Erie County Department of Environment and Planning

Division of Sewerage Management

Sewer District No. 5
Transit Road Corridor Sanitary Sewer
Service Evaluation Report

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In conjunction with:

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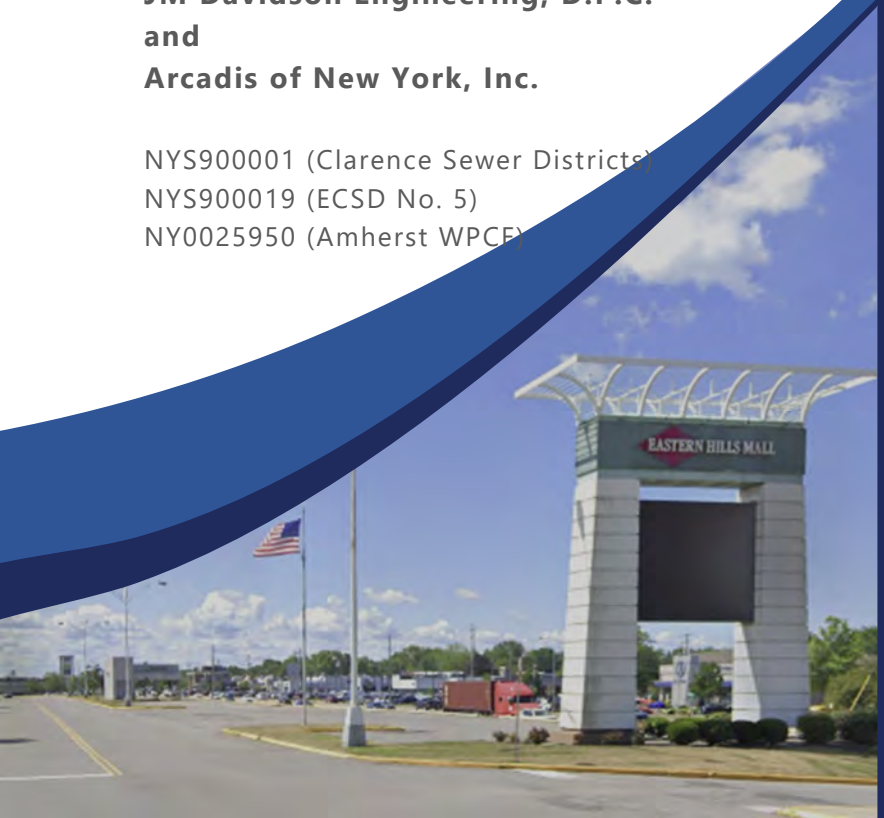

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Abbreviations and Acronyms

AACE	Association for the Advancement of Cost Engineering
BSPS	Bryant and Stratton Pumping Station
CSD	Clarence Sewer District
CRP	Clarence Research Park
ECDSM	Erie County Division of Sewerage Management
ECSD5	Erie County Sewer District No. 5
EDU	Equivalent Dwelling Unit
EHPS	Eastern Hills Pumping Station
EIS	Environmental Impact Statement
EJA	Environmental Justice Area
FEMA	Federal Emergency Management Agency
GIS	Geographical Information System
HBTS	Heise-Brookhaven Trunk Sewer
HGL	Hydraulic Grade Line
I/I	Inflow and infiltration
JMD	JM Davidson Engineering, DPC
LCC	Life cycle costs
MGD	Million gallons per day
MHI	Median household income
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
NYSEFC	New York State Environmental Facilities Corporation
O&M	Operations and maintenance
OPCC	Opinion of Probable Construction Cost
PC-SWMM	Personal Computer - Storm Water Management Model
PVC	Polyvinyl Chloride
QFD	Qualitive Function Deployment
RDII	Rainfall-Derived Inflow and Infiltration
RTK	Real time Kinematic
SCS	Soil Conservation Service
SEQR	State Environmental Quality Review
SPDES	State Pollution Discharge Elimination System
SWPPP	Stormwater Pollution Prevention Plan
TDH	Total discharge heat
WPCF	Water Pollution Control Facility
WRRF	Water Resource Recovery Facility
WWTP	Wastewater Treatment Plant

Executive Summary

The Erie County Department of Environment and Planning, Division of Sewerage Management (ECDSM) owns and operates Erie County Sewer District No. 5 (ECSD5), which is comprised of sanitary sewers, pumping stations, and other appurtenances within portions of the Town of Clarence. Wastewater generated within ECSD5, along with flows from adjacent Town of Clarence sewer districts, is conveyed downstream to the Town of Amherst's collection system and ultimately to the Amherst Water Pollution Control Facility (Amherst WPCF).

The Town of Clarence developed several master plans and associated sewer master plans over the last two decades. The purpose of these plans was to establish strategies for targeted development and the implementation of that development within the Town, with special emphasis on sanitary sewer infrastructure, as further development has traditionally been restricted in the past by public sanitary sewer capacity. In the master plans, the Town indicated the following priorities for sewer improvements:

- Utilize existing sewer infrastructure (gravity sewers and pumping stations) within ECSD5 and Clarence Sewer Districts (CSD) 2, 4, 6, 7, 9, & 10 and areas where smaller treatment systems (Spaulding Lake, Clarence Research Park, etc.) may already be present, to minimize the need for new infrastructure and to limit "sprawl" into designated agricultural areas.
- Incorporate areas where private septic systems remain, such as the Harris Hill area, into the public sewer system to mitigate potential pollution and other impacts from aging septic systems.
- Continue providing reliable sanitary sewer collection system capacity to allow unsewered areas to be further marketed to companies and developers looking to relocate or expand within the Town.
- Provide reliable service to areas focused on long-term industrial growth, such as in the Gunville/Wehrle and County Road Industrial Business Park Areas.
- Infill areas outside of existing publicly sewered properties to eliminate private septic systems located adjacent to existing public sanitary sewer districts.

In addition to the Town's potential development areas outlined in the Master Plan, Uniland Development Company recently undertook initial planning efforts to redevelop the existing Eastern Hills Mall property into a mixed-use development containing residential, commercial, hospitality, and entertainment/recreational uses. Such proposed uses would increase the amount of wastewater flow produced on the mall property, further stressing existing sewer infrastructure.

The urban growth objectives of the Town and the proposed redevelopment of the Eastern Hills Mall site have created some challenges addressed within this evaluation:

- Ensuring that adequate sanitary sewer capacity exists within ECSD5 and CSDs to receive the new flows expected from the ultimate buildout of the Eastern Hills Mall redevelopment and sewer system expansion areas identified by the Town.
- Ensuring that adequate sewer capacity exists within the neighboring Town of Amherst's collection system, receiving flows from the CSDs and ECSD5 and further conveying the flows to the Amherst WPCF. Previous evaluations indicated that sewer capacity in the portion of the Amherst collection system downstream of ECSD5 and the CSDs has constrained potential development opportunities in Clarence. This evaluation

contemplates the adequacy of the construction of a parallel 24-inch diameter Peanut Line sewer in the Town of Amherst to provide additional capacity for the conveyance of flows from Clarence.

- Continuing to address the upgrades necessary to maintain and manage aging septic systems within the Town.
- Balancing the potential need for new infrastructure with the operational and maintenance needs of Erie County and Town of Clarence staff. This could include the potential elimination of pump stations, thereby decreasing operations and maintenance efforts. This could also include phased approaches to increasing the size of the existing collection system to accommodate "just-in-time" project demands, without immediately increasing the size of the collection system and then having that system be severely underutilized if the proposed development does not happen or is smaller than originally envisioned.

Flows from the Town of Clarence and ECSD5 are conveyed to the Town of Amherst through three major pipelines:

- **Dodge Road Interceptor** – 24-inch diameter sewer that extends west along Dodge Road from the ECSD5 metering structure near the intersection of Dodge Road and Transit Road
- **Klein Road Sewer** – 12-inch diameter sewer that extends west along Klein Road from the intersection of Klein Road and Transit Road to a 30-inch sewer in the Town of Amherst. Up until 2022, the upstream portions of the Klein Road sewer only acted as a relief for the ECSD5 and CSDs, handling high flows to decrease the volume conveyed via the Dodge Road Interceptor. The relief weir was subsequently removed to allow additional flows from the portion of ECSD5 located south of Klein Road to flow in either direction (toward Dodge or toward Klein) to the Amherst WPCF for treatment.
- **Amherst Peanut Line Sewer** - 18-inch diameter sewer that conveys flow from various areas of the Town of Clarence in a westerly direction from Transit Road along the former alignment of the Peanut Line Railroad.

The JMD Team looked at the capacity of the existing sewers, the capacity increase with the construction of a new parallel Peanut Line sewer, and the projected flows associated with development both at the Eastern Hills Mall site and other areas identified by the Town. Options for conveying the projected additional flows were identified and subsequently evaluated.

The basis of evaluation flows for the existing Amherst Peanut Line sewer, the proposed parallel Amherst Peanut Line sewer and the 30-inch diameter Peanut Line sewer west of Paradise Road are provided in Table ES-1. These flows were developed by the Town of Amherst, the Town of Clarence, and ECSD5, and were compared against the capacities of the existing main line sewers shown in Table ES-2.

The Town of Amherst's previously developed hydraulic model was expanded to represent the key larger sewers located within ECSD5 and the CSDs using record drawings. The representation of the larger pipes within the model allowed for an evaluation of scenarios to determine which proposed additional flows (as shown in Table ES-1) could be added without causing excessive surcharging within the system. Ultimately, the model was used to eliminate some scenarios, as several indicated that surcharging would occur in the Dodge Road Interceptor, the existing 18-inch Peanut Line Sewer, the proposed 24-inch Parallel Peanut Line Sewer, and the 30-inch Peanut Line Sewer under certain conditions.

The proposed 24-inch Parallel Peanut Line sewer is intended, in part, to relieve the Dodge Road Interceptor. Currently, the Dodge Road Interceptor receives flow from ECSD5 and has experienced surcharging within recent years during higher flow events. The construction of a Parallel Peanut Line sewer would divert a portion of the

ECSD5 flow prior to reaching the Dodge Road sewer to reduce surcharging at Dodge Road. The proposed Parallel Peanut Line sewer is also intended to provide additional sewer capacity to the Town of Clarence to solve environmental issues by elimination of existing failing septic systems and package treatment plants and providing service for buildout in existing Town sewer districts. The collection system model used during this project confirmed that the greater the amount of flow diverted from the Dodge Road Interceptor into the Parallel Peanut Line sewer, the less the potential for Dodge Road surcharging. However, the greater the Dodge Road diversion, the less remaining capacity is available to other proposed development and redevelopment areas.

Table ES-1: Summary of Existing and Projected Additional Flows by Tributary Pipe

Description	Type of Flow Data	Existing Flow (MGD)	Proj. Additional Flow (MGD)
30" dia. Peanut Line (west of Paradise)			
Existing Flow (includes existing 18" PL flow)	Measured (5 yr, 6-hr)	4.5	
Klein Diversion	Nodes B + C + D + E		
Node B (Harris Hill and Woodland Hills)			0.18
Node C (Legacy Woods)			0.06
Node D (Thompson) + Bliss	Proposed Future		0.15
Node E (Bevilaqua)	Proposed Future		0.19
	Total	**4.5**	**0.58**
18" Peanut Line (existing)			
Existing Clarence Flow	Measured	1.2	
Existing Amherst Flow	Measured	0.2	
Available lots in CSD 2, 4, 6, 9	Proposed Future		0.51
CSD 9 Phase 2	Proposed Future		0.24
Spaulding Lake	Proposed Future		0.16
Clarence Research Park	Proposed Future		0.06
	Total	**1.4**	**0.97**
24" Peanut Line (proposed parallel sewer)			
Harris Hill	Proposed Future		1.77
Main Street	Proposed Future		0.55
Node A (Eastern Hills Mall Redevelopment)	Proposed Future		1.48
Dodge Diversion	Proposed Future		0.9
	Total	**0**	**4.7**

Table ES-2: Summary of Capacity of Main Line Sewers

Description	Location	Sewer Capacity (MGD)
30" Peanut Line (west of Paradise) *	Amherst	8.8
18" Peanut Line (existing) *	Amherst	2.54
24" Peanut Line (proposed parallel sewer) *	Amherst	4.89
24" Dodge Road Sewer*	Amherst	4.2
24" Peanut Line **	Clarence	5.27

Description	Location	Sewer Capacity (MGD)
18" Peanut Line **	Clarence	4.13
18" Heise Brookhaven Trunk Sewer **	Clarence	3.00 (Ph1***)/ 2.74 (Ph2***)
12" Heise Brookhaven Trunk Sewer **	Clarence	1.14 (Ph2***)

Notes: *Capacity provided by Town of Amherst / ** Capacity calculated by JMD / ***Phases here refer to phases of the Heise Brookhaven Trunk Sewer construction

Using collection system modeling, it was determined that there is not sufficient capacity to service all proposed future development opportunities, as capacity would become limited in the existing 30-inch section of the Peanut Line sewer downstream of Paradise Road. However, the implementation of the proposed 24-inch Parallel Peanut Line would alleviate capacity constraints in the Peanut Line corridor between Transit Road and the connection to the existing 30-inch diameter sewer at Paradise Road, under future conditions. If the full amount of projected future flow from the area is to be serviced in the future, upgrading the capacity of the 30-inch Peanut Line sewer would be required.

In addition, some of the development opportunities within the Town of Clarence are more imminent than others, including the Eastern Hills Mall Redevelopment project. While the feasibility of connecting all proposed development opportunities to the system were considered in this project, the following improvements (also depicted in pink and orange in Figure ES-1) are recommended for implementation within the next 5-10 years to coincide with the first phase of the Eastern Hills Mall Development and to serve as a launching point of necessary sanitary improvements to ultimately service the remainder of the projected development opportunities:

- Construction of the new 24-inch diameter Amherst Parallel Peanut Line Sewer. This project has been in the design process for several years, even without the contemplation of newer developments such as the Eastern Hills Mall Redevelopment project.
- Adjustment of the Transit Road gate in the short-term at the new Parallel Peanut Line Sewer to provide adequate relief to the Dodge Road Interceptor.
- Design and installation of a new Eastern Hills Pumping Station (EHPS) at or near its current location to continue receiving flows from the upstream tributary area, which includes the Main/Wehrle/Transit neighborhood and the area tributary to the Bryant and Stratton Pumping Station (BSPS) and construction of a new force main north along the Transit Road alignment to the new 24-inch Parallel Peanut Line. The existing force main could potentially be retained as a backup force main for lower flows, especially if the EHPS remains in nearly the same location as it is presently.
- Continued diversion of flows from the Transit Road sewer to the Klein Road sewer.
- Working with the developer of the Eastern Hills Mall Redevelopment project to determine if new sewers on the Eastern Hills Mall site can be designed and constructed to potentially eliminate the BSPS and centralize pumping operations in this area at the new EHPS.

It should be noted that the other planned Town of Clarence developments (shown in blue on Figure ES-1) are not included in the short-term recommendations above, as they may or may not materialize in the longer-term timeframe. However, the following projects could be implemented by ECSD5 and the Town of Clarence in the future (after the construction of the Parallel Peanut Line), as the future need for sanitary sewer service arises and as funding may become available:

- Design and construction of the Spaulding Lake, CSD9 Phase 2, and Clarence Research Park sewer projects to convey flow to the Heise-Brookhaven Trunk Sewer (HBTS).
- Addition of available lots in CSDs 2, 4, 6, and 9 into the HBTS and the Clarence Peanut Line Sewer as they are built upon.
- Upsizing the capacity of the 30-inch Peanut Line, either by increasing the pipe size or adding a new parallel pipe.
- Addition of the Harris Hill/Main Street area.

