BUFFALO
SEWER AUTHORITY

SPDES Permit No. NY0028410

Long Term Control Plan Semi-Annual Status Report
Reporting Period: *January through June 2022*
Amended Administrative Order
CWA-02-2014-3033
(Amends CWA-02-2012-3024)

September 2022

Long Term Control Plan Semi-Annual Status Report

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ATTACHMENT:

1. INTRODUCTION

The Buffalo Sewer Authority (Authority) received approval of its Long Term Control Plan (LTCP) from the United States Environmental Protection Agency (USEPA) and New York State Department of Environmental Conservation (NYSDEC) on March 18, 2014. The Authority entered into an Amended Administrative Order on April 16, 2014 (herein after referred to as the AO), with the USEPA. This AO establishes a schedule for implementation of the Authority's LTCP, approved by the USEPA and NYSDEC.

The AO in part requires that the Authority submit written Semi-Annual Status Reports to the USEPA and NYSDEC by September 1st for current year January 1– June 30 reporting period, and March 1st for the previous calendar year July 1 – December 31 reporting period. The AO requires that the following be provided in each Semi-Annual Status Report:

- The project milestones, deadlines and other terms that the Authority is required to meet since the date of the last Semi-Annual Status Report, whether and to what extent the Authority has met those requirements, and the reason for any anticipated delays and/or noncompliance.
- A general description of the work completed during the reporting period and the applicability of the work to meet indicated design criteria, as well as the projection of work to be performed during the next reporting period and any anticipated delays for the upcoming work. Any changes in key personnel must also be noted.
- Enclosure of public meeting (if held) materials including: advertisements, handouts, formal meeting notes, and a summary of the meeting (see Attachment C).
- Copies (to USEPA only) of all monthly monitoring reports or other reports pertaining to combined sewer overflows (CSOs) and bypasses that Authority submitted to the NYSDEC during the reporting period. Please note DMRs are now submitted electronically directly to the USEPA and no dry weather overflows occurred during this period, so this item does not apply during this reporting period.

This report covers January through June 2022 which serves as Semi-Annual Report No. 17.

2. REQUIREMENTS DUE IN REPORTING PERIOD

Attachment A provides the current status of all projects listed in the Administrative Order. Issues with implementing these projects are detailed in Section 4 of this document.

This document serves as the September 1, 2022 semi-annual report.

The Certificate of Acceptance and Occupancy was issued during this reporting period for the Babcock Pumping Station RTC (a copy is included in Attachment D).

3. WORK COMPLETED IN CURRENT REPORTING PERIOD AND PROJECTION OF WORK TO BE PERFORMED NEXT REPORTING PERIOD

A general description of the work completed on LTCP projects during the current reporting period and the work projected to be performed during the next reporting period is provided in Attachment A. Items that have been completed have been highlighted orange.

A more detailed description of each project including the location and the goal to be achieved through each project is provided in Attachment B.

4. IMPLEMENTATION ISSUES

The ongoing COVID-19 pandemic has continued to impact Authority operations, as well as those of consultants and contractors working on LTCP projects. The Authority continues to experience decreased revenues due to the pandemic, and the Authority, consultants, and contractors have all experienced significantly reduced staff capacity at times during the reporting period. Additionally, as a reflection of nationwide employment trends, during this reporting period, the Buffalo Sewer Authority has experienced unprecedented turnover in staffing and consulting partners have expressed that similar issues, together with a significant decrease in the local labor pool for many engineering and other technical trades, has led to increases in periods of vacancies. Nevertheless, the Authority has been, and will continue to, work with internal staff and all necessary outside parties to facilitate the timely completion of LTCP projects.

4.1 Approval of Collection System Model- Model Update Report (2018)

Following the approval of the Recalibrated Hydraulic Model (10/6/2021), the Buffalo Sewer Authority has continued reevaluating the remaining projects in the Long Term Control Plan for physical and financial feasibility, schedule, environmental justice impacts, and effectiveness in achieving water quality objectives. In reevaluating these projects, potential alternative projects, many of which are proposed to utilize globalized Real Time Control logic whether for in-line storage, off-line storage, or some combination thereof are being considered.

As anticipated, the Authority is realizing greater reduction in combined sewer overflows due to the installed Real Time Control projects and is currently exploring globalized control logic to allow for even greater efficiency. In furtherance of this effort, the Authority is deploying sensors to better characterize flow dynamics system-wide. There are currently 58 sensors deployed in the collection system and the Authority is collaborating with the Erie County Division of Sewerage Management to create an expanded rain gauge network. Additionally, the Authority is working toward globally coordinated control to balance flows with underused portions of the system during wet weather events and is working to identify the next Real Time Control projects.

In reviewing data from these sensors, the issue of backflow especially during seiche events and the impacts of such events upon the Buffalo Sewer Authority's system including reduced capacity have gained prominence. In the case of several outfalls, controlling these events is expected to provide significant CSO activation reduction and as such this data is being further evaluated to determine feasible projects that both reduce CSO activations and create greater climate resilience.

As discussed during a May 27, 2022 meeting, Buffalo Sewer is expected to develop an array of projects which will achieve compliance and submit this array to the regulators by October 2022. The costs and the proposed implementation schedule will be provided by January 2023.

4.2 Amherst Quarry Off-line Storage

This project is being progressed in phases with the first phase being Real Time Control placement on Bailey Avenue at Minnesota Avenue and Bailey Avenue at East Amherst Street where flows are diverted from and returned to the Bailey Avenue Trunk Sewer, Notice to Proceed for this engineering work was issued on April 8, 2022.

.This project, in the interest of ensuring competitive bidding, is being combined with the Breckenridge at Niagara Street In-line Storage (4.6) and Gates Circle In-line Storage (4.7)..

The second phase of this project is expected to start Engineering by the beginning of the following period and consist of the station rehabilitation and logic improvements. A third phase is being contemplated under the system reevaluation referenced in Section 4.1 to divert flows from the SPP 337 sewershed to the Amherst Quarry.

4.3 Babcock Pumping Station In-line Storage

On September 21, 2021, the Babcock Pumping Station In-line Storage pumps were put into operation with localized Real-Time Control signifying Substantial Completion. A Certificate of Acceptance for this facility was issued on June 22, 2022 and a copy is included in Attachment D.

4.4 Smith Street and Eagle Street In-line Storage

On December 31, 2021, the Smith Street and Eagle Street In-line Storage project was put into operation with localized Real-Time Control signifying Substantial Completion. The site is in the process of being integrated into the facility's SCADA system, however no Certificate of Completion will be issued for at least another year as the Buffalo Sewer Authority has issued a change order to this contract to ensure critical long lead time spare parts are available for

both this station and the original Smith Street RTC. Due to supply chain issues, the lead time for these parts is currently over a year.

4.5 Broadway at Oak RTC

Engineering of the Broadway at Oak RTC was completed on October 20, 2021. Notice to Proceed for construction was issued on January 21, 2022. Work was originally anticipated to be completed by November 17, 2022, however material with low-level radioactive properties was encountered in the pavement subbase. The testing and remediation of this material resulted in several weeks of delays and together with other unknown and unexpected site conditions has resulted in a time extension into the Spring of 2023. Substantial Completion by March 18, 2024 is still anticipated. Please note that this project is in furtherance of the Hamburg Drain Optimizations as well as being an added RTC project.

4.6 Breckenridge at Niagara Street In-Line Storage

This project is proposed to replace the LTCP project "CSOs 010,008/010, 061, 004 Underflow Capacity Upsizing." CSOs 061 and 008 were determined by the Recalibrated Hydraulic Model to already have achieved activation levels in compliance with the goals of the Long-Term Control Plan. Site considerations for the proposed underflow sewer and the future potential for globalized control logic drove the decision making to pivot towards this option over the underflow sewer. Additional engineering for this project is ongoing with an Engineering Report expected to be available and submitted to the regulators in the next few weeks.

4.7 Gates Circle In-Line Storage

This project is an additional project that was not originally included in the Long-Term Control Plan which is proposed to modify SPP 322 to create a globalized control logic balancing of flows between the Scajaquada Tunnel and Bird Avenue Trunk. An engineering contract for this project was awarded on April 8, 2022 in combination with the Breckenridge at Niagara and the first phase of the Amherst Quarry project in the Fall of 2022.

4.8 Existing RTC Issues

In depth data analysis by Buffalo Sewer and our consultants has demonstrated that some meters currently being used to determine overflow volumes and volumes prevented from overflowing are mis-calibrated. The meter for determining flows from the Smith Street RTC back to the Southern Interceptor was over estimating flows being conveyed.

The Smith Street site went into failure mode due to a controller fault on July 23, 2021, repairs have been significantly delayed by purchasing and supply chain issues together with the ongoing pandemic. It is anticipated that the existing actuator at Smith Street will be repaired within the next period and replaced with a more reliable system.

Buffalo Sewer is replacing and changing the specifications for several components of the actuator/valve/controller system to ensure greater reliability and accuracy in reporting moving forward. Additionally, components at Smith Street RTC will be replaced, however we have been informed that there is currently a one-year lead time on these parts, and therefore we are anticipating a delay in achieving the desired reliability.

During the construction of the Smith at Eagle RTC contract, the issue of flooding within the Valley neighborhood and backflow over the Smith Street RTC were identified as issues that will be exacerbated by climate change and will harm the long-term effectiveness of the LTCP. A similar issue of the Hertel Avenue RTC experiencing backflow due to seiche events was also identified. With the Smith Street site, it was determined that a two-pronged approach is necessary, first small backflow valves would be installed in localized combined sewer overflow regulators to prevent basement flooding. But then, second, a larger scale control system will also be required for both Smith Street and Hertel Avenue to prevent backflow due to high river levels. These larger scale projects will be funded in part with NYSDEC WQIP funds which were originally allocated to the Hertel at Deer RTC and Smith at Eagle RTC to ensure that these two projects are functional long-term. An Engineering Report for the Hertel Avenue (Cornelius Creek) component of this project is attached as Attachment E to this report.

4.9 Hamburg Drain Optimizations

Construction of the Mill Race RTC has been delayed due to ongoing land acquisition; ancillary work within the right of way and to ensure the reliability of this and other LTCP projects despite rising Lake Erie levels is ongoing. The Mill Race RTC project together with the Broadway at Oak In-line Storage Project (See 4.5) substantially meet the goals of the Hamburg Drain Optimizations as outlined in the Long-Term Control Plan. Additional projects which may reduce the size, change the character or location, or eliminate the need for the Foundation 4- Hamburg Drain Storage Project are being considered as outlined in 4.1.

4.10 WWTP Improvement Project Alternative C2

This project is being phased in three parts. The first of these phases is the Secondary System Rehabilitation and Upgrade Project. This project is intended to restore capacity through the Secondary Treatment System resulting in an increase from the existing 320MGD capacity to the designed 360MGD. The design contract for this work was approved by the Board of the Buffalo Sewer Authority on September 25, 2019. Five (5) contracts for this project were put out to bid and recommended Contractors were awarded the projects at the June 23rd, 2021, Board Meeting. A consultant Engineering Firm was also selected to move forward for the oversite of construction for the Secondary System Rehabilitation and Upgrade Project. Notice to Proceed for this project has been delayed significantly due to funding compliance issues with contractors. Groundbreaking is anticipated for the end of September 2022.

In October 2020, Buffalo Sewer awarded a contract with an Engineering firm to provide design services for the second phase of this project, the Primary System NFA project. This phase includes rehabilitation of existing primary clarifier tanks, rehabilitation of sludge pumping, installation of a new HRD chlorine contact tank and new wet weather pumping

station. A copy of the Draft Engineering Report for this project was submitted to the New York State Department of Environmental Conservation (NYSDEC) on October 7, 2021. Pursuant to comments from NYSDEC, on May 31, 2022, a revised Draft Engineering Report was submitted. A meeting is currently being scheduled with Buffalo Sewer, the design engineer, and the regulators present to discuss the regulators' comments in regard to this report. Until the Engineering Report is approved, design for this project cannot be completed and bidding and commencement of construction will remain on hold.

Engineering design of the third and final phase, consists of further upgrades to the Secondary System to increase capacity to 400MGD as outlined in the Long-Term Control Plan. It is anticipated that the solicitation for design of the third phase will commence in the Spring of 2023 to facilitate construction of this third phase upon the completion of the first phase, however there are significant space limitations on-site that prohibit the concurrent construction of all three phases.

4.11 North Relief-Interceptor

Preliminary subsurface investigation in conjunction with the North Relief-Interceptor concept has revealed concerns with the location of bedrock and the feasibility of the proposed tunnel location. More cost efficient and physically feasible projects are being considered as part of the effort as outlined in Section 4.1.

As an initial phase of replacement, the Bird Avenue Underflow Sewer Project has been completed. Additionally, during investigations it was found that there was a significant blockage in a previously unmapped sewer which resulted in decreased overflows to the Black Rock Canal. Engineering analysis for additional phases is currently focused on the implementation of real time control technology, short circuit methodologies, upstream storm relief sewers, and other projects to reduce the size, scope, and cost of the North Relief-Interceptor. At this time the Engineering Completion date is not expected to be achieved by March 18, 2022, as outlined in the Long-Term Control Plan.

4.12 Jefferson Avenue & Florida Street (CSO 053) Satellite Storage

Progress continues on this project continues, at the May 4, 2022, Board Meeting, the Buffalo Sewer Authority took the unprecedented step of replacing the design engineer with the purpose of expediting this project and ensuring the expertise required on this complex project is being allocated.

5. CHANGES IN KEY PERSONNEL

On January 9, 2022, Ronald Brown, Chief Financial Officer for Buffalo Sewer passed away. On March 11, 2022, Taylor Brown, Junior Sanitary Engineer and Project Manager for Green Infrastructure and Collection System projects resigned. On April 22, 2022 Sarah Rennells, Junior Sanitary Engineer and Project Manager for Facility projects resigned. On June 13, 2022, Timothy Brown, Sr. was hired as Intergovernmental Coordinator to assist with public outreach and

coordination for LTCP and other major projects. On June 17, 2022, Casterland Fanfan, Junior Sanitary Engineer and Project Manager for Green Infrastructure and Collection System projects resigned. On June 28, 2022, Colleen Makar, GIS Specialist II and Project Manager for Green Infrastructure projects resigned.

6. PUBLIC MEETINGS

In March 2022, as part of the start of construction of the Broadway at Oak RTC, fencing signage was developed to communicate the impact of this project to the general public throughout construction a copy of the fencing imagery is included in Attachment C.

On March 7, 2022, Buffalo Sewer's General Manager, Oluwole A. McFoy, PE, Principal Sanitary Engineer, Rosaleen B. Nogle, PE, and Director of Sewer Maintenance, Joel Renzoni were invited to speak at the Valley Community Center regarding flooding and the Smith Street Real Time Control and Sewer Separation projects. News reports regarding this public meeting are available at:

https://www.wgrz.com/article/news/local/search-for-new-solutions-to-ongoing-flooding-issues-along-the-buffalo-river/71-7cb8bc2a-d254-4e1b-a669-b901f6156900
https://www.wkbw.com/news/local-news/valley-community-homeowners-call-city-of-buffalo-to-take-action-to-stop-flooding
https://www.wivb.com/news/local-news/buffalo/buffalo-communities-meet-to-discuss-flooding/

As this meeting was called by the Community Center and was a question and answer session, there were no prepared presentations associated with this meeting.

On March 8, 2022, Buffalo Sewer's Treatment Plant Administrator, Roberta L. Gaiek, PE and other staff and consultants presented on both the Secondary System and Primary System projects at the Greater Buffalo Environmental Conference sponsored by the New York Water Environment Association's Western Chapter. Copies of the slides from these presentations are included in Attachment C.

On March 24, 2022, at the American Public Works Association New York Annual Conference, Senior Engineer, Regina Harris, EIT, presented on the Smith at Eagle Real Time Control Structure. Slides from this presentation are included in Attachment C.

On April 21, 2022, Buffalo Sewer's Principal Sanitary Engineer, Rosaleen B. Nogle, PE was asked to present on the approach that Buffalo Sewer is taking to revising the Long-Term Control Plan in light of the updated Model and outcomes to date at the Water Environment Federation's Collection System Conference. Slides and the associated paper for this presentation are included in Attachment C.

7. MODEL MODIFICATIONS

On October 6, 2021, the United States Environmental Protection Agency (EPA) and New York State Department of Environmental Protection (NYSDEC) approved Buffalo Sewer's "Collection System Model- Model Update Report." The Buffalo Sewer Authority has since been utilizing the updated model to review the physical and financial feasibility and efficacy of projects remaining in the Long-Term Control Plan.

8. GREEN INFRASTRUCTURE

Buffalo Sewer remains committed to meeting the original conditions of the LTCP under the Amended Administrative Order to use Green infrastructure (GI) to the extent originally approved. At this time GI is not being proposed as a replacement for gray infrastructure, but rather in conformance with the approved LTCP.

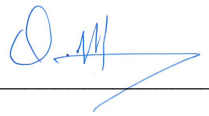
Niagara St. Phase 3 has been completed as of April 25, 2022. Notice to proceed has been issued on construction of Niagara St. phase 4A with anticipated completion in the Next Reporting Period. Notice to Proceed for Niagara Street phase 4B is tentatively scheduled for the First Reporting Period of 2023. Upon completion of Niagara phase 4 A, Buffalo Sewer will have achieved the 677 acres of control required under Phases Green 1 and Green 2 as outlined in the approved LTCP.

A private property green infrastructure grant program is being developed with official engineering and program management award issued on April 6, 2022.

Projects to be funded through the Environmental Impact Bond and the American Rescue Plan Act including a mix of bioretention within the right-of-way, permeable pavement, and offline stormwater green infrastructure storage projects within parks and other public spaces are being vetted and developed. In general, these projects are being targeted to provide multiple benefits to the community including increasing climate resiliency, eliminating lead service lines, and replacing aging sewer and water lines while also reducing flow and nutrient loading to the combined sewer system. Through these projects, Buffalo Sewer expects to make significant progress towards Green Phase 3. These projects will be developed in conformance with the New York State Stormwater Management Design Manual..

9. CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."



9/1/2022

Oluwole A. McFoy, P.E., General Manager Date

Attachment A to the Semi-Annual Status Report: September 2022

Work Completed in Current Period/ Projection of Work to be Performed in Next Reporting Period

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Phase I Projects				
CSO 060 GI Project	---	---	Prior to 1/1/2014	Complete.
Bird/Lang RTC Projects	Construction Start	3/17/2014	2/24/2014	Complete
	Completion Date	9/2/2014	5/9/2016	Complete
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete
Bird RTC Project	Construction Start	3/17/2014	2/24/2014	Complete
	Completion Date	9/2/2014	5/6/2016	Complete
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete
Lang RTC Project	Construction Start	3/17/2014	2/24/2014	Complete
	Completion Date	9/2/2014	5/9/2016	Complete
	Operations/ Optimization (RTC)	9/3/2014 – 9/3/15	10/1/2016	Complete
Foundation Projects				
Foundation 1 - Smith Street Storage	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	6/10/2015	Complete
	Notice to Proceed	3/18/2015		Complete
	Substantial Completion	3/18/2017	10/9/2017	Complete
CSO No. 026 Sewer Separation	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	4/3/2015	Complete
	Notice to Proceed	3/18/2015	7/8/2015	Complete
	Substantial Completion	3/18/2017	6/22/2016	Complete
CSO No. 026 RTC Structure	Engineering Start	3/18/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	6/10/2015	Complete
	Notice to Proceed	3/18/2015	7/13/2016	Complete
	Substantial Completion	3/18/2017	10/9/2017	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Foundation 2 - SPP Optimization (20 projects)	Engineering Start	3/1/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	4/20/2015	Complete
	Notice to Proceed	3/1/2014	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017		
SPP 180 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 331 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2015	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete
SPP 036 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	1/20/2014	Complete
	Notice to Proceed	---	5/30/2014	Complete
	Substantial Completion	3/18/2017	8/4/2014	Complete
SPP 217 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/3/2015	Complete
	Notice to Proceed	---	7/8/2015	Complete
	Substantial Completion	3/18/2017	12/21/2015	Complete
SPP 318 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/3/2015	Complete
	Notice to Proceed	---	7/8/2015	Complete
	Substantial Completion	3/18/2017	12/21/2015	Complete
SPP 097A Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 122 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 163 Optimization	Engineering Start	---	3/1/2014	Complete
	Engineering Completion	---	11/25/2014	Complete
	Notice to Proceed	---	3/1/2015	Complete
	Substantial Completion	3/18/2017	8/6/2015	Complete
SPP 165 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 165A Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/4/2014	Complete
	Notice to Proceed	---	7/25/2014	Complete
	Substantial Completion	3/18/2017	11/3/2014	Complete
SPP 178 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 335B Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 336A Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	4/20/2015	Complete
	Notice to Proceed	---	9/8/2015	Complete
	Substantial Completion	3/18/2017	12/16/2015	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 341A Optimization	Engineering Start	---	1/1/2014	Complete
	Engineering Completion	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Notice to Proceed	---		
	Substantial Completion	3/18/2017		
SPP 342B Optimization	Engineering Start:	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 001 Optimization	Engineering Start:	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	3/27/2014	Complete
	Notice to Proceed	---	6/16/2014	Complete
	Substantial Completion	3/18/2017	12/12/2014	Complete
SPP 183 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 283 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete
SPP 211 Optimization	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2017	Prior to 1/1/2014	Complete

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Foundation 3 - Remaining RTC (14 sites)	Engineering Start	3/18/2016	8/9/2016	Ongoing
	Notice to Proceed	3/18/2017		
	Engineering Completion	3/18/2023		
	Substantial Completion	3/18/2024		
Hertel Northwest (Hertel at Deer) In-Line Storage	Engineering Start	---	1/19/2018	Complete
	Engineering Completion	---	12/13/2018	Complete
	Notice to Proceed	---	2/9/2019	Complete
	Substantial Completion	3/18/2024	5/6/2020	Complete
Hertel South (Hertel at Deer) In-Line Storage	Engineering Start	---	1/19/2018	Complete
	Engineering Completion	---	12/13/2018	Complete
	Notice to Proceed	---	2/9/2019	Complete
	Substantial Completion	3/18/2024	5/6/2020	Complete
Hertel Northeast In-Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Bird East In-Line Storage (Final Bird location between proposed East & West locations)	Engineering Start	---	2/24/2014	Complete
	Engineering Completion	---	5/6/2016	Complete
	Notice to Proceed	---	5/6/2016	Complete
	Substantial Completion	3/18/2024	10/1/2016	Complete
East Ferry In-Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Colorado In-Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
North Bailey In-Line Storage	Engineering Start	---	12/8/2017	Complete
	Engineering Completion	---	6/5/2018	Complete
	Notice to Proceed	---	10/16/2018	Complete
	Substantial Completion	---	5/27/2020	Complete
South Bailey In-Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Roslyn In-Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Hazelwood (Kay) In-Line Storage	Engineering Start	---	8/9/2016	Complete
	Engineering Completion	---	9/22/2017	Complete
	Notice to Proceed	---	2/2/2018	Complete
	Substantial Completion	3/18/2024	6/19/2019	Complete
Amherst Quarry Off-Line Storage	Engineering Start	---	4/8/2022	Complete
	Engineering Completion	---		See 4.2
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Fillmore North In-Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		
Gibson CSO Line Storage	Engineering Start	---		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Montgomery (Smith at Eagle) CSO Line Storage	Engineering Start	---	4/4/2019	Complete
	Engineering Completion	---	2/27/2020	Complete
	Notice to Proceed	---	7/13/2020	Complete; See 4.4
	Substantial Completion	3/18/2024	12/31/2021	Complete
Babcock Pump Station In-Line Storage	Engineering Start	---	6/19/2019	Complete
	Engineering Completion	---	5/15/2020	Complete
	Notice to Proceed	---	7/24/2020	Complete
	Substantial Completion	3/18/2024	9/21/2021	Complete; See 4.3
Broadway at Oak In-Line Storage	Engineering Start	---	4/4/2019	Complete
	Engineering Completion	---	10/20/2021	Complete
	Notice to Proceed	---	1/21/2022	Complete; See 4.5
	Substantial Completion	3/18/2024		
Breckenridge at Niagara Street In-Line Storage	Engineering Start	---	6/15/2021	Complete; See 4.6
	Engineering Completion	---		
	Notice to Proceed	---		
	Substantial Completion	3/19/2024		
Gates Circle In-Line Storage	Engineering Start	---	4/8/2022	Complete
	Engineering Completion	---		See 4.2
	Notice to Proceed	---		
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Foundation 4 - Hamburg Drain Optimizations	Engineering Start	3/18/2015	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2017	2/23/2017	Complete
	Notice to Proceed	3/18/2016	5/16/2017	Complete
	Substantial Completion	3/18/2018		
Mill Race In-Line Storage	Engineering Start	---	4/4/2019	Complete
	Engineering Completion	---	11/22/2021	Complete
	Notice to Proceed	---	5/10/2022	Complete; See 4.9
	Substantial Completion	3/18/2032		
Foundation 4 - Hamburg Drain Storage	Engineering Start	3/18/2028		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	3/18/2030		
	Notice to Proceed	3/18/2030		
	Substantial Completion	3/18/2032		
WWTP				
WWTP Improvement Project Alternative C2	Engineering Start	3/18/2015	11/25/2019	See 4.10. As requested on Nov. 8, 2018, BSA submitted a written Request for Extension that reflects these amended dates. Completion dates are still under review.
	Engineering Completion	3/18/2019		
	Notice to Proceed	3/18/2017		
	Substantial Completion	3/18/2022		
Green Infrastructure Projects				
Green 1 - Pilot Projects – 267-acres of GI control SEE DETAILS FOLLOWING	Engineering Start	3/1/2014	Prior to 1/1/2014	Complete
	Engineering Completion	3/18/2016		Complete
	Substantial Completion	3/18/2018	12/31/2016	Complete.
2001-2016 Residential (traditional) Demolitions	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/31/2016	Complete.
2001 - 2016 Commercial and Industrial Demolitions	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/31/2016	Complete.

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Green 2 – 410 acres of GI Control	Engineering Start:	3/18/2019	Prior to 1/1/2014	Complete
	Engineering Completion:	3/18/2023		See 8.
	Substantial Completion:	3/18/2024		
2017 - 2024 Demolitions	Engineering Start		Prior to 1/1/2014	Complete.
	Engineering Completion:			
	Substantial Completion:	3/18/2018		
Green Demolition Pilot Project	Engineering Start		Prior to 1/1/2014	Complete
	Engineering Completion			Complete
	Substantial Completion		7/31/2017	Complete.
PUSH Blue Projects	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	7/1/2015	Complete.
Carlton Street Porous Asphalt	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	7/25/2014	Complete.
Fillmore Avenue Porous Parking and Green Lots	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	4/23/2015	Complete.
Ohio Street	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2018	12/1/2014	Complete.
Kenmore Avenue	Engineering Start	---	4/30/2014	Complete
	Engineering Completion		4/20/2015	Complete
	Substantial Completion	3/18/2018	3/1/2017	Complete.
Genesee Street	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	6/8/2015	Complete
	Substantial Completion	3/18/2018	6/1/2017	Complete.
Allen Street	Engineering Start	---	Prior to 1/1/2014	Green infrastructre will no longer be implemented as part of the Allen Street streetscape project due to site constraints.
	Engineering Completion	---		
	Substantial Completion	3/18/2018		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Willert Park	Engineering Start	---	6/1/2016	Complete
	Engineering Completion	---	2/1/2017	Complete
	Substantial Completion	3/18/2018	4/26/2019	Complete
Northland Ave	Engineering Start	---	7/1/2016	Complete
	Engineering Completion	---	3/1/2017	Complete
	Substantial Completion	3/18/2018	12/17/2019	Complete
612 Northland Ave	Engineering Start	---	1/1/2019	Complete
	Engineering Completion	---	6/1/2019	Complete
	Substantial Completion	---	12/1/2019	Complete
Niagara Street Phase 1: Elmwood Street to Virgina Street	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	3/19/2014	Complete
	Substantial Completion	3/18/2018	12/1/2016	Complete.
Niagara Street Phase 2: Virgina Street to Porter Avenue	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	6/3/2015	Complete
	Substantial Completion	3/18/2018	11/16/2017	Complete.
Niagara Street Phase 3: Hampshire Street to Scajaquada Expy	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---	3/21/2018	Complete
	Substantial Completion	3/18/2024		See 8.
Niagara Street Phase 4a: Scajaquada Expy to Hertel Ave	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---	6/13/2018	Complete
	Substantial Completion	3/18/2024		See 8.
Niagara Street Phase 4b: Hertel Ave to Ontario St	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---	6/13/2018	Complete
	Substantial Completion	3/18/2024		See 8.

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Niagara Street Phase 5: Porter Avenue to Hampshire Street	Engineering Start	---	10/28/2015	Complete
	Engineering Completion	---		
	Substantial Completion	3/18/2024		
Green 3 – 375 acres of GI Control	Engineering Start:	3/18/2023		See 8.
	Engineering Completion:	3/18/2028		
	Substantial Completion:	3/18/2029		
Green 4 – 263 acres of GI Control	Engineering Start:	3/18/2028		
	Engineering Completion:	3/18/2033		
	Substantial Completion:	3/18/2034		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
Gray Projects				
CSOs 014/15 – Erie Basin In-line storage and optimization projects	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	3/18/2014	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2015	12/29/2014	Complete
SPPs 206A&B	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	5/30/2014	Complete
	Substantial Completion	3/18/2015	12/29/2014	Complete
SPP 035	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	Prior to 1/1/2014	Complete
	Substantial Completion	3/18/2015	5/31/2014	Complete
SPP 036	Engineering Start	---	Prior to 1/1/2014	Complete
	Engineering Completion	---	Prior to 1/1/2014	Complete
	Notice to Proceed	---	5/30/2014	Complete
	Substantial Completion	3/18/2015	12/5/2014	Complete
CSO 013 – Satellite storage, conveyance, FM & PS	Engineering Start	1/1/2020	3/12/2020	See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	1/1/2021		
	Notice to Proceed	1/1/2021		
	Substantial Completion	1/1/2023		
North Relief – Interceptor	Engineering Start	3/18/2019	5/15/2015	Complete
	Engineering Completion	3/18/2022		See 4.11;
	Notice to Proceed	3/18/2022		
	Substantial Completion	3/18/2026		
CSOs 010, 008/010, 061, 004 – Underflow capacity upsizing	Engineering Start	3/18/2021	6/15/2021	Complete
	Engineering Completion	3/18/2023		This project is transitioning to an RTC project; See 4.6.
	Notice to Proceed	3/18/2023		
	Substantial Completion	3/18/2024		

Project Name	Project Milestone	AO Project Deadline	Actual Completion Dates	Project Status
SPP 337 (CSO 053) – Satellite storage, conveyance, FM & PS	Engineering Start	3/18/2023		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	3/18/2025		
	Notice to Proceed	3/18/2025		
	Substantial Completion	3/18/2027		
SPP 336A&B (CSO 053) – Satellite storage, conveyance, FM & PS	Engineering Start	3/18/2024		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion	3/18/2026		
	Notice to Proceed	3/18/2026		
	Substantial Completion	3/18/2029		
Jefferson Avenue & Florida Street (CSO 053) – Satellite storage, conveyance and FM	Engineering Start	3/18/2025	9/24/2021	Complete; See 4.12
	Engineering Completion	3/18/2027		
	Notice to Proceed	3/18/2027		
	Substantial Completion	3/18/2030		
CSO 055 – Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2027		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion:	3/18/2030		
	Notice to Proceed:	3/18/2030		
	Substantial Completion:	3/18/2034		
CSOs 028/044/047 - Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2028		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion:	3/18/2031		
	Notice to Proceed:	3/18/2031		
	Substantial Completion:	3/18/2034		
CSO 052 – Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2030		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion:	3/18/2032		
	Notice to Proceed:	3/18/2032		
	Substantial Completion:	3/18/2034		
CSO 064 – Satellite storage, conveyance, FM & PS	Engineering Start:	3/18/2030		See 4.1; this project is currently being reevaluated in light of the Approved Recalibrated Hydraulic Model Results.
	Engineering Completion:	3/18/2032		
	Notice to Proceed:	3/18/2032		
	Substantial Completion:	3/18/2034		

Attachment B to the Semi-Annual Status Report: September 2022

Detailed Project Descriptions

Project Name	Project Description	Project Purpose*
Phase I Projects		
CSO 060 GI Project	This project consisted of the construction of 4768 CF of rain garden on Windsor, Parkdale and Elmwood Avenues between Bird and Forest Avenues and 39,600 SF of permeable pavement on Clarendon and Claremont Avenues between Bird and Forest Avenues, installation of a Stormceptor unit at Bird Avenue and Granger Place and a total of 6,125 LF of 12-30 inch sewer designed to carry street flow to the existing storm overflow sewer on Forest Avenue from the above mentioned street segments. Additionally, weirs were raised in SPPs 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, and 240.	This project was designed to treat 13,600 cf of stormwater runoff from the 0.9 inch water quality storm event and remove 49.5 cfs of peak flow from the combined sewer system. Thereby reducing overflows through SPPs 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, and 241 to CSO 060. Together with other LTCP projects, this project is projected reduce CSO 060 discharges to Scajaquada Creek based on the 1993 Modified Typical Year (TY) to negligible activations and flow.
Bird/Lang RTC Projects	These RTC projects utilize available capacity of large sewers to provide flow control measures during wet weather events through the use of gates which allow continuous dry weather underflow.	
Bird RTC Project	The Bird RTC Project is located on Bird Avenue between Parkdale Avenue and Hoyt Street.	The Bird RTC project is designed to provide 1.01 MG of storage volume, thereby reducing discharges through SPP 013 to CSO 004. Together with other LTCP projects, this project is projected reduce CSO 004 discharges to the Black Rock Canal based on the TY to 3 activations.
Lang RTC Project	The Lang RTC Project is located on Lang Avenue between Courtland Avenue and Hagen Street.	The Lang RTC project is designed to have a storage volume of 0.84 MG, thereby reducing discharges through SPP 340 to CSO 053. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the 1993 Modified Typical Year (TY) to 4 activations.

Project Name	Project Description	Project Purpose*
Foundation Projects		
Foundation 1 - Smith Street Storage	Originally envisioned as a single project, these two projects have been separated to realize cost advantages due to the different levels of skill required for the projects and to expedite the sewer separation component.	
CSO No. 026 Sewer Separation	This project consisted of the installation of collection sewers for street receiver flows on Leddy Street, South Park Avenue, Owahn Place, Prenatt Street, Bolton Place, St. Stephen's Place, and Buffalo River Place, tributary to to SPP 88 and 90, in order to discharge these storm flows downstream of regulators, in conjuction with the optimization projects for SPP 217 and SPP 318.	Together with the Smith Street in-line storage project, the Smith Street partial sewer separation project is designed to divert storm flows directly to the Smith Street Drain thereby reducing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations or less.
CSO No. 026 RTC Structure	The second contract consists of an in-line storage project which is designed to detain wet weather flows along the western side of Smith Street using a weir structure between the I-190 and the I-190 off ramp within the Smith Street Drain for discharge to the South Interceptor thereby diverting combined sewer flows from CSO 026.	Together with the Smith Street partial sewer separation project, the Smith Street in-line storage project is designed to divert and detain the equivalent of a storage volume of 1.94 MG, thereby reducing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations or less.

Project Name	Project Description	Project Purpose*
Foundation 2 - SPP Optimization (20 projects)	Project consists of multiple smaller projects that will overlap in engineering and construction. SEE DETAILS FOLLOWING FOR SPECIFIC PROJECTS	In general, these projects will reduce discharges to the CSOs by detaining flows within the BSA's system through the modification of existing control structures.
SPP 180 Optimization	This project consisted of raising of the weir associated with SPP 180 by 2.0' along its entire length. SPP 180 is located on Delaware Avenue at the intersection with West Delavan. As part of the revised SPP 331 Optimization, this weir will be raised an additional 1.75' along its entire length.	The SPP 180 Optimization project was designed to increase the capacity of the CSS at SPP 180 thereby decreasing CSO 006 discharges. Together with other LTCP projects, this project is projected to reduce CSO 006 discharges to the Black Rock Canal based on the TY to 4 activations.
SPP 331 Optimization	SPP331 is located at the intersection of Elmwood Avenue and West Delavan Avenue. Preliminary plans were for the diversion of flows from this point through a new sewer to Bird Avenue along the centerline of Elmwood Avenue. This would have required major disruption of a very high traffic commercial area and was deemed impractical. Plans have been developed to instead divert the same flow that was to have been diverted through this project through a system of localized weir modifications rather than extensive pipe installation. These modifications include raising the weir at SPP 180 by 1.75' and the bench located in SPP 332 on the northeast quadrant of Gates Circle which currently directs dry weather flows into the interceptor will be removed and replaced with a 6.2' weir and restored sewer trough which will direct dry weather flows into the Bird Avenue trunk sewer.	The SPP 331 Optimization project is designed to increase the underflow capacity at SPP 331 thereby decreasing CSO 006 discharges. Together with other LTCP projects, this project is projected to reduce CSO 006 discharges to the Black Rock Canal based on the TY to 4 activations.
SPP 036 Optimization	This project consisted of the reconstruction of 35' of 30" sewer associated with SPP 036 to reverse the slope. It was located on Church Street between the off and on ramps of the Skyway (State Route 5).	The SPP 036 Optimization project was designed to increase the underflow capacity at SPP 036 thereby decreasing CSO 015 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
SPP 217 Optimization	In association with the Smith Street partial sewer separation project, this project consisted of the removal of two bottom orifice plates totaling 1.42' in height, increasing the orifice size and conveyance capacity of the Emslie Street Sewer. SPP 217 is located on Emslie Street at its intersection with Eagle Street.	The SPP 217 Optimization project is designed to increase the underflow capacity at SPP 217 thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.

Project Name	Project Description	Project Purpose*
SPP 318 Optimization	In association with the Smith Street partial sewer separation project, this project consisted of the removal of an orifice plate, increasing the orifice size and conveyance capacity of the Clinton Avenue Sewer. SPP 318 is located east of the intersection of Fillmore Avenue and Clinton Street.	The SPP 318 Optimization project is designed to increase the underflow capacity at SPP 318 thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
SPP 097A Optimization	This project consisted of abandoning an inactive combined sewer, converting another to a storm sewer and abandoning the underflow connection. SPP 097A is located at the intersection of the extension of Prenatt and Orlando Streets.	The SPP 097A Optimization project is designed to eliminate SPP 097A thereby decreasing CSO 026 discharges. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
SPP 122 Optimization	This project consisted of raising of the weir associated with SPP 122 by 0.5' along its entire length. SPP 122 is located on South Legion Drive just north of the intersection with Meriden Street.	The SPP 122 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 122 thereby decreasing CSO 037 discharges. Together with other LTCP projects, this project is projected to reduce CSO 037 discharges to the Buffalo River based on the TY to 6 activations.
SPP 163 Optimization	The SPP 163 Weir Optimization project consisted of replacing the existing weir with a new weir 0.75' higher. It is located to the East of the intersection of Fillmore Avenue and Northland on Northland Avenue.	The SPP 163 Optimization project is designed to increase the flow volume conveyed by the CSS at SPP 163 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 165 Optimization	This project consisted of raising of the weir associated with SPP 165 by 0.5' along its entire length. SPP 165 is located on Fillmore Avenue just north of the intersection with East Delavan Street.	The SPP 165 Optimization project was designed to increase the capacity of the CSS at SPP 165 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 165A Optimization	The weir associated with SPP 165A located at the intersections of Fillmore and Kensington Avenues.	The SPP 165A Optimization project was designed to increase the capacity of the CSS at SPP 165A by raising the weir by 0.75' and upsizing 675' of 15" pipe to 18” pipe to reduce CSOs in association with CSO 053. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 178 Optimization	This project consisted of raising of the weir associated with SPP 178 by 0.5' along its entire length. SPP 178 is located on Masten Avenue just north of the intersection with Northland Avenue.	The SPP 178 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 178 thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
SPP 335B Optimization	This project consisted of raising of the weir associated with SPP 335B by 1.0' along its entire length. SPP 335B is located on Hager Street just south of the intersection with Florida Street.	The SPP 335B Optimization project was designed to increase the flow volume conveyed by CSS at SPP 335B thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 336A Optimization	This project has been constructed in association with the SPP 331 optimization. The project consist sof removing a sluice gate and orifice plate and modifying the existing structure by changing the existing side channel opening from 24" to 30". SPP 336A is located on Humboldt Parkway North of the Scajaquada Drain.	The SPP 336A Optimization project is designed to increase the underflow capacity of the CSS at SPP 336A thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 341A Optimization	SPP 341A is located on Genesee Street east of Kerns Avenue. This project is on hold pending the results of post-construction monitoring of Lang and Hazelwood RTCs.	The SPP 341A Optimization project would increase the flow volume conveyed by the CSS at SPP 341A thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations. Field conditions may require modification to this planned optimization.
SPP 342B Optimization	This project consisted of raising of the weir associated with SPP 342B by 1.0' along its entire length. SPP 342B is located on Sprenger Avenue adjacent to Schiller Park.	The SPP 342B Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 342B thereby decreasing CSO 053 discharges. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 001 Optimization	The weir associated with SPP 001 located at the discharge of Cornelius Creek into the Niagara River and tributary to CSO 055 has been raised 1.0' to reduce CSOs.	The SPP 001 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 001 thereby decreasing CSO 055 discharges. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
SPP 183 Optimization	This project consisted of raising of the weir associated with SPP 183 by 2.0' along its entire length. SPP 183 is located at the intersection of Bradley Avenue and Dewitt Street.	The SPP 183 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 183 thereby decreasing CSO 059 discharges. Together with other LTCP projects, this project is projected to reduce CSO 059 discharges to Scajaquada Creek based on the TY to 0 activations.

Project Name	Project Description	Project Purpose*
SPP 283 Optimization	SPP 283 is located in the median between the I-190 South ramp to Porter Avenue and a service road near the West Side Rowing Club. This project consisted of removing an orifice plate which restricted flows from entering the Swan Trunk and the installation of a new 1.0' tall weir to restrict flows from discharging through CSO 063.	The SPP 283 Optimization project was designed to increase the underflow capacity of the CSS at SPP 283 thereby decreasing CSO 063 discharges. Together with other LTCP projects, this project is projected to reduce CSO 063 discharges to the Niagara River based on the TY to 4 activations.
SPP 211 Optimization	This project consisted of constructing a weir to an elevation above the overflow raised pipe invert at SPP 211. SPP 211 is located at the South East corner of the intersection of Clinton and South Ogden Streets.	The SPP 211 Optimization project was designed to increase the flow volume conveyed by the CSS at SPP 211 thereby decreasing CSO 066 discharges. Together with other LTCP projects, this project is projected to reduce CSO 066 discharges to the Buffalo River based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Foundation 3 - Remaining RTC (14 sites)	These RTC projects propose to utilize available capacity in the CSS to provide flow control measures during wet weather events through the use of active controls.	In general, these projects are designed to reduce discharges to the CSOs through the detention of flows within the BSA's CSS system.
Hertel Northwest (Hertel at Deer) In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is within the northern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Hertel South (Hertel at Deer) In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is within the southern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Hertel Northeast In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project will be located within the northern portion of the two large combined sewers which are located under Hertel Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 055 discharges to the Niagara River based on the TY to 9 activations.
Bird East In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project will be located to the east of the above mentioned Bird RTC project along the same Bird Avenue sewer.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 004 discharges to the Black Rock Canal based on the TY to 3 activations.
East Ferry In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along the Ferry Street sewer upstream of its leaping weir overflow to the Scajaquada Drain north of Florida Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Colorado In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along the Colorado Avenue sewer which runs underneath the manufacturing facility located at 1001 East Delavan Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
North Bailey In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along Bailey Avenue north of Scajaquada Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
South Bailey In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is along Bailey Avenue north of Scajaquada Street and south of the afore mentioned North Bailey In-Line Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Roslyn In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is near Roslyn Street on Lang Avenue.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Hazelwood (Kay) In-Line Storage	This RTC project, now known as Hazelwood, is proposed to utilize available capacity in the CSS capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Hazelwood Avenue between East Delavan and Easton Avenues.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.

Project Name	Project Description	Project Purpose*
Amherst Quarry Off-Line Storage	This RTC project proposes to utilize available capacity within the active Amherst Quarry to provide flow control measures during wet weather events, once downstream capacity is available, flows will then be pumped back into the system. The Amherst Quarry is located in an area bounded by Parkridge Avenue, East Amherst Street, and Hewitt Avenue.	This RTC project is proposed to utilize available capacity of the quarry to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 053 discharges to Scajaquada Creek based on the TY to 4 activations.
Fillmore North In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. This project is proposed to be located on Fillmore Avenue, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
Gibson CSO Line Storage	This project is proposed to utilize the available capacity of the CSO pipe downstream of the SPP, but before the discharge point or outfall. It would be designed to convey water to prevent surface flooding and overflows through upstream SPPs. Once the storm event has subsided, it would be designed to dewater back into the combined system. The dewatering rate would be controlled so that it would not cause overflows downstream from the control structure. The proposed project location is on Gibson Street, however pending the results of post-construction monitoring, it may be eliminated depending on the efficancy of the Smith Street Storage project.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
Babcock Pump Station In-Line Storage	This RTC project is proposed to modify the function of an existing pump station to utilize available capacity of a large sewer to provide flow control measures during wet weather events. The proposed project location is at the existing pump staion on New Babcock Street at Howard Street.	This RTC project is proposed to utilize available capacity within the collection system to reduce the peak flow into the Swan Trunk. Together with other LTCP projects, this project is projected to reduce CSO 027 discharges to the Buffalo River based on the TY to 6 activations.

Project Name	Project Description	Project Purpose*
Montgomery CSO (Smith at Eagle) In-Line Storage	This RTC project is proposed to utilize available capacity in the Smith St Drain to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is upstream of the existing CSO 026 RTC project on Smith St. and Eagle St.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 026 discharges to the Buffalo River based on the TY to 6 activations.
Broadway at Oak In-Line Storage	This RTC project is proposed to utilize available capacity in the collection system to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Broadway St. at Oak St.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 017 discharges to the Buffalo River based on the TY to 6 activations.
Breckenridge at Niagara Street In-line Storage	This RTC project is proposed to replace the CSOs 010, 008/010, 061-Underflow capacity upsizing project and will be designed to store flows in the Breckenridge Street Sewer and release these flows back into the Northern Interceptor as capacity is available. It will be located at Niagara and Breckenridge Streets.	This RTC project is proposed to utilize available capacity within the existing Breckenridge combined sewer to store flows and then release them when there is available capacity to the Northern Interceptor Sewer rather than directly connecting into the syphon gates connection. It is anticipated to reduce CSO 010 discharges to the Black Rock Canal based in the TY to 4 activations.
Gates Circle In-line Storage	This project is proposed to be located at the North East corner of Gates Circle and will provideThis project is an additional project that was not originally included in the Long-Term Control Plan which is proposed to modify SPP 322 to create a globalized control logic balancing of flows between the Scajaquada Tunnel and Bird Avenue Trunk. An engineering contract for this project is expected to be	This RTC project is proposed to balance flows between the Bird Avenue Trunk and Scajaquada Tunnel to work together with other projects to reduce discharges to the Black Rock Canal through CSO 061 and CSO 004 in the TY to 4 activations.
Foundation 4 - Hamburg Drain Optimizations	This project will entail several in-system optimizations, e.g. rerouting of flows, installation of weirs, partial sewer separations etc. and/or green infrastructure to reduce the overflow events at a number of upstream SPPs in order to control flows through CSOs 017, 022, and 064. These optimizations would be located within the Hamburg Basin.	These optimization projects are proposed to increase the flow volume conveyed by the CSS upstream of the SPPs and diverting stormwater flows out of the CSS thereby decreasing CSO 017, 022, and 064 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Buffalo River through CSO 017 to 4 activations, CSO 022 to 5 activations, and CSO 064 to 3 activations.

Project Name	Project Description	Project Purpose*
Foundation 4 - Hamburg Drain Storage	Together with the Hamburg Drain Optimizations, this project would be designed to provide the equivalent of 5 MG of offline storage. This facility would be located within the Hamburg Basin and may involve the installation of RTCs.	This storage project is proposed to provide off-line storage thereby decreasing CSO 017, 022, and 064 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Buffalo River through CSO 017 to 4 activations, CSO 022 to 5 activations, and CSO 064 to 3 activations.
Mill Race In-Line Storage	This RTC project is proposed to utilize available capacity of a large sewer to provide flow control measures during wet weather events while allowing continuous dry weather underflow. The proposed project location is on Larkin Street near Roseville Street.	This RTC project is proposed to utilize available capacity within the collection system to detain flows until downstream capacity becomes available. Together with other LTCP projects, this project is projected to reduce CSO 017 discharges to the Buffalo River based on the TY to 6 activations.
WWTP		
WWTP Improvement Project Alternative C2	The proposed project is expected to rehabilitate the existing primary clarifiers by adding high rate disinfection and provide additional secondary clarifiers at the Bird Island WWTP.	This project would be designed to provide treatment of wet weather flows and increased secondary treatment capacity.

Project Name	Project Description	Project Purpose*
Green Infrastructure Projects		
Green 1 - Pilot Projects – 267-acres of GI control	Projects consist of multiple green infrastructure projects that will overlap in engineering and construction.	In general, this phase is designed to control stormwater flow from 267 acres of impervious area in the various sewer sheds within the targeted areas.
2001-2016 Residential Demolitions	This project consists of the demolition of vacant houses thereby replacing impervious with pervious surfaces.	This project is designed to remove 256 total acres of impervious area and manage stormwater on site.
2001-2016 Commercial and Industrial Demolitions	This project consists of the demolition of commercial and industrial structures thereby replacing impervious with pervious surfaces.	This project is designed to control stormwater flow from 78 total acres of impervious area.

Project Name	Project Description	Project Purpose*
Green 2 – 410 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in future reports.	In general, these projects would be designed to retain stormwater flow from 410 acres of impervious area in the various sewer sheds in the targeted areas.
2017 -2024 Demolitions	This project consists of the demolition of vacant and dilapidated structures thereby replacing impervious surface with pervious surface	This project is designed to control stormwater flow for each post demolition vacant lot. Total acreate TBD on a rolling basis depending upon demolitions completed.
Green Demolition Pilot Project	A three year pilot study where the City of Buffalo's demolition specifications were altered to allow for the use of shallow bioretention to increase onsite infiltration	Over the course of the pilot project the revised demolition specifications/bioretention approach was applied to 221 sites impacting a total of 19.03 acres.
PUSH Blue Projects	PUSH-Buffalo will install rain gardens, porous pavement and a green roof and distribute rain barrels within the CSO 012 sewershed.	This project is designed to control stormwater flow from 1 acre of impervious area.
Carlton Street Porous Asphalt	This project consisted of the installation of pervious pavement to retain stormwater from the area tributary to the Right-of-Way on Carlton Street between Michigan and Jefferson Avenues in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from a 5.9 acre sewershed.
Fillmore Avenue Porous Parking Lots and Green Lots	This project consisted of the installation of porous pavement parking lots and modified rain gardens to retain stormwater from the area tributary to the Right-of-Way of Fillmore Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 0.4 total acres of impervious area.
Ohio Street	This project consisted of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Ohio Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 6.1 total acres of impervious area.
Kenmore Avenue	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Kenmore Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 5.17 total acres of impervious area.
Genesee Gateway Project	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way on Genesee Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2.8 total acres of impervious area.

Project Name	Project Description	Project Purpose*
Allen Street	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of Allen Street between Main Street and Elmwood Avenue in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2.5 total acres of impervious area.
Willert Park	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of William Street between Michigan and Jefferson in the City of Buffalo.	This project is designed to control stormwater flow from 13.9 total acres of impervious area.
Northland Ave	This project will consist of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the portion of Northland Avenue between Fillmore and Grider in the City of Buffalo.	This project is designed to control stormwater flow from 6.1 total acres of impervious area.
612 Northland Ave	The project consists of a rain garden, permeable gravel pavement, and conversion of impervious pavement to lawn/shrubs.	The project is designed to control stormwater flow from 0.26 acres of impervious area.
Niagara Street Phase 1: Elmwood Street to Virgina Street	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 2 total acres of impervious area.
Niagara Street Phase 2: Virgina Street to Porter Avenue	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 7.3 total acres of impervious area.
Niagara Street Phase 3: Hampshire Street to Scajaquada Expressway		

Project Name	Project Description	Project Purpose*
Niagara Street Phase 4a: Scajaquada Expy to Hertel Ave *Niagara Street Phase 4b: Hertel Ave to Ontario St* *Niagara Street Phase 5: Porter Avenue to Hampshire Street*	This project consists of the installation of green infrastructure to retain stormwater from the area tributary to the Right-of-Way for the length of Niagara Street in the City of Buffalo as part of the City's streetscape project.	This project is designed to control stormwater flow from 15 total acres of impervious area in MS4 drainage areas and 25.5 in CSO drainage areas.
Green 3 – 375 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in the Phase 2 Green Infrastructure Master Plan.	In general, these projects would be designed to retain stormwater flow from 375 acres of impervious area in the various sewer sheds in the targeted areas.
Green 4 – 263 acres of GI Control	These projects will consist of multiple green infrastructure projects that will overlap in engineering and construction. Details will be provided in the Phase 2 Green Infrastructure Master Plan.	In general, these projects would be designed to retain stormwater flow from 263 acres of impervious area in the various sewer sheds in the targeted areas.

Project Name	Project Description	Project Purpose*
Gray Projects		
CSOs 014/15 – Erie Basin In-line storage and optimization	**SEE DETAILS FOLLOWING FOR SPECIFIC PROJECTS**	
SPPs 206A&B	A new 113,000 gallon in-line storage facility was constructed in association with SPPs 206A&B to reduce CSOs at CSO 014. This site is located at Trenton Road/ Village Court north east of Fourth Street.	This project was designed to provide in-line storage thereby decreasing CSO 014 discharges through SPPs 206A&B. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 014 to 2 activations.
SPP 035	A new 50,000 gallon in-line storage facility was constructed between the Genesee Trunk and Swan Trunk sewers to create additional storage capacity in association with SPP 035 (CSO 015). This project is located to the north west of the intersection of South Elmwood Avenue and West Genesee Street.	This project was designed to provide in-line storage thereby decreasing CSO 015 discharges through SPP 35. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
SPP 036	This project consisted of the reconstruction of 35' of 30" sewer associated with SPP 036 to reverse the slope. This site is located on Church Street between the off and on ramps of the Skyway bridge (State Route 5).	This sewer reconstruction project was designed to increase the underflow capacity of the CSS thereby decreasing CSO 015 discharges. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Erie Basin through CSO 015 to 0 activations.
CSO 013 – Satellite storage, conveyance, FM & PS	CSO 013 is located at the extension of Virginia Street, in LaSalle Park, into the Black Rock Canal, the structure is tentatively planned to be built between the last SPP structure and the Canal. The proposed satellite storage facility would consist of a covered, concrete, underground tank. This project is currently on hold pending the Model Recalibration.	This storage project would provide off-line storage thereby decreasing CSO 013 discharges. Preliminary design is for a 0.3 MG offline storage facility. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Black Rock Canal through CSO 013 to 4 activations.
North Relief – Interceptor	The original conception of this project was of a deep tunnel relief sewer to run in the vicinity of Niagara Street between Bird Avenue and Albany Street with an additional line connecting the tunnel to the WWTP influent siphon. Preliminary design is for 5,310' of 96"pipe and 571' of 120" pipe. Due to site constraints this project may be redesigned.	The purpose of this project is to reduce discharges through CSOs 004, 011, and 012, by creating a new relief sewer thereby creating offline storage capacity capacity in the CSS. Together with other LTCP projects, this project is projected based on the TY to reduce discharges to the Black Rock Canal through CSO 004 to 3 activations, CSO 011 to 4 activation, and CSO 012 to 2 activations.

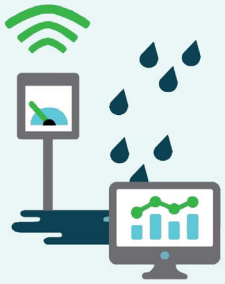
Project Name	Project Description	Project Purpose*
CSOs 010, 008/010, 061, 004 – Underflow capacity upsizing	This Project is No Longer being Considered and is being superceded by Breckenridge at Niagara Street In-Line Storage	This underflow capacity upsizing project would increase the capacity of the CSS thereby decreasing CSO 010, 008, 061 and 004 discharges. Together with other LTCP projects, this project is projected based on the 1993 Modified Typical Year to reduce discharges to the Black Rock Canal through CSO 004 to 3 activations, CSO 010 to 1 activations, CSO 008 to 0 activations, and CSO 061 to 4 activations.
SPP 337 (CSO 053) – Satellite storage, conveyance, FM & PS	SPP 337 is located at Colorado Street North of Scajaquada Street. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 0.7 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
SPP 336A&B (CSO 053) – Satellite storage, conveyance, FM & PS	SPP 336A&B are located on Humboldt Parkway on each side of the Scajaquada Drain. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 4.2 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
Jefferson Avenue & Florida Street (CSO 053) – Satellite storage, conveyance and FM	The proposed location for this facility is in the vicinity of the intersection of Jefferson Avenue and Florida Street. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 53 to the Scajaquada Creek. Preliminary design is for a 1.5 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to Scajaquada Creek based on the TY to 4 activations.
CSO 055 – Satellite storage, conveyance, FM & PS	For CSO 055, the proposed storage facility would be located upstream of the regulator, near Military Road. At this location, an offline facility would be constructed and flows above 26 MGD (instantaneous peak) would be diverted from the South Hertel Trunk sewer into the storage facility. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 55 to the Niagara River. Preliminary design is for a 7.5 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Niagara River through CSO 55 based on the TY to 9 activations.

Project Name	Project Description	Project Purpose*
CSOs 028/044/047 - Satellite storage, conveyance, FM & PS	The proposed location for this facility is underneath the Tops parking lot between South Park Avenue and the Buffalo River. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 28 to the Buffalo River and through CSOs 047 and 044 to Cazenovia Creek. Preliminary design is for a 2.3 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges based on the TY to 6 activations through CSO 028, 2 activations through CSO 044 and 3 activations through CSO 047.
CSO 052 – Satellite storage, conveyance, FM & PS	The proposed location for this facility is in the vicinity of South Ogden Street between Mineral Springs Road and Cazenovia Creek. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 52 to the Buffalo River. Preliminary design is for a 0.6 MG offline storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Buffalo River through CSO 052 based on the TY to 3 activations.
CSO 064 – Satellite storage, conveyance, FM & PS	The proposed location for this facility is in the vicinity of the confluence of Ohio, Louisiana and Saint Claire Streets. The proposed satellite storage facility would consist of a covered, concrete, underground tank.	The purpose of this project is to reduce discharges through CSO 064 to the Buffalo River. Preliminary design is for a 0.1 MG off-line storage facility. Together with other LTCP projects, this project is projected reduce CSO discharges to the Buffalo River through CSO 064 based on the TY to 3 activations.

