



Lower Paxton Township Authority

Beaver Creek Corrective Action Plan Phase 2 – Proposed Long-Term Solution & Implementation Schedule (FOR APPROVAL)

2016-2017 Annual Progress Report – Supplemental
Submittal

June 2017



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1. Background

The Second Beaver Creek Drainage Basin Hydraulic Overload Corrective Action Plan (BC CAP) was developed by Lower Paxton Township Authority (LPTA) in September 2011, accepted by DEP, and signed by the court in September 2013. The purpose of this report is to demonstrate the completion of the Beaver Creek CAP Phase 2 tasks and document the proposed Long-Term Implementation Plan identified in Phase 3.

Phase 2 of the CAP addresses developing “long-term implementation goals to meet allocated inter-municipal flows and manage conveyance system surcharging. This phase will consist of a combination of flow metering and hydraulic modeling, which should be completed by 2014, depending on the occurrence of a sufficient number of metered wet weather events to provide adequate data for prioritization and model calibration and verification.”

The key requirements set forth in the 2015 Swatara Inter-municipal Agreement (IMA) as well as the Second Amendment to the Second Consent Decree are as follows:

Second Amendment

The Second Amendment to the Second Consent Decree was accepted and signed by the court in August 2013. This amendment modified the approach from a wastewater treatment facility to a mini-basin rehabilitation program in the Beaver Creek Drainage Basin in Lower Paxton Township. Section 5 – “Beaver Creek Basin Solution” (Paragraph b.) of the Second Amendment of the Second Consent Decree provides the following directives for the Beaver Creek program:

- Eliminate sanitary sewer overflows (SSOs) within 15-years (by 2028),
- Reduce the hydraulic overload within 20-years (by 2033).

2015 Swatara IMA & Storage Considerations

The 2015 IMA sets forth the reserved, allocated peak hourly flow (PHF) at the Swatara Wastewater Treatment Plant (WWTP) and the Joint Use Interceptor (JUI) for LPTA, Swatara Township Authority (STA), South Hanover Township, and the Borough of Hummelstown. LPTA must reduce their flows in order to accommodate future build-out projections and maintain the allocated peak wet weather flow rates:

- WWTP PHF Limit = 9.49 mgd,
- JUI PHF Limit = 7.40 mgd.

As stated under Section 3.04 – Redistribution of Reserved Capacity, Article (4) of the IMA:

“Where an entity or party acquires an interest in reserved capacity in the Swatara Plant or the Joint Use Interceptor, such entity or party must thereafter pay to Swatara the acquiring party’s proportional share of capital improvement costs, debt service payments and costs incident to ownership, including but not limited to, its share of all expenses, without limitation. Such acquiring party shall be bound by the terms of this Agreement, as it may from time to time be amended. Notwithstanding the above, it is acknowledged that the allocated peak flow capacities in the



Treatment Plant exceed those allocated in the Joint Use Interceptor, as presented in Exhibit "C". It is further acknowledged that recent modeling of the Joint Use Interceptor indicates that the carrying capacity of the Joint Use Interceptor is greater than the sum of the allocated capacities in Exhibit "C". It is agreed that further verification of the model will be done using metering data and field measurements satisfactory to Swatara to establish the safe carrying capacity of the JUI without the threat of backups (the discharge of sewage into buildings from the sewage collection/conveyance system via lateral connections due to surcharging) or overflows. Once the safe carrying capacity is determined by agreement of the parties, the safe carrying capacity of the Joint Use Interceptor will be allocated in proportion to the allocations presented in Exhibit "C", and Exhibit "C" revised to show these allocations, which shall not exceed any party's peak instantaneous flows allocation in the Treatment Plant, at which time the Agreement is amended."

The annual meeting between LPTA and STA was held on February 20, 2017, and the IMA flow limits were discussed. LPTA proposed that Swatara modify the IMA to have the JUI reserve PHF allocations match the WWTP reserve PHF allocations based on the results of the JUI model evaluation. Otherwise, additional efforts such as increased storage would be required by LPTA to meet the requirements. Rather than alter the IMA at this point in time, STA proposed that LPTA may be allowed to exceed the JUI limit of 7.40 mgd without enforcing IMA overage fines.

