

## Chiques Creek Withdrawal Rationale and TMDL/TMDL Alternative Proposal

### INTRODUCTION

Chiques Creek appeared on Pennsylvania's 1996 303(d) List of Impaired Waters (List) as being impaired by nutrients from agricultural sources. The impairment was modified as part of the 1998 List to also include siltation from agriculture. The Chiques Creek Watershed TMDL for phosphorus and sediment was developed by Pennsylvania Department of Environmental Protection (DEP) and approved by the United States Environmental Protection Agency (EPA) on 4/9/2001 and was one of the first TMDLs completed in partial fulfillment of EPA's Consent Decree requirements. While the original TMDL adequately included the known regulated dischargers and sources of impairment at the time, it has several major deficiencies that render it ineffective as any sort of planning tool for pollutant reduction purposes in present day.

Therefore, DEP is proposing that the current Chiques Creek TMDL be immediately withdrawn and the waterbodies in the Chiques Creek watershed returned to Category 5 in the integrated report with updated sources and causes. Based on DEP's current resources and funding, March 2016 is the current target date by which the withdrawn TMDL will be replaced by a TMDL for nutrients and sediment or an alternative approach that will be more comprehensive in its geographic extent, more accurate in its characterization/inclusion of all sources, and provide a management tool for both point and nonpoint sources in the watershed. At that time, the listing placement can be reevaluated to determine the most appropriate category for the Chiques Creek Basin waters.

### STATUS OF CURRENT TMDL(s)

Since the Chiques Creek TMDL approval, the WLAs included in the original TMDL have been fully implemented (i.e. dischargers are in compliance with the requirements of the 2001 TMDL). Further reductions requirements in accordance with the Chesapeake Bay TMDL have also been instituted and three waste water treatment plants (WWTPs) have already upgraded their facilities. These new requirements are not accounted for in the existing TMDL.

The larger issue still remains that many dischargers were not assigned WLAs, nor were stormwater sources that are now NPDES permittees. Implementation of the nonpoint source (NPS) portion of the TMDL has not been overly successful as there was no stakeholder involvement in its development and no plan to follow the TMDL with funding targeted to NPS BMP implementation. This proposed pilot remedies both of those flaws with a more intensive public engagement effort along with DEP/EPA grant program coordination during development of the watershed plan.

The remainder of this document will provide more specific updates on the implementation status of both point and nonpoint sources along with details for the proposed -alternative approach for the restoration of Chiques Creek Watershed or, as necessary, revised TMDL.

## ISSUES IN CURRENT TMDL

### *Assessments*

The Chiques Creek TMDL (2001) has some major deficiencies that not only make implementation impossible, but are so major in scope that a revision to resolve the problems on an expedient timeframe is not feasible. The current health of the streams in the watershed and existing sources/causes of impairments must be understood in order to properly revise the TMDL. Any revision of the TMDL should also address the entire geographical extent of the watershed, but evaluate water quality on a subwatershed basis that helps guide implementation efforts.

The last assessments in the Chiques Creek watershed were performed in 1997. The assessments were not done using the ICE protocol which is currently the method used today. The advantage of the ICE protocol is that it is quantitative and can be used to demonstrate incremental progress in waterbody health. The prior methodology used a pass/fail outcome that did not lend itself to measuring progress using comparisons to previous surveys. DEP proposes a complete reassessment of the Chiques Creek watershed using the ICE protocol to get a new baseline. Additionally, DEP would initiate a monitoring effort that would include collection of continuous instream data (CIM), water chemistry and periphyton. This work is slated to begin in the fall of 2014 and continue through the summer of 2015.

### *NPDES Permits*

Certain existing NPDES discharge permits were not provided WLAs in the original TMDL. These permits must be renewed and there are no WLAs in the existing TMDL to accommodate them. Additionally, dischargers would need to be addressed by extending the geographical revisions to be more inclusive of the entire Chiques Creek Watershed as discussed later in this proposal.

The Municipal Separate Storm Sewer System (MS4) permittees in the Chiques Creek watershed ( $\approx 12$ ) did not receive WLAs and are not required to plan for pollutant reductions from their outfalls. The 2001 TMDL was also developed prior to the James Hanlon memorandum of November 22, 2002, "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Requirements Based on Those WLAs." Simply moving the loads around and updating the existing TMDL to include these permittees is not an option as the 2001 model did not include a streambank erosion component; therefore, no sediment in that TMDL was attributed to urbanized areas. Revising the TMDL will entail a remodeling effort to better characterize the contributions to the watershed sediment load from MS4s through bank and channel degradation. Table 1 below shows the MS4s in the Chiques Creek watershed based on the revised geographical extent.

