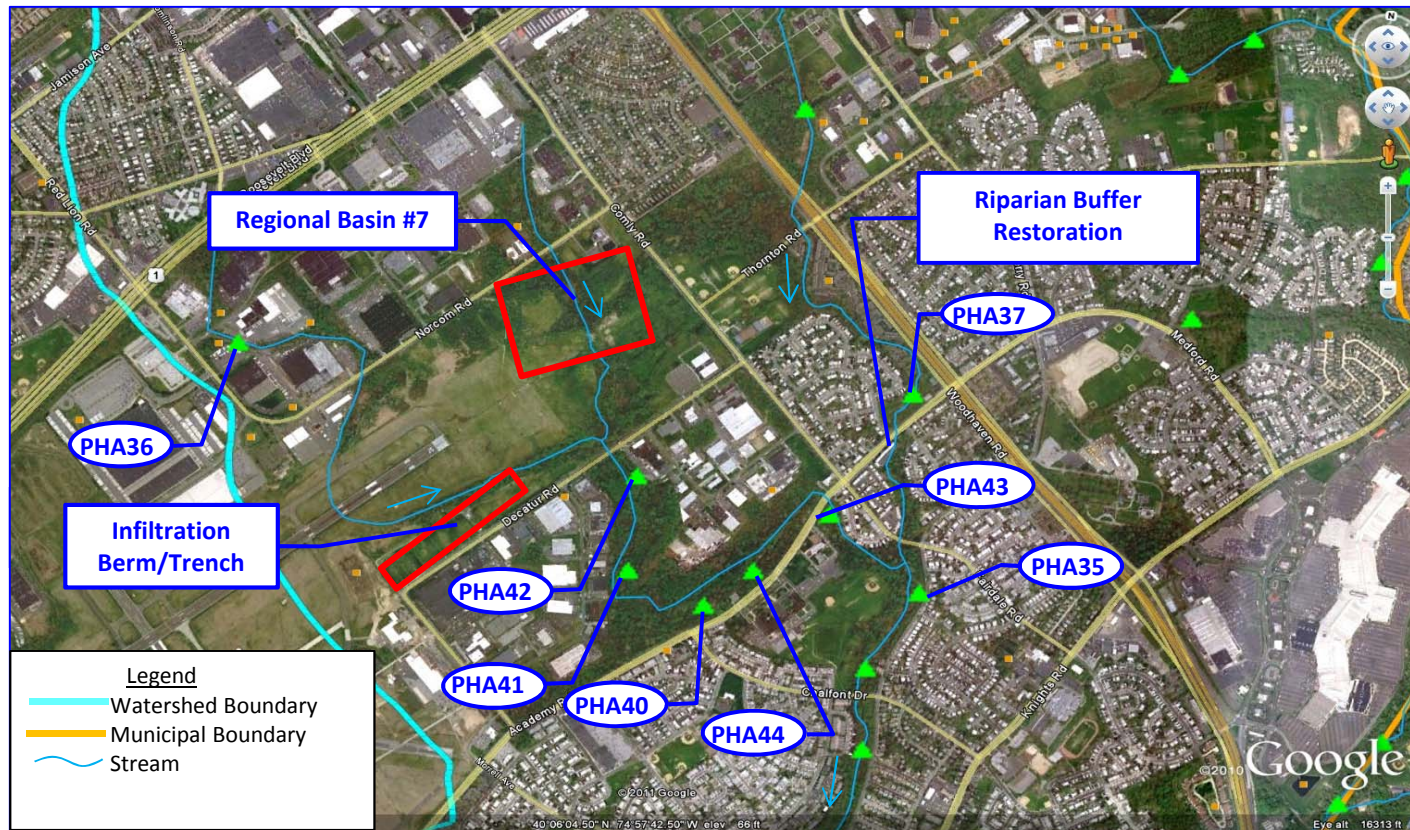
Drainage Area	RB #4 - 88 acres	RB #5 - 137.19 acres	RB #6 - 38.53 acres
Potential Storage	RB #4 - 21.2 acre-ft	RB #5 - 13.4 acre-ft	RB #6 - 20.6 acre-ft
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
RB #4			
2-Year	309.51	100.52	-208.99
50-Year	635.11	591.46	-43.65
RB #5			
2-Year	485.11	203.00	-282.11
50-Year	996.86	740.40	-256.46
RB #6			
2-Year	135.39	4.52	-130.87
50-Year	226.67	43.31	-183.36