At the same meeting, GHD presented preliminary options for wet weather storage sizing and operations. STA indicated initial concerns with the impact of extended discharge rates from storage on the WWTP operations. Subsequent to the meeting, LPTA, GHD, STA, and ARRO continued to collaborate through several correspondences regarding the JUI capacity and the operational approach of using peak flow storage as a solution. The letters are included as Appendix A and are summarized as follows:

- May 15, 2017 letter from STA to LPTA – Preferences for the potential timing and sizing of the wet weather storage facility.
- May 24, 2017 response letter from LPTA to STA – Response to previous letter acknowledging consideration for future analysis and eventual operation of wet weather storage facility.
- May 9, 2017 letter from ARRO to LPTA – Outlined engineering related questions regarding the JUI model development and additional considerations for refining the model.
- May 25, 2017 response letter from GHD to ARRO – Response to previous letter providing additional details and supplemental JUI memo from 2013.
- June 16, 2017 response letter from ARRO to GHD – Continued conversation and considerations for JUI model application and improvements and desire to meet to refine model application.

GHD is in the process of compiling the hydraulic model and relevant documentation and will be scheduling a meeting with ARRO to review the JUI model results. STA and LPTA agreed to revisit the storage sizing and operations after evaluating Beaver Creek rehabilitation progress in five (5) years.



2. Phase 2 Task Completion

2.1 Phase 2 - Section 1: Interceptor Metering

2.1.1 CAP Requirements

“Installation of additional meters in the fall of 2011 at strategic locations on the Beaver Creek and Nyes Road Interceptors, and the Joint Use Interceptor as permitted and at locations recommended or reviewed by Swatara Township Authority. Flow data from these meters and existing meters in Beaver Creek will be used to capture verification data for a significant and an extreme wet weather event. These two events as well as typical dry weather flows will be used to assist with the development and verification of a hydraulic model of the interceptors.”

2.1.2 Submittal

Results from the metering studies were previously provided in LPTA's 2012-2013 Annual Progress Report, demonstrating the successful completion of Phase 2 – Section 1 requirements of the BC CAP.

2.1.3 Key Results

Flow meters were installed along the Beaver Creek, Nyes Road, and Joint Use Interceptors during the 2011-2012 and 2012-2013 metering seasons. Flow data from these meters, along with supplemental data from STA, successfully captured verification data for various WWEs which were used for hydraulic model validation.

2.2 Phase 2 - Section 2: Hydraulic Modeling

2.2.1 CAP Requirements

“Develop a hydraulic model of the Beaver Creek and Nyes Road Interceptors, as well as the Joint Use Interceptor, as permitted by Swatara Township Authority. These models will be calibrated and verified using the metering data collected above.

Once verified for existing conditions, the Beaver Creek Basin Sewer Model will be used to (1) verify and manage surcharging sewers, (2) identify capacity limitations, (3) comply with inter-municipal agreements.

The model will also be used along with cost analysis to compare various rehabilitation, storage and capacity improvement scenarios to determine the most effective long-term solutions for implementation. The model results and suggested long-term solutions will be submitted to the Department for approval along the annual report in June 2012, assuming the appropriate weather conditions are experienced to allow collection of necessary data. If sufficient data cannot be obtained, an extension of time to complete the modeling will be required.

All raw data will be made available to STA as soon as it becomes available, and data analysis and reporting upon completion.”



2.2.2 Submittals

Beaver Creek/Nyes Road Interceptor Models Development and Validation

The model development and validation process and results is attached as Appendix B – “Beaver Creek and Nyes Road Interceptor Models Report”, dated August 2014. This report was originally submitted as an appendix of the 2013-2014 Annual Progress Report. It is included to demonstrate the completion of developing and validating the Beaver Creek and Nyes Road Interceptor models.

Joint Use Interceptor Model Development and Validation

The model development and validation process and results is attached as Appendix C – “Joint Use Interceptor Capacity Analysis Report”, dated April 5, 2013. This report was originally submitted as an appendix of the 2012-2013 Annual Progress Report. It is included to demonstrate the completion of developing and validating the JUI Interceptor model.

Model Analysis of Long-Term Solutions

A model analysis of the various long-term solution options is attached as Appendix D – “2016-2017 Long-Term CAP Goals Evaluation Report”, dated June 2017. This report is included to demonstrate the completion of using the models to compare various rehabilitation, storage, and capacity improvement scenarios to determine the most effective long-term solutions for implementation.

Long-Term Evaluation – I/I Program Cost Analysis

A cost analysis memo comparing the various long-term solution options is attached as Appendix E – “Beaver Creek CAP: Phase 2 – Section 2 I/I Program Cost Analysis Report”, dated June 29, 2017. This memo is included to demonstrate the completion of the cost analysis of the various rehabilitation, storage, and capacity improvement scenarios to determine the most effective long-term solutions for implementation.