**Table 1. MS4 Permittees in the Chiques Creek Watershed**

<b>NPDES</b>	<b>Chiques Creek Dischargers, MS4s</b>
PAG133612	East Donegal Township
PAG133632	East Hempfield Township
Waiver	Elizabeth Township

PAG133640	Manheim Borough
PAG133567	Penn Township
Waiver	Rapho Township
PAG133536	West Hempfield Township
TBD	West Donegal Township
PAG133578	Mount Joy Township
PAG133658	Mount Joy Borough
PA139602	PA Turnpike Commission
PA139601	PennDOT

In addition to the MS4s, DEP finds that additional NPDES discharge permits were left out of the original TMDL. Table 2 shows the active NPDES permits in the Chiques Creek watershed based on the revised geographical extent. .

**Table 2. Active NPDES Permits in the Chiques Creek Watershed**

<b>NPDES</b>	<b>Name</b>
PA0081787	Telco Developers (Gretna Springs)
PA0081191	Outdoor World
PA0086461	Pinch Pond
PA0086428	Mazza Vineyard
PA0043028	Hemlock Acres (Evergreen Enterprises)
PA0261050	Quail Creek (new Bay)
PA0260134	Camp Shand
PA0034363	Pine View Acres
PA0084026	Northwestern Lanc Co
PA0034860*	Penn Valley MHP
PA0020893	Manheim Borough
PA0082228	Hilltop Acres
PA0081299	Rolling Hills MHP
PA0042285	Pleasant View Rest Home
PA0008559	Raymark Industries
PA0021067	Mt Joy STP
PA0042781	Mt Joy Wire
PA0261572	Mt Hope Nazarene
PA0261661	Red Carpet Inn

\* Bold indicates accounted for in existing TMDL

Concentrated animal feeding operations (CAFOs) were not subject to NPDES permits in 2001, and thus were considered as part of the nonpoint sources. These existing sources now have NPDES permits. Table 3 shows the CAFOs in the Chiques Creek Watershed based on the revised geographical extent.

**Table 3. CAFO Permits in the Chiques Creek Basin**

PERMIT_ID	LIVESTOCK
PA0248274	SWINE
PAG123749	CHICKEN
PA0248584	CHICKEN
PA0260037	SWINE
PAG123643	DAIRY
PAG123634	SWINE
PAG123604	CHICKEN
PAG123767	DAIRY
PAG123709	CHICKEN
PAG123757	CHICKEN
PAG123626	SWINE
PAG123632	SWINE
PAG123657	CHICKEN
PA0246409	CHICKEN
PAG123663	CHICKEN
PA0260398	DAIRY
PAG123780	CHICKEN
PAG123582	SWINE
PAG123665	CHICKEN
PAG123666	DAIRY
PAG123753	CHICKEN
PAG123744	CHICKEN
PAG123690	CHICKEN
PAG123756	CHICKEN
PAG123739	SWINE
PAG123680	CHICKEN
PAG123686	DUCK
PAG123682	SWINE
PA0088285	CHICKEN
PA0247511	DAIRY
PAG123572	DAIRY
PAG123698	CHICKEN
PAG123545	SWINE

### *Nonpoint Sources*

In the years following the establishment of the existing TMDL, several initiatives and projects were undertaken to address nonpoint source (NPS) inputs to the system. There was a Chiques Cr. Watershed Alliance formed around 2001. This group did a watershed wide stream assessment with Growing Greener funds in 2002 and also received Growing Greener funding for stream restoration work in Mummau Park and on Rife Run. After several years of dormancy, the group has been reformed and have a new joint NFWF/Growing Greener grant to do another stream restoration project on Rife Run with

work schedule to begin in the summer of 2015. The group has also been active in organizing educational/outreach events such as farm shows, watershed expos, watershed nights, creek stumps, stream cleanups and tree plantings.