***Note:** Black Rock Canal Performance Criterion is 4 Activations in the Typical Year
Buffalo River Performance Criterion is 6 Activations in the Typical Year
Cazenovia Creek - B Performance Criterion is 4 Activations in the Typical Year
Cazenovia Creek - C Performance Criterion is 6 Activations in the Typical Year
Erie Basin Performance Criterion is 2 Activations in the Typical Year
Niagara River Performance Criterion is 9 Activations in the Typical Year
Scajaquada Creek - Performance Criterion is 4 Activations in the Typical Year

Attachment C to the Semi-Annual Status Report: September 2022

Public Meeting Materials



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AECOM

Operations Collaboration & Coordination

How Buffalo Sewer Prepared for Their Largest Project in Nearly 50 Years

Roberta Gaiek, PE & Dan O'Sullivan, BSA; Jamie Johnson, PE, AECOM

Life Cycle of the Long-Term Control Plan and NFA

March 2014
EPA and NYSDEC jointly approve BSA's Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP)

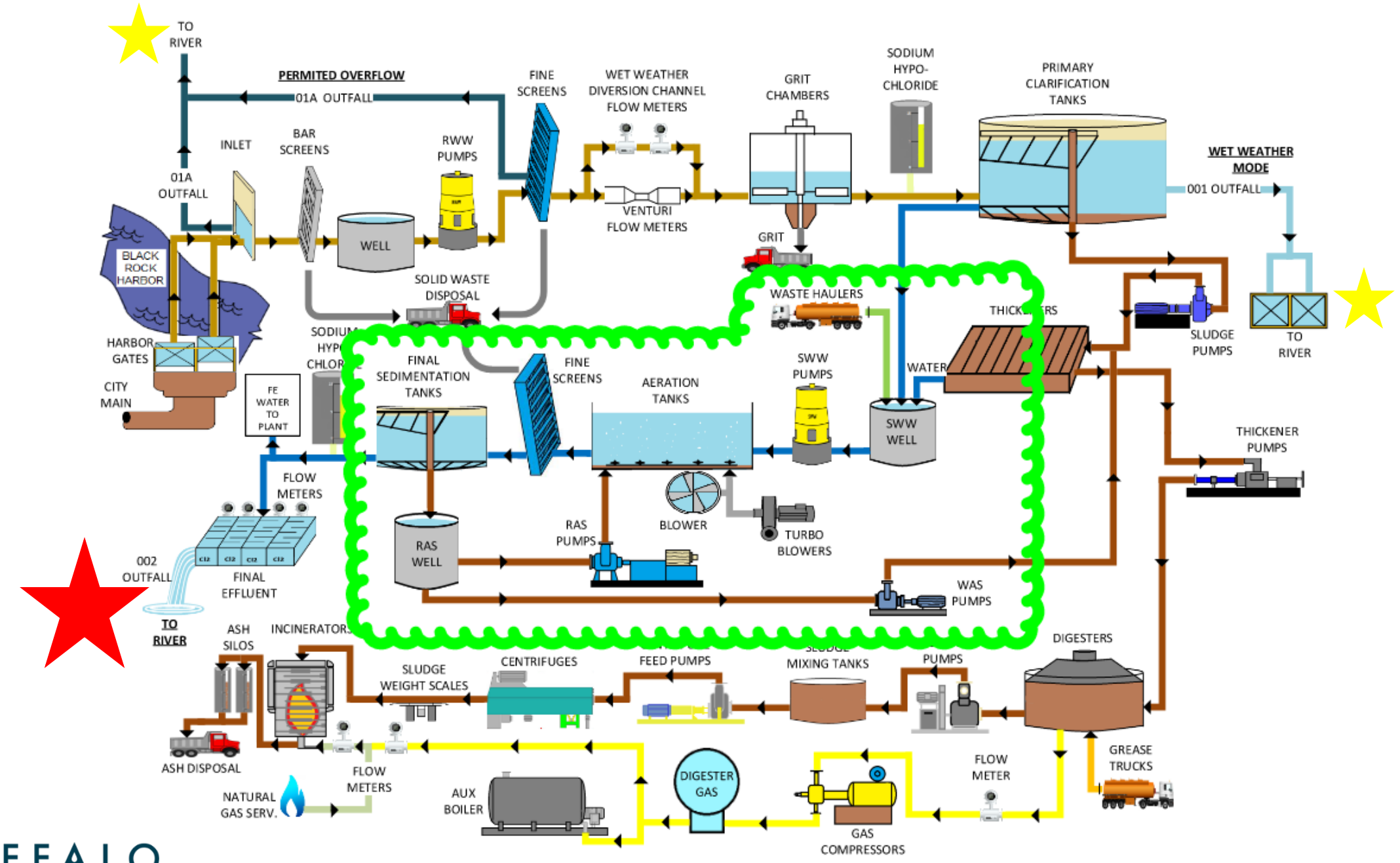
November 2018
BSA request schedule extension for implementation of No Feasible Alternative (NFA) project per LTCP

April 2019
Schedule extension granted with Engineering to be started no later than Sept. 1, 2021

December 2019
Issue Notice to Proceed (NTP) to AECOM for design services including hydraulic evaluation and process model

Spring 2022
Issue Notice to Proceed (NTP) for Construction

BIRD ISLAND WASTEWATER TREATMENT FACILITY



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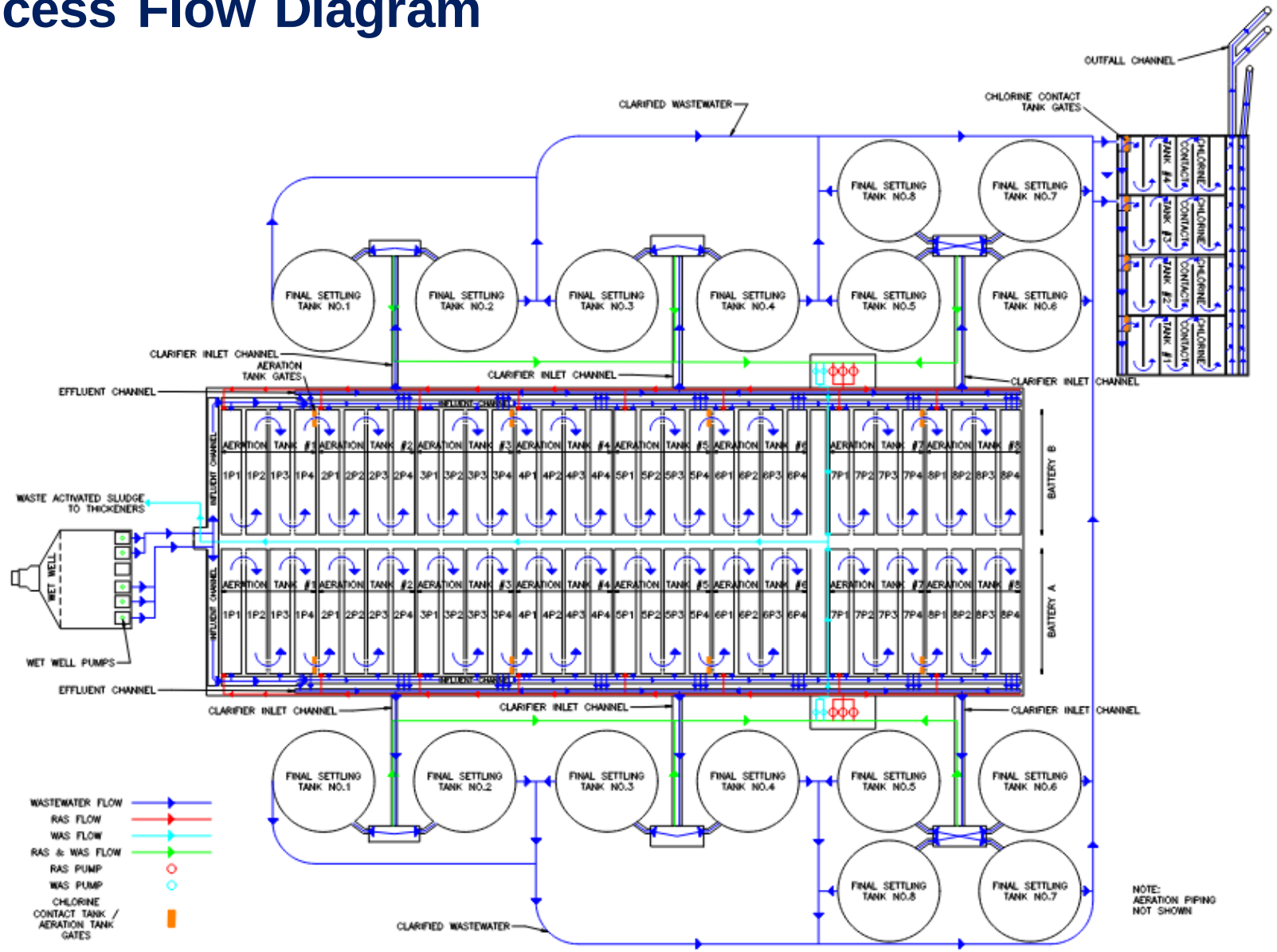
Secondary Process Flow Diagram



EXISTING SECONDARY SYSTEM – WASTEWATER

NOT TO SCALE

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AECOM

Design Phase

Design Team

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Phases of a Project

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Collaboration during Design Process

As we have previously discussed, due to the difference in the condition of the "A" & "B" side, operationally starting on the "A" side would make the most sense.

Comment #3 – This is actually something the BSA needs to attend to. The isolation gates for the SWW well need to checked for proper operation and leakage.
These have not been used in years and if at the time of the cleaning of the SWW well they are inoperable this will add time to the project.
If we take care of this beforehand the delay can be avoided.

- When we speak of training be sure to make it understood that there are three shifts of personnel that need to be trained so there should be at least three sessions per training course to accommodate all shifts.

NEED TO COORDINATE SWW SHUT DOWN WITH IWS WASTE HAULERS (West side of wet well)

01010-3 n. removal of electrical box to allow for WAS piping repair? (Is this in electrical drawings not yet designed?)

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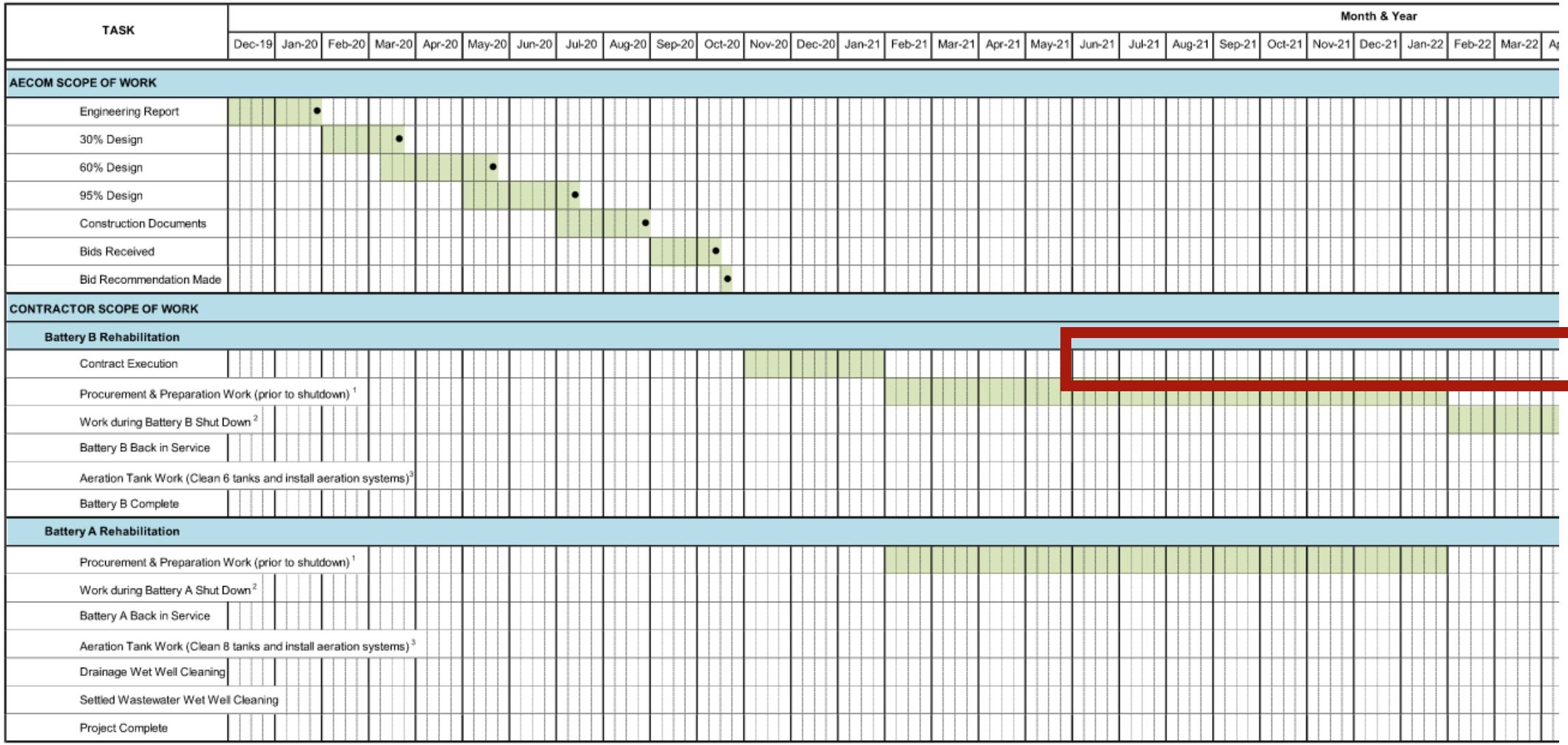
Design Schedule



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AECOM

Construction Phase

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Phases of a Project

WHERE WE ARE

Study or Conceptual Design (aka, Planning)

Preliminary Design including Basis of Design Report

Detailed Design

Construction

Commissioning and Startup

Project Closeout

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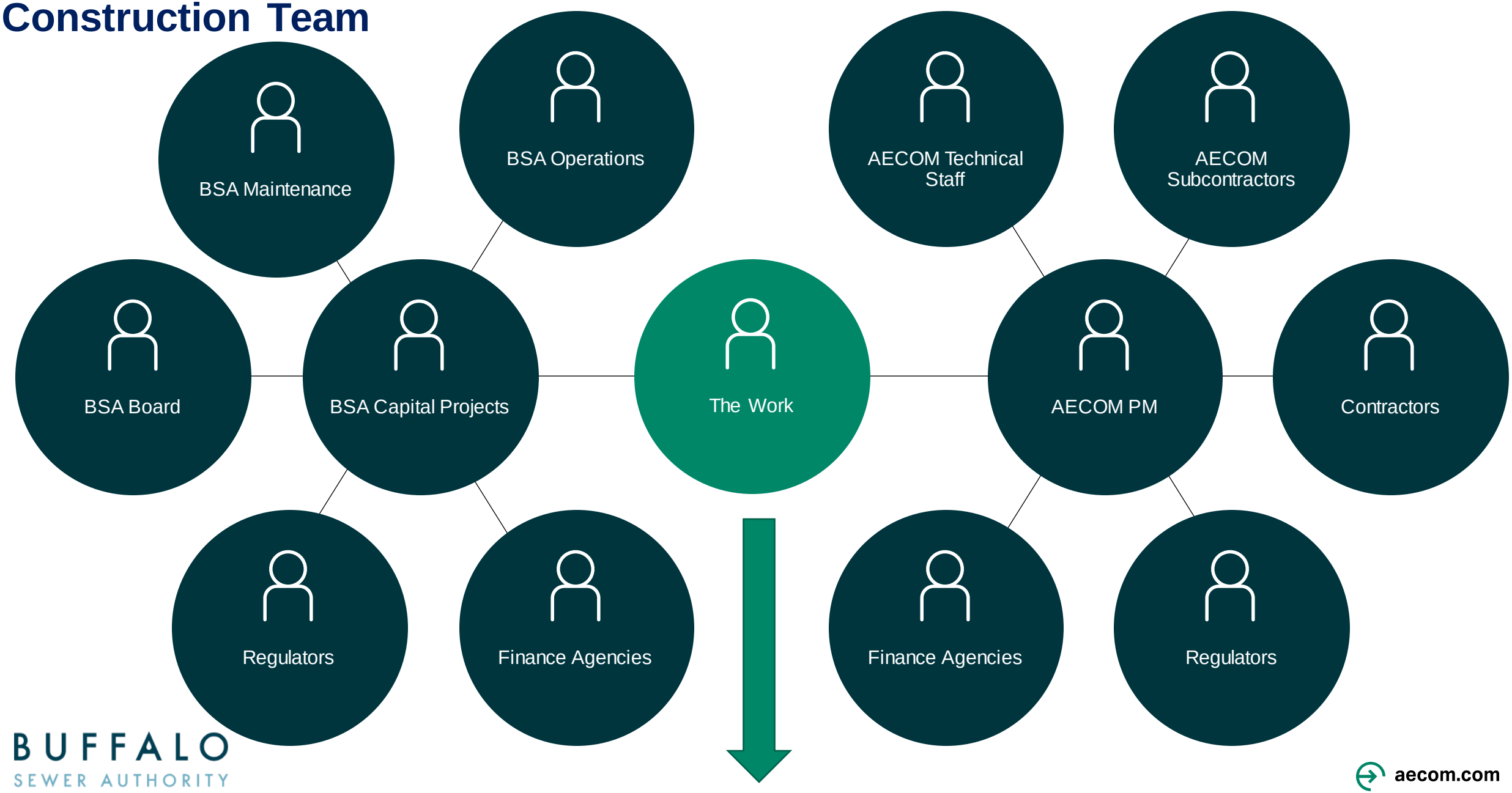
Construction Team



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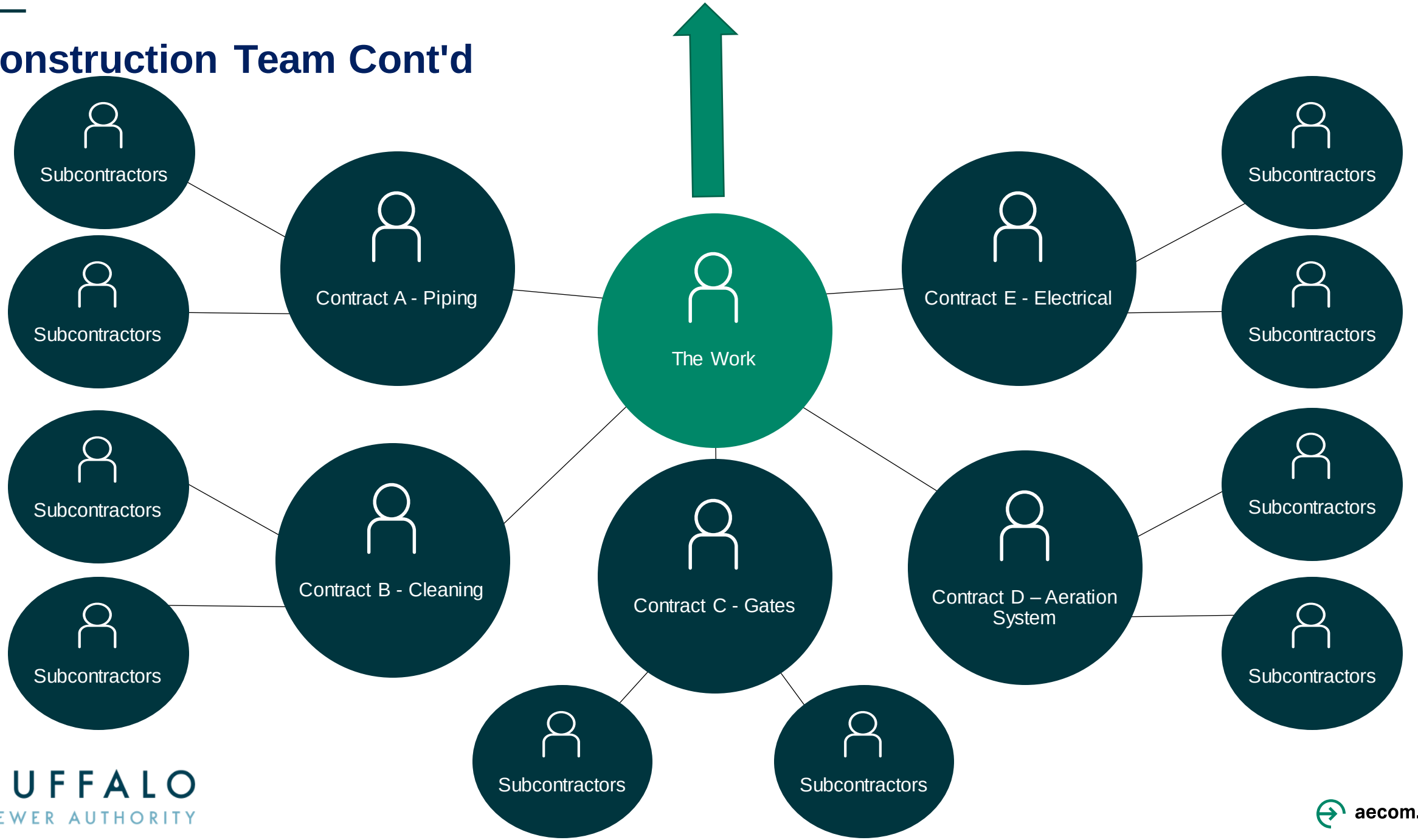
Construction Team Cont'd



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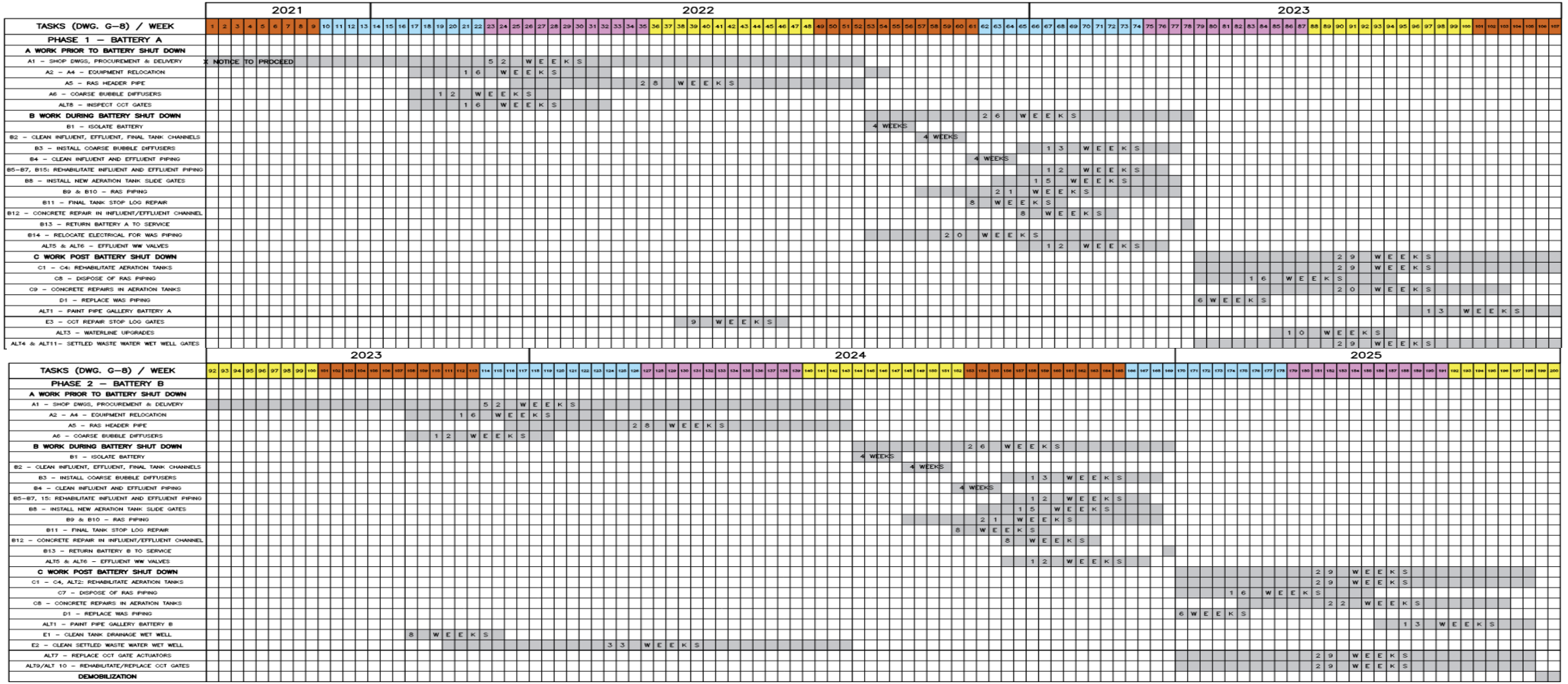
Construction Schedule



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Construction Phasing

Phase 1A

- RAS piping, fittings, valves, meters, and supports.
- Ventilation fans and access platform steel.
- Trench drain dewatering pumps
- Concrete and reinforcing steel for equipment pads.
- Piping, conduits, etc. required to relocate the existing Scum Pots.

Phase 1B

- Aeration Basin sluice gates and portable actuators.
- Stop log frames.
- Debris removal and dewatering work plan.
- Debris transportation plan and disposal location(s).
- Coarse bubble diffuser system for the influent, effluent, and final clarifier influent channels.
- 36” and 42” butterfly valves for the influent pipes.
- 36” actuators for the influent pipes.
- 36” magnetic flow meters for the influent pipes.
- Concrete repair materials.
- Electrical cable and conduit for WAS pipe relocation

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Construction Preparation

Preparation Checklist:

- **8B Aeration Tank**
- Clean pass 4 using trash pump.
- Cleaning started 09/2/21
- Remove rags.
- Fix drop legs.
- Assess diffuser stones, replace where necessary.
- Install 8BP1 RAS actuator. (Actuator in stock)

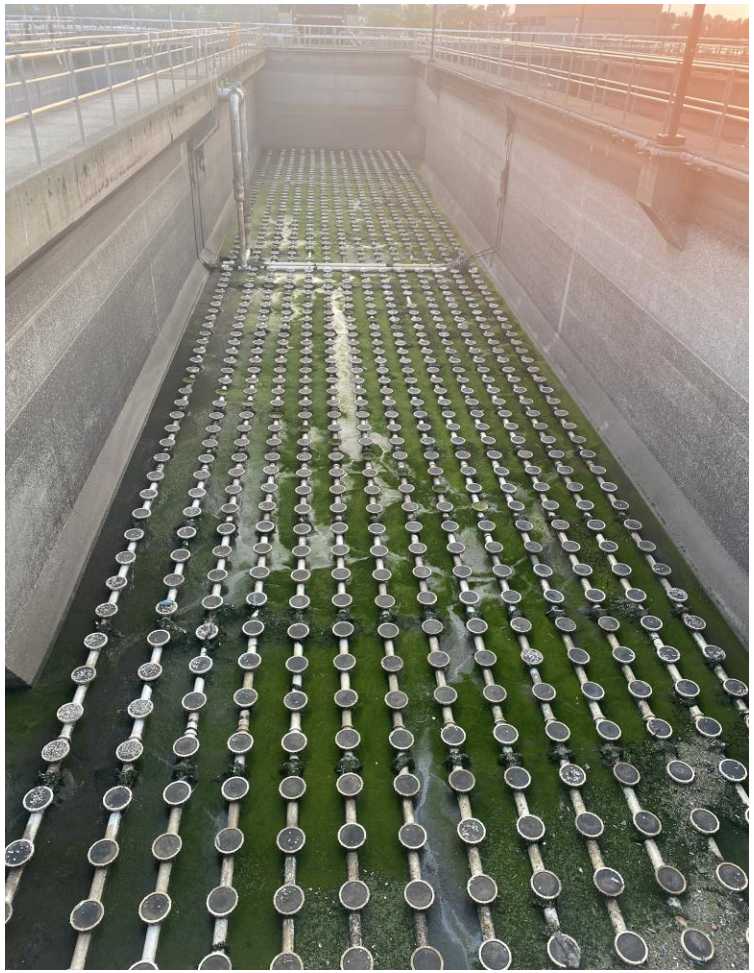
- **6B Control Building**
- Replace 5B mixed liquor butterfly valve actuator. (Actuator in stock)
  - Scheduled for 9/08/21
- Order mixed liquor dump valve actuator.
- Spec sheet forwarded to Isiah for Itech review. 09/2/21
- Replace mixed liquor dump valve actuator.

Cleaning

Removal

Piloting

Preparation Work



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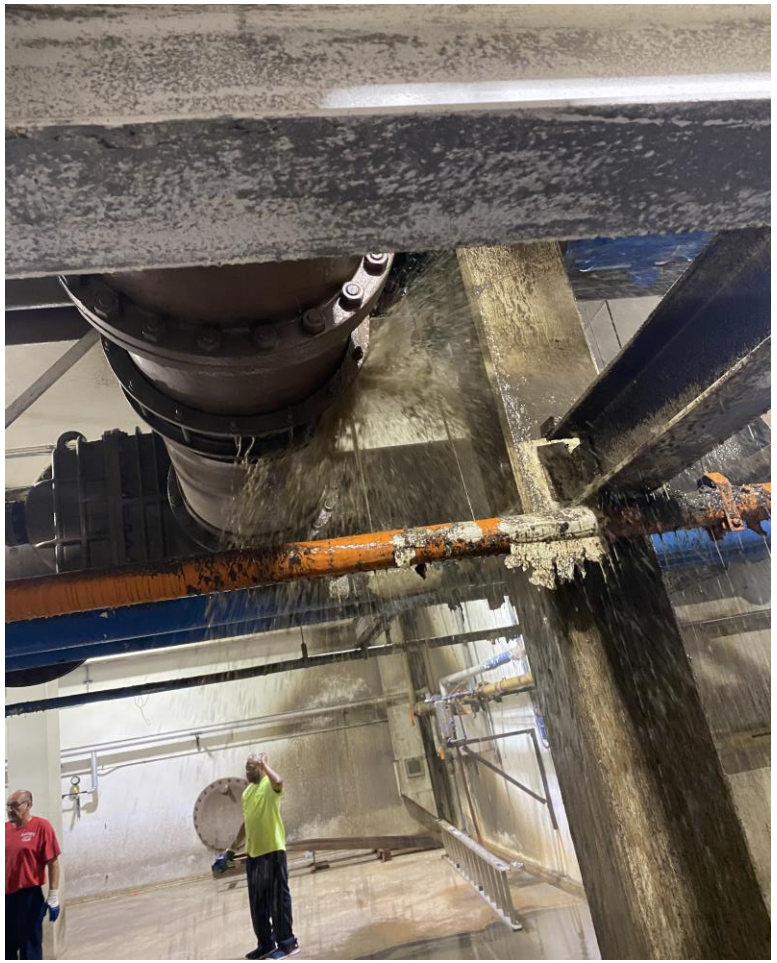
Surprise Repairs and justification



Construction Staging

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Construction Staging

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Coordination

Operations and Maintenance Manual

- An **important part of construction** administration is to work closely with the contractor to **assemble** and rationally compile for simple use the manufacturer's **data for each product** in the construction that will **allow the BSA to properly operate** and **maintain all new products**. In addition, all **start-up test results** and the **results of** all previous **testing** performed **during the construction phase work will be included in the O&M Manual.**

- We will submit a draft **O&M Manual** to the **BSA** and meet with you to review your **comments**. Once received, your comments will be **incorporated** into the draft document and the **final O&M Manual produced**. We will provide the BSA with both paper and electronic copies of the final O&M Manual.

Start-Up Services: *An important part of the project will be starting-up the various systems installed prior to returning that area to service. This effort will need to be performed in the following phases:*

Phase 1 – Battery A

Task A:

a. New ventilation fans

b. Relocated Scum pots

c. New Trench pumps •

Task B:

a. New RAS piping

b. Influent valves and flow meters

c. Coarse bubble diffuser system

d. New sluice gates

e. New electrical feed and junction boxes at WAS piping •

Task C:

a. Fine bubble diffuser aeration system •

Task D:

a. New WAS pipe

Phase 2 – Battery B

Task A:

a. New ventilation fans

b. Relocated Scum pots

c. New Trench pumps •

Task B:

a. New RAS piping

b. Influent valves and flow meters

c. Coarse bubble diffuser system

d. New sluice gates

e. New electrical feed and junction boxes at WAS piping

Task C:

a. Fine bubble diffuser aeration system •

Task D:

a. New WAS pipe

Phase 3:

Chlorine Contact Tank – new sluice gates •

Settled Waste Water Wet Well - new sluice gates • Waterline upgrades

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Project Takeaways

- Collaboration amongst all departments at Buffalo Sewer Authority, the Consultant and five separate Contractors will be key to the success of the project

- An investment in local waterways by Buffalo Sewer Authority to reduce CSOs in the City of Buffalo and surrounding communities

- To help maintain and improve the infrastructure, innovation, and efficiency of our water resources to ensure quality of life throughout Western New York

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AECOM

Thank you.

Roberta Gaiek, PE, Buffalo Sewer Authority
Treatment Plant Administrator

Dan O'Sullivan, Buffalo Sewer Authority
Treatment Plant Operations Shift Supervisor

Jamie Johnson, PE, AECOM
Senior Project Manager

Description of Project: AECOM was contracted to perform an engineering report, design and bid phase services to the Buffalo Sewer Authority to improve the existing Secondary System. The project includes the following scope:

- Upgrade the entire aeration system including removing and disposing of the debris in the aeration tanks, installing new fine bubble diffuser aeration system in the Aeration Tanks, replacing and installing new coarse bubble diffusers in the Influent and Effluent Channels and the Final Tank Influent Channels, installing ninety (90) new sluice gates at the influent and effluent pipes in the Aeration Tanks, and performing miscellaneous concrete repairs.
- Upgrade the Return Activated Sludge (RAS) System with new ductile iron pipe, butterfly valves and actuators, gate valves, and flow meters.
- Replace the influent wastewater butterfly valves, actuators and flowmeters. Clean the influent and effluent wastewater pipes of all debris.
- Upgrade the Waste Activated Sludge (WAS) System with new butterfly valves and actuators.
- Rehabilitate the existing Aeration Tank Influent Channel stop log gates, Final Tank Influent Channel stop log gates and Chlorine Contact Tank stop log gates.
- Clean the Settled Waste Wet Well and Drainage Wet Well of all debris.
- Relocate and upgrade existing exhaust fans, sump pumps, and scum pots.

Primary Treatment Renovation: Plant Operations and Capital Projects Team Collaborating to Achieve a Common Objective

Roberta Gaiek, PE
Treatment Plant Administrator – Buffalo Sewer Authority

Dan O'Sullivan
Shift Superintendent – Buffalo Sewer Authority

Walt Walker, PE, ENV SP
Project Manager / Water Equity Practice Leader – Greeley and Hansen

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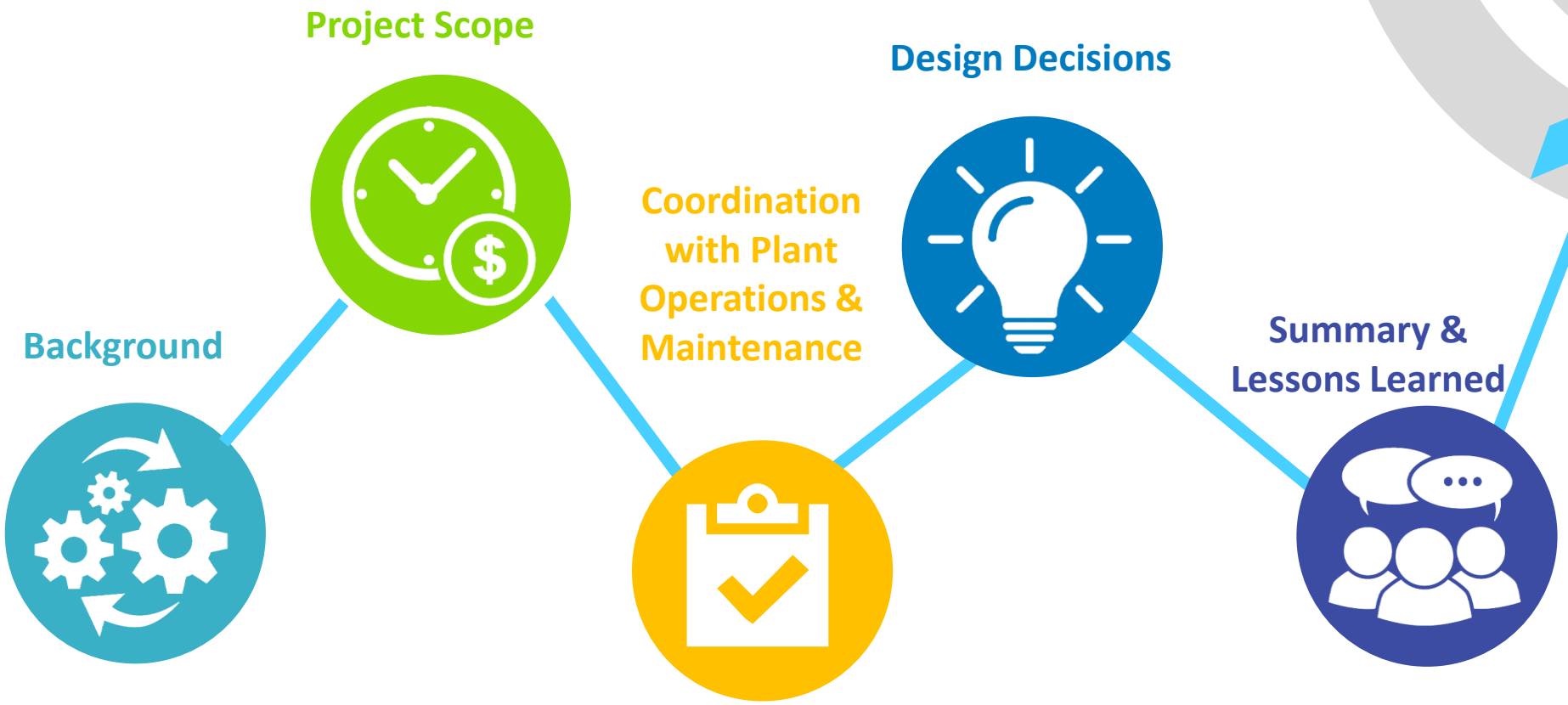
GREELEY AND HANSEN

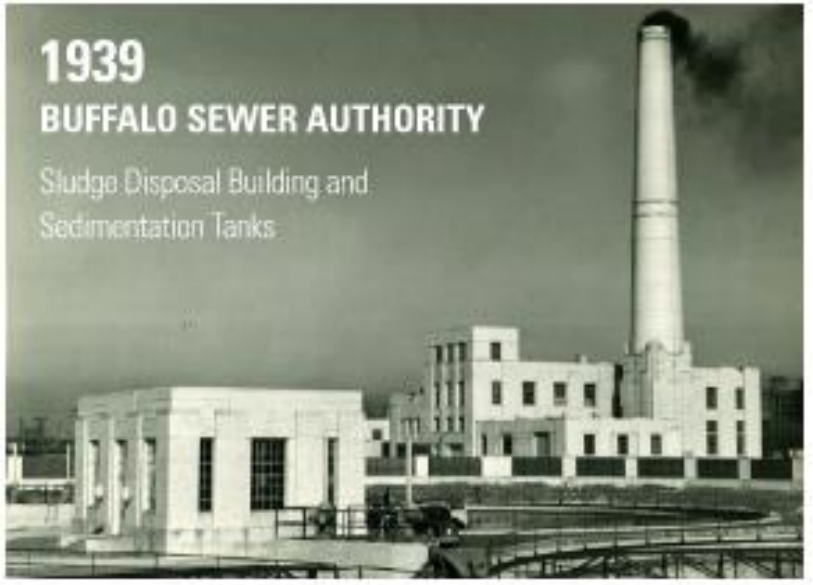
Presentation Outline



Background

BSA Project Background

- The Buffalo Sewer Authority provides wastewater service to approximately 550,000 people. The Authority owns and operates the Bird Island WWTF
  - Primary treatment system constructed in 1935
  - Secondary treatment system constructed in 1980s
- As part of the approved 2014 LTCP, the Authority committed to increasing the wet weather capacity of the treatment facility to 560 MGD. Achieving this goal will involve:
  - Renovate the primary treatment system at 160 MGD during normal conditions, with capacity for increased disinfection of flows as needed
  - Currently restoring the full secondary treatment capacity up to 360 MGD, and in the future designing for peak capacity up to 400 MGD
- Once-in-a generation upgrade and rehabilitation of the BSA Bird Island WWTF primary treatment system
  - Project design started in April 2021 and through an aggressive schedule to meet regulatory and funding deadlines is on track to complete design in Summer 2022.



BSA Project Goals

- Protect Public Health and Environment
- Compliance with Regulatory Requirements to Achieve LTCP / NFA Goals
- Modernize the Treatment Facility and Improve Efficiency
  - Improved Maintenance of Facility Operations (MOFO)
- Affordability – Securing Funding
- Community Benefits
  - Odor Control
  - Communication with BSA
  - Commitment of Local M/WBE Utilization

Project Scope

Primary Treatment Renovation: Project Scope

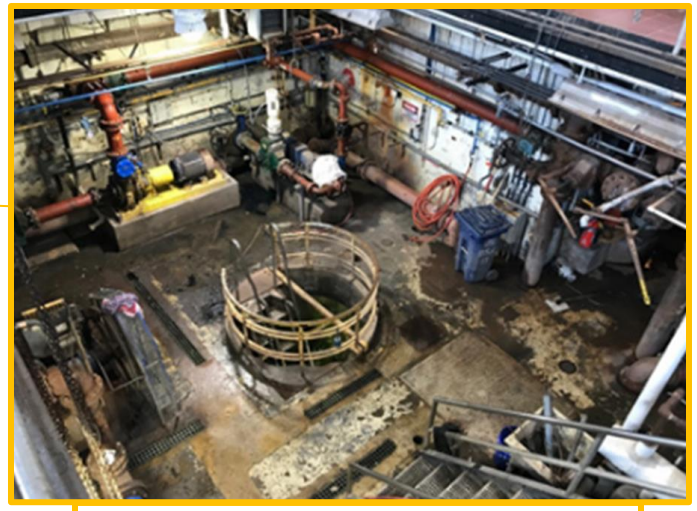
PRIMARY CLARIFICATION AND HIGH RATE DISINFECTION IMPROVEMENTS

- Bypass and flow control chamber, and relocation of Outfall 001
- Community engagement
- Regulatory approvals

Removal of Existing Sodium Hypo Feed System
Maintain existing building for opportunity to reuse for other plant services

- New chlorine contact system for high-rate disinfection of primary treatment effluent
- New sodium hypochlorite storage and pump building with containment system
- Connect discharge to relocated Outfall 001

Bypass and flow control chamber, and connection to Outfall 001



Primary Sludge Pump Building needs an overhaul.
Electrical distribution equipment would need to come out of the building, or be isolated. Our MOPO approach will determine continuous primary sludge withdrawal and conveyance when the Primary Sludge Building is overhauled.

- Restoration of pavement area
- Installation of landscaping
- Bird Island WWTP is public-facing utility. (Adjacent waterfront commercial/residential development, and bike/pedestrian path along Niagara River)

Primary Tanks

- Sludge & scum collection systems
- Enhanced primary treatment for improved effluent and maximizing 160 MGD capacity
- Mechanical and structural improvements
- Reinstall ferric chloride chemical dosing
- Odor control
- OSHA Safety through Design improvements (handrails, toeboards)

Sludge Pump Building

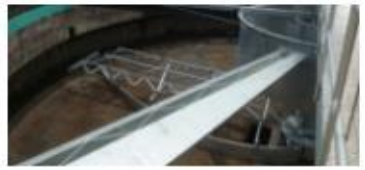
- Pumps and process piping
- Drainage
- HVAC
- Electrical systems and controls integration, including improved automation and O&M flexibility
- Architectural and Structural improvements, while maintaining exterior art deco elements
- LED lighting
- Enhancements to meet OSHA and NFPA code

SCHEMATIC 2: State-of-the-Art Primary Clarification Improvements Designed for Optimum Performance during Dry Weather and Wet Weather Operations, Achieve O&M Efficiency, Odor Control and Safety

Covered Effluent Launders

FRP covers on effluent launders to contain odors. Access hatches provided for operational observation and maintenance. Prevent algae growth on overflow weir.

Scum Trough



Full radius scum trough and dual scum removal arms (180 degree apart) to adequately remove scum and prevent scum buildup on clarifier surface. Continuous flushing of scum trough with washwater to remove scum and prevent odors.

Center Drive Unit Assembly

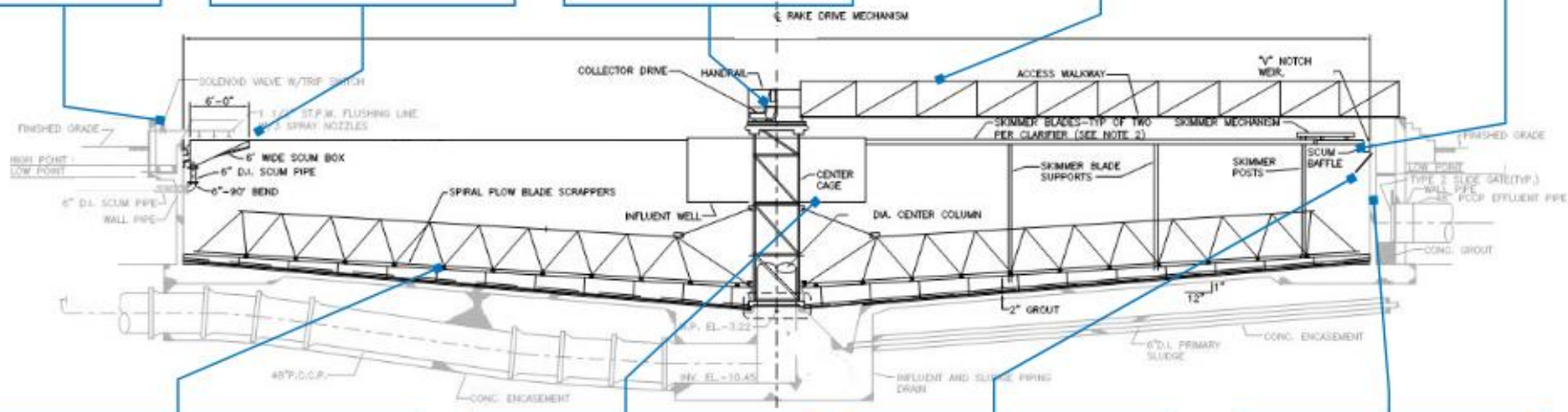
Collector drive mechanism designed to remove denser grit laden sludge, resulting in high torque. Equipped with safety cages for O&M safety. Space around center drive unit to allow efficient maintenance.

Access Walkway

Equipped with handrails that are OSHA compliant. Equipped with kick-plates for fall protection. Adequate lighting to facilitate night time operations and emergency maintenance.

Scum Baffles

Scum baffles along the perimeter to prevent scum and flotables carry over the overflow weir and to high rate disinfection

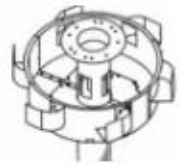


Multi-Plow Clarifier Mechanism

Spiral Sweep Clarifier Mechanism

Collaborate with BSA O&M staff to review sludge loading conditions, maintenance requirements and costs to design an optimum sludge removal mechanism.

Energy Dissipating Influent Well



A well-designed influent wet well to dissipate energy of the incoming influent flow, especially during high wet weather flow conditions. Promote uniform flow distribution and solids settling.

Density Current Baffles

Passive mechanism to prevent solids carry over the overflow weir, especially during wet weather and high flow conditions

Concrete Protective Coating

Repair concrete for chips, cracks and exposed rebar. Corrosion resistant protective coating on existing concrete surface exposed to drying and wetting cycles. Restore tank service life.

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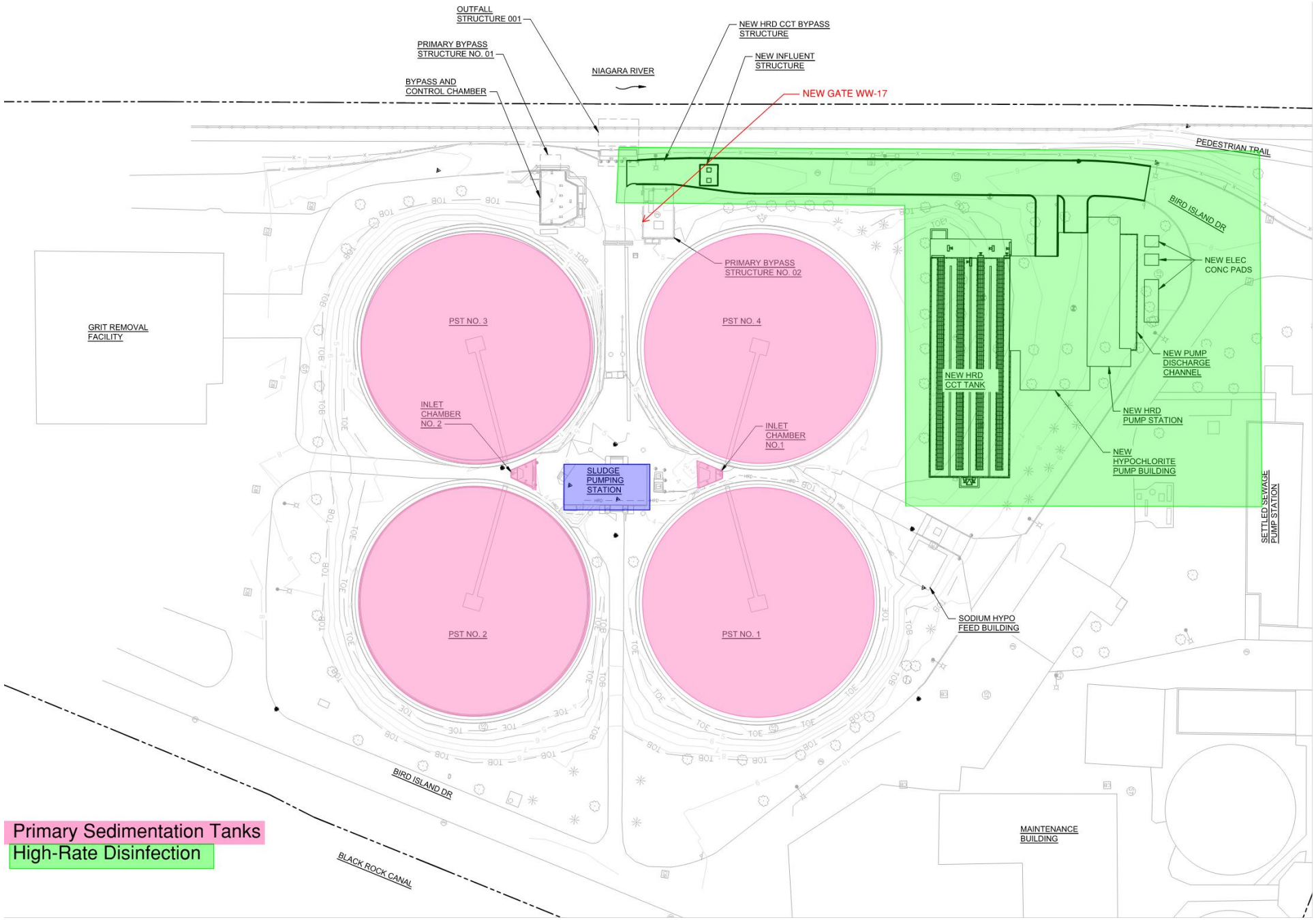
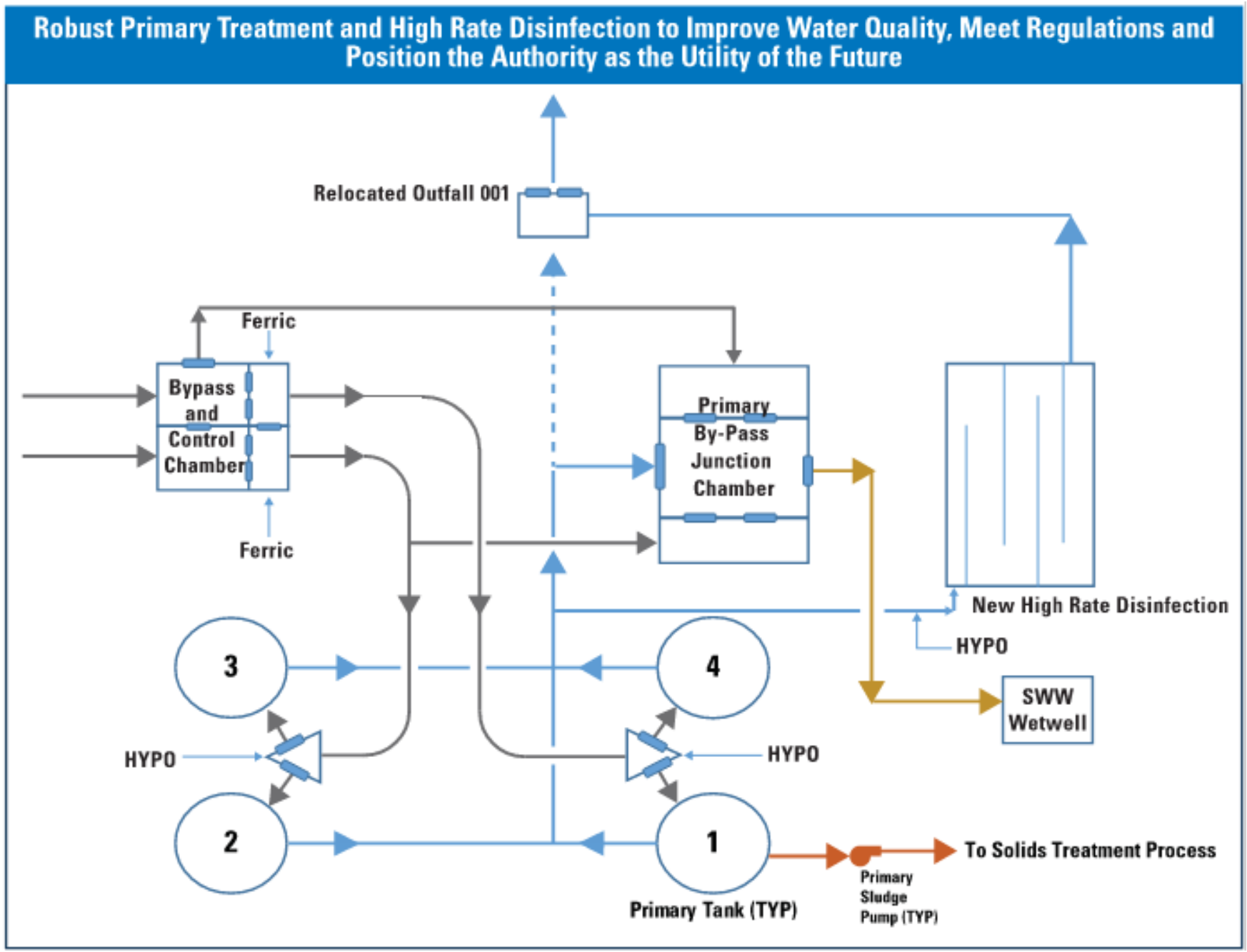
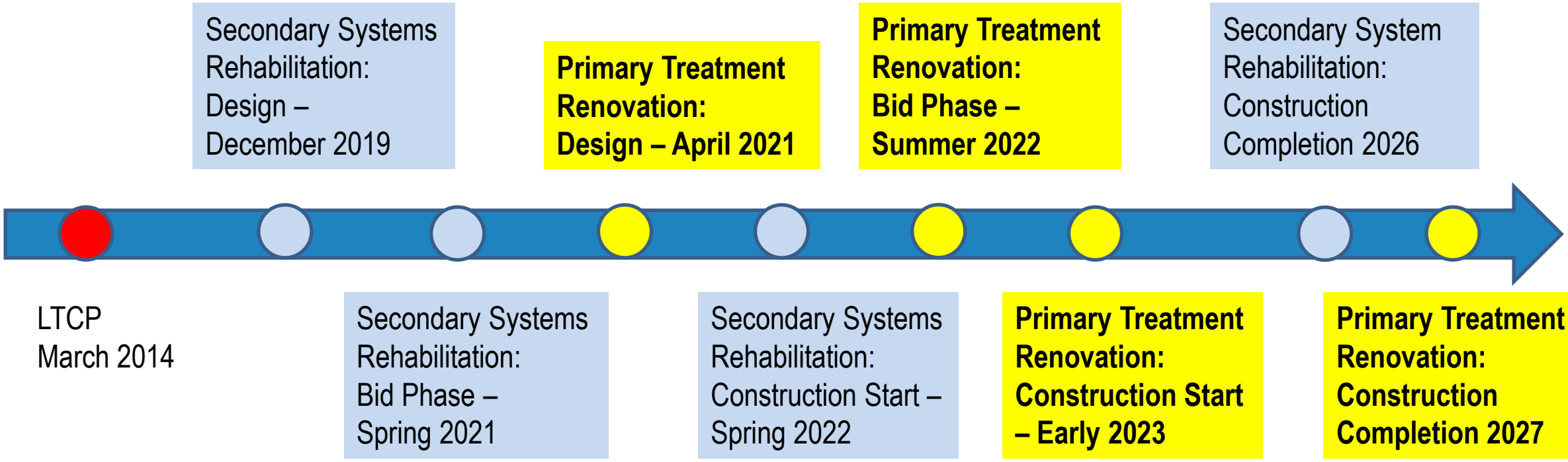

OUTFALL STRUCTURE 001
PRIMARY BYPASS STRUCTURE NO. 01
BYPASS AND CONTROL CHAMBER
NIAGARA RIVER
NEW HRD CCT BYPASS STRUCTURE
NEW INFLUENT STRUCTURE
NEW GATE WW-17
PEDESTRIAN TRAIL
BIRD ISLAND DR
NEW ELEC CONC PADS
PRIMARY BYPASS STRUCTURE NO. 02
GRIT REMOVAL FACILITY
PST NO. 3
PST NO. 4
NEW HRD CCT TANK
NEW PUMP DISCHARGE CHANNEL
INLET CHAMBER NO. 2
INLET CHAMBER NO.1
NEW HRD PUMP STATION
SLUDGE PUMPING STATION
NEW HYPOCHLORITE PUMP BUILDING
SETTLED SEWAGE PUMP STATION
PST NO. 2
PST NO. 1
SODIUM HYPO FEED BUILDING
BIRD ISLAND DR
MAINTENANCE BUILDING
BLACK ROCK CANAL
Primary Sedimentation Tanks
High-Rate Disinfection

Robust Primary Treatment and High Rate Disinfection to Improve Water Quality, Meet Regulations and Position the Authority as the Utility of the Future



Buffalo Sewer Authority Capital Projects Timeline



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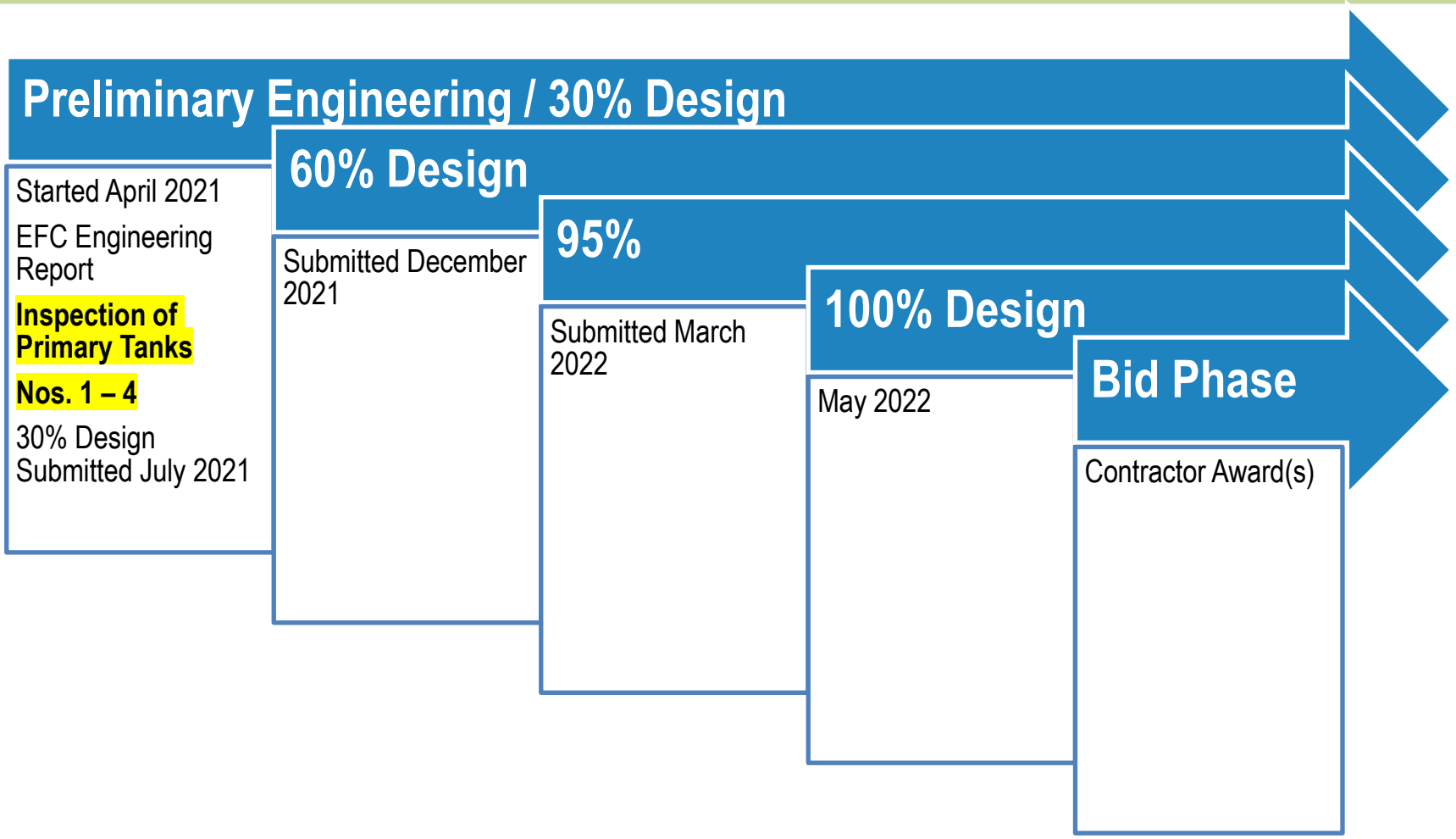
Project Design Phases



Coordination with Plant Operations & Maintenance

Inspection of Primary Sedimentation Tanks

Tank No.1 Dewatering & Inspection: July 2021

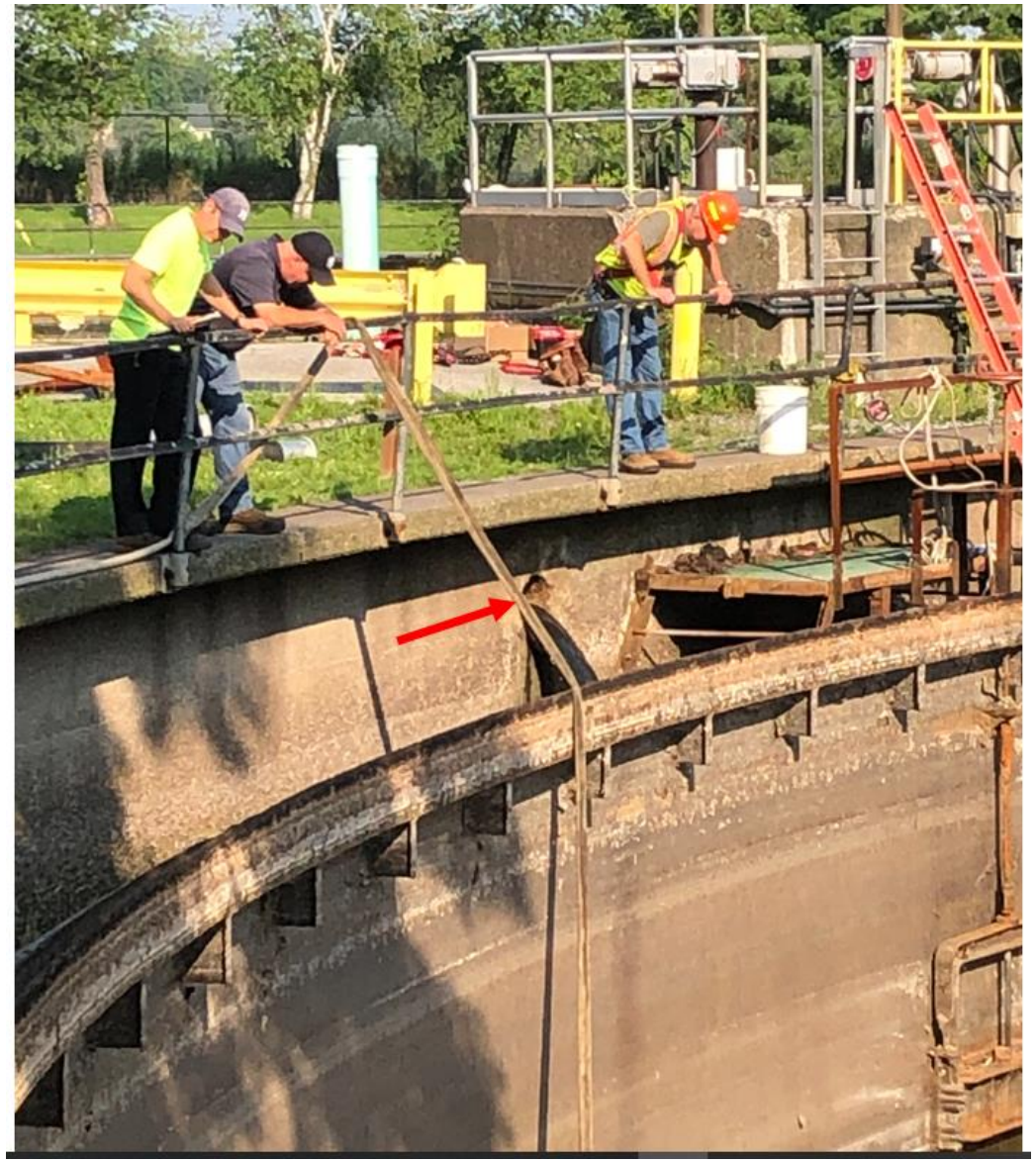
Tank No. 2 Dewatering & Inspection: June 2021

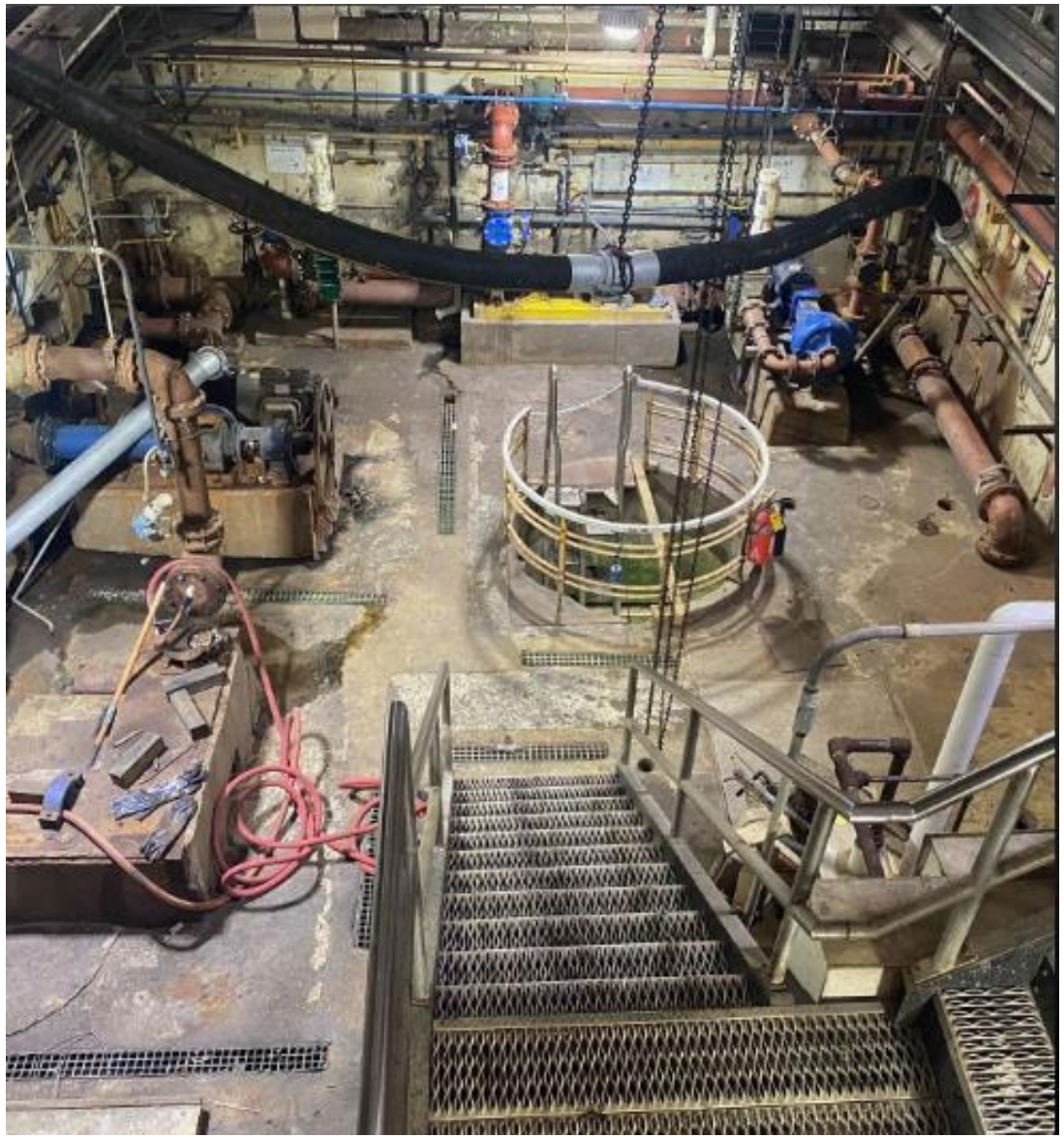
Tank No. 4 Dewatering & Inspection: August 2021

Tank No. 3 Dewatering & Inspection: June 2021

Coordination of Tank Inspections

- Occurred June – August 2021
  - Structural and Mechanical Inspection by Design Team
  - Health and Safety Plan
- Only One Tank Shutdown at a Time
  - Plan Around Wet Weather Events
  - Groundwater and Tank Cracking
  - Bypass Pumping to Maintain Dry Tanks
- Coordination with BSA Capital Projects, Maintenance, and Operations Teams for Tank Shutdown, Dewatering, Cleaning, and Safe Entry for Design Team Inspections

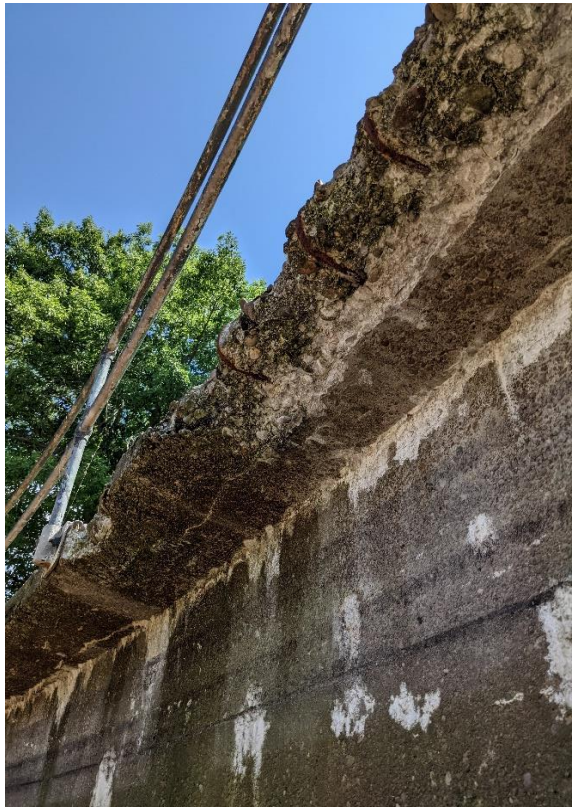


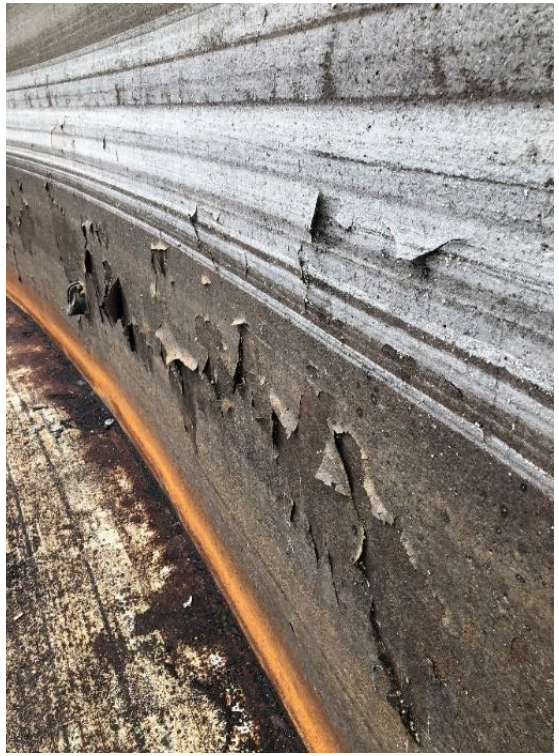



Finally cleaned!