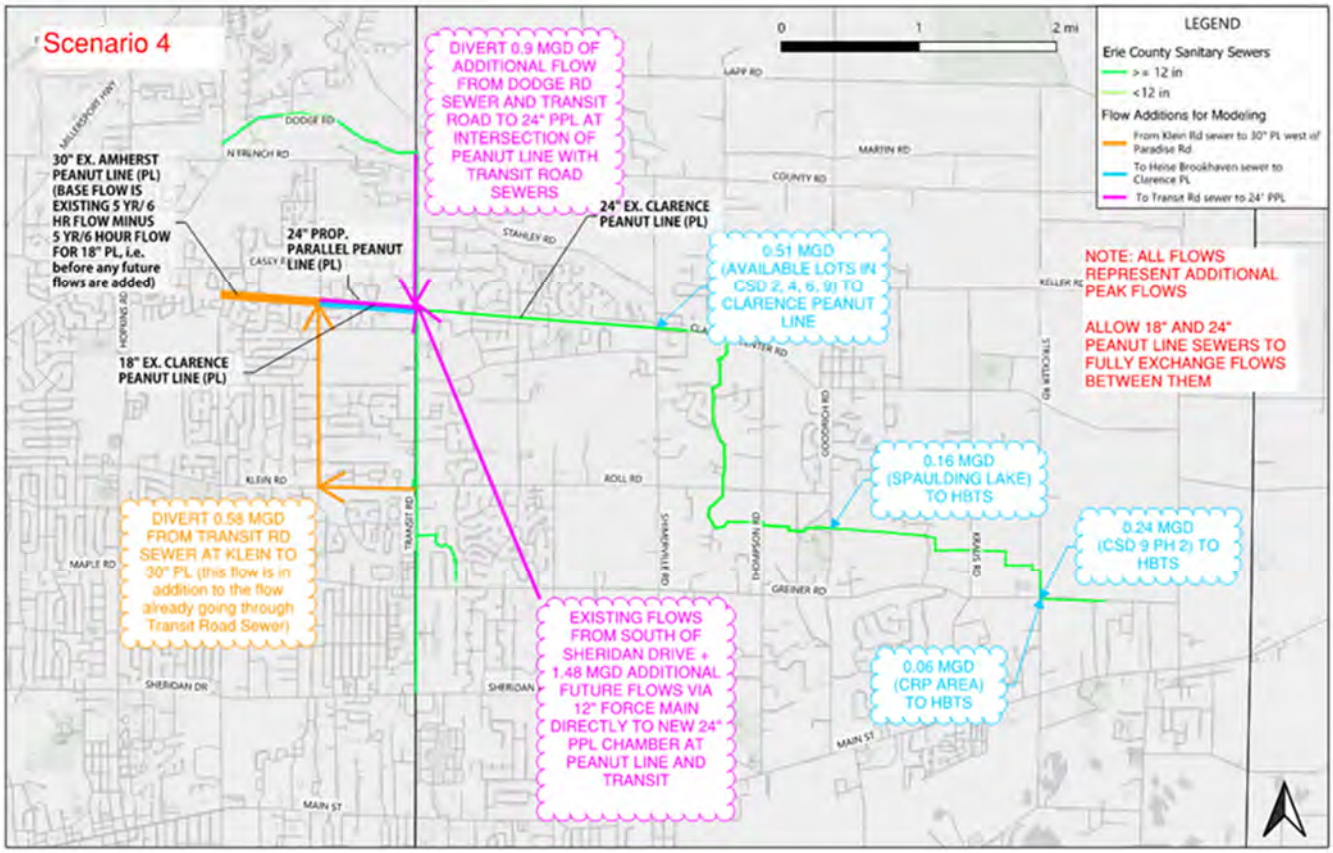


Figure ES-1: Flow Distribution for Recommended Scenario 4 and Option 4 for new EHPS tributary conveyance

Table ES-3 summarizes the opinion of probable construction cost for the recommended alternative for serving the Eastern Hills Mall Redevelopment project in the next few years.

Table ES-3: Opinion of Probable Construction Cost for Recommended Alternative for Expected Short-Term Development

Item			OPTION 4
Parallel Peanut Line Costs		$	3,818,195
Upsizing of Eastern Hills Pump Station		$	2,530,000
Opt 4 - Transit Rd Force Main		$	11,550,000
Option Total Cost		**$**	**17,898,195**
Contingency	30%	$	5,369,459
SUBTOTAL		**$**	**23,267,654**
Contractor Mobilization	3%	$	698,100
General Conditions, Bonds, and Insurances	3%	$	698,100
SUBTOTAL		**$**	**24,663,854**
Engineering, Legal, and Administration	20%	$	4,932,800
TOTAL PROJECT COST (2023)		**$**	**29,600,000**

Note: *Costs are consistent with an AACE Class IV estimate which are typically -30 percent to +50 percent accurate.

Given the above, 50-year present worth costs for the various components of the buildout of the public sanitary sewer system to serve the additional development areas within the Town of Clarence are shown in Table ES-4 and the proposed preliminary schedule is given in Table ES-5.

Table ES-4: Summary of 50-year Present Worth Costs

	Cost
Recommended Scenario Capital Cost*	$ 29,600,000
50-year Present Worth of Eastern Hills Mall Redevelopment Option**	$ 656,000
50-year Present Worth (TOTAL)	$ 30,256,000

Notes: *Costs are consistent with an AACE Class IV estimate which are typically -30 percent to +50 percent accurate.
**50-year Present Worth of O&M represents the differential O&M costs between operations today and operations in implementing the improvements.

Table ES-5: Preliminary Schedule for Implementation of Recommended Alternative

Project	Timeframe from Start of Project	Opportunities/ Constraints
Parallel Peanut Line Sewer Design Completion and Bid	Year 1	--
Parallel Peanut Line Sewer Construction	Year 2	Can be constructed as soon as design is completed
EHPS and Force Main Preliminary Design and SEQR	Years 3 and 4	Schedule can be consolidated into shorter time period, if necessary
EHPS and Force Main Final Design/Permitting	Years 5 and 6	Schedule can be consolidated into shorter time period, if necessary
EHPS and Force Main Bid	Year 7	Schedule can be consolidated into shorter time period, if necessary
EHPS and Force Main Construction	Years 7, 8, and 9	--
EHPS and Force Main Startup	Years 9 and 10	Requires that Parallel Peanut Line be constructed and in operation.

The recommended alternative provides a means for serving additional development expected in the short-term, while still allowing the flexibility for conveying additional future flows from Spaulding Lake, Clarence Research Park, Clarence Sewer District No. 9 Phase 2, infill in existing Clarence Sewer Districts, and/or the Harris Hill/ Main Street area. However, ultimately serving all projected flows will require additional improvements to be completed in the Amherst collection system, such as upsizing the 30-inch Peanut Line sewer or installing a new gravity sewer to operate in parallel with the 30-inch Peanut Line Sewer. The timeframe for such implementation is not currently known and would depend on the timing of potential development opportunities and the availability of funding. It is recognized that if any of the projected development flows do not materialize or are less than anticipated, there is the potential that improvements to the Peanut Line Sewer downstream of Paradise Road will not be required. It is recommended that the Towns and ECSD5 continue to use the model along with updated flow information to inform future development decision making.

1 Introduction

The Erie County Department of Environment and Planning, Division of Sewerage Management (ECDSM) owns and operates Erie County Sewer District No. 5 (ECSD5), which is comprised of sanitary sewers, pumping stations, and other appurtenances within portions of the Town of Clarence. Wastewater generated within ECSD5, along with flows from adjacent Town of Clarence sewer districts, is conveyed downstream to the Town of Amherst's collection system and ultimately to the Amherst Water Pollution Control Facility (Amherst WPCF).

On December 14, 2022, the ECDSM, in conjunction with the Towns of Clarence and Amherst, issued a request for proposals for professional services to prepare a report evaluating options to address the future sanitary sewer system needs for ECSD5 along the Transit Road corridor, along with various areas identified in town of Clarence master planning documents. This report is the culmination of the sanitary sewer capacity and evaluation of flow distribution scenarios within this corridor, which is vital to the entire Western New York community.

1.1 Project Drivers

Over the last several decades, the Town of Clarence has undergone significant population growth. As a result of that growth, the Town of Clarence subsequently developed several master plans and the associated sewer master plans, as further development within the Town has traditionally been restricted in the past by public sanitary sewer capacity. The master plans were developed to address future development pressure within Clarence Sewer Districts and strategies to address environmental issues related to package treatment plants and future failing septic systems. In the master plans, the Town indicated the following priorities for sewer improvements and expansions of the existing collection system:

- Within the existing sewer districts of Erie County Sewer District No. 5 (ECSD5) and Clarence Sewer Districts (CSD) 2, 4, 6, 7, 9, & 10, to utilize existing infrastructure already present and areas where private treatment systems may already be present. The Eastern Hills Mall site is currently served by the Eastern Hills Pumping Station in ECSD5. By focusing on existing sewer districts, the Town intends to take advantage of the existing infrastructure (both collector gravity sewers and nearby pumping stations) to minimize the need to construct new infrastructure and to limit "sprawl" into designated agricultural areas.
- In areas where private septic systems remain, such as the Harris Hill and CSD9 expansion area. The goal is to ultimately incorporate these properties into the public sewer system (whether it be in ECSD5 or in a CSD) to help mitigate potential pollution from aging septic systems and provide a long-term reliable plan for serving residential and commercial customers.
- In areas focused on long-term industrial growth, such as the Gunville/Wehrle and County Road Industrial Business Park Areas. Continuing to provide reliable sanitary sewer collection system capacity will allow these areas to be further marketed to companies looking to relocate or expand within the Town.
- Providing service to areas currently served by small "package" wastewater plants, specifically the Clarence Research Park WWTP and the Spaulding Lake WWTP, to foster the economies of scale that would result if the collection systems were instead operated and maintained by the Town of Clarence or ECSD5. The Clarence Research Park WWTP is owned and operated by ECSD5 and Spaulding Lake WWTP is privately owned.

- Infill areas outside of existing publicly sewered properties to eliminate private septic systems located adjacent to existing public sanitary sewer districts. Connection of these properties will be sporadic and will connect to the nearest collection system.

Despite the higher residential growth within the Town, declining use of the Eastern Hills Mall in recent years, as well as the departure of retail establishments, led to the submittal of an application by Uniland Development Company to redevelop the existing mall property into a mixed-use development containing a variety of residential, commercial, hospitality, and entertainment/recreational uses. Such proposed uses would greatly change both the flows and characteristics of wastewater produced from the Eastern Hills Mall property.

The urban growth objectives of the Town and the redevelopment of the Eastern Hills Mall site create some challenges that must be addressed prior to subsequent design and construction of collection system improvements, such as:

- Ensuring that adequate sanitary sewer capacity exists within ECSD5 and CSDs to receive the new flows expected from the targeted development areas, including the ultimate buildout of the Eastern Hills Mall site. This includes the existing pump stations and downstream ECSD5 and Town of Clarence gravity sewers on Transit Road, which have adequate capacity for current flow conditions, but do not have sufficient capacity to convey the projected additional flows associated with the targeted development areas.
- Ensuring that adequate sewer capacity exists within the Town of Amherst 's collection system to convey Town of Clarence sewer flows to the Town of Amherst's Water Pollution Control Facility (Amherst WPCF) without adverse effects (i.e., excessive surcharging of sewers within either the Town of Clarence or the Town of Amherst). Currently all flows generated by properties served by public sewers within the Town of Clarence are conveyed to the Amherst WPCF, except for a small portion of ECSD5 in the Clarence Research Park area, which is served by a smaller package wastewater treatment plant. In addition, the existing Spaulding Lake WWTP is privately owned, and the tributary neighborhood has considered options to eliminate the existing treatment plant and convey their flows to the public sewer system. The amount of flow that the Town of Amherst's collection system can receive from the Town of Clarence may be limited in several locations, including:
    - Downstream of ECSD5's connection to the Town of Amherst's system at Dodge Road.
    - Downstream of ECSD5's connection to the Town of Amherst's system at Klein Road.
    - Within the Amherst portion of the Peanut Line Trunk Sewer, which is an 18-inch gravity sewer that conveys flow from areas east of Transit Road to the 30-inch portion of the Peanut Line sewer at Paradise Road. The Town of Amherst previously commissioned the design for the installation of a new 24-inch diameter Peanut Line Trunk Sewer ("parallel Peanut Line sewer") to provide additional capacity for flows from the Town of Clarence, while not worsening surcharging the Town of Amherst's collection system further downstream and simultaneously diverting flow from the Dodge Road Interceptor.
    - Within the 30-inch Amherst collector sewer downstream of the 18-inch Peanut Line sewer at Paradise Road.
- Continuing to address the need for upgrades dealing with aging septic systems, which may contribute to localized environmental pollution if such systems fail.

Effective planning considers the above aspects now, so that infrastructure proposed and implemented within the next few years could be "right sized" to meet expected near-term needs, but easily expandable in the future if more development is implemented. Given that development and incorporation of currently unsewered areas will take place in a phased approach, the consideration for expansion of, and upgrades to, the existing sewer infrastructure should also be phased.

1.2 Review of Relevant Previous Studies

This evaluation included the review of the following relevant previous reports (more detailed discussions of some of these reports are also provided later this this report, as applicable):

- **Town of Clarence Master Plan 2015** (prepared by the Town in 2001), laid out the expansion of development within the Town while still preserving open space, parks, historic character, and existing residential areas of the Town. The Master Plan 2015 briefly described the existing sewer infrastructure and indicated the extension of sewer lines as a critical factor in determining future growth and land use planning in the Town. Appendix C of the Master Plan 2015 comprised the corresponding update to the Town's Sewer Master Plan, as discussed below.

- **Town of Clarence Master Plan 2015 Amendments, Sewer Expansion Priorities** (prepared by the Town's Planning Board in 2007) expanded upon the Sewer Master Plan first developed in 2001 as part of the Master Plan 2015. This amendment prioritized the provision of public sewers to the following areas, in decreasing order of priority: Full buildout of the existing sewer districts (including ECSD5 and CSD9), remediation of the Harris Hill neighborhood, Harris Hill Trunkline Sewer Extension, Gunville/Wehrle industrial area, County Road industrial area, and infill to eliminate other septic systems in the growth corridor.

- **Harris Hill Sanitary Sewer Cost Analysis (GPI, 2013).** This report came out of the priorities discussed in the 2007 Sewer Expansion Priorities document and evaluated the probable cost of providing public sewer services to the Harris Hill area, which currently relies on private, residential septic systems. The report assumed that sewer services would be provided to 2,000 equivalent dwelling units (EDUs) or almost 7,000 residents, at a cost of $41 million in 2013 to run public sewers throughout the Harris Hill area. In addition, the following improvements would be required to connect the Harris Hill area to the nearest existing public sewers, and the costs for implementing the following are not included in the $41 million mentioned above:

    - A parallel 24-inch Peanut Line sewer in the town of Amherst from Transit Road to Paradise Road,
    - A new 3-mile interceptor from the Harris Hill neighborhood to the existing 24-inch Clarence Peanut Line sewer, and
    - 1,800 LF of 8" force main from a pump station with two 30-hp pumps operating at 690 gpm at 110 ft TDH.

    The area studied extends east of the existing ECSD5 boundaries to the intersection of Main Street and Sheridan Drive and is bounded by Sheridan Drive in the north and Wehrle Drive to the south. The presence of shallow limestone bedrock (with much of the area having rock <2 ft to 6 ft below the surface) is noted as a significant factor contributing to the $41 million cost estimate.

- **Spaulding Lake Sewer District Feasibility Study (Nussbaumer & Clarke, 2014).** This study also came out of the 2007 Sewer Expansion Priorities document. It noted that the existing Spaulding Lake WWTP (owned by Spaulding Lake Sewerage Works, Inc.) had several effluent violations in the 2011-2012 timeframe.

The Spaulding Lake Subdivision Homeowners Association subsequently asked the Town to evaluate elimination of the WWTP and conveyance of the flows to a public sanitary sewer collection system via the Heise-Brookhaven Trunk Sewer. The report summarized the capacity available in existing sewer infrastructure in Clarence but noted that the parallel 24-inch Peanut Line sewer would need to be constructed from Transit Road to Paradise Road in Amherst to service the proposed Spaulding Lake connection, other nearby properties in Clarence tributary to the Clarence Research Park WWTP, the Harris Hill neighborhood, and the remainder of CSD9/ Clarence Hollow.

- **Clarence 2030 Comprehensive Plan (2016)** was an update to the Town's Master Plan 2015 that provided the framework for future planning and policy decision making and set forth the goals for increasing sewer capacity by planning and providing public sewers to existing high density residential areas, eliminating known pollution sources, coordinating timing and location of development with availability of adequate wastewater capacity, and providing sewer access in the most cost-effective way possible. However, due to financial constraints, the accompanying sewer master plan was not completed until April 2018 (see following bullet for description).