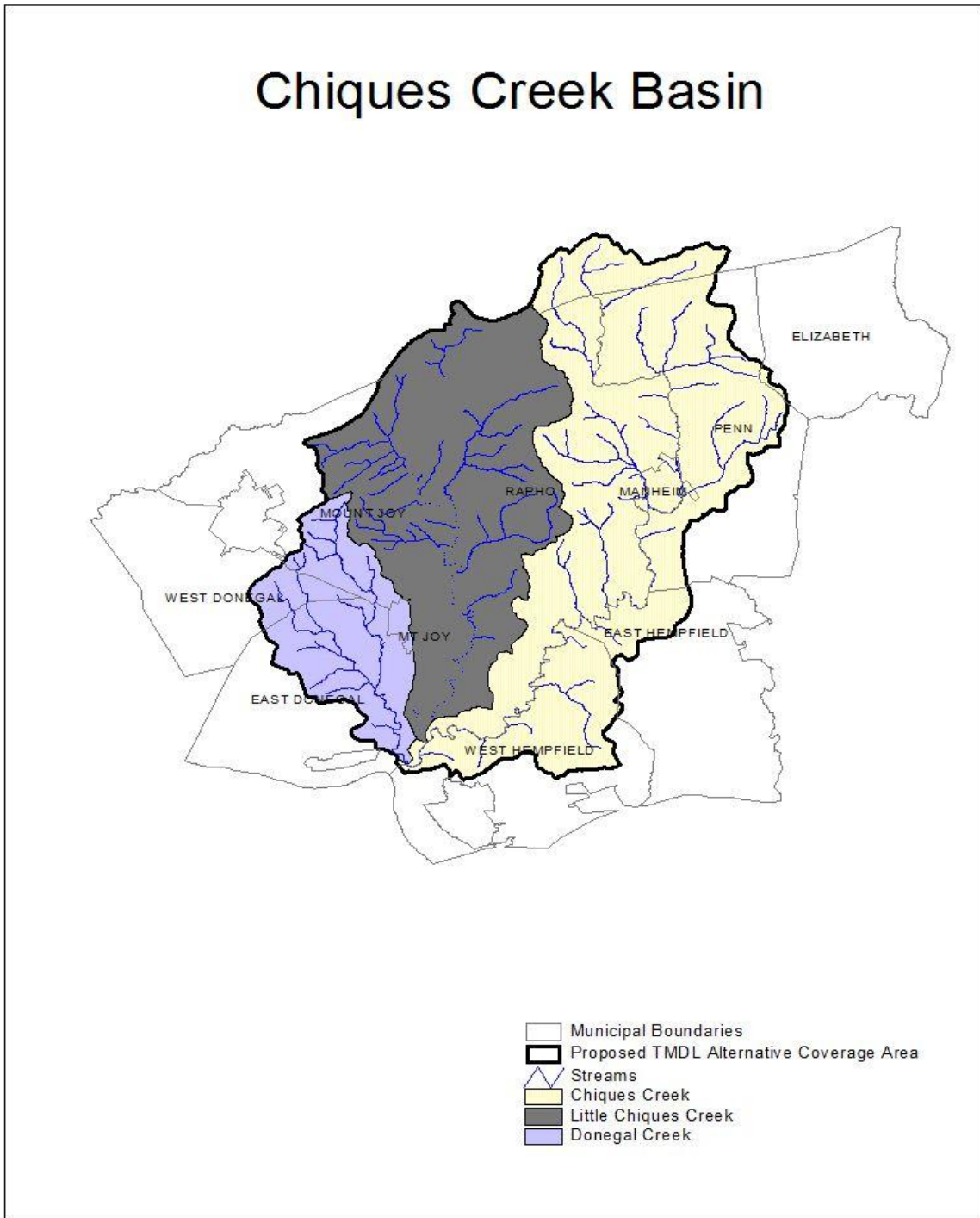
Other work has been done in the watershed, though not affiliated with the Chiques Creek watershed group. For example, a Little Chiques Creek Rivers Conservation Plan was created in 2005, streambank and fish habitat improvement work was done in 2007 on Shearers Creek, along with several feasibility studies aimed at a combination of pollution and flood control. Several municipalities, including Rapho Township and Mount Joy Borough have been active in the basin both in terms of participation in many of the activities mentioned above along with on-site BMPs at their offices.

In the proposed Chiques Creek alternative approach, in collaboration with stakeholders, DEP will take a much more coordinated and targeted approach to NPS BMP implementation. Chiques Creek is being considered for designation as a priority watershed under the state's Growing Greener Program. This state funded program provides grant monies to support watershed restoration activities in areas defined by the Department as priority watersheds for implementation. The Growing Greener Program allocates approximately \$20.0 million a year for watershed restoration activities. The Department is likewise considering a portion of the Chiques Creek watershed as a focal area for agricultural compliance assessment and support. Being selected as one of these focal areas initiates on the ground assessment by state program staff of every farm in the area to ensure that they are meeting agricultural compliance obligations established through state and federal laws and therefore appropriately protecting the water resources in the area. These focused efforts in the watershed can greatly enhance restoration activities in the Chiques Creek watershed and significantly shorten the timeframe needed to restore impaired stream reaches within this watershed.