Cost Estimate

1) \$1,060,000	3) \$1,834,000
2) \$1,193,000	

DETAILED PROBLEM AREA #5

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA36, PHA37, PHA40-44	Philadelphia	Walton Run, Byberry Creek	2

Description: These problem areas are located along Walton Run and Byberry Creek, near and upstream of their confluence. These problem areas were all reported by the Philadelphia Water Department. Both streams are experiencing significant erosion that is likely the result of uncontrolled runoff from upstream developed areas. Some SWM facilities exist within the commercial areas; however, severe erosion is still occurring within this small section of the watershed. There were 8-10 erosion problem areas reported in this localized area.

DETAILED PROBLEM AREA #5

Poquessing Watershed Act 167 Plan

Problem Area - Map ID:	PHA36-37 & PHA40-44	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Philadelphia	Checked By/Date:	PAD / 6/28/2011
Type of Problem(s)	Erosion		



The photograph on the left was taken along Walton Run (PHA44) and the photograph on the right was taken along Byberry Creek (PHA37). Both stream channels are experiencing high levels of erosion with subsequent sediment deposits downstream of these areas. Bank undercutting has exposed root systems and caused trees to fall into the stream, which is creating additional obstructions in the channel. Flooding is also a prevalent problem downstream of these problems areas.

Potential Solutions

- 1) Riparian Buffer Restoration (BMP 6.7.1): Several areas along Byberry Creek and Walton Run have very little or no riparian buffer. This would help to stabilize the streambanks, while at the same time increasing water quality through the use of natural filtering mechanisms, temperature reduction, and volume mitigation.
- 2) Regional Basin (RB) #7 (Detention, Infiltration)(BMP 6.8.2): This area would also be an ideal location for a large scale detention/infiltration facility. This storage area could consist of an embankment and outlet structure across the stream within the wooded area to the east North Philadelphia Airport. This area could detain a large amount of water and help to prevent downstream erosion.

This storage area could also be an overflow floodplain storage facility. This type of storage would not detain as much flow as the berm but would not impact the area as much.

Regional Basin Modeling Results

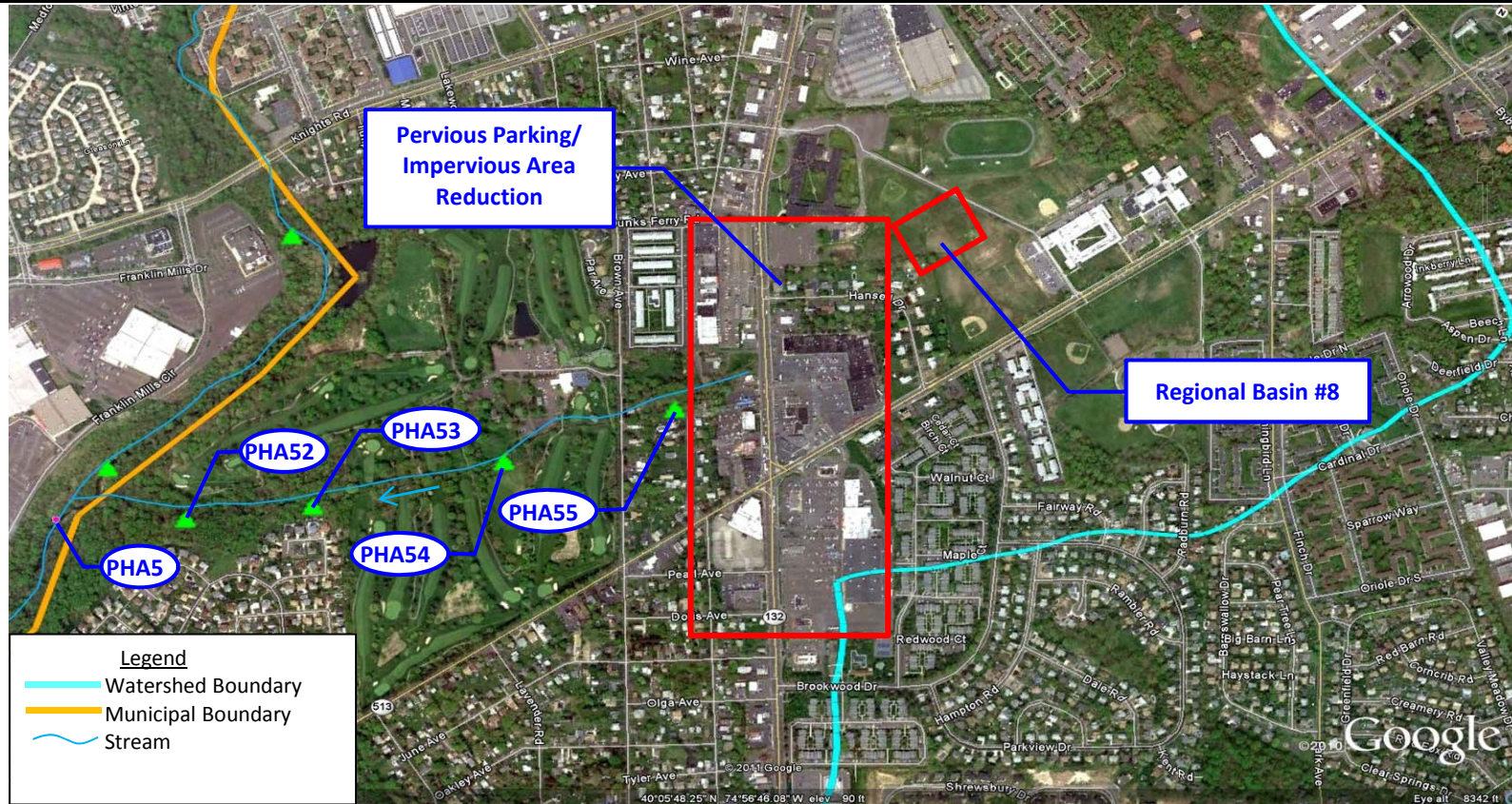
Drainage Area	RB #7 - 637 acres		
Potential Storage	RB #7 - 35.97 acre-ft		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	1528.41	1029.42	-498.99
50-Year	2535.53	1696.57	-838.96

