City of Lancaster NPDES Permit No.: PAG133577
Pollutant Reduction Plan
2025 Amendment

Introduction

This Pollutant Reduction Plan (PRP) Amendment includes the addition of the Little Conestoga Creek Blue/Green Corridor (LCCBGC) Floodplain Restoration Projects as another proposed BMPs that the City of Lancaster may utilize to satisfy the City of Lancaster's MS4 pollutant reduction requirements.

As was discussed with representatives from DEP's Southcentral Regional Office (SCRO) MS4 program on March 21, 2024, this PRP Amendment provides:

- Information on the City of Lancaster's Current PRP Best Management Practice (BMP) Implementation Status
- Information on the LCCBGC Floodplain Restoration Projects, including general project information; load reduction calculations; post-construction Operations and Maintenance (O&M) responsibilities; mapping.

As discussed with DEP, the City of Lancaster will publish this draft PRP Amendment on the City of Lancaster's website (engage.cityoflancasterpa.gov) for a 30-day public comment period. A copy of the comments and records of consideration shall be included in the Public Participation section below.

Public Participation

The PRP Amendment was available for public review and comment on the City of Lancaster's website from 3/24/2025 to 4/24/2025. The following public comments were received:

CITY OF LANCASTER'S PRP BMP Implementation Status

The City of Lancaster has met the obligations of its PRP. The City's TSS Pollutant Load Reduction Requirement was 140,151 lbs./yr. The Pollutant Load Reductions Achieved (Credit) is 141,373 lbs./yr. The following BMPs were installed, as noted in the October 13, 2023 report sent to Mr. Jacob S. Rakowsky:

- BMP No. 1. Wet Ponds and Wetlands. Installed 07/11/2023 Annual Sediment Load Reduction (lbs./year) 12,137. Lat 40.065 Long -76.333
- BMP N. 2. Street Sweeping - AST - 1P 2W (~25 passes/yr). Installed 06/30/2023. Annual Sediment Load Reduction (lbs./year) 59,038. Lat 40.038 Long -76.264

- BMP No. 3 Bioretention - Raingarden (C/D soils w/ underdrain). Installed 05/31/2018. Annual Sediment Load Reduction (lbs./year) 17,394. Lat 40.035 Long -76.264
- BMP No. 4. Permeable Pavement w/o Sand or Veg (C/D soils w/underdrain). Installed 05/31/2018. Annual Sediment Load Reduction (lbs./year) 36,027. Lat 40.035 Long -76.264
- BMP NO. 5 Bioswale. Installed 05/31/2018. Annual Sediment Load Reduction (lbs./year) 16,777 Lat 40.035 Long -76.264

Proposed BMP – Little Conestoga Creek Blue/Green Corridor Floodplain Restoration Project

Project Overview

The Little Conestoga Creek Foundation has begun the LCCBGC Floodplain Restoration Project along the Little Conestoga Creek in Lancaster County, Pennsylvania. As shown in Attachment 1, the various restoration sites of the LCCBGC project are all located within the Millers Run – Little Conestoga Creek HUC12 Subwatershed and fall within the borders of Manheim Township, East Hempfield Township, City of Lancaster and Lancaster Township.

The vision for the Blue/Green Corridor is to establish a series of floodplain restoration projects in combination with a pedestrian trail, linking recreation with restoration projects. The floodplain restorations along this reach will remove legacy sediment impairments, promote the reduction of fine-grained sediment in the waterway and restore riparian wetlands. The floodplain restoration at the Barrcrest Apartments has been completed and the remaining projects are anticipated to be designed and implemented in phases over the next 1-3 years.