Primary Sedimentation Tanks – Inspections

- All Four (4) Sedimentation Tanks Included:
  - Wall Scour
  - Failed Coating
  - Failed Joints
  - Corroded Effluent Weirs
  - Deteriorated Perimeter Rail
  - Unsound Concrete





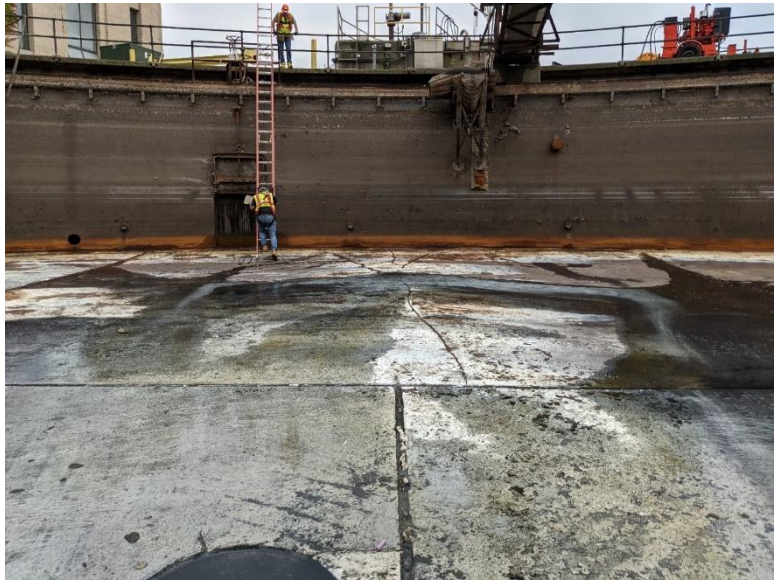
Primary Sedimentation Tanks – Inspections

Additional Findings:

- Tank 1 – Influent Line Heave, Cracked Slab, Elevation Issues
- Tank 2 – Honeycombed Interior Face of Weir Wall
- Tank 3 – Bridge Pier At Weir Wall has Unsound / Spalled Concrete
- Tank 4 – Efflorescence at Interior Pier

Additional Findings:

- Spalling, Efflorescence, Cracks, and Exposed Rebar at Perimeter Walkway for Tanks 1, 2, And 3
- Delaminated Toping Slab for Tanks 3 And 4
- Chemical Staining At Center Pier for Tanks 1 and 2

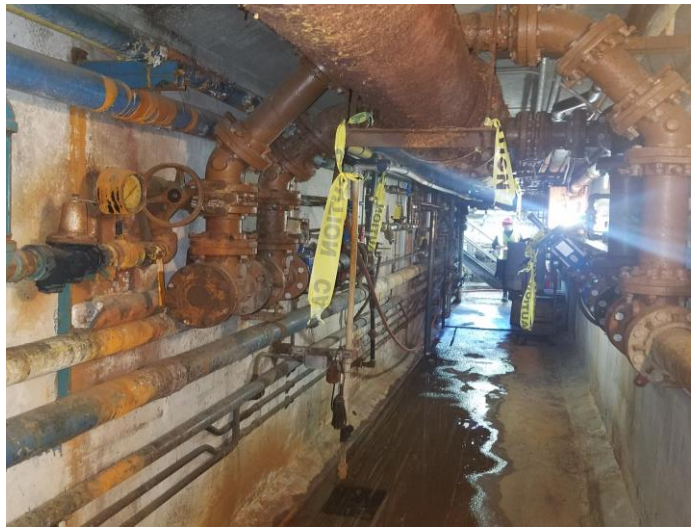


Scum Collection

- Inlet Structures 1 & 2
  - Efflorescence and Cracked Concrete
  - Corroded Grating
  - Grating Support Section Loss
  - Spalled Concrete and Exposed Rebar
  - Missing and Mismatched Railing
  - Steel Modifications

Sludge Pumping Station

- Masonry Bearing Walls
  - Repair Step Cracks and Open Joints in Brick Masonry
  - Re-attached Brick Pilasters at West Elevation
  - Install New Sealant at Precast Coping Joints
- Completely Renovate Interior
- Repair the effects or groundwater and pipe leaks around the building

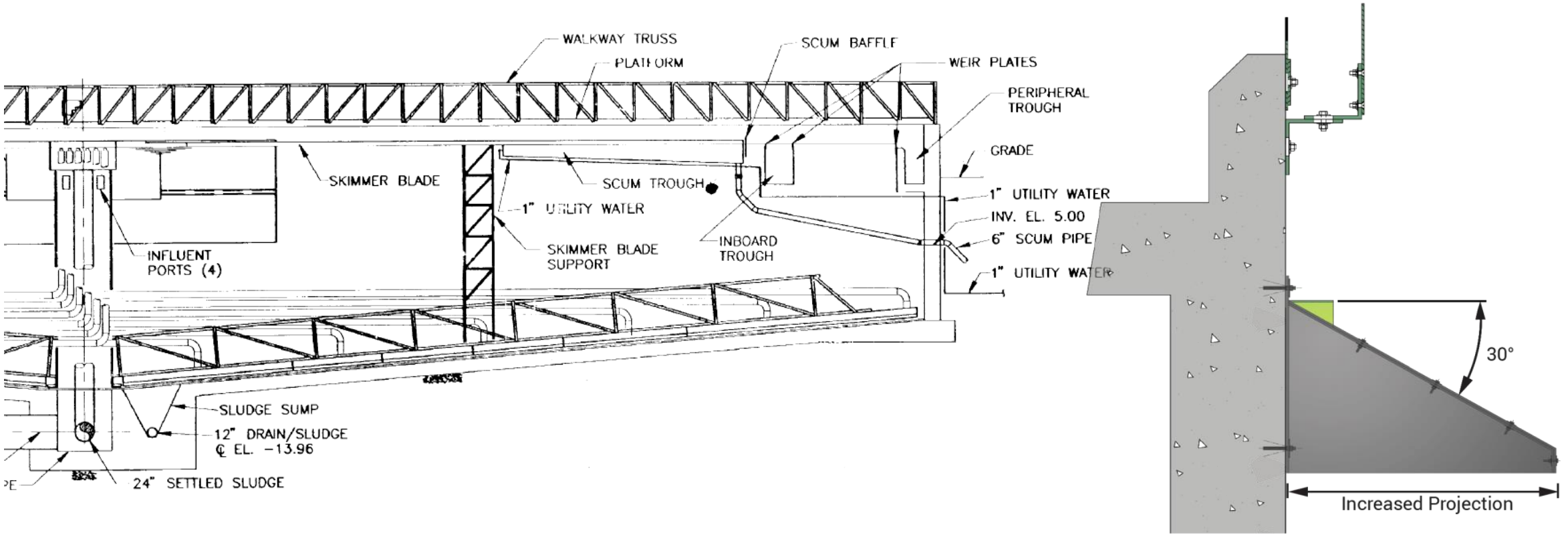


Design Decisions with BSA Staff – Capital Projects, Operations, and Maintenance Teams

- Virtual Meetings During Pandemic
  - Allowed More Participation from Staff Across the Plant Campus
  - Decision Making with Operations and Maintenance
- Monthly Progress Meetings
- Workshops After Design Milestones
- Standalone Design Meetings
  - Odor Control Technology
  - Scum and Sludge Treatment Upgrades
  - Layout of new facilities
- Design + BSA Operations Team Coordination in Planning / Sequencing
- Reliance of Operations Internal Knowledge of Processes and History (Why, How)
- Need for Operators and Maintenance Coordination, Taking Equipment Out of Service
- Opportunities for Operations and Maintenance staff to have direct access/contribution to Design team members…
  - …and for the Design team to learn from Operations and Maintenance!

Primary Sedimentation Tanks

- Existing Peripheral Weirs vs. Addition of In-Board Launder
- Baffles



Sludge Pumping Station

- Existing Hoist vs. New Bridge Crane
- Sludge Pump Level Drainage and Sanitary Line
- Sludge Pump Building Basement Flooding
- Existing Drainage Pump Parameters
- Location of New MCC

Develop Maintenance of Facility Operations (MOFO) Plan

- Standalone Workshops Held
- Operational Impacts Report – Findings to be Provided in Contract Documents
  - Construction Sequencing and Constraints
  - Standard Shutdown / MOFO Procedures
- BSA Involvement in Cleaning / Draining the Tanks
- Contract Distribution Based on Sequencing
- Coordination with Other On-going Contracts (Secondary Systems Rehab)
- MOFO Plan Updated as the Design Progresses
- Understanding Duration of Plant and Tank Shutdowns
- Limit Any Potential Discharge Permit Violations/Conflicts

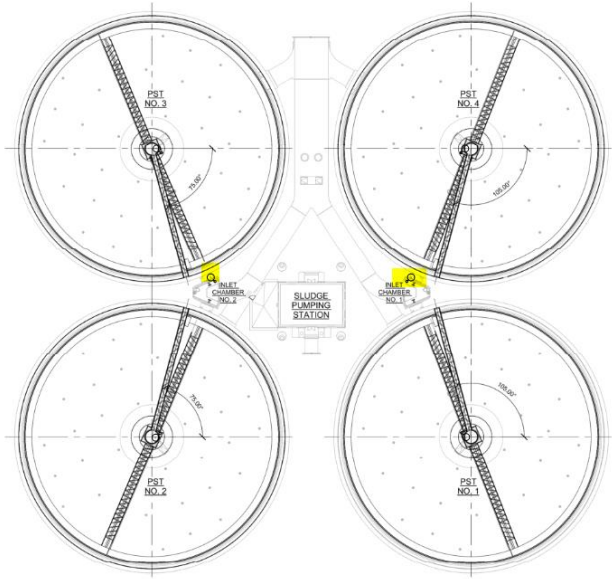
Activity	Estimated Duration	Mitigation	Limitations/ Related Processes
Complete Plant Shutdown			
Gate 17 Replacement	TBD – 3 days +	• Must be done prior to HRD tie in	• Requires DEC approval
Gate Inspections	12 -24 hours (all gates)	• Split up into shorter shutdowns • Avoid shutdowns by doing inspections prior to construction of other work	• Requires DEC approval
Bypass PSTs – All PSTs Out of Service			
Tie in outfall 001 conduit from new HRD 96in effluent	1 week	Sequence with PST work Public Outreach	• Outfall 001
Tie in 10x10 HRD Influent to PST Effluent Conduit	1 week	Sequence with PST work and Gate 17 installation	• Outfall 001
Relocation of Sludge Discharge Header in Tunnel B	1 - 2 months (temporary shutdown for pipe tie in - 2 days)	Temporary pipe in Tunnel B	• Sludge Pumps • PSTs

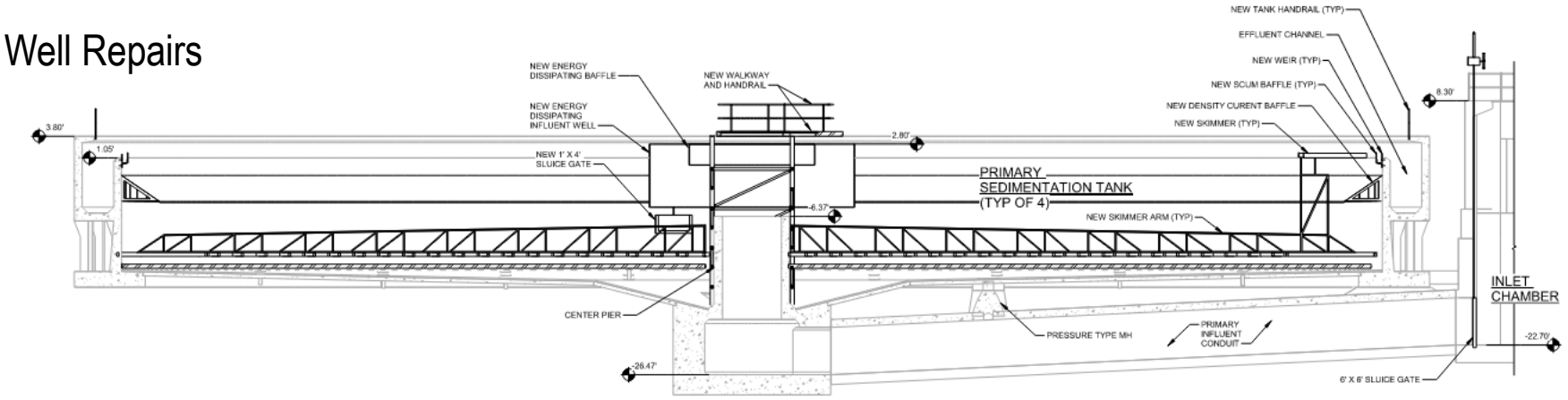
Activity	Estimated Duration	Mitigation	Limitations/ Related Processes
One PST Out of Service			
Structural Rehabilitation of PST	1 - 2 months	• Only one PST out of service at a time • Sequencing with related work	Can't be done in winter months
PST Equipment Replacement (clarifying equipment, walkways, odor control covers, scum collection)	1 - 2 months	• Only one PST out of service at a time • Sequencing with related work	• Sludge Pumps • Scum Pumps • PST Influent Gates • PST Effluent Gates
MCC	4 - 12 hours per PST	• Build new MCC as the first PST is being rehabilitated. • Construct new MCC before any shutdown of existing • Transfer loads from existing MCC to new MCC during shutdown of each PST	Would need electrical contractor on site multiple days for startup/load transfer
Inspection of Sludge Piping	1 week per PST	• To be done prior to any construction activity	
Sludge Pump Replacement	1 week per PST	• Sequence with work at PSTs	
Two PSTs Out of Service			
Scum Pump Replacement	1 week	Sequence with PST work and Gate Inspections	

Design Decisions

Primary Sedimentation Tanks

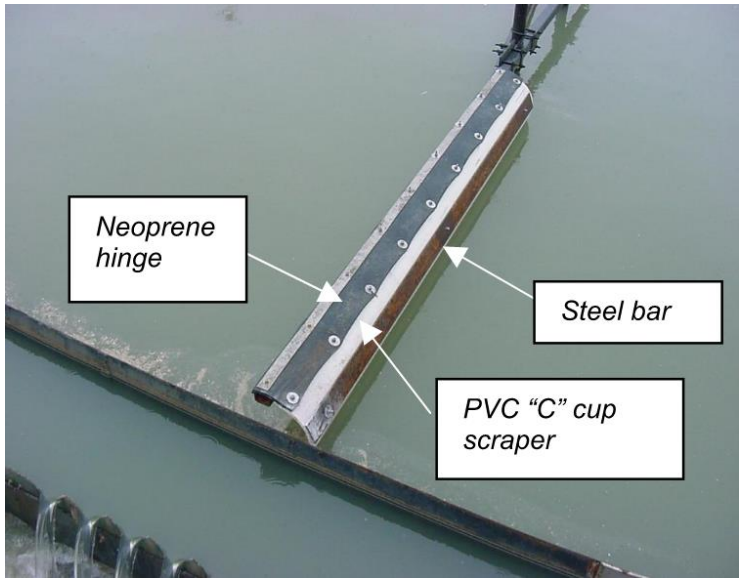
- New Clarifying Equipment
  - New Sludge and Scum Collection Equipment
  - Density Current Baffles
  - Energy Dissipating Inlets
  - Replace GW relief valves
  - New Scum Trough, Beach
  - Effluent Weir Covers – Odor Control
- Structural Repairs
  - GW Relief Valve Replacement
  - Concrete Crack / Spall repairs
  - Concrete Coating Inlet Chamber Repairs
  - Inlet Chamber & Scum Well Repairs
- Electrical
  - New Area Lighting
    - SwivelPole Type at PSTs and PST Walkway
- New Handrails around PSTs
- Davit Mounts
- Inlet Chamber / Scum Well Handrails Left in Place

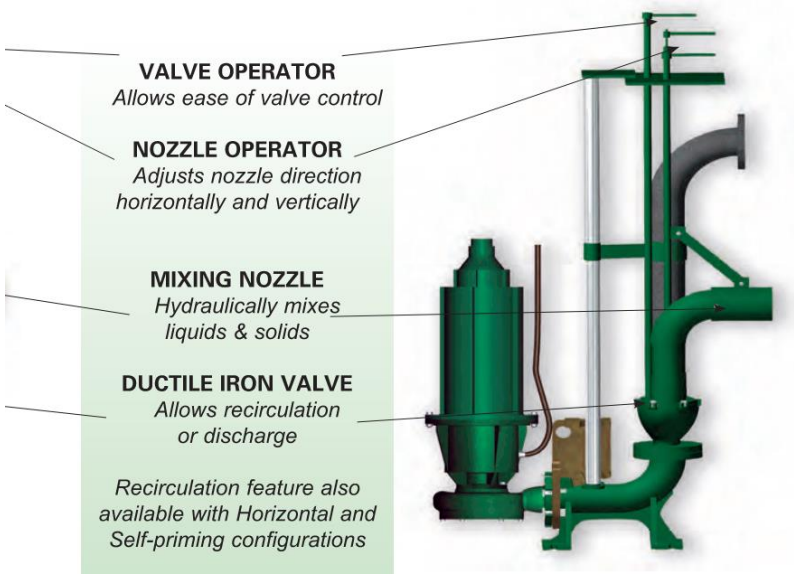


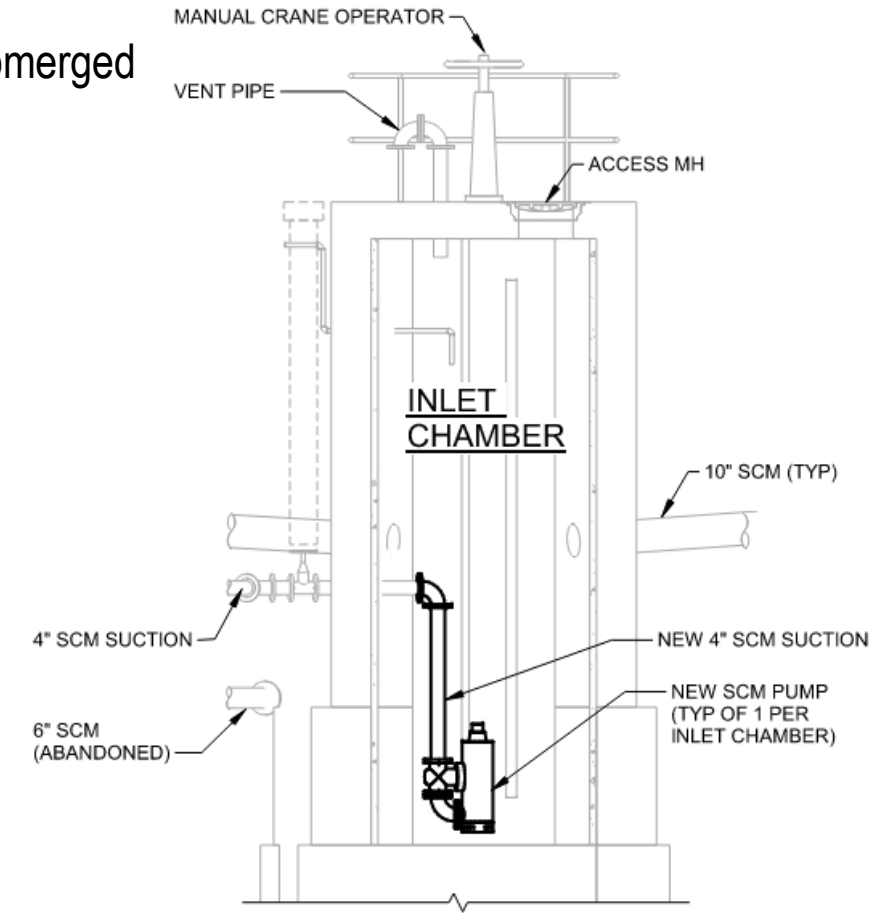


Scum Collection

- Operation
  - Automatic Based on Level
    - Electrode Level Control
- Submersible Recirculation Pumps
  - Eliminates Need for Mixer
- Scum Collection Equipment
  - Increase Scum Beach and Trough Length
- Scum Collection Equipment
  - Scum Beach to be Mostly Submerged
  - Hinged Scum Skimmer Arm

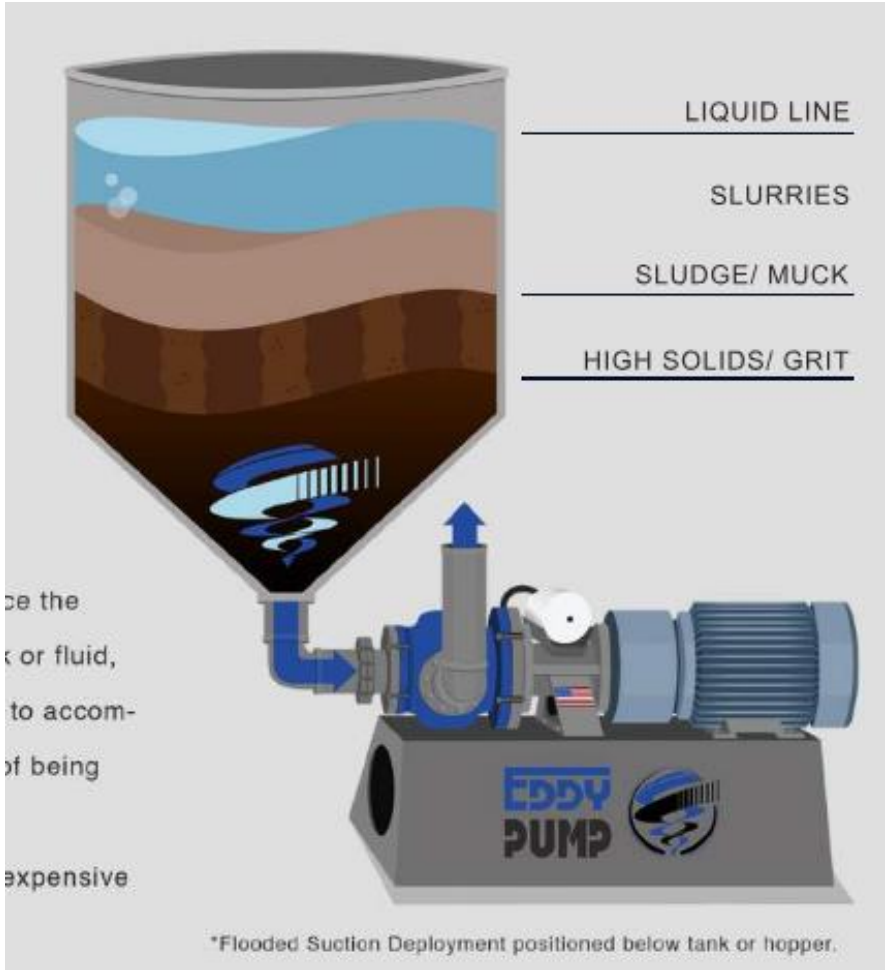






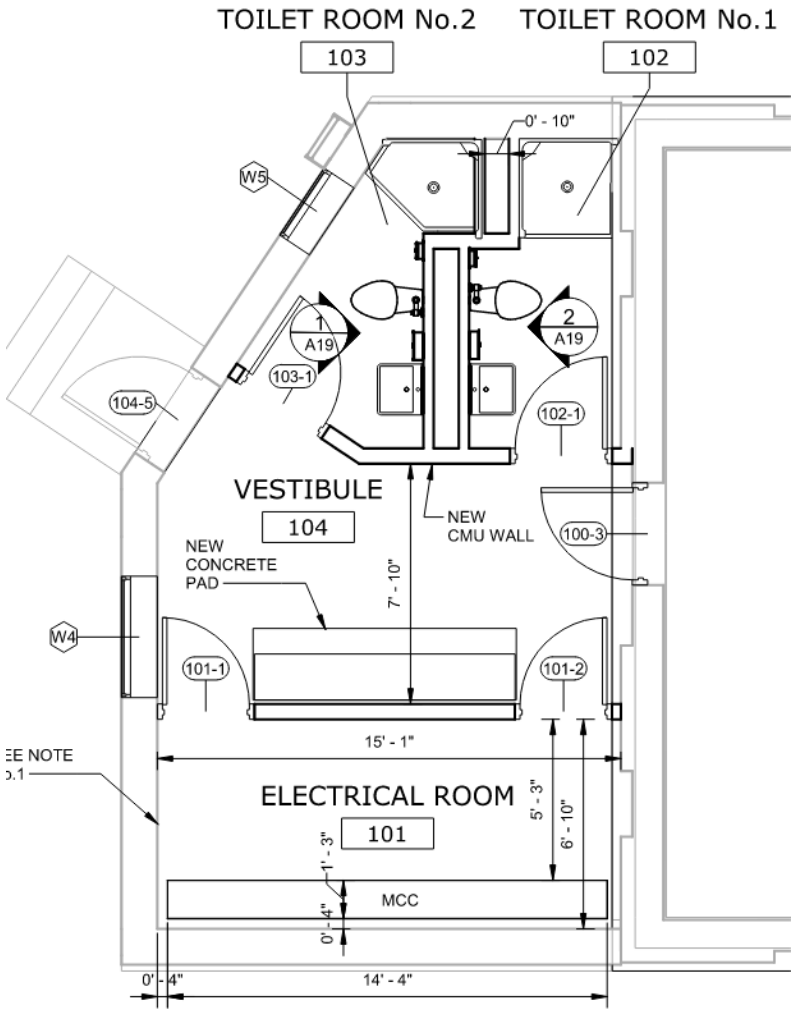
Sludge Pumping Station

- Operation
  - Pumps to Operate Automatically Based on Timer and Sludge Density Meters
  - Manual Valve Actuation
- Primary Sludge Pumps
  - Eddy Pumps
- Sludge Monitoring
  - Sludge Density Meters
- Drainage Pumps
  - Dry Pit Submersible with Control Panel on Upper Level
  - Operated Based on Level



Sludge Pumping Station

- Structural Repairs
  - Inside Sludge Pumping Station
- Architectural
  - Repair While Keeping Integrity of Façade
  - Added Railings on Roof for HVAC Equipment
  - New Sludge Pump Station Control Room
    - Electrical Room
    - Toilet Room
- Electrical
  - MCC Located in New Electrical Room
  - New Feeder Route for MCC



Primary Sedimentation Tanks

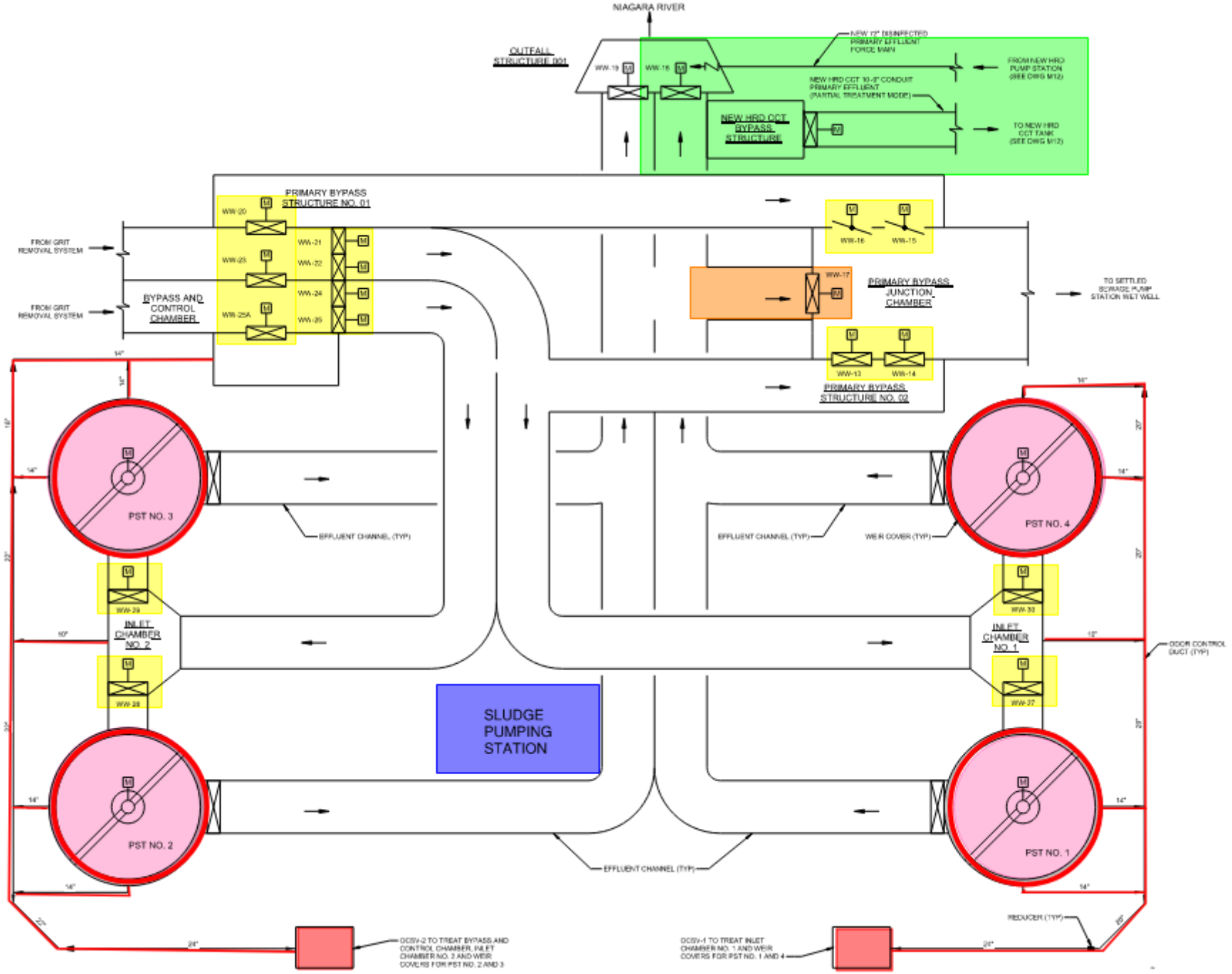
Gate 17

Sludge Pumping Station

HRD

Odor Control

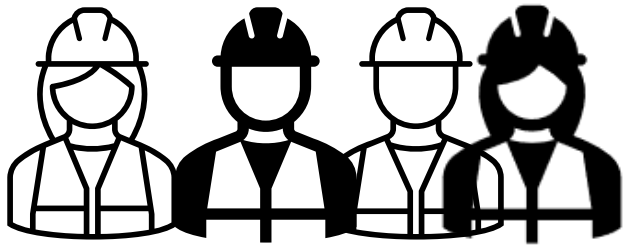
Gates



Summary & Lessons Learned

Summary / Lessons Learned

- Reliance of BSA Operations and Maintenance Staff Internal Knowledge of Processes and History
- Necessity of Design + BSA Capital Projects/Operations/Maintenance Team Coordination in Planning / Sequencing
- Decision Making with Capital Projects, Operations, and Maintenance Teams
- Coordination with operators in taking equipment out of service
- Utilizing Technology to Facilitate Meetings
  - Project Management – Weekly Check-ins
- Early understanding of context of regulatory issues to address, and stakeholder communication which needs to occur
- Managing Capital Budget Needs, While Expediting Completion



Next Steps

- Project is Currently in 95% Design Phase
  - Primary Sedimentation Tanks Renovation
  - Sludge Pumping Station Renovation
  - I&C / Ovation Integration
  - New Odor Control System
  - New High-Rate Disinfection Effluent Pumping Station
  - Maintenance of Facility Operations / Construction Sequencing
- Secure Funding (SRF, WIIA, etc.) - $90-95M
- Community Outreach
- DEC / EPA Coordination to Approve Design
- Future NYWEA presentations on other elements of this project

THANK YOU!

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NYWEA
LEADING THE WAY IN WATER QUALITY MANAGEMENT

BUFFALO SEWER AUTHORITY

GREELEY AND HANSEN

BUFFALO
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ARCADIS

Smith Eagle Real Time Control Structure

Presented by:

Regina Harris, EIT – BSA

Dave Barnes, P.E. – Arcadis of NY

APWA NY Annual Conference
March 24, 2022

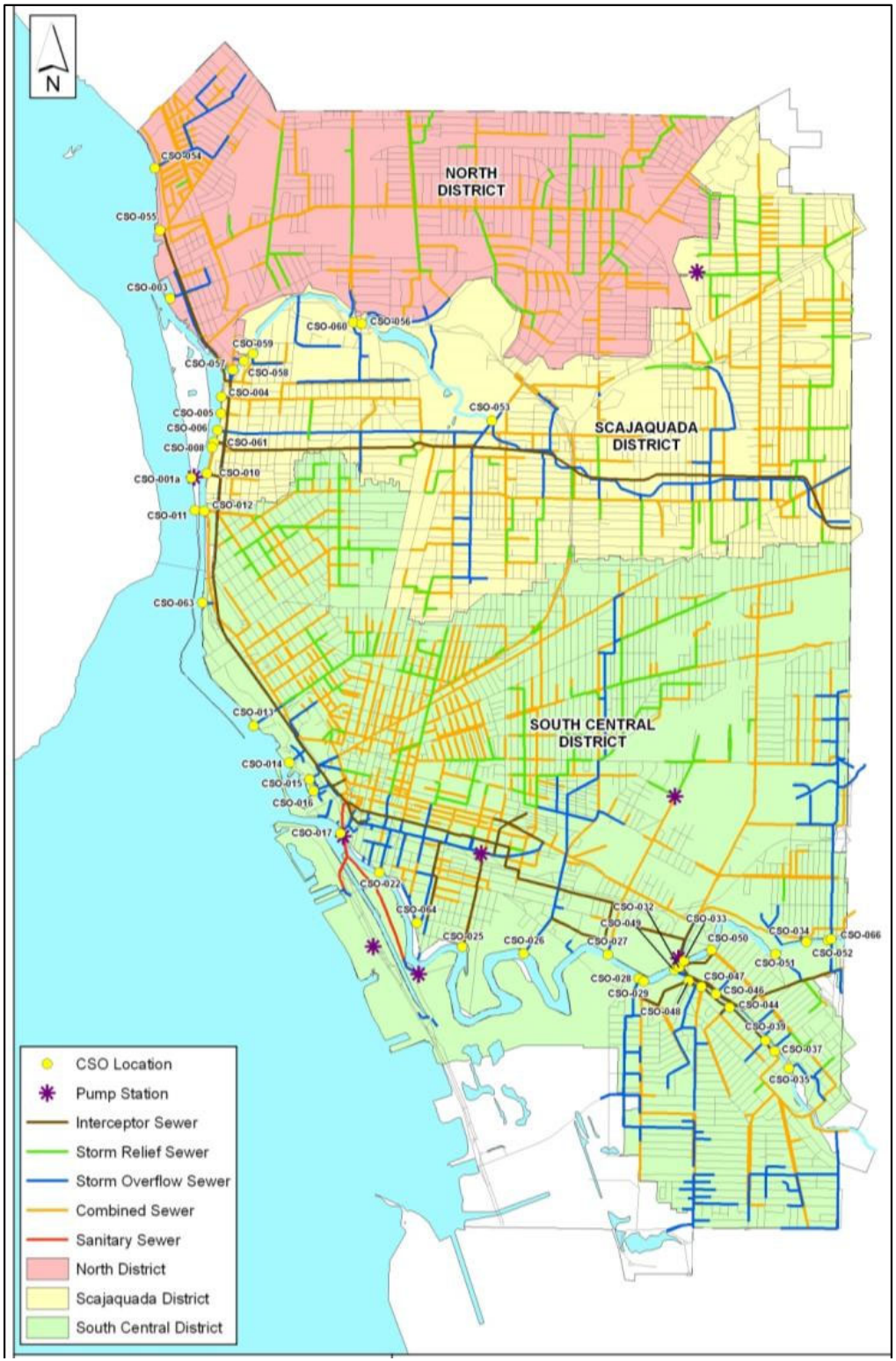
BSA Collection System

- **Consists of:**
  - Separate Sanitary Sewer Systems (SSS)
  - Separate Storm Sewers
  - Combined Sewer Systems (CSS)
- **More than 850 miles of sewers**
- **790 miles of sewer are combined**
- **258 Sewer Patrol Points (SPPs)**
- **52 Permitted Combined Sewer Overflows (CSOs)**

BSA Combined Sewer System

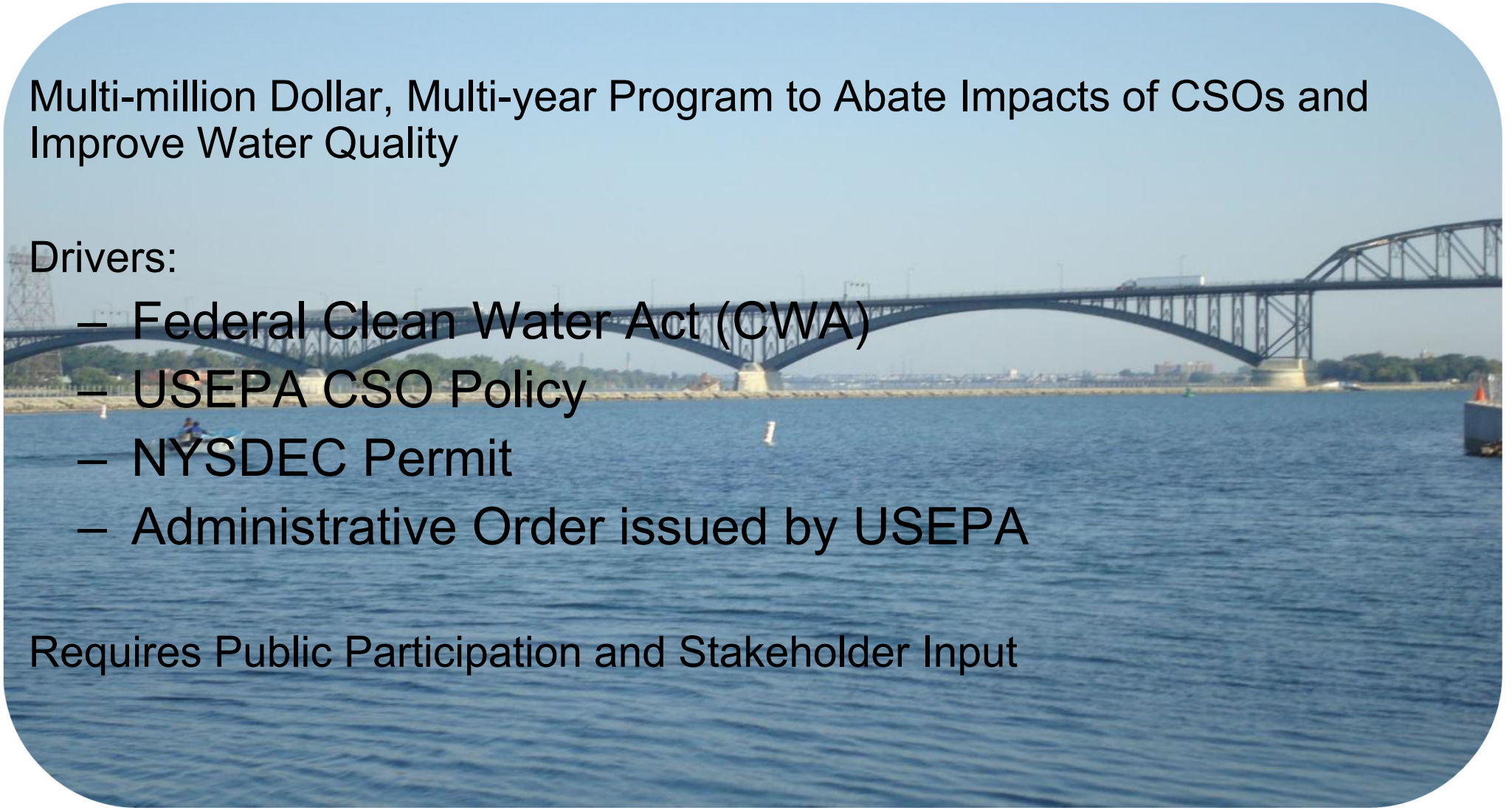
North District
- 6 CSOs
- Main Receiving Water – Niagara River

South Central District
- 30 CSOs
- Main Receiving Waters – Cazenovia Creek and Buffalo River



Scajaquada District
- 9 CSOs
- Main Receiving Waters – Black Rock Canal and Scajaquada Creek

What is an LTCP?



Multi-million Dollar, Multi-year Program to Abate Impacts of CSOs and Improve Water Quality

Drivers:

- Federal Clean Water Act (CWA)
- USEPA CSO Policy
- NYSDEC Permit
- Administrative Order issued by USEPA

Requires Public Participation and Stakeholder Input

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LTCP History

1994	• USEPA CSO Control Policy Issued (in part required development of LTCP)
2004	• Submitted Initial LTCP to NYSDEC
2006-2007	• Received Comments from NYSDEC • NYSDEC/USEPA Request Additional Evaluations
2008	• Additional LTCP Work Starts
2009	• Negotiation of Consent Decree Begins
April 2012	• Submitted LTCP Update to USEPA/NYSDEC (as dire
January 2014	• Final LTCP Report Submitted to USEPA/NYSDEC (revised to address regulatory comments)
Ongoing	• Over $120 Million Invested in CSO Controls/WRRF Improvements since 2000
2019-2022	• Smith at Eagle RTC

Additional Flow/Rainfall Monitoring
Collection System Model Refinement
Water Quality Sampling
Receiving Water Quality Model Development
Revised Financial Capability Analysis

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LTCP Creative Solutions

- 10 year process meant technologies changed
- Traded gray for green, using the latest data on **Green Infrastructure**
- Two unique approaches due to population decline in the City:
  - ➢ Daily flows were reduced; hence, the adoption of **real time control became viable**
  - ➢ 15,000 vacant structures that needed to be demolished
    - Just keep vacant
    - Require new development to detain
    - Installation of rain gardens, pervious parking, and modified soil lots

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Real Time Control – Smart Sewers

- RTC Technologies Evaluated Included:
  - **RTC Interception:** Increasing regulated flows to interceptors that are under utilized during storm events
  - **In-line Storage:** Existing larger diameter pipes with excess capacity available during storm events to store wastewater

- Study identified over 500 MG of avoided CSO during the typical year

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RTC Benefits

- RTC satisfies the NYSDEC CSO Best Management Practice of "Maximize Existing Collection System For Storage"

- USEPA lists benefits(1) including:
  - Route flows in-line, off-line, to a treatment plant
  - Control flooding, overflows, or surcharges
  - Maximize storage space
  - Optimize treatment plant capacity
  - Protect receiving waters

- Cost effective – utilize existing infrastructure

(1)Mary K. Stinson, USEPA, National Risk Management Laboratory, 2005

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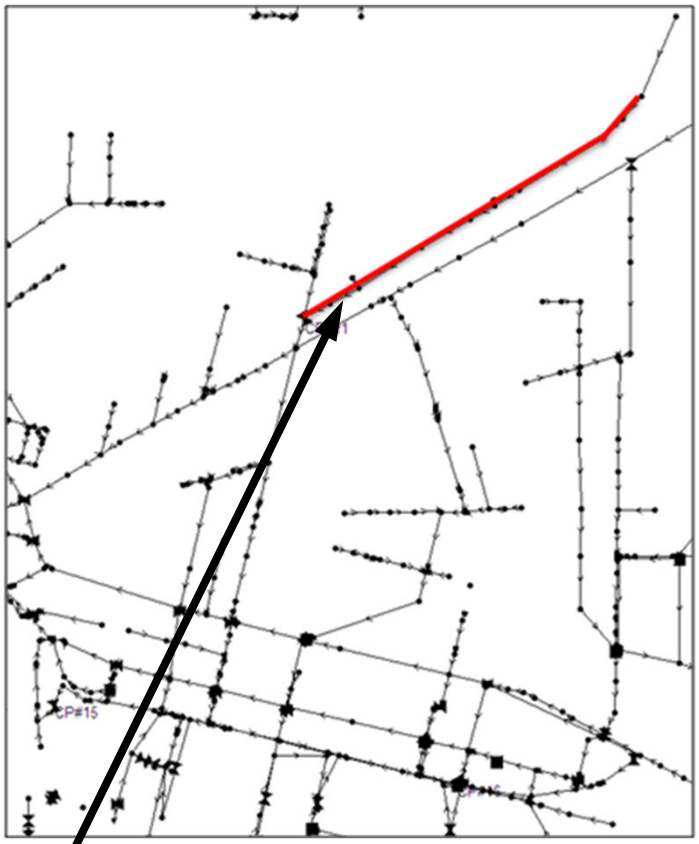
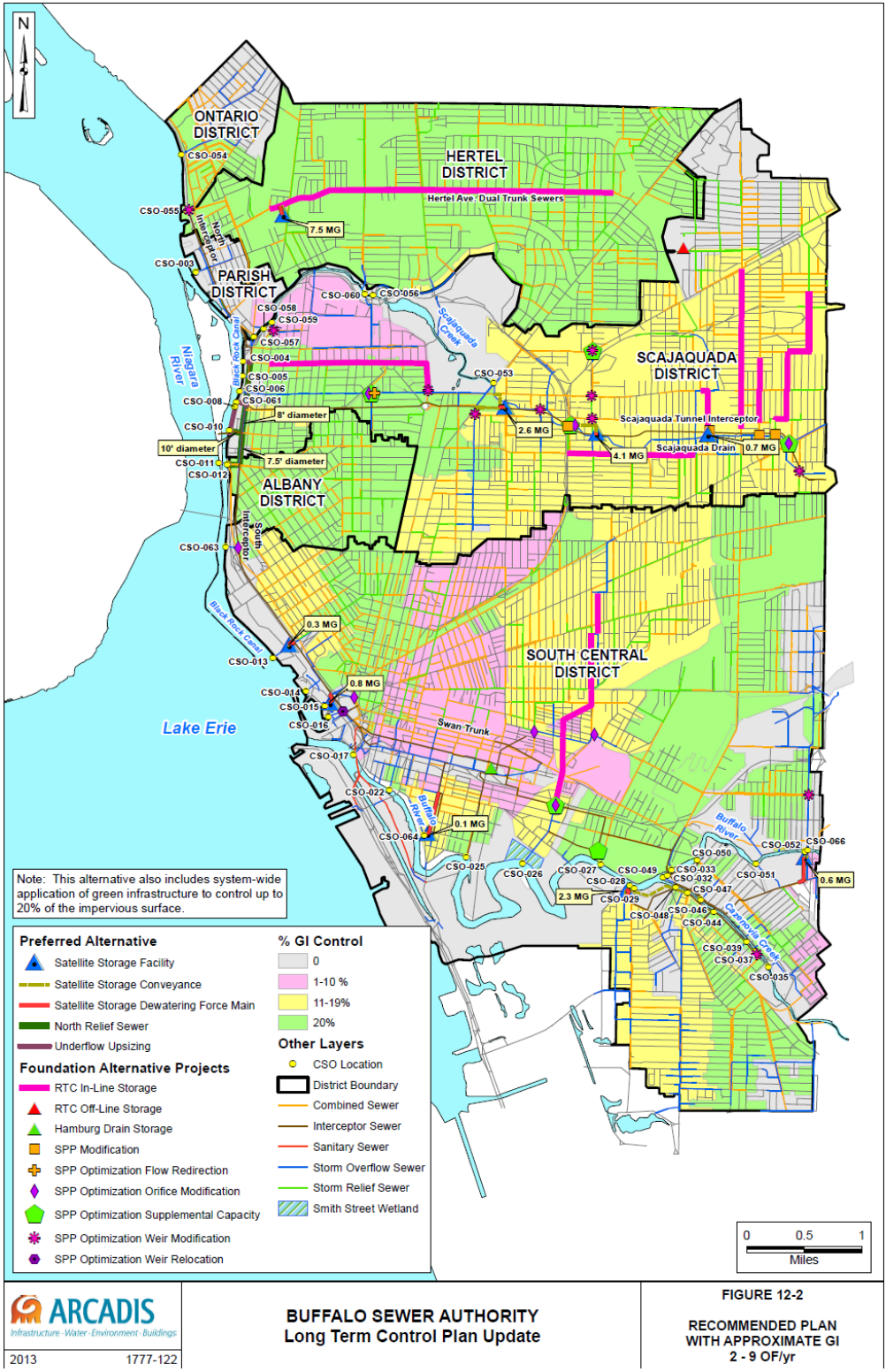
RTC: Asset Identification

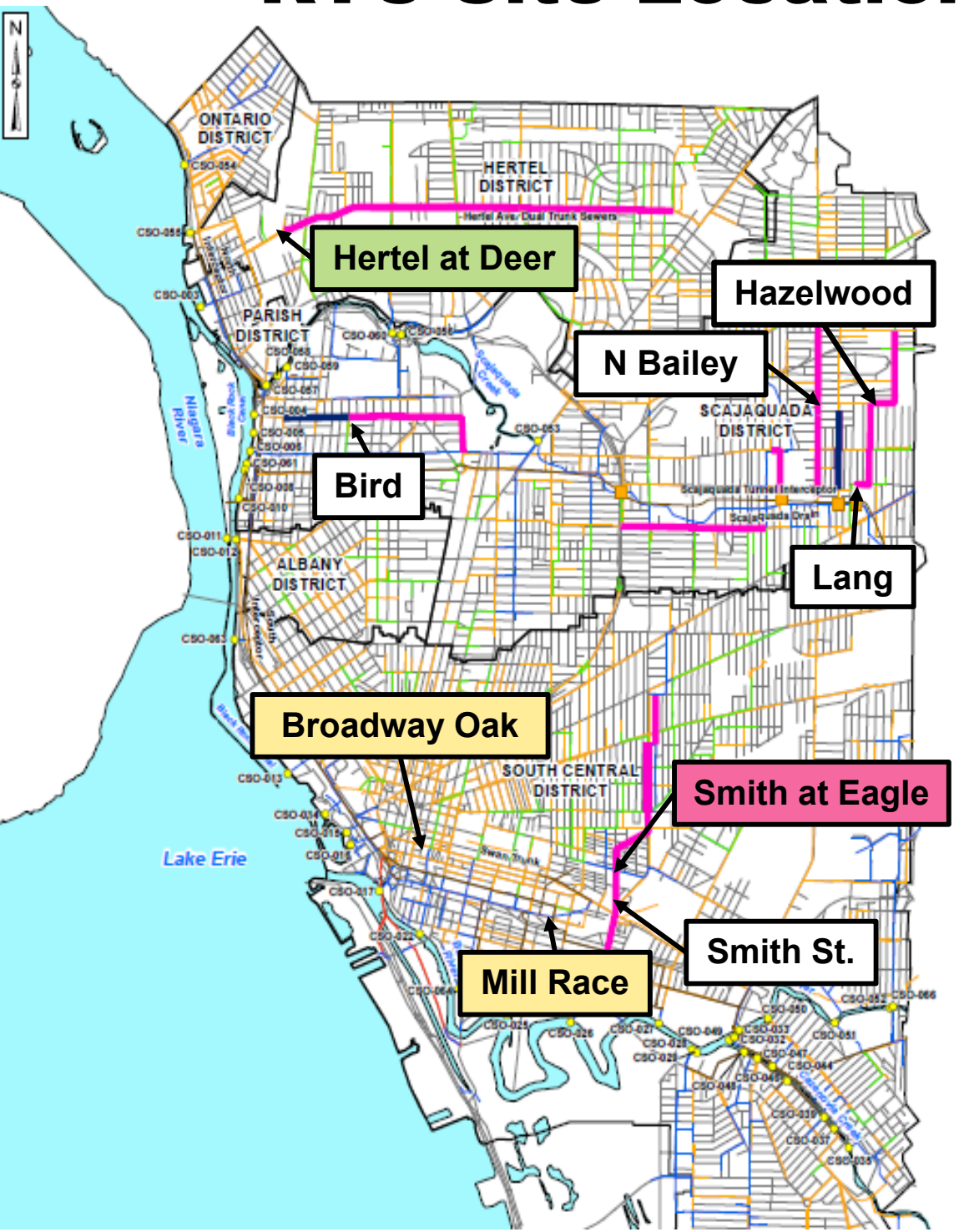
- LTCP identified 16 sites to implement RTC



Genesee In-Line Storage
Control Point ID: CP11
Capacity: 1.1 Million Gal.
Usable Length: 5000 ft.



RTC Site Locations and Status



In Service:

- Smith St, Bird, Lang, Hazelwood – coordinates with Lang's operations, and North Bailey

Completed, undergoing tuning:

- Hertel at Deer, Babcock Pump Station

In Construction: Smith at Eagle – will coordinate with Smith St.

Construction begins April 2022:

- Broadway at Oak, Mill Race

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Smith Street Drain CSO 026 RTC Storage Structure

Fifth most active CSO
63 OFs/TY per LTCP

Storm relief sewer, 47 SPPs

Outlets to Buffalo River at Red Jacket Riverfront Park

2.3 miles long, cross section 8.5’ x 8.5’ to 16’ x 11’ outlet

1,900 acre drainage area
South of Genesee St
East of Jefferson Ave
West of Bailey Ave

CSO No. 026 Outfall

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Smith Street Drain CSO Design Evolution

Original Concept - 2012

- Weir control structure with sluice gates at Buffalo River outlet
- Pump station dewatering to South Interceptor
- NO MORE PUMP STATIONS!!