#### *Geographic Extent*

The entire Chiques Creek Watershed consists of four HUC 12 subwatersheds. The Chiques Creek TMDL captured two of the four subwatersheds comprising the mainstem of Chiques Creek from its headwaters to a point in the watershed ( $\approx 65\text{mi}^2$  TMDL approved in 2001) above the confluence of Chiques Creek with Little Chiques Creek ( $\approx 45\text{mi}^2$  with no current TMDL) and Donegal Creek ( $\approx 17\text{mi}^2$  TMDL approved in 1999). DEP proposes the TMDL Revision or alternative approach for Chiques Creek be more comprehensive and include new assessments for Little Chiques and Donegal Creek (Figure 1). Donegal Creek has had a lot of BMP implementation activity, some post-TMDL but predominantly before the TMDL was completed. New assessments in this watershed may provide a basis for delisting Donegal Creek. The assessment findings will appear on Pennsylvania's 2016 IR. In order to properly understand both the point and nonpoint source contributions at a manageable scale for implementation, the Chiques Creek watershed will be broken into even smaller subwatersheds.

Figure 1. Chiques Creek Basin including Chiques Creek, Little Chiques Creek and Donegal Creek



## **PATHWAY FORWARD**

The assessment work is slated to begin in the fall of 2014 and continue through the summer of 2015. A detailed plan for assessment, monitoring and sampling can be found in Appendix A. DEP and SRBC will partner in the monitoring effort, the exact division of responsibilities is still being worked out. SRBC will coordinate all workgroups including scheduling/facilitation of meetings. SRBC will also take the lead in the TMDL/TMDL Alternative development process and act as the point-of-contact for Chiques Creek stakeholders. An initial stakeholder engagement meeting will be held in January 2015. This group will consist of representatives from all sectors and will be the core of what is envisioned to be a steering committee. EPA will be represented on the Steering Committee and will provide guidance to ensure that the Alternative Implementation Strategy meets all necessary criteria. Data collection, as discussed in Attachment A, will commence in spring 2015 and continue through the summer. Parallel to the data collection efforts and after several (monthly) meetings with the steering committee members, several workgroups will be formed. These groups will represent the major stakeholder interests (nonpoint source/agriculture, MS4s, WWTPs) and also a technical (modeling) workgroup. The goal is to have a new TMDL Alternative/Chiques Creek Watershed Implementation Strategy for meeting newly derived endpoints in place by March 2016.

## **SUMMARY**

DEP is proposing to withdraw the existing Chiques Creek TMDL and replace it with a revised TMDL or TMDL Alternative. Either resolution will be guided by additional data collection, modeling, and analysis work and engage stakeholders from all sectors. At this point, the Chiques Creek TMDL (2001) is no longer an effective vehicle to affect point or nonpoint source pollutant reductions in the watershed. The watershed has not had an aquatic life use assessment in approximately 15 years; meanwhile, assessment methods and sources of impairment in the growing area have changed dramatically. Additionally, many current NPDES dischargers were not included in the original TMDL. These discharges must be included in a comprehensive TMDL/TMDL Alternative for the entire watershed (Chiques, Little Chiques and Donegal Creeks) that addresses the current sources/causes of impairment as determined by new, watershed-wide, aquatic life use assessments. This comprehensive approach will take a considerable amount of time and also require a complete remodeling of the watershed; however, this is the only way to determine nutrient/sediment load reductions required for Chiques Creek to meet water quality standards. Based on the ineffectiveness of the existing TMDL, the obstacle that the current TMDL poses in the implementation and renewal of current permits, and the time required to complete the work necessary to replace it with a quality TMDL/TMDL Alternative, DEP requests approval of the withdrawal of the *Total Maximum Daily Loads (TMDLs) Development Plan for Chiques Creek Watershed (2001)* and the impaired waters returned to Category 5 while an appropriate replacement is prepared.

**Appendix A**  
**Proposed Chiques Creek Sampling Plan**  
**CHIQUES CREEK**  
**LANCASTER COUNTY**

**PROPOSED SAMPLING PLAN**  
**WATER QUALITY ASSESSMENT**

**Segment: Basin**

**Stream Code: 07919**

**Drainage List: O**

**WATER QUALITY MONITORING SECTION**  
**DIVISION OF WATER QUALITY STANDARDS**  
**BUREAU OF POINT AND NON POINT SOURCE MANAGEMENT**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION**



## **INTRODUCTION**

Chiques Creek (aka Chickies Creek) is a fifth order freestone tributary to the Susquehanna River located in Lancaster County. The Chiques Creek basin, from headwaters to its confluence with the Susquehanna River is being assessed as part of a pilot project to assess the watershed for possible TMDL revision or TMDL alternatives as part of the Department's 303(d) revisioning effort, to recognized improving waters and assist stakeholders in meeting water quality goals.