The purpose of this the floodplain restoration component of the project is to remove legacy sediment, restore impaired historic wetlands along the stream corridor and enhance natural aquatic resources within the floodplain. The restored wetlands and enhanced aquatic resources functions will replicate natural conditions and processes to the maximum extent possible given modern constraints (infrastructure, property limitations, sediment regime, etc.). Removing the legacy sediment also will eliminate a substantial sediment and nutrient source from within the Little Conestoga Creek Watershed by preventing bank erosion. Restored floodplain and wetland functions within the floodplain will include removing and processing sediment and nutrients transported from the upstream watershed. In addition, reconnecting the floodplain areas with both surface water and groundwater will restore natural biogeochemical processes that improve water quality from hyporheic exchanges. The restored natural aquatic resources also will provide important secondary benefits of aquatic habitat restoration, including critical wetland and stream habitats that support indigenous flora and fauna. Overall, the project will provide significant systemic ecological uplift by restoring natural aquatic resources and the processes they provide. This project will provide

significant sediment and nutrient load reductions within the Little Conestoga Creek watershed.

Load Reduction Calculations and Crediting

Site specific load reduction calculations for the LCCBGC Floodplain Restoration Project sites were developed using Protocols 1,2, and 3, as established in the Expert Panel Report and as detailed in the FPR Load Reduction Summary (see Attachment 2). A summary of the reductions per site is shown in Table 1 below.

Table 1. Reductions per Restoration Site

Restoration Site	Site Location	Construction Status	Sediment Reductions (Lbs.)[a]
Shreiner Station	Manheim Township, East Hempfield Township	Pending	420,787[b]
Woodcrest Villa	Manheim Township, East Hempfield Township, City of Lancaster	Pending	774,463[b]
Mennonite Home	Manheim Township, East Hempfield Township	Pending	534,247[b]
Franklin & Marshall	Manheim Township, East Hempfield Township, Lancaster Township	Pending	489,706[b]
Barrcrest Apartments	East Hempfield Township	Constructed	831,925[c]
Conestoga House	Lancaster Township	Pending	961,205[b]
		Project Total:	4,012,334

[a] See Attachment 2 for calculation details, including corresponding nutrient reductions
[b] Reduction calculation per design plans
[c] Reduction calculation per as-built data

As specified within the executed Memorandum of Understanding (MOU) between the Little Conestoga Creek Foundation (Foundation) and East Hempfield Township, Lancaster Township, Manheim Township, and the City of Lancaster, annual pollutant reductions have been realized through the completion of the Barrcrest Floodplain Restoration Project within East Hempfield Township within the Millers Run – Little Conestoga Creek HUC12 Subwatershed. In accordance with the MOU, each municipality is entitled to share in, transfer, or allocate 25,000 lbs. of sediment reduction credit. Therefore, the City of

Lancaster plans to incorporate these 25,000 lbs. of sediment reduction into the City of Lancaster's current PRP to offset future load reduction requirements.

In addition to the initial 25,000 lbs. of sediment reduction, there is currently a total remaining balance of 731,925 lbs. of sediment reductions from the Barrcrest floodplain restoration site that may be available for distribution among the municipalities within the MOU pending a resolution between the Foundation and the municipalities regarding an agreement of sharing for the pollutant reduction credits. As part of the agreement, reduction allocations per municipality will be documented to ensure that a maximum of 731,925 lbs. is distributed between parties and that there is no double-counting of credits for this project.

As construction is completed on the other restoration sites, similar agreements will be developed to provide the opportunity for allocation of additional sediment reduction credits to be used to satisfy the City of Lancaster's MS4 requirements. The final quantity of sediment reduction credits available for allocation from these other restoration sites will be based on as-built data.

As credits are available and agreements are finalized, the City of Lancaster will provide documentation of these allocated load reduction credits as part of the MS4 Annual Report.