Sewer Separation South of Thruway and SPP Optimizations – Constructed 2015

Control Structure at Thruway – Started August 2016

- Gravity drainage to South Interceptor
- Eliminated sluice gates by lengthening the overflow weir
- Motorized drain valves operated with RTC

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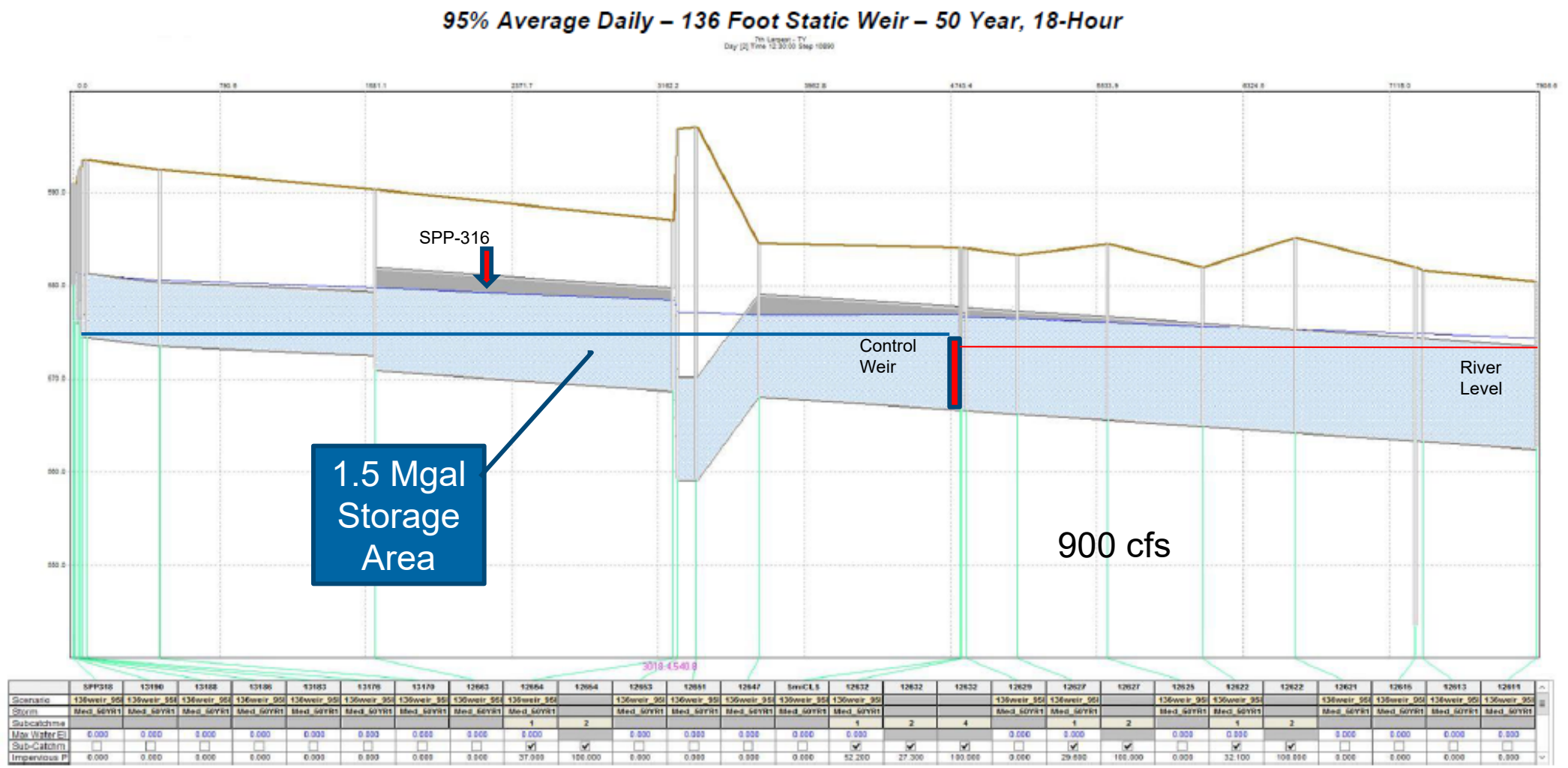
Control Weir Design

- HGL influenced by River level and storm intensity
- Historical river levels from NOAA weather station
- Monthly Avg. (1860), Daily Avg. (1970), 95% Daily, and Peak Hourly (Seiche)
- Prevent river backflow over weir 95% of time based on Daily Average
- Existing vs proposed HGL under 25, 50, and 100-year event
- 50-year event need to pass 900 cfs
- Maintain water surfaces below upstream SPP weirs
- Keep the collection system free draining
- Prevent river backflow into the South Interceptor
- Maintain ability to pass high intensity storm events

Most Importantly – PREVENT BASEMENT BACKUPS

Design HGL – High River and 50-Year High Intensity Storm



RTC Control Chamber Location

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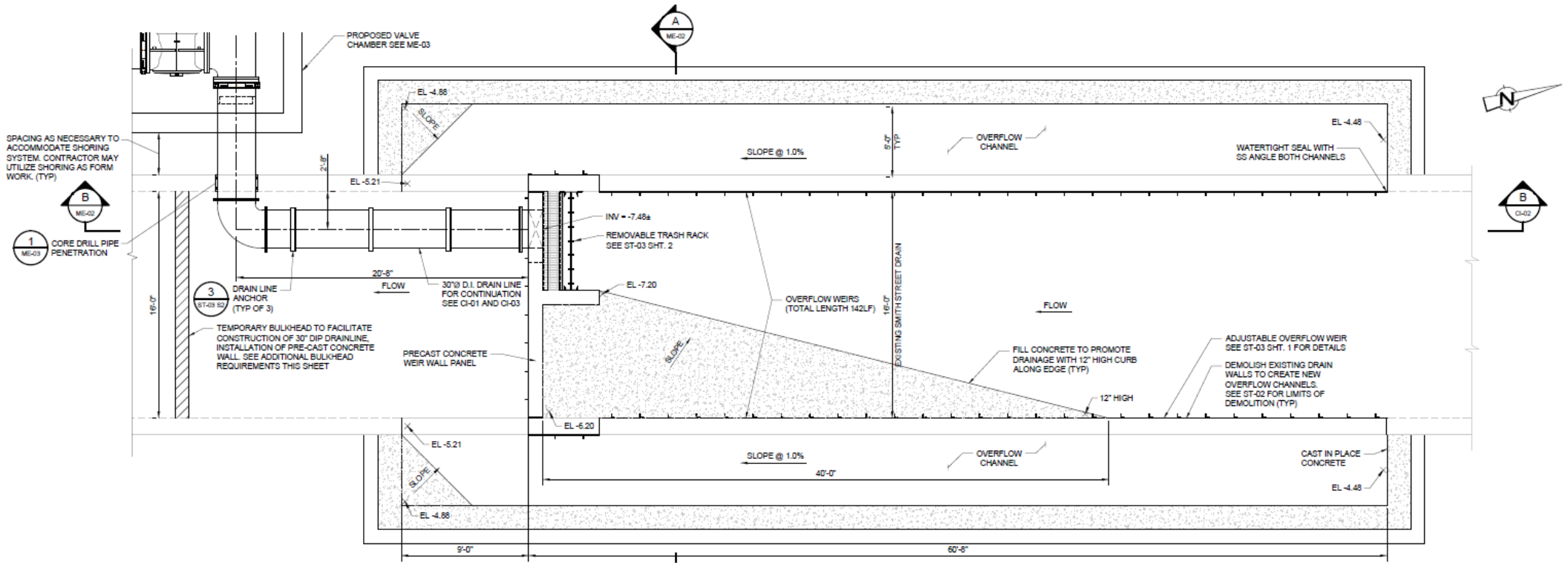

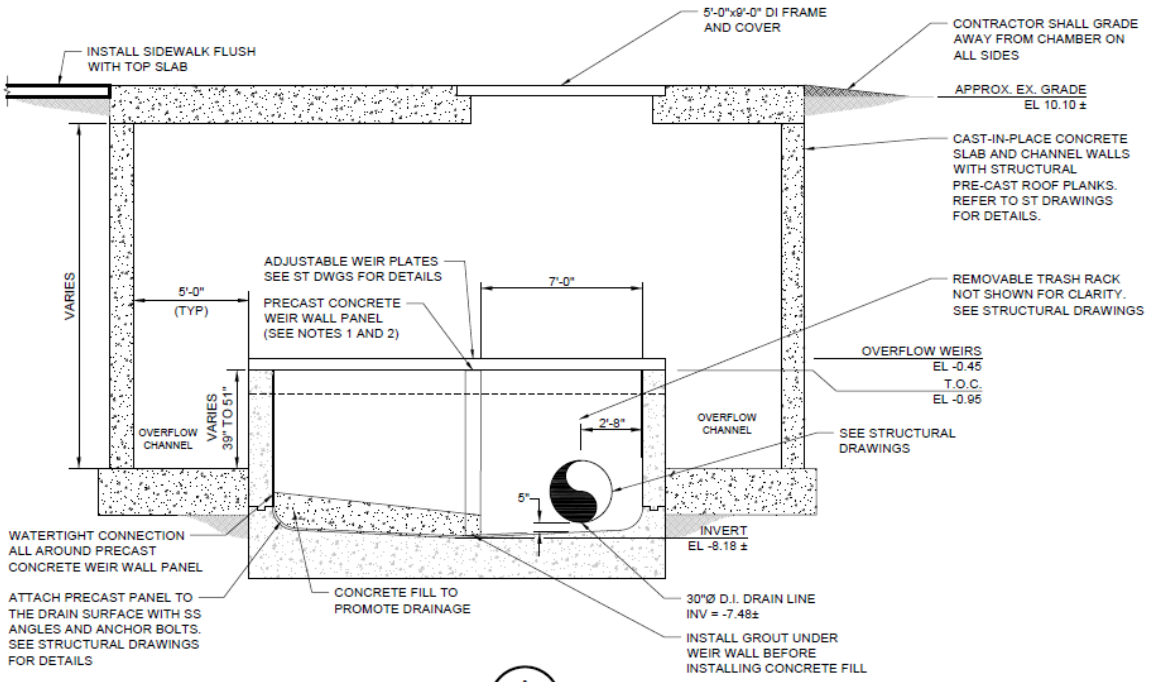

SECTION A ME-01
SCALE: 1/4"=1'-0"

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RTC In Line Storage – Operation

- 1.5 million gallons of in line storage per large storm event
- Normally open drain valve to keep the storage area dewatered
- Valve controlled utilizing real-time system analysis
- Gravity dewatering of in line storage area
- First flush returned to South Interceptor
- Close drain valves when South Interceptor water level rises
- Close drain valve if there is not enough driving head in order to prevent the South Interceptor from flowing out to the River
- Close drain valves under high river level conditions

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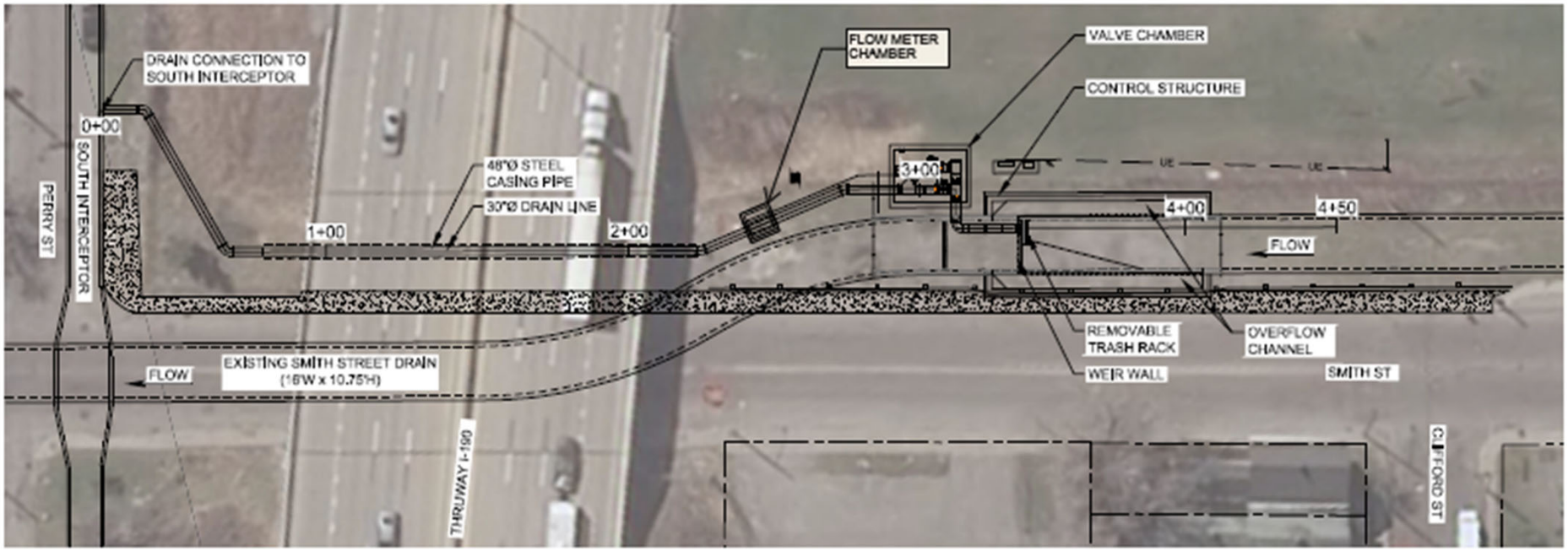
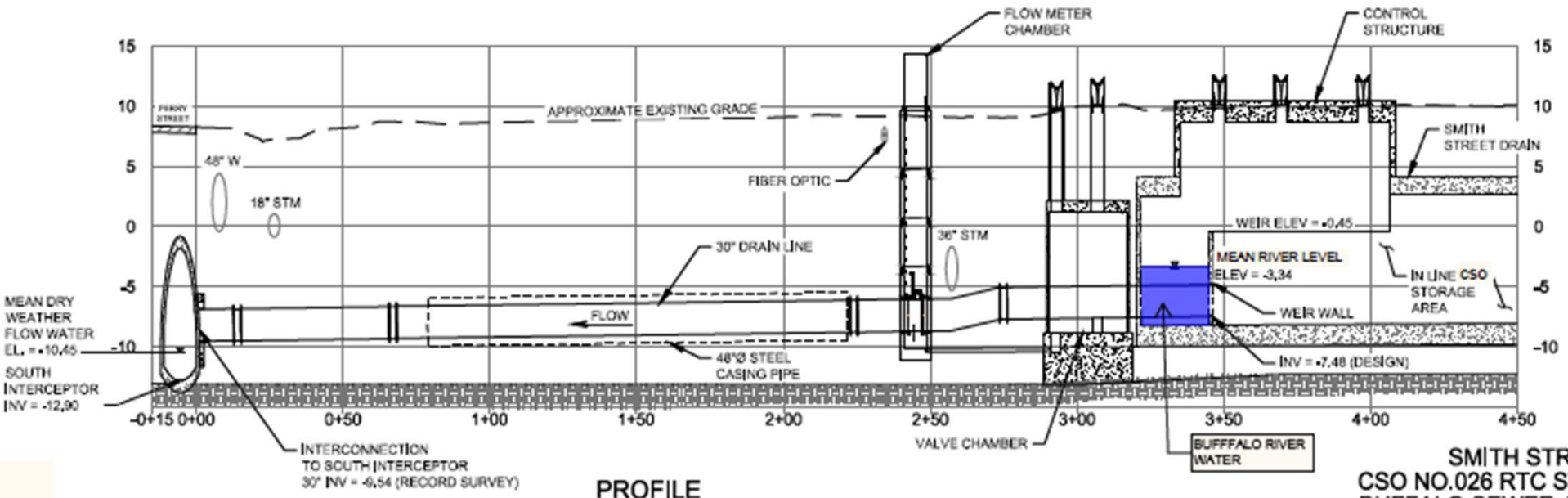


PLAN

SCALE: 1" = 40'



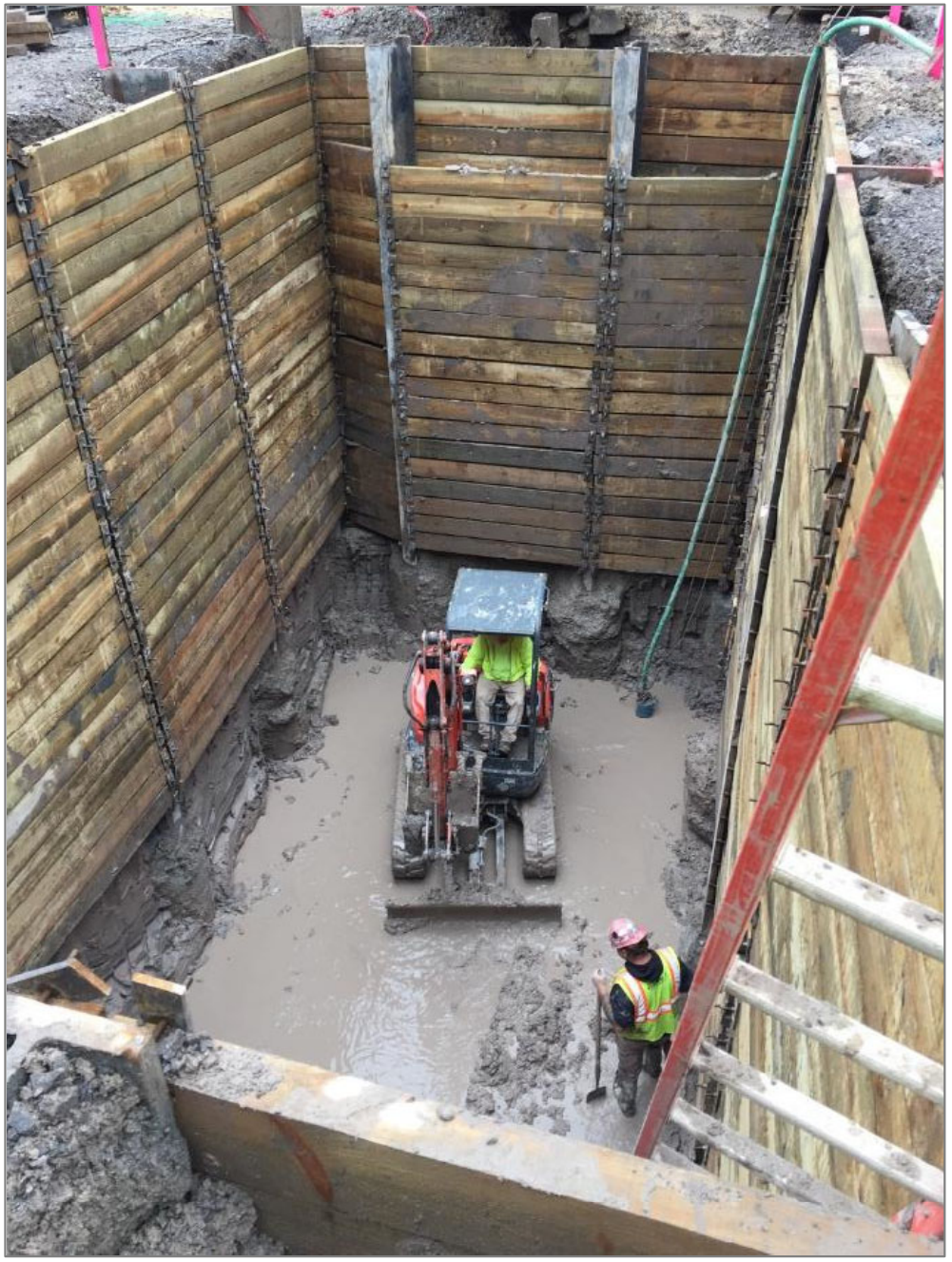
PROFILE

HORZ SCALE: 1" = 40'
VERT SCALE: 1" = 10'

SMITH STREET DRAIN
CSO NO.026 RTC STRUCTURE
BUFFALO SEWER AUTHORITY
Buffalo, New York

Smith Street RTC Structure

Pile Driving October 2016



Launch Pit November 2016

Smith Street RTC Structure

Casing Pipe December 2016

Smith Street RTC Structure

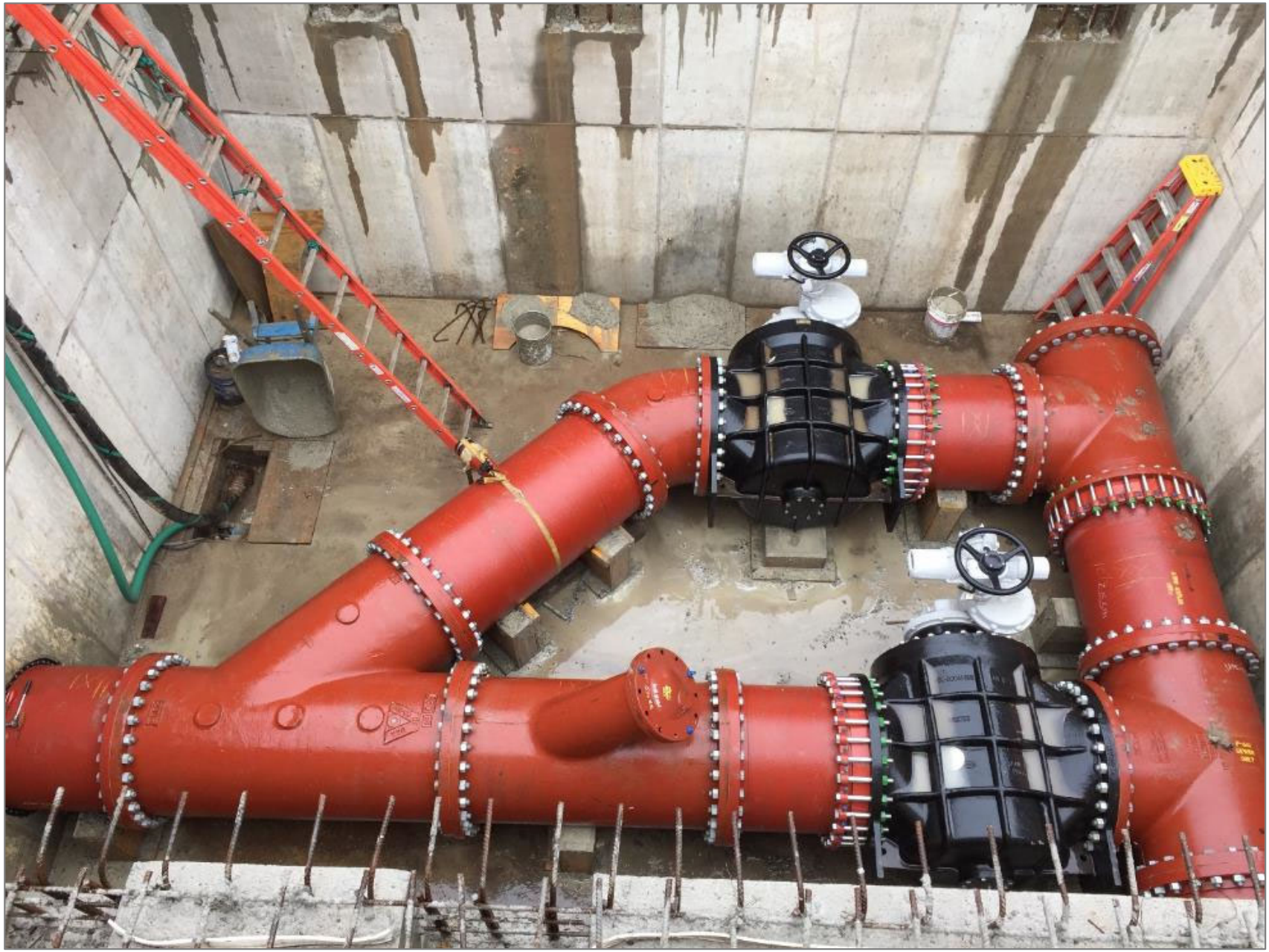
Flow Meter Chamber
January 2017

Smith Street RTC Structure

Interceptor Sewer Interconnection February 2017

March 2017

Smith Street RTC Structure



Valve Chamber
May 2017

Smith Street RTC Structure

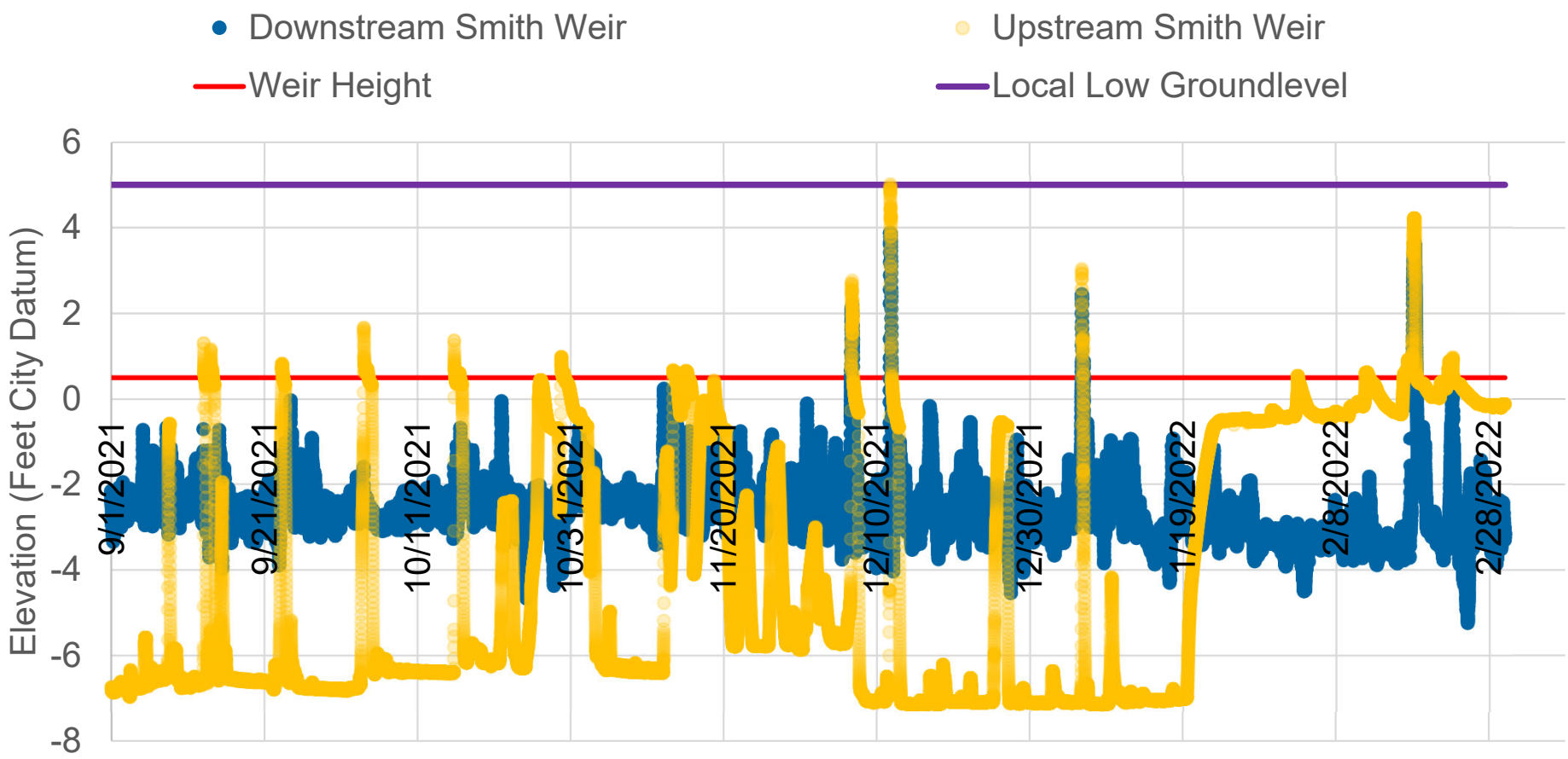
Smith St Drain
Roof Removal
June 2017

Smith Street RTC Structure

Dewatering Upstream of
Temporary Bulkhead Weir
June 2017

Smith Street RTC Structure

Metering at Upstream and Downstream Weirs



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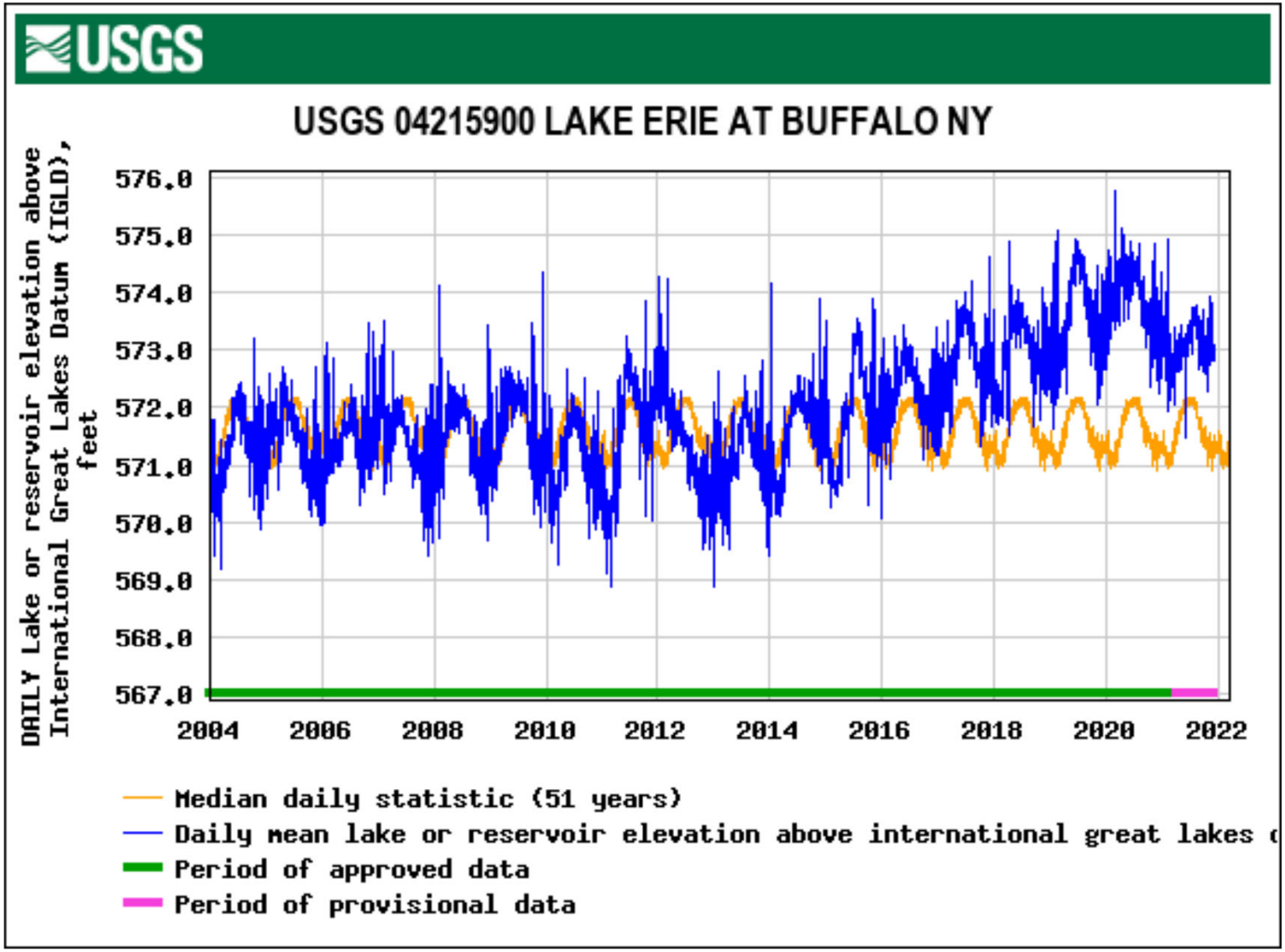
USGS Lake Levels at Buffalo



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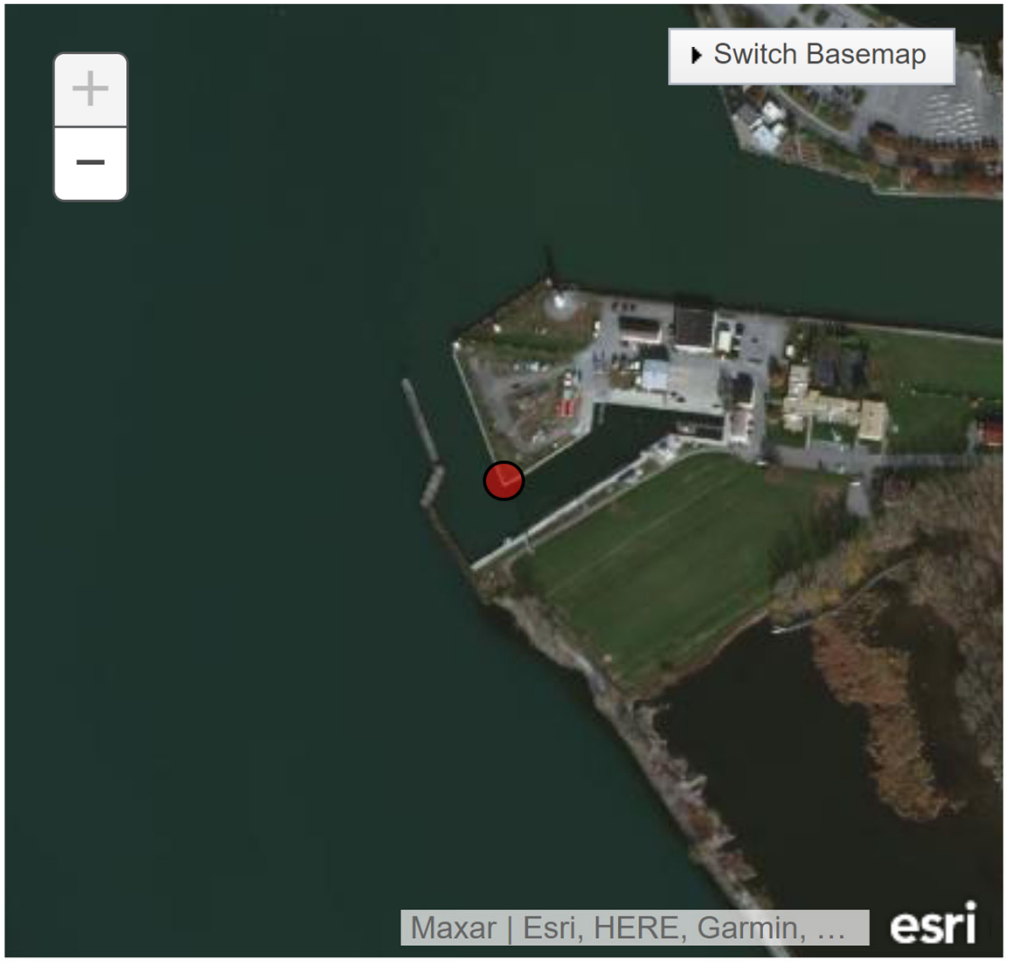
Lake Erie Level History

Historic Crests

(1) 12.08 ft on 12/02/1985
(2) 11.12 ft on 11/15/2020
(3) 11.06 ft on 01/30/2008
(4) 10.65 ft on 04/06/1979
(5) 10.65 ft on 11/01/2019
(6) 10.57 ft on 12/11/2021
(7) 10.36 ft on 12/12/2020
(8) 10.31 ft on 11/10/1975



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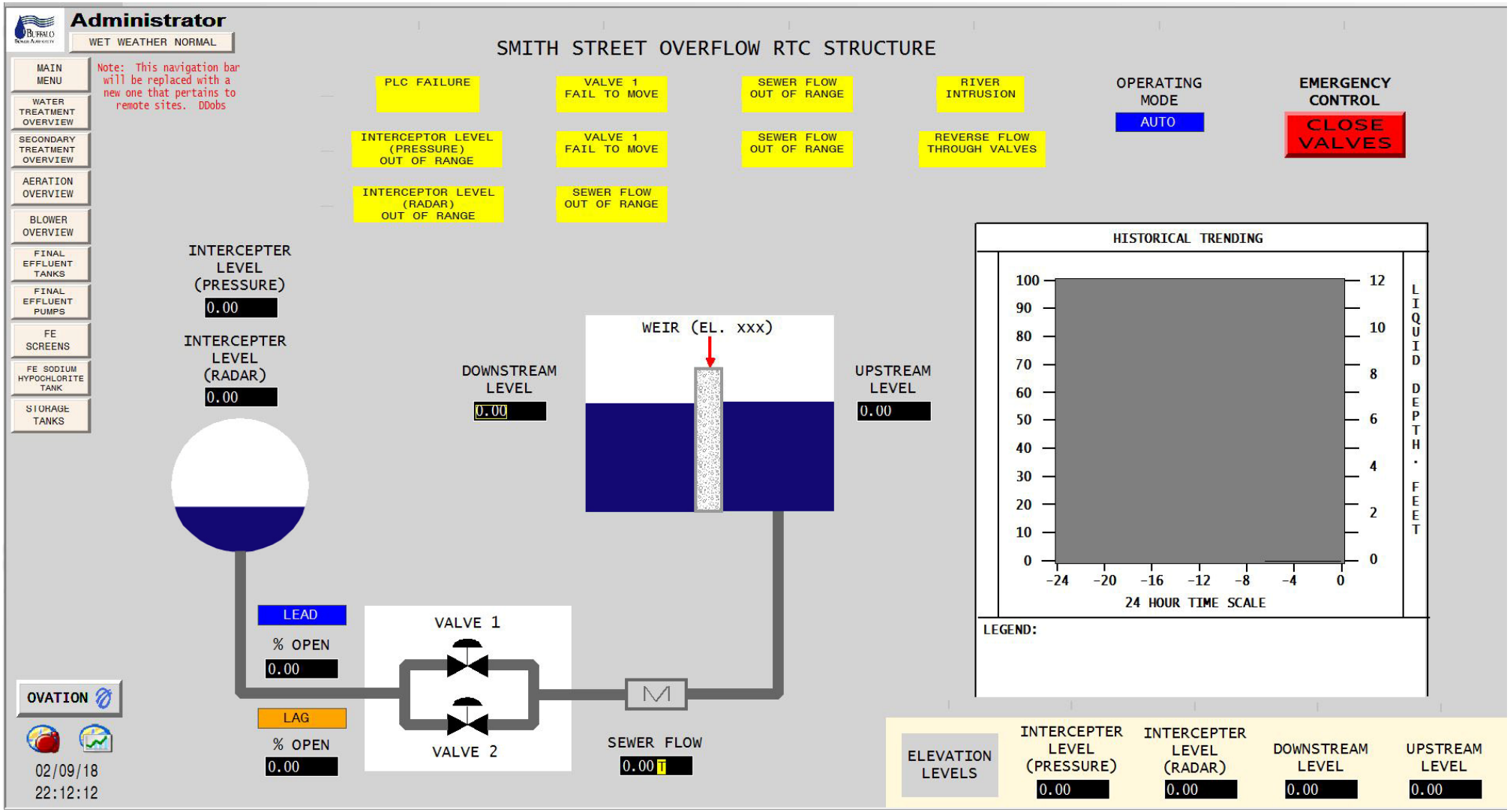
WWTP SCADA Screen



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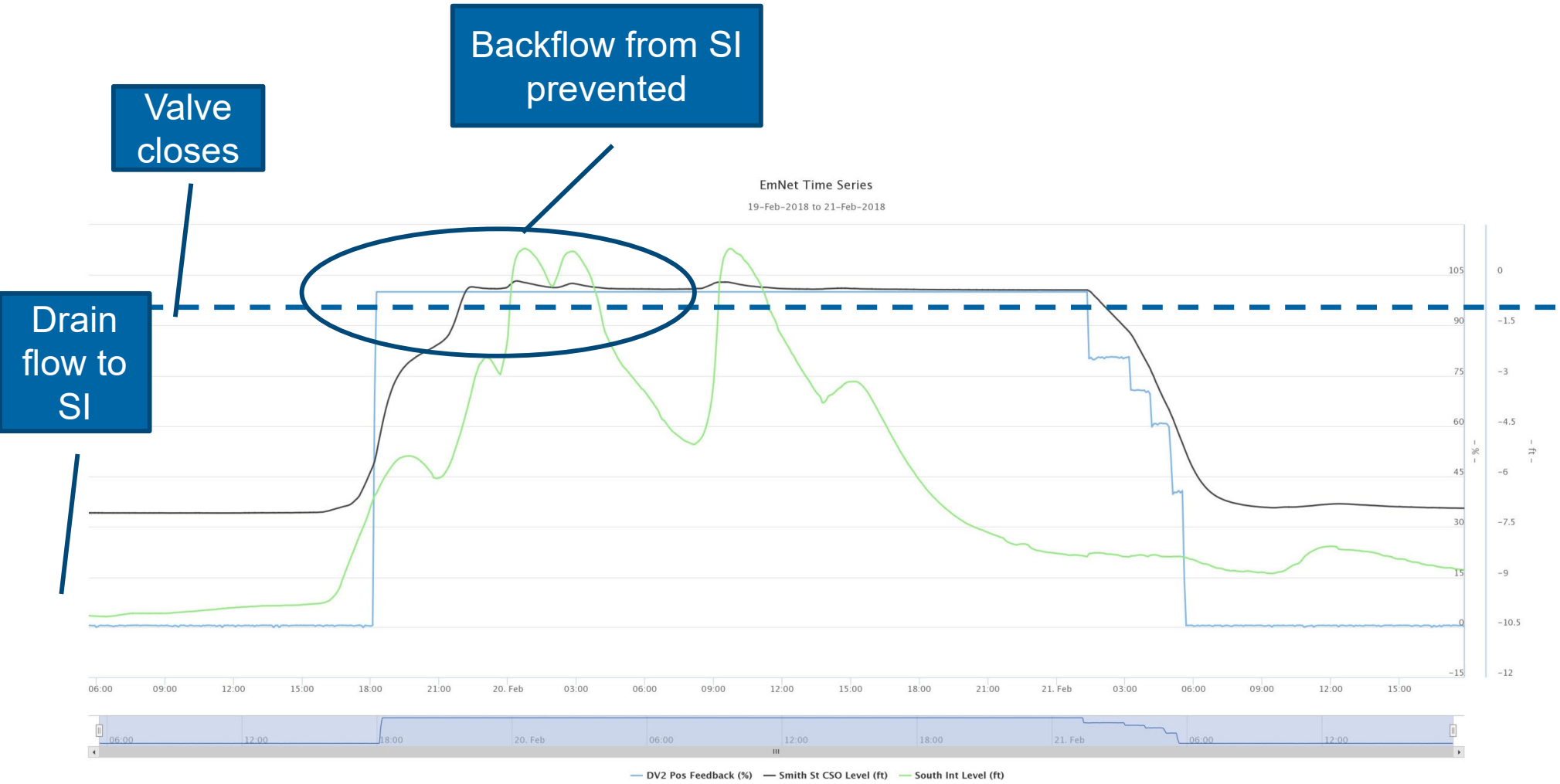
Smith St. Drain Monitoring & Tuning



RTC Structure Lessons Learned

- Coordination with another RTC – affects ability to dewater
- Choose appropriate flow control method – be prepared with backup
- Level/Flow measurement equipment
- Redundancy in equipment for storage – spares
- Scada coordination

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Smith Eagle Real Time Control Structure

Smith Eagle Real Time Control Structure

Questions?

BUFFALO SEWER AUTHORITY

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ARCADIS

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wef Education & Training Events

COLLECTION SYSTEMS
SEWERS IN THE MOTOR CITY – THE ENGINE OF OUR INDUSTRY!

Rethinking Buffalo Sewer's CSO Long Term Control Plan

Rosaleen B. Nogle, PE

Principal Sanitary Engineer

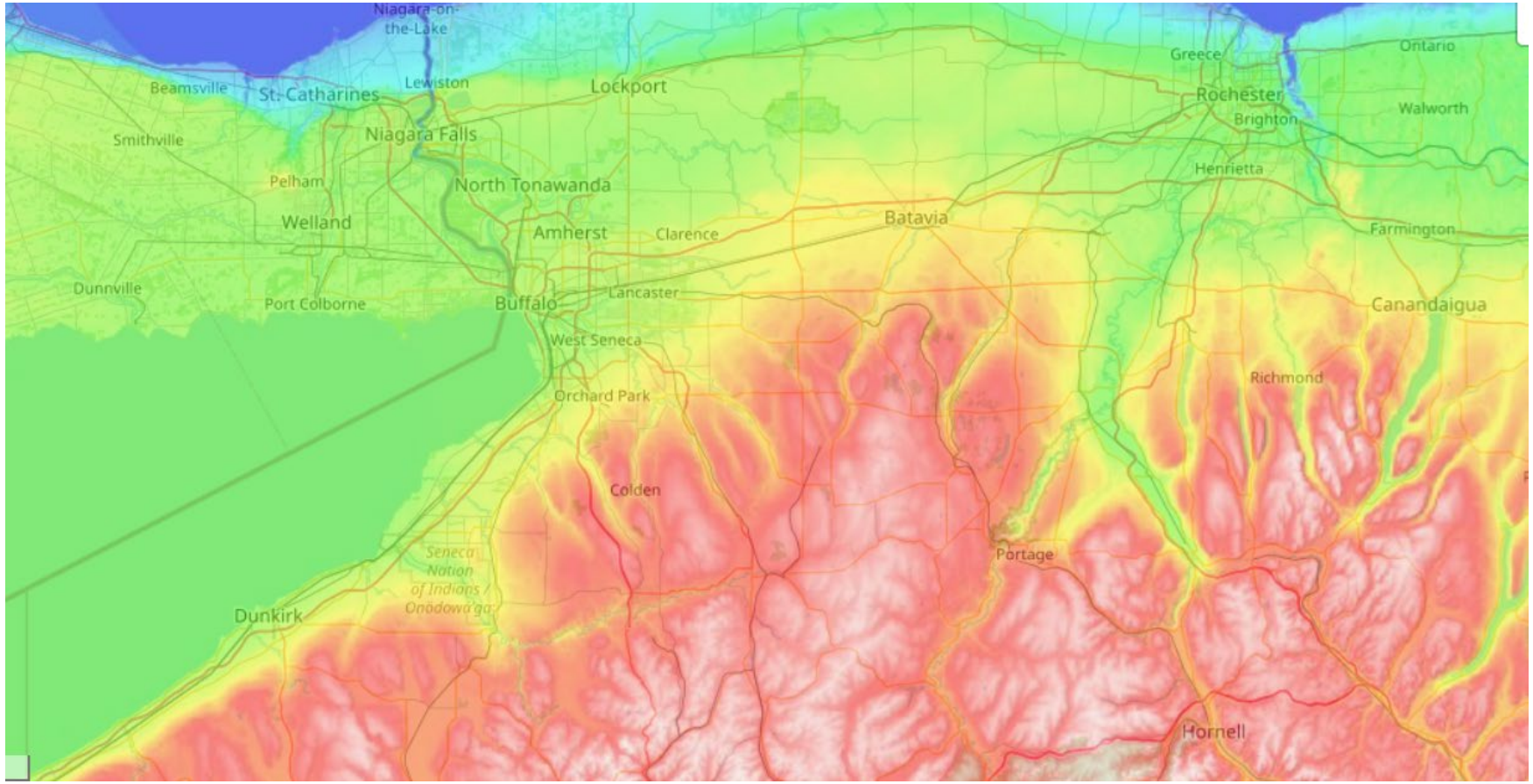
BUFFALO SEWER AUTHORITY

Agenda

- Buffalo Sewer Authority's System
- Development of Long-Term Control Plan
- Eight Years of Progress
- Recalibration and Retooling

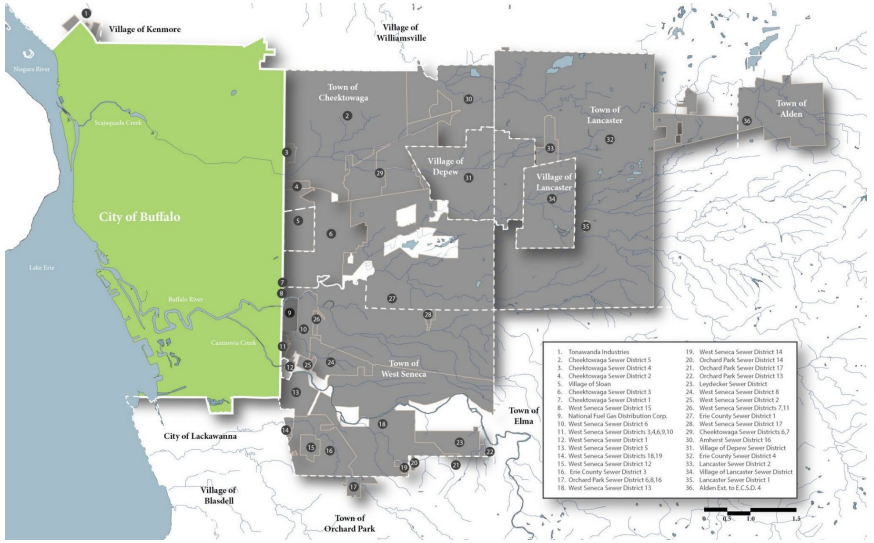
Where is Buffalo, NY?

Topography


Niagara-on-the-Lake
Beamsville
St. Catharines
Lewiston
Lockport
Niagara Falls
Smithville
Pelham
North Tonawanda
Welland
Amherst
Clarence
Batavia
Dunnville
Port Colborne
Buffalo
Lancaster
West Seneca
Orchard Park
Colden
Seneca Nation of Indians / Onödowá'ga:
Dunkirk
Portage
Hornell
Greece
Rochester
Brighton
Ontario
Walworth
Henrietta
Farmington
Canandaigua
Richmond

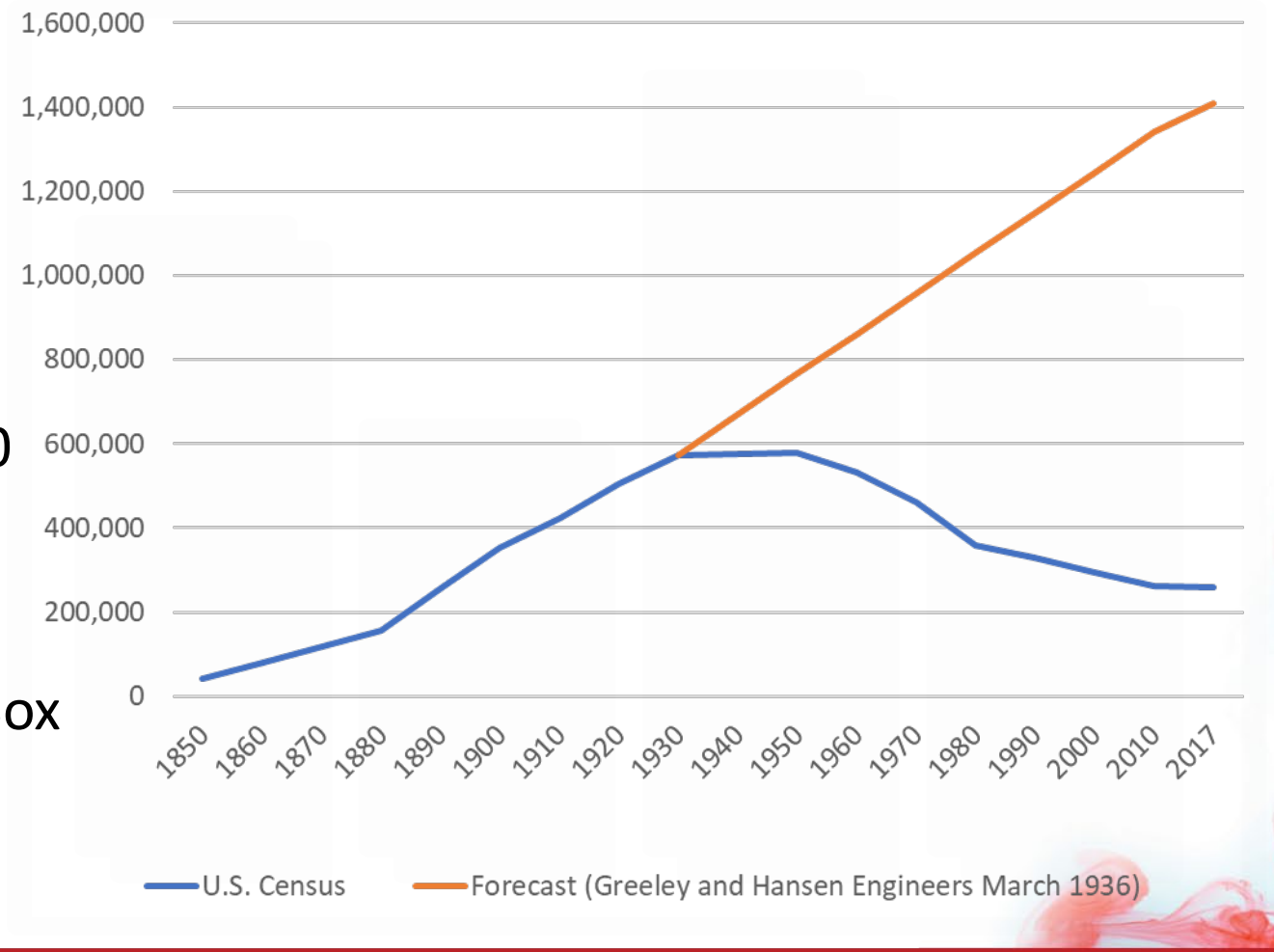
Buffalo Sewer Authority

- Founded on April 8, 1935
- Created to “provide an effectual means for relieving the Niagara River, Buffalo River and Lake Erie from pollution by sewage and waste”
- Approximately 200 employees
- Bird Island Treatment Facility
  - 90 MGD Average Flow
  - Rated for 160 MGD
  - Current Peak Flow 520 MGD
  - Long-Term Peak Flow 560 MGD
  - Serves Buffalo and 11 Outlying Communities



Buffalo Sewer's Collection System

- Draining of City
  - Wetlands
  - Flat topography
- Rapid expansion
  - Erie Canal and West
  - Most pipes laid by 1900
- Today
  - 850 Miles of Pipe
  - 8" PVC - 32' x 17' RCP Box
  - 52 CSOs
  - 258 Regulators



A History of Continuous Improvements

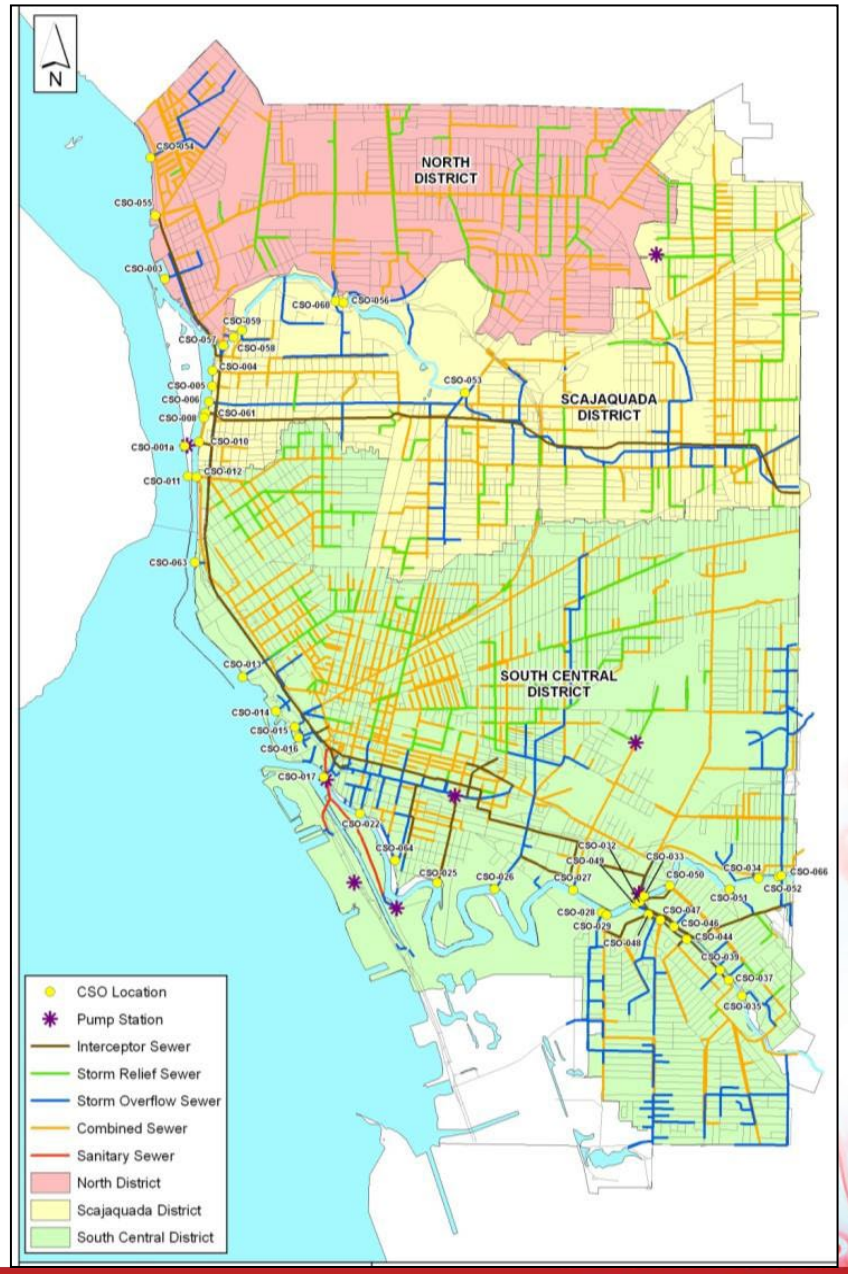
- Swan Trunk System: Flushed Canal System to Mighty Niagara
- Primary Treatment Facility and Interceptors
  - Effectively Eliminated Typhoid in Downstream Communities
  - Formation of Buffalo Sewer Authority
- Storm Relief Sewers
- Clean Water Act Improvements
  - Scajaquada Tunnel
  - Kelly Island Separate Sanitary and Pumping Station System
  - Bird Island Treatment Facility Secondary System
- Sewer Separation and Regulator Adjustments

Development of LTCP

1994	• USEPA CSO Control Policy Issued (Required Development of LTCP)
2004	• Submitted Initial LTCP to New York State Department of Environmental Conservation (NYSDEC)
2007	• NYSDEC/USEPA Request Additional Evaluations
2009	• Negotiation of Consent Decree Begins
2012	• Submitted LTCP Update to USEPA/NYSDEC (as directed by regulatory agencies)
2014	• Final LTCP Report Approved by USEPA/NYSDEC

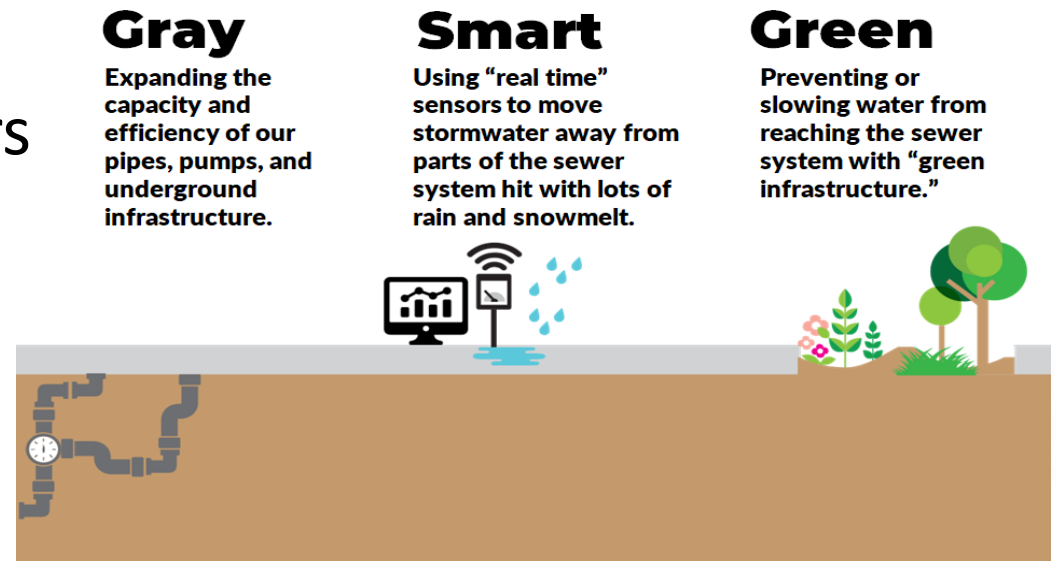
Modeling

- Malcolm Pirnie/Arcadis Hosted
  - Data Analysis Split Among 3 Consultants
  - North District: Niagara River
  - Scajaquada District: Scajaquada Creek and Black Rock Canal
  - South Central District: Cazenovia Creek and Buffalo River
- XP-SWMM
  - 2000-2003 Initial Model
  - 2008-2009 Focused Recalibration
- Larger diameter pipes (and CSOs) only



Components of LTCP

- 2-9 Activations Allowable per Waterway in Typical Year
- 20 Year Plan: 3/18/2014-3/18/2034
- $380 M (2012 Dollars)
- Real Time Control Smart Sewers
- Green Infrastructure
- Gray Infrastructure
  - Optimizing Existing System
  - Off-line Pumped Storage Tanks
  - Treatment Facility Upgrades (NFA)



Recalibration Effort

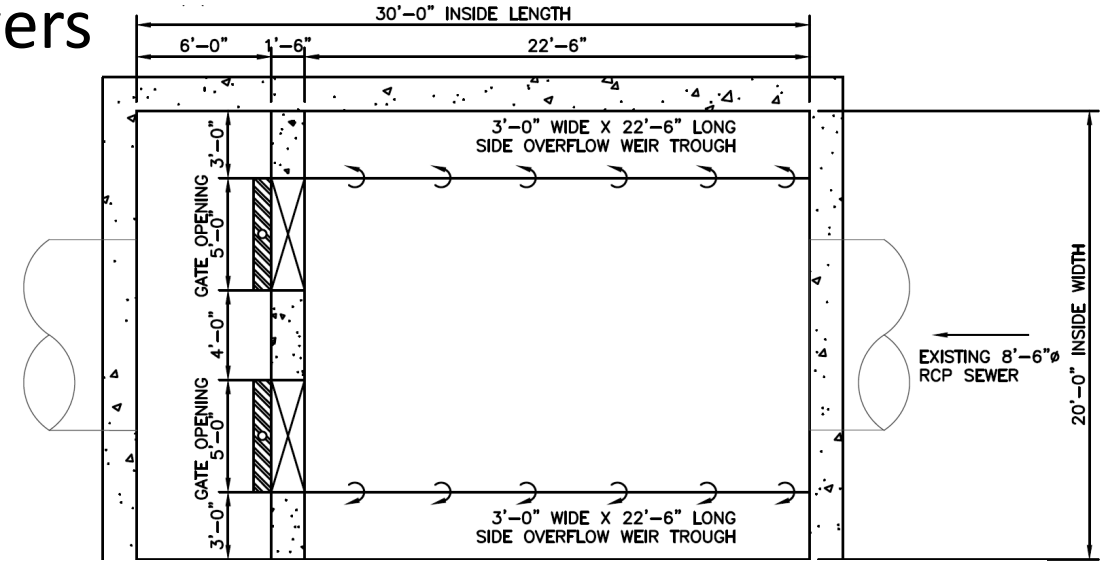
- Required by LTCP
  - Refine Inclusion of Green Infrastructure
  - Confirm Work to Date
- Moved Earlier in Project Schedule
  - 2016 Recalibration Began
  - 2021 Recalibrated Model Approved
- XP-SWMM to PC-SWMM
- 142 of Flow and Level Gauges

Approved Recalibration Results

- Some CSOs Already in Compliance (Some Projects Not Needed)
- LTCP Does Not Reach Compliance for Others!!!!
  - Niagara River
    - Target= 9
    - Projected= 14
  - Scajaquada Creek
    - Target= 4
    - Projected= 19
  - Buffalo River
    - Target= 6
    - Projected= 15

Work Completed to Date

- Real-Time Controlled Smart Sewers
  - Overflow Recapture
    - 1 Complete; 1 in Construction
  - Inline Storage
    - 6 Complete; 1 in Construction
  - Pumping Station
- Optimizations
- Green Infrastructure
  - 602 Acres Demolitions
  - 53 Acres Permeable Pavement
  - 14 Acres Bioretention