2.2.3 Key Results

Beaver Creek/Nyes Road Interceptor Model Validation

The Beaver Creek and Nyes Road Interceptor Models were built in the Bentley SewerGEMS modeling software using LPTA’s GIS database and associated record drawings. The models were validated using flow data collected from metering of the interceptor as well as mini-basins and sub-basins.

Joint Use Interceptor Model Validation

The Joint Use Interceptor Model was built in the Bentley SewerGEMS modeling software from the survey completed by D.L. Reiber Associates in May 2012 and validated using flow data in 2013. The model evaluated in-pipe and surcharge capacities. The model demonstrated the WWTP reserve PHF capacity (9.49 mgd) for Lower Paxton can be successfully conveyed through the Joint Use Interceptor with only marginal surcharging. This surcharging is well within the safe carrying capacity of the line.



Long-Term Evaluation of Beaver Creek/Nyes Road Interceptor Model

The validated Beaver Creek and Nyes Road Interceptor Models were used initially to assess various rehabilitation scopes and anticipated removal results. Out of these preliminary assessments, two (2) rehabilitation program options warranted further analysis and were fully evaluated to determine the most effective long-term solution to satisfy the requirements of the Second Consent Decree. These long-term solution options were developed for a selected design storm event based on the largest historical non-excused wet weather event (WWE):

- Option 1 – All Basins Rehabilitated
- Option 2 – Significant I/I Basin Rehabilitation

Option 1 included completing rehabilitation projects in all mini-basins that have a comparative peak flow higher than 1,000 gpd/EDU. Option 2 included completing cost-effective mini-basin rehabilitation projects that have significant I/I removal potential and mini-basins necessary to eliminate overflows and hydraulic overload in the LPTA system.

In both options, prioritization of the basin rehabilitation was based on eliminating overflows and removing the most significant excess I/I. Mini-basin projects were also grouped based on adjacent location and by sub-basin, where available, to maximize contract productivity, minimize local community disturbances, coordinate paving schedules, and better quantify overall effectiveness of rehabilitation.

Each program option was evaluated against the 2028 and 2033 requirements of the Second Consent Decree and both are projected to achieve a successful resolution to overflows and future hydraulic overload. As demonstrated in the model, similar conveyance upgrades are required for both options in order to eliminate overflows and alleviate future hydraulic overload conditions. The model also indicates that storage will be eventually needed in either option to comply with current and proposed IMA flow limits. The sizing of the storage is currently projected to be approximately 5 mg in Option 1 and 9 mg in Option 2.

Long-Term Evaluation – I/I Program Cost Analysis

A cost analysis was completed for the two (2) selected program options evaluated in the hydraulic model. The cost analysis included updated cost projections for the proposed mini-basin rehabilitation projects, conveyance improvements, and storage for each option. While both options are projected to eliminate overflows and alleviate future hydraulic overload conditions, the cost analysis results, included in Appendix D, indicate a potential savings of \$82.6 million by selecting Option 2. By reducing the number of ineffective basin rehabilitations and constructing a slightly larger storage facility earlier than originally scheduled would be both an effective and cost-conscious solution.



Suggested Long-Term Solution

LPTA provides the following suggested plan outline for DEP's approval:

2018 – 2023

- **Complete rehabilitation in Mini-Basins BC-2A/2B/2C and BC-7A/7B/7C/7D.**

2023 – 2028

- **Determine if Swatara Township Authority will amend the Joint Use Interceptor IMA allocated PHF limit to match the WWTP IMA allocated PHF limit of 9.49 mgd or acknowledge that fine provisions will not be enforced.**
- **Evaluate the progress of the program by 2024 in order to:**
 - **Re-evaluate future growth projections in the Beaver Creek Basin,**
 - **Verify Beaver Creek Sub-Basin flows following the additional capacity available from the completed rehabilitation projects to date,**
 - **Use the model and revised flows to confirm the extent of conveyance improvements needed to remove remaining overflow locations by 2028,**
 - **Use the model and revised flows to confirm the extent of additional conveyance improvements projected to address the future hydraulic overload by 2033,**
 - **Use the model and the revised flows to confirm the sizing requirements of the projected storage facilities required to meet the IMA flow limits.**
- **Complete rehabilitation in Mini-Basins BC-5B and BC-8C/8D to remove significant I/I contributions.**
- **Construct wet weather storage facility.**
- **Construct identified interceptor upgrades and force main upgrades.**

2028 - 2033

- **Construct any additional Beaver Creek Interceptor upgrades, if needed, to reduce the future hydraulic overload.**
- **Begin long-term rehabilitation program to address basin deterioration and excess I/I.**

While not anticipated to be strict program milestones for compliance, this outline provides the framework for the successful implementation of rehabilitation set forth in Phase 2 - Section 3 below.