Post construction Operations & Maintenance (O&M)

Post construction Operations & Maintenance (O&M) Plans have been developed for each LCCBGC restoration site as part of the permit documentation. Generally, inspections will occur semiannually. General O&M activities for these sites include:

- Maintenance of desirable vegetation and control of weeds and invasive plants;
- Repair of eroded and damaged areas and replanting the damaged area with appropriate plant material;
- Removal of debris hindering the function of the system;

As part of the agreement between the Foundation and the City of Lancaster, the Foundation will be responsible for the O&M activities as specified within the O&M Plans and in accordance with permit requirements for the individual sites. The Foundation will work with a qualified third-party to complete the O&M activities to maintain functionality of these restoration areas.

Conclusion/Recommendations

This PRP Amendment identifies sediment reduction credit opportunities for City of Lancaster with the incorporation of the LCCBGC Floodplain Restoration Project that was not included in the City of Lancaster's original PRP. At the time of this PRP Amendment, a minimum of 25,000 lbs. of additional sediment reduction credits will be added to the City of Lancaster's total load reductions achieved to date. Additional pollutant load reduction credits may also be added to the PRP once allocated to the City of Lancaster, as outlined above.

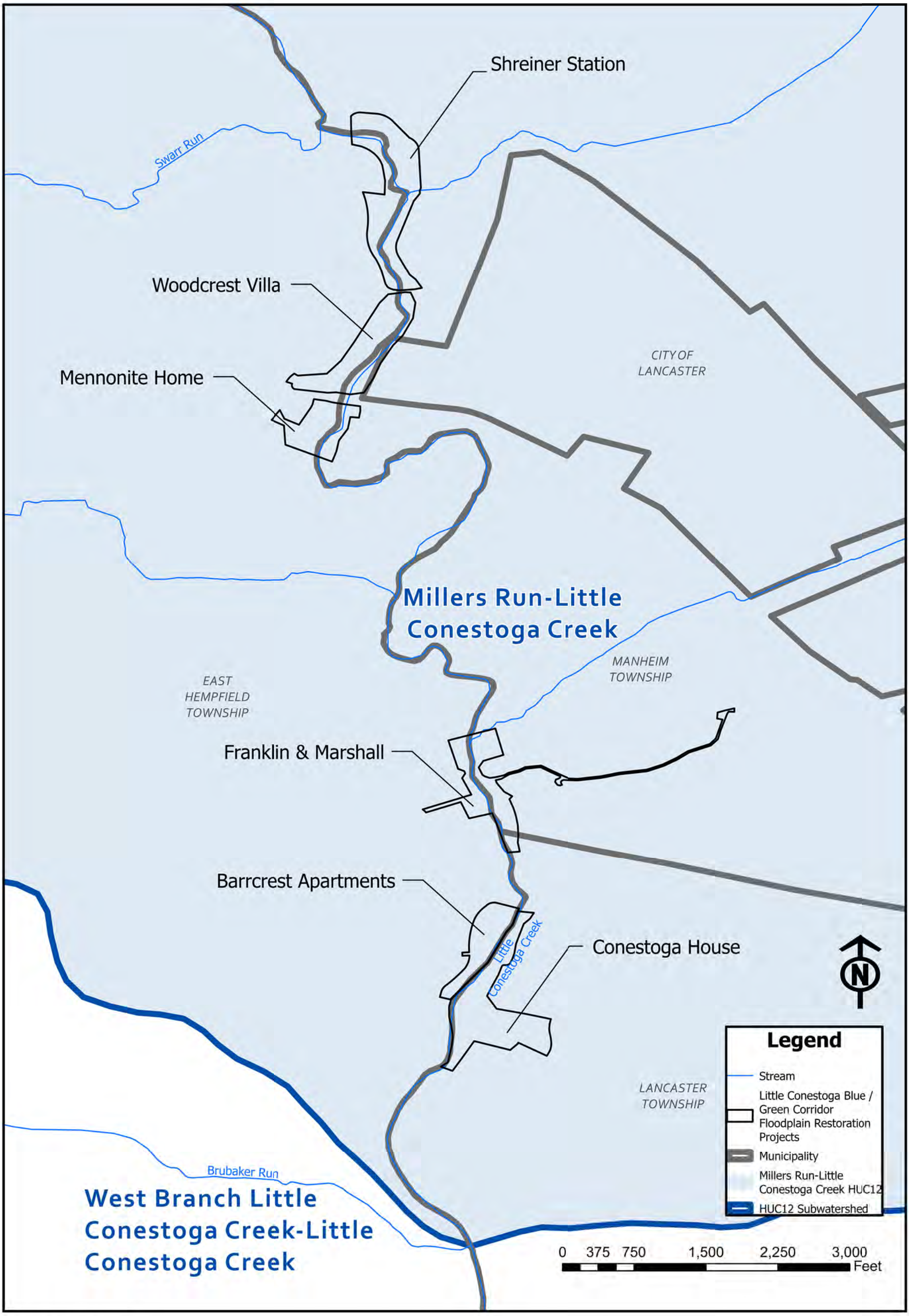
Documentation of MS4 credits obtained as part of the LCCBGC Project will be included as part of City of Lancaster's MS4 Annual Report Documentation.