### **Current Chapter 93 Designated Uses for Chiques Creek Basin:**

- 2—Chiques Creek Main Stem Lancaster WWF, MF
- 3—Unnamed Tributaries to Chiques Creek Basins Lebanon-Lancaster WWF, MF
- 3—Shearers Creek Basin Lancaster HQ-CWF, MF
- 3—Boyers Run Basin Lancaster WWF, MF
- 3—Rife Run Basin Lancaster WWF, MF
- 3—Dellinger Run Basin Lancaster WWF, MF
- 3—Little Chiques Creek Basin Lancaster TSF, MF
- 3—Donegal Creek Main Stem Lancaster TSF, MF
- 4—Unnamed Tributaries to Donegal Creek Basins Lancaster CWF, MF
- 4—Donegal Springs Basin Lancaster HQ-CWF, MF

### **Current Integrated Water Quality Monitoring and Assessment Report Listing for Chiques Creek Basin:**

2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report - Streams, **Category 4a Waterbodies**, Approved TMDLs

***Stream Name***

***Source***

***Cause***

***Use Designation (Assessment ID) Date Listed TMDL Date***

**Chiques Creek**

HUC: 02050306

Aquatic Life (6) - 7.71 miles

Agriculture Nutrients 1996 2001

Aquatic Life (8440) - 16.19 miles

Agriculture Siltation 1998 2001

Potable Water Supply (11841) - 0.4 miles

Agriculture Nutrients 1996 2001

Aquatic Life (13443) - 0.09 miles

Agriculture Nutrients 2008 2001

Siltation 2008 2001

**Chiques Creek Unnamed Of (ID:57462297)**

HUC: 02050306

Aquatic Life (8474) - 1.23 miles

Agriculture Nutrients 1998 2001

Siltation 1998 2001

**Chiques Creek Unnamed Of (ID:57462405)**

HUC: 02050306

Aquatic Life (8474) - 2.4 miles

Agriculture Nutrients 1998 2001

Siltation 1998 2001

**Chiques Creek Unnamed Of (ID:57463523)**

HUC: 02050306

Aquatic Life (8440) - 0.84 miles

Agriculture Siltation 1998 2001

**Chiques Creek Unnamed To (ID:57462535)**

HUC: 02050306

Aquatic Life (8474) - 4.07 miles

Agriculture Nutrients 1998 2001

Siltation 1998 2001

**Donegal Creek**

HUC: 02050306

Aquatic Life (7977) - 6.16 miles

Agriculture Nutrients 1996 2000

Organic Enrichment/Low D.O. 1996 2000

Suspended Solids 1996 2000

**Donegal Creek Unnamed To (ID:57463545)**

HUC: 02050306

Aquatic Life (7977) - 3.08 miles

Agriculture Nutrients 1996 2000

Organic Enrichment/Low D.O. 1996 2000

Suspended Solids 1996 2000

**Donegal Creek Unnamed To (ID:57463763)**

HUC: 02050306

Aquatic Life (7868) - 3.4 miles

Agriculture Nutrients 1996 2000

Organic Enrichment/Low D.O. 1996 2000

Siltation 1996 2000

2014 Pennsylvania Integrated Water Quality Monitoring and Assessment Report - Streams,  
**Category 5 Waterbodies**, Pollutants Requiring a TMDL

***Stream Name***

***Source Cause***

***Use Designation (Assessment ID) Date Listed TMDL Date***

**Chiques Creek Unnamed Of (ID:57462297)**

HUC: 02050306

Aquatic Life (8474) - 1.23 miles

Urban Runoff/Storm Sewers Cause Unknown 1998 2011

**Chiques Creek Unnamed Of (ID:57462405)**

HUC: 02050306

Aquatic Life (8474) - 2.4 miles

Urban Runoff/Storm Sewers Cause Unknown 1998 2011

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**Chiques Creek Unnamed To (ID:57462535)**