Cost Estimate

1) \$51,500	2) \$3,204,000
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DETAILED PROBLEM AREA #6

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA5, PHA52 - 55	Bensalem	UNT Poquessing Creek	2

Description: These problem areas were reported by the Philadelphia Water Department. The problem areas are located along a tributary to Poquessing Creek that flows through the Bensalem Country Club. The reach stability was reported as intermediate and the bank erosion was classified as high. The streambanks are not capable of withstanding the high flows and velocities being conveyed from developed upstream areas. The erosion of the streambanks is also contributing substantial sediment loads downstream, as evident from PHA5, which is classified as a sedimentation problem area.

DETAILED PROBLEM AREA #6

Poquessing Watershed Act 167 Plan

Problem Area - Map ID:	PHA5 & PHA52-55	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Bensalem	Checked By/Date:	PAD / 6-28-2011
Type of Problem (s)	Erosion		



The banks of this tributary are experiencing severe erosion. Streambank erosion was estimated at approximately 12 feet. Pipes that discharge directly into the tributary without any form of outlet protection also contribute the erosion problems observed in this area.

Potential Solutions

- 1) Regional Basin (RB) #8 (Detention/Infiltration)(BMP 6.8.2): This storage area would be constructed by building a low level berm at the down slope limits of the recreational fields. This will help by reducing peak rates and volumes of runoff to the downstream channel where erosion is occurring.
- 2) Pervious Parking/Impervious Area Reduction(BMP 5.7.2): This area is almost entirely impervious. Pervious parking would have water quality benefits by slowing, filtering, and cooling runoff while at the same time potentially reducing peak rates and volumes of runoff. Traffic studies could also be completed to determine if all of the provided parking is necessary. Unnecessary parking could then be converted into SWM facilities such as bioretention or infiltration areas.