ATTACHMENTS:

1. Map

2. FPR Load Reduction Summary*

* Full LCCBGC Floodplain Restoration Load Reduction Summary Report available for review at 120 N Duke St, Lancaster, PA 17602, upon request. Please contact Angela Brackbill, Water Resources Engineer, at abrackbill@cityoflancasterpa.gov or (717)239-9296 with any questions.



Attachment 1:
Little Conestoga Blue / Green Corridor Floodplain Restoration Projects within Millers Run - Little Conestoga Creek HUC12 Subwatershed

Little Conestoga Blue/Green Corridor Floodplain Restoration

Load Reduction Summary
LSI Project No. D-1245.5-21
September 14, 2023
Revised: July 15, 2024

Introduction

The Little Conestoga Creek Foundation has begun the Little Conestoga Creek Blue/Green Corridor project along the Little Conestoga Creek in Lancaster County, Pennsylvania. The vision for the Blue/Green Corridor is to establish a series of floodplain restoration projects in combination with a pedestrian trail, linking recreation with restoration projects. The trail will strategically connect a 3+-mile pedestrian corridor along the Little Conestoga Creek and interface into pedestrian trail networks that are presently disconnected. The floodplain restorations along this reach will remove legacy sediment impairments, promote the reduction of fine-grained sediment in the waterway and restore riparian wetlands. The floodplain restoration at the Barrcrest Apartments has been completed and the remaining projects are anticipated to be designed and implemented in phases over the next 1-3 years.

The purpose of the floodplain restoration component of the project is to remove legacy sediment, restore impaired historic wetlands along the stream corridor and enhance natural aquatic resources within the floodplain. The restored wetlands and enhanced aquatic functions will replicate natural conditions and processes to the maximum extent possible given modern constraints (infrastructure, property limitations, sediment regime, etc.). Removing the legacy sediment also will eliminate a substantial sediment and nutrient source from within the Little Conestoga Creek Watershed by preventing bank erosion. Restored floodplain and wetland functions within the floodplain will include removing and processing sediment and nutrients transported from the upstream watershed. In addition, reconnecting the floodplain areas with both surface water and groundwater will restore natural biogeochemical processes that improve water quality from hyporheic exchanges. The restored natural aquatic resources also will provide important secondary benefits of aquatic habitat restoration, including critical wetland and stream habitats that support indigenous flora and fauna. Overall, the project will provide significant systemic ecological uplift by restoring natural aquatic resources and the processes they provide.

This project will provide significant sediment and nutrient load reductions within the Little Conestoga Creek watershed. The resulting load reductions could contribute towards the targets in the approved Pollutant Reduction Plans (PRP) for the municipalities participating in the various project sites along the reach. Load reduction estimates presented in this summary and the attachments are based on the Protocols described in A Unified Guide for Crediting Stream and Floodplain Restoration Projects in the Chesapeake Bay Watershed (Wood, Schueler and Stack, 2021) (Expert Panel Report).