- **Town of Clarence Master Sewer Plan 2030 (2018).** This document reviews progress made since the adoption of the "Master Sewer Plan 2015" in 2001 and identifies further sanitary sewer collection system priorities required for future development in the Town. This plan identified the need for a new 24-inch diameter Peanut Line sewer but did not consider the use of this new Peanut Line sewer in parallel with the existing 18-inch Peanut Line Trunk Sewer, as is being considered by the current evaluation.

- **Flow Monitoring and Inflow and Infiltration Quantification Report (Arcadis, April 2021).** Arcadis completed a flow metering evaluation with the installation of sixteen flow monitors and one rain gauge in 2019 throughout ECSD5 and the various CSDs. Four storms (all under or approaching a one-year storm) were evaluated and the average peaking factor among the subbasins evaluated was four resulting in few subbasins being designated for follow-up; however, one subbasin, in which the Eastern Hills Mall is located (Subbasin 9), was rated as a medium priority for follow-up work due to higher peaking factors of up to 10. It was surmised that the calculated peaking factors were higher in Subbasin 9 than in other ECSD5 areas due to the relatively low dry weather baseline flows (averaging 0.10 MGD). The evaluation concluded that in all other subbasins, no improvements were necessary due to low peaking factors and lower rates of inflow and infiltration. The basin containing the Eastern Hills Mall was recommended to undergo manhole inspections as most of the peak flows were assumed to be entering at the sanitary sewer manholes. All follow-up manhole work, including repairs completed by the Eastern Hills Mall for their private system, was subsequently completed.

- **Eastern Hills Mall Redevelopment, Conceptual Master Plan Application (June 2021, Uniland; and Amendment dated Dec. 2022).** This document was developed and submitted by Uniland Development and outlines implementation of a new mixed-use development to replace the existing mall. Development is proposed to be completed in three phases, with the initial phase developed within 5-10 years after approval and Phase 2 and Phase 3 to be implemented in Years 10-15 and 15-20, respectively. Cumulative peak flows for the three phases are estimated at 0.94, 1.11, and 1.58 MGD, respectively.

The development opportunities associated with these sewer studies are described in greater detail in Section 2.2.4, Proposed Development Opportunities.

2 Project Background and History

2.1 Site Information

2.1.1 Location

The project is in the Town of Clarence in the northeastern portion of Erie County, New York. The Town is bordered by Transit Road on the west, Davison Road and Berghorn Road to the east, Wehrle Drive to the south, and Tonawanda Creek to the north, as depicted in Figure 2-1. The total area of the Town is approximately 53.63 square miles.

This project specifically evaluated the following areas of the Town, shown on Figure 2-1:

- Erie County Sewer District No. 5 (ECSD5), located in the Town of Clarence along the east side of Transit Road from Dodge Road south to Wehrle Drive and along a portion of Clarence Center Road from Transit Road to Heise Road. ECSD5 includes two narrow strips on the west side of Transit Road within the Town of Amherst from Wehrle Drive to Main Street, and from Clarence Center Road to Deer Creek Lane. In addition, ECSD5 consists of two noncontiguous extensions known as Sisters of Saint Joseph (tributary to CSD No. 9), and Clarence Research Parkway (serviced by the ECSD5 Clarence Research Park Water Resource Recovery Facility).
- Town of Clarence Sewer Districts (CSD) Nos. 2, 4, 6, 7, 9, and 10
- Clarence Hollow Area along Main Street in the southeastern portion of the Town
- The Harris Hill area, located near the intersection of Harris Hill Road and Main Street
- The Spaulding Lake area, roughly bounded by Goodrich Road, Greiner Road, Kraus Road, and Main Street.

2.1.2 Geologic and Soil Conditions

In the area of the project, especially in the areas between Main Street and Greiner Road, depth to bedrock is less than 2 feet, as the Onondaga Escarpment is found within through this area. However, the depth to bedrock increases north of the Goodrich/Greiner Road intersection to where rock depth is greater than six feet below the surface. The shallow depth to rock, particularly in the southern portion of the Town where extension of public sewer service may occur, will greatly increase costs in terms of rock excavation and may require the use of clay dams in pipe trenches to prevent migration of groundwater during pipe installation, especially in fractured rock.

No geotechnical evaluations were completed as part of the project; however, approximate rock elevations were obtained from previous evaluations, record drawings, and experience of two local geotechnical engineering firms.

The geological and soil conditions for the Town of Clarence are shown in Figure 2-2. In the southern two-thirds of the Town (in the location of the project), major soil types include:

- BfA Benson very channery loam, 0 to 3 percent slopes - somewhat excessively and excessively drained soils on glaciated uplands formed in loamy till. Bedrock is at depths of 10 to 20 inches.
- Cd Canandaigua mucky silt loam – very deep, poorly and very poorly drained soils, located on lowland lake plains and depressional areas on glaciated uplands.
- CdB Canandaigua silt loam, 3 to 8 percent slopes – same as listed above.
- La Lakemount silt loam, 0 to 3 percent slopes - deep, poorly drained and very poorly drained soils of lake plains. Permeability is moderately slow on the surface and very slow in the subsoil sand substratum.

- Od Odessa silt loam, 0 to 3 percent slopes -very deep, somewhat poorly drained soils formed in red, clayey lacustrine deposits. These soils are in moderately low areas on lake plains and valley terraces.
- OvA Ovid silt loam, 0 to 3 percent slopes - very deep, somewhat poorly drained soils formed in moderately fine textured, reddish colored till.
- WaA Wassaic silt loam, 0 to 3 percent slopes - moderately deep, well drained soils formed in loamy till. They are on bedrock controlled till plains. Bedrock is at depths of 20 to 40 inches.

In general, the soils encountered in the Town are primarily poorly drained soils, except for the Benson very channery loam and Wassaic silt loam, which correspond with the areas of shallow bedrock, particularly in the area between Main Street and Sheridan Drive. Further geotechnical evaluations will need to be completed as individual projects are implemented to gain additional information on the types of soil controls that may be necessary in more specific locations.

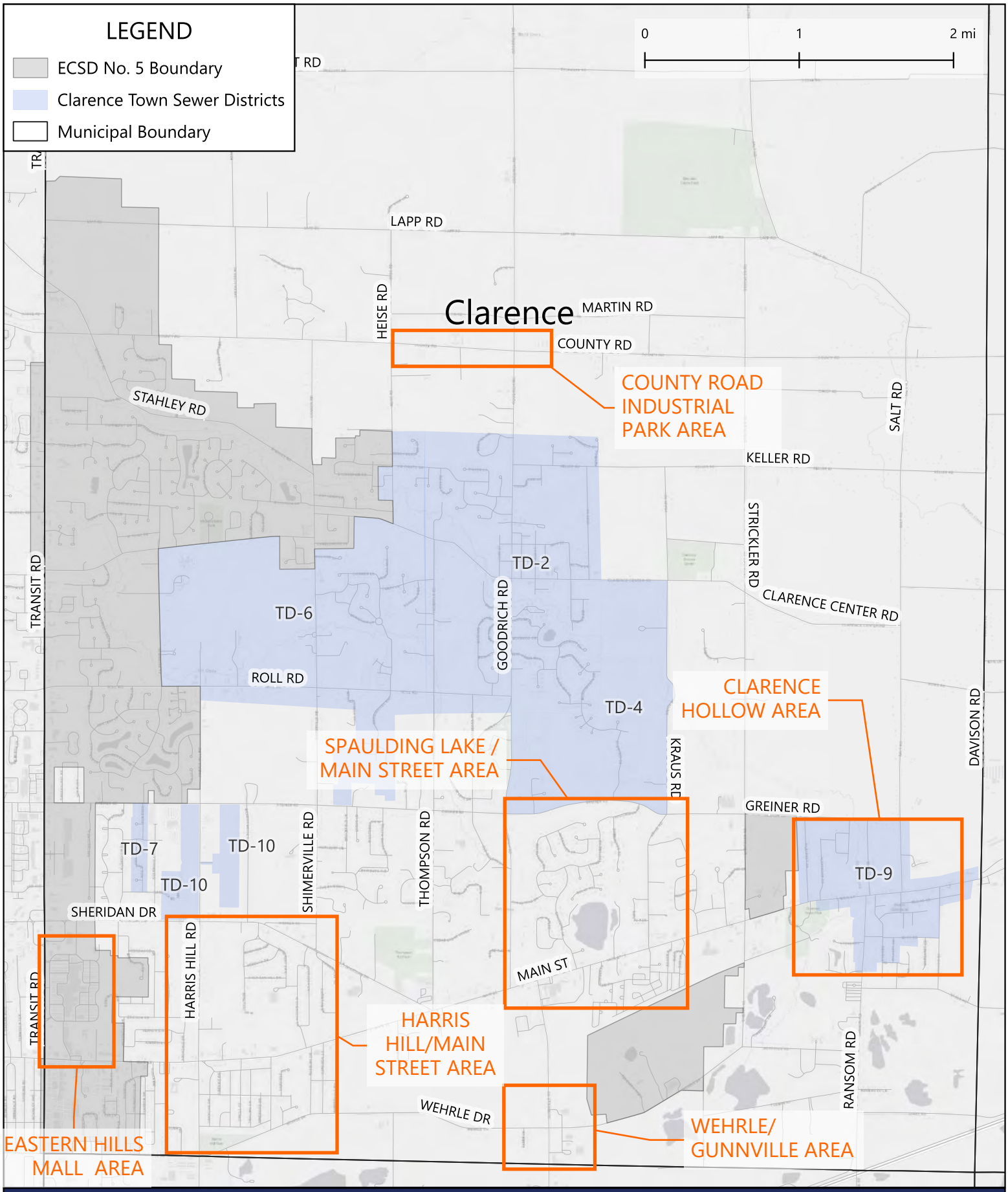


FIGURE 2-1

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

PROJECT AREAS WITHIN THE TOWN OF CLARENCE

JMDavidson Engineering, D.P.C.

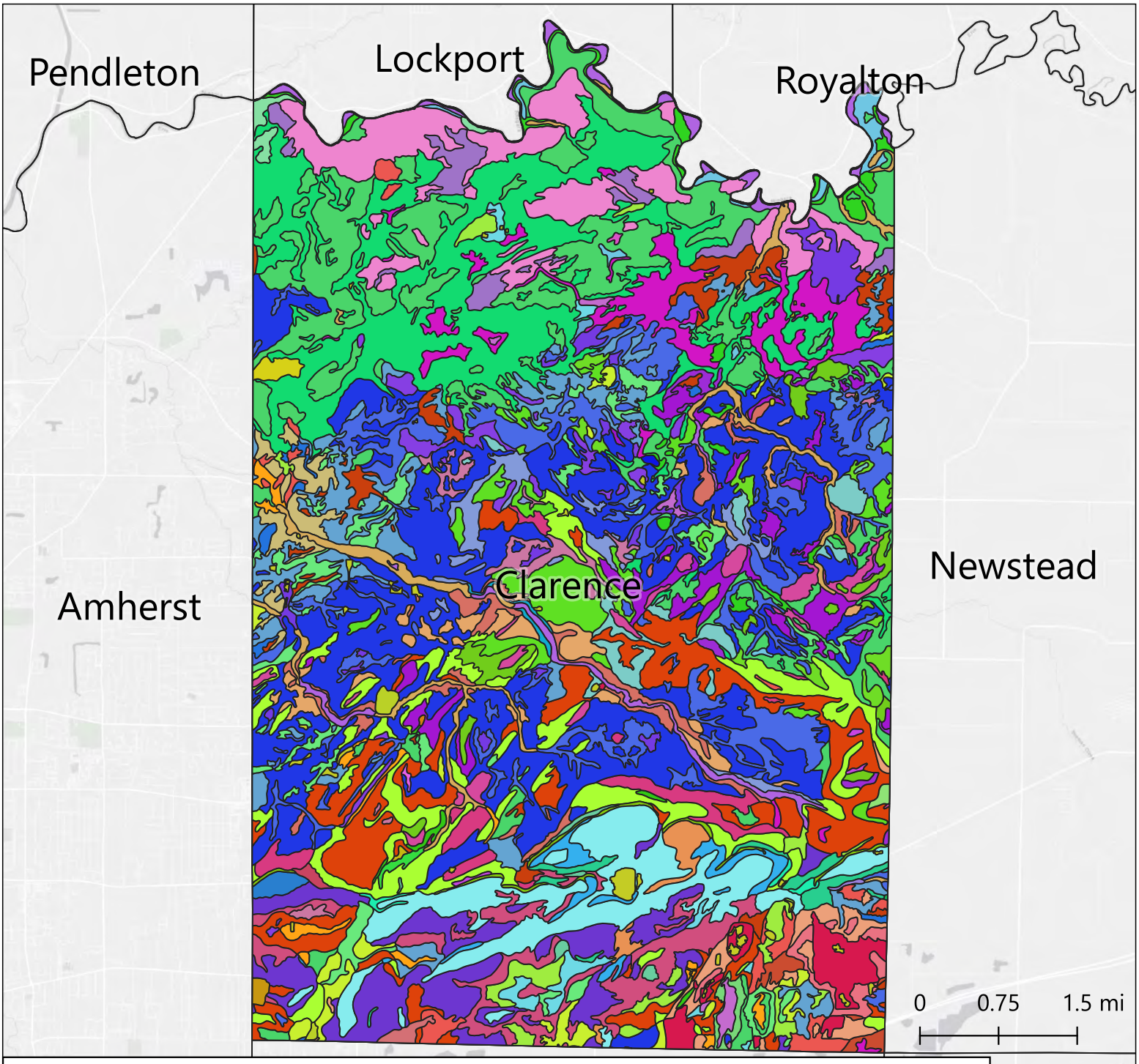


FIGURE 2-2

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

GEOLOGIC MAP FOR TOWN OF CLARENCE

JMDavidson Engineering, D.P.C.

2.1.3 Environmental Resources

2.1.3.1 Water Resources

Several creeks run through the Town, as shown on Figure 2-3, and are listed from north to south:

- Tonawanda Creek – Class B waterway
- Black Creek and its northern and southern tributaries – Class C waterway
- Beeman Creek and its southern tributaries – Class C waterway
- Ransom Creek – Class C waterway
- Gott Creek and its two tributaries – Class C waterway
- Unnamed creek crossing Greiner Road – Class C waterway

All waterways and waterbodies in New York State are assigned a letter classification in NYS Regulation 6 NYCRR Chapter X (Parts 800 - 941) that denotes their best uses, which in turn sets forth the allowable levels of pollutants. As indicated above, the named waterbodies are designated as Class B and Class C waterways. Class B waterways have swimming, fishing, and other recreational activities as their best use. Class C waterways have only fishing as their designated best use.

As a result, any new sewers crossing the noted creeks must be designed to not contribute additional pollution loadings to the water courses. Water quality concerns in Ransom Creek were the rationale for the implementation of public sewer system expansion in this area in the past. In 1993 the Town of Clarence entered an Order on Consent with the New York State Department of Environmental Conservation (NYSDEC) to address water quality problems present in Ransom Creek due to failing septic systems in the Clarence Hollow area. The Consent Order further prompted the installation of the Clarence Peanut Line Sewer (extending from the corner of Clarence Center Rd and Heise Rd west to Transit Rd), the creation of CSD9 in the Clarence Hollow area, and the eventual installation of the Heise-Brookhaven Trunk Sewer (HBTS) as part of the larger Clarence Hollow Pollution Abatement Project.

2.1.3.2 Agricultural Resources

The Town of Clarence currently has approximately 15,000 acres of land within the Clarence-Newstead Agricultural District (Erie County District #14). Most of the Town's agricultural land is in the northern half of the Town (Figure 2-4). The establishment of an agricultural district protects existing open space and prevents development that would normally require the extension of services such as utilities, including sanitary sewer system. The Town has further indicated that any extension of sewer service in the major areas noted for agricultural use would be restricted to only providing service to the industrial-zoned properties along County Road near the intersection with Goodrich Road.

2.1.3.3 Recreational Resources

The Clarence Peanut Line Sewer from Transit Road to Heise Road follows the Town of Clarence Bike Path as shown on Figure 2-5. This recreational trail provides recreational opportunities for pedestrians, runners, and cyclists.