Regional Basin Modeling Results

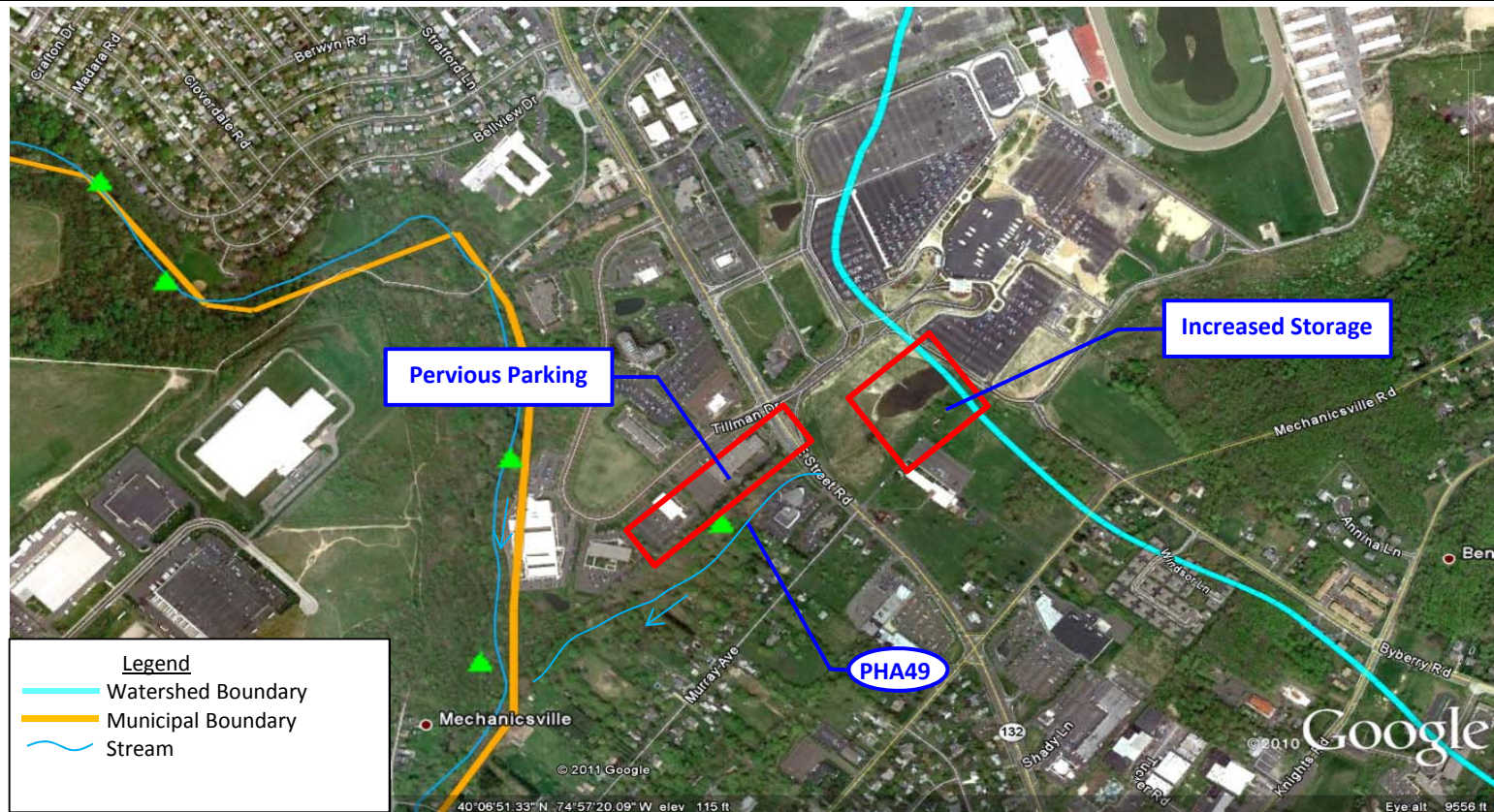
Drainage Area	RB #8 - 141.45 acres		
Potential Storage	RB #8 - 23.69 acre-ft		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	472.03	123.83	-348.20
50-Year	1015.70	612.24	-403.46

Cost Estimate

1) \$3,000/Pervious Parking Spot	2)\$1,000,000
\$20,000/ Bioretention-Rain Garden	

DETAILED PROBLEM AREA #7

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA49	Bensalem	UNT Poquessing Creek	3, 4

Description: This problem area was reported by the Philadelphia Water Department. The problem area is located within the Township of Bensalem south of Tilman Drive. The reach was reported to be actively degrading and the bank erosion was classified as high. Significant commercial development parallels the stream to the north, and minimal stormwater management is provided in these areas. In addition to increased volumes and flow rates, uncontrolled runoff from the impervious areas likely contains high pollutant loads and increased temperatures that are discharging directly into the stream.

DETAILED PROBLEM AREA #7

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA49	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Bensalem	Checked By/Date:	PAD / 6-28-2011
Type of Problem(s)	Erosion, Water/Groundwater Pollution, Dumping		



Substantial erosion was observed in this area. Dumping is also a problem in this area. Trash and debris containing pollutants can lead to water/groundwater pollution in and downstream of the problem area.