Project Status

The Blue/Green corridor consists of numerous properties in various stages of implementation. As of the date of this report, the project statuses and associated grading utilized in this pollutant reduction analysis are as follows:

- Shreiner Station: 50% design
- Woodcrest Villa: 75% design
- Mennonite Home: Final design completed, Chapter 105 permit obtained
- Franklin & Marshall: 75% design
- Barrcrest: Construction Completed 2023
- Conestoga House: Final design completed, Chapter 105 permit obtained
- Trib to Little Conestoga Creek: Final design completed, Chapter 105 permit obtained

Site Assessment and Monitoring

As part of the geomorphic site assessment completed prior to the floodplain restoration, bank erosion rates were estimated using the Bank Assessment for Non-point source Consequences of Sediment (BANCS) method, which utilizes a Bank Erodibility Hazard Index (BEHI) and Near Bank Stress (NBS) evaluation to approximate annual bank erosion based on regional curves developed from empirical data (Rosgen, 2009). Sets of bank pins were installed throughout the reach at locations that were chosen to represent the ranges of typical conditions found in the restoration area. Each project site received the following number of sets:

- Shreiner Station: 3 sets
- Woodcrest Villa: 3 sets
- Mennonite Home: 3 sets
- Franklin & Marshall: 1 set
- Barrcrest: 2 sets
- Conestoga House: 2 sets
- Trib to Little Conestoga Creek: 2 sets

Bulk density and soil nutrient samples were collected at each bank pin location and analyzed at an accredited lab to provide site specific data for use in the load reduction calculations. Initial BANCS assessments and estimates were conducted at the time of bank pin installation. These dates are as follows:

- Shreiner Station: October 6, 2020
- Woodcrest Villa: October 6, 2020
- Mennonite Home: October 6, 2020
- Franklin & Marshall: October 26, 2020

- Barrcrest: October 26, 2020
- Conestoga House: October 26, 2020
- Trib to Little Conestoga Creek: October 26, 2020

The Barrcrest site bank pins were measured again on September 14, 2022, to determine actual rates of erosion at these representative locations. See Protocol 1 section for further discussion. The remaining project sites will be measured and calibrated prior to construction.

Load Reduction Calculations

Load reduction calculations for the Little Conestoga Blue/Green Corridor floodplain restoration project sites were developed using Protocols 1, 2 and 3, as established in the Expert Panel Report. Protocol 1 estimates reduced sediment and nutrient loading from prevented bank erosion. Protocol 2 estimates nitrogen load reduction as a result of increased nitrogen processing in the hyporheic zone. Protocol 3 estimates the trapping of incoming sediment from the upstream watershed.

The load reduction calculations and results are presented as Attachment 1. The final reported load reductions are adjusted based on a site-specific delivery ratio to align with the baseline load calculation methodology used in the PRP. These delivery ratios are calculated by multiplying the “Stream to River” and “River to Bay” factors for Sediment, Nitrogen, and Phosphorus, respectively as provided by the Chesapeake Bay scenario viewer for the “Stream Bed and Bank” load source in the Land River Segment in which the project resides.

Protocol 1

Protocol 1 identifies the BANCS Assessment as an acceptable method to estimate bank erosion rates. A BANCS assessment was used to establish an initial estimate of the pre-restoration sediment loading resulting from bank erosion. Bank pin monitoring data will be used to calibrate the BANCS estimates to reduce potential variability and provide a more robust erosion rate estimate. Rivermorph software was used to evaluate the BANCS assessment data and develop a reach weighted loading (lb/ft/yr).

For the Barrcrest site, Rivermorph was also used to evaluate the bank pin profiles and calculate the actual erosion rate for use in calibration. The measured erosion rate for Barrcrest confirmed the original erosion rate estimates so no calibration adjustments were necessary.