Implementation Issues to Date

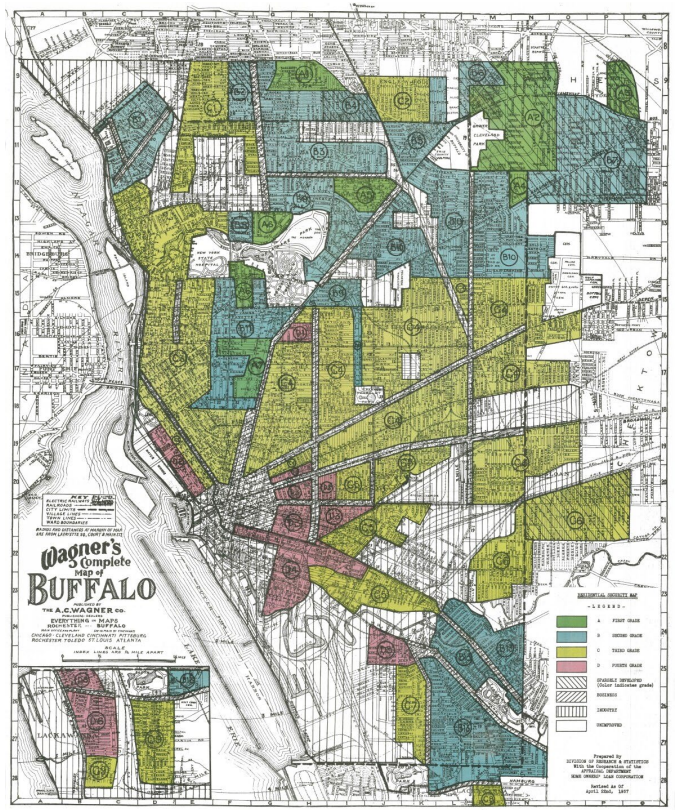
- Pre-Construction and Construction
  - NFA Preparation Work Required
  - Betterment Lessens Control of Consultants and Contractors
  - Land Acquisition
  - Electrical Connections
  - Industrial Legacy
    - Superfund Sites
    - Radioactive Road Base
- Post-Construction
  - Gates, Valves, and Actuators
  - Level Sensors and Communications
  - Site Access and Maintenance

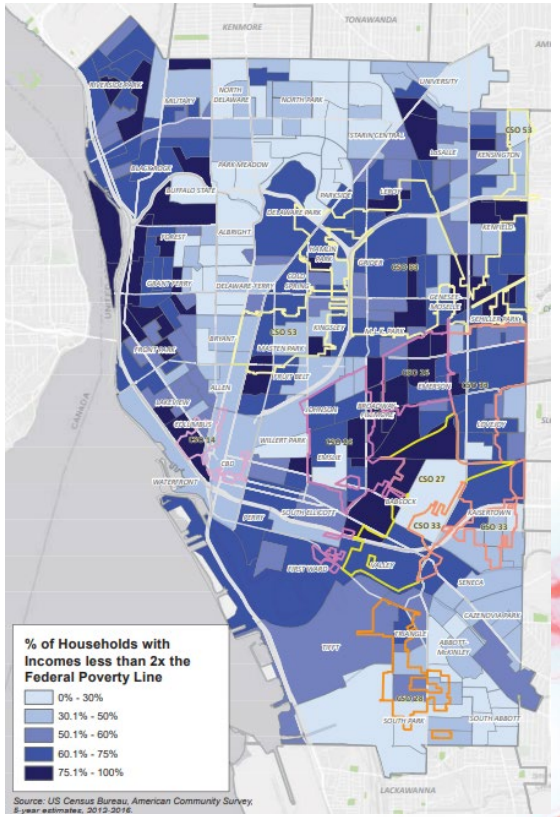
Feasibility of Remaining Projects

- Basements and Connecting Sewers
- Project Constructability
  - Superfund Sites
  - Rock Depth
- Project Costs
  - Land Acquisition
  - Pumping Stations
  - Bridging
- Maintenance

Equity Issues

- History of Environmental Justice Issues
- One of the Most Segregated Metropolitan Areas in the United States
- Proposed Neighborhood Demolitions
- Large Storage Tanks and Pump Stations

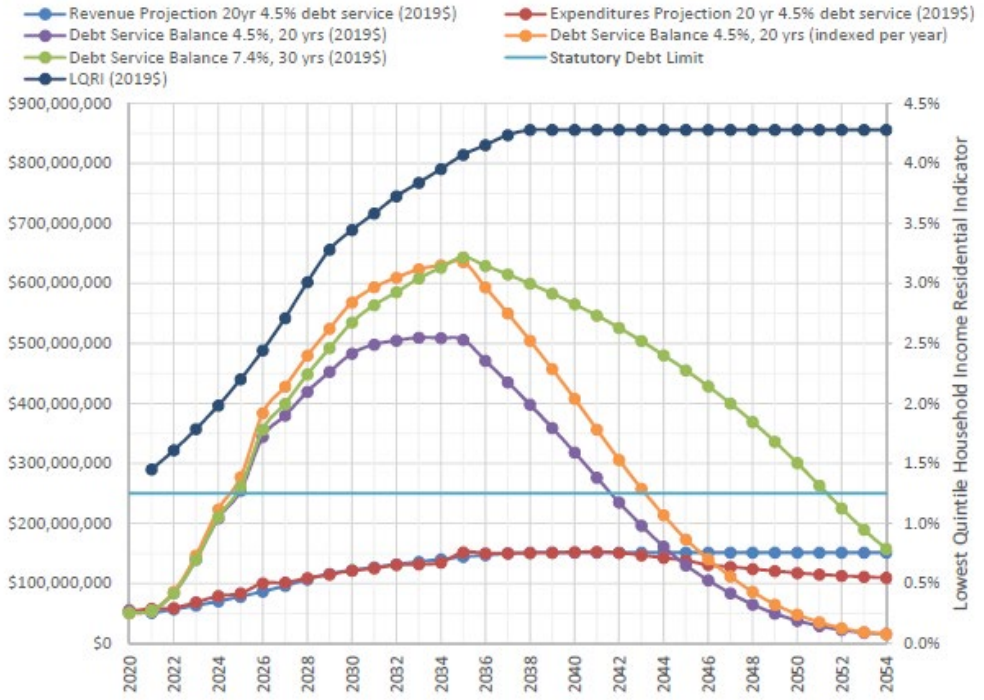




Instructions to HOLC Agents: *Any threat of infiltration of foreign-born, negro or lower grade population? If so, indicate these by nationality and rate of infiltration like this: "Negro-rapid."*

Draft Financial Capability Analysis

- $180 M Increase in Costs in 2012 Dollars
  - $100 M for NFA
  - $80 M for GI
- $25 M Increase for Inflation
- 2020 Affordability Criteria
  - High Burden Community
  - Decreased Population from 2014
  - Existing LTCP Projects; 2019 Costs
- Debt Limit Set at $250 M
- 20 Year Extension Required Without Grant Assistance



Climate Change

- Climate Refuge
  - Average Rainfall Stable
  - Average Temperature Increase Negligible
  - Winds: Poorly Modeled, But Likely Increasing
- Seiche and Up-Lake Communities
  - Average Rainfall Increasing
  - 2016- Current Historical High Lake Levels
  - Buffalo and Niagara Rivers
    - Basement Back-ups
    - Syphon Risks

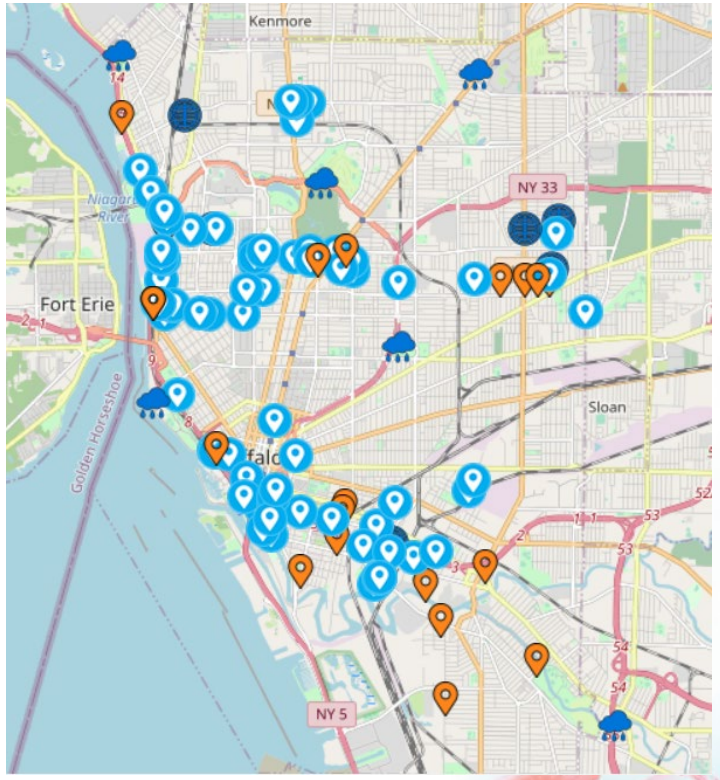
Historic Crests
(Station Established 4/1/1860)
(1) 12.08 ft on 12/02/1985
(2) 11.12 ft on 11/15/2020
(3) 11.06 ft on 01/30/2008
(4) 10.65 ft on 11/01/2019
(5) 10.65 ft on 04/06/1979
(6) 10.57 ft on 12/11/2021
(7) 10.36 ft on 12/12/2020
(8) 10.31 ft on 11/10/1975

Staffing

- Collection System Engineering Department
  - Current: 3 Engineers; 2 GIS Specialists; 5 Inspectors
  - Maximum: 5.5 Engineers; 1 Landscape Architect; 1 Public Affairs Specialist; 7 Inspectors; 1 Americorps Worker;
  - Other Responsibilities: Public Outreach; Collection and MS4 Systems Regulatory Compliance and Permitting; Resilience Planning
- Facility Capital Projects Department
  - Current: 1 Engineer; 1 PM/SCADA Technician
  - Maximum: 2 Engineers; 1 PM/SCADA Technician
  - Other Responsibilities: SCADA Coordination; Energy Management

Blu-X and Globalized Logic

- Benefits with Existing Smart Sewer Installations
  - Overall Annual Systemwide Reduction: 30.7 MG
  - Up to 3 Fewer Activations in Critical Locations
- Future Large Projects Even Greater Benefit
- Facility Operators can see the System
- Inter-Municipal Relations
- Diagnose System Issues
  - Grit
  - Grease
  - Flooding



Environmental Impact Bond

- Opportunity Areas
- Green Infrastructure
- Public Sites Only
- Impervious Surface Capture
  - $200,000.00/Acre
  - 0.90” Storm
- Total: $49.2 M
- Closed on June 16, 2021
- Time Limited (June 16, 2028)

Funding Opportunities

- American Recovery Plan Act
- FEMA BRIC Grants
- Environmental Impact Bond
- New York State Funding
  - Clean Water State Revolving Fund Loans
  - Water Quality Improvement Program
  - Water Infrastructure Improvement Act
  - Green Innovation Grant Program
  - NYS Clean Water, Clean Air, and Green Jobs Environmental Bond Act (Proposed)
  - Safe Water Infrastructure Action Program “SWAP” (Proposed)

Municipalities Awarded 50 Percent of Estimated Project Costs

Applicant Name	Region	Estimated Federal Subsidy	Estimated WIIA Grant	Total Grant Award
Buffalo Sewer Authority	Western NY	$9,054,768	$9,054,768	$18,109,535

New Engineering Opportunities

- Gravity Flow Systems and Flipping the Script on Smart Sewers
- Community Development Instead of Community Detriment
  - Not a Perfume Factory! to What Can We Do?
  - Redeveloping Parks
  - Combining Green and Gray
- Relief Sewers
- Synergistic Projects
  - Flooding
  - Aging Sewers
- Forgotten Tunnels
  - Delavan Drain
  - Albany Tunnel

Moving Forward Short-Term

- Development of project lists
- High level screening
- Revised cost-estimation
- Model runs with base system
- Globalized logic evaluation
- Continuous project work
  - EIB
  - ARPA
  - Low-hanging fruit

BUFFALO SEWER AUTHORITY

xylem Let's Solve Water

GHD

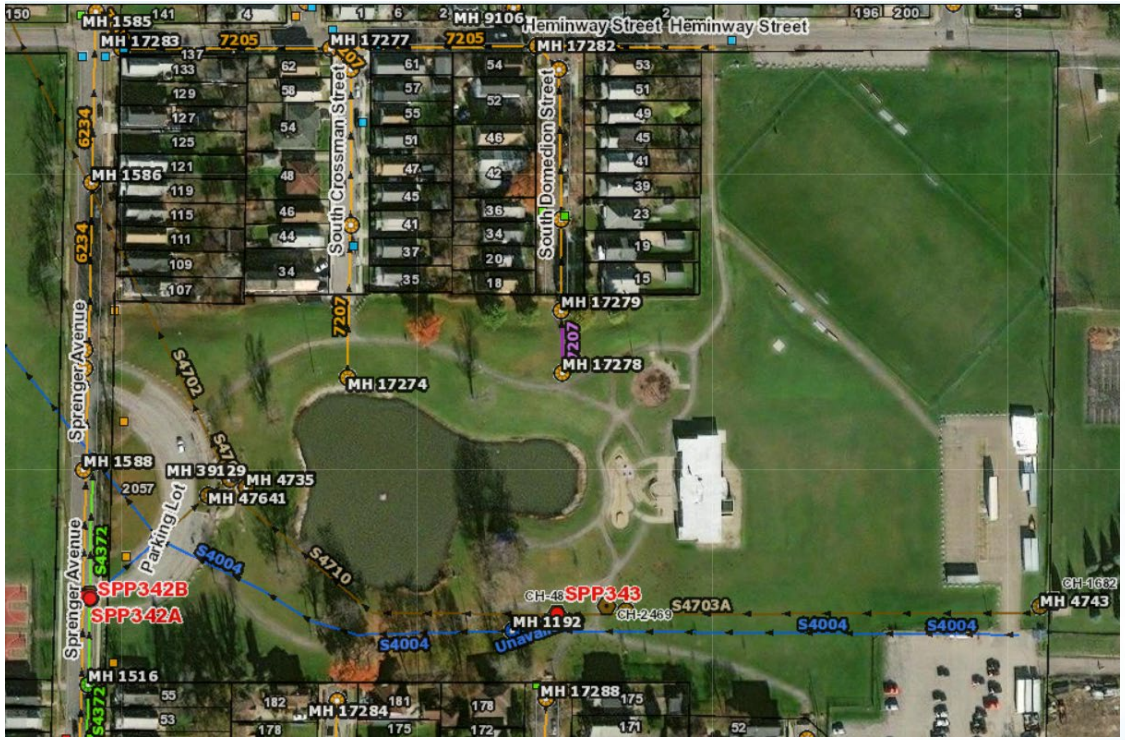
ARCADIS

JM Davidson Engineering, D.P.C.

A CERTIFIED WBE/DBE ENGINEERING FIRM

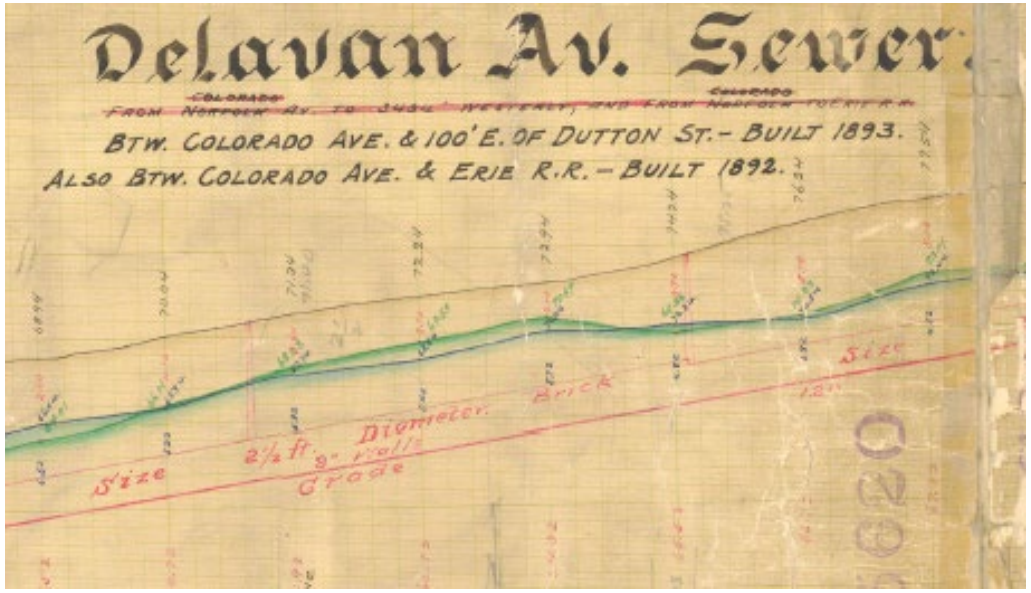
Development of Project Lists

- Holistic and watershed thinking over individual CSO
  - Informed by Individual CSO Needs
  - Globalization Opportunities
- City owned lands
  - Parks
  - Vacant Lots
  - Right of Ways
- Minimizing maintenance
- Relief Sewers
- Synergistic Thinking



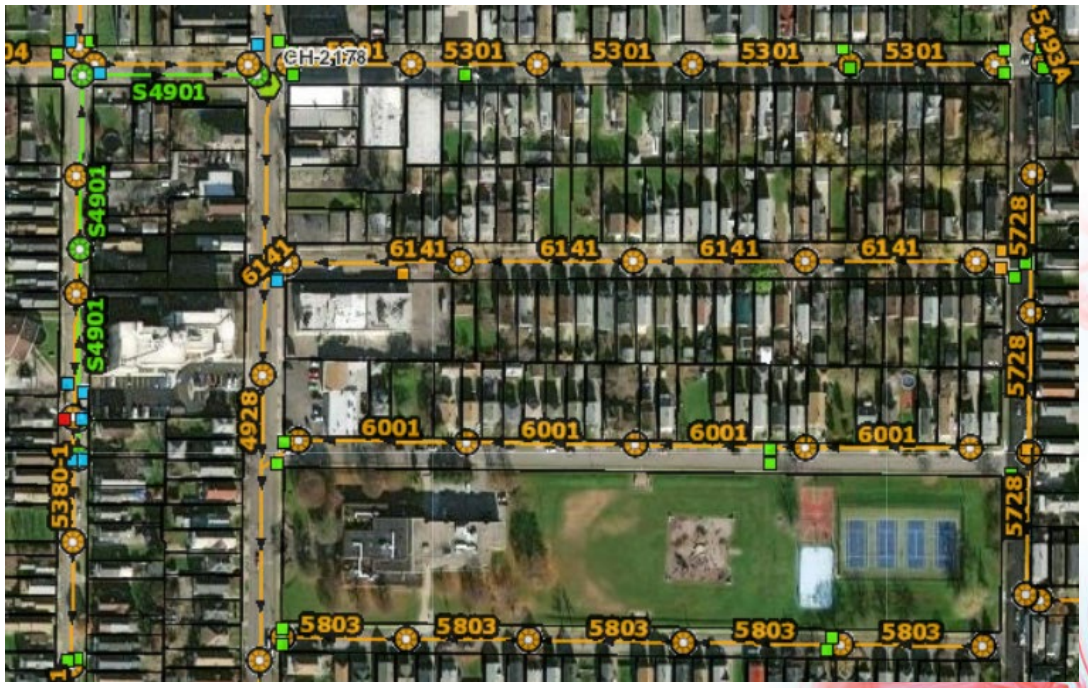
High Level Feasibility Analysis

- Brownfields
  - Active Superfund Sites
  - Historic Industrial locations
  - Allowability of “Slag”
- Depth to Bedrock
- Ownership
- Revised Cost-Estimation
- Current Land Uses and Community Impacts
- Model Runs with Different Combinations: Local and Global Controls



Moving Forward Long- Term

- Changing Dynamics with Consultants and the Public
- Graying our Green: Concentrating Flows to Increase Affordability
- Greening our Gray: Place Making Instead of Camouflage
- Globalized System Logic
- “Finalize” Project List
  - Public outreach
  - Submit revision to regulators
  - Secure land
- Continuous System Monitoring
- Constant Improvement



Thank you to our partners!
(apologies to those I missed)

- Funding and Regulatory: USEPA, NYSDEC, NYSEFC
- LTCP Modeling and Planning: GHD, Arcadis, Xylem
- Design: Wendel, AECOM, CHA, Watts, Bergmann, JM Davidson, Greeley and Hansen, Kheops, Stantec
- Research: USGS, University at Buffalo, Buffalo State College, Buffalo-Niagara Waterkeeper
- Cooperating Agencies: NYSDOT, Erie County, City of Buffalo DPW
- Overall: The City of Buffalo and Our Residents

Q & A

Rethinking Buffalo Sewer's CSO Long Term Control Plan

Rosaleen B. Nogle, Buffalo Sewer Authority

ABSTRACT

As Buffalo Sewer prepares for its second decade of implementation of the approved Combined Sewer Overflow Long Term Control Plan (LTCP), results of a recalibrated hydraulic model, updated Financial Capability Assessment, a cost-benefit analysis of early projects, a deeper understanding of the existing system's design, and increasing recognition of issues of environmental justice and implications of systemic racism and climate change have all driven a re-evaluation of how to achieve the goals of the LTCP while also building a more equitable, inclusive, and resilient city.

Buffalo Sewer's approved 2014 LTCP made use of innovative strategies with a focus on Green Infrastructure and Real Time Controlled Smart Sewers. As part of this approved plan Buffalo Sewer agreed to recalibrate the hydraulic model upon which the LTCP was based in and around 2017. After significant discussions, on October 6, 2021, Buffalo Sewer's hydraulic model recalibration was approved by the United States Environmental Protection Agency.

This approval has meant the Buffalo Sewer needs to both continue to move forward with work towards a March 18, 2034 overall completion date, but also that we need to rethink how best to achieve the goals set forth in the original plan. On the one hand, the new model has meant a realization that the specific blend of projects as described in the LTCP will not result in the desired outcome and a revised Financial Capability Analysis has revealed that the actual cost to construct these projects is almost three times what was originally calculated.

On the other hand, as we move forward, we are also learning how to implement Green Infrastructure in a more sustainable and maintainable way that also addresses long-standing disinvestment in the existing increasingly aged collection system. We are also finding new and innovative ways to implement Real Time Controlled Smart Sewer technology to take advantage of opportunities created by the historical design of our collection system and the disinvestment in redlined neighborhoods while also creating visible community benefits and simplifying maintenance.

Six traditional Smart Sewer Projects have been completed, three additional traditional projects are in bidding or construction phases, and a final project which implements Smart Sewer technology at an existing pumping station is constructed and expected to be fully operational by July 1, 2022. Over the next year, several additional Smart Sewer projects which take advantage of a global implementation strategy rather than a more traditional CSO or even waterbody specific strategy are being designed and expected to go into construction throughout 2023.

Similarly, on the Green Infrastructure front, RainCheck 1.0 has been completed and it has become increasingly clear that while the demolition of vacant and abandoned homes has created vast swaths of new green space throughout large tracts of Buffalo at limited cost to Buffalo Sewer, the opportunity for further demolitions is limited and at the same time, bioretention cells within the public right of way are costly to construct and maintain and other green infrastructure

techniques are more sustainable and create opportunities for other co-benefits without negatively impacting long-term residents in disinvested neighborhoods.

INTRODUCTION

The city of Buffalo, New York is often ranked as one of the poorest cities within the United States of America. After over five decades of continuous declines in population, the 2020 census showed a slight increase in Buffalo. As with many urban areas, Buffalo is also a majority global majority city, with large African American, Puerto Rican, and new American populations from throughout the world.

The collection system in Buffalo dates back to the 1840s with some pipes from those earliest years still in the ground and the vast majority of pipes well over one hundred years old. While a treatment facility and separated collection system were contemplated in the 1890s, because Buffalo is situated on the Niagara River, a strait which connects Lake Erie to Lake Ontario and through which the upper Great Lakes drain towards the Atlantic, it was deemed unnecessary at the time. Within a few short decades, however, the downstream international community of Niagara Falls was found to have one of the highest typhoid rates in the western world due to the lack of treatment of Buffalo's wastewater.

In 1935, the Buffalo Sewer Authority was founded by the New York State legislature with the express mission of ameliorating the nuisance being caused by the direct discharge of untreated wastewater from the city of Buffalo. By 1938, a new state of the art Primary Treatment Facility and a series of connecting interceptor sewers was constructed which substantially eliminated the pollution of the Niagara River. Upstream waterbodies however continued to be impacted by the overflow during wet weather of combined sewer discharges.

Over the next seventy-six years, the Buffalo Sewer Authority continued to work to reduce the occurrence and volume of these events and to prevent flooding caused by both lack of capacity in the system and the backing up of overflows. On March 18, 2014, the United States Environmental Protection Agency (USEPA) approved a Long-Term Control Plan of Combined Sewer Overflows (LTCP) after over a decade of modeling, metering, research, calculation, reporting, discussions, and negotiations.

Buffalo Sewer's approved 2014 LTCP made use of innovative strategies with a focus on Green Infrastructure and Real Time Controlled Smart Sewers in addition to large underground off-line storage facilities with pumping stations, a deep tunnel and treatment facility upgrades. It also required periodic recalibration of the hydraulic model upon which it was based.

METHODOLOGY

As Buffalo Sewer prepares for its second decade of implementation of the approved LTCP, results of the recalibrated hydraulic model, updated Financial Capability Assessment, a cost-benefit analysis of early projects, a deeper understanding of the existing system's design, and increasing recognition of issues of environmental justice and implications of systemic racism and climate change have all driven a re-evaluation of how to achieve the goals of the LTCP while also building a more equitable, inclusive, and resilient city.

In 2017, Buffalo Sewer conducted metering to recalibrate our hydraulic model. Over the next five years, data from this metering effort has been analyzed for data quality and then utilized to upgrade our hydraulic model from XP-SWMM to PC-SWMM and to calibrate the upgraded model. Over the next several years, the model was then further refined to address concerns from the USEPA and the New York State Department of Conservation (NYSDEC) and on October 6, 2021, the refined model was approved.

In 2020, USEPA and NYSDEC also requested the Buffalo Sewer utilize the draft Financial Capability Analysis (FCA) format developed by the USEPA to evaluate the cost and affordability of the LTCP to date and through to completion.

RESULTS

With the updated model in hand, Buffalo Sewer proceeded to conduct a model run with the remaining project as described in the LTCP together with the projects constructed to date to verify that they would produce the expected benefits to the water bodies. Unfortunately, this was found not to be the case, rather than achieving nine or fewer activations to each water body, the updated model forecasts up to thirty-one activations.

Additionally, in taking a deeper dive into the forecast costs for projects, it was found that land acquisition, site conditions especially shallow bedrock, pumping station and wet well construction, operation, and maintenance, and bridging costs were all significantly underestimated. The FCA similarly found that the costs for the treatment facility upgrades and bioretention heavy green infrastructure had been underestimated on order of three to four times.

With all of these costs taken into consideration, between the FCA and updated plan what was calculated in 2013 dollars to be a $380,000,000.00 plan on March 18, 2014, in 2019 dollars has ballooned to a $1 billion plan. Based on revised modeling, it does not actually meet the water quality goals set forth in the plan. And it would require the demolition of large sections of occupied housing and extended periods of depriving businesses of parking areas.

Rather than being an economic driver and a means to bring about environmental justice and equity, implementing the LTCP as written would cause further inequities through both the cost of the project and the impact on the neighborhoods being impacted during construction and operation of large-scale pump facilities. To make the existing plan affordable without significant federal and/or state grant funding would require a twenty year or more extension of the already twenty yearlong LTCP.

DISCUSSION

In anticipation of a need to decrease the overall cost and to allow the people of the city of Buffalo to be able to afford the financial burden that increased sewer fees will impose, Buffalo Sewer is in the midst of a multi-pronged strategy to revamp the LTCP. First, Buffalo Sewer has worked with Xylem to install over one hundred flow and level sensors throughout our collection system. We have also worked with partners at Erie County Division of Sewerage Management to install rain gauges not only in our system, but in their upstream system as well to be able to better forecast where and when flows will be increasing throughout our system.

As we move forward, these sensors are being used to fine tune our existing Smart Sewer projects and to begin to implement a global control strategy across these facilities. We are also in the midst of design of several additional Smart Sewer projects which will further take advantage of this global control strategy to balance flows within the system. These sensors have also been used to identify issues regarding seiche events along Lake Erie which have increasingly resulted in flows being pushed from the downstream side of the overflow weirs into the combined sewer system and we are in the midst of developing projects and identifying resiliency funding sources to prevent these impacts of climate change on our system.

Finally, these sensors have allowed for a better understanding of both the hydraulics of the system and of where flow constrictions may be occurring. This in turn has allowed for increased targeted maintenance that has reduced the need for capital construction and also for the development of new project ideas that target overflows through a more comprehensive strategy rather than focusing on individual overflow locations.

Buffalo Sewer's increasing commitment to equity and inclusion have also resulted in a rethinking of the siting of larger facilities and how existing system configurations can allow for continuous gravity flow, off-line storage in park lands rather than parking lots. While it will be important to ensure that these facilities do not become a nuisance to the community through stagnant water or odors, this refocus means that restoration funding can be put towards park improvements, private parties are not losing access to their lands for significant periods of time, and that blocks of occupied homes are no longer being targeted for demolition to make way for storage. It also reduces not only the capital construction costs, but because of the focus on gravity flow, it also will significantly reduce operations and maintenance costs as well.

At the same time, Buffalo Sewer has also secured a $50 million Environmental Impact Bond to construct green infrastructure to detain and/or retain 0.95 inches of rain for two hundred acres of impervious surface. To make this viable, we are taking a multi-faceted approach. One strategy being employed is combining this funding with American Recovery Plan Act funding to install permeable pavement in streets where the sewer mains, water mains, and lead service lines are being replaced, and street trees planted. Bioretention is also being reconsidered to be a more focused strategy with water from larger areas being hard-piped in to increase the effectiveness and decrease costs per square foot of surface expression per cubic foot of storage.

CONCLUSIONS

The final proposed plan of recommended projects to achieve the goals of the LTCP using the updated hydraulic model is not yet ready to submit for approval, but early results of model runs using revised project proposals have yielded significantly better results than the original LTCP projects at a significant decrease in project costs. Continued refinement of these projects and an ongoing openness to new opportunities is expected to produce a final project list that can be submitted in Fall of 2022 for approval. It will be important, however moving forward to ensure that all involved remain open to the possibility that there may be further refinements that allow for more cost effective and timely compliance with water quality objectives. Additionally, in 2021, Buffalo Sewer was able to secure over $14 million in competitive grants and several million dollars more in ARPA grant funding has been allocated to Buffalo Sewer by the city of Buffalo. Continued success in the securing of such grants will be critical to ensure the

affordability in a timely manner of the LTCP with an ultimate goal of achieving the original March 18, 2034 deadline.

Attachment D to the Semi-Annual Status Report: September 2022

Certificates of Acceptance and Occupancy

ITEM NO. 29

CERTIFICATE OF ACCEPTANCE AND OCCUPANCY

PROJECT: Babcock Pump Station Real Time Control Project

CONTRACTOR: Pinto Construction Services Inc.
132 Dingens Street
Buffalo, NY 14206

WHEREAS: The Buffalo Sewer Authority Principal Sanitary Engineer and Staff have certified that the Contractor completed the work in accordance with the plans and specifications on 6/22/2022.

NOW THEREFORE
BE IT RESOLVED: That the Board of the Buffalo Sewer Authority hereby finds and determines that:

a. The work to be performed under the terms of the Contract has been complete and is accepted;

b. The date of entrance and occupancy be fixed as of 6/22/2022;

c. The maintenance period commences on 6/22/2022;

d. The Board approved Change Order No. 3 on June 22, 2022, resulting in a net increase of $11,215.36, thereby making the adjusted contract cost $1,560,347.31;

MOTION TO APPROVE

MADE BY MRS. PETRUCCI

2ND BY MR. ROOSEVELT

AYES 3 NOES 0

Board Meeting of June 22, 2022

Attachment E to the Semi-Annual Status Report: September 2022

Cornelius Creek Engineering Report

ENGINEERING REPORT
July 2022

BUFFALO SEWER AUTHORITY

CORNELIUS CREEK CSO BACKWATER GATE FLOODING MITIGATION PROJECT

wendel

Executive Summary

The City of Buffalo is situated in the northeastern corner of Lake Erie. Due to the position of the City in relation to the orientation of Lake Erie causes unique weather conditions such as Lake effect snow and seiche events. A seiche event is a wind or air pressure driven oscillation in water levels across a lake or pond, often associated with changes atmospheric conditions. When winds are blowing from the west-southwest it intensifies the seiche potential. When winds are in this orientation lengthwise down the lake, the winds avoid the frictional effects of land, largely maintaining speed thus effectively pushing more water at the northeastern side of the lake.

Within the City of Buffalo, the Buffalo Sewer Authority (BSA) operates the Wastewater treatment plant and collection system. The collection system includes 10 pumping stations and 850 miles of collection system. Much of the collection system contains combined sewers of which collect both sanitary and stormwater runoff. Due to capacity constraints within these combined sewers during wet weather events, combined sewer overflow (CSO) points were constructed to provide discharge into surrounding waterbodies such as Lake Erie, Buffalo River & Niagara River.

In particular several of the CSO outfalls are located on the West end of the City that encounter significant seiche events. One of the most frequently impacted CSO's is Cornelius Creek (CSO 055). The CSO elements include dual 12'Wx13'H box culverts that daylight into Cornelius Creek which directly leads to the Niagara River. Within the CSO structure is a serpentine weir that holds back normal water levels from the Creek and allows the collection system to discharge to the treatment plant. During seiche events the high winds ultimately force the Niagara River back into the box culverts. When this event occurs the river water overtops the weir and significantly overwhelms the combined collection system both locally and throughout the network. Due to excessive flows entering the collection system, areas upstream of the outlet structure are unable to discharge freely. This causes basement backups to residents/businesses in addition creates localized flood events in several areas. Also, sub shed areas downstream of the weir generate significant additional flow to the WWTP which impacts the overall treatment plant costs for treatment and maintenance during these events.

Currently, there is no prevention measures for water from the Niagara River to flow over the weir and into the combined system during seiche events or other storm surges. To prevent these additional flows entering the system, and based on Wendel's recommendation from this document, improvements will be made to stop backflow from the Niagara River in these large, high windstorm events. The recommended alternative is to install two backwater gates in front of the existing outfall. The preliminary cost of the preferred alternative is approximately 2 million dollars. Project construction is anticipated to begin Spring of 2023.

Project Background & History

1. Ownership

The Buffalo Sewer Authority (BSA) owns and operates the combined sewer collection and treatment system within the City of Buffalo, including over 50 Combined Sewer Overflow (CSO) discharge locations. The City is under a Consent Order from US EPA to address the issue of combined sewer overflows into the Niagara River. Improvements are necessary to comply with the Clean Water Act. The CSO overflows can result in localized flooding and harm the effectiveness of the City's sewer infrastructure. The BSA is required, under their SPDES permit with NYS DEC, to adopt best management practices for CSOs. BSA is guided by a Combined Sewer Overflow Long Term Control Plan (LTCP), prepared for the New York State Department of Environmental Conservation (NYSDEC) to address overflows and identify appropriate improvements. This report found that some CSOs allow additional flows into the system due to backwater from the adjacent water bodies flowing into the system. This problem is escalating due to higher lake levels and more frequent occurrences of high winds, which push the water toward shore in seiches, and tend to aggravate the backwater problem. The LTCP outlined various alternatives to control the CSO discharges.

2. Site Information

The Project is located in Buffalo, New York situated on the Northwest limits of the City. The site is within the Sewer Authority North district, at the Cornelius Creek CSO 055. Cornelius Creek is located just West of Niagara Street and adjacent NYS Interstate I-190, along Black Rock Harbor Road. It is adjacent to Black Rock Canal Park and a Dog Park. The structure itself sits under the existing Black Rock Harbor Road as well as under the Interstate 190 northbound and southbound travel lanes. The off-ramp for southbound Exit 14 Ontario Street runs overhead and is supported by columns adjacent to the creek, just to the west of the outfall opening. In addition to the parks, the NYS Shoreline Trail travels along the outfall and the remaining portion of Cornelius Creek.

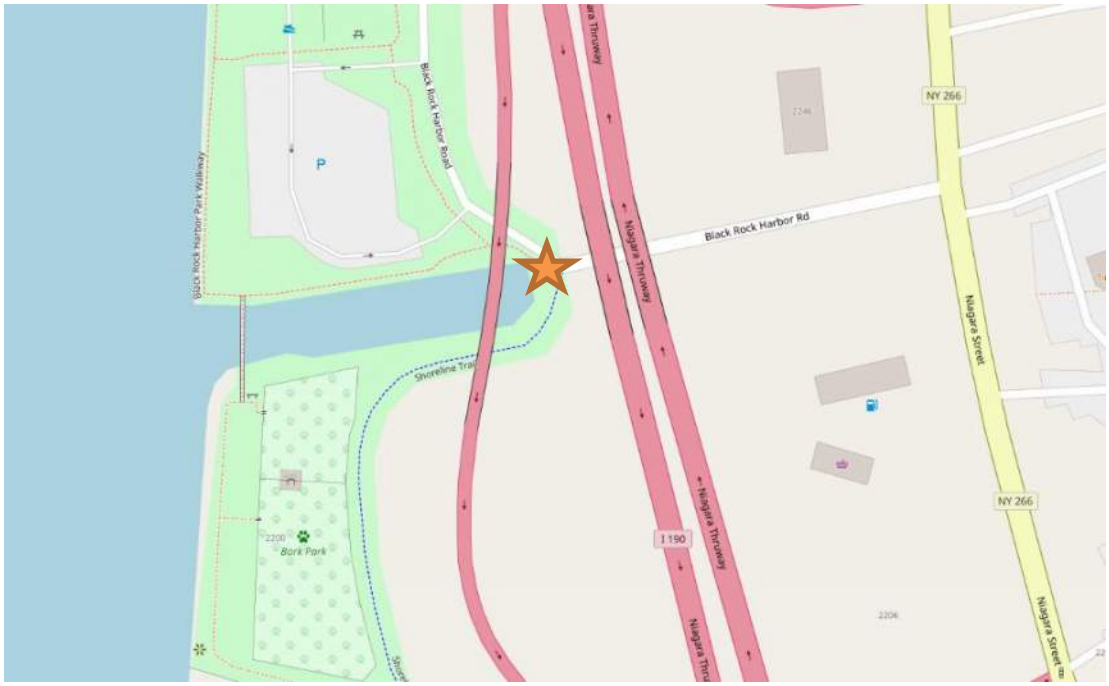


Figure 1 - Location Map

3. Existing Conditions

Constructed in the late 1930's to intercept sewer flow from entering Cornelius Creek the intercepting structure has two parallel combined sewers, 15'-6" x 8'-6" and 10'-0" x 8'-6", flowing westerly from Niagara Street, join at the eastern end of the structure. The existing sewers collect a majority of the North district sewer subshed. Within the structure the two sewers merge where flow deflects 90-degrees approximately southernly, into a 7'-0" intercepting sewer that conveys flows to the plant for treatment. On the western side of the structure is a serpentine weir, broad crested concrete weir located directly in-line with the two existing sewers. The downstream side of the weir is sloped downward, away from the river to dissipate the flow that would come from the existing sewers. Over the weir, the bottom is sloped downward, toward the river to dissipate any wave action from storm events. The outlet to the West with has two, symmetrical 12'-0" x 13'-0" openings.

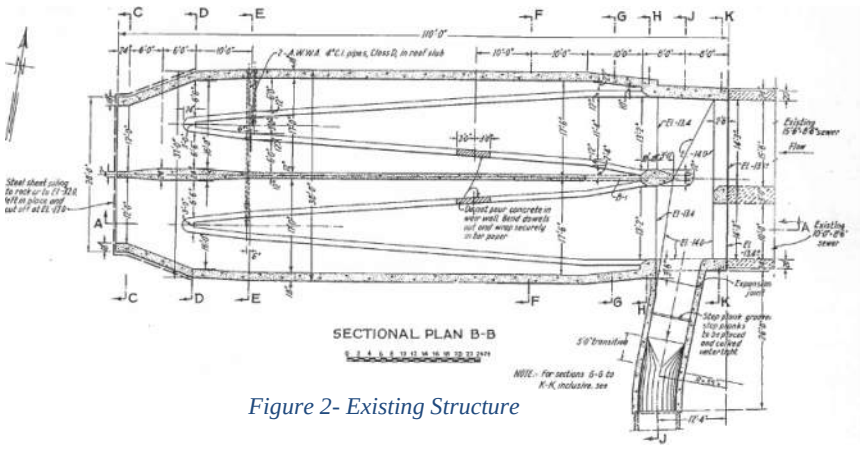


Figure 2- Existing Structure

Over time the structure has had modifications and repairs based on improving performance and maintenance. Most recently the concrete walls and weir showed signs of deterioration. The concrete was spalling away at several locations and rebar was exposed in some areas. In 2013 the concrete repairs were made. It is unknown what the condition of the structure is without further inspection being done by boat or diver due to the outfall in a submerged condition. It is expected that additional repairs will be required as part of this project after further investigations. In addition, more recently it was identified the adjacent crib wall has erosion concerns due to backing material being washed out behind the wall system from fluctuating creek levels over time.

Figure 3 - Existing Outfall

4. Need for Project

The purpose of this project is to design and construct a backflow prevention system on the existing CSO 055 structure. This location was specifically identified due to the significant amount of flow contributed to the sewer collection system from the Niagara River during storm events. This backwater system will prevent flow coming from the Niagara River to be blocked from the entering the closed collection sewer system that directs flows to the wastewater treatment plant (WWTP). Ultimately less flow during these storm events will aid in the BSA's goal of reducing the frequency of combined sewer overflow events and flooding both locally and system wide. Review of existing flow monitoring data indicates since 2020 indicates there have been 10 seiche events experienced at this location.

5. Project Goals

In order to be considered successful, the Project must achieve the following goals:

- Implement select improvements to repair any damaged portions of the existing overflow structure to maximize structure lifespan.
- Construct a robust, cost effective and low maintenance backwater gate system to prevent backflow from Niagara River into the existing collection sewer system.
- Provide a backwater system and equipment that withstand a 50-year life span.
- Allow backwater gate operations to be controlled remotely from the WWTP with monitoring and associated communications to predict when the water levels will become an issue.
- Allow operators ability to perform post commissioning logic and control updates based on changing weather patterns after construction.

6. Financial Status

The opinion of probable construction cost for the proposed Cornelius Creek CSO Backwater Gate Flooding Mitigation Project is $2,000,000 dollars. This preliminary opinion of probable cost can be found in Section 4 of this report.

Alternatives Analysis

This section includes descriptions of the alternatives that were considered for the Project, including identification of the technically feasible alternatives. For an alternative to be considered technically feasible, it must achieve the Project goals.

1. Alternative 1: No Action

a. Description

A non-action alternative consists of leaving the existing structure as is and not making any modifications to the structure. In high-wind storm events, the water from the Niagara River flows back into the sewer system. There would be no increase or decrease in the flows at the WWTP. Debris would still have the potential to flow into the sewer system.

The existing structure would not have repairs made. The areas of chipped concrete would continue to erode and could cause issues later, resulting in future costs. The surrounding land and parks would not be impacted by non-action. No additional noise, air pollution, or impact to waterways would result. Local traffic and park activities along Black Rock Harbor Road would not be obstructed.

b. Cost Estimate

The estimate for this alternative is $0.00. Leaving the existing structure would not produce a direct cost to the Authority. However, as the structure continues to deteriorate from wave action and the elements, the risk increases for a larger, more expensive repairs. There are also indirect costs related to the additional flows coming back into the system from the water bodies. These added flows contributed to flooding of local areas which can result in emergency repairs, damage to property, and traffic delays.

c. Non-Monetary Factors

Non-action will not provide any defense from high-wind storm events. Leaving the structure as is would hinder the goal of the BSA to limit overflow events. This alternate would continue to allow storm debris to enter the system as well, which has been known to cause maintenance issues on the plant systems.

2. Alternative 2: Real Time Controlled Slide Gate

a. Description

Alternative 2 consists of installing two motorized slide gates to the exterior of the existing structure at Cornelius Creek. Each slide gate would be mounted to an extension of the culvert over the 12’x13’ openings. In open position the gates would be suspended approximately 10’ in the air the majority of the time. It is estimated when open the gates will be roughly as high as the top of the adjacent existing fence when in open position. In anticipation of seiche events, the gates would be controlled remotely from the WWTP and/or by instrumentation and lowered. Once in closed position, river water would not be able to flow back into the system from the Niagara River.

Due to the significant size of these gates being proposed, it is proposed there will be one actuator and two stems per gate also known as a tandem system. The actuators will be mounted to the top of the structure. A support structure will be required for actuators and gates using a self-constrained system. Due to the size several gate materials were identified

such as cast iron, stainless steel and composite. Based on evaluating costs, lifespan, durability and availability the use of stainless-steel gates is the recommend material for this application. Each gate will also include the ability to open and lose manually by a handwheel in case of emergency. Seasonal elements have been evaluated such as ice blockage. The actuator will be sized to be able to open the gates through 2"-3" of ice and minor debris. Final design will incorporate actuator manufacturer recommendation on level of safety factor of 1.25 is sufficient for this application. One concern that may arise with this solution is if the gates are left open and ice forms greater than 3" thick enough within creek to stop the gates from shutting. In this situation, overflow events will be able to occur, and the only negative would be limited effectiveness to seiche events. The probability of such an occurrence is minuscule. The same scenario could apply due to large debris collected within outfalls preventing gate closure. Video surveillance is an opportunity that can be assessed if this is a concern to the Authority.

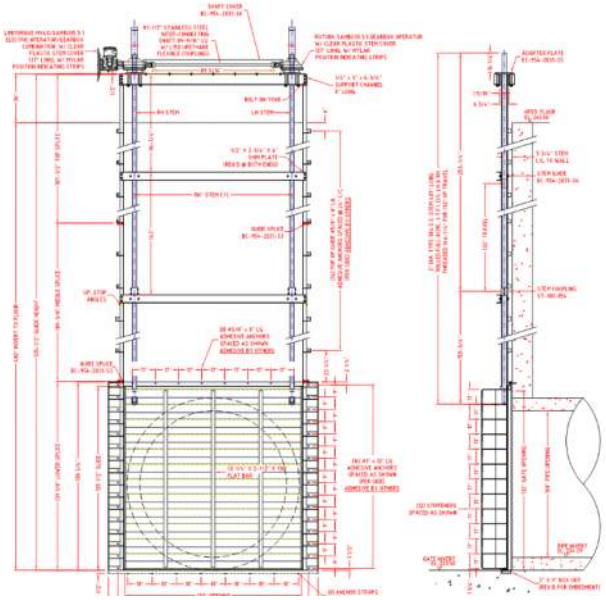


Figure 1 - Slide Gate Example

The equipment will require electrical service and telecommunications to be compatible with the current SCADA system. An electric control panel will be required in close proximity to the structure. The control panel will contain a PLC for communicating between plant, gates and actuators. Power from an existing National Grid pole located in the adjacent park or along the bike path has been identified as a potential source. Instrumentation such as level sensors will be evaluated and strategic placement locations during final design. Instrumentation for weather forecasting will also integrated if required. Engineer will coordinate instrumentation with modeling consultant on various types, locations, and preferred manufacturers. This project will follow the focus on "Smart Sewer" technologies to benefit the residents and community.

In addition to the gate installation, improvements and repairs will be done to the existing concrete structure. The existing northern edge of the culvert is directly connected to the wall system of the support column for NYSDOT exit from the I-190. The gates slide along a bracket that is doweled to the structure. This requires a flat face for mounting properly; therefore, a column would be installed projecting out into Cornelius Creek. In total, three columns would be added onto the face of the existing culverts to make the gates parallel with each other. The columns will need to be micro piles driven to refusal to prevent any settlement or movement over time for gates. Structural supports will be designed for the members carrying the weight of the gates and actuators. Structure will be reinforced to handle the new loads of the gate with a structurally designed support system. The exterior portions of the existing structure where concrete is deteriorating, will be properly repaired at this time. An assessment of the interior of the structure will be done to ensure proposed loads can be met. During this assessment, interior locations for repair will be noted and provided in construction documents.

During construction, the bike path will be impacted, and a portion of the park parking lot will likely be used for staging and offline for the duration of the project. Cornelius Creek will have erosion and sediment protection to contain any sediment from leaving the construction area. Additional measures would be required during any demolition work and concrete work such as

a temporary coffer dam. Except for specific workdays, such as pour day, traffic to park will be controlled using work zone traffic control to maintain pedestrian and vehicular access to the adjacent parks and trails. On specific days, closing of the park entrance and bike path for a few hours shall be expected.

b. Cost Estimate

The preliminary costs for this alternative includes $400,000 for the manufacturing of the two slide gates and associated mounting materials. The overall cost for the new columns and repair of the existing structure is estimated at $350,000. Wendel considered strength and durability concerning initial cost and maintenance cost for the gates. Overall, the gates, mounting equipment, a structural system to secure the gates and framework to the top of the structure, mechanical and electrical connections, new concrete work, and concrete repair work would total to $1,075,000. A breakdown of this can be seen in Section 4 with supporting material in Appendix C.

c. Non-Monetary Factors

This alternative has some potential flaws. It is currently unknown how frequently large debris flows into the system here. In these situations, workers would be sent to remove any blockage, but the gates would not be operational until this is cleared. If this continues to result in problems, a large trash rack or buoy system downstream of the outfall could be installed to deflect and capture debris from entering the outfall. This is not included in this project and would require further coordination with the Army Corp of Engineers (ACOE).

As noted above, ice formation in Cornelius Creek during the winter months was observed and the thickness varies dependent on weather. If the gates are closed, they should be able to open for an overflow event without any problems. Depending on the thickness, ice could prohibit the gates from closing for a seiche event. The gates would be able to close to the level of the ice but this would limit its ability to stop backflow into the BSA system. An additional concern would be with surges crashing against the closed gates and the associated spray freezing to the actuator stems. A partial enclosure would protect the mechanical equipment from freezing spray and other weather. The top of the existing structure is limited and could result in realigning the existing fence to provide enough space for this enclosure. This limited area on top of the structure will need to provide enough access for routine maintenance to be completed on the actuators with, or without an enclosure.

The actuators will require maintenance along with the other appurtenances. The high-wind storm events that this system will be designed for will occur intermittently so the actuators will go long durations without operating. A maintenance plan will be provided that would illustrate how often to exercise the system to ensure it is functioning properly. A routine maintenance program including greasing stems and oiling gate brackets will be provided. This will reduce the likelihood of the actuators malfunctioning. It is estimated that the system should be exercised every month with greasing and oil every six months. Similar to the inline storage RTC's this project will include a greasing system for routine maintenance operations. The site should be monitored for debris after all large storm events.

The general location of these gates could provide issues with maintenance. The work would be completed at an intersection of a bike path and a parking lot. Crews working here may need to have flagging for traffic control dependent on the actions required. Depending on the issues found, boat access may be required to make repairs. These issues on site constraints are common to all the different options.

The slide gate setup has been used on other BSA systems throughout the City. The personnel for the Authority are familiar with the actuator and slide gates which would help in the routine maintenance that will be needed for this site.

3. Alternative 3: Static Flap Gate

a. Description

Alternative 3 consists of installing dual flap gates to the exterior of the existing structure at Cornelius Creek. Similar to Alternate 2, each gate would be mounted on the 12'x13' opening, dowelled into the structural concrete and additional columns constructed. Unlike Alternate 2, these gates would not be mechanically controlled, rather they are controlled by flow. This would not require actuators or additional bracing on top of the structure. These gates operate one-directional flow only. In the event of a large storm event that would require a combined sewer overflow into the Niagara River, enough head pressure would have to build up in the existing sewers to push the gate open. Due to the size of the gates the use of cast iron material would be too much so a stainless steel gate would be recommended. In all other conditions the gate would be closed, no backwater from the Niagara River would be able flow into the structure.

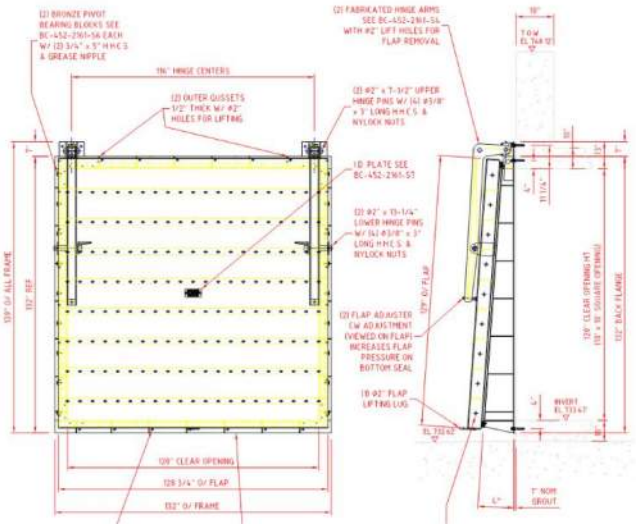


Figure 2 - Flap Gate Example

In addition to the flap gates, the existing structure would be repaired to handle the new loads of the gate valves as well as typical maintenance while the site is under construction. Like Alternate 2, the bike path will be impacted, and a portion of the parking lot will likely be offline to be used for staging for the duration of the project. All the same erosion and sediment controls would be required. This would have a similar impact to the adjacent properties as alternative 2.

b. Cost Estimate

The estimate for this alternative is $390,000 for the manufacturing of the two flap gates and associated mounting material. The overall cost for the repair of the existing structure is the same for all alternatives. The total cost would be approximately $940,000. The cost includes the gates, mounting equipment, concrete column construction, and concrete repair work. This option is cost effective, but it does not support all the goals associated with the project. Supporting material on cost can be found in Appendix C.

c. Non-Monetary Factors

This alternate has all the same site constraints as the slide gate option. The major flaw with this option is that overflow capacity will be decreased. Flap gates required head pressure to build up to overcome the weight of the gates. This would prohibit overflow events from happening as required until head pressure is greater enough to break the seating head. This

would mean all combined sewers flowing to the plant would be inundated at this time. The upstream subsheds could begin to back up and cause local and system wide capacity issues. The risk of flooding the streets/residences/businesses with the community far outweigh the benefits of implementing this option.

4. Alternative 4: Spillway Gates

a. Description

Spillway gates consists of constructing a concrete structure west of the current culvert that contains the gates. When not in use the spillway gates and bladder lay flat along the bottom of the culverts. When activated the gates are raised from the bottom at an angle by inflating the bladder which provides closure of the existing culverts. Construction of new concrete wing walls and base would extend west into Cornelius Creek. In seiche events, the gate would be controlled at the WWTP and be able to close the opening to the outfall. When closed, no overflow events could take place in either direction.

Figure 3 - Spillway Gate Example

Each gate or gates will require mechanical equipment to open and close the bladder. The electrical cabinet can be placed nearby. Like alternate 2, the gate would be connected to the Authorities SCADA system. From the WWTP, BSA personnel can engage the bladder that lifts the spillway gate into place. Additional sensors or video surveillance can be installed to help determine if debris needs to be removed, or if there are other issues with the gate.

Like the other alternatives, the spillway gate would involve concrete repair work to be done on the existing structure. As stated previously, the exterior portions of the chamber where concrete is eroding, or rebar is exposed, would be properly fixed. An assessment of the interior of the chamber will be done to ensure proposed loads can be met. During this assessment, interior locations for repair will be noted.

This alternate requires a whole additional structure to be added on the western side of the existing outfall. This area is controlled by the ACOE and all necessary reviews, permits, and specifications would be required for the work. Additionally, the structure would be close to existing NYSTA structures. This would add another authority to review the design. Due to the unknowns of the creek soils, it is expected that piles will be required to anchor the new structure.

This alternate has all the same site restrictions as the alternatives before but adds a new issue. The construction of the spillway structure further into Cornelius Creek will result in further disturbance in the creek for a longer duration. Erosion and sediment protection will be implanted to contain any sediment from leaving the construction area. Additional measures would be required during any demolition work and concrete work. To construct the base of the attached structure, bypass pumping will be required for overflow events and the additional storm sewer adjacent to the NYSTA. Continuous pumping of groundwater and river water from the creek will be necessary to keep any water out of the forms.

b. Cost Estimate

Wendel has requested quotes for two 12' x 13' spillway gates as well as a single 12' x 26' spillway gate. The dual gates have a total cost of $479,930 for the gates to be manufactured, delivered, and installed, excluding dewatering. The single gate has a cost of $420,980 for manufacturing, delivered, and installation, excluding dewatering. Although the cost of the gates is similar in price to the slide gates, the structure to support and operate the gate would be a massive expense. In addition to the cost, the constructability of the structure comes into question with the Creek and Thruway. As stated above, the Army Core of Engineers would be involved and the structure would most likely require deep foundation system for support the loads, all of this in conjunction next to an active NYSTA thruway. Due to these concerns, this alternative was not pursued further. Supporting material on cost can be found in Appendix C.

5. Alternative 5: Rubber Dam

a. Description

Similar to the spillway gates, the rubber dam alternative requires a large support structure to be constructed on the exterior of the existing culverts. The rubber bladder is mounted on to the bottom and sides. Once engaged, the bladder inflates to prevent the opening into the culvert. This system would be connected to the BSA SCADA system and controlled at the WWTP. As the other alternates provide, there will be video relayed back to the WWTP to allow workers to identify any debris blocking the dam. Once a seiche event is over, the bladder would be deflated and will lay flat below the normal water elevation.

Figure 4 - Rubber Dam Example

The rubber dam system is inflated by air. An air compressor will be required relatively close to the structure along with associated piping. A structure housing this equipment adjacent to the site along the bike bath or on the fencing outside of the parking lot can house this equipment. The equipment would be connected to the BSA System, allowing it to be operated at the WWTP.

Due to the size and orientations of the outfall of the structure, the rubber dams would not be able to be constructed inside the structure. Rather, a new structure would be built attached to the outside on a deep pile foundation, similar to alternate 4. The same potential concerns will occur with reviews by ACOE and NYSTA, as well as constant dewatering to construct the cast-in-place concrete structure and piles. Bypassing will be required for any overflow events and the additional storm sewer that discharges adjacent to the structure from the NYSTA. Also concerns regarding the rubber dam with debris puncture, ice blockage, U/V degradation to the rubber over time and maintenance on rubber dam and specialty equipment are of serious concern for this alternative.

b. Cost Estimate

A 12' x 26' rubber dam has a total cost of $282,200 that includes the manufacturing, delivery, and installation cost for the whole dam system. The price of the rubber dam is the cheapest

out of all the barrier systems. However, the additional structure and equipment required to install and operate the rubber dam has a large financial impact and complicates the construction and maintenance program. All the same concerns with the additional structure from the spillway gate apply for the rubber dam. For this reason, the rubber dam was not pursued as a feasible option for this application. Supporting material on cost can be found in Appendix C.

6. Alternative 6: Tideflex Check Valve

a. Description

Tideflex valves would operate similar to the flap gates. No backflow would be allowed to enter the system, but overflow events could not happen freely. These 54" Tideflex check valves would be installed to a plate that is bolted in place to the face of the chamber.

The biggest issue with this option, like the flap gates, is that the overflow capacity is decreased, and the check valves are fixed to the chamber, not on a gate controlled by the plant. Sewage would have to build up with enough pressure to provide an overflow event. Although it solves the issue for the backflow, limiting the capacity for overflow events would create a larger impact to the system.

This alternative also looked at attaching multiple Tideflex valves to a slide gate, assumed to be two 54" per opening. The gates would operate as explained in the slide gate analysis above. The only difference is during a seiche event when the gates are closed, and the system requires an overflow event, head pressure can build up and allow for an overflow event to happen while prohibiting any backflow into the system. This solves the flaw each option had. Overflow events will still be capable during seiche events. If the overflow requires a larger capacity, the whole gate will slide open to allow for the full capacity as it is now.

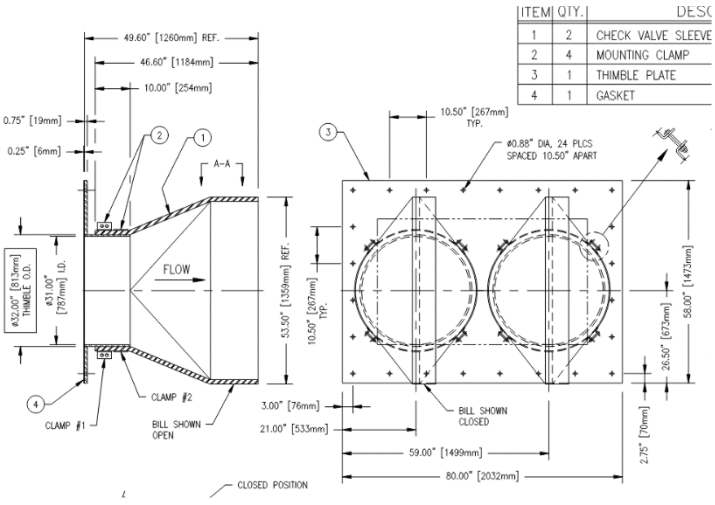


Figure 5 - Check Valve Example

b. Cost Estimate

To manufacture and install the Tideflex valves to a fixed plate on the opening of the outfalls, it is estimated to be $420,000. This option, as noted above, decreases the capacity for overflow events, therefore it was not considered a feasible option.

The second option of a whole system of slide gate with check valves would be a much larger cost. For this option, the slide gates would have to increase in thickness for the additional load. The cost estimate would be anticipated to be around $750,000.

This alternate would only be used if the overflow events were critical during a seiche event. From the data provided to Wendel from Xylem regarding seiche events and overflows in the system, only one seiche event required an overflow event during a two-year data collection.

This increase in cost for the minor frequency of such events is why this option was deemed not viable.

Summary of Alternatives

1. Summary

The recommended alternative is Alternative No. 2 – Install dual real time-controlled slide gates. Based on the analysis presented in Section 3 – Alternatives Analysis, this is the most technically feasible alternative to achieve all the goals for this project. The resiliency, price, and past history of being used widely within the BSA system were some of the many reasons this was chosen as Wendel's recommended option. Schematic drawings have been provided in Appendix D which include detailed site plan and cross sections for this solution.

2. Land Requirements

No additional land requirements are necessary to implement the proposed improvements at CSO 055. All improvements will be constructed on the existing structure which is BSA-owned. An agreement would be put in place with the adjacent owners for staging areas. A permanent easement may be required depending on the final design of the columns on the western face of the existing structure. Further coordination with ACOE and NYSTA will be required as design progresses.

3. Potential Construction Problems

Potential construction challenges associated with the selected alternatives will generally consist of maintaining the operation of the systems during construction activities. It will be necessary to provide bypass for overflow events and keep the existing sewer running without obstruction. This will require preparation of a detailed bypass plan and coffer dam. Additionally, the new concrete work would involve substantial dewatering to form, pour, and cure within the footprint of the creek.

The site location possesses difficulties with the NYSTA, adjacent parks, and ACOE. Although careful planning and coordination will be required to overcome these challenges, permitting and coordination could push the length of design and construction. It will be important to begin coordination with all authorities early in the design process to ensure the permits can be obtained quickly by the contractor with little to no delays. This coordination will continue throughout the design process.

Recommended and Selected Alternatives

1. Engineer's Opinion of Probable Construction Costs

An opinion of probably construction cost for each of the improvements as identified in the previous sections has been included in the table below.