Potential Solutions

- 1) Trash Removal (BMP 5.9.1): Removing trash deposited in surrounding area will keep pollutants from polluting surface waters and groundwater.
- 2) Stream Bank Stabilization (BMP 6.7.1): Stabilize existing stream bank to limit further erosion and sediment transport downstream.
- 3) Increased Storage: Increase storage capabilities of the SWM facility that treats runoff from Parx Racing and Casino. Even if existing storage is sufficiently sized to treat runoff from the casino, increased storage in this area could help to make up for areas in the watershed that are lacking SWM controls and have limited options for stormwater facilities.
- 4) Pervious Parking Areas (BMP 5.7.2): Construct pervious parking along large impervious parking area that parallels the UNT. Pervious parking would have water quality benefits by slowing, filtering, and cooling runoff while at the same time potentially reducing runoff from smaller storm events.

Regional Basin Modeling Results

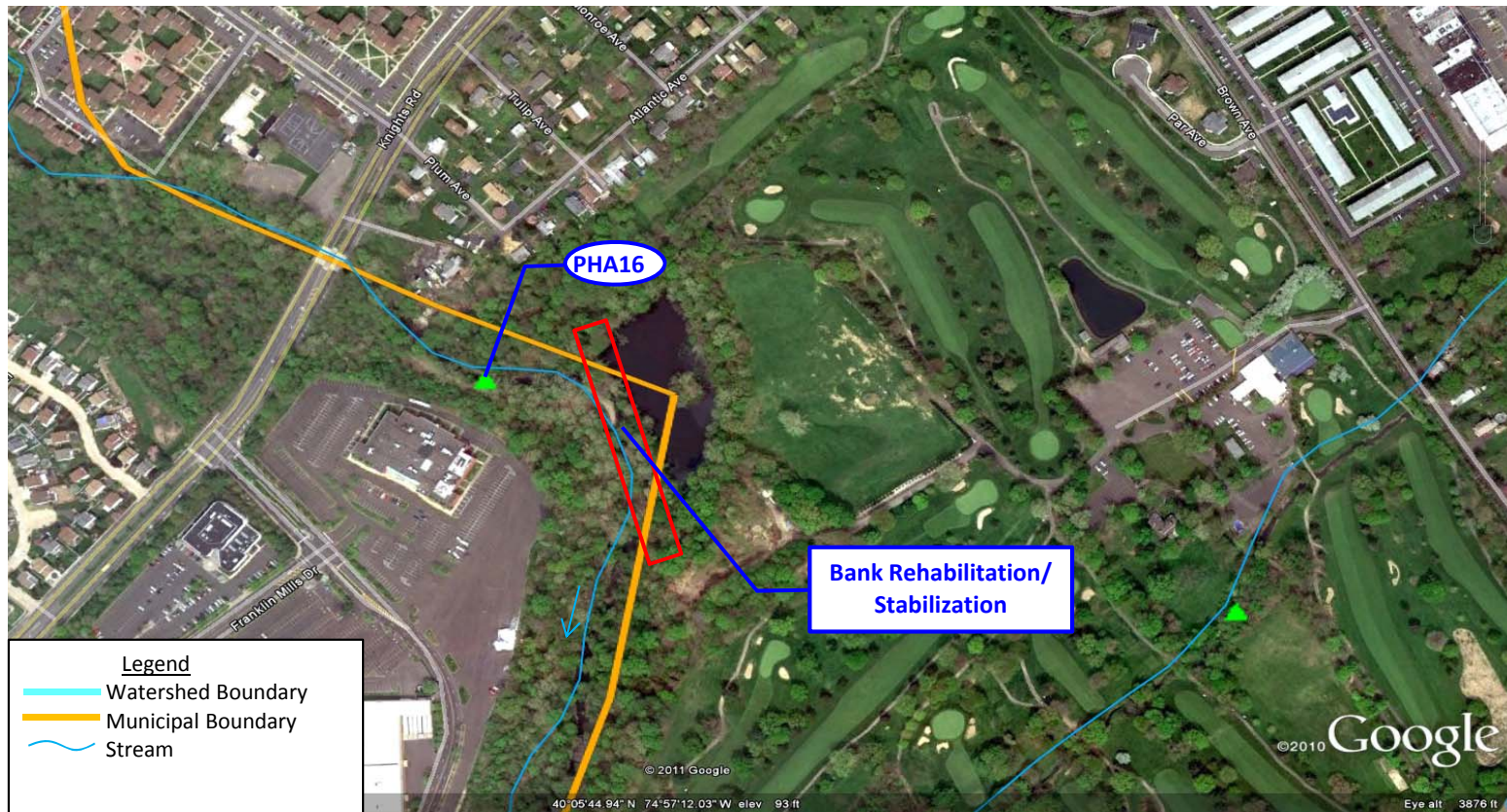
Drainage Area	N/A		
Calculation Methodology	N/A		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	N/A		
5-Year	N/A		