HUC: 02050306

Aquatic Life (8474) - 4.07 miles

Urban Runoff/Storm Sewers Cause Unknown 1998 2011

**Little Chiques Creek**

HUC: 02050306

Aquatic Life (8406) - 15.33 miles

Agriculture Nutrients 1998 2011

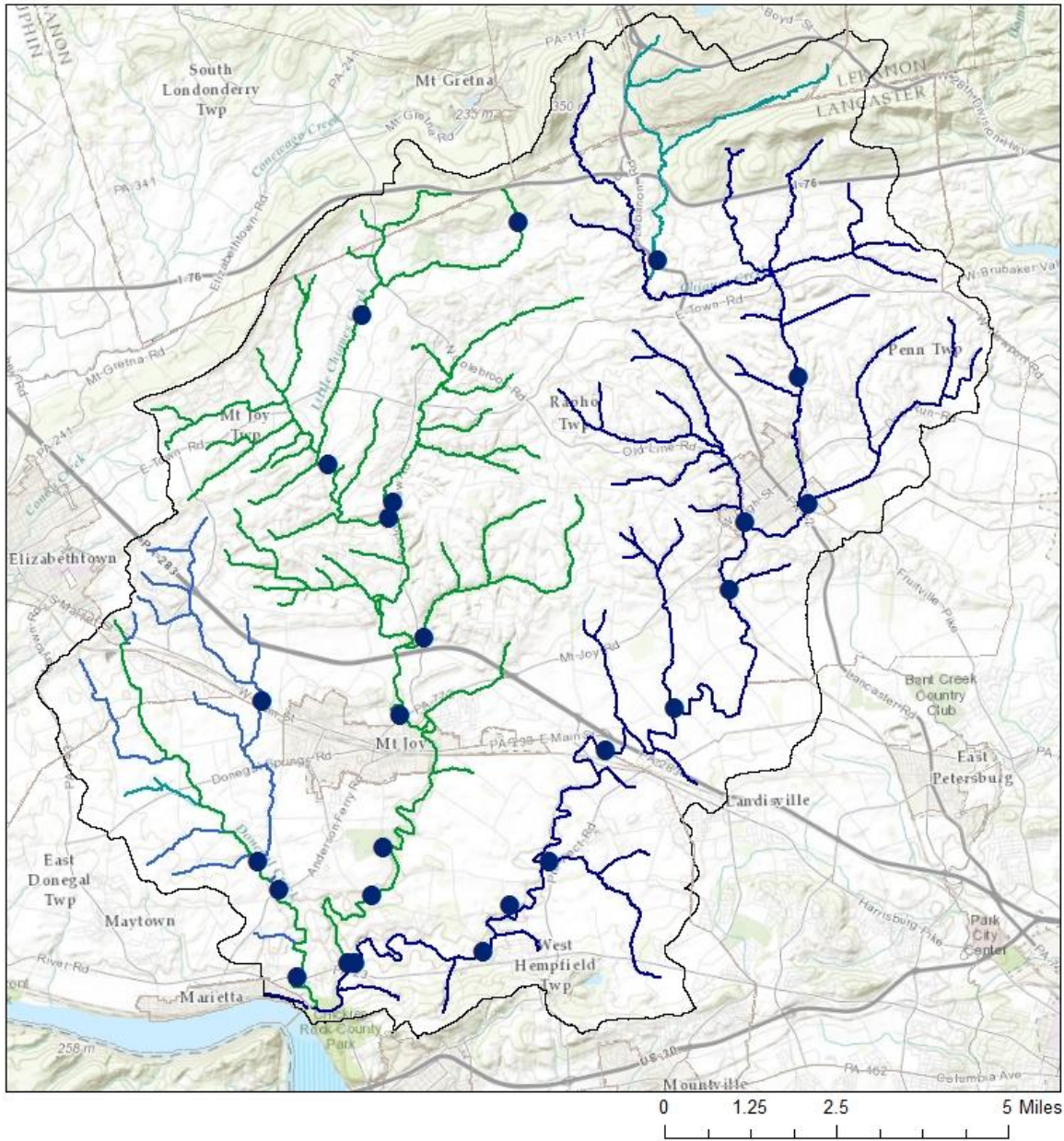
Siltation 1998 2011

## **PROPOSED SAMPLING (subject to change)**

25 sites are proposed in the Chiques, Little Chiques, and Donegal Creek watersheds. Sites have been selected based on their ease of access, suitable substrate, and bracketing of influences within the watershed. These sites are proposed and may be moved within reason if the proposed site, upon closer inspection is deemed not accessible or the habitat is not ideal for sampling (deep pool, lack of riffle habitat). In initial recon of the watershed, it was noted that the majority of the substrate present was small cobble and sand. To assess the Chiques Creek watershed, the Department will collect chemistry, benthic macroinvertebrates, periphyton, and fish. Additionally, long-term continuous instream monitoring of pH, turbidity, specific conductance, dissolved oxygen, and temperature will be collected at three of the sites, the locations will be determined at a later date.