2.1.3.4 Local Flora and Fauna

The New York Nature Explorer (www.dec.ny.gov/natureexplorer/) provides distribution and status information on New York's animals, plants, and significant natural communities. The report for the Town of Clarence is included in Appendix A. It is noted that this tool includes information from several databases, maintained by the NYSDEC, including biodiversity databases of the New York Natural Heritage Program, the 2nd NYS Breeding Bird Atlas Project from 2000-2005, and the NYS Amphibian & Reptile Atlas Project (Herp Atlas) from 1990-1999.

It is noted that Animals listed as Endangered or Threatened by New York State, and animals and plants particularly vulnerable to collection and disturbance, are reported by NY Nature Explorer only at the level of county and watershed, but not at the town or site-specific level.

Based on this tool, the following were identified more specifically as protected in NYS:

- Great Blue Heron – Protected Bird
- Black Redhorse (minnows, shiners, and suckers) – noted as Special Concern
- Redfin Shiner (minnows, shiners, and suckers) – noted as Special Concern
- Marsh Lousewort – Threatened Flowering Plant
- Northern Tansy Mustard – Endangered Flowering Plant
- Stiff Flat-topped Goldenrod – Threated Flowering Plant

In addition, the following are species within Erie County that are listed as Threatened and/or Endangered under the US Endangered Species Act:

- Bog turtle
- Easter Massasauga rattlesnake
- Monarch butterfly
- Northern Long-Eared Bat
- Tricolored Bat

Once specific projects are implemented, research into location-specific species that may be federally or state protected will be required, and any measures needed to protect the environment would be taken at that time.

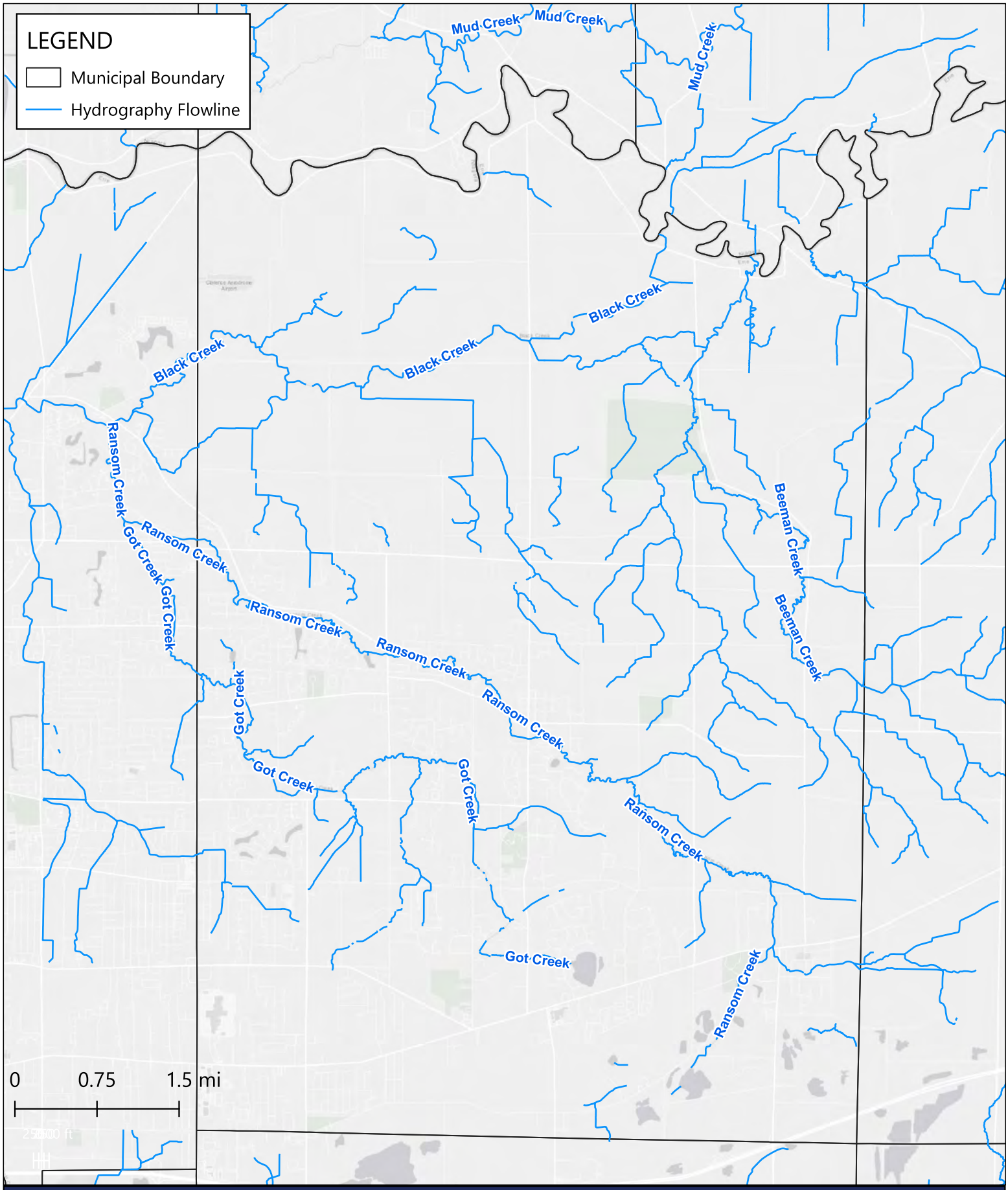


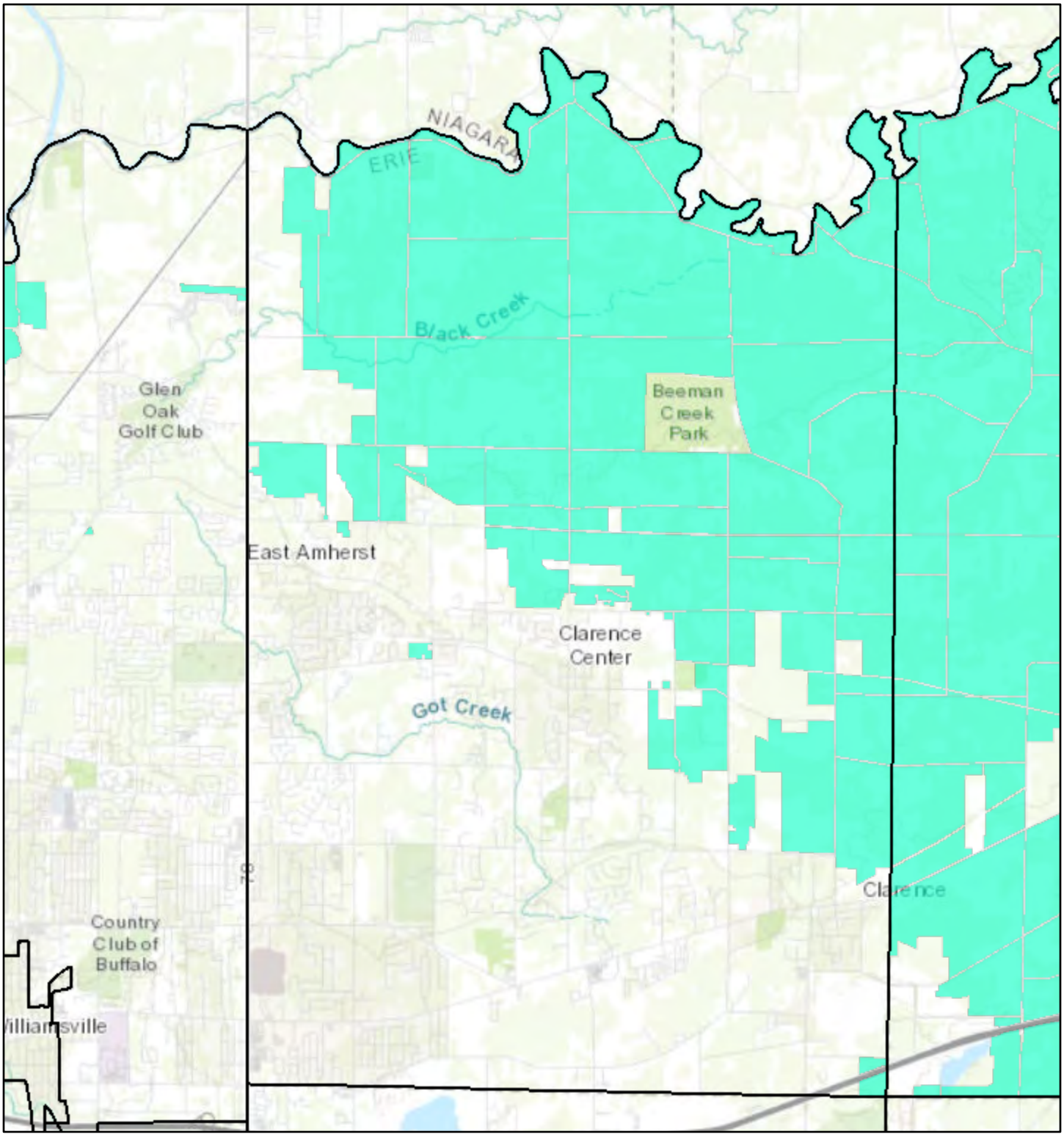
FIGURE 2-3

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

WATERWAYS WITHIN THE TOWN OF CLARENCE

JMDavidson Engineering, D.P.C.

Figure 2-4: Agricultural Districts within the Town of Clarence



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0 0.5 1 2 mi

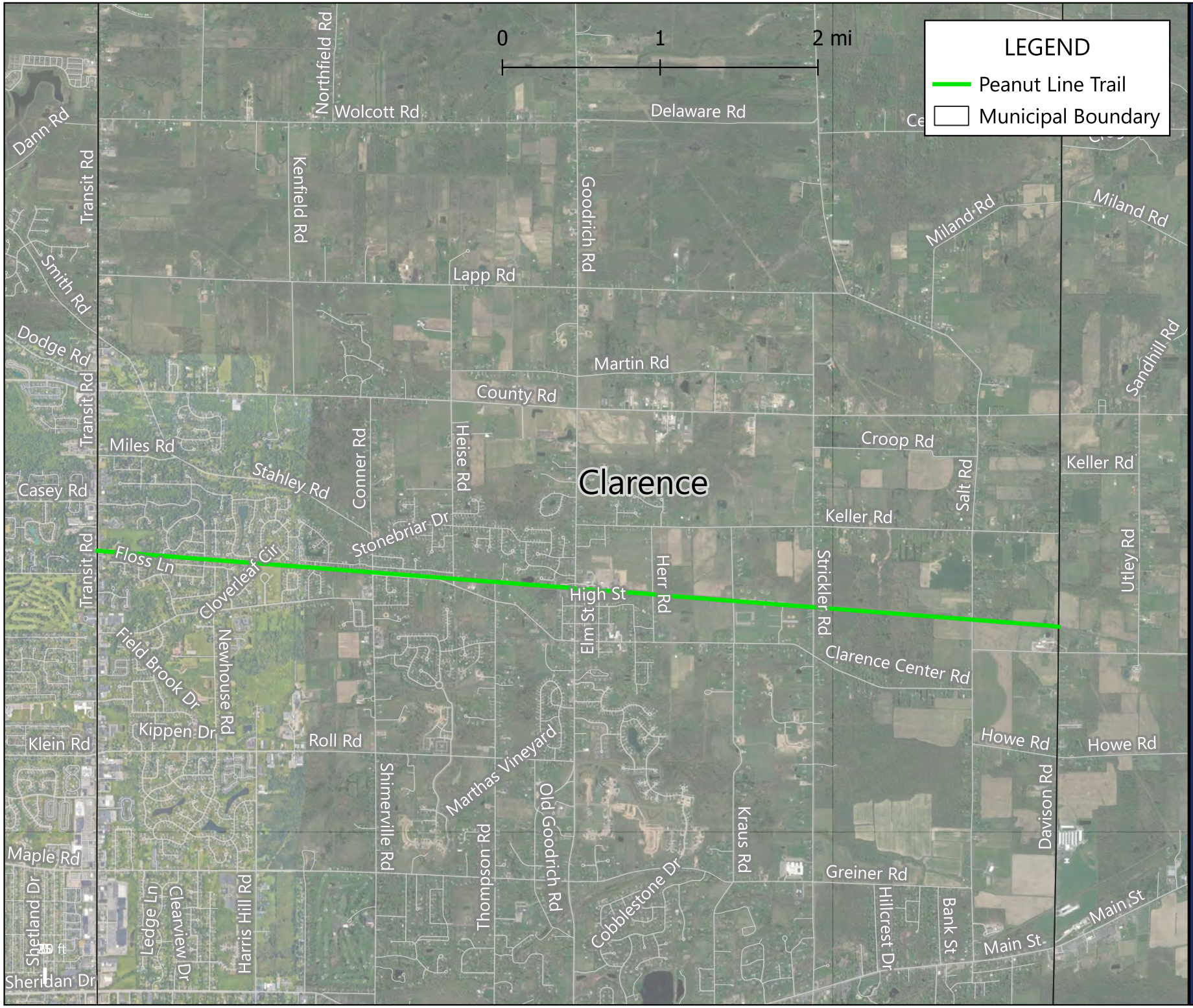
0 1 2 4 km

Agricultural Districts

- Southeast #15
- Southwest #8
- Central #5
- North#1

Municipalities

- City
- Town
- Village
- Reservation


0
1
2 mi
LEGEND
Peanut Line Trail
Municipal Boundary
Clarence
Northfield Rd
Wolcott Rd
Delaware Rd
Dann Rd
Transit Rd
Kenfield Rd
Goodrich Rd
Miland Rd
Smith Rd
Lapp Rd
Dodge Rd
Martin Rd
County Rd
Sandhill Rd
Miles Rd
Stahley Rd
Conner Rd
Heise Rd
Croop Rd
Keller Rd
Salt Rd
Casey Rd
Stonebriar Dr
Floss Ln
Cloverleaf Cir
High St
Herr Rd
Strickler Rd
Utley Rd
Elm St
Clarence Center Rd
Field Brook Dr
Newhouse Rd
Kippen Dr
Klein Rd
Roll Rd
Howe Rd
Shimerville Rd
Marthas Vineyard
Old Goodrich Rd
Kraus Rd
Davison Rd
Maple Rd
Thompson Rd
Cobblestone Dr
Greiner Rd
Harris Hill Rd
Clearview Dr
Hillcrest Dr
Bank St
Main St
Shetland Dr
Sheridan Dr
FIGURE 2-5
TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY
RECREATIONAL TRAILS IN PROJECT AREA
JMDavidson
Engineering, D.P.C.

2.1.4 Floodplain/ Wetland Considerations

The Clarence 2030 Comprehensive Plan (2016) indicated that 24% of the Town was in the 100-year floodplain, with most of that area in the northern portion of the Town, which coincides with many of the defined Agricultural Districts, limiting it for future development. The FEMA floodplain mapping (Figure 2-6) uses the following codes:

- 0.2% PCT – Low risk (orange on figure); 0.2-percent-annual-chance (or 500-year) flood
- 1% PCT – High risk (light blue on figure); 1-percent annual chance (or 100-year) flood
- Purple/light blue-striped area – Floodway within the high-risk areas

Most of the flood risk is in the northern portion of the Town, which is not within the limits of the sanitary sewer area under evaluation, except for potential sewer crossings of Ransom Creek. However, Ransom Creek currently crosses through the northern portion of ECSD5, which has been previously established with sanitary sewers, and no additional sewer crossings of Ransom Creek are expected under this project.

The overall designation of both state and federal wetlands in the project area are shown in Figure 2-7. Most of the state and federal wetlands fall into the agricultural district in the northern portion of the Town, although smaller federally-designated wetlands are scattered throughout the Town. It is also noted that there are several large state-designated wetlands in the southern portion of the Town between Main Street and Wehrle Drive.

As development has proceeded in the Town of Clarence, the 2030 Master Plan has indicated that the Town has worked extensively with NYSDEC and the US Fish and Wildlife Service in the past to protect wetlands by regulating new development and undergoing the SEQR process for potential projects to identify and mitigate adverse impacts of project implementation. This same level of coordination will continue to be followed as additional development opportunities are identified and implemented.

2.1.5 Potential Environmental Justice Areas

Figure 2-8 indicates that there are no identified potential Environmental Justice Areas (EJA) within the Town of Clarence, although there is an identified EJA in the southeast corner of the Town of Amherst, which abuts the Town of Clarence.