2.3 Phase 2 - Section 3: Continued Mini-Basin Metering and Implementation Schedule

2.3.1 CAP Requirements

“More aggressive metering of unmetered mini-basins throughout the fall of 2012 – spring 2014 in order to prioritize the remaining mini-basins, where feasible, in Beaver Creek. (Note: Not all mini-basins will be able to be successfully metered due to access or hydraulic factors. Also, a mini-basin will not be included in the prioritization if it is determined to have a peak flow rate equal to or less than 1,000 gpd/EDU or does not contribute significant I/I.) The resulting mini-basin rehabilitation schedule and associated collection system improvements will be grouped into five-year periods for implementation and submitted to the Department for approval with the annual report in June 2014. Prioritization will be based on (1) elimination of overflows and (2) most significant excess I/I.”

2.3.2 Submittals

In addition to the previous metering results reported in their corresponding Annual Progress Reports, a compiled summary of the mini-basin prioritization results from the aggressive metering from 2012 – 2015 is attached as Appendix F – “Beaver Creek CAP: Phase 2 – Section 3 Metering Summary Report”, dated June 29, 2017. This report is included to demonstrate the completion of mini-basin metering assessment and basin rehabilitation prioritization.

2.3.3 Key Results

Metering Results

The remaining unmetered mini-basins were metered from Fall 2012 through Spring 2015. The metering program took slightly longer than projected due to a combination of lack of sufficient wet weather events and difficulties metering some of the challenging mini-basins. Mini-basin flows were ranked based on their contribution of significant I/I. The individual basin results are included in Appendix E, but summarized as follows:

- 9 – High priority mini-basins in which rehabilitation is already completed,
- 10 – High priority mini-basins that contribute a significant amount of I/I,
- 4 – Medium priority mini-basins that may contribute a significant amount of I/I,
- 18 – Low priority mini-basins that do not contribute significant I/I.

Rehabilitation Prioritization

A long-term implementation plan has been developed based on the results of the completed hydraulic modeling and flow metering efforts. The plan prioritizes the efforts based on the elimination of overflows and the most significant contributors of excess I/I. The primary goals of the proposed plan are designed to cost-effectively meet both the Second Consent Decree 2028 overflow elimination and 2033 hydraulic overload reduction deadlines as well as the proposed IMA flow limit requirements with STA.



LPTA provides the following proposed mini-basin rehabilitation and associated collection system implementation schedule for DEP's approval:

Table 2-1 Beaver Creek CAP – Proposed Implementation Schedule

Mini-Basin	2016 EDUs	Estimated Pre-Rehab Comp. Peak (gpd/EDU)	Estimated Comp. Peak Excess I/I (mgd)	Estimated ACP/VCP Mainline (LF)	Estimated "Other" Mainline (LF)	Proposed Completion Date
TENTATIVE PRIORITY FOR 2018 - 2023						
BC-2A	325	7,700	2.18	10,944	4,067	2023
BC-2B	145	7,700	0.97	8,748	647	2023
BC-2C	188	5,300	0.81	9,837	1,245	2023
BC-7A	108	6,700	0.62	11,621	537	2023
BC-7B	114	9,000	0.91	6,037	1,643	2023
BC-7C	92	5,000	0.37	6,089	673	2023
BC-7D	190	5,000	0.76	2,120	7,500	2023
TENTATIVE PRIORITY FOR 2023 - 2028						
BC-5B	170	5,200	0.71	6,430	10,218	2028
BC-8D	60	12,000	0.66	3,707	333	2028
BC-8C [Smithfield]	155	3,400	0.37	2,508	1,602	2028
Beaver Creek Force Main Upgrade						2028
Storage Facility						2028
Nyes Road Interceptor Upgrades (as needed)						2028
TENTATIVE PRIORITY FOR 2028 - 2033						
Beaver Creek Interceptor Upgrades (as needed)						2033

This proposed plan, if approved by DEP, would represent the program milestones for compliance as outlined in Phase 3 of the Beaver Creek CAP.

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