Table 4-1: Engineer's Opinion of Probable Construction Cost

Item	Cost
Repair of the Existing Concrete Structure	$200,000
Dewatering/Sediment Controls	$200,000
Extending Concrete Columns	$150,000
Manufacturing, Delivery, and Installation of Gates	$400,000
Structural Improvements	$75,000
Electrical Improvements	$50,000
Cost Subtotal	**$1,075,000**
Bonds and Insurance (2%)	$21,500
Mobilization (3%)	$32,250
Maintenance and Protection of Traffic (5%)	$53,750
General Conditions (5%)	$53,750
Contractor's Overhead and Profit (10%)	$107,500
Direct Construction Cost Subtotal	**$1,343,750**
Contingency (20%)	$268,750
Total Direct Construction Costs	**$1,612,500**
Engineering, Inspection, Legal and Admin. (23%)	$371,000
Total Opinion of Probable Cost	**$1,983,500**

2. Project Schedule:

Below represents the proposed project schedule for the Cornelius Creek CSO Backwater Gate Flooding Mitigation Project. The schedule is dependent on funding and regulatory approvals.

Design	August 2022 - January 2023
Regulatory Review	December 2022 - January 2023
Bidding	February 2023
Award Contracts	April 2023
Construction	May 2023 - August 2023

APPENDIX A – SITE PHOTOS

Site Photo 1

Site Photo 2

Site Photo 3

Site Photo 4

Site Photo 5

Site Photo 6

Site Photo 7

Site Photo 8

Site Photo 9


Site Photo 10

Site Photo 11

Site Photo 12

Site Photo 13

Site Photo 14

Site Photo 15

Site Photo 16

Site Photo 17

Site Photo 18

Site Photo 19

Site Photo 20

Site Photo 21

Site Photo 22

Site Photo 23

Site Photo 24

Site Photo 25

Site Photo 26

Site Photo 27

Site Photo 28

Site Photo 29

Site Photo 30

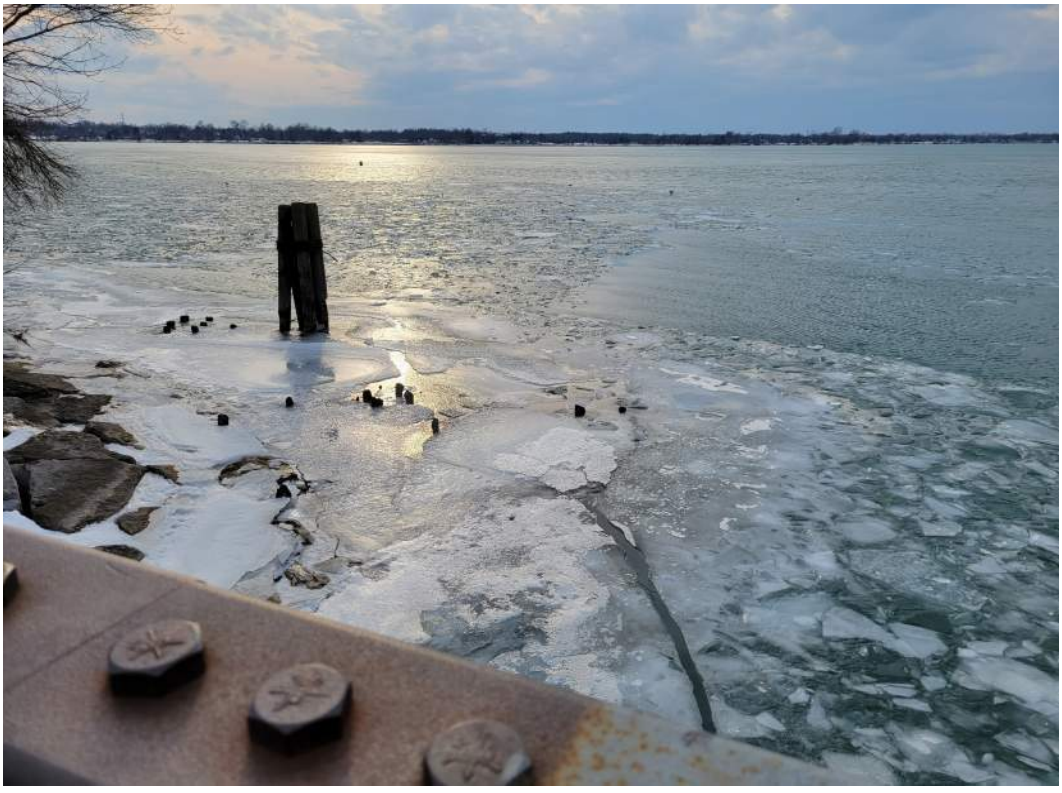
Site Photo 31

Site Photo 32

Site Photo 33

Site Photo 34

Site Photo 35



Site Photo 36

Site Photo 37

Site Photo 38

Site Photo 39

Site Photo 40

Site Photo 41

Site Photo 42

Site Photo 43

Site Photo 44

Site Photo 45


Site Photo 46

Site Photo 47


Site Photo 48

Site Photo 49

Site Photo 50

APPENDIX B – EXISTING DRAWINGS

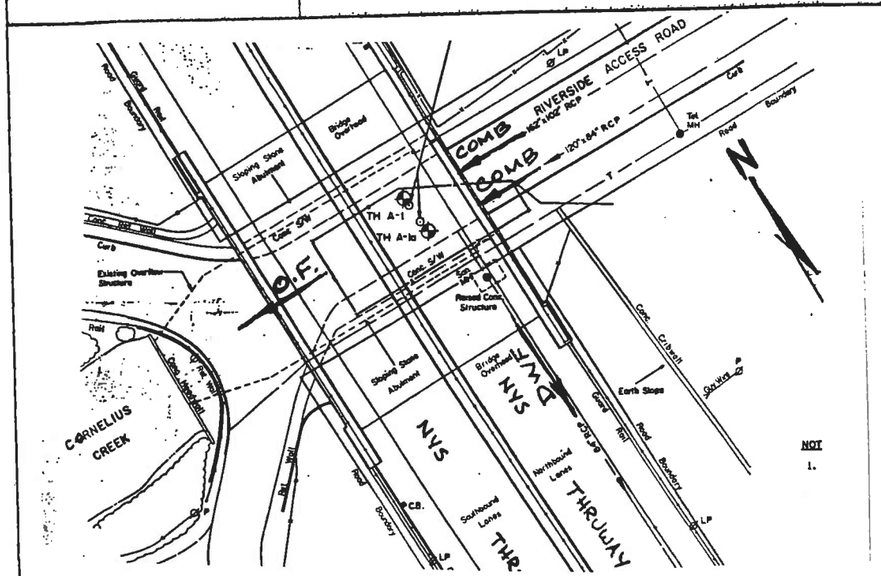
Div. Div

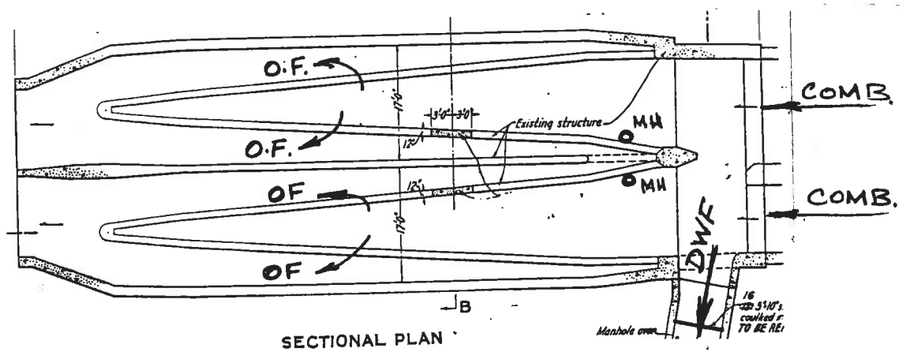
BUFFALO SEWER AUTHORITY X3, Y24, S4563 E27
COMBINED SEWER OVERFLOW
INSPECTION PROGRAM

SPP NO.: 1

LOCATION: Cornelius Creek, S.S. Thruway, E. Lane.

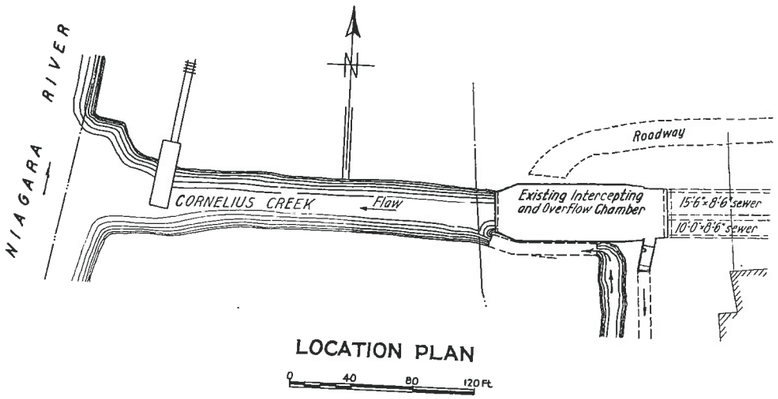
DATE OF INSPECTION:



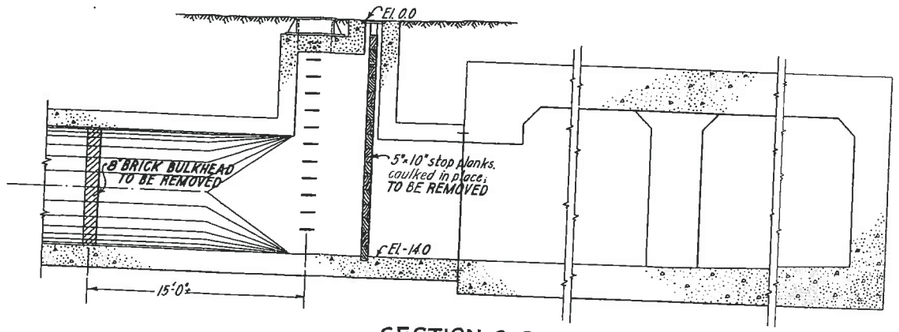


SECTIONAL PLAN

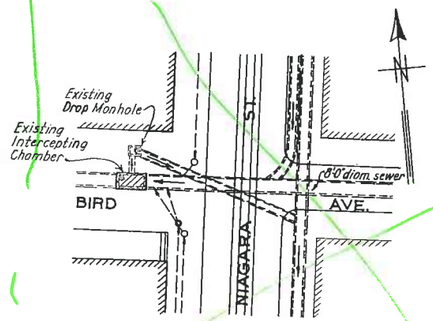
NOTES:



LOCATION PLAN



SECTION C-C



LOCATION PLAN

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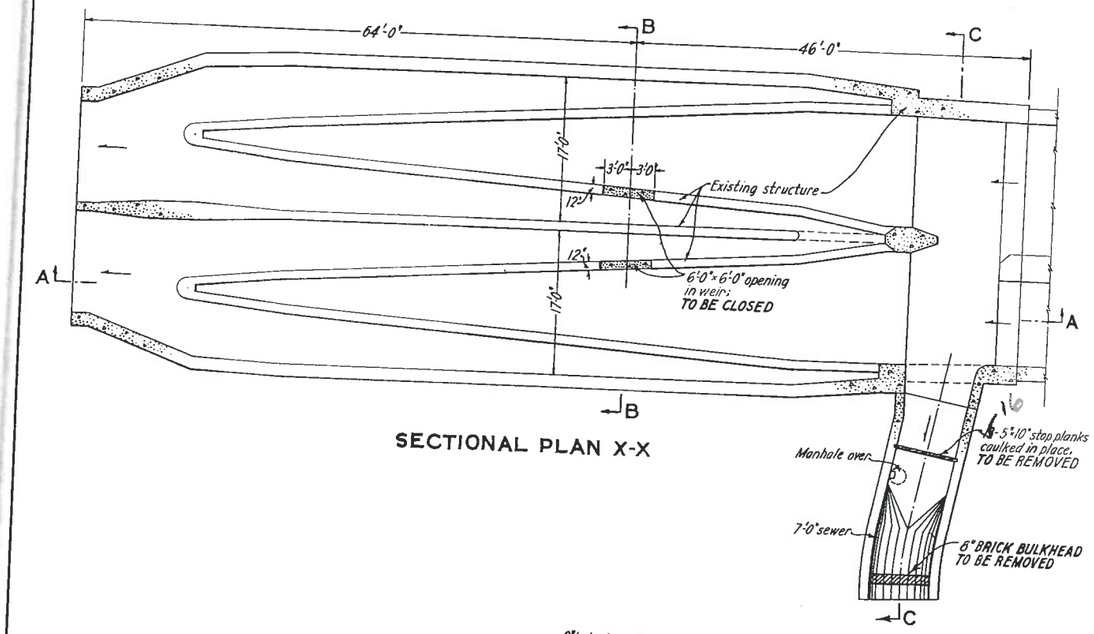
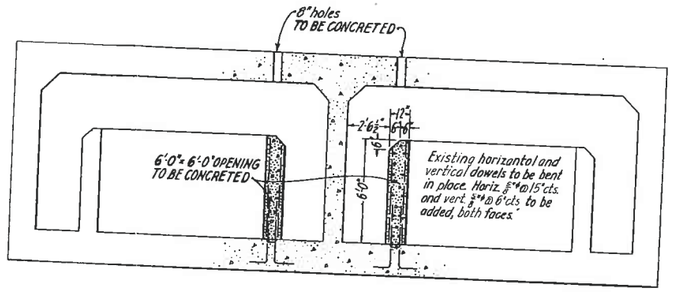
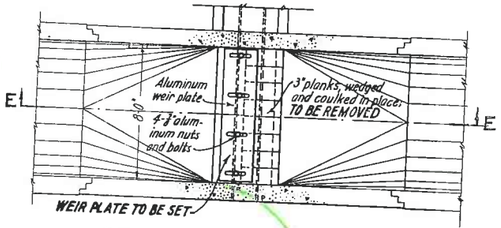


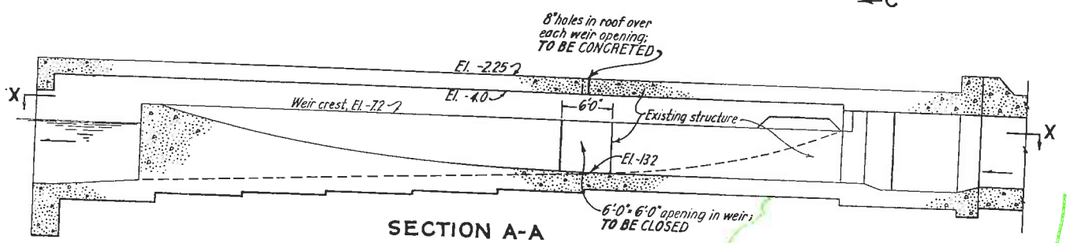
SECTIONAL PLAN X-X



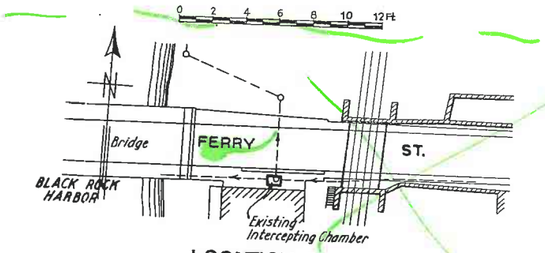
SECTION B-B



SECTIONAL PLAN F-F



SECTION A-A



LOCATION PLAN

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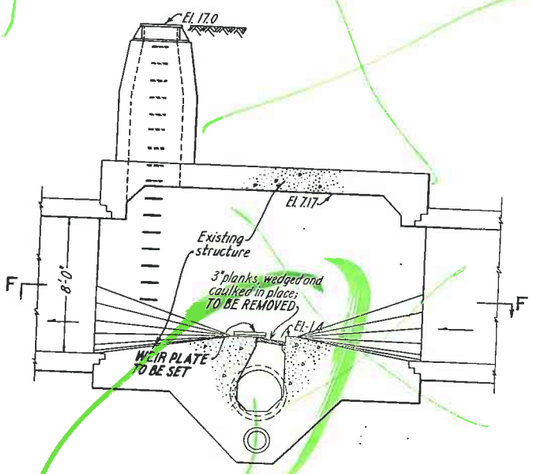
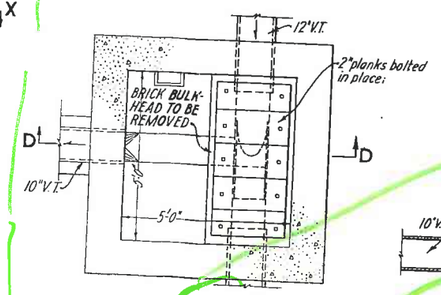
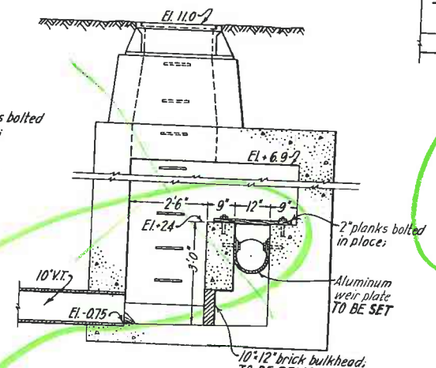


SECTION E-E



SECTIONAL PLAN



SECTION D-D

FERRY ST. INTERCEPTING CHAMBER ITEM Y-21

0 1 2 3 4 5 6 Ft.

CORNELIUS CREEK INTERCEPTING AND OVERFLOW CHAMBER
ITEM Y-18

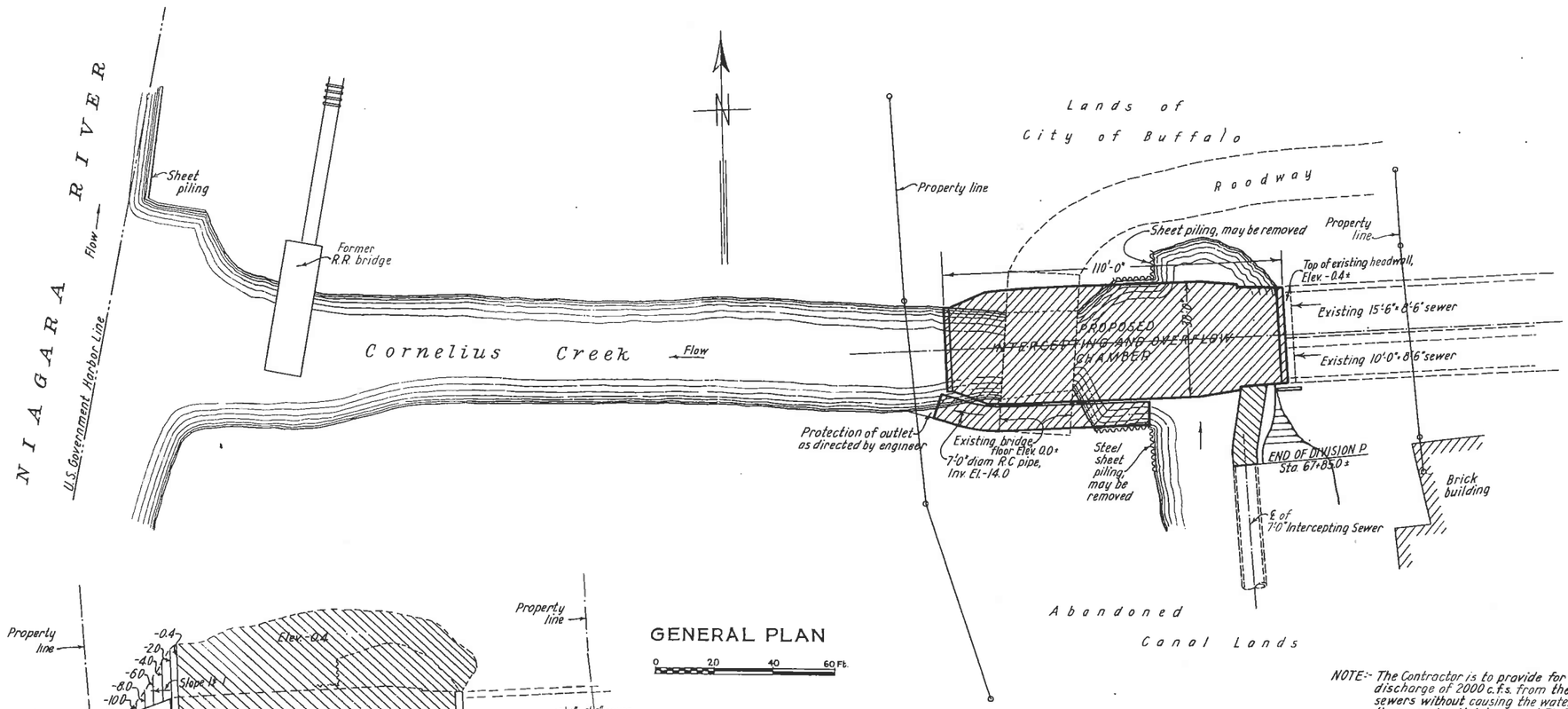
0 2 4 6 8 10 12 14 16 18 20 22 24 Ft.

AVE. INTERCEPTING CHAMBER ITEM Y-20

0 2 4 6 8 10 12 Ft.

BUFFALO, NEW YORK
BUFFALO SEWER AUTHORITY
INTERCEPTING SEWER
DIVISION Y
SEWER CONNECTIONS AND ACCESSORIES

OPENING
EXISTING INTERCEPTING CHAMBERS



GENERAL PLAN

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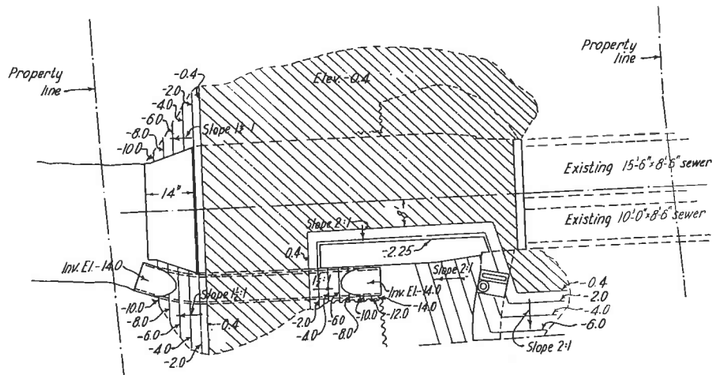
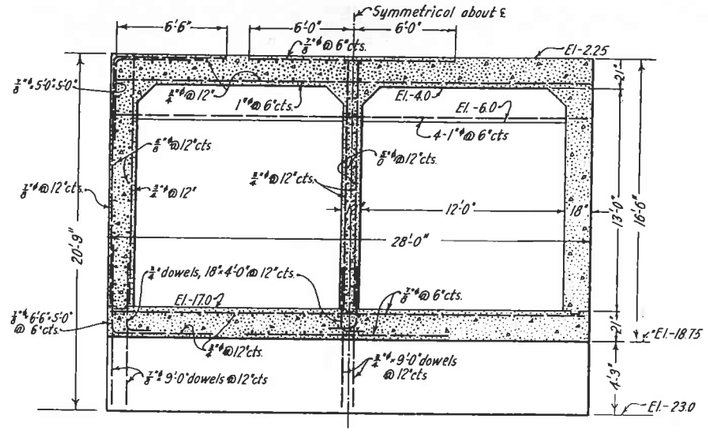


PLAN SHOWING FINISHED GRADE

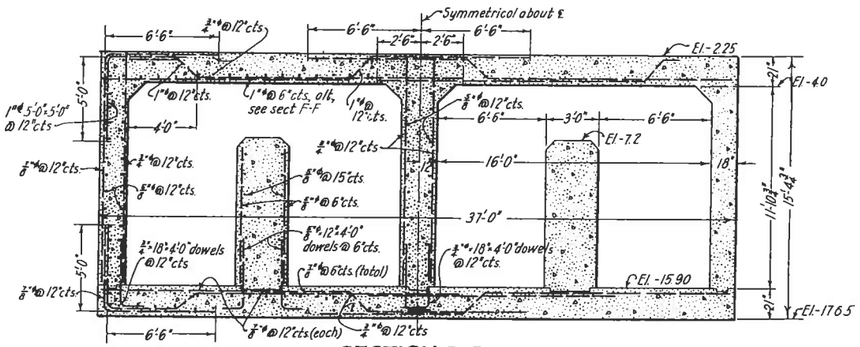
NOTE:- The Contractor is to provide for a possible discharge of 2000 c.f.s. from the present sewers without causing the water level at the present outlet to exceed El.-2.0. The capacity of the 7'-0" R.C pipe shown on plan can be considered 500 c.f.s.

BUFFALO, NEW YORK
BUFFALO SEWER AUTHORITY
INTERCEPTING SEWER
DIVISION X
SPECIAL STRUCTURES AND SEWERS
CORNELIUS CREEK to ALBANY ST.
CORNELIUS CREEK
INTERCEPTING AND OVERFLOW CHAMBER

MARCH, 1937 — 16 SHEETS. NO. 3



SECTION C-C



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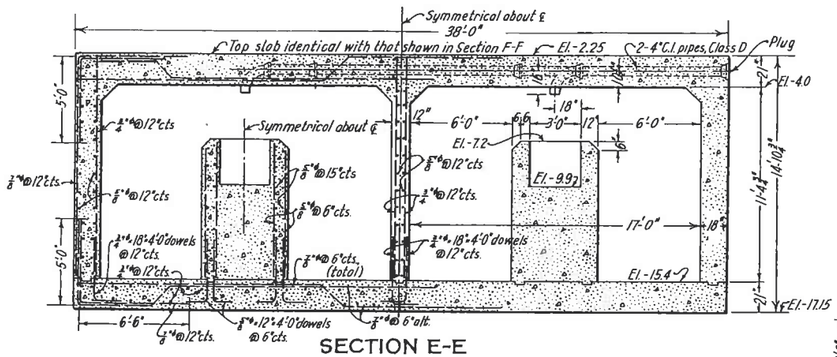

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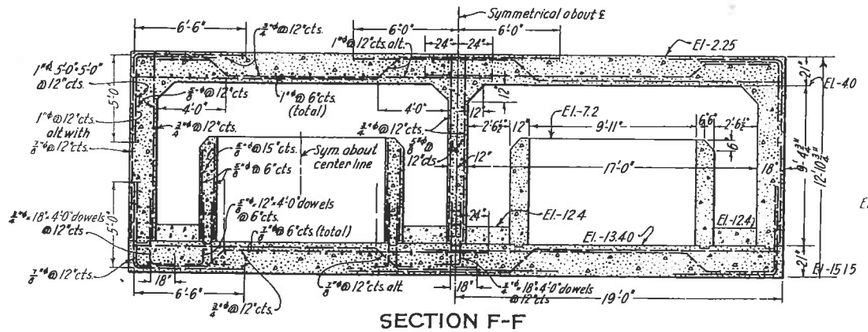

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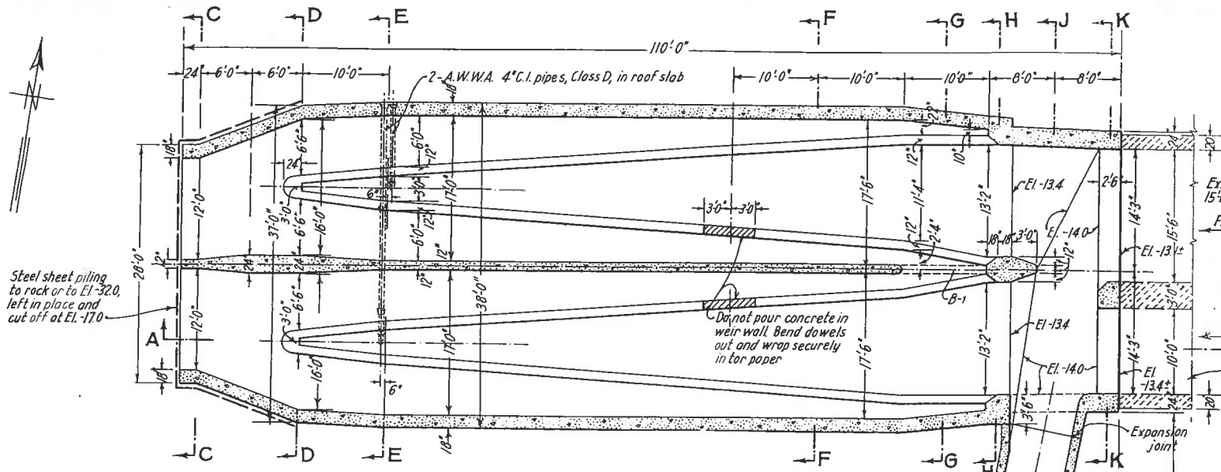
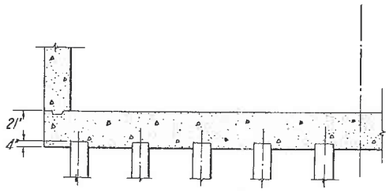
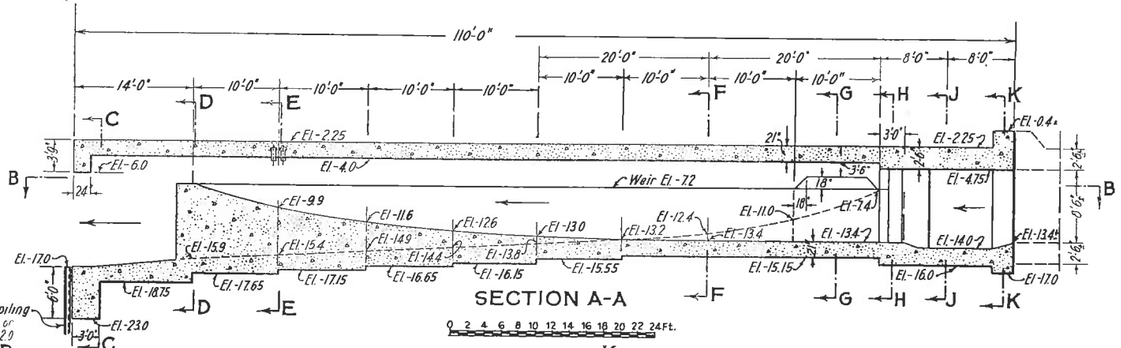


SECTIONAL PLAN B-B

0 2 4 6 8 10 12 14 16 18 20 22 24 Ft



TYPICAL SECTION OF BOTTOM SLAB
(IF PILING IS USED)



SECTION A-A

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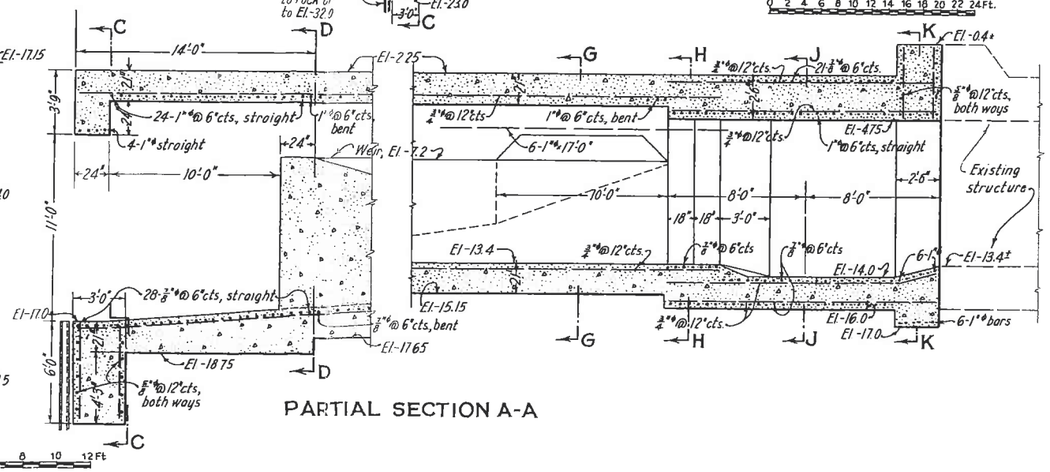
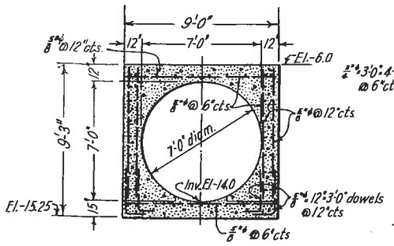


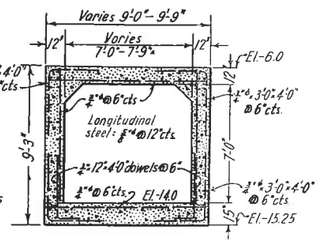
PARTIAL SECTION A-A

0 2 4 6 8 10 12 Ft

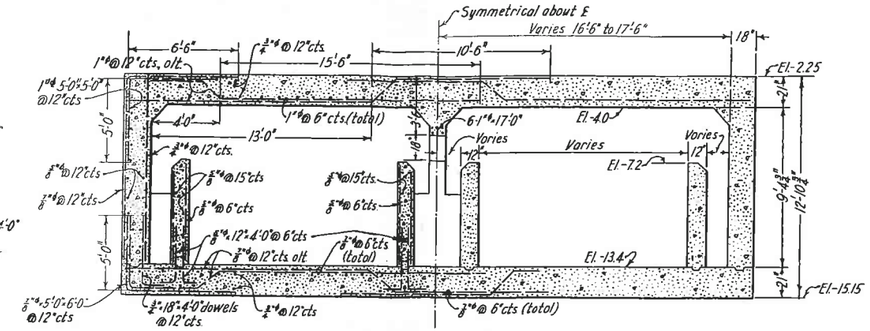
BUFFALO, NEW YORK
BUFFALO SEWER AUTHORITY
INTERCEPTING SEWER
DIVISION X
SPECIAL STRUCTURES AND SEWERS
CORNELIUS CREEK to ALBANY ST.
CORNELIUS CREEK
INTERCEPTING AND OVERFLOW CHAMBER
MARCH 1937
16 SHEETS NO. 4



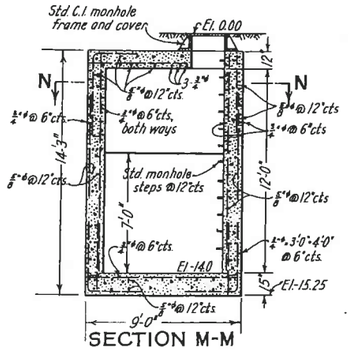
SECTION O-O



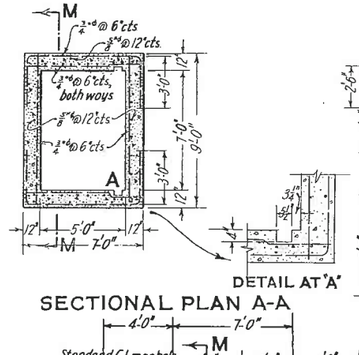
SECTION L-L



SECTION G-G

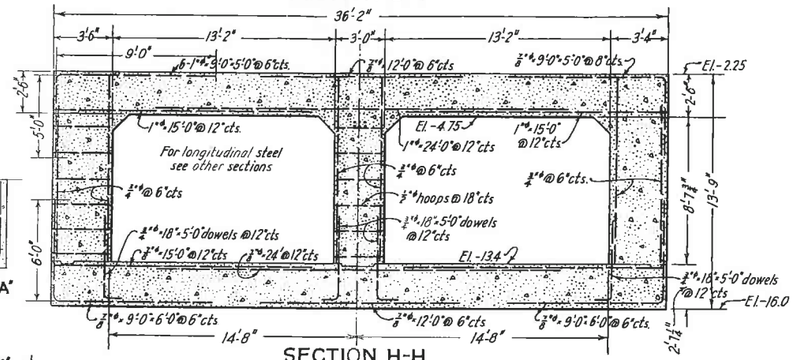


SECTION M-M

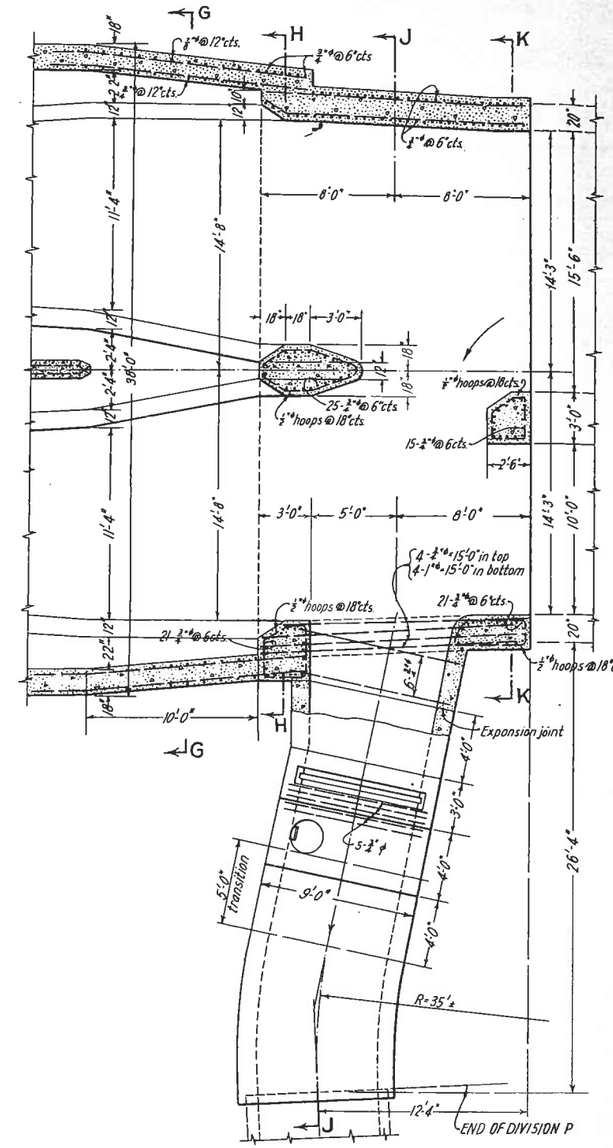


DETAIL AT "A"

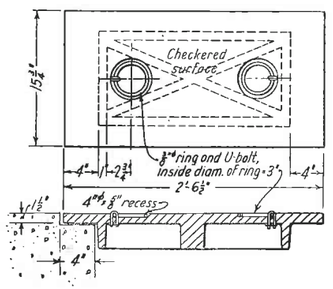
SECTIONAL PLAN A-A



SECTION H-H

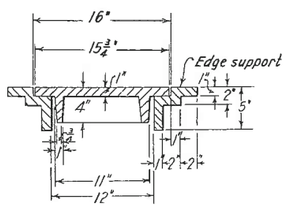


PARTIAL SECTIONAL PLAN B-B



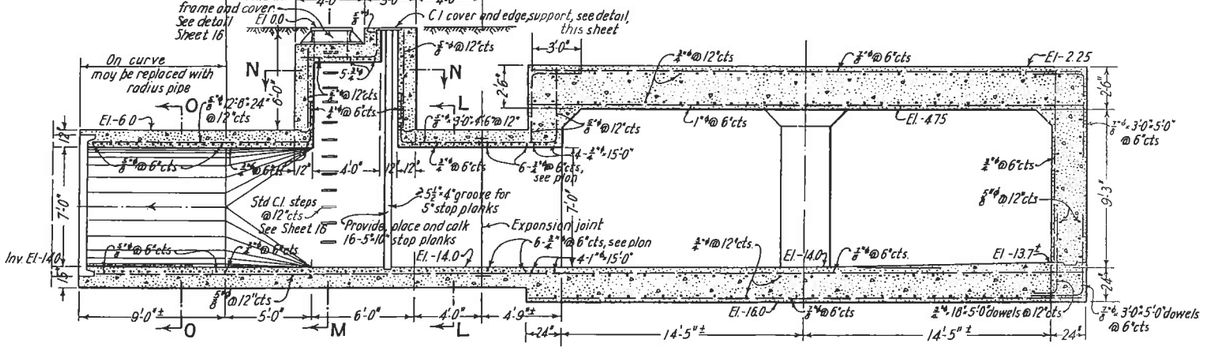
REQUIRED

3 covers, as shown
2 edge supports, 7'-8" long

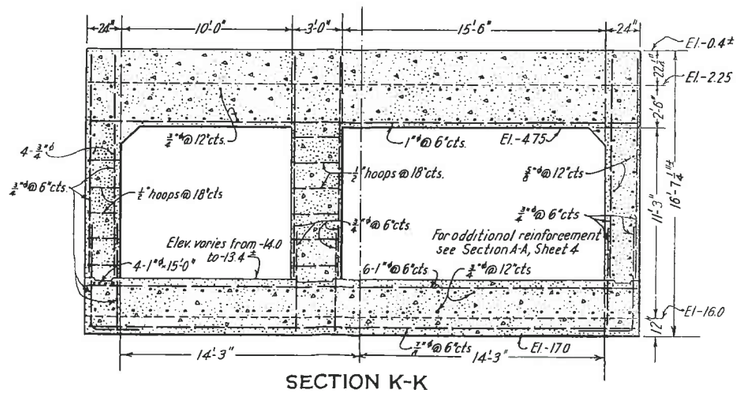


C.I. COVER FOR STOP PLANK GROOVE

0 12 24 In



SECTION J-J



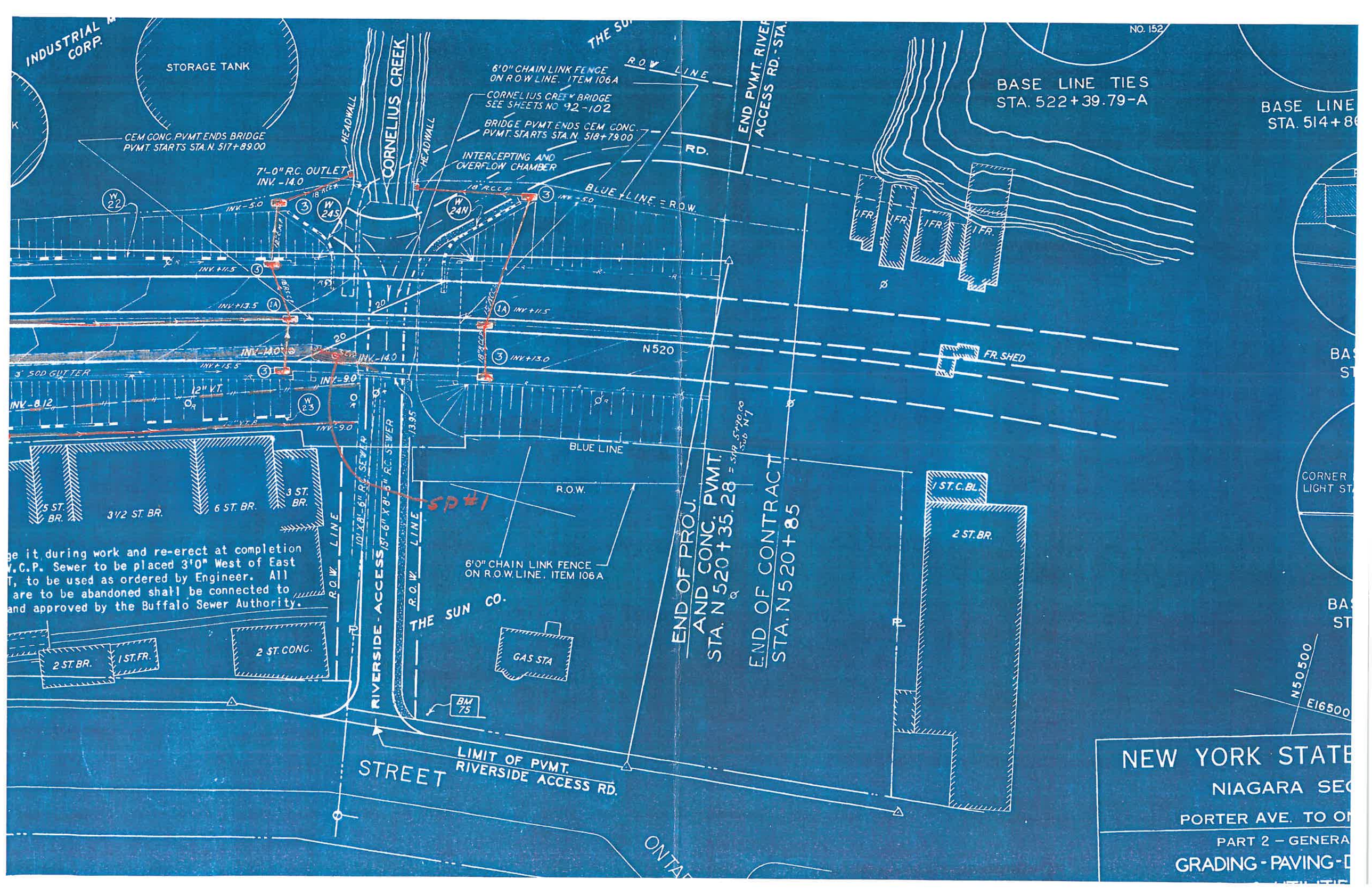
SECTION K-K

BUFFALO, NEW YORK
BUFFALO SEWER AUTHORITY
INTERCEPTING SEWER
DIVISION X
SPECIAL STRUCTURES AND SEWERS
CORNELIUS CREEK to ALBANY ST.
CORNELIUS CREEK
INTERCEPTING AND OVERFLOW CHAMBER

0 2 4 6 8 10 12 Ft

MARCH, 1937

15 SHEETS, NO. 5


INDUSTRIAL CORP.
STORAGE TANK
CEM. CONC. PVMT. ENDS BRIDGE PVMT. STARTS STA. N. 517+89.00
7'-0" R.C. OUTLET INV. -14.0
HEADWALL
CORNELIUS CREEK
HEADWALL
6'0" CHAIN LINK FENCE ON R.O.W. LINE. ITEM 106A
CORNELIUS CREEK BRIDGE SEE SHEETS NO 92-102
BRIDGE PVMT. ENDS CEM. CONC. PVMT. STARTS STA. N. 518+79.00
INTERCEPTING AND OVERFLOW CHAMBER
R.O.W. LINE
END PVMT. RIVER ACCESS RD. - STA.
RD.
BLUE LINE = R.O.W.
BASE LINE TIES STA. 522+39.79-A
NO. 152
BASE LINE STA. 514+86
W 22
W 24S
W 24N
W 23
INV. -5.0
INV. +11.5
INV. +13.5
INV. -14.0
INV. +13.0
INV. -9.0
INV. -8.12
3" SOD GUTTER
12" V.T.
18" R.C.P.
1A
20
N520
FR. SHED
1 FR.
BLUE LINE
R.O.W.
13.95
5 ST. BR.
3 1/2 ST. BR.
6 ST. BR.
3 ST. BR.
SP #1
ge it during work and re-erect at completion
V.C.P. Sewer to be placed 3'0" West of East
T, to be used as ordered by Engineer. All
are to be abandoned shall be connected to
and approved by the Buffalo Sewer Authority.
10'x8'-6" R.C. SEWER
5'-6"x8'-6" R.C. SEWER
RIVERSIDE ACCESS
R.O.W. LINE
R.O.W. LINE
6'0" CHAIN LINK FENCE ON R.O.W. LINE. ITEM 106A
THE SUN CO.
GAS STA
BM 75
2 ST. BR.
1 ST. FR.
2 ST. CONC.
END OF PROJ. AND CONC. PVMT. STA. N 520+35.28
END OF CONTRACT STA. N 520+85
1 ST. C. BL.
2 ST. BR.
CORNER LIGHT ST.
N50500
E16500
LIMIT OF PVMT. RIVERSIDE ACCESS RD.
STREET
ONTA
NEW YORK STATE
NIAGARA SEC
PORTER AVE. TO ON
PART 2 – GENERA
GRADING - PAVING - D

STRUCTURAL ABBREVIATION LIST

A	
A/E	Architect/Engineer
AB	Anchor Bolt
ABBRV	Abbreviation
ACI	American Concrete Institute
ADH	Adhesive
ADJ	Adjustable
AFF	Above Finished Floor
AIA	American Institute Of Architects
AISC	American Institute Of Steel Construction
ALT	Alternate
ALUM	Aluminum
ANSI	American National Standards Institute
APA	American Plywood Association
APPROX	Approximate
ARCH	Architect / Architectural
ASCE	American Society Of Civil Engineers
ASI	Architect's Supplemental Instruction
ASPH	Asphalt
ASTM	American Society For Testing And Materials
ASWG	American Steel Wire Gauge
AVG	Average
AWPA	American Wood Preservers' Association
AWS	American Welding Society
B	
B PL	Base Plate
B.O.	Bottom Of
B/B	Back To Back
BC	Bottom Chord
BD	Board
BD FT	Board Feet (Foot)
BEV	Bevel
BF	Braced Frame
BIT	Bituminous
BL	Base Line / Building Line
BLK	Block
BLKG	Blocking
BM	Bench Mark
BOT	Bottom
BRG	Bearing
BRG PL	Bearing Plate
BSA	Buffalo Sewer Authority
BTWN	Between
C	
C	Channel
C/C	Center To Center
CAM	Camber
CANTIL	Cantilever
CEM	Cement
CFMF	Cold-Formed Metal Framing
CI	Cast Iron
CIP	Cast-In-Place
CJ	Construction Joint
CL	Center / Column Line
CLG	Ceiling
CLR	Clear
CMU	Concrete Masonry Unit
CO	Cleanout
COL	Column
CONC	Concrete
CONSTR	Construction
CONT	Continuous
COV	Cover
CRSI	Concrete Reinforcing Steel Institute
CS	Combined Sewer
CSI	Construction Specifications Institute
CSO	Combined Sewer Overflow
CTR	Center

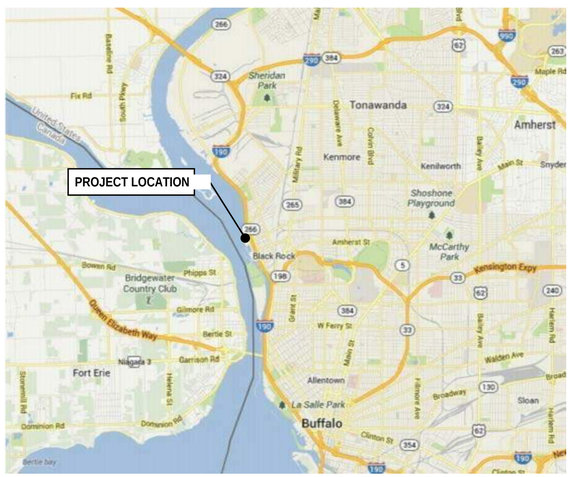
D	
DBL	Double
DEMO	Demolition
DET	Detail
DEV	Development
DIA	Diameter
DIM	Dimension
DL	Dead Load
DP	Drilled Pier
DWG	Drawing
DWL	Dowel
E	
E	East
EA	Each
EE	Each End
EF	Each Face
EIFS	Exterior Insulation And Finish System
EJ	Expansion Joint
EL	Elevation
ELEC	Electrical
ELEV	Elevator
ENGR	Engineer
EOD	Edge Of Deck
EOS	Edge Of Slab
EQ	Equal
EQUIP	Equipment
ES	Each Side
EST	Estimate
EW	Each Way
EWA	Engineered Wood Association
EXIST	Existing
EXP	Expansion
EXT	Exterior
F	
FAB	Fabrication
FDTN	Foundation
FIG	Figure
FIN	Finish
FIN FLR	Finish Floor
FLR	Floor
FRMG	Framing
FS	Far Side
FT	Foot / Feet
FTG	Footing
FUT	Future
G	
G	Gas
GA	Gage
GAL	Gallon
GALV	Galvanized
GB	Grade Beam
GC	General Contractor
GFRC	Glass-Fiber-Reinforced Concrete
GFRP	Glass-Fiber-Reinforced Plastic
GLU LAM	Glued Laminated Wood
H	
HC	Hollow Core
HM	Hollow Metal
HORIZ	Horizontal
HSS	Hollow Structural Steel
HT	Height
HWY	Highway
HYD	Hydrant

I	
IBC	International Building Code
ID	Inside Diameter
IF	Inside Face
INCL	Included
INFO	Information
INSTR	Instrument
INSUL	Insulation
INT	Interior
INV	Invert
J	
JT	Joint
K	
K	Kip
KB	Knee Brace
KSF	Kip Per Square Foot
KSI	Kips Per Square Inch
L	
L	Structural Angle
LAD	Ladder
LATL	Lateral
PLF	Pound-Force Per Foot
PSF	Pound-Force Per Square Foot
PSI	Pound-Force Per Square Inch
LBS	Pound
LDFC	Low Density Foam Concrete Fill
LF	Linear Feet (Foot)
LL	Live Load
LLH	Long Leg Horizontal
LLV	Long Leg Vertical
LOC	Location
LONG	Longitudinal
LSH	Long Side Horizontal
LSV	Long Side Vertical
M	
MAS	Masonry
MATL	Material
MAX	Maximum
MECH	Mechanical
MFR	Manufacturer
MIN	Minimum
MIRR	Mirror
MISC	Miscellaneous
MO	Masonry Opening
MSL	Mean Sea Level
MTL	Metal
N	
N	North
NA	Not Applicable
NBC	National Building Code
NF	Near Face
NFC	National Fire Code
NIBS	National Institute Of Building Sciences
NIC	Not In Contract
NS	Near Side
NTS	Not To Scale

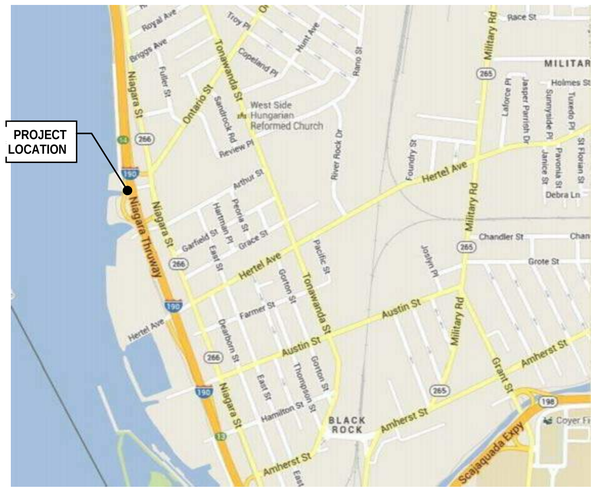
O	
oc	On Center
OD	Outside Diameter
OF	Outside Face
OH	Overhang
OPNG	Opening
OPP	Opposite
P	
PART	Partition
PC	Portland Cement
PCA	Portland Cement Association
PCC	Precast Concrete
PCF	Pounds Per Cubic Foot
PCI	Precast/Prestressed Concrete Institute
PERF	Perforated
PERIM	Perimeter
PERM	Permanent
PERP	Perpendicular
PL	Plate
PLAS	Plastic
PLAT	Platform
PLBG	Plumbing
PLF	Pounds Per Linear Foot
PLG	Piling
PLYWD	Plywood
POI	Point Of Interconnection
POLY	Polyethylene (Plastic)
POT	Point Of Tangent
PRCST	Precast
PRELIM	Preliminary
PROJ	Projection
PROP	Property
PSF	Pounds Per Square Foot
PSI	Pounds Per Square Inch
PT	Pressure Treated
PT CONC	Post-Tensioned Concrete
PUR	Purlins
PVC	Polyvinyl Chloride (Plastic)
PVMT	Pavement
Q	
QA	Quality Assurance
QC	Quality Control
QTY	Quantity
QUAD	Quadrant
R	
R	Radius
RD	Roof Drain
REBAR	Reinforcing Steel Bars
REF	Reference
REINF	Reinforce
REPL	Replace
REQD	Required
REV	Revision
RH	Roof Hatch
RO	Rough Opening
ROW	Right Of Way
RT	Right
RTU	Roof Top Unit
RV	Roof Vent

S	
S	South
SCHED	Schedule
SDI	Steel Deck Institute
SECT	Section
SF	Square Foot (Feet)
SHT	Sheet
SIM	Similar
SJ	Sawcut Joint
SJI	Steel Joist Institute
SPEC	Specification
SPP	Sewer Patrol Point
SQ	Square
SS	Stainless Steel
STD	Standard
STIFF	Stiffener
STL	Steel
STRUCT	Structural
SURV	Survey
SYM	Symbol
SYMM	Symmetrical
T	
T	Tread
T&B	Top And Bottom
T.O.	Top Of
T.O. CONC	Table Of Content
T.O. FDN	Top Of Foundation
T.O. FTG	Top Of Concrete Footing
T.O. MAS	Top Of Masonry
T.O. STEEL	Top Of Steel
T.O. WALL	Top Of Wall
TB-XX	Test Boring-Xx (E.G., TB-01)
TEMP	Temporary
THK	Thick / Thickness
TYP	Typical
U	
UBC	Uniform Building Code
UFC	Uniform Fire Code
UGND	Underground
UL	Underwriters Laboratories
UNO	Unless Noted Otherwise
UON	Unless Otherwise Noted
V	
VAR	Varies
V.I.F.	Verify In Field
VOL	Volume
W	
W	West
W/	With
WD	Wood
WF	Wide Flange
WF BM	Beam, Wide Flange
WP	Working Point
WS	Water Stop
WT	Weight
WTR	Water
WWF	Welded Wire Fabric
WWR	Welded Wire Reinforcement

STRUCTURAL DRAWING LIST	
DRAWING No.	DRAWING TITLE
S001	STRUCTURAL NOTES, ABBREVIATIONS AND LOCATION MAPS
S101	EXISTING CONDITIONS
S102	CHANNEL BASE PLAN AND UNDER SLAB PLAN
S103	WALL ELEVATIONS
S104	PICTURES
WE101	OVERFLOW CHANNEL PLAN AND SECTIONS



AREA MAP
N.T.S.



PROJECT LOCATION MAP
N.T.S.