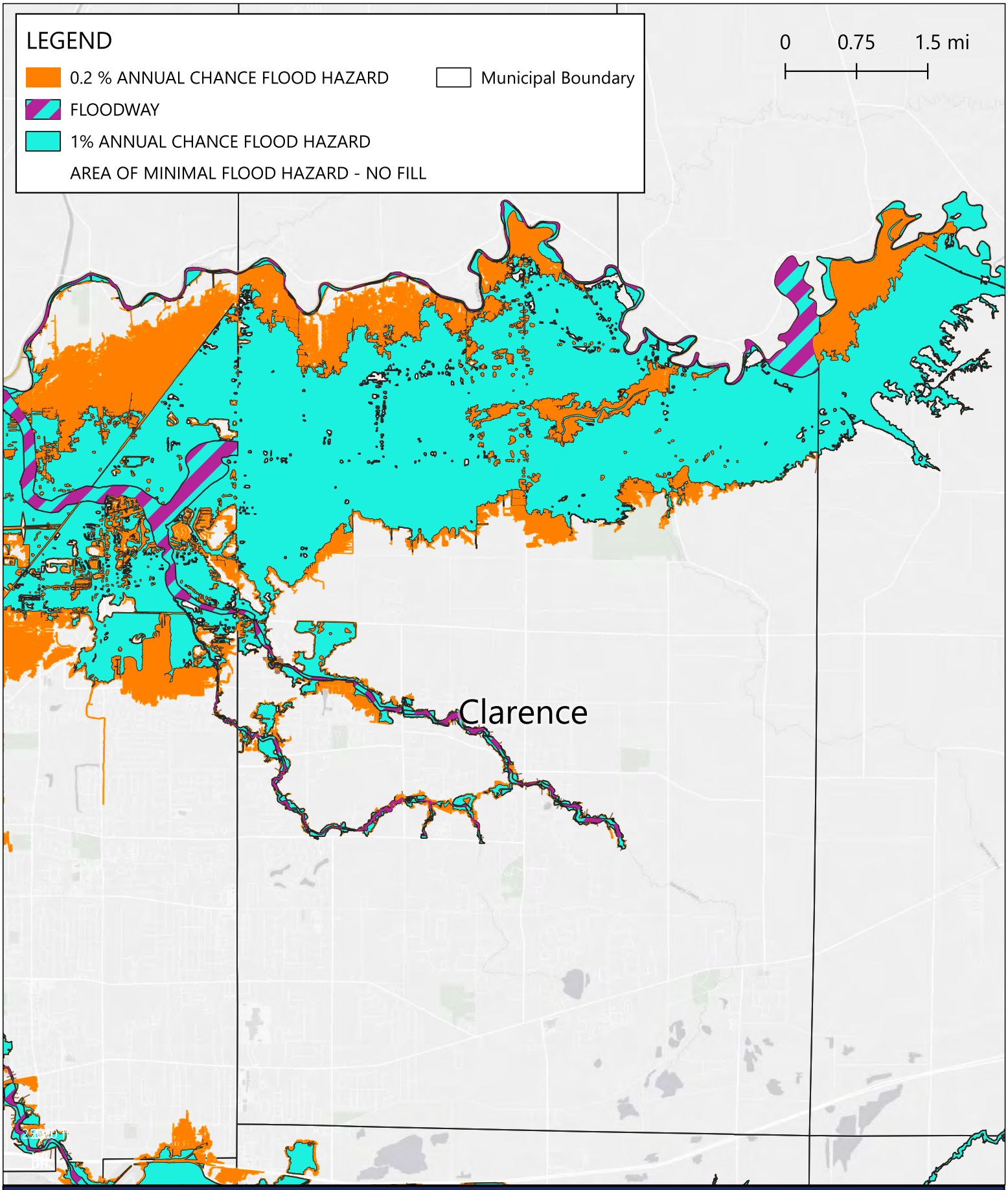


FIGURE 2-6

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

FEMA FLOODPLAIN MAP OF THE TOWN OF CLARENCE

JMDavidson Engineering, D.P.C.

FIGURE 2-7

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

WETLAND MAP OF THE TOWN OF CLARENCE

JMDavidson Engineering, D.P.C.

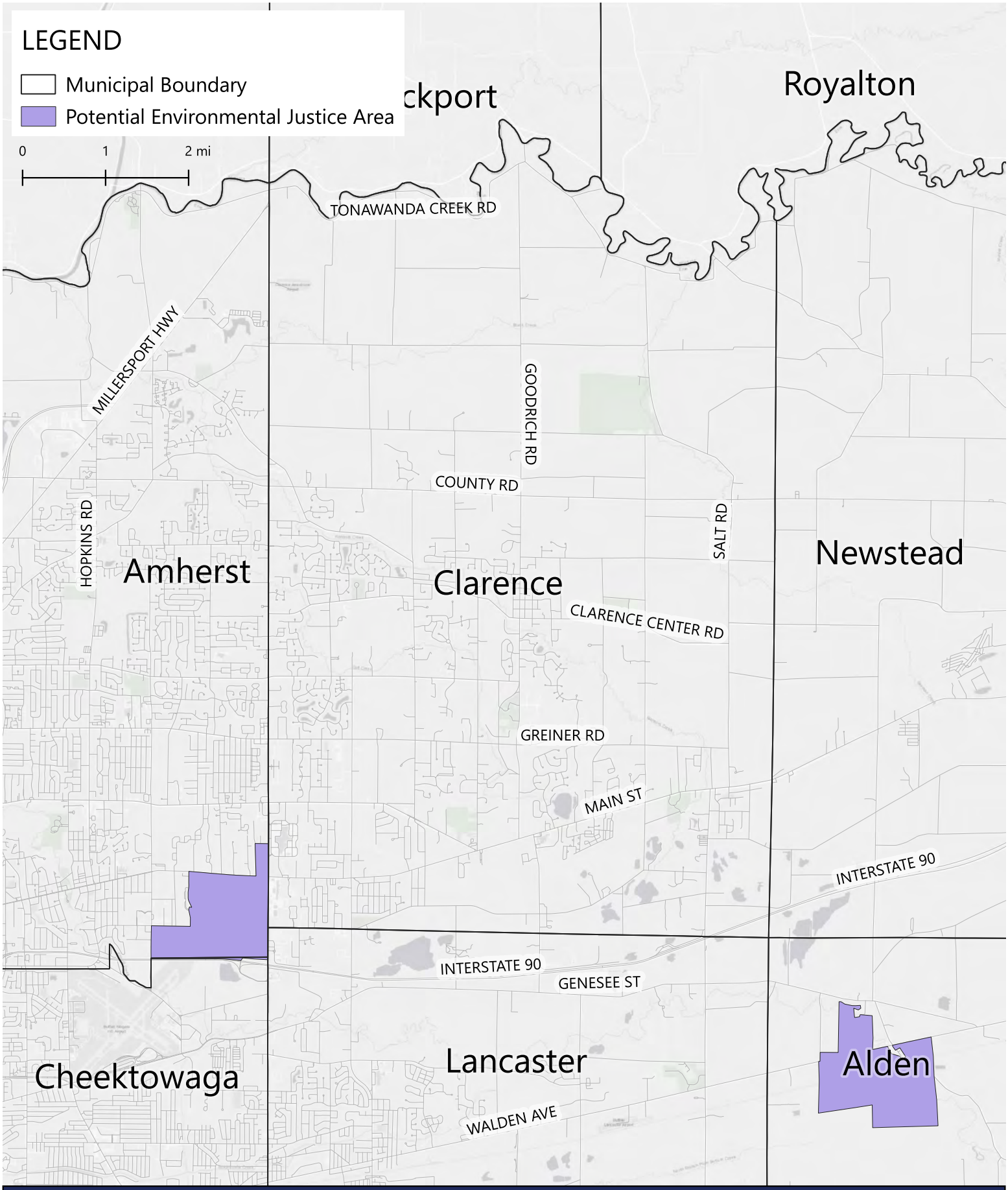


FIGURE 2-8

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

ENVIRONMENTAL JUSTICE MAP FOR THE TOWN OF CLARENCE

JMDavidson Engineering, D.P.C.

2.2 Ownership and Service Area

2.2.1 Ownership

The Town of Clarence is served by several different sanitary sewage conveyance and treatment systems (Figure 2-9). These systems include:

- **Private septic systems** – owned and operated by individual property owners, both residential and commercial installations.
- **Small wastewater treatment plants**
    - Spaulding Lake package WWTP – owned and operated by Spaulding Lake Sewerage Works, Inc., a private entity serving the homeowners in the Spaulding Lake Subdivision Homeowners Association. This WWTP currently has an average daily flow of approximately 50,000 gpd with a peak hourly flow of 100,000 gpd.
    - Clarence Research Park package WWTP – owned, operated, and maintained by ECSD5. This plant only receives flow from Clarence High School, Integer Holdings (formerly Wilson Greatbatch), and one other small industry. However, while the existing facility has a peak capacity of 20,000 gpd, the research park does have the ability to expand with future estimated peak flows of up to 60,000 gpd.
- **Clarence Sewer Districts**
    - CSD2 (area bounded by the following: just north of Keller Road running south to just south of Roll Road extended and just west of Thompson Road running east to just east of Herr Road extended) – owned by the Town of Clarence and operated and maintained by ECSD5.
    - CSD4 (area bounded by Goodrich Road to the west, Kraus Road to the east, Clarence Center Road to the north and Greiner Road to the south, except that portion covered in CSD2) – owned by the Town of Clarence and operated and maintained by ECSD5.
    - CSD6 (area bounded by Clarence Center Road to the north, Roll Road to the south, Newhouse Road to the west, and Thompson Road to the east, with a small portion extending north to the Beech Meadow subdivision, and a sewer district extension extending south of Roll Road to service the Northwoods subdivision) – owned by the Town of Clarence and operated and maintained by ECSD5.
    - CSD7 (area between Greiner Road and Sheridan Drive along Fox Trace and Red Tail Run) – owned by the Town of Clarence and operated and maintained by ECSD5.
    - CSD9 (area near Main Street and Ransom Road, otherwise known as Clarence Hollow. The northern portion of CSD9 is bounded by Greiner on the north, Main Street on the South, Salt Road on the east and Hillcrest Drive. The southern portion of this district extends south of Main Street between Ransom Road and Scharf Road, to just shy of Manor Wood) – owned by the Town of Clarence and operated and maintained by ECSD5.
    - CSD10 (area consisting of Harris Hill Commons and Woodland Hills Subdivisions between Greiner Road and Sheridan Drive near Anfield Road) – owned by the Town of Clarence and operated and maintained by ECSD5.

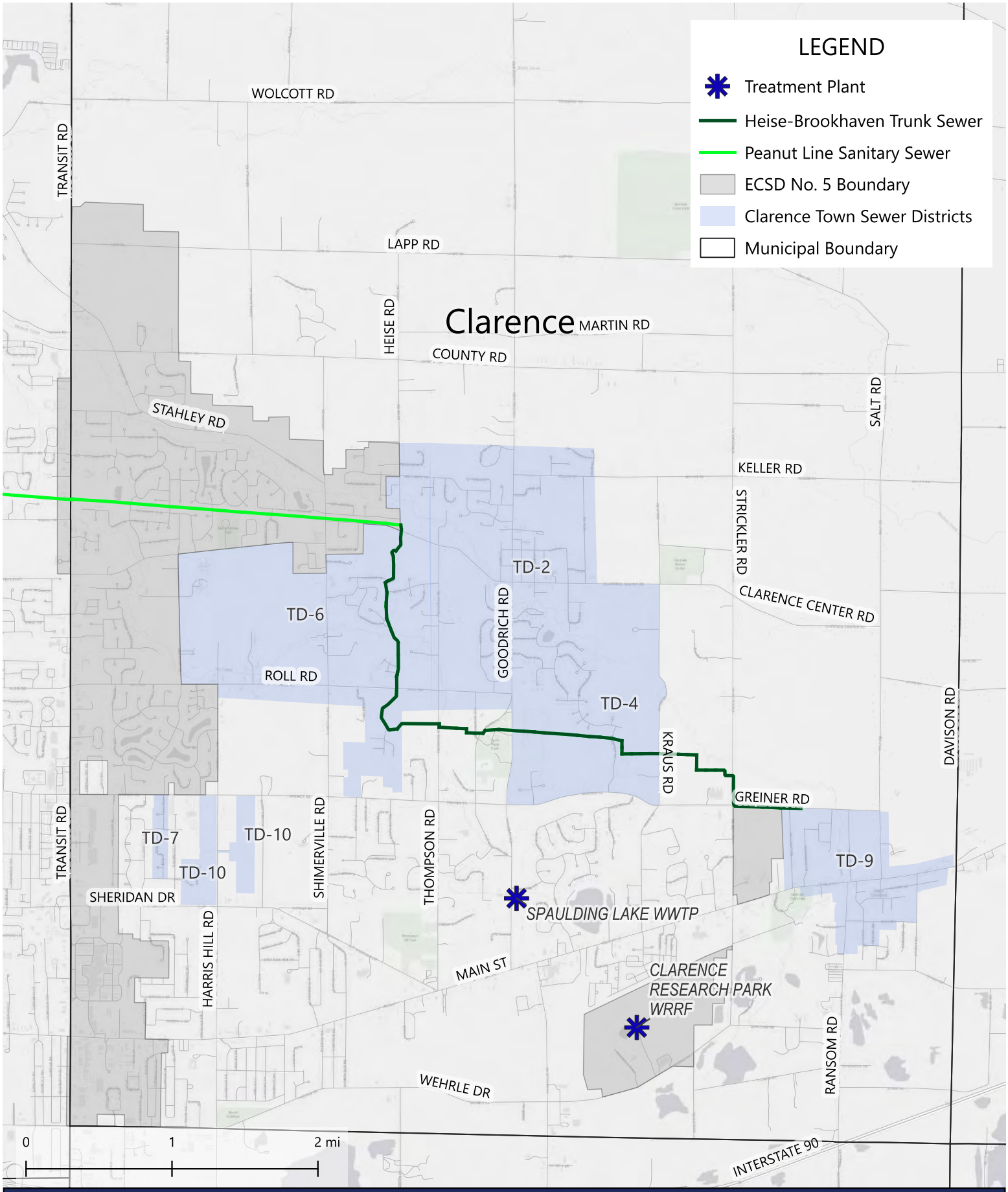


FIGURE 2-9

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

OWNERSHIP AND SERVICE AREAS

JMDavidson Engineering, D.P.C.

- **Erie County Sewer District 5** services the western portion of the Town of Clarence from Heise Road on the east to Transit Road, including development along Transit Road, and conveys flow to the Amherst Peanut Line Sewer, the Klein Road Sewer, and the Dodge Road Interceptor, which in turn convey the wastewater ultimately to the Town of Amherst's WPCF.

- **Heise-Brookhaven Trunk Sewer** (HBTS, extending from the northwest corner of existing CSD9 (near the intersection of Greiner Road and Strickler Road) and going west and then north and ending at the Clarence Peanut Line sewer at the corner of Clarence Center Road and Heise Road) – owned, operated, and maintained by ECSD5 through an agreement with the Town of Clarence. The HBTS has a total length of approximately 24,140 LF and is comprised of both 18-inch PVC pipe (closer to the Clarence Peanut Line Sewer) and 12-inch PVC pipe (towards CSD9). This sewer currently services CSD9 and CSD4.

- **Clarence Peanut Line Sewer** is a 24-inch diameter sewer owned by the Town of Clarence and maintained by ECSD5 through agreement with the Town. It was originally owned by the Peanut Line Sewage Works Corporation, which was a public/private partnership originally developed to provide sewer service to the Clarence Hollow area and Harris Hill areas. It receives flow from CSD2, CSD4, part of CSD 6, and CSD9.

In the Town of Clarence, there are several larger commercial, institutional, and industrial users of note, which include:

- Eastern Hills Mall on Transit Road – discharges to the ECSD5-owned and operated Eastern Hills Pump Station.
- The Shops at Main Street and Transit Road – have a private pumping station that conveys flow to ECSD5.
- Eastgate Plaza on Transit Road – discharges by gravity into ECSD5 along Transit Road.
- Clarence High School, near the corner of Main Street and Gunnville Road – has an equalization tank and pumping station that conveys flow to the ECSD5 Clarence Research Park WRRF.