**FIGURE 1. 2014/2015 SAC 907 Chemistry and Spring 2015 Macro Samples for Chiques Creek**

**Chickies Creek Watershed, Lancaster County**



**Legend**

- |                               |                    |                          |
|-------------------------------|--------------------|--------------------------|
| <b>Designated Use Streams</b> | Overlap            | Proposed Sampling Points |
| Cold Water Fish               | Trout Stocking     |                          |
| Exceptional Value             | Warm Water Fish    |                          |
| High Quality                  | Missing from CH 93 |                          |

## Chemistry

### IN-SITU GRAB SAMPLE (SAC 907) STATIONS (TABLE 1).

All samples should be coupled with specific conductance, temperature, dissolved oxygen, and pH field measurements collected with a hand held meter calibrated to standards within 24 hours of sampling. Selected sites will be periodically supported by additional real-time sonde deployments in order to characterize pH, temperature, dissolved oxygen, specific conductance, and turbidity. Chemistry sampling should not avoid high or low flows and storm events. Two exceptions to this are extreme events in which rainfall may be more than 0.25 inches and drought conditions. Chemistry sampling should be able to characterize the water quality as a whole and take into consideration those critical periods that may adversely affect water quality. Sampling will follow the departments ["Surface Water Collection Protocol"](#). Please see table at end of document for SAC 907 specifics (Table 3).

**TABLE 1. SAC 907 Chemistry Sample Sites**

Stream Name	Lat	Lon
Donegal Creek	40.061554	-76.529373
Chiques Creek	40.064383	-76.513604
Little Chiques Creek	40.064487	-76.515625
Chiques Creek	40.066263	-76.478406
Chiques Creek	40.075948	-76.470907
Little Chiques Creek	40.078481	-76.508544
Donegal Creek	40.080259	-76.533983
Chiques Creek	40.084953	-76.459818
Donegal Creek	40.086093	-76.53989
Little Chiques Creek	40.088733	-76.50539
Chiques Creek	40.108366	-76.443685
Little Chiques Creek	40.116622	-76.500107
Chiques Creek	40.116977	-76.424734

UNT to Donegal Creek	40.120035	-76.537775
Back Run	40.132669	-76.493125
Chiques Creek	40.141815	-76.408795
Rife Run	40.155987	-76.404483
Little Chiques Creek	40.158204	-76.502158
UNT to Chiques Creek	40.159554	-76.387005
Brubaker Run	40.161494	-76.50109
Little Chiques Creek	40.169473	-76.518472
Chiques Creek	40.186267	-76.388848
Little Chiques Creek	40.200985	-76.508494
Shearers Creek	40.211452	-76.426867
Little Chiques Creek	40.219852	-76.465133

## Macroinvertebrates

All macroinvertebrate samples collected at sample sites (Table 2) should be coupled with specific conductance, temperature, dissolved oxygen, and pH field measurements collected with a hand held meter calibrated to standards within 24 hours of sampling but preferably at the time of collection if possible. All samples should also include field alkalinity titration, habitat, and chemistry grab (SAC 907, Table 3). All samples will be collected in accordance with the Department's ["ICE"](#) protocol.

**TABLE 2. Macroinvertebrate Sample Sites**

Stream Name	Lat	Lon	Macros
Donegal Creek	40.061554	-76.529373	Winter
Chiques Creek	40.064383	-76.513604	Winter
Little Chiques Creek	40.064487	-76.515625	Winter
Chiques Creek	40.066263	-76.478406	Winter



Chiques Creek	40.075948	-76.470907	Winter
Little Chiques Creek	40.078481	-76.508544	Winter
Donegal Creek	40.080259	-76.533983	Winter
Chiques Creek	40.084953	-76.459818	Winter
Donegal Creek	40.086093	-76.53989	Winter
Little Chiques Creek	40.088733	-76.50539	Winter
Chiques Creek	40.108366	-76.443685	Winter
Little Chiques Creek	40.116622	-76.500107	Winter
Chiques Creek	40.116977	-76.424734	Winter
UNT to Donegal Creek	40.120035	-76.537775	Winter
Back Run	40.132669	-76.493125	Winter
Chiques Creek	40.141815	-76.408795	Winter
Rife Run	40.155987	-76.404483	Winter
Little Chiques Creek	40.158204	-76.502158	Winter
UNT to Chiques Creek	40.159554	-76.387005	Winter
Brubaker Run	40.161494	-76.50109	Winter
Little Chiques Creek	40.169473	-76.518472	Winter
Chiques Creek	40.186267	-76.388848	Winter
Little Chiques Creek	40.200985	-76.508494	Winter
Shearers Creek	40.211452	-76.426867	Winter
Little Chiques Creek	40.219852	-76.465133	Winter

## **Continuous Instream Monitoring (CIM)**

Continuous Instream Monitoring sites will be selected based on suitable habitat, stable flow regime, and site security. Three of the long-term chemistry sites will be chosen for deployment of sondes, most likely one site in the Little Chiques basin and two in the Chiques Creek basin, as equipment and staff permit. Continuous field measurements of dissolved oxygen (mg/L), oxygen saturation (%), temperature (°C), specific conductance ( $\mu\text{S}/\text{cm}^\circ$ ), turbidity, and pH will be measured using YSI 6-Series Sondes or Eureka Manta2 Sondes. Instruments will be calibrated prior to sampling using analytical standards as detailed in the Department's [Continuous Instream Monitoring Protocol](#). In addition to continuous field measurements, discrete field measurements will be routinely collected along with water chems in an effort to document loading logistics at each site.