Cost Estimate

1) \$0, Volunteer Cleanup	3) \$30,000-\$100,000
2) \$3,000/Pervious Parking Spot	4) \$300,000

DETAILED PROBLEM AREA #8

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA16	Philadelphia/Bensalem	UNT Poquessing Creek	1

Description: This section of stream was reported as a problem area by the Philadelphia Water Department. The problem area is located along Poquessing Creek south of Knights Road. The reach stability was reported as intermediate and the bank erosion was classified as high. A pond within this section of stream shares a bank with Poquessing Creek. This embankment is experiencing significant erosion that will eventually lead to a embankment failure. Therefore, this problem area should be a high priority because it creates an increased risk to life, property, and the environment.

DETAILED PROBLEM AREA #8

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA16	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Philadelphia/Bensalem	Checked By/Date:	PAD / 6-28-2011
Type of Problem	Erosion, Potential Pond Failure		



The pictures above show the severely eroded stream bank that is jeopardizing the stability of the shared stream/pond embankment. Continued bank erosion will eventually lead to a bank failure and potential flooding downstream.

Potential Solutions

1) Embankment Repair and Stabilization: The embankment shared by Poquessing Creek and the adjacent pond needs to be immediately repaired and stabilized. Additional design and calculations will be required to determine the appropriate stabilization for the embankment; however, possible solutions include riprap armoring, gabions, or articulated concrete block revetments.

Regional Basin Modeling Results

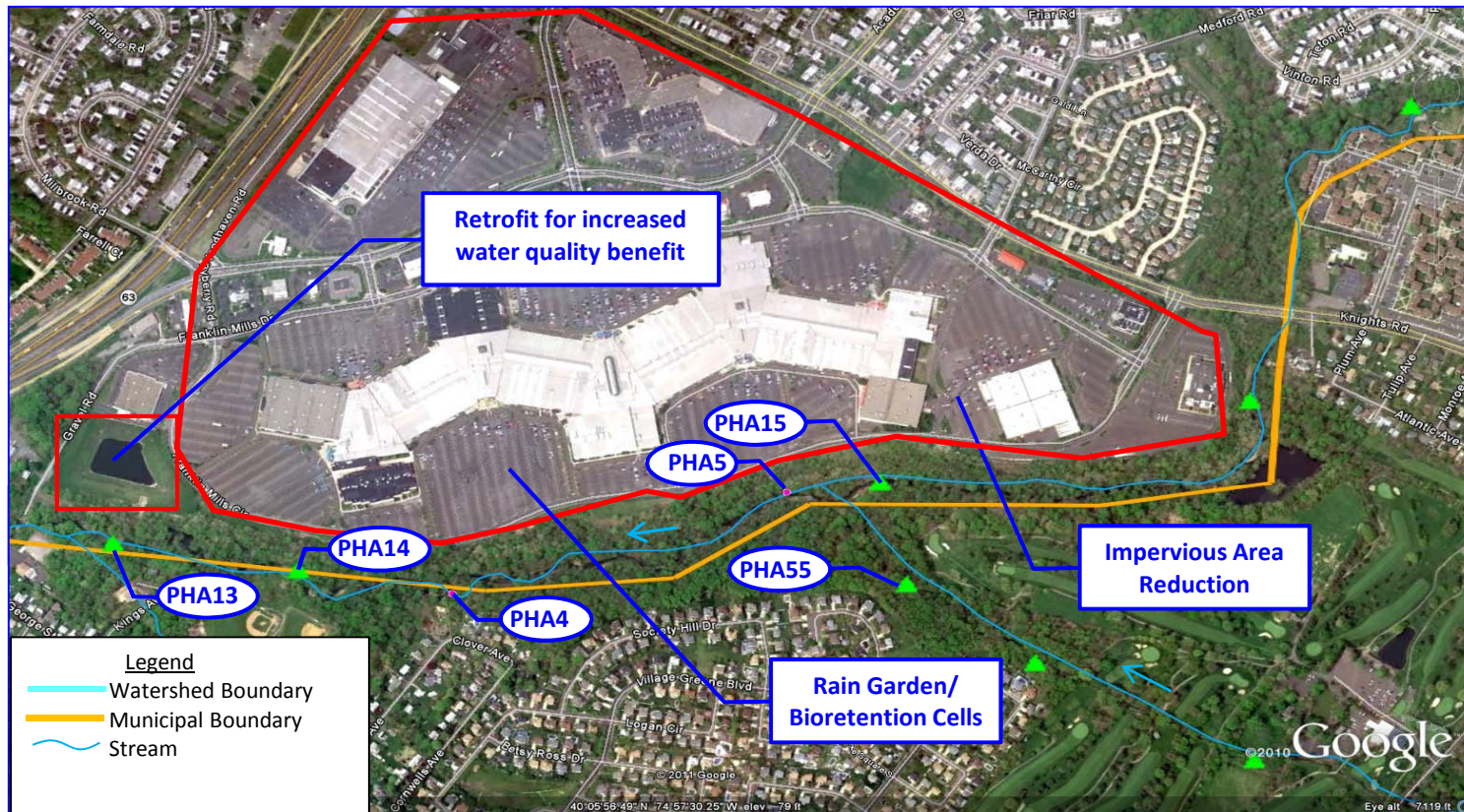
Drainage Area	N/A		
Potential Storage	N/A		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	N/A		
50-Year	N/A		