In addition, several smaller commercial and residential locations are serviced by private sewers and pumping stations that convey flow to either ECSD5 or a CSD. These locations include:

- Transit Town
- The Home Depot
- Coventry Green Apartments
- Fireside Apartments
- Stonegate
- Main Transit Professional Park
- Hollows at Loch Lea
- Roll Road Senior Housing
- Transit Valley Gardens
- Vinecroft Senior Community
- Part of Bristol Village
- Transit Meadows Office Park
- Clarence Retirement Home
- Transit Road Senior Housing
- Bevilacqua Development
- Heritage Path Townhomes
- Village Mill Townhomes
- Emerald Lake Estates
- Essex Greens at Waterford
- Waterford Townhomes
- Stonecliff Court
- Cimato Family Business Park

2.2.2 Town of Amherst Sewers

The Town of Amherst conveys flow from the various areas within the Town of Clarence to the Amherst WPCF for subsequent treatment. These three lines are owned and operated by the Town of Amherst and include:

- **Dodge Road Interceptor** – 24-inch diameter sewer extending west along Dodge Road from the ECSD5 metering structure near the intersection of Dodge Road and Transit Road.

- **Klein Road Sewer** – 12-inch diameter sewer extending west along Klein Road from the intersection of Klein Road and Transit Road. Up until 2022, the upstream portions of the Klein Road sewer only acted as a relief for the ECSD5 and CSD collection systems, handling high flows to decrease the volume conveyed via the Dodge Road Interceptor. The relief weir was subsequently removed to allow flows from the portion of ECSD5 located south of Klein Road to flow either in the direction of Dodge Road or to Klein Road. Those flows are conveyed directly to the downstream 30-inch diameter Peanut Line Sewer within the Town of Amherst for conveyance to the Amherst WPCF for treatment.
- **Amherst Peanut Line Sewer** - Initially an 18-inch diameter sewer that conveys flow west from Transit Road along the former alignment of the Peanut Line Railroad, gradually increasing in size and ultimately discharging to the Town of Amherst's West Side Interceptor just west of Sweet Home Road.

2.2.3 Population Trends and Growth

Based upon recent census data and projections, the Town of Clarence's population has increased by a little over 2,000 people from 2010 through 2021, with an average annual increase of 0.59% over the 11 years, as shown in Table 2-1. Taking this same projected increase over the next 25 years yields a projected Town population of 37,291 in 2046.

Table 2-1: Population Table for the Town of Clarence from 2010 through 2021

Year	Population	Annual Increase
2021	32727	0.33%
2020	32620	0.55%
2019	32440	0.94%
2018	32137	0.57%
2017	31954	0.59%
2010	30673	---

Sources:
1. www.uspopulation.org/new-york/erie-county/clarence/ (accessed Nov 14, 2023) for 2017-2021 population
2. www.census.gov/quickacts/fact/table/clarencetowneriecountynewyork/PST045221 (accessed Nov 14, 2023) – for 2010 population

Based on 2020 U.S. Census data, 38.05% of the 2020 population have a bachelor's degree and 30.74% have a master's degree or higher. Eighty-one percent of the housing units in the Town are owner-occupied and the average household size is 2.57 people, which is on par with the US average household size of 2.55 people in 2021.

The Town has a median household income (MHI) of $107,333 and an average household income of $128,231. On a per capita basis, the average income per person is approximately $54,007 per person. 19.52 percent of the Town's households are classified as high income (i.e., earning more than $200,000 per year) and 5.3% of the households fall below the poverty levels identified for the Town according to household size.

While the projections indicate a population of 37,392 people in 2046, the proposed development opportunities as listed in the next section account for increases in population based on the specific developments planned. For example, the proposed Eastern Hills Mall Redevelopment was based upon the construction of a mixed-use development with a certain number of residential units over three phases. The sewer flows used for the evaluation already consider the projected increase in population associated with the various developments.

2.2.4 Proposed Development Opportunities

The following describes the proposed development opportunities, shown in Figure 2-1. Maps showing the areas for each individual development are included in Appendix B.

2.2.4.1 Eastern Hills Mall Redevelopment

Uniland Development first submitted the Eastern Hills Mall Redevelopment Conceptual Master Plan Application (EH Master Plan) in June 2021 (and amended in December 2022) to redevelop the existing Eastern Hills Mall site into a new mixed-use development, consisting of residential, commercial, recreational, and social spaces. The EH Master Plan was comprised of three phases to be implemented over 20 years as follows (square footage rounded to the nearest 1,000 sf):

- Phase 1 – to be implemented between years 5 and 10:
  - 516,000 sf retail/commercial space
  - 92,000 sf restaurant
  - 58,000 sf hotel
  - 353,000 sf office/coworking space
  - 62,000 sf entertainment
  - 21,000 sf fitness
  - 87 multi-family residential units
- Phase 2 – to be implemented between years 10 and 15:
  - 256,000 sf retail/commercial/grocery
  - 122,000 sf restaurant
  - 58,000 sf hotel
  - 415,000 sf office/coworking space
  - 80,000 sf entertainment
  - Additional 469 multi-family residential units
- Phase 3 (full-buildout) – be implemented between years 15 and 20:
  - 108,000 sf retail/commercial space
  - 125,000 sf restaurant
  - 58,000 sf hotel
  - 932,000 sf office/coworking space
  - 120,000 sf entertainment
  - Additional 879 multi-family residential units

Projected wastewater flows from each phase of development were calculated as part of the amended EH Master Plan and are summarized in Table 2-2.

Table 2-2: Summary of Expected Flows for Eastern Hills Mall Redevelopment Project

			Phase 1		Phase 2		Phase 3	
	Use	**units**	**sf or #**	**use (gpd)**	**sf or #**	**use (gpd)**	**Sf or #**	**Use (gpd)**
Commercial/Retail	0.1	gpd/sf	516,375	51,638	256,250	25,625	108,000	10,800
Restaurant	35	gpd/seat	92,250	129,150	122,400	171,360	124,500	174,300
Hotel	110	gpd/sleeping unit	58,000	7,376	58,000	7,376	58,000	7,376
Pool	10	gpd/swimmer	67	671	67	671	67	671
Banquet Hall	10	gpd/seat	6,000	2,400	6,000	2,400	6,000	24,00
Office	15	gpd/employee	352,700	26,453	414,500	31,088	932,250	69,919
Entertainment	10	gpd/patron	62,200	3,110	80,000	4,000	80,000	4,000
Fitness	20	gpd/patron	21,475	35,792	0	0	0	0
1 bed apartment	100	gpd	44	4,400	235	23,500	440	44,000
2 bed apartment	200	gpd	43	8,600	234	46,800	439	87,800
Avg Daily Flow (gpd)				**269,588**		**325,819**		**484,565**
Population				**2,696**		**3,258**		**4846**
Peaking Factor				**3.481**		**3.412**		**3.258**
Peak Flow (gpd)				**938,551**		**1,111,594**		**1,578,518**
Peak Flow (MGD)				**0.94**		**1.11**		**1.58**
Avg Daily Flow (gpm)				**187**		**226**		**337**
Peak Flow (gpm)				**652**		**772**		**1,096**

Source: Appendix C-1, Conceptual Master Plan Application, Eastern Hills Mall Redevelopment, as amended December 8, 2022

2.2.4.2 Harris Hill Area/Main Street

The Harris Hill/Main Street service area is comprised of approximately 1,720 acres near the intersection of Harris Hill Road and Main Street. The area is home to approximately 7,000 people in 1,400 residences, 250 commercial establishments, and two schools. The homes and businesses in Harris Hill are situated on small lots, have no access to public sewer, have aging septic systems that may not comply with current regulations, and are constructed in soils not suitable for on-site waste disposal (e.g., shallow bedrock or poor soil percolation rates). Given the status of the septic systems in this neighborhood, providing public sanitary service to the Harris Hill neighborhood is an important consideration for the Town in this project.

The 2013 Harris Hill Sanitary Sewer Cost Analysis, developed by GPI, outlined a 5-phase approach to implementing public sewers in this neighborhood. Estimated flows for the five phases are summarized in Table 2-3. The recommendations in that report indicated that one new pump station near the intersection of Harris Hill Road and Wehrle Drive would be required. This pump station would require two 30-hp pumps operating at 690 gpm and 110-ft TDH in a 31.2-ft deep wet well. In addition, the design had considered approximately 1800 LF of 8-inch force main running along Harris Hill Road, across Main Street, and ending at Sheridan Drive.

However, it was also noted in the 2013 Cost Analysis that there is not enough capacity in existing sewer lines to convey flows from the Harris Hill area, necessitating a new trunk line paralleling Transit Road, preferably along Harris Hill Road. The gravity trunk sewer from the Intersection of Harris Hill Road and Sheridan Drive to the Clarence Peanut Line sewer was not included in the 2013 cost analysis but was considered as part of this evaluation. In addition, the new 24-inch Parallel Peanut Line Sewer in Amherst is required to implement public sanitary sewers in the Harris Hill

area. The expansion of public sewers in the Harris Hill area would require a new sewer district or an extension of ECSD5.

Table 2-3: Projected flows from Harris Hill Area/Main Street

Phase Number	Design Population	Average Flow (MGD)	Peak Flow (MGD)
1	734	0.0734	0.285
2	1404	0.1404	0.5193
3	3411	0.3411	1.1579
4	1029	0.1029	0.3902
5	361	0.0361	0.1458
SUM	**6939**	**0.6939**	**2.1582***

Note: *Peaking flows are based on individual peaking factors for each area, based on Ten States Standards and are not additive. Total peak flow peaking factor is based upon peaking factor for entire population in all phases.

2.2.4.3 Gunnville/Wehrle Area

The Town of Clarence has contemplated enhancing existing industrial zones within the town to make these areas more appealing for "office type" facilities – clean, quiet, high-employment operations, distinct from residential areas. The Clarence Research Park area is located within the Gunnville Road/Wehrle Road area. It is believed that this area has a higher growth potential than the Lakeside Industrial Park on County Road, giving it a higher priority in sewer service.

The Clarence Research Park area is currently served by a 20,000 gpd package treatment plant. The plant serves Clarence High School, Integer Holdings, and MTI, Inc. Currently effluent from the treatment facility is discharged to two alternating infiltration wells.

The existing treatment facility is modular in design and can be expanded up to 60,000 gpd, and so any future sewer planning within the Town should consider this future flow rate.

2.2.4.4 Spaulding Lake Area

Based on enforcement actions indicated by the NYSDEC in 2012 regarding violations of State Pollution Discharge Elimination System (SPDES) Permit #NY0170887 of the privately-owned Spaulding Lake WWTP, the Spaulding Lake Subdivision Homeowners Association requested that the Town of Clarence conduct an evaluation to eliminate the WWTP and connect to the public sanitary sewer collection system. The Town's evaluation indicated that conveying the flows from the Spaulding Lake tributary area to the Amherst WPCF is limited by the capacity of the existing 18-inch diameter Amherst Peanut Line sewer between Transit Road and Paradise Road. Therefore, a new parallel 24-inch diameter Amherst Peanut Line sewer would be required.

The Spaulding Lake Sewer District Feasibility Study (2014) provided a preliminary plan and cost for the implementation of a new Spaulding Lake Sewer District, which would convey flows from the Spaulding Lake area via a new pumping station (located at the site of the existing WWTP) and a 6-inch diameter force main, to a new 10-inch diameter PVC Goodrich Road Trunk Sewer to the existing Heise Brookhaven Trunk Sewer (HBTS), which would subsequently discharge to the Clarence and Amherst Peanut Line sewers. The Spaulding Lake sewer area includes:

- Existing Spaulding Lake Subdivision
- Homes on the east side of Goodrich Road tributary to the Spaulding Lake WWTP
- Properties along Goodrich Road between the HBTS and the Spaulding Lake WWTP.

The 2014 report also looked at potential future service areas including:

- Phase 1
    - Properties along the west side of Goodrich Road between the Spaulding Lake WWTP and Main Street
    - Properties along the north side of Main Street between Goodrich Road and Spaulding Lake Drive
    - The Clarence Research Park WWTP.
- Phase 2
    - Properties along Main Street from Thompson Road to Pineledge Road, many of which are commercial properties.

2.2.4.5 Clarence Hollow (extension of CSD9)

The service area constructed as part of Clarence Hollow Phase 2 would provide service to the southeast and southwest portions of CSD9 and would be an expansion of CSD9. Implementation of this project would finalize abatement of the Clarence Hollow pollution area, as well as foster investment in the hamlet. Neither a cost estimate nor a study has been previously done on this area.

2.2.4.6 County Road Industrial Park

Another potential area of focus within the Town is the County Road Industrial Park, located on County Road between Heise Road and Strickler Roads. A small pump station and collection system have already been constructed in this area to serve the 11 lots within this business park. These flows would be conveyed to the Amherst WPCF via the Dodge Road Interceptor; however, the business park remains empty with no flows being conveyed to the Amherst collection system. Apart from the Industrial Park, the County and the Town have indicated that this area has no active prospects for development currently and even if some of the lots were to be occupied, the original development was only granted flow equal to 21 equivalent dwelling units, so additional flows even at full buildout would be negligible.

2.2.4.7 Infill in Erie County Sewer District No. 5 and Clarence Sewer Districts

ECSD5 connects to the Amherst sewer system through the Dodge Road Interceptor and most recently the Klein Road Interceptor. The Town of Amherst has now restricted additional sewer flows to either Dodge or Klein Road due to concerns of surcharging within the system. Additional flow allotments through these sewers would require coordination between ECSD5, the Town of Amherst and the Town of Clarence to determine available capacity.

However, there are opportunities throughout ECSD5 and the Clarence Sewer Districts for infill housing, resulting in slight increases in the projected wastewater flows in this area. As discussed in Section 4, consideration has been given to flows projected for the infill projects both in ECSD5 and in the CSDs, with flow allotments given by ECSD5 and the Town of Clarence to account for currently vacant lots in existing sewer districts that may be built upon in the future.

2.2.5 Major Gravity Sewer Overview

2.2.5.1 Transit Road Gravity Sewers

Transit Road is an exceptionally busy commercial corridor with a wide range of commercial enterprises. Gravity sewers run primarily along the east side of Transit Road, with a few local gravity sewers along part of the west side of Transit Road, and flow is conveyed north from Garfield Road to either the Klein Road Sewer, the Dodge Road Interceptor, or the Peanut Line sewer. The Klein Road Sewer, the Dodge Road Interceptor, and the Peanut Line sewer are all located within the Town of Amherst and convey wastewater collected from the publicly-sewered portions of the Town of Clarence to the Amherst collection system and ultimately to the Amherst WPCF for subsequent treatment.

2.2.5.2 Heise Brookhaven Trunk Sewer (HBTS)

The Heise-Brookhaven Trunk Sewer is owned, operated and maintained by the Town of Clarence. It extends from the intersection of Brookhaven Drive and Greiner Road to the intersection of Heise Road and Clarence Center Road. The HBTS is 12 inches in diameter until it crosses Goodrich Road, where the diameter increases to 18 inches. It discharges to the Clarence Peanut Line Sewer and is ultimately conveyed to the Amherst WPCF via the Amherst portion of the Peanut Line sewer.

2.2.5.3 Dodge Road Interceptor

The Dodge Road Interceptor starts as a 24-inch diameter sewer near the ECSD5's metering location near Transit Road. As flow moves downstream along New Road, North French Road, and Sundridge Drive in the Town of Amherst, the interceptor gradually increases in size to a 30-inch, 36-inch, and ultimately a 48-inch diameter pipe as it enters the Amherst WPCF. It collects flow from points north, east, and south of Dodge Road via a 12-inch sewer flowing south along Transit Road, a 15-inch sewer flowing west along Ransom Creek, and a 24-inch sewer flowing north along Transit Road. A majority of the flows conveyed by the Dodge Road Interceptor are generated in ECSD5 and the Ransom Oaks Development in Amherst and are conveyed via the Interceptor to New Road, North French Road, and to the WPCF.

2.2.5.4 Klein Road Sewer

The Klein Road sewer is primarily a 12-inch diameter sewer that runs along the north side of Klein Road to Paradise Road. The sewer then runs north along Paradise Road where it connects into the 30-inch diameter section of the Amherst Peanut Line sewer downstream of Paradise Road. The upstream portions of this sewer previously operated as a relief sewer as flow from ECSD5 conveyed north along Transit Road would continue to be directed north to the Dodge Road Interceptor, while a weir in a flow control manhole at the intersection of Klein Road and Transit Road diverted flows to the 12-inch diameter Klein sewer during high flow events. In 2022, the weir was removed to allow additional flow from the portion of ECSD5 located south of Klein Road to be conveyed to the downstream 30-inch diameter portion of the Peanut Line Sewer and subsequently to the Amherst WPCF for treatment.