## **Algal Sampling**

### *Algal Biomass and Cellular Nutrients*

Nutrient and algal sampling will be conducted at tributary location during early spring before leaf-out to characterize nutrient loading if nutrients are causing an impairment.

Epilithic periphyton sampling is conducted using the Department's [Periphyton Protocol](#)

## **Flow**

Manual flow measurements, if CIM site location is not near a USGS gaging station, will be collected during each continuous instream monitoring field visit, each discrete transect characterization, and during the collection of each lab chemistry grab and algal sample.

## **Fish**

At least one semi-quantitative sample will be collected July 1 – September 15, 2015 at proposed CIM locations.

**TABLE 2 : Standard Analysis Codes**

		Standard Analysis Code								
Parameter	Method	036	046	047	166	907	908	909	910	Stormwater
Specific Conductivity at 25.0 °C	0095		X							
Biochemical Oxygen Demand, Inhibited 5-Day	00314		X							
pH	00403	X	X			X	X	X	X	X
Alkalinity, Total as CaCO <sub>3</sub> (Titrimetric)	00410	X	X	X		X	X	X	X	X
Hardness, Total (Calculated)	00900		X				X	X		X
Acidity, Total hot as CaCO <sub>3</sub> (Titrimetric)	70508							X	X	
Biochemical Oxygen Demand 5 Day	00310					X				
Residue, Dissolved at 180° C	70300U		X		X	X				
Total Suspended Solids	00530		X			X				
Nitrogen, T	00600A			X						
Ammonia, Total as Nitrogen	00610A		X			X			X	X
Nitrite Nitrogen, Total	00615A					X				X
Nitrate as Nitrogen	00620A	X				X			X	X
Nitrite + Nitrate, Total	00630A		X		X					
Phosphorus, Total as P	00665A	X	X	X		X			X	X

		Standard Analysis Code								
Parameter	Method	036	046	047	166	907	908	909	910	Stormwater
Phosphorus, Dissolved as P	00666A									X
Phosphorus, Ortho Dissolved	00671A									X
Phosphorus, Total, Orthophosphate as P	70507A									X
Carbon, Total Organic	00680	X								
Calcium, Total by Trace Elements	00916A		X				X		X	
Sodium, Total by Trace Elements	00929A		X							
Magnesium, Total by Trace Elements	00927A		X				X		X	
Arsenic, Total by Trace Elements	01002H		X		X					
Barium, Total by Trace Elements	01007A		X							
Boron, Total	01022K		X							
Cadmium, Total by Trace Elements	01027H						X			X
Copper, Total by Trace Elements	01042A						X			X
Lead, Total by Trace Elements	01051H						X			X
Nickel, Total by Trace Elements	01067H						X			
Strontium, Total by Trace Elements	01082A		X		X					
Zinc, Total by Trace Elements	01092H		X				X	X		X

		<b>Standard Analysis Code</b>								
<b>Parameter</b>	<b>Method</b>	<b>036</b>	<b>046</b>	<b>047</b>	<b>166</b>	<b>907</b>	<b>908</b>	<b>909</b>	<b>910</b>	<b>Stormwater</b>
Aluminum, Total by Trace Elements	01105H		X				X		X	X
Aluminum, Dissolved 0.1 micron filter	01106D								X	
Selenium, Total by Trace Elements	01147H		X							
Sulfate by Ion Chromatography	00945	X	X		X				X	
Iron, Total by Trace Elements	01045A	X	X		X			X	X	X
Manganese, Total by Trace Elements	01055A		X		X			X	X	
Chloride by Ion Chromatography	00940	X	X		X				X	
Chromium, Total by Trace Elements	01034A									X
Mercury, Dissolved	718901									X
Fluoride by Ion Chromatography	00951				X					
Bromide by Ion Chromatography	99020		X		X					
Osmotic Pressure	82550		X		X					
Color	00080				X					

<b>Required Bottles</b>	
	<b>Number of Bottles</b>
<b>Fixative</b>	