Cost Estimate

1) \$10,000

DETAILED PROBLEM AREA #9

Poquessing Watershed Act 167 Plan



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
PHA4, PHA5, PHA13-15	Philadelphia	Poquessing Creek	1

Description: These problem areas are located along a section of Poquessing Creek that parallels Franklin Mills Mall. The mall and adjacent commercial areas consist of over 180 acres (~0.3 sq. miles) of impervious area. Without proper SWM controls, impervious areas of this magnitude can have significant effects on the receiving watershed. The only apparent SWM control is a large detention pond located near the southern limits of the mall. This type of SWM approach conflicts with the currently preferred SWM methodologies that stress mitigating runoff at the source using small localized BMPs that are incorporated into a treatment train. Impervious areas that do not discharge to this pond are conveyed directly into Poquessing Creek with little opportunity to reduce, filter, or cool runoff.

DETAILED PROBLEM AREA #9

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	PHA4-5 & PHA13-15	Inspected By/Date:	DJS,BAK / 10-28-2010
Municipality:	Philadelphia	Checked By/Date:	PAD / 6-28-2011
Type of Problem	Existing Management		



As shown in the picture on the left, the major SWM control for the mall is a large wet pond. Although the wet pond has the ability to control runoff rates, it has little effect on runoff quality and volume. The picture on the right depicts one of the many large parking lots that are located directly adjacent to Poquessing Creek. Although some a small riparian buffer is present the majority of runoff is directly discharged into Poquessing Creek.

Potential Solutions

- 1) **Impervious Area Reduction (BMP 5.7.2):** Often, parking areas for large commercial centers are larger than needed. A traffic study could be conducted to determine if all of the provided parking is necessary. Unnecessary parking could be converted to vegetated BMPs that promote infiltration and filtering of pollutants through natural processes (bioretention/rain garden, vegetated filter strips, constructed filters, etc.). Additionally, existing impervious islands that are not used for parking could be converted to similar BMPs, and curbing could be removed from existing vegetated islands to allow runoff into these areas for treatment.
- 2) The existing wet detention pond should be analyzed for retrofit opportunities to reduce runoff volume

Regional Basin Modeling Results

Drainage Area	N/A		
Potential Storage	N/A		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	N/A		
50-Year	N/A		
Cost Estimate			
1) \$3,000/Pervious Parking Space	2) \$30,000-\$100,000		
\$20,000/ Bioretention-Rain Garden			