Bank Pin profiles will be evaluated for the remaining sites prior to construction and calibration adjustments to the erosion rate estimates will be made if appropriate. The BANCS assessment results and bank profile data are provided in Attachment 2.

The final reach weighted average sediment loading is used in the Protocol 1 calculations provided in Attachment 1. Rivermorph uses a default bulk density of 96 lb/ cf so the sediment loading is adjusted based on the field sampled bulk density results. In addition, Protocol 1 suggests a 50% efficiency factor be applied to the final sediment reduction estimate as a factor of safety. Because two methods of bank erosion estimation are used, and because the restoration design applied to this site inherently removes all the eroding

bank material and creates a low shear stress condition, an efficiency factor of 75% is used in this case. This is consistent with the precedent set on other similar floodplain restoration projects in PA.

The soil nitrogen concentration and soil phosphorus concentrations from the lab analysis are multiplied by the final sediment load reduction value to estimate the nitrogen and phosphorus load reductions. Lab analysis results are provided in Attachment 3.

Protocol 2

Protocol 2 estimates nitrogen load reduction through nitrogen processing in the hyporheic zone. Based on the procedures provided in Expert Panel Report, this calculation is a function of floodplain and stream area, the connectedness of base flow and flood flows to groundwater, and the hydraulic conductivity of the substrate. The Little Conestoga Creek Blue/Green Corridor floodplain restoration project will restore connectivity between baseflow and groundwater as well as flood flows, and the anticipated substrate of will have good hydraulic conductivity to facilitate hyporheic exchange. Channel substrates were determined via field observation, as the proposed condition does not alter the existing channel. Anticipated floodplain substrates were determined via exploratory trenches excavated within the project footprints. See the table below for the anticipated substrates on each project site:

Table 1 - Protocol 2 Substrates

Project Site	Channel Substrate	Floodplain Substrate
Shreiner Station	Gravel, Sandy Gravel, Sand, or Peat	Gravel, Sandy Gravel, Sand, or Peat
Woodcrest Villa	Gravel, Sandy Gravel, Sand, or Peat	Gravel, Sandy Gravel, Sand, or Peat
Mennonite Home	Gravel, Sandy Gravel, Sand, or Peat	Gravel, Sandy Gravel, Sand, or Peat
Franklin & Marshall	Clayey Gravel, Sandy Silt or Sandy Clay Loam, Loam, Silt Loam, Silt	Sandy Clay, Clay Loam, Silty Clay Loam, Organic Clay with no coarse grain layer in connected to channel
Barrcrest Apartments	Clayey Gravel, Sandy Silt or Sandy Clay Loam, Loam, Silt Loam, Silt	Sandy Clay, Clay Loam, Silty Clay Loam, Organic Clay with no coarse grain layer in connected to channel
Conestoga House	Clayey Gravel, Sandy Silt or Sandy Clay Loam, Loam, Silt Loam, Silt	Sandy Clay, Clay Loam, Silty Clay Loam, Organic Clay with no coarse grain layer in connected to channel
Trib to Conestoga House	Silty Gravel, Silty Sand or Loamy Sand, Sandy Loam, and Organic Silt with no coarse grain layer connected to channel	Silty Gravel, Silty Sand or Loamy Sand, Sandy Loam, and Organic Silt with no coarse grain layer connected to channel

Protocol 2 assumptions and calculations are provided in Attachment 1.

Protocol 3

Protocol 3 estimates the trapping of incoming sediment from upstream in the watershed. The primary process driving this increased sediment trapping is the connection of the active floodplain to the stream channel, allowing frequent access of flood flows to a wide floodplain, reducing velocity, and encouraging the deposition of sediment rather than

transporting sediment load downstream. The Protocol 3 calculations estimate the percentage of annual stream flow that accesses the floodplain at a depth and velocity that are conducive to sediment deposition.