2.2.5.5 Peanut Line Sewer

As indicated above, there are two portions to the existing Peanut Line Sewer (the Clarence Portion and the Amherst Portion), and the sewer is named as the horizontal alignment of the sewer pipes follow the route of the former Peanut Line Railroad. The intent of the Peanut Line sewers was to convey flow from the CSDs, while the ECSD5 conveys flow to the Dodge Road Interceptor and Klein Road sewer.

- **Amherst Peanut Line Sewer**– This sewer is connected to the Clarence Peanut Line Sewer via 100 LF of 30-inch pipe under Transit Road. The Amherst Peanut Line sewer is 18 inches in diameter immediately

downstream of the intersection with Transit Road and increases in diameter to 30-inches west of Paradise Road. This interceptor gradually increases to a maximum diameter of 66-inches, until it joins with the Town of Amherst's West Side Interceptor for conveyance of flows to the Amherst WPCF.

- **Clarence Peanut Line Sewer** – This sewer is owned by the Town of Clarence and is located east of Transit Road. It connects into the 18-inch Amherst Peanut Line at its western end and into the Heise-Brookhaven Trunk Line Sewer at its eastern end. The Clarence Peanut Line sewer is 21 inches in diameter at its upstream end at the HBTS and 24 inches in diameter where it connects to the Amherst Peanut Line sewer.

2.2.6 Major Pumping Stations and Force Mains

2.2.6.1 Eastern Hills Pumping Station (EHPS)

The EHPS is located at the southwest corner of the Eastern Hills mall parcel slated for redevelopment. It collects flows from the entire mall parcel as well as points east and south of the mall, which are then pumped north through an 8-inch, 2,600 LF force main, discharging to a 15-inch gravity sewer near Sheridan Drive. The pumping station was originally built in 1973 and is currently equipped with two Flygt submersible pumps (Flygt Model No. NP-3153.185 6-inch pump, 230V/3-phase/60 Hz, 15 hp, 1750 rpm, 436 impeller) installed in 2016 with a design point of approximately 625 gpm at 45 feet TDH. Figure 2-10 shows the pump and system curves for the pumping station and its associated force main, which confirms the above design point.

The pumping station does not currently have a flow meter, but flows were estimated from:

- Pump Run Times from Uniland's Conceptual Master Plan Application – The Downstream Sanitary Capacity Analysis, included as Appendix C-2 to the updated Application indicated that pump run times for November 2020 through January 2021 were 3.8 – 5.5 hours per day on average, which corresponds to approximately 142,500 – 204,435 gallons per day pumped at the pumping flow rate of 625 gpm. The Downstream Capacity report also indicated that the County had indicated that the maximum daily volume pumped as 211,250 gallons per day, which corresponds to 5.6 hours of pumping at the 625-gpm flow rate. Given that the maximum capacity of the pumping station is 900,000 gpd (625 gpm X 24 hours x 60 minutes), the ESPS pumps operate approximately 16-23% of the time.
- ECSD5 Operations Report – The October 2023 operations report for ECSD5 indicated similar flows (177,250 – 206,250 gpd) pumped using data from June 2023 to August 2023.

Calculations for the flows for the EHPS are included in Appendix C.

Note, however, that the flows above were average daily flows and are not representative of peak instantaneous flows. Using an assumed peaking factor of 3.3, the maximum peak flow rate is estimated at 612,857 gpd. Peak flows measured downstream of the EHPS force main discharge pipe during the Downstream Sanitary Capacity Analysis indicated a peak daily flow of 0.644 MGD, which corresponds well to the estimated 612,857 gpd. The Erie County Division of Sewerage Management design standard for pumping rates is twice the peak flow of the basin. Therefore, it appears that the EHPS has an estimated available capacity of approximately 128,000 gpd at peak flows (900,000 gpd maximum capacity less 644,000 gpd peak daily flow, divided by 2).

While data from flow monitoring and pump run times indicate that the EHPS may have some additional capacity, JMD confirmed during the site visit that the physical space within the wet well (Figure 2-11) and valve vault (Figure 2-12), cannot accommodate larger pumps, piping, or valves to increase the capacity of the EHPS beyond its current

maximum capacity of 900,000 gpd. In addition, the existing concrete wet well structure continues to age and most likely will require replacement in the coming years.

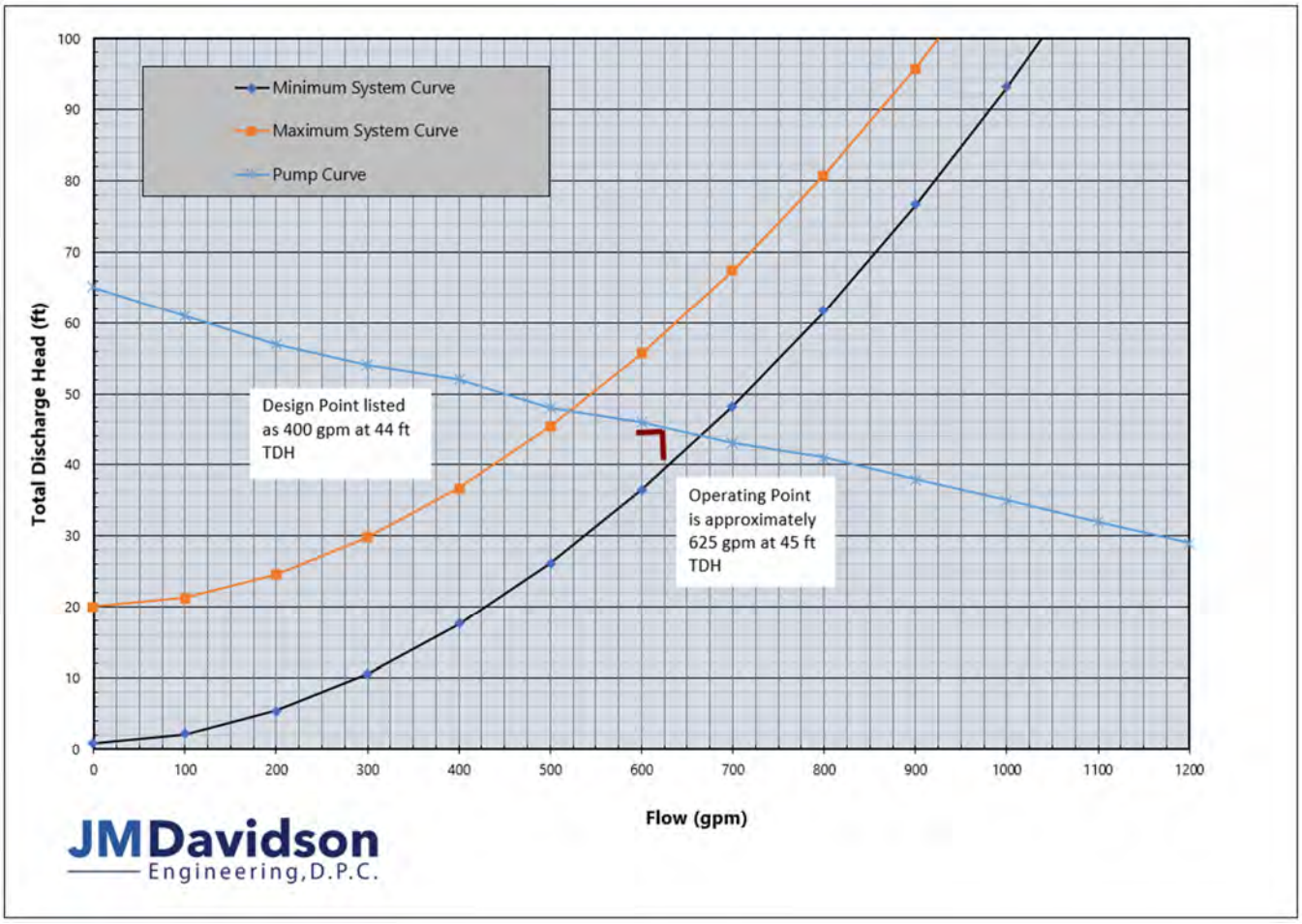


Figure 2-10: Pump and System Curve for the EHPS and its 8-inch force main

Figure 2-11: EHPS Wet Well

Figure 2-12: EHPS Valve Vault

2.2.6.2 Bryant & Stratton Pumping Station (BSPS)

The BSPS is located behind a commercial plaza on the east side of Bryant and Stratton Way. It collects flows from points north, east, and south of the station, which are then pumped west through a 6-inch, 2,090 LF force main that discharges to a 15-inch gravity sewer near the intersection of Main Street and Transit Road. The pumping station was built in 1981 and is currently equipped with two Ebara submersible pumps installed in 2013 that have a design point of 550 gpm at 117 feet TDH. The pump and system curves for the pumping station and its associated force main are provided in Figure 2-13.

The BSPS conveys flow through its force main to the gravity sewer immediately upstream of the EHPS; therefore, a large portion of the flow conveyed by EHPS was first conveyed by the BSPS. Flow rates for the BSPS averaged 95,480 – 129,800 gpd using data from June 2023 to August 2023. Using that data, the BSPS made up 46% to 73% of the flow conveyed by the EHPS. Calculations for the BSPS are included in Appendix C.

Peak flows at the BSPS were estimated using a peaking factor of 3.8 for a smaller tributary population relative to the EHPS, which gives a maximum peak flow of 428,032 gpd. Using the ECDSM's standard for requiring pumps to be sized at 2 times tributary area flow, approximately 182,000 gpd in capacity remains.

In addition, the pumping stations are located approximately 2,000 ft apart, which may offer the ability to combine the pumping stations. Erie County has expressed the desire to eliminate the BSPS in the past and this evaluation also examines that potential.

Similar to the EHPS, the estimated BSPS flow rates indicate that there is some additional capacity available within the pumping station, but the site could not accommodate significantly larger pumps or piping within the existing wet well (Figure 2-14).

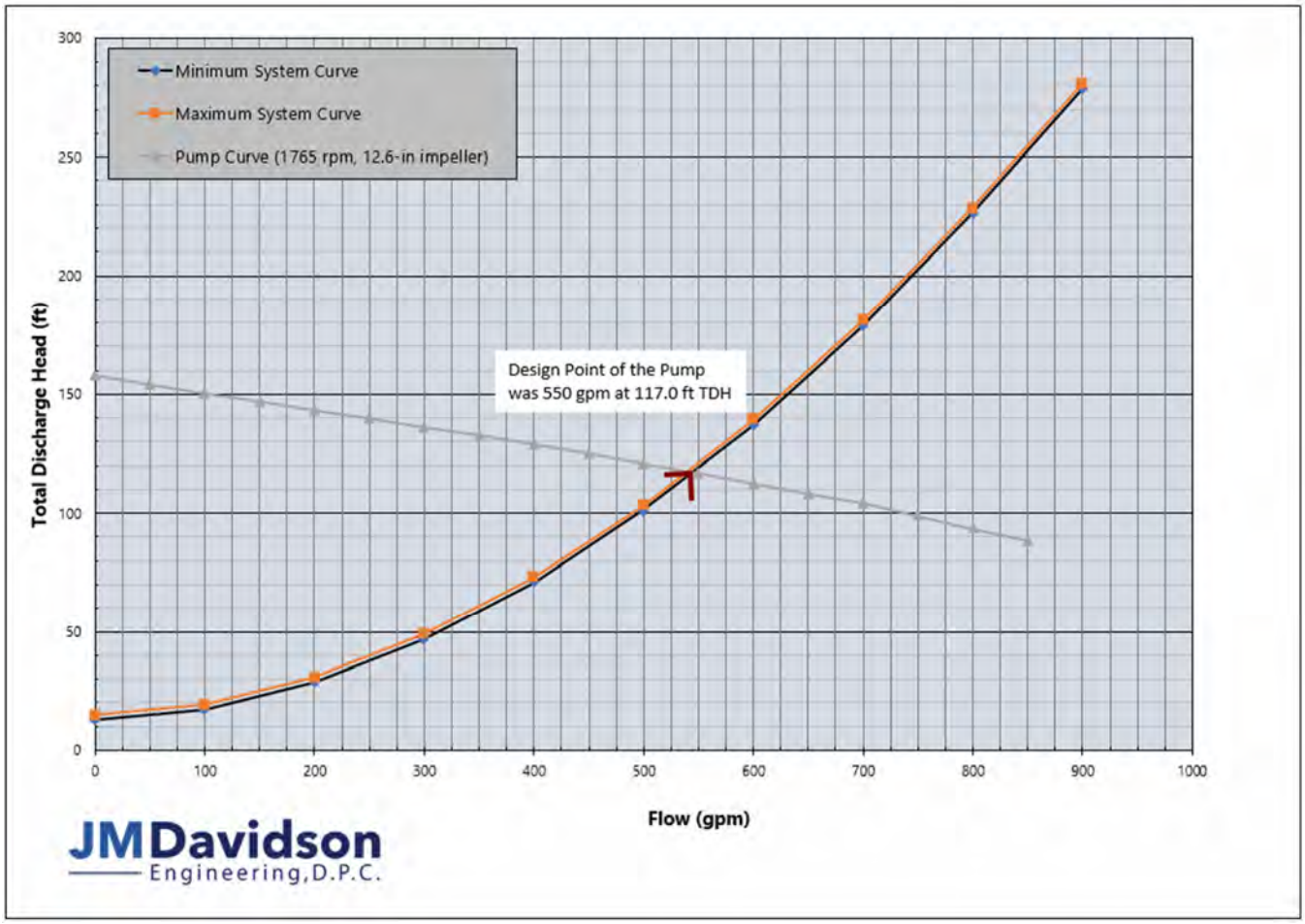


Figure 2-13: Pump and System Curves for BSPS and 6-inch diameter force main

Figure 2-14: BSPS Wet Well

2.2.7 Amherst Water Pollution Control Facility (WPCF)

The Amherst Water Pollution Control Facility (WPCF) is located on Tonawanda Creek Road in the Town of Amherst and is owned and operated by the Town. In addition to the flows received from the Town of Clarence and ECSD5 through the Klein Road, Dodge Road, and Peanut Line Sewers, the WPCF also receives and treats raw sewage from the Town of Amherst, the Village of Williamsville, and the State University of New York at Buffalo (SUNY Buffalo). Flow to the WPCF from Clarence and ECSD5 is metered at the points where the flow enters the Town of Amherst's collection system.

At the WPCF, flow enters the facility by gravity through an 84-inch trunk sewer, passes through four mechanically cleaned bar screens and is pumped via the four influent pumps to the aerated grit chambers. From the grit chambers, flow is settled in the Primary Equalization Tanks. Settled wastewater is then conveyed via gravity to a two-stage oxygen activated sludge process, followed by final clarifiers, for the removal of carbon and nitrogen. Tertiary treatment at the Amherst WPCF includes an intermediate pump station followed by cloth media filters for final polishing. Disinfection is accomplished using sodium hypochlorite and the effluent is dechlorinated before final discharge. Treated effluent is discharged to Tonawanda Creek under conditions of a SPDES permit issued by the NYSDEC.

2.3 Definition of the Problem

Given that the Town of Clarence does not have its own wastewater treatment facility, all flows from the Town of Clarence have been conveyed from the CSDs and ECSD5 into the Town of Amherst's collection system for subsequent treatment at the Amherst WPCF. Much of the capacity of the three main sewers carrying flow from the Town of Clarence (Klein Road Sewer, Dodge Road Interceptor, and the Amherst 18-inch Peanut Line Sewer) has been previously allocated. Future development in Clarence is primarily limited by the existing connections to the Amherst sewer system. Engineering and planning evaluations completed within the last decade have recognized the need for a parallel 24-inch Amherst Peanut Line Sewer between Transit Road and Paradise Road to increase wastewater conveyance capacity from the Town of Clarence and allow future development, as well as the removal of existing septic systems and package treatment systems currently existing in the Town of Clarence.