DETAILED PROBLEM AREA #10

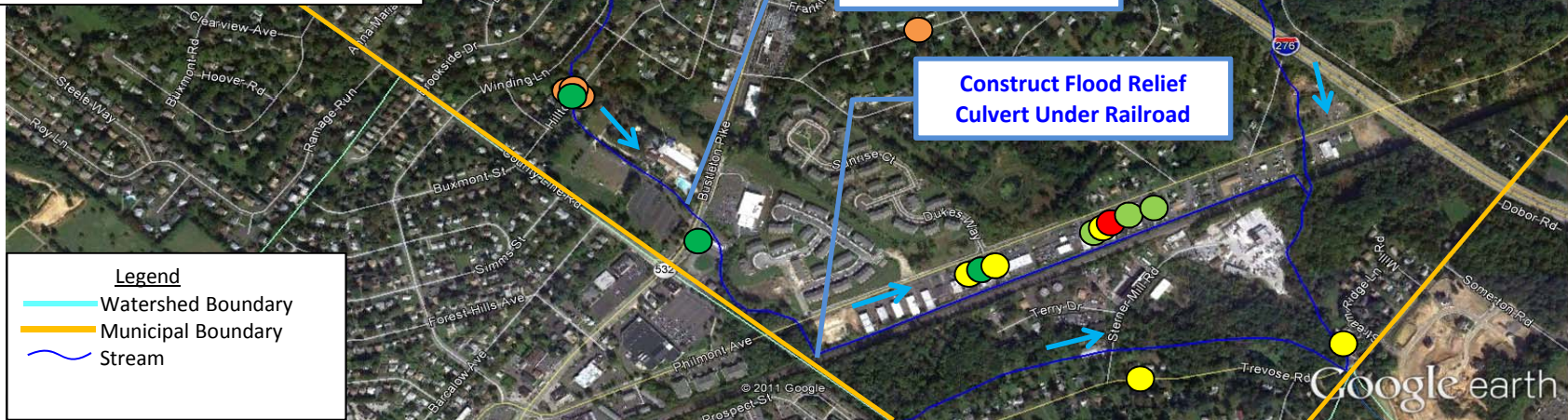
Poquessing Watershed Act 167 Plan

Total Flood Insurance Claims, 2010

Claim Value (US Dollars)

- \$0 - \$5,000.00
- \$5,000.01 - \$10,000.00
- \$10,000.01 - \$25,000.00
- \$25,000.01 - \$50,000.00
- \$50,000.01 - \$100,000.00

NOTE: The information contained on this map is legally privileged and confidential. Its use is protected under the privacy act of 1974, 5 U. S. C. section 552(a). Use of the information provided should be restricted to applicable routine use cited in the systems notice published in 56 FR 26415.



Problem Area(s) - Map ID	Municipality	Stream Name	Preferred Solution
N/A	Lower Southampton	Poquessing Creek	1, 3

Description: No problem areas were reported in this portion of the watershed, but several flood insurance claims have been documented in the subject area that led to its classification as a detailed problem area. These flood insurance claims are located along a section of Poquessing Creek that parallels Philmont Ave and a SEPTA Rail Line. The stream appears to have been diverted parallel to the SEPTA Rail Line instead of flowing under it.

DETAILED PROBLEM AREA #10

Poquessing Watershed Act 167 Plan

Problem Area(s) - Map ID:	N/A	Inspected By/Date:	N/A
Municipality:	Lower Southampton	Checked By/Date:	N/A
Type of Problem	Flooding		



As shown in the image on the left, the tributary follows a relatively straight path to the south until it abruptly changes course at the railroad and flows east along the rail line. The aerial image on the right depicts several buildings that are located adjacent to the stream and are susceptible to flooding.

Potential Solutions

- 1) Rain Gardens/Cisterns (BMP 6.4.5): Implementing rain gardens and cisterns in the upstream residential areas could have a significant effect on runoff rates and volumes from smaller storm events. Residents could reuse the captured runoff for water lawns, gardens, and other vegetated landscaping.
- 2) Riparian Buffer Enhancement (BMP 6.7.1): This stretch of the stream has very little or no riparian buffer. This would help to stabilize the streambanks, while at the same time increasing water quality through the use of natural filtering mechanisms, temperature reduction, and volume mitigation.
- 3) Install Culvert: A flood relief culvert could be constructed under the railroad to divert higher flows away from the developed area where the majority of the claims were reported.

Regional Basin Modeling Results

Drainage Area	N/A		
Potential Storage	N/A		
Storm Frequency	Existing Peak Discharge (cfs)	Mitigated Peak Discharge (cfs)	Difference (cfs)
2-Year	N/A		
50-Year	N/A		

Cost Estimate

1) \$1,000/Residence	3) \$500,000
2) \$23,500	

*Insufficient information available to determine cost estimate.