GENERAL NOTES

1. DRAWINGS SHOW GENERAL LOCATION OF THE EXISTING SEWER PATROL POINT (SPP) TO BE MODIFIED UNDER THIS CONTRACT.
2. DIMENSIONS, ELEVATIONS, ETC. SHOWN ON DRAWINGS ARE BASED UPON RECORD DRAWING INFORMATION AND ARE APPROXIMATE ONLY. CONTRACTOR SHALL FIELD VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OR AUTHORITY OF ANY DISCREPANCIES.
3. THE CONTRACTOR IS RESPONSIBLE FOR ALL HORIZONTAL AND VERTICAL CONTROL, PROJECT STAKEOUT AND LINE AND GRADE. SUBMIT SURVEY INFORMATION
4. CONTRACTOR IS RESPONSIBLE FOR MAINTAINING AND ENFORCING A SAFETY PROGRAM IN ACCORDANCE WITH ALL NEW YORK STATE AND OSHA REGULATIONS, INCLUDING CONFINED SPACE ENTRY. WHILE THE ENGINEER AND AUTHORITY ARE NOT RESPONSIBLE FOR JOB SAFETY, THE CONTRACTOR IS REQUIRED TO COORDINATE HIS SAFETY PLAN WITH THE AUTHORITY SAFETY OFFICER. THE SAFETY OFFICE MAY BE REACHED AT (716) 851-4664 EXT. 5214.
5. CONTRACTOR RESPONSIBLE TO MAINTAIN TRAFFIC CONTROL IN ACCORDANCE WITH CITY OF BUFFALO STANDARD SPECIFICATIONS.
6. CONTRACTOR RESPONSIBLE TO MAINTAIN SEWER FLOW AT ALL TIMES IN ACCORDANCE WITH THE BSA STANDARD SPECIFICATIONS. NOTIFY AUTHORITY AT LEAST THREE DAYS IN ADVANCE OF PROPOSED BYPASSING OPERATIONS.
7. CONTRACTOR SHALL MONITOR WEATHER CONDITIONS TO ENSURE THAT SEWER FLOWS ARE MINIMIZED DURING CONSTRUCTION ACTIVITIES.
8. CONTRACTOR IS ADVISED THAT SEWER FLOW DEPTH, VELOCITY, AND VOLUME VARY GREATLY AND THAT THE SPP MAY SURCHARGE (FLOOD) DURING WET WEATHER. THE CONTRACTOR SHALL PROTECT THE WORK SURFACES AND SHALL AS NECESSARY SUSPEND WORK DURING WET WEATHER EVENTS.
9. ALL WORK AND FLOW CONTROL METHODS MUST BE CONTAINED WITHIN THE SPP CHAMBER. NO WORK WILL BE PERMITTED IN CORNELIUS CREEK.
10. ACCESS TO THE WEIR IS AVAILABLE FROM THE SEWER SIDE ONLY, THROUGH SPP ACCESS MANHOLES.
11. FLOW CONTROL METHODS MAY BE LOCALIZED IN THE AREA WORK IS BEING PERFORMED.
12. CONTRACTOR SHALL VISIT THE SITE AND EXAMINE THE CONDITIONS ON WHICH HIS WORK IS IN ANY WAY DEPENDENT FOR THE BEST WORKMANSHIP AND OPERATION ACCORDING TO THE INTENT OF CONSTRUCTION DOCUMENTS.
13. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, CERTIFICATIONS, CATALOG CUT SHEETS, AND PRODUCT DATA FOR ALL EQUIPMENT, COMPONENTS AND MATERIALS TO BE INSTALLED IN THE PROJECT.
14. DEMOLITION AND CONSTRUCTION WORK SHALL BE EXECUTED IN A SAFE, CAREFUL AND ORDERLY MANNER, WITH THE LEAST POSSIBLE NOISE, DUST AND DISTURBANCE TO THE OWNER. CONTRACTOR SHALL COORDINATE CONSTRUCTION SEQUENCING WITH THE OWNER SO AS NOT TO DISRUPT THE OWNER'S OPERATIONS.
15. CONTRACTOR SHALL PROTECT EXISTING CONSTRUCTION. COORDINATE DEMOLITION WITH THE DRAWINGS. REMOVE FROM PROJECT SITE ALL DEMOLISHED MATERIALS. ALL DEMOLISHED MATERIALS BECOME THE PROPERTY OF THE CONTRACTOR WHO SHALL LEGALLY DISPOSE OF SUCH MATERIALS.
16. FOR ALL REMOVALS, THE CONTRACTOR SHALL PATCH REMAINING SURFACES AS REQUIRED TO MATCH EXISTING ADJACENT SURFACES. CONTRACTORS SHALL PROTECT EXISTING CONDITIONS AND REPAIR ALL DAMAGED AREAS PROMPTLY TO ITS ORIGINAL CONDITION.
17. WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS.
18. CONSTRUCTION STAGING & STORAGE AREAS TO BE COORDINATED WITH OWNER'S REPRESENTATIVE.
19. THE ENGINEER SHALL BE NOTIFIED IN WRITING, OF ANY CONDITIONS THAT VARY FROM THOSE SHOWN ON THE PLANS. THE CONTRACTORS WORK SHALL NOT VARY FROM THAT SHOWN ON THE PLANS WITHOUT THE EXPRESS APPROVAL OF THE ENGINEER
20. THE CONTRACTOR SHALL BE AWARE THAT DUE TO THE NATURE OF RECONSTRUCTION PROJECTS, THE EXACT EXTENT OF RECONSTRUCTION WORK CANNOT ALWAYS BE ACCURATELY DETERMINED PRIOR TO BEGINNING THE WORK. THE PLANS HAVE BEEN PREPARED BASED ON FIELD INSPECTION AND OTHER INFORMATION AVAILABLE AT THE TIME. ACTUAL FIELD CONDITIONS MAY REQUIRE MODIFICATIONS TO THE WORK AND PAYMENT QUANTITIES. THE CONTRACTOR SHALL PERFORM THE WORK IN ACCORDANCE WITH FIELD CONDITIONS AS DIRECTED BY THE ENGINEER.
21. DURING REMOVAL OPERATIONS, THE CONTRACTOR SHALL NOT BE ALLOWED TO DROP WASTE CONCRETE, DEBRIS, OR OTHER MATERIAL INTO THE RIVER. PLATFORMS, NETS, SCREENS OR OTHER PROTECTIVE DEVICES SHALL BE USED TO CATCH THE MATERIAL. IF AT ANY TIME THE ENGINEER DETERMINES THAT ADEQUATE PROTECTIVE DEVICES ARE NOT BEING EMPLOYED, THE ENGINEER SHALL ORDER THAT ALL WORK BE SUSPENDED UNTIL ADEQUATE PROTECTION IS PROVIDED. THE COST OF FURNISHING, INSTALLING, MAINTAINING, AND REMOVING ALL PLATFORMS, NETS, SCREENS, OR OTHER PROTECTIVE DEVICES SHALL BE INCLUDED IN THE CONTRACT. ANY AND ALL MATERIAL FALLING ON AN AREA WHERE DROPPING IS NOT PERMITTED SHALL BE REMOVED AND DISPOSED OF BY THE CONTRACTOR AT THE CONTRACTOR'S SOLE EXPENSE. UPON COMPLETION OF WORK ON EACH WORKDAY, LEAVE PREMISES NEAT AND ORDERLY.
22. DURING THE COURSE OF CONSTRUCTION, THE CONTRACTOR SHALL CONDUCT OPERATIONS IN SUCH A MANNER AS TO PREVENT OR REDUCE TO A MINIMUM ANY DAMAGE TO THE NIAGARA RIVER / CORNELIUS CREEK FROM POLLUTION BY DEBRIS. SEDIMENT OR OTHER FOREIGN MATERIAL, OR FROM MANIPULATION OF EQUIPMENT AND/OR MATERIALS IN OR NEAR THE NIAGARA RIVER / CORNELIUS CREEK. WATER THAT HAS BEEN USED FOR WASH PURPOSES OR OTHER OPERATIONS THAT CAUSE THIS WATER TO BECOME POLLUTED WITH SAND, CEMENT, OIL, OR OTHER IMPURITIES SHALL NOT BE RETURNED DIRECTLY TO THE NIAGARA RIVER / CORNELIUS CREEK.
23. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING AND MAINTAINING SERVICE OF ALL UTILITIES ENCOUNTERED IN THE WORK AREA. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DISRUPTION OF UTILITY SERVICE CAUSED BY THE CONTRACTOR'S OPERATIONS. DAMAGE TO EXISTING UTILITIES AND APPURTENANCES RESULTING FROM THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED, AT THE CONTRACTOR'S SOLE EXPENSE, TO THE OWNER'S SATISFACTION OR AS ORDERED BY THE ENGINEER.
24. IN THE EVENT THE CONTRACTOR DAMAGES AN EXISTING UTILITY SERVICE, CAUSING AN INTERRUPTION IN SAID SERVICE, THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE ENGINEER AND THE UTILITY COMPANY AND BEGIN WORK TO RESTORE SERVICE AND SHALL NOT CEASE SUCH WORK UNTIL SERVICE IS RESTORED.
25. IT SHALL BE THE CONTRACTOR'S OBLIGATION AND RESPONSIBILITY TO EMPLOY METHODS AND EQUIPMENT WHICH WILL ENSURE THE SATISFACTORY COMPLETION OF THE WORK WITH MINIMUM DELAY.
26. ALL WORK AREAS SHALL BE IN COMPLIANCE WITH APPLICABLE OSHA REGULATIONS AT ALL TIMES AND TO THE SATISFACTION OF THE ENGINEER, SO AS TO PROTECT THE CONTRACTOR'S EMPLOYEES, THE GENERAL PUBLIC, AND TO PREVENT UNAUTHORIZED ENTRY INTO THE WORK AREA. THE COST OF THIS WORK SHALL BE INCLUDED IN THE CONTRACT.
27. THE OWNER SHALL EMPLOY AND PAY FOR A QUALIFIED INDEPENDENT TESTING AGENCY TO PERFORM ALL QUALITY CONTROL INSPECTION AND TESTING SERVICES AND TO SUBMIT TEST REPORTS FOR RECORD. INSPECTION AND TESTING SERVICES ARE REQUIRED TO VERIFY COMPLIANCE WITH THE REQUIREMENTS SPECIFIED OR INDICATED.

REMOVAL AND REPLACEMENT OF STRUCTURAL CONCRETE

1. THE WORK SHALL CONSIST OF THE REMOVAL AND LEGAL AND ENVIRONMENTALLY SAFE DISPOSAL OF UNSOUND STRUCTURAL CONCRETE FROM AN EXISTING STRUCTURE AND ITS REPLACEMENT WITH NEW STRUCTURAL CONCRETE, OR AN APPROVED PATCHING MATERIAL, AS INDICATED ON THE CONTRACT PLANS.
2. REMOVAL OF UNSOUND CONCRETE – ALL UNSOUND CONCRETE SHALL BE REMOVED TO A SOUND SURFACE. EXISTING CONCRETE SHALL BE SAW-CUT TO OBTAIN A STRAIGHT JOINT BETWEEN THE EXISTING CONCRETE AND THE NEW MATERIAL. CARE SHALL BE EXERCISED WHILE REMOVING THE UNSOUND CONCRETE SO AS NOT TO DAMAGE MATERIALS WHICH ARE TO REMAIN IN PLACE. EXPOSED REINFORCEMENT REMAINING IN PLACE SHALL BE CLEANED TO REMOVE ALL DETERIORATION.
   A. CONCRETE REPLACEMENT (FOR REPAIRS GREATER OR EQUAL TO 2 INCHES IN DEPTH)
      -THE MINIMUM DEPTH OF REMOVAL SHALL BE THE GREATER OF THE FOLLOWING
      I. A DEPTH NO LESS THAN 1-1/2 INCHES FROM THE REAR MOST POINT OF REINFORCEMENT TO SOUND CONCRETE.
      II. THE DEPTH NECESSARY TO REACH SOUND CONCRETE.
   B. PATCHING REPLACEMENT (FOR REPAIRS LESS THAN 2 INCHES IN DEPTH)
      – FEATHER EDGES SHALL NOT BE PERMITTED. THE MINIMUM PATCH DEPTH SHALL BE ½ INCH AS MEASURED FROM THE THEORETICAL PLANE OF THE ORIGINAL CONCRETE SURFACE.
3. PREPARATION OF SURFACE – ALL SURFACES RECEIVING NEW MATERIAL SHALL BE CLEANED WITH STIFF BRUSH PRIOR TO APPLICATION OF NEW MATERIAL. BAR SHALL BE PLACED AS INDICATED ON THE PLANS.
4. PLACEMENT – CLEAN, DAMPEN WITH WATER, AND BRUSH-COAT HOLES AND VOIDS WITH BONDING AGENT. FILL AND COMPACT WITH CONCRETE OR PATCHING MORTAR BEFORE BONDING AGENT HAS DRIED. KEEP PATCHED AREA CONTINUOUSLY MOIST FOR AT LEAST 72 HOURS.
5. REPAIR MATERIALS AND INSTALLATION NOT SPECIFIED ABOVE MAY BE USED, SUBJECT TO ENGINEER'S APPROVAL.
6. PATCHING MATERIAL – EUCLID VERTICOAT SUPREME, OR APPROVED EQUIVALENT.
7. CRACK INJECTION - SIMPSON STRONG TIE - "CRACK PAC" INJECTION EPOXY SYSTEM WITH PASTE OVER EPOXY AND INJECTION PORTS, OR APPROVED EQUAL SUITABLE FOR OVERHEAD APPLICATIONS.

MATERIAL SPECIFICATIONS

SECTION 033000 - CAST-IN-PLACE CONCRETE

1. WORKMANSHIP AND MATERIAL SHALL CONFORM TO THE "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" (ACI-315), AND BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI-318).
2. ALL CONCRETE SHALL HAVE THE FOLLOWING PROPERTIES:
   A. 4000 PSI MINIMUM STRENGTH AT 28 DAYS
   B. SLUMP AS REQUESTED BY CONTRACTOR
   C. 0.40 MAXIMUM WATER CEMENT RATIO
   D. ASTM C33, SIZE #57 COARSE AGGREGATE
   E. 6% AIR CONTENT (+/- 1.5%)
3. CONCRETE MATERIALS SHALL HAVE THE FOLLOWING PROPERTIES:
   A. PORTLAND CEMENT: ASTM C150, TYPE I OR II.
   B. FLY ASH: ASTM C618, TYPE C OR F (20% MAXIMUM).
   C. NORMAL WEIGHT AGGREGATES: ASTM C33.
   D. LIGHTWEIGHT AGGREGATES: ASTM C330.
   E. AIR-ENTRAINING ADMIXTURE: ASTM C260.
   F. WATER-REDUCING ADMIXTURE: ASTM C494.
   G. HIGH-RANGE WATER-REDUCING ADMIXTURE (SUPERPLATICIZER): ASTM C494, TYPE F OR TYPE G.
   H. WATER: CLEAN AND DRINKABLE.
4. ADMIXTURES: PROVIDE ADMIXTURES FROM ONE MANUFACTURER THAT CONTAIN NOT MORE THAN 0.1 PERCENT CHLORIDE IONS.
5. BAR REINFORCEMENT SHALL CONFORM TO ASTM A615, GRADE 60. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185. BAR SUPPORTS SHALL BE GALVANIZED OR STAINLESS STEEL. BAR SUPPORTS IN CONTACT WITH EXPOSED SURFACES SHALL BE GALVANIZED AND PLASTIC TIPPED.
6. RELATED MATERIALS;
   A. ALL REINFORCING BAR SHALL BE HOT-DIPPED GALVANIZED
   B. LIQUID-TYPE MEMBRANE-FORMING CURING COMPOUND: COMPLYING WITH ASTM C309, TYPE I, CLASS B. PROVIDE "KUREZ DR VOX" BY EUCLID CHEMICAL CO. OR APPROVED EQUIVALENT.
   C. BONDING AGENT: ACRYLIC BASE OR STYRENE BUTADIENE. PROVIDE "SIKALATEX" BY THE SIKA CORP. OR APPROVED EQUIVALENT.
7. SUBMIT CONCRETE MIX DESIGNS WITH BACK UP DATA AND MATERIAL SPECIFICATIONS, FOR REVIEW AND APPROVAL, PRIOR TO PLACEMENT.
8. SUBMIT SHOP DRAWINGS, FOR REVIEW AND APPROVAL, PRIOR TO FABRICATION OF REINFORCING. DRAWINGS SHALL SHOW REINFORCING DETAILS, INCLUDING GRADE, SIZE, AND SPACING OF BARS. SHOP DRAWINGS SHALL INDICATE CONSTRUCTION JOINTS, CURBS, DEPRESSIONS, SLEEVES, AND OPENINGS, ETC. WITH ALL ADDITIONAL REINFORCING REQUIRED.
9. ISOLATION JOINT MATERIAL SHALL BE CLOSED CELL JOINT FILLER (ASTM D1752) AND JOINT SEALANT SHALL BE "THC-900" BY TREMCO OR APPROVED EQUIVALENT.
10. REFER TO ACI 305 FOR HOT WEATHER CONCRETE REQUIREMENTS AND ACI 306 FOR COLD WEATHER CONCRETE REQUIREMENTS.
11. REINFORCING SHALL BE INSPECTED AND APPROVED BY THE TESTING AGENCY BEFORE CONCRETE IS PLACED.
12. QUALITY CONTROL TESTING DURING CONSTRUCTION.
   A. SAMPLING FRESH CONCRETE: ASTM C172, EXCEPT MODIFIED FOR SLUMP TO COMPLY WITH ASTM C94.
   B. SLUMP: ASTM C143; ONE TEST AT POINT OF DISCHARGE FOR EACH SET OF COMPRESSIVE TEST SPECIMENS AND WHENEVER CONCRETE CONSISTENCY SEEMS TO HAVE CHANGED. TEST PUMPED CONCRETE AT THE HOPPER AND AT THE DISCHARGE POINT, TO DETERMINE A CHANGE IN THE SLUMP.
   C. AIR CONTENT: ASTM C173 OR ASTM C231; ONE TEST FOR EACH SET OF COMPRESSIVE TEST SPECIMENS.
   D. CONCRETE TEMPERATURE: ASTM C1064, TEST HOURLY WHEN AIR TEMPERATURE IS 40 DEG. F AND BELOW, WHEN 80 DEG. F AND ABOVE, AND ONE TEST FOR EACH SET OF COMPRESSIVE TEST SPECIMENS.
   E. COMPRESSIVE TEST SPECIMEN: ASTM C31; ONE SET OF 4 STANDARD CYLINDERS FOR EACH COMPRESSIVE STRENGTH TEST. MOLD AND STORE CYLINDERS FOR LABORATORY-CURED TEST SPECIMENS.
   F. COMPRESSIVE STRENGTH TESTS: ASTM C39; ONE SET FOR EACH DAY'S PLACEMENT EXCEEDING 5 CU. YDS. PLUS ADDITIONAL SETS FOR EACH 50 CU. YDS. OF EACH CONCRETE CLASS PLACED IN ANY ONE DAY; ONE SPECIMEN TESTED AT 7 DAYS, TWO SPECIMENS TESTED AT 28 DAYS, AND ONE SPECIMEN RETAINED IN RESERVE FOR LATER TESTING IF REQUIRED.

BUFFALO SEWER AUTHORITY

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CORNELIUS CREEK INTERCEPTING AND OVERFLOW CHAMBER

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WENDEL ENGINEERING, P.C.

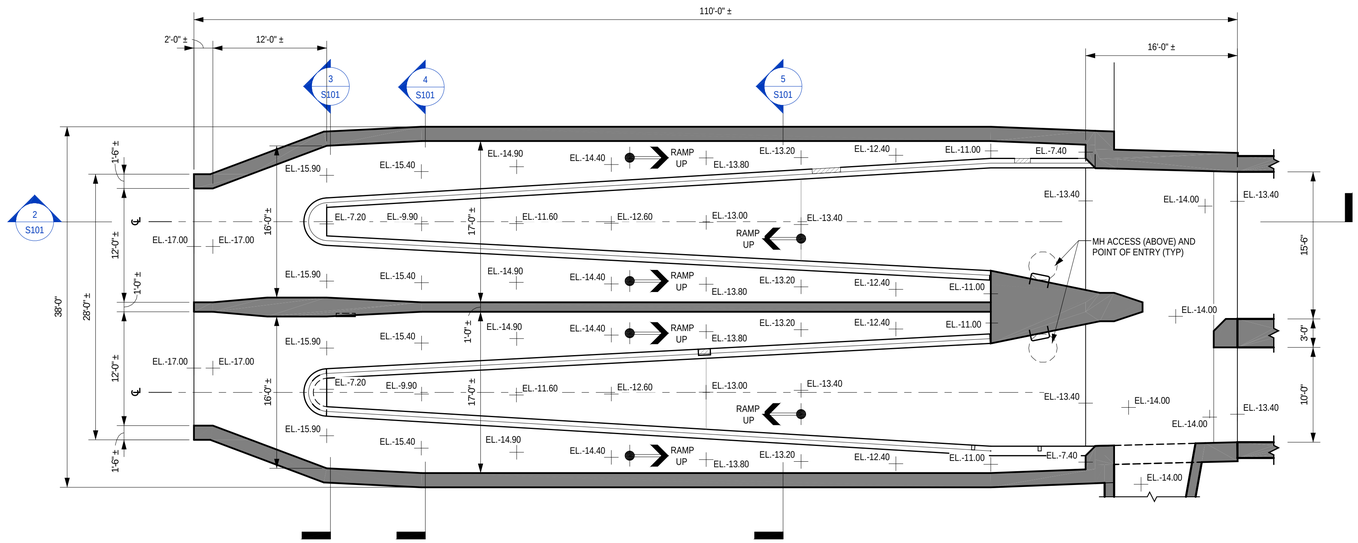
NO.	BY	REVISIONS	DATE

DWG. TITLE

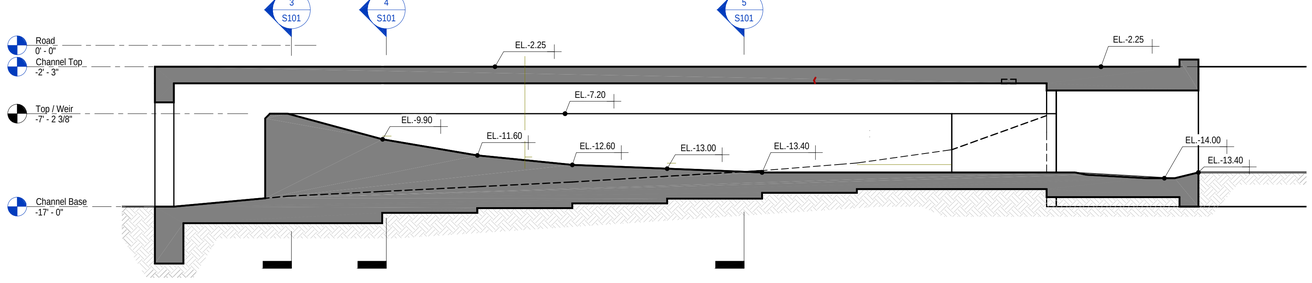
STRUCTURAL NOTES, ABBREVIATIONS AND LOCATION MAPS

DATE	June 21, 2013
SCALE	As indicated
DWN.	whm
CHK.	PDK
PROJ. No.	434913
DWG. No.	

S001



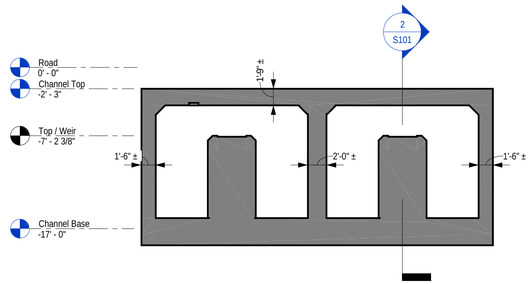
1 INTERCEPTING AND OVERFLOW CHANNEL PLAN
1/8" = 1'-0"



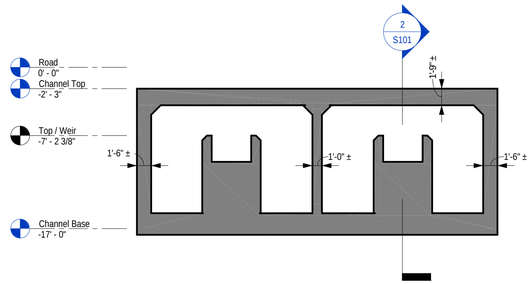
2 OVERFLOOR CHANNEL LONGITUDINAL SECTION
1/8" = 1'-0"

GENERAL NOTES:

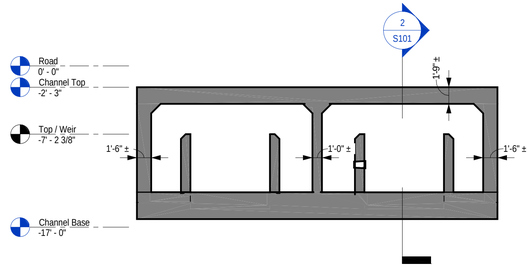
1. ALL ELEVATIONS ARE REFERENCEED TO BUFFALO CITY DATUM
2. ALL DIMENSIONS AND ELEVATIONA ARE APPROXIMATE,
   VERIFY ALL DIMENSIONS AND ELEVATIONS IN FIELD (V.I.F.) AS REQUIRED.



3 OVERFLOOR CHANNEL CROSS SECTION
1/8" = 1'-0"



4 OVERFLOOR CHANNEL CROSS SECTION
1/8" = 1'-0"



5 OVERFLOOR CHANNEL CROSS SECTION
1/8" = 1'-0"

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WENDEL ENGINEERING, P.C.

0' 2'-0" 4'-0" 8'-0" 16'-0"
SCALE: 1/8"=1'-0"

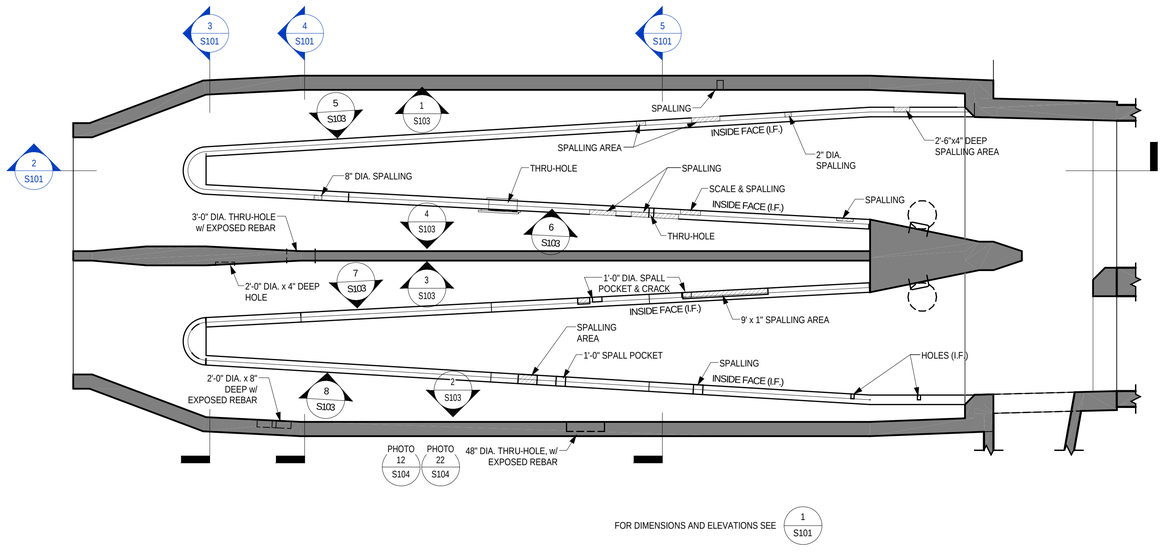
NO.	BY	REVISIONS	DATE

DWG. TITLE

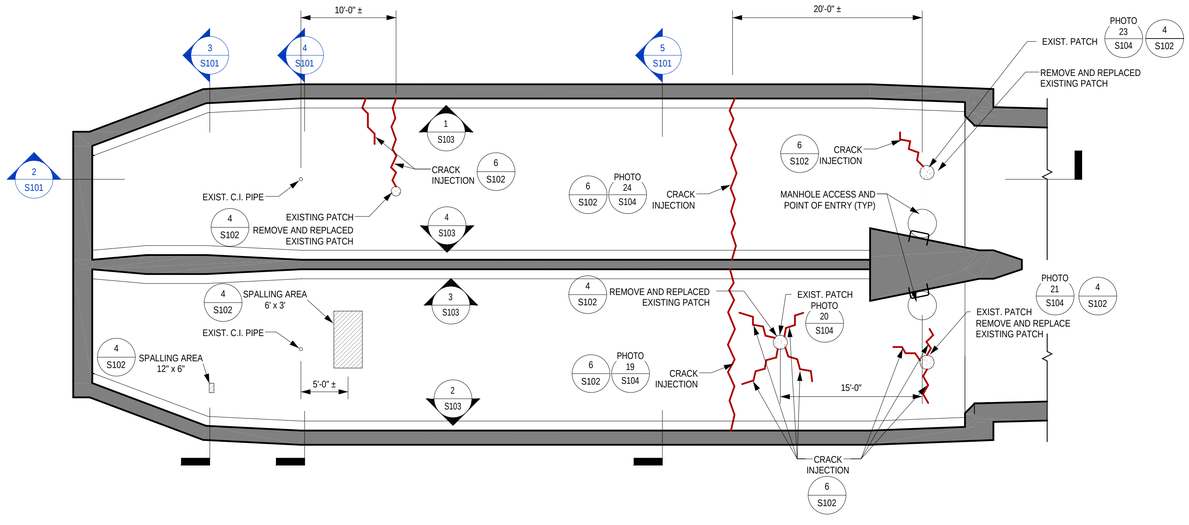
EXISTING CONDITIONS

DATE	June 21, 2013
SCALE	As indicated
DWN.	whm
CHK.	PDK
PROJ. No.	434913
DWG. No.	

S101



1 EXISTING INTERCEPTING AND OVERFLOW CHANNEL PLAN
1/8" = 1'-0"



2 REFLECTED CEILING PLAN
1/8" = 1'-0"

GENERAL NOTES

1. REFER TO WALL ELEVATIONS ON DWG S103, AND PHOTOGRAPHS ON DWG S104 FOR COMPLETE EXTENT OF CONCRETE DETERIORATION
2. SEE NOTES AND MATERIAL SPECIFICATIONS ON DWG S001 FOR INFORMATION ON THE REMOVAL AND REPLACEMENT OF STRUCTURAL CONCRETE
3. CONTRACTOR SHALL REPAIR ALL DETERIORATED CONCRETE AREAS NOTED ON THE PLANS
4. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY AREAS OF CONCERN OR DISCREPENCIES WITH DRAWINGS
5. ALL DIMENSIONS ARE APPROXIMATE. ACTUAL EXTENT OF REPAIRS WILL VARY

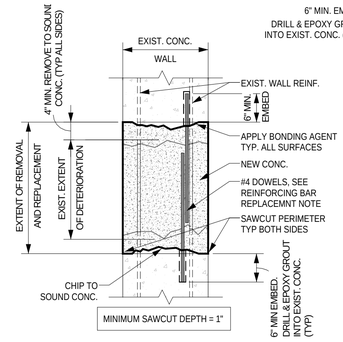
REINFORCING NOTES

1. EXISTING REINFORCING WHICH HAS 25% OR GREATER SECTION LOSS SHALL BE REMOVED AND REPLACED WITH #4 GALVANIZED DOWEL, 6" MINIMUM EMBEDMENT WITH EPOXY GROUT
2. EXISTING REINFORCING TO REMAIN SHALL BE THOUROGHLY CLEANED OF ALL CONCRETE AND DETERIORATION

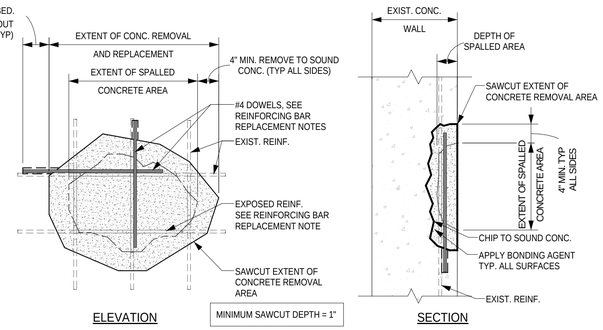
LEGEND

- SPALLING CONCRETE
- EXIST. CONCRETE PATCH
- CRACK

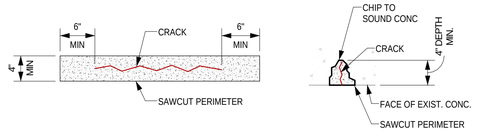
* IF REPAIR AREA IS LESS THAN 2" IN DEPTH, PATCH MATERIAL SHALL BE USED.



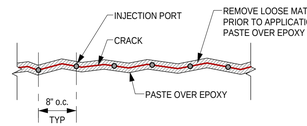
3 TYPICAL REPAIR AT THRU-HOLE
N.T.S



4 TYPICAL REPAIR AT SPALLED AREA
N.T.S



5 CRACK REPAIR
N.T.S



6 CRACK INJECTION DETAIL
N.T.S

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CORNELIUS CREEK INTERCEPTING AND OVERFLOW CHAMBER

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0' 2'-0" 4'-0" 8'-0" 16'-0"
SCALE: 1/8"=1'-0"

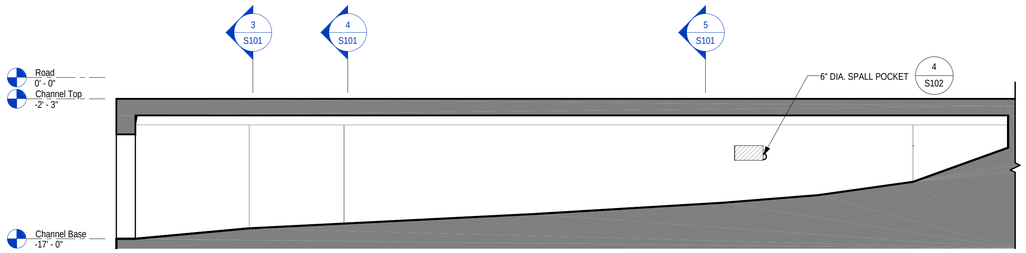
NO.	BY	REVISIONS	DATE

DWG. TITLE

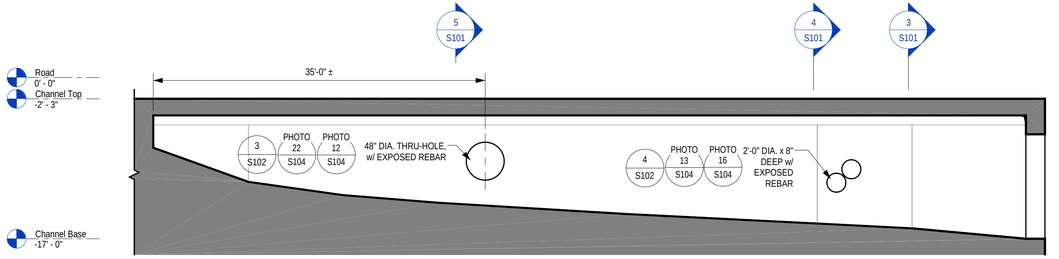
CHANNEL BASE PLAN AND UNDER SLAB PLAN

DATE	June 21, 2013
SCALE	As indicated
DWN.	whm
CHK.	PDK
PROJ. No.	434913
DWG. No.	

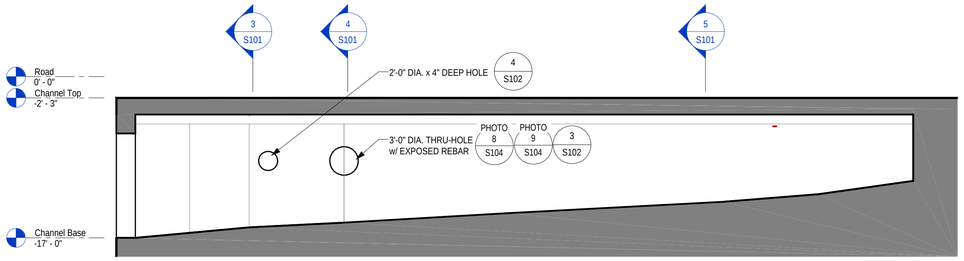
S102



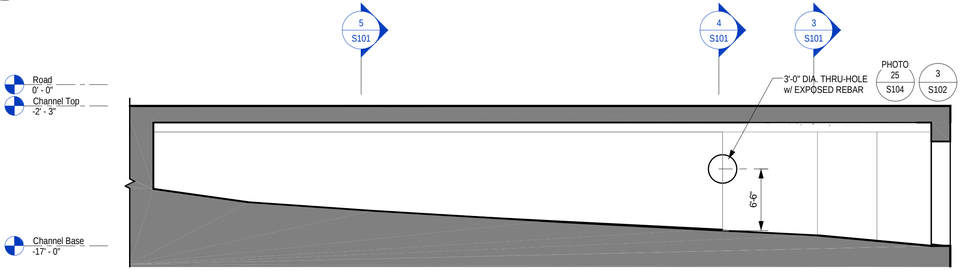
1 WALL ELEVATION
1/8" = 1'-0"



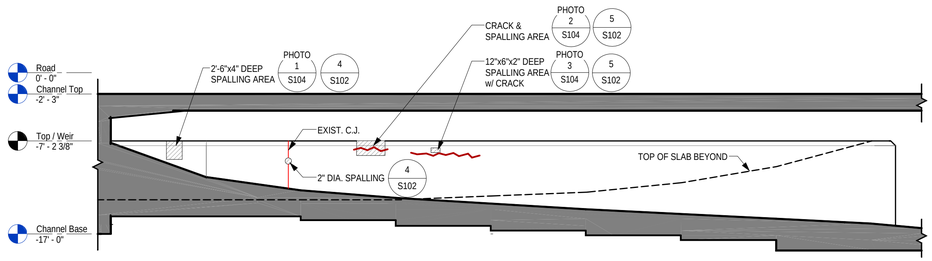
2 WALL ELEVATION
1/8" = 1'-0"



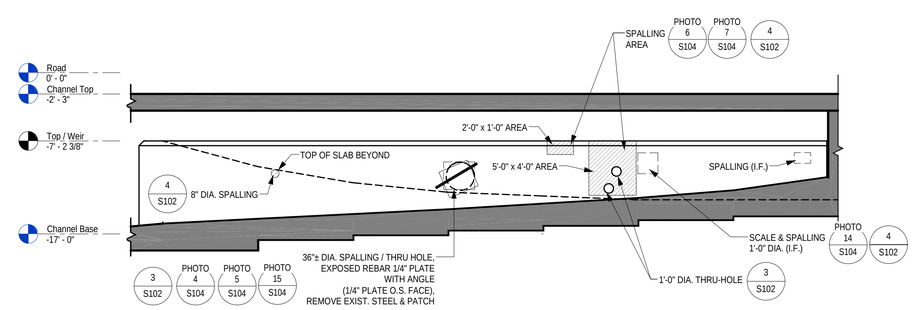
3 WALL ELEVATION
1/8" = 1'-0"



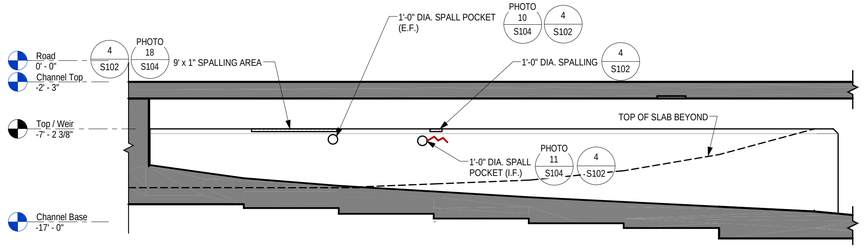
4 WALL ELEVATION
1/8" = 1'-0"



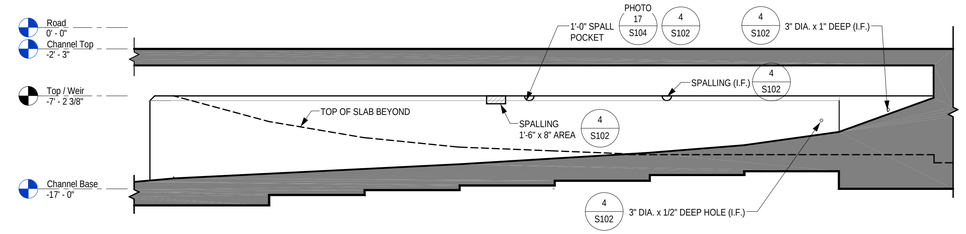
5 WALL ELEVATION
1/8" = 1'-0"



6 WALL ELEVATION
1/8" = 1'-0"



7 WALL ELEVATION
1/8" = 1'-0"



8 WALL ELEVATION
1/8" = 1'-0"

GENERAL NOTES

1. REFER TO WALL ELEVATIONS ON DWG S103, AND PHOTOGRAPHS ON DWG S104 FOR COMPLETE EXTENT OF CONCRETE DETERIORATION
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LEGEND

SPALLING CONCRETE

EXIST. CONCRETE PATCH

CRACK

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0' 2'-0" 4'-0" 8'-0" 16'-0"
SCALE: 1/8"=1'-0"

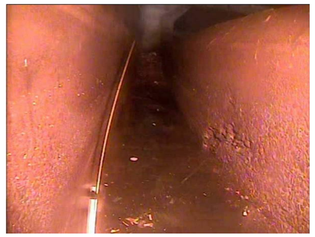
NO.	BY	REVISIONS	DATE

DWG. TITLE

WALL ELEVATIONS

DATE	June 21, 2013
SCALE	As indicated
DWN.	whm
CHK.	PDK
PROJ. No.	434913
DWG. No.	

S103

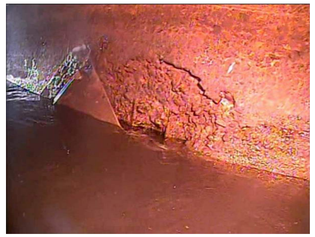


1 PHOTO

2 PHOTO

3 PHOTO

4 PHOTO



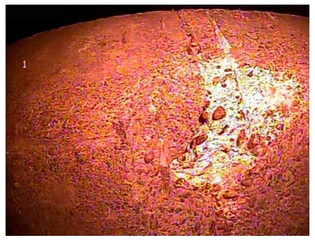
5 PHOTO

6 PHOTO

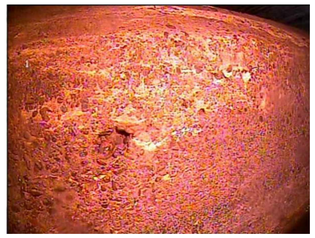
7 PHOTO

8 PHOTO

9 PHOTO



10 PHOTO



11 PHOTO

12 PHOTO

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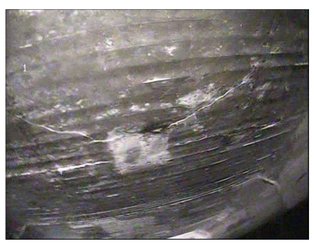
18 PHOTO

19 PHOTO



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BUFFALO SEWER AUTHORITY

BUFFALO SEWER AUTHORITY

65 Niagara Square
Buffalo, New York 14202

CORNELIUS CREEK INTERCEPTING AND OVERFLOW CHAMBER

STRUCTURAL REPAIR

wendel

140 John James Audubon Pkwy, Suite 201
Buffalo, NY 14228
www.wendelcompanies.com
p:716.688.0766 f:716.625.6825

WENDEL ENGINEERING, P.C.

NO.	BY	REVISIONS	DATE

DWG. TITLE

PICTURES

DATE	June 21, 2013
SCALE	As indicated
DWN.	whm
CHK.	PDK
PROJ. No.	434913
DWG. No.	

S104

APPENDIX C – GATE MANUFACTURER INFORMATION

BUDGET QUOTATION

WATER CONTROL GATES

Whipps, inc.
370 South Athol Road
Athol, MA 01331
Phone : 978-249-7924
Fax : 978-249-3072

February 8, 2022

Please Reply To :
Siewert Equipment
107 Hiawatha Trail
Liverpool, NY 13088
Craig Moore

Budget Quotation No. 10683

Subject : Lake Erie Outfall
Buffalo, New York
Bid Date : Thursday, February 10, 2022
Bid Expires : Monday, April 11, 2022

Bidding Contractors :

We are pleased to offer the following quotation for **STAINLESS STEEL SLIDE GATES AND FLAP GATES**

Option A: Slide Gates
Item No 1

Quantity :	Two (2)
Gate Size - Model :	144" Wide x 156" High - **Model 954I Self Contained Stainless Steel Slide Gate**
Invert To Floor :	15 ft
Max Design Head :	15 ft seating - 15 ft unseating
Description :	The upward opening stainless steel slide gate will have the following features : SS316 construction; UHMW side and top seals and a neoprene invert seal; The dual operating stems will be SS316 with plastic stem covers.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Lifting Mechanism :	Yoke mounted interconnected gearbox operators with single hand wheel.
Anchor Bolts :	3/4" anchor studs and nuts included.

$400,000 total

Option B: Flap Gates
Item No 2

Quantity :	Two (2)
Size - Model :	144" Wide x 156" High - **Model 452 Stainless Steel Flap Gate**
Invert To Floor :	14.75 ft
Max Design Head :	15 ft seating
Description :	The Pontoon Tide Gate will have the following features : Type SS316 stainless steel frame construction with polyurethane lip seals mounted on the perimeter of the opening. Double hinge arms with stainless steel hinge pins and uhmw bushings. The valve is supplied with a 4° offset from the vertical.
Mounting Style :	Wall mounted with non-shrink grout and SS anchor studs.
Anchor Bolts :	3/4" anchor studs and nuts included.

$390,000 total

In order to mount this equipment, Whipps Inc. requests a new headwall be constructed to mount onto. The existing wall is in to poor of condition to support the weight of this equipment. A center pillar with a minimum diameter of 2' will be required. If this cannot be made, Whipps Inc. will have to revise budgetary costs to include a fabricated stainless steel mounting pillar to support the equipment.

This quotation represents our best interpretation of the information provided. Any subsequent changes may result in a price change.

INCLUDED: Submittal drawings and O&M manuals.

EXCLUDED: Installation, concrete, grout, deck sleeves, blind flanges, mastic, lubricant, control panels, instrumentation, wiring and epoxy capsules for anchor bolts. Field measurements are also not included as part of this quotation.

DURATION: Please contact our local representative for updated pricing after 90 days.

PAYMENT TERMS: Payment terms are net 30 days with no retainer allowance. Interest will be charged on amounts past due at 1-1/2% per month.

SPARE PARTS: No spare parts are included.

TAXES: Taxes, duties and tariffs are not included in this quotation. Sales tax is not included in our Total Price. However, Whipps, Inc. is registered to collect sales tax in the states of California, Florida, Maryland and Massachusetts.

FREIGHT: The price quoted is F.O.B. our factory in Athol, Massachusetts with freight allowed to jobsite. Partial shipments may be provided upon request for an additional charge. Price includes shipment via common carrier. Price does not include unloading at job site.

VOLUME DISCOUNT DISCLAIMER: The price shown reflects a volume discount for the quantity quoted. Please contact our local representative if you need to order a different quantity than the number shown herein and we will send a revised quotation.

FIELD SERVICE: **Field service is not included.** Field service is available at $850 per eight (8) hour day plus actual travel and maintenance expenses. Sundays and holidays the rate is $1275 per eight (8) hour day plus expenses. Three weeks advance notice in writing is required for field service.

OPERATION AND MAINTENANCE MANUALS : Whipps, Inc. manuals are produced project specific. Our manual is set up in a manner designed for the user to easily comprehend information relating to our gates. This is our standard structured document representing the Whipps, Inc. products. Whipps, Inc. reserves the right to deviate from what is listed in the Project Specifications should Whipps, Inc. determine that specific provisions add little or no value to the Manual.

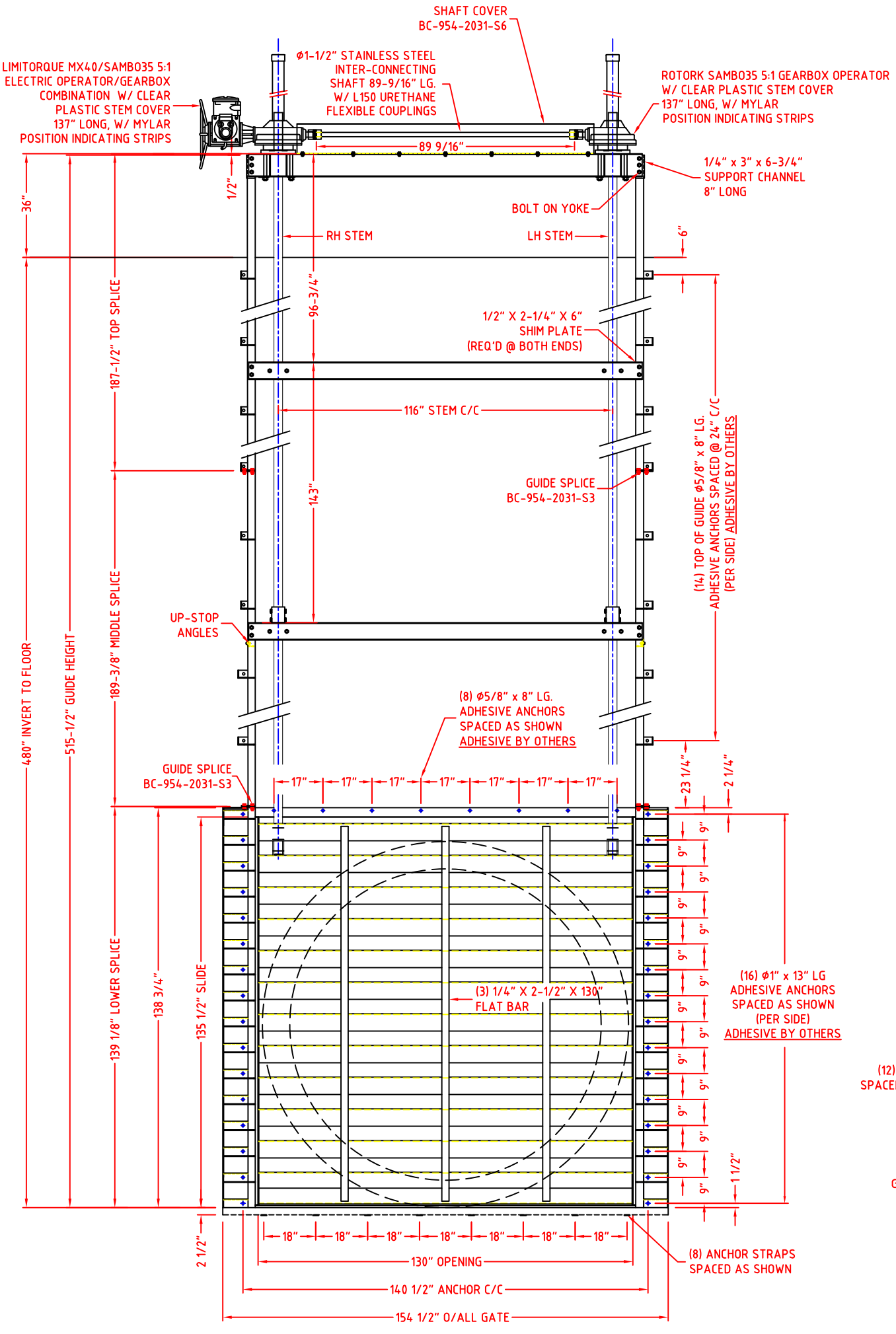
Sincerely,

Garrick Bassett
Whipps, Inc.
370 South Athol Road
Athol, MA 01331
Phone : 978-249-7924
Fax : 978-249-3072

REF. PLAN SHEET: MA-4

YOKE: 1/4" X 4" X 8" CHANNEL
STEM GUIDE CHANNEL: 1/4" X 3" X 6" CHANNEL
(11) TOP HORIZONTAL STIFFENER: 1/4" X 6" X 18" ANGLE
(1) LOWER HORIZONTAL STIFFENER: 1/4" X 11" X 18" CHANNEL
BC-954-2031-S2: GATE SECTION DETAILS
BC-954-2031-S3: STEM GUIDE DETAILS
APPROX. WEIGHT OF FRAME ASSEMBLY: 4100 LB.

ALL OBSTRUCTIVE HAND RAILING OR FLOORING TO BE MODIFIED BY OTHERS



Title	SERIES 954 SLUICE GATE INSTALL. 130" X 132"	Quantity: 1	Scale: FD
Project	SAVANNA WWTP PHASE 1A IMPROV. JACKSON, MS	Tag No's:	
Location	INFLUENT PUMP STATION (INFLUENT CHAMBER)	Item: A5	Seating / Unseating
Drg. No.	BC-954-2031	S.O. No.	28909
		Design Head	35.0' / 35.0'
		Leakage Rate GPM/ft of seal	0.05 / 0.05

DO NOT SCALE THIS DRAWING
Work to Dimensions
Linear Dimensions are Inches
Requested Concrete Opening Tolerances
Height & Width ±1/4"
Squareness ±3/8 Diagonal
THIRD ANGLE PROJECTION

Rev.	Rev. Record	Date	Eng.	Chk.
D	Operator Type	3/9/20	KS	
C	Over All Frame Width	1/24/20	KS	
B	Reversed LH and RH	1/10/20	MJ	
A	Original Issue	12/13/19	KS	

Whipps, inc.
370 SOUTH ATHOL RD.
ATHOL, MA 01331

Whipps, inc.

P.O. Box 1058 • 370 South Athol Rd.
Athol, Massachusetts 01331
Phone: (978) 249-7924
Fax: (978) 249-3072

SECTION _____
STAINLESS STEEL GATES (920 AND 950)

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required to install, ready for operation and field test stainless steel gates and appurtenances as shown on the Contract Drawings and as specified herein.
B. The gates and appurtenances shall be supplied in accordance with the latest edition of AWWA C561 Standard for Fabricated Stainless Steel Slide Gates as modified herein. The allowable leakage rate for the stainless steel gates in this specification shall be 1/2 the allowable leakage listed in the latest revision of AWWA C561.

1.02 SUBMITTALS

A. Provide the following information to confirm compliance with the specification in addition to the submittal requirements specified in Section _____.
   1. Complete description of all materials including the material thickness of all structural components of the frame and slide.
   2. Installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations.
   3. Maximum bending stress and deflection of the slide under the maximum design head.
   4. The location of the company headquarters and the location of the principle manufacturing facility. Provide the name of the company that manufactures the equipment if the supplier utilizes an outside source.

1.03 QUALITY ASSURANCE

A. Qualifications
   1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years experience designing and manufacturing water control gates. The manufacturer shall have manufactured water control gates for a minimum of 100 projects.
   2. The specification is based on the 900 Series Stainless Steel Gate as manufactured by Whipps, Inc. of Athol, Massachusetts.

PART 2 EQUIPMENT

2.01 GENERAL

A. Gates shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.

B. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.
C. The gate shall utilize self-adjusting seals. Due to the difficulty of accessing gates when they are in service, gates that utilize adjustable wedges, wedging devices or pressure pads are not acceptable.
D. All structural components of the frame and slide shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
E. Slide gate frames shall be shipped fully assembled with the invert member welded to the side frames and the slide installed in the frame unless the overall width of the slide gate exceeds 96 inches or the overall height of the slide gate exceed 25 feet.
F. All welds shall be performed by welders with AWS D1.6 certification.
G. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All iron and steel components shall be properly prepared and shop coated with a primer.
H. Materials:

Components	Materials
Frame Assembly and Retainers	Stainless Steel, Type 304L, ASTM A240
Slide and Stiffeners	Stainless Steel, Type 304L, ASTM A240
Stem	Stainless Steel, Type 304, ASTM A276
Anchor Studs, Fasteners and Nuts	Stainless Steel, Type 316, ASTM A276
Invert Seal (Upward Opening Gates Only)	Neoprene ASTM D-2000 or EPDM
Seat/Seals and Facing	Ultra-High Molecular Weight Polyethylene ASTM D4020
Lift Nuts	Bronze ASTM B584
Pedestals and Wall Brackets	Stainless Steel, Type 304L, ASTM A240
Operator Housing	Cast aluminum or ductile iron

2.02 FRAME

A. The frame assembly, including the guide members, invert member and yoke members, shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
1. Frame design shall allow for embedded mounting, mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a wall thimble with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
2. All wall mounted or wall thimble mounted gates shall have a flange frame. Flat frame gates are not acceptable.
3. The structural portion of the frame that incorporates the seat/seals shall be formed into a one-piece shape for rigidity. Guide members that consist of two or more bolted structural members are not acceptable. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.
4. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts or the wall thimble studs.
5. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening gates or downward opening weir gates.
6. On self-contained gates, a yoke shall be provided across the top of the frame. The yoke shall be formed by two structural members affixed to the top of the side frame members to provide a one-piece rigid assembly. The yoke shall be designed to allow removal of the slide.

7. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flushbottom type on upward opening gates.
8. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
9. A rigid stainless steel member shall be provided across the invert of the opening on downward opening weir gates.

2.03 SLIDE

A. The slide and reinforcing stiffeners shall be constructed of stainless steel plate. All structural components shall have a minimum thickness of 1/4-inch.
1. The slide shall not deflect more than 1/360 of the span or 1/16 inch, whichever is smaller, under the maximum design head.
2. When the width of the gate opening multiplied by the maximum design head is greater than 120 square feet, the portion of the slide that engages the guide members shall be of a "thick edge" design. The thick edge portion of the slide shall have a minimum thickness of 3 inches.
3. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement.
4. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

2.04 SEALS

A. All gates shall be provided with a self-adjusting UHMW-PE seal system to restrict leakage in accordance with the requirements listed in this specification.
A .
1. The seat/seals shall extend to accommodate the 1-1/2 x the height of the slide when the slide is in the fully closed or fully opened position.
2. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.
3. All downward opening weir gates shall be provided with UHMW polyethylene seat/seals across the invert member.
4. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.
5. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit or held in place with adhesives are unacceptable.
6. The seals shall be mounted so as not to obstruct the water way opening.
7. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
8. The seal system shall have been factory tested to confirm negligible wear (less than 0.01") and proper sealing. The factory testing shall consist of an accelerated wear test comprised of a minimum of 25,000 open-close cycles using a well-agitated sand/water mixture to simulate fluidized grit.

2.05 STEM

A. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. On rising stem gates, the threaded portion shall engage the operating nut in the

manual operator or motor actuator. On non-rising stem gates, the threaded portion shall engage the nut on the slide.

1. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
2. The stem shall be constructed of solid stainless steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
3. The stem shall be threaded to allow full travel of the slide unless the travel distance is otherwise shown on the Contract Drawings.
4. Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.
5. In compression, the stem shall be designed for a critical buckling load caused by a 40 lb effort on the crank or handwheel with a safety factor of 2, using the Euler column formula.
6. The stem shall be designed to withstand the tension load caused by the application of a 40 lb effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
7. The threaded portion of the stem shall have machine rolled threads of the full Acme type with a 16 microinch finish or better. Stub threads are not acceptable.
8. Stems of more than one section shall be joined by stainless steel or bronze couplings. The coupling shall be bolted to the stems.
9. Stems, on manually operated gates, shall be provided with adjustable stop collars to prevent over closing of the slide.

2.06 STEM GUIDES

A. Stem guide shall be provided when necessary to ensure that the maximum L/R ratio for the unsupported part of the stem is 200 or less.

1. Stem guide brackets shall be fabricated of stainless steel and shall be outfitted with UHMW or bronze bushings.
2. Adjustable in two directions.

2.07 WALL THIMBLES

A. Wall thimbles shall be provided when shown on the Contract Drawings.

1. The wall thimble depth shall be equal to the thickness of the concrete wall in which the thimble is to be mounted.
2. Wall thimbles shall be fabricated stainless steel construction of adequate section to withstand all operational and reasonable installation stresses.
3. Wall thimbles shall be constructed of 1/4-inch minimum thickness stainless steel and the front face shall have a minimum thickness of 1/4–inch.
4. The fabrication process shall ensure that the wall thimble is square and plumb and the front face is sufficiently flat to provide a proper mounting surface for the gate frame.
5. The face of the wall thimble shall only be machined if recommended by the gate manufacturer. If the wall thimble is to be machined, the front face shall have a minimum thickness of 1/4-inch after machining.
6. A water stop shall be welded around the periphery of the thimble. Wall thimbles shall be designed to allow thorough and uniform concrete placement during installation.
7. Studs and nuts shall be stainless steel. Water stop may be stitch welded.
8. A suitable gasket or mastic shall be provided to seal between the gate frame and the wall thimble.

2.08 MANUAL OPERATORS

A. Unless otherwise shown on the Drawings, gates shall be operated by a manual handwheel or a manual crank-operated gearbox. The operator shall be mounted on the yoke of self contained gates or on the pedestal of non-self contained gates.
   1. The gate manufacturer shall select the proper gear ratio to ensure that the gate can be operated with no more than a 40 lb effort when the gate is in the closed position and experiencing the maximum operating head.
   2. An arrow with the word "OPEN" shall be permanently attached or cast onto the operator to indicate the direction or rotation to open the gate.
   3. Handwheel operators shall be fully enclosed and shall have a cast aluminum housing.
      a. Handwheel operators shall be provided with a threaded cast bronze lift nut to engage the operating stem.
      b. Handwheel operators shall be equipped with roller bearings above and below the operating nut.
      c. Positive mechanical seals shall be provided above and below the operating nut to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
      d. The handwheel shall be removable and shall have a minimum diameter of 15 inches.
   4. Crank-operated gearboxes shall be fully enclosed and shall have a cast aluminum or ductile iron housing.
      a. Gearboxes shall have either single or double gear reduction depending upon the lifting capacity required.
      b. Gearboxes shall be provided with a threaded cast bronze lift nut to engage the operating stem.
      c. Bearings shall be provided above and below the flange on the operating nut to support both opening and closing thrusts.
      d. Gears shall be steel with machined cut teeth designed for smooth operation.
      e. The pinion shaft shall be stainless steel and shall be supported on ball or tapered roller bearings.
      f. Positive mechanical seals shall be provided on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
      g. The crank shall be cast aluminum or cast iron with a revolving nylon grip.
      h. The crank shall be removable.
   5. All gates having widths in excess of 72 inches and widths greater than twice their height shall be provided with two gearboxes connected by an interconnecting shaft for simultaneous operation.
      a. Interconnecting shafting shall be constructed of aluminum or stainless steel.
      b. Flexible couplings shall be provided at each end of the interconnecting shaft. Couplings shall be stainless steel or non-metallic.
      c. One crank shall be provided to mount on the pinion shaft of one of the gearboxes.
   6. An extended operator system utilizing chain and sprockets shall be furnished by the manufacturer when the centerline of the crank or handwheel, on a non-geared operator, is located over 48-in above the operating floor. Chain wheels are not acceptable.
      a. A removable stainless steel or aluminum cover shall be provided to enclose chain and sprockets.
      b. The extended operator system shall lower the centerline of the pinion shaft to 36-in above the operating floor.
      c. A handwheel may be utilized in conjunction with a gearbox in lieu of the extended operator system if the centerline of the pinion shaft is 60-in or less above the operating floor.
   7. Pedestals shall be constructed of stainless steel. Aluminum pedestals are not acceptable.

a. The pedestal height shall be such that the handwheel or pinion shaft on the crank-operated gearbox is located approximately 36-in above the operating floor.
b. Wall brackets shall be used to support floor stands where shown on the Drawings and shall be constructed of stainless steel.
c. Wall brackets shall be reinforced to withstand in compression at least two times the rated output of the operator with a 40 lb effort on the crank or handwheel.
d. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and shall be approved by the ENGINEER. The gate manufacturer shall supply the bracket, anchor bolts and accessories as part of the gate assembly.

8. Operators shall be equipped with fracture-resistant clear butyrate or lexan plastic stem covers.
   a. The top of the stem cover shall be closed.
   b. The bottom end of the stem cover shall be mounted in a housing or adapter for easy field mounting.
   c. Stem covers shall be complete with indicator markings to indicate gate position.
9. When shown on the Contract Drawings, provide 2 inch square nut, mounted in a floor box, with a non-rising stem.
   a. The square nut shall be constructed of bronze.
   b. The floor box shall be constructed of stainless steel or cast iron and shall be set in the concrete floor above the gate as shown.
   c. Provide one aluminum or stainless steel T-handle wrench for operation.

2.09 ELECTRIC MOTOR ACTUATORS

A. See Section _____.

2.10 ANCHOR BOLTS

A. Anchor bolts shall be provided by the gate manufacturer for mounting the gates and appurtenances.
   1. Quantity and location shall be determined by the gate manufacturer.
   2. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
   3. Anchor bolts shall have a minimum diameter of 1/2-inch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
B. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.
C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
D. The CONTRACTOR shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer’s recommendations.
E. The CONTRACTOR shall add a mastic gasket between the gate frame and wall thimble (when applicable) in accordance with the manufacturer’s recommendations.

3.02 FIELD TESTING

A. After installation, all gates shall be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting. The effort to open and close manual operators shall be measured, and shall not exceed the maximum operating effort specified above. Electric motor actuators shall function smoothly and without interruption. Each gate shall be water tested by the CONTRACTOR, at the discretion of the ENGINEER and OWNER, to confirm that leakage does not exceed the specified allowable leakage.