Representative flow data from a USGS gauge station with similar carbonate geology and urban land cover were used to develop a flow duration curve that was normalized based on watershed area. HEC-RAS two-dimensional models were used to evaluate flow break points for the pre- and post-restoration conditions including, flow rates at top of bank, one- and three-foot flow depth over floodplain, and two feet per second velocity. In addition, base flow is estimated based on harmonic stream flow using the USGS StreamStats web application.

Edge of stream loading rates were obtained from the 2019 Progress Scenario exported from CAST and multiplied by the upstream stream length obtained from ArcGIS to calculate incoming sediment loading to each reach. Because the multiple restoration sites are along the same reach, the sediment loading to each site must take into account the reductions provided by the proposed restorations occurring upstream. This accounting is included in the Protocol 3 calculations and summarized in the table below:

Table 2 - Little Conestoga Blue/Green Corridor Sediment Loading

Project Site	**Loading Rate** (lbs/mile)*	**Upstream Reach Length** (miles)**	**Sediment Loading** (lbs)***	**Total Reductions Provided Upstream** (lbs)	**Net Sediment Loading** (lbs)
Shreiner Station	417,081.74	60.14	25,081,463	N/A	25,081,463
Woodcrest Villa		63.83	26,623,323	951,133	25,672,190
Mennonite Home		64.57	26,932,817	2,903,274	24,029,543
Franklin & Marshall		73.23	30,543,101	4,324,223	26,218,878
Barrcrest Apartments		73.94	30,837,428	5,617,726	25,219,702
Conestoga House		74.15	30,928,270	7,730,201	23,198,069
Tributary @ Conestoga House		1.27	529,804	N/A	529,804

* From CAST unit loading for stream bed and banks
**From ArcGIS
***Loading rate times upstream reach length

The project qualifies as wetland restoration with regard to the pollutant removal rates applied to the treated flow, as the purpose of the project is to restore the floodplain to its historical condition, which would have included wetlands. Therefore removal rates for Wetland Restoration included in Table 14 of the Expert Panel Report have been assumed.

The data above was used to estimate the percentage of annual stream flow resulting in treatable flow within the identified sediment trapping zone of the existing and restored floodplain, the sediment and nutrient loading within that treatable flow, the removal efficiency of the restored floodplain and ultimately the estimated sediment and nutrient load reduction, as shown in Attachment 1.

Summary

Based on the data discussed above, and the attached load reduction calculations, the sediment and nutrient load reductions anticipated as a result of the Little Conestoga Blue/Green Corridor Floodplain Restorations are presented in the following table. The table provides "Edge of Stream" reductions representing the load reductions at the site, as well as "Delivered to Bay" estimated based on the sediment and nutrient delivery ratios, discussed above. There are no Chapter 102 or NPDES permits requiring water quality credits associated with this project, so all load reductions are applicable to meeting the PRP targets.

Little Conestoga Blue/Green Corridor Floodplain Restoration: Load Reduction Summary

Project Site		Total Nitrogen (lbs/yr)	Total Phosphorus (lbs/yr)	Total Suspended Sediment (lbs/yr)
Shreiner Station	Edge of Stream	2,162	384	1,185,316
	Delivered to Bay	1,220	173	420,787
Woodcrest Villa	Edge of Stream	3,035	694	2,181,586
	Delivered to Bay	1,711	313	774,463
Mennonite Home	Edge of Stream	1,842	448	1,504,920
	Delivered to Bay	1,039	202	534,247
Franklin & Marshall	Edge of Stream	1,457	409	1,379,453
	Delivered to Bay	822	185	489,706
Barrcrest Apartments	Edge of Stream	2,488	711	2,343,452
	Delivered to Bay	1,403	321	831,925
Conestoga House	Edge of Stream	2,438	682	2,588,812
	Delivered to Bay	1,375	308	919,028
Trib to Conestoga House	Edge of Stream	322	88	118,810
	Delivered to Bay	182	39	42,177
Project Total	Edge of Stream	13,744	3,416	11,302,349
	Delivered to Bay	7,752	1,540	4,012,334