As discussed in Section 1.1, the ultimate goals of this evaluation are to:

- plan and systematically provide for public sewers for areas of the Town of Clarence in which planning documents have identified are appropriate for development,
- determine the most appropriate option to eliminate septic systems and package treatment systems to achieve economies of scale associated with a larger public sewer system,
- coordinate the timing and location of future development within the Town of Clarence with the availability of adequate wastewater collection system conveyance capacity; and
- determine the approach to provide cost-effective public sewer access.

Sewer extensions within the Town of Clarence constructed to date have provided pollution abatement by addressing failing septic systems in areas around Ransom Creek. Increased public sewer service may lead to additional growth and higher density developments. In the past several decades, the extension of public sewers has resulted in increases in residential housing developments within the Town. In parallel, the Town of Clarence developed several master plans and associated sewer master plans over the last 2 decades which indicate that the Town desires to:

- Utilize existing sewer infrastructure (gravity sewers and pumping stations) within Erie County Sewer District No. 5 (ECSD5) and Clarence Sewer Districts 2, 4, 6, 7, 9, & 10 and areas where smaller treatment systems may already be present (Spaulding Lake, Clarence Research Park, etc.) to minimize the need for new infrastructure and to limit "sprawl" into designated agricultural areas.
- Incorporate areas where private septic systems remain, such as the Harris Hill area, into the public sewer system to mitigate potential pollution and other impacts from aging septic systems.
- Continue providing reliable sanitary sewer collection system capacity to allow unsewered areas to be further marketed to companies and developers looking to relocate or expand within the Town.
- Provide reliable service to areas focused on long term industrial growth, such as in the Gunville/Wehrle and County Road Industrial Business Park Areas.
- Infill areas outside of existing publicly sewered properties to eliminate private septic systems located adjacent to existing public sanitary sewer districts.

In addition to the Town's potential development areas outlined in the Master Plan, Uniland Development Company recently undertook initial planning efforts to redevelop the existing mall property into a mixed-use development, containing residential, commercial, hospitality, and entertainment/recreational uses. These planning efforts commenced after the Town of Clarence re-zoned the Eastern Hills Mall property to a "Lifestyle Center District". Such proposed uses would increase the amount of wastewater flow produced on the Eastern Hills Mall property, further stressing existing sewer infrastructure.

The urban growth objectives of the Town and the proposed redevelopment of the Eastern Hills Mall site have created some challenges addressed within this evaluation:

- Ensuring that adequate sanitary sewer capacity exists within ECSD5 and Town Sewer Districts to receive the new flows expected from the ultimate buildout of the Eastern Hills Mall redevelopment and sewer system expansion areas identified by the Town.
- Ensuring that adequate sewer capacity exists within the neighboring Town of Amherst's collection system that receives flows from the Town of Clarence sewer districts and ECSD5 and further conveys the flows to the Town of Amherst's WPCF. Previously completed evaluations indicated that sewer capacity in the portion of the Amherst collection system downstream of the ECSD5 and the Clarence Sewer Districts is limited. This evaluation contemplates the adequacy of the construction of a parallel 24-inch diameter Peanut Line sewer in the Town of Amherst to provide additional capacity for the conveyance of flows from Clarence.
- Continuing to address the need for upgrades necessary to deal with aging septic systems within the Town of Clarence to further protect environmental resources, such as streams, wetlands, and other ecologically sensitive areas.
- Balancing the potential need for new infrastructure with the operational and maintenance needs of Erie County and Town of Clarence staff. This could include the potential elimination of pump stations, thereby decreasing operations and maintenance efforts. This could also include phased approaches to increasing the size of the existing collection system to accommodate "just-in-time" project demands, without immediately increasing the size of the collection system and then having that system be severely underutilized if the proposed development does not happen or is smaller than originally envisioned.

2.4 Financial Status

ECSD5 is one of three sewer districts in ECDSM's Northern Region, which also includes ECSD1 and ECSD4. A single budget is developed for the Northern Region and is allocated between the three sewer districts. Additionally, the Northern Region and ECSD5 budgets also include pro-rata costs for Division-wide expenses (for all seven sewer districts in Erie County), such as various administrative functions, laboratory, and centralized vehicle expenses.

In 2023, ECSD5 represented 14.8% of the shared costs for the Northern Region. ECSD5's budget includes appropriations and revenues associated with operation and maintenance of the Clarence Town Sewer Districts. Currently (2023) fiscal year, ECSD5's rate formula is comprised of a flat fee of $170.00 per dwelling unit, footage charges of $1.00/ft, and ad valorem charges of approximately $0.29 per $1000 of assessed valuation. In addition, non-residential users are assessed based on the amount of flow sent to ECSD5 above 91,250 gallons per year, based on water use data. The total charges for the typical single-family home in ECSD5 were projected to be close to the same in 2024.

The Town of Clarence has separate budget appropriations for each Town Sewer District. Table 2-4 summarizes the adopted 2024 budgets for the CSDs. Rates per Equivalent Dwelling Unit (EDU) range from $277.59 - $423.48, with the highest rates per EDU associated with those sewer districts with the fewest EDUs.

Table 2-4: Summary of Appropriations and Revenues for CSDs

	Budget Appropriations	Estimated Revenues	Appropriated Fund Balance	Taxation Amount	Rate per EDU
CSD2	$ 439,500	$ 10,200	$ 25,000	$ 404,300	$ 299.33
CSD4	$ 71,000	$ 8,200	$ 13,675	$ 49,125	$ 282.33
CSD6	$ 276,000	$ 9,600	$ 23,000	$ 243,400	$ 315.08
CSD7	$ 35,000	$ 100	$ 11,075	$ 23,825	$ 301.58
CSD9	$ 245,000	$ 3,500	$ 42,150	$ 199,350	$ 277.59
CSD10	$ 40,000	$ 50	$ 12,000	$ 27,950	$ 423.48

Only CSD9 has existing debt service, most likely due to the installation of gravity sewers within the Clarence Hollow area. Currently the debt service for CSD9 is 84% of the budget appropriations and is reduced by fund balances and debt reserves, resulting in a tax rate of $1.34 per $1000 of assessed value.

Based on the 2024 Amherst Town Budget, sewer expenditures ($25,836,626) comprise 15.67% of overall expenditures, while sewers provide only 6.67% of the total revenues for the Town. Approximately $50,000 is designated as appropriated fund balance use. As a result, approximately $21,698,751 needs to be raised from taxes, which is a decrease of approximately $7,000 from 2023.

3 Methodology

Because this project impacts the goals of numerous local entities, including three municipalities (Erie County, Town of Amherst, and Town of Clarence), several commercial and residential real estate development companies, and local homeowners and businesses, a holistic and comprehensive approach was used for review of relevant background data. The resources described below formed the foundation of the study's analysis.

3.1 Data Review

A considerable amount of data was reviewed for this project. Specifically, the following elements provided important background information:

- Existing data and record drawings for both the existing collection systems within ECSD5 and the CSDs, as well as relevant pumping stations (Eastern Hills and Bryant & Stratton Pump Stations).
- Site visits to Eastern Hills and Bryant and Stratton pump stations.
- GIS mapping provided by ECDSM showing the location and relevant properties of existing infrastructure.
- Town of Amherst's existing collection system model. The model was expanded during this project to incorporate the appropriate areas of ECSD5 and the CSDs and the flow data collected by Arcadis in their previous Flow Monitoring & Inflow and Infiltration Quantification project, as well as projected flows from anticipated development, to determine capacities within existing infrastructure and develop options to expand capacities in the collection system as necessary to convey the proposed flows.
- Previous reports completed for various areas of development, including the Spaulding Lake and Harris Hill areas.
- Utility mapping from the New York State Department of Transportation and the Erie County Department of Public Works.
- Information provided by key stakeholders in meetings held during the project to better understand objectives, constraints, and overall views of the project (discussed in greater detail in Section 3.2).

Collectively, the information described above enabled the following analyses:

- Verification of proposed peak flows for the various proposed development areas.
- Identification of scenarios to provide sewer service to the various development opportunities.
- Analysis of the impact of existing and projected flows on existing sanitary sewers (HBTS, Clarence and Amherst Peanut Line Sewers, Klein sewer and Dodge Road Interceptor) to determine the most appropriate approaches for inputting the projected additional flows into the existing sanitary sewers.
- Comparison of scenarios and options to achieve the most appropriate solution for balancing Clarence and ECSD5 flows within the Dodge Road Interceptor, Klein Road sewer, existing Peanut Line sewer, and proposed parallel Peanut Line sewers to minimize surcharge conditions.
- Development of opinions of probable construction costs (OPCCs) and life cycle costs (LCCs) for viable options to provide planning-level costs for sanitary sewer expansion.

- Ultimate determination of recommended approach, schedule, and costs to implement the recommended scenario.

3.2 Meetings

Several meetings were held during the project. Meeting minutes are included in Appendix D.

3.2.1 Development Workshop

A development workshop was held on August 30, 2023, that included stakeholders from the Town of Amherst Engineering Department, Town of Clarence Engineering Department, the ECDSM, ECSD5, Arcadis, and JMD. Discussions focused on gathering additional background and information on the current state of existing infrastructure, current challenges, and future needs.

Discussions primarily were focused on projected flows from the proposed areas of development, as described in Section 2.2.4, to ensure that a consistent basis of evaluation was used. Other key topics discussed included:

- The existing 18-inch Peanut Line sewer, west of Transit Road, would continue to receive the same flows it does currently (i.e., flows from the 24-inch Clarence Peanut Line sewer and the HBTS). This is primarily because the proposed Peanut Line Sewer is ~2.5-ft lower than the 18-inch Peanut Line sewer and is intended for capturing new flows.
- Manning's n-values for pipe vary depending on pipe material, with smoother pipe such as PVC having lower n-values than concrete pipe. The value of n is important for determining pipe capacities, as smoother pipe results in higher flow capacities.
- Spaulding Lake Priority and Phase 1 and 2 areas should be considered within this project and these flows would be directed to the HBTS, along with additional flows generated by expansion of CSD9 in Clarence Hollow.
- It was noted that full buildout at the end of Phase 3 of the Eastern Hills Mall redevelopment would result in total peak flows of 1.58 MGD (or an additional ~1.48 MGD beyond the flows currently generated by the mall).
- Any size upgrades to the Peanut Line Sewer Transit Road crossings that may be necessary will be confirmed through model runs conducted under this project.
- A new EHPS would be required under most scenarios because the existing wet well and pumps cannot be expanded within the existing footprint. Evaluations should consider eliminating the Bryant and Stratton Pump Station, if possible.
- The existing capacity of the existing Dodge Road Interceptor (<3 MGD) is a concern and has resulted in limitations on new developments due to insufficient sewer capacity.
- It is recognized that the sewer on Transit Road is presently sufficient for the current uses with ECSD5 but may be undersized for other higher sewer loading purposes in several locations, including near Sheridan Drive, and would require upsizing if additional capacity is required.
- Utilities along Transit Road present a formidable challenge, especially as the road has been widened over the years with little to no increase in the width of the right-of-way. In addition, various utilities are currently

within the roadway width and installing upsized sanitary sewers would be extremely difficult with many potential conflicts with other utilities, as well as the heavy traffic within this corridor.

- A new Harris Hill sewer could be aligned north along Harris Hill Road until Roll Road and then there are several options for its configuration north of Roll Road. Configurations north of Roll Road include navigating through the Loch Lea Subdivision, along Newhouse Road, or through the former National Gypsum property. There are advantages and disadvantages for each route considered.
- The County indicated that phasing of development and of sewer expansion needs to be considered as part of a long-term plan for implementing public sanitary sewers for currently un-sewered areas, as well as for areas of new development opportunities.
- JMD suggested the idea of using an attenuation tank at the Eastern Hills Mall redevelopment site as a solution to accept the proposed flows but limit peak discharges into ECSD5 and the Town of Amherst sewer system through storage, but subsequent research did not yield any instances of a similar configuration used for a residential community, as there may be issues with hydrogen sulfide formation and acceptance of this option by the NYSDEC.

3.2.2 Flow Confirmation Meeting

Following the August 30, 2023, workshop, the Towns and the County met to discuss the proposed additional flows, as further clarification was requested by the JMD team. Subsequently, the results of their discussion were sent to the JMD team (see Tables 3-1 and 3-2 and Figure 3-1) as confirmation of the additional flow projections, listed by municipality.

Future additional peak flows currently projected to be conveyed from the Town of Clarence and/or diverted from locations in the Amherst collection system adjacent to the Transit Road Corridor, for a total flow of 6.75 MGD, are summarized in Table 3-1.

Table 3-2 includes the flows from Table 3-1 with an additional column that indicates the flows considered for either the existing Amherst Peanut Line sewer or for the proposed parallel Peanut Line sewer. This table and Figure 3-1 were used to develop the basis of design table (Table 4-2) for future additional flows. Flows from ECSD5 Nodes B and C are assumed to go through Klein Road (0.24 MGD), while flows from Nodes E and F would go through the Dodge Road Interceptor. The figure does not show flows from nodes G and H, which are in the northern portion of the Town; however, the County has indicated that there are no imminent development plans in these areas. Following the flow confirmation meeting, the Town of Amherst indicated that there exists a future flow potential of 0.31 MGD, opposite of the County's identified nodes G and H. Development of these parcels on the west side of Transit Road in the Town of Amherst is not expected to occur within the planning horizon of this study and, as such, is brought forward here for accounting purposes only. Currently, the Dodge Road Interceptor does not have adequate capacity to accommodate the additional 0.31 MGD flows.

In summary, 5.67 MGD of future additional flows / diversions would need to be conveyed through the Peanut Line corridor between Transit and Paradise – approximately 4.7 MGD through the 24-inch Parallel Peanut Line sewer and an additional 0.97 MGD through the existing 18-inch Amherst Peanut Line sewer. If including the existing flows in the Amherst Peanut Line sewer (~1.4 MGD), approximately 7.07 MGD would need to be conveyed through the Peanut Line corridor between Transit Road and Paradise Road. These values are identified for each Peanut Line sewer on Table 4-2.

It should also be noted that the flows presented in this section represent point flows, while actual flows through pipes could vary depending on upstream and downstream conditions. However, these values were used as a basis for collection system modeling which is further discussed in Sections 4 and 5.

Table 3-1: Summary of Anticipated Flows*

		NOTES
Town of Amherst	**Flow (MGD)**	
Dodge Flow diversion	0.9	Relieve 0.75 MGD of existing flow from Dodge Road Interceptor & 0.15 MGD for ECSD No. 5 Node D
Future flow potential on the opposite side of Transit Road from County Nodes G and H and additional flow from Amherst side	0.31	Future (not analyzed within this project as future development in this area is not anticipated to occur within the planning horizon of this evaluation). Flow presented for future reference only. Upgrades needed on Amherst side.
AMHERST TOTAL	**1.2**	
Town of Clarence		
Available lots in CSD 2, 4, 6, 9	0.51	
CSD9 Phase 2	0.24	
ECSD5 Node B	0.18	CSD No. 10 - Harris Hill Commons & Woodland Hills
Main Street	0.55	
Harris Hill	1.77	
Spaulding Lake	0.16	
CLARENCE TOTAL	**3.41**	
ECSD No. 5		
Node A (Eastern Hills Mall Redevelopment)	1.48	Latest EHM projection 1.58 MGD, less existing peak 0.1 MGD
Node B (HHC / Woodland Hills)	--	(included in Town of Clarence flows, above)
Node C (Legacy Woods)	0.06	
Node D (Bliss/Thompson)	0	(included in Dodge Diversion, above)
Node E (Bevilaqua)	0.19	
Node F (Stahley)	0.04	
Node G (between Stahley and Lapp Roads east of Transit)	0.36	Future (not analyzed within this project as no upcoming future development in this area envisioned at this time)
Node H (north of Lapp Road east of Transit)	0.25	Future (not analyzed within this project as no upcoming future development in this area envisioned at this time)
Clarence Research Park	0.06	Presently 0.02 MGD; may expand to 0.06 MGD
ECSD5 TOTAL	**2.44**	
ULTIMATE TOTAL FOR ALL MUNICIPALITIES	**6.75**	

Source: J. Fiegl email of October 10, 2023, and updated with J. Boudreau email of October 18, 2023.
*Note: *Data listed in this table are projects developed based on the best available information and do not indicate approval for any one project.*

Table 3-2: Portion of Additional Projected Flows to Be Directed to the Peanut Line Corridor