END OF SECTION

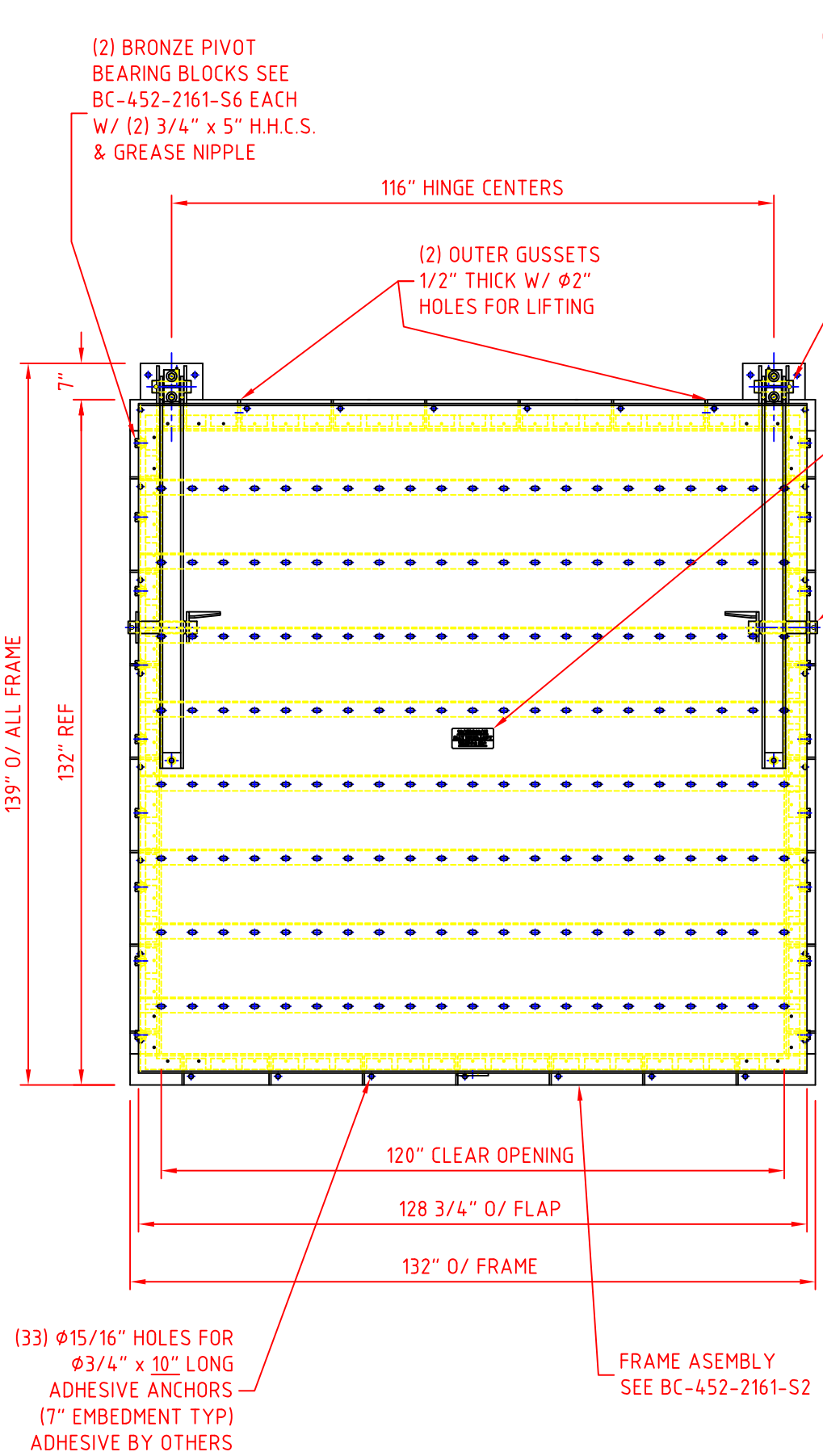
Ref Plan Sheet: A-308, S-305

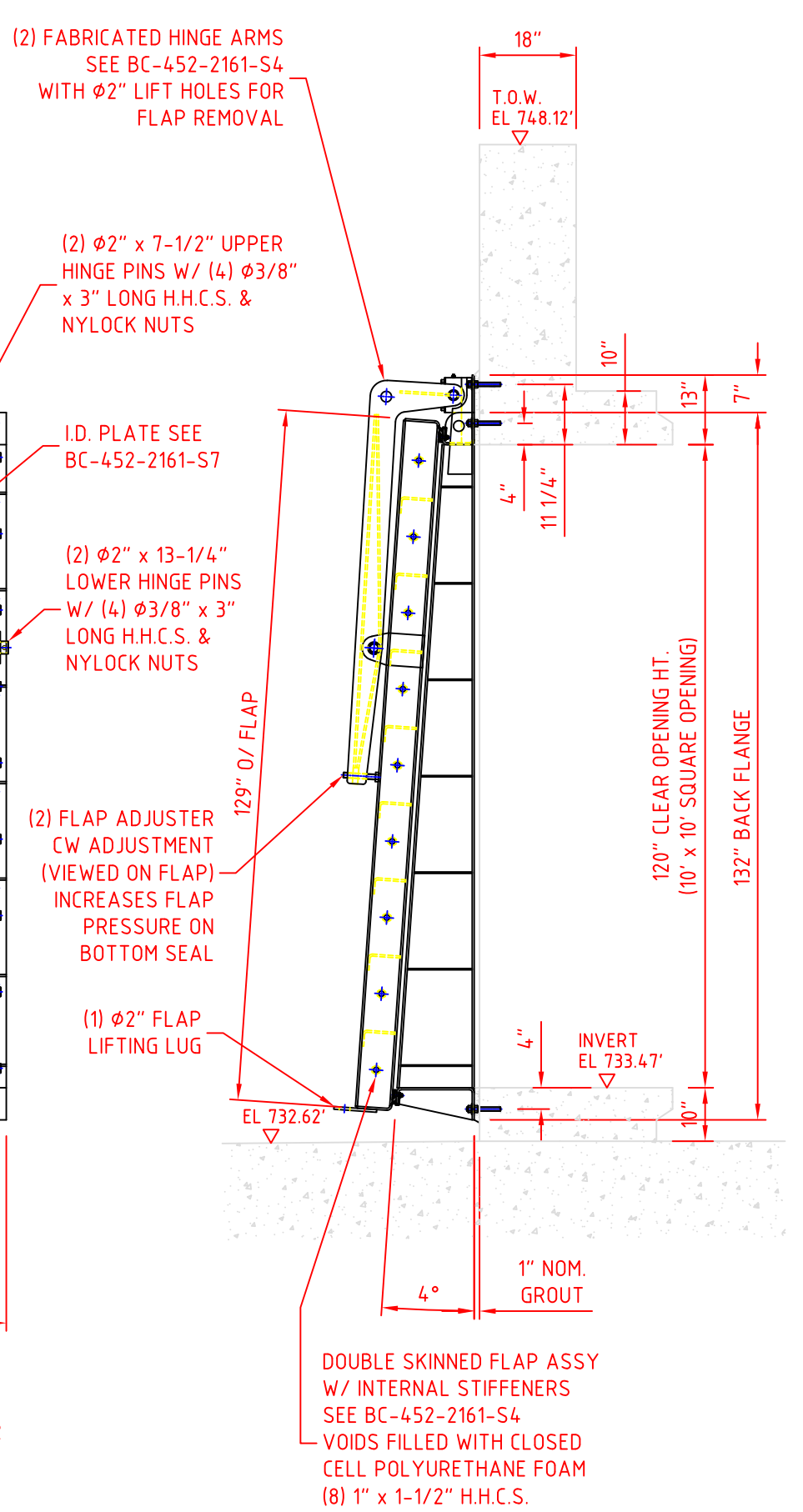
FOR FRAME SEE: BC-452-2161-S2
FOR GUSSETS SEE: BC-452-2161-S3
FOR FLAP SEE: BC-452-2161-S4
FOR HINGE ARM SEE: BC-452-2161-S5
FOR HINGE PIVOT SEE: BC-452-2161-S6
FRAME - 3/8" THICK
FLAP SKIN PLATES - 3/8" THICK
HORIZONTAL STIFFENERS - 6" x 3" x 3/8" ANGLE

ESTIMATED WEIGHTS:

ASSEMBLY	6000 LB
FLAP -	4600 LB
HINGE ARMS (EA) -	150 LB
FRAME -	1100 LB

WATER LOAD = 239,242 LB





Title	SERIES 452 FLAP VALVE INSTALL. 120"x 120"	Quantity: 1	Scale: 1:30
Project	ARGENTINE UNIT P.S., KS.	Tag No's: T.B.C.	
Location	PUMP STATION OUTLET	Job No: #C5	Seating / Unseating
Drg. No.	BC-452-2161	S.O. No. 30797	Design Head: 42' / -
			Leakage Rate GPM/ft of seal: 0.1 / -

DO NOT SCALE THIS DRAWING
Work to Dimensions
Linear Dimensions are Inches
Requested Concrete Opening Tolerances
Height & Width ±1/4"
Squareness ±3/8 Diagonal
THIRD ANGLE PROJECTION

Rev.	Rev. Record	Date	Eng.	Chk.
A	Original Issue	02/19/18	APC	APC

Whipps, inc.
370 SOUTH ATHOL ROAD
ATHOL, MA 01331

Whipps, inc.

P.O. Box 1058 • 370 South Athol Rd.
Athol, Massachusetts 01331
Phone: (978) 249-7924
Fax: (978) 249-3072

SECTION _____
STAINLESS STEEL FLAP GATES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required to install and ready for operation stainless steel flap gates as shown on the Contract Drawings and as specified herein.

1.02 SUBMITTALS

A. Provide the following information to confirm compliance with the specification in addition to the submittal requirements specified in Section _____.
   1. Complete description of all materials including the material thickness of all structural components of the frame and flap.
   2. Installation drawings showing all details of construction, details required for installation, dimensions and anchor bolt locations.
   3. Maximum bending stress and deflection of the flap under the maximum design head (seating head).
   4. The location of the company headquarters and the location of the principle manufacturing facility. Provide the name of the company that manufactures the equipment if the supplier utilizes an outside source.

1.03 QUALITY ASSURANCE

A. Qualifications
   1. All of the equipment specified under this Section shall be furnished by a single manufacturer with a minimum of 20 years experience designing and manufacturing water control gates.
   2. The specification is based on the Series 450 Stainless Steel Flap Gate as manufactured by Whipps, Inc. of Athol, Massachusetts.

PART 2 EQUIPMENT

2.01 GENERAL

A. Gates shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings.
B. Leakage shall not exceed 0.1 gpm/ft of wetted seal perimeter in seating head condition.
C. The flap gate shall utilize a resilient seal around the perimeter of the opening.

D. All structural components of the frame and flap shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
E. All welds shall be performed by welders with AWS D1.6 certification.
F. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale.
G. Materials:

Components	Materials
Frame	Stainless Steel, Type 304L, ASTM A240
Flap, Stiffeners and Hinge Arms	Stainless Steel, Type 304L, ASTM A240
Hinge Pins	Stainless Steel, Type 304, ASTM A240
Anchor Studs, Fasteners and Nuts	Stainless Steel, Type 316, ASTM A276
Seal	Polyurethane, Neoprene or EPDM ASTM D-2000

2.02 FRAME

A. The frame shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
1. Frame design shall be of the flanged back type suitable for mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a pipe flange with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
2. The angle of the flap when seated against the frame shall be between 3 degrees and 7 degrees from the vertical.
3. Lifting lugs shall be provided on the top of the frame to facilitate installation.

2.03 HINGE ARMS

A. Hinge arms shall be constructed of formed stainless steel plate with a minimum thickness of 3/4-inch and shall connect the frame to the flap.
1. Dual hinge arms shall be provided on all flap gates in excess of 18 inches wide.
2. Flap gates in excess of 18 inches wide shall have two pivot joints per arm. An adjustable lower pivot with limited rotation and a fixed or adjustable upper hinge lug arrangement to permit adjustment of the opening sensitivity to unseating head.
3. The hinge pins shall have a minimum diameter of 1-inch and shall be constructed of solid stainless steel rod.

2.04 FLAP

A. The flap and reinforcing stiffeners shall be constructed of stainless steel plate with a minimum thickness of 1/4-inch.
1. The flap shall not deflect more than 1/360 of the span under the maximum design head.
2. Reinforcing stiffeners shall be welded to the flap.

2.05 SEALS

A. All flap gates shall be provided with a seal system to restrict leakage in accordance with the requirements listed in this specification.
1. A continuous resilient seal shall be mounted to the seating surface of the frame to restrict leakage.

2. The seal system shall be durable and shall be designed to accommodate frequent operation without loosening or suffering damage.
3. All seals must be bolted or otherwise mechanically fastened to the frame. Arrangement with seals that are force fit and/or held in place with adhesives are unacceptable.
4. The seals shall be mounted so as not to obstruct the water way opening.

2.06 ANCHOR BOLTS

A. Anchor bolts shall be provided by the flap gate manufacturer for mounting the gates when shown on the Contract Drawings.
   1. Quantity and location shall be determined by the gate manufacturer.
   2. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
   3. Anchor bolts shall have a minimum diameter of 5/8-inch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
B. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.
C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
D. The CONTRACTOR shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer’s recommendations.

3.02 FIELD TESTING

A. After installation, all gates shall be field tested in the presence of the ENGINEER and OWNER to ensure that all items of equipment are in full compliance with this Section. Each gate shall be visually inspected to confirm that the flap seats against the frame properly.

END OF SECTION

Dyrhoff Inc
354 West Boylston Rd, Suite 221
West Boylston, MA 01583-2373
Tel: 508 755 0440 Fax: 508 755 9589

QUOTATION

To: Christopher M. Chapman, PE (NY) LEED (AP)
Attn: Wendel Architects and Engineers, Centerpointe Corporate Park, 375 Essjay Road, Suite 200, Williamsville, NY 14221
No. E22016-2
Date: February 20th, 2022
Project: Design and supply of pneumatic spillway gate: Cornelius Creek, Buffalo, NY

We have pleasure in submitting our offer for supply of the goods/services listed below.

Description	Price (US$)
1. Design, manufacture and supply of a pneumatically-operated spillway gate of dimensions: 11.0' high x 25.0' wide Supply includes: **Steel Package**: One (1) nominal 25' wide carbon steel gate panel along section with ductile iron clamp castings, carbon steel hinge retainers, web retainers, nappe breakers, restraining strap clamps and two (2) stainless steel abutment plates. Gate panels to be sand blasted and coated with CeramKote 54 epoxy paint or similar. Peripheral steel parts and clamps will be sand blasted and hot dip galvanized in accordance with ISO1461. **Bladder Package:** One (1) nominal 25' wide polyester reinforced air bladder complete with air-bladder connection assembly for connecting air bladder into contractor-supplied air piping. Note: Piping is not included except for above-mentioned pipe flanges	$280,000
2. Manufacture and supply of inflation equipment and control system: **Automatic water level control system:** Control system to utilize a Siemens/Allen Bradley series PLC (other brands and models available upon request) to measure and maintain a user input upstream water elevation. System complete with Trafag submersible depth transmitter, ASM inclinometers and other mechanical components required for controlling a single gate.	$81,880

Control system provided in IP65 rated electrical boxes (PLC cabinet). Operator interface to PLC to be via colour touchscreen HMI. Supply includes: **Air Supply:** Two (2) Ingersoll Rand compressors TAS complete air supply systems (or similar). Package complete with rotary screw air compressor, refrigerated air dryer and filtration system. An air receiver tank will be supplied to store clean and dry compressed air.	
3. Transport/shipping of all spillway gate components from place of manufacture to project site in Buffalo, NY.	$34,100
4. Installation supervision by Dyrhoff engineer or technician • 16 man-days supervision of installation, testing and commissioning, including travel • Installation by others • Additional days chargeable at US $1000 per day	$25,000
Total (US$)	**$420,980**

Conditions:

1. General conditions are as per standard Dyrhoff sales agreement.
2. The currency of this offer is US Dollars (US$). Once agreed, the price will be fixed for the duration of the contract.
3. This offer is valid for 60 days from the date of the quotation.
4. Payment conditions are:
   - 35% of the contract amount upon placing the order;
   - 60% of the contract amount upon shipment of main components from place of manufacture;
   - 5% of the contract amount due 60 days from the date of shipment or upon commissioning whichever is earlier;

   Advance payment must be made before any manufacturing can take place.
5. The price for on-site supervision includes travel and accommodation expenses and is based on two supervisors from Dyrhoff, one for the spillway gate and another for the control system, being assigned to the project for a total period of 16 man-days to supervise installation and testing of the spillway gate. The supervisors will visit the site once each to supervise installation of the gate followed immediately by system start-up and commissioning. Additional days of supervision will be charged at a rate of US $1000 per man-day. Travel and accommodation costs will be in addition to the daily rate. The number of man-days of supervision written in this offer is for estimating purposes only. Dyrhoff Inc accepts no responsibility if the actual number of days' supervision is different to the estimated number of days.

6. All project documentation will be submitted in the English language.

7. The design of this spillway gate is a standard design with the following features:

   - Air-inflated
   - Single 25' long bladder
   - Hydrostatic loading from both sides of the dam will be taken into account in the design
   - Maximum overflow depth of no more than 12in (from the upstream side of the gate). Operation of the spillway gate in a partially-inflated (open) position with an overflow of more than 12in is allowed.
   - Abutments are assumed to be constructed at an angle of 90.0 degrees (vertical).

   Any deviations from the above-mentioned design criteria may invalidate this quotation.

8. This quotation is for supply of the spillway gate, inflation equipment and control system only, including any purchased supervision. It excludes:

   - Supply of piping between flanges and control room
   - Installation of the spillway gate
   - Supply of any installation tools, lifting equipment or cranes.
   - Bid, supply, or performance bonds.

9. Quotation is based on delivery of all components to the project site in Buffalo, NY on a DAP basis (INCOTERMS® 2020). Price is exclusive of any sales tax and/or any other national, local or state taxes.

10. Manufacturing period (ex-factory) is generally 5 months after approval of the design submittal depending on the workload in the factory at the time of placing the order.

11. This proposal is based on a standard Dyrhoff 2-year warranty.

12. The proposal and price for this equipment and associated services shall only become binding upon mutual agreement by both parties of all commercial and warranty terms.

We would like to thank you for giving us the opportunity to submit this offer. If you should have any questions or if you require any additional information, please do not hesitate to contact us.

Yours faithfully,
For Dyrhoff Inc

Donald Mason

_____

Donald Mason,
President

Dyrhoff Inc
354 West Boylston Rd, Suite 221
West Boylston, MA 01583-2373
Tel: 508 755 0440 Fax: 508 755 9589

QUOTATION

To: Christopher M. Chapman, PE (NY) LEED (AP)
Attn: Wendel Architects and Engineers, Centerpointe Corporate Park, 375 Essjay Road, Suite 200, Williamsville, NY 14221
No. E22016-2
Date: February 20th, 2022
Project: Design and supply of pneumatic spillway gate: Cornelius Creek, Buffalo, NY

We have pleasure in submitting our offer for supply of the goods/services listed below.

Description	Price (US$)
1. Design, manufacture and supply of a pneumatically-operated spillway gate of dimensions: 11.0' high x 12.0' wide x 2 no. Supply includes: **Steel Package**: Two (2) nominal 12' wide carbon steel gate panels along section with ductile iron clamp castings, carbon steel hinge retainers, web retainers, nappe breakers, restraining strap clamps and four (4) stainless steel abutment plates. Gate panels to be sand blasted and coated with CeramKote 54 epoxy paint or similar. Peripheral steel parts and clamps will be sand blasted and hot dip galvanized in accordance with ISO1461. **Bladder Package:** Two (2) nominal 12' wide polyester reinforced air bladders complete with air-bladder connection assembly for connecting air bladders into contractor-supplied air piping. Note: Piping is not included except for above-mentioned pipe flanges	$339,250
2. Manufacture and supply of inflation equipment and control system: **Automatic water level control system:** Control system to utilize a Siemens/Allen Bradley series PLC (other brands and models available upon request) to measure and maintain a user input upstream water elevation. System complete with Trafag submersible depth transmitter, ASM inclinometers and other mechanical components required for controlling a single gate.	$81,880

Control system provided in IP65 rated electrical boxes (PLC cabinet). Operator interface to PLC to be via colour touchscreen HMI. Supply includes: **Air Supply:** Two (2) Ingersoll Rand compressors TAS complete air supply systems (or similar). Package complete with rotary screw air compressor, refrigerated air dryer and filtration system. An air receiver tank will be supplied to store clean and dry compressed air.	
3. Transport/shipping of all spillway gate components from place of manufacture to project site in Buffalo, NY.	30,800
4. Installation supervision by Dyrhoff engineer or technician • 19 man-days supervision of installation, testing and commissioning, including travel • Installation by others • Additional days chargeable at US $1000 per day	28,000
Total (US$)	**$479,930**

Conditions:

1. General conditions are as per standard Dyrhoff sales agreement.
2. The currency of this offer is US Dollars (US$). Once agreed, the price will be fixed for the duration of the contract.
3. This offer is valid for 60 days from the date of the quotation.
4. Payment conditions are:
   - 35% of the contract amount upon placing the order;
   - 60% of the contract amount upon shipment of main components from place of manufacture;
   - 5% of the contract amount due 60 days from the date of shipment or upon commissioning whichever is earlier;

   Advance payment must be made before any manufacturing can take place.
5. The price for on-site supervision includes travel and accommodation expenses and is based on two supervisors from Dyrhoff, one for the spillway gate and another for the control system, being assigned to the project for a total period of 19 man-days to supervise installation and testing of the spillway gate. The supervisors will visit the site once each to supervise installation of the gate followed immediately by system start-up and commissioning. Additional days of supervision will be charged at a rate of US $1000 per man-day. Travel and accommodation costs will be in addition to the daily rate. The number of man-days of supervision written in this offer is for estimating purposes only. Dyrhoff Inc accepts no responsibility if the actual number of days' supervision is different to the estimated number of days.

6. All project documentation will be submitted in the English language.

7. The design of this spillway gate is a standard design with the following features:

   - Air-inflated
   - Twin 12' wide bladders (2 gates).
   - Hydrostatic loading from both sides of the dam will be taken into account in the design
   - Maximum overflow depth of no more than 12in (from the upstream side of the gate). Operation of the spillway gate in a partially-inflated (open) position with an overflow of more than 12in is allowed.
   - Abutments are assumed to be constructed at an angle of 90.0 degrees (vertical).

   Any deviations from the above-mentioned design criteria may invalidate this quotation.

8. This quotation is for supply of the spillway gate, inflation equipment and control system only, including any purchased supervision. It excludes:

   - Supply of piping between flanges and control room
   - Installation of the spillway gate
   - Supply of any installation tools, lifting equipment or cranes.
   - Bid, supply, or performance bonds.

9. Quotation is based on delivery of all components to the project site in Buffalo, NY on a DAP basis (INCOTERMS® 2020). Price is exclusive of any sales tax and/or any other national, local or state taxes.

10. Manufacturing period (ex-factory) is generally 5 months after approval of the design submittal depending on the workload in the factory at the time of placing the order.

11. This proposal is based on a standard Dyrhoff 2-year warranty.

12. The proposal and price for this equipment and associated services shall only become binding upon mutual agreement by both parties of all commercial and warranty terms.

We would like to thank you for giving us the opportunity to submit this offer. If you should have any questions or if you require any additional information, please do not hesitate to contact us.

Yours faithfully,
For Dyrhoff Inc

Donald Mason

_____

Donald Mason,
President

PROJECT DATA SHEET No. 37
Mouzon

Project name:	Mouzon
Location:	France
Client:	EPAMA
Application:	Flood Control
Type:	Spillway gate
Installation date:	2008
Dimensions:	Height: 3.0m Length: 15.0m


GATE PANEL
PROJEKT MOLIZON
DWG. NO.: 06-172-200
Sandblast of the construction units


Atlas Copco

Dyrhoff Inc
354 West Boylston Rd, Suite 221
West Boylston, MA 01583-2373
Tel: 508 755 0440 Fax: 508 755 9589

QUOTATION

To: Christopher M. Chapman, PE (NY) LEED (AP)
Attn: Wendel Architects and Engineers, Centerpointe Corporate Park, 375 Essjay Road, Suite 200, Williamsville, NY 14221
No. E22016-1
Date: February 20th, 2022
Project: Design and supply of air-inflated rubber dam: Cornelius Creek, Buffalo, NY

We have pleasure in submitting our offer for supply of the goods/services listed below.

Description	Price (US$)
1. Design, manufacture and supply of an air inflated rubber dam system of dimensions: 11.0' high x 25.0' wide Supply includes: • Rubber membrane: EPDM rubber outer layer, 3 layers of nylon or polyester fabric, nominal thickness > 15mm, tensile strength: > 3200 lb/in (warp direction), > 2150 lb/in (weft direction) • Clamp plates: ASTM A536 Grade 60, hot dip galvanized • Anchor bolts: ASTM F1554 Grade 55, hot dip galvanized • Special pipe connection flanges: stainless steel ASTM A240 grade 304L Note: Piping is not included except for above-mentioned pipe flanges	$148,000
2. Manufacture and supply of inflation equipment and control system: Control system to be fully automatic with manual override. Rubber dam to be automatically deflated as upstream water level rises. Rubber dam inner pressure will be maintained automatically within a defined range. Supply includes: • Inflation equipment: regenerative packaged air blower system (two units) achieving full inflation in a time of approximately 30 minutes. • Deflation time: approximately 15 minutes	$79,500

• Control panel: wall-mounted cabinet with PLC, colour touch screen HMI, push buttons and selector switches. • Valves and sensors: all necessary valves (manual and electric), sensors, switches and gauges for a fully self-contained operating system • Mechanical safety devices: - high water level deflation system: drop-bucket type: ASTM A240 grade 304L - overpressure prevention: pressure relief valve	
3. Transport/shipping of all rubber dam components from place of manufacture to project site in Buffalo, NY.	29,700
4. Installation supervision by Dyrhoff engineer or technician • 16 man-days supervision of installation, testing and commissioning, including travel • Installation by others • Additional days chargeable at US $1000 per day	25,000
Total (US$)	**$282,200**

Conditions:

1. General conditions are as per standard Dyrhoff sales agreement.
2. The currency of this offer is US Dollars (US$). Once agreed, the price will be fixed for the duration of the contract.
3. This offer is valid for 60 days from the date of the quotation.
4. Payment conditions are:
   - 35% of the contract amount upon placing the order;
   - 60% of the contract amount upon shipment of main components from place of manufacture;
   - 5% of the contract amount due 60 days from the date of shipment or upon commissioning whichever is earlier;

   Advance payment must be made before any manufacturing can take place.
5. The price for on-site supervision includes travel and accommodation expenses and is based on two supervisor from Dyrhoff, one for the rubber dam and another for the control system, being assigned to the project for a total period of 16 man-days to supervise installation and testing of the rubber dam. The supervisors will visit the site once each to supervise installation of the rubber dam followed immediately by system start-up and commissioning. Additional days of supervision will be charged at a rate of US $1000 per man-day. Travel and accommodation costs will be in addition to the daily rate. The number of man-days of supervision written in this offer is for estimating purposes only. Dyrhoff Inc accepts no responsibility if the actual number of days' supervision is different to the estimated number of days.

6. All project documentation will be submitted in the English language.

7. The design of this rubber dam is a standard design with the following features:

   - Air-inflated
   - Dual anchor lines
   - Hydrostatic loading from both sides of the dam will be taken into account in the design
   - Maximum overflow depth of no more than 20% of the dam height (from the upstream side of the dam). Operation of the rubber dam in a partially-inflated position with an overflow of more than 20% of the actual dam height is not recommended.
   - Abutments are assumed to be constructed at an angle of 90.0 degrees (vertical) although an angle of 2V:1H (63 degrees) would be preferable.

   Any deviations from the above-mentioned design criteria may invalidate this quotation.

8. This quotation is for supply of the rubber dam, inflation equipment and control system only, including any purchased supervision. It excludes:

   - Supply of piping between flanges and control room
   - Installation of the rubber dam
   - Supply of any installation tools, lifting equipment or cranes.
   - Bid, supply, or performance bonds.

9. Quotation is based on delivery of all components to the project site in Buffalo, NY on a DAP basis (INCOTERMS® 2020). Price is exclusive of any sales tax and/or any other national, local or state taxes.

10. Manufacturing period (ex-factory) is generally 4 months after approval of the design submittal depending on the workload in the factory at the time of placing the order.

11. This proposal is based on a standard Dyrhoff 2-year warranty.

12. The proposal and price for this equipment and associated services shall only become binding upon mutual agreement by both parties of all commercial and warranty terms.

We would like to thank you for giving us the opportunity to submit this offer. If you should have any questions or if you require any additional information, please do not hesitate to contact us.

Yours faithfully,
For Dyrhoff Inc

Donald Mason

_____

Donald Mason,
President

PROJECT DATA SHEET No. 42
New York R20

Inflated rubber dam upstream view

Project Name: New York R20

Location: USA

Client: City of New York
Department of Environmental
Protection

Application: Sewage Control

Type of rubber dam: Air-inflated

Installation date: 2009/2010

Dimensions: Height: 10'
Length: 16'

Before rubber body installation

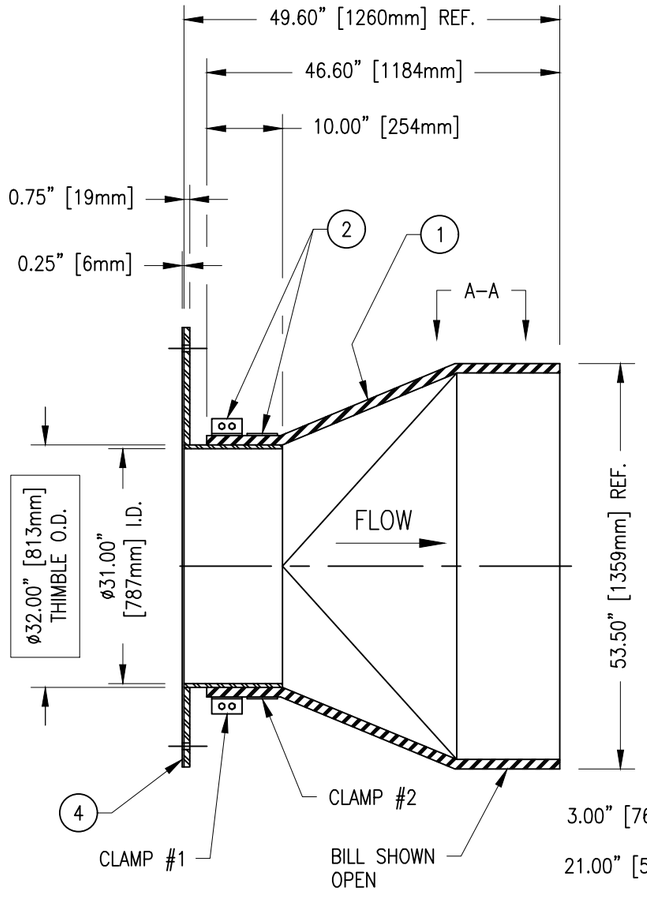
Inflated rubber dam downstream view

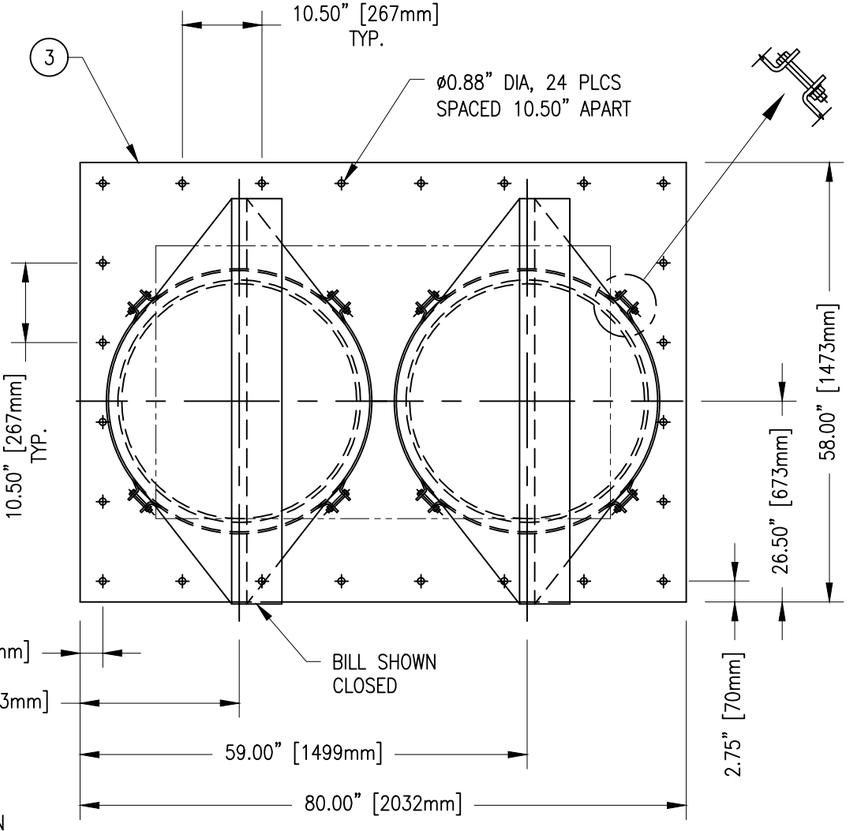
Rubber body handling

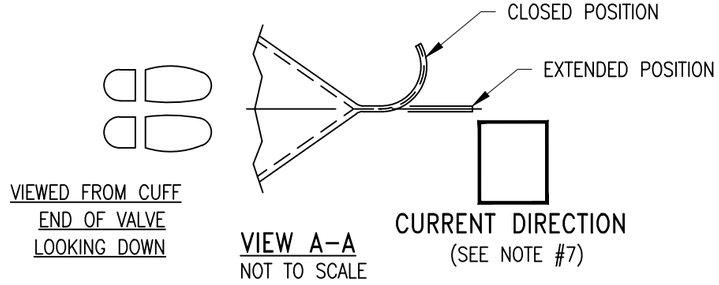
Rubber body installation

Concrete works and bottom clamp plates

ITEM	QTY.	DESCRIPTION	MAT'L
1	2	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	4	MOUNTING CLAMP	MUST BE SUPPLIED
3	1	THIMBLE PLATE	MUST BE SUPPLIED
4	1	GASKET	MUST BE SUPPLIED







NOTES:
1. MAXIMUM BACK PRESSURE: MUST BE SUPPLIED
   LINE PRESSURE: MUST BE SUPPLIED
2. TIDEFLEX IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION
3. IT IS RECOMMENDED TO BOLT OR PIN TIDEFLEX TO PIPE AS SHOWN, 4 PLACES 90° APART
4. TIDEFLEX TO FIT ON A 32.0 INCH (813mm) O.D. THIMBLE PLATE.
5. BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED
6. THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING. THIS PLATE CONFIGURATION WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED
7. CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A–A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

CUSTOMER: XXX

ORDER No: XXX

OPPORTUNITY No: XXXXX | SALES ORDER No: TXX–XXXX

Tideflex® Technologies
A Division of Red Valve Company, Inc.
750 HOLIDAY DR. STE.400
PITTSBURGH, PA. 15220
info@redvalve.com
412.279.0044
fax 412.279.5410

TT PRODUCT: (2) 32" TF–1 TIDEFLEX W/ 58"x 80" PLATE

TT PART No: TF1–320–APPROVAL

DR. BY: TLM DATE: 2–1–16 | CHKD. BY: DATE:

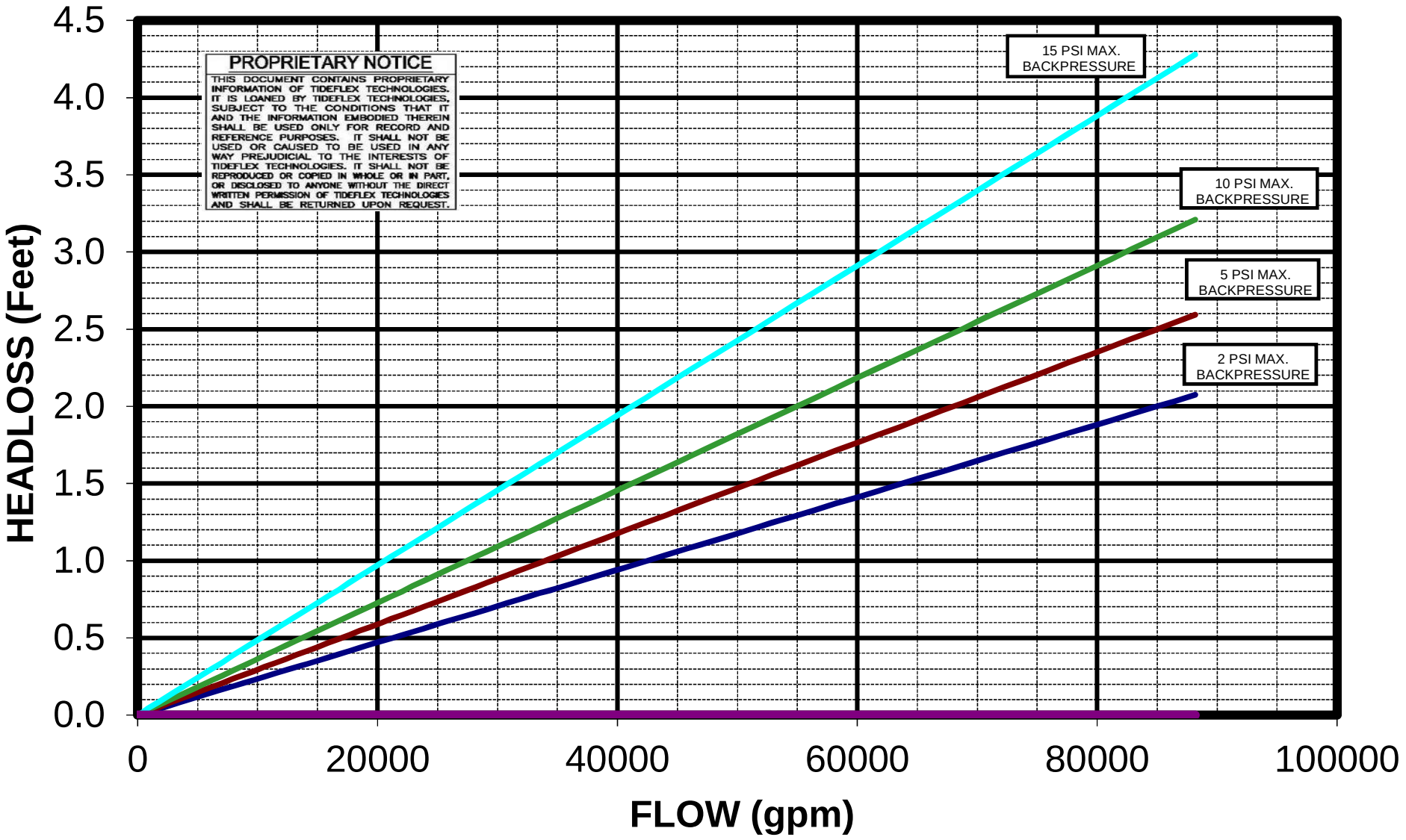
CAD SCALE: FULL

PLOT SCALE: 1 = 1

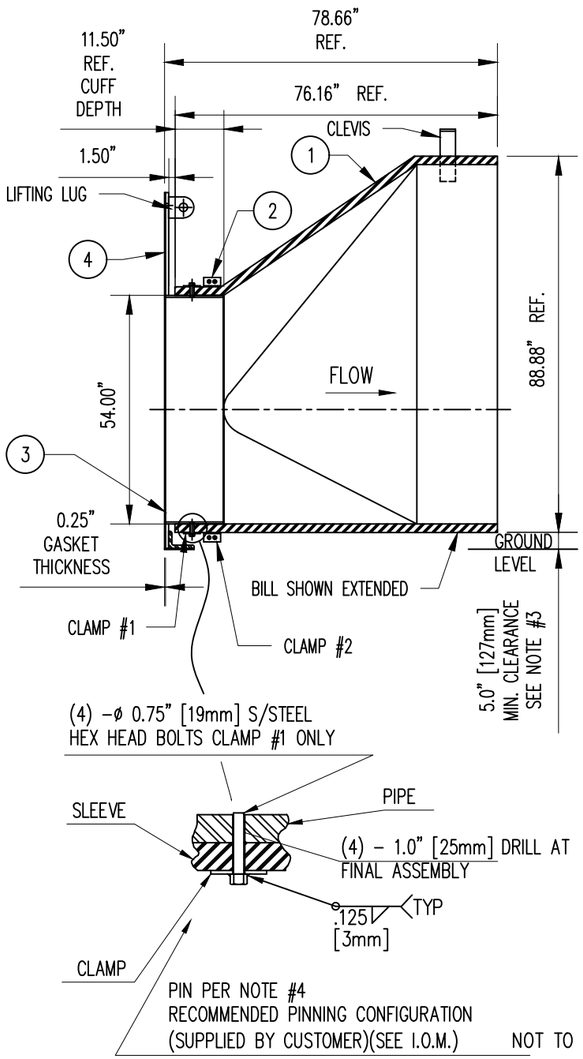
DWG No: TTS–DWG

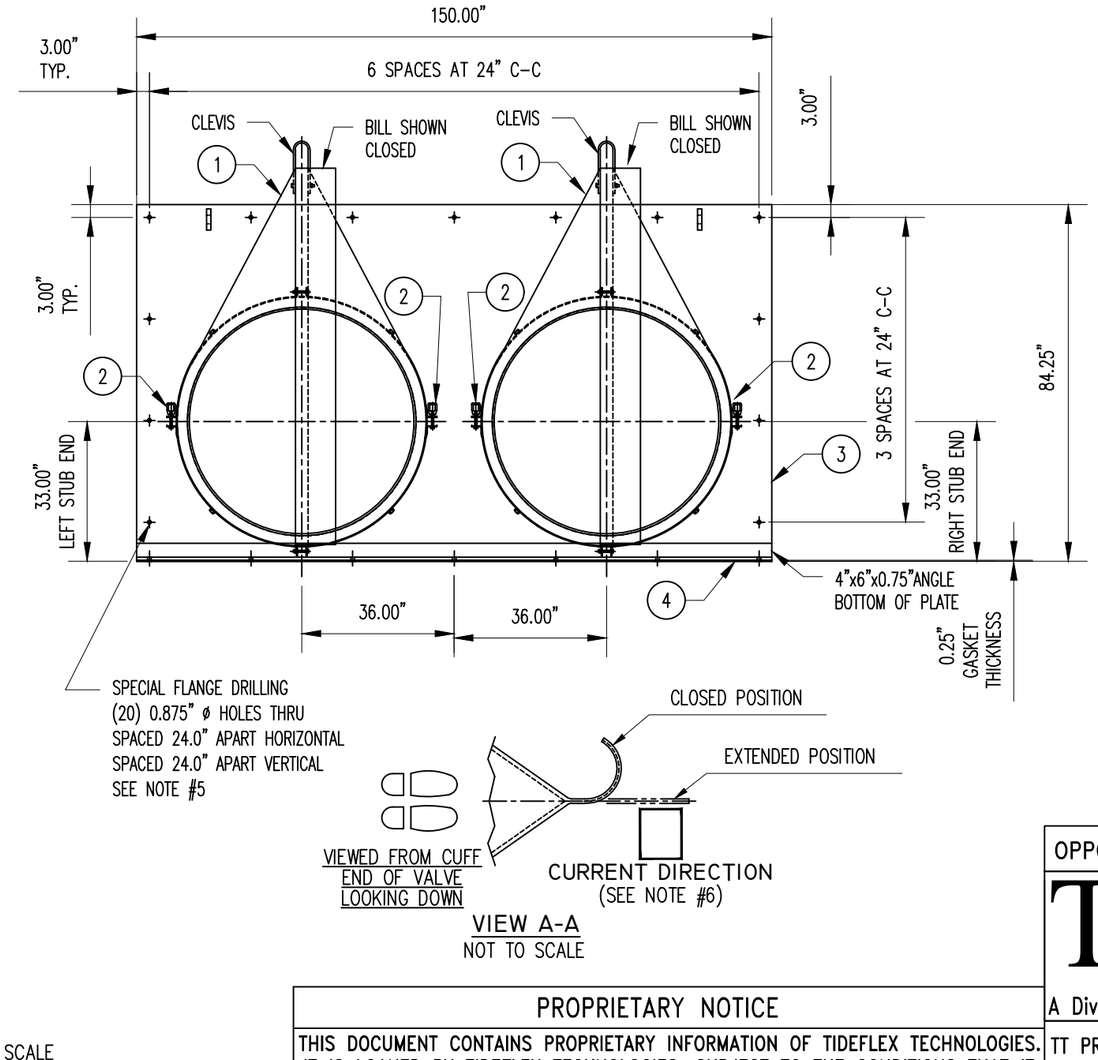
REV

54" TIDEFLEX SERIES TF-2, TF-1, 35, 35-1, 39F
Headloss vs. Flow (Submerged Discharge)



ITEM	QTY.	DESCRIPTION	MAT'L
1	2	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	4	MOUNTING CLAMPS	MUST BE SUPPLIED
3	1	THIMBLE PLATE	MUST BE SUPPLIED
4	1	GASKET	MUST BE SUPPLIED





NOTES:
1. MAXIMUM BACK PRESSURE – MUST BE SUPPLIED
   LINE PRESSURE – MUST BE SUPPLIED
2. VALVE IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION.
3. BECAUSE OF SAND, ROCK, AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED
4. IT IS RECOMMENDED TO BOLT OR PIN TIDEFLEX TO PIPE AS SHOWN, 4 PLACES 90° APART.
5. THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING. THIS PLATE CONFIGURATIONS WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED
6. CUSTOMER TO SHOW DIRECTION OF PREDOMINANT CURRENT FLOW WITH ARROW IN VIEW 'A–A'. (IF NO CURRENT CUSTOMER TO WRITE NO IN BOX.)

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

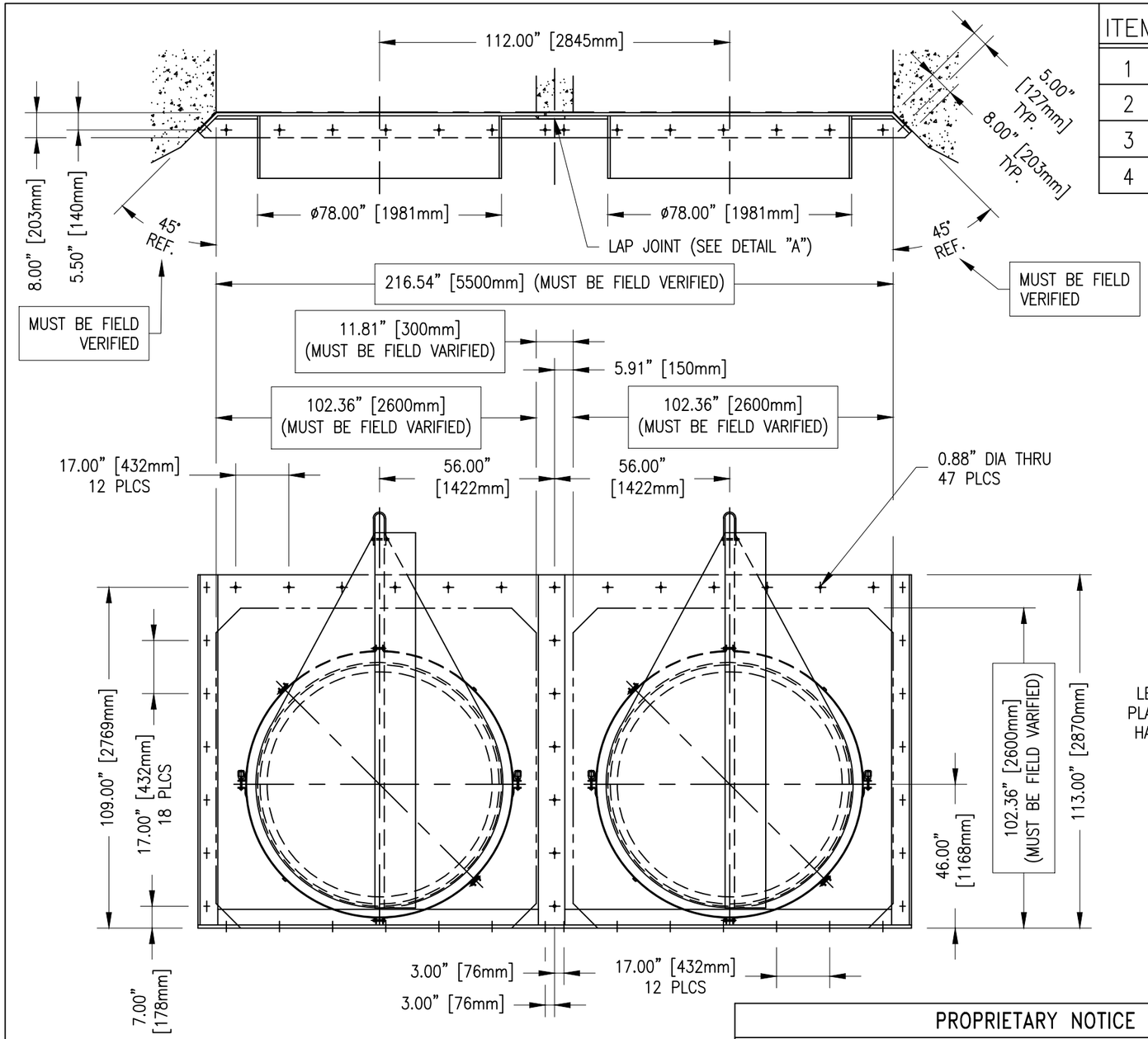
CUSTOMER: XXX

ORDER No: XXX

OPPORTUNITY No:	SALES ORDER No:TXX–XXXX

Tideflex® Technologies
A Division of Red Valve Company, Inc.
750 HOLIDAY DR. STE.400
PITTSBURGH, PA. 15220
info@redvalve.com
412.279.0044
fax 412.279.5410

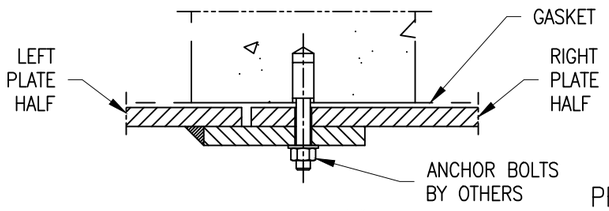
TT PRODUCT: (2) 54" TF–1 W/84"x150" PL.		
TT PART No: TF1–540–APPROVAL		
DR. BY: PAP DATE: 12–28–11	CHKD. BY: DATE:	
CAD SCALE: FULL		REV
PLOT SCALE: .05	DWG No:TTS–DWG	



ITEM	QTY.	DESCRIPTION	MAT'L
1	2	CHECK VALVE SLEEVE	MUST BE SUPPLIED
2	6	MOUNTING CLAMP	MUST BE SUPPLIED
3	1	THIMBLE PLATE, 2 PIECE	MUST BE SUPPLIED
4	1	GASKET, (AS REQUIRED)	MUST BE SUPPLIED

NOTES:

1. MAXIMUM BACK PRESSURE – MUST BE SUPPLIED
   LINE PRESSURE – MUST BE SUPPLIED
2. TIDEFLEX IS TO BE MOUNTED WITH THE OUTLET IN THE VERTICAL POSITION
3. IT IS RECOMMENDED TO BOLT OR PIN TIDEFLEX TO PIPE AS SHOWN, 4 PLACES 90° APART
4. TIDEFLEX TO FIT ON A 78.0" THIMBLE O.D
5. BECAUSE OF SAND, ROCK AND OTHER DEBRIS ACCUMULATION BY BACKFLOW OF WATER THE SUGGESTED BOTTOM CLEARANCE SHOULD BE PROVIDED
6. THIMBLE PLATE DIMENSIONS ARE FOR REFERENCE ONLY ENGINEER IS TO DETERMINE ADEQUATE PLATE DIMENSIONS NUMBER OF HOLES, DIAMETER OF HOLES AND SPACING THIS PLATE CONFIGURATION WILL BE SUPPLIED WITH APPROVED DRAWING UNLESS REVISED DIMENSIONS ARE SUPPLIED



DETAIL – "A"
LAP JOINT FOR THIMBLE PLATE

PRELIMINARY DRAWING
NOT FOR APPROVAL PURPOSES

CUSTOMER: XXX

ORDER No: XXX

OPPORTUNITY No: XXXXX | SALES ORDER No: TXX–XXXX

Tideflex® Technologies
A Division of Red Valve Company, Inc.

750 HOLIDAY DR. STE.400
PITTSBURGH, PA. 15220
info@redvalve.com
412.279.0044
fax 412.279.5410

TT PRODUCT: DUAL 78" TF-1 TIDEFLEX W/SPL. SPLIT PLATE

TT PART No: TF1–720–APPROVAL

DR. BY: TLM DATE: 4–19–17 | CHKD. BY: DATE:

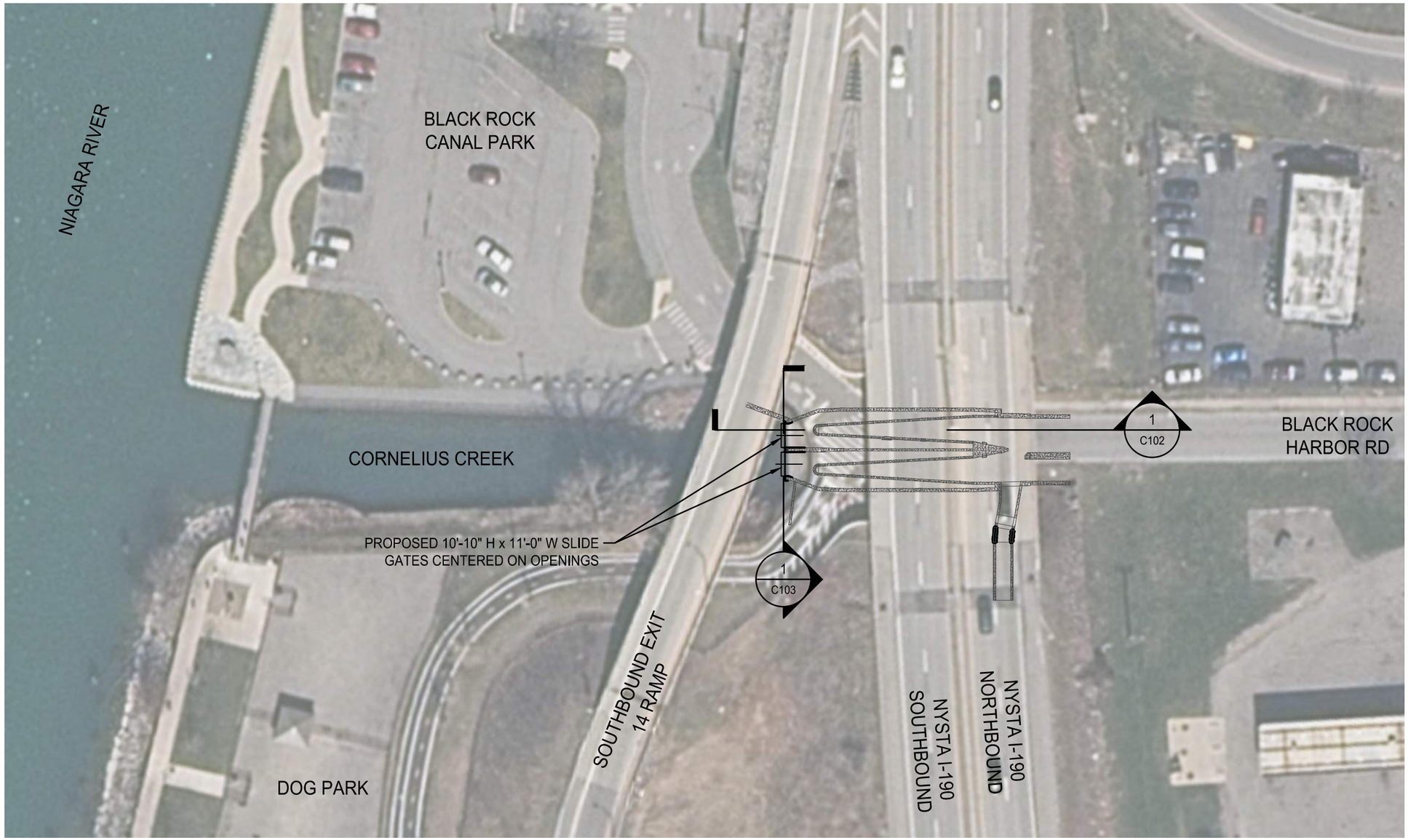
CAD SCALE: FULL

PLOT SCALE: 1 = 1

DWG No: TTS–DWG

REV —

APPENDIX D – SCHEMATIC DESIGN



N

1 SITE LAYOUT PLAN

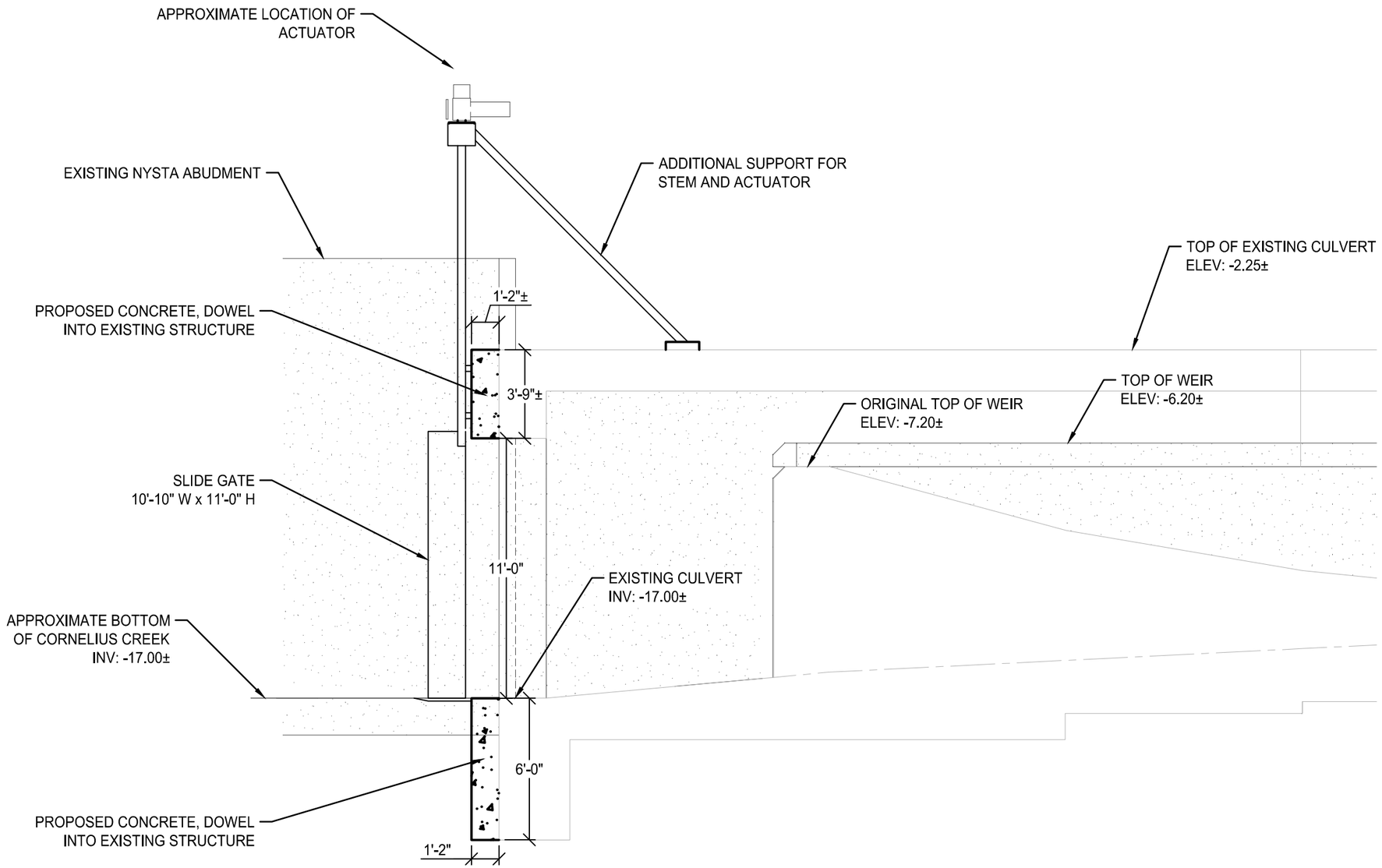
SCALE: 1" = 50'

wendel
www.wendelccompanies.com

BUFFALO SEWER AUTHORITY
CORNELIUS CREEK SCO BACKWATER GATE
FLOODING MITIGATION PROJECT

SITE LAYOUT PLAN

Proj. No.	434939
Date	JULY 2022
Ref. Dwg.	-
No.	C101



1 SECTION OF EXISTING CULVERT

SCALE: 1" = 5'

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BUFFALO SEWER AUTHORITY
CORNELIUS CREEK SCO BACKWATER GATE
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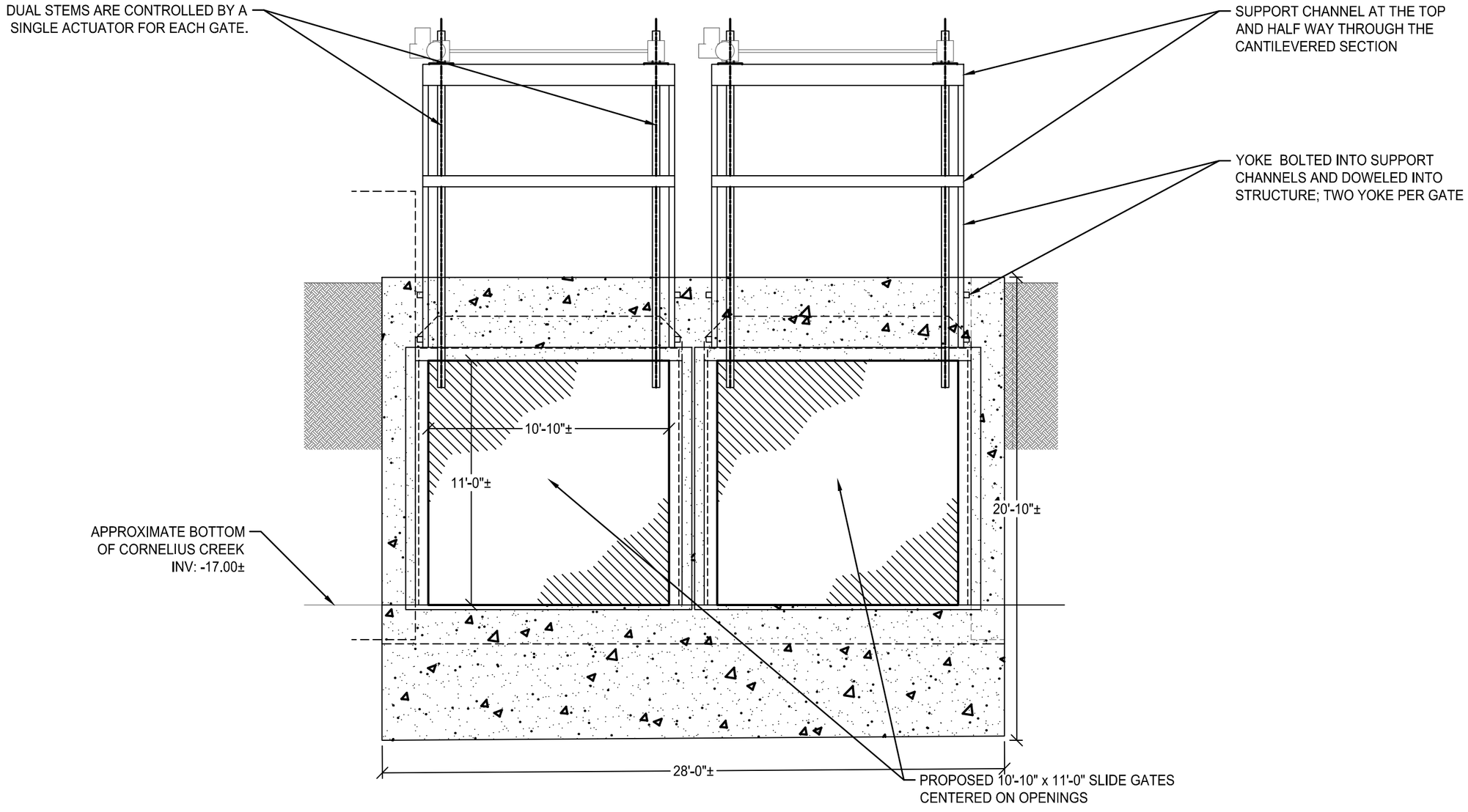

1 SECTION AT GATES

SCALE: 1" = 50'

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