Attachments

- Attachment 1 – Load Reduction Calculations
- Attachment 2 – Rivermorph BANCS Summary Report & Bank Heights Table
- Attachment 3 – Lab Analysis
- Attachment 4 – Restoration Drawings

LITTLE CONESTOGA - SHREINER STATION

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	445	119	234,183
Protocol 2	739	N/A	N/A
Protocol 3	979	265	951,133
Total	**2,162**	**384**	**1,185,316**
Adjusted Load Reduction Based on Delivery Ratio =	**1,220**	**173**	**420,787** lb/ yr

Sediment Delivery Ratio	0.355
Nitrogen Delivery Ratio	0.564
Phosphorus Delivery Ratio	0.451

LITTLE CONESTOGA - WOODCREST VILLA

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	528	156	229,445
Protocol 2	524	N/A	N/A
Protocol 3	1,982	539	1,952,141
Total	**3,035**	**694**	**2,181,586**

Adjusted Load Reduction Based on Delivery Ratio =	**1,711**	**313**	**774,463**	lb/ yr

Sediment Delivery Ratio	0.355
Nitrogen Delivery Ratio	0.564
Phosphorus Delivery Ratio	0.451

LITTLE CONESTOGA - MENNONITE HOME

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	227	65	83,971
Protocol 2	214	N/A	N/A
Protocol 3	1,402	383	1,420,949
Total	**1,842**	**448**	**1,504,920**
:ed Load Reduction Based on Delivery Ratio =	**1,039**	**202**	**534,247** lb/ yr

LITTLE CONESTOGA - FRANKLIN & MARSHALL

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	172	64	85,951
Protocol 2	26	N/A	N/A
Protocol 3	1,259	345	1,293,503
Total	**1,457**	**409**	**1,379,453**

Adjusted Load Reduction Based on Delivery Ratio =	**822**	**185**	**489,706**	lb/ yr

Sediment Delivery Ratio	0.355
Nitrogen Delivery Ratio	0.564
Phosphorus Delivery Ratio	0.451

LITTLE CONESTOGA - BARRCREST

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	416	156	230,976
Protocol 2	52	N/A	N/A
Protocol 3	2,020	555	2,112,476
Total	**2,488**	**711**	**2,343,452**

Adjusted Load Reduction Based on Delivery Ratio =	**1,403**	**321**	**831,925**	lb/ yr

Sediment Delivery Ratio	0.355
Nitrogen Delivery Ratio	0.564
Phosphorus Delivery Ratio	0.451

LITTLE CONESTOGA - CONESTOGA HOUSE

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	79	31	43,626
Protocol 2	4	N/A	N/A
Protocol 3	2,356	651	2,545,186
Total	**2,438**	**682**	**2,588,812**

Adjusted Load Reduction Based on Delivery Ratio =	**1,375**	**308**	**919,028**	lb/ yr

Sediment Delivery Ratio	0.355
Nitrogen Delivery Ratio	0.564
Phosphorus Delivery Ratio	0.451

LITTLE CONESTOGA - CONESTOGA HOUSE - TRIB

Load Reduction Summary **9/14/2023**

Load Reduction Method	Nitrogen (lb/yr)	Phosphorus (lb/yr)	Sediment (lb/yr)
Protocol 1	215	78	86,117
Protocol 2	73	N/A	N/A
Protocol 3	34	9	32,693
Total	**322**	**88**	**118,810**

Adjusted Load Reduction Based on Delivery Ratio =	**182**	**39**	**42,177**	lb/ yr

Sediment Delivery Ratio	0.355
Nitrogen Delivery Ratio	0.564
Phosphorus Delivery Ratio	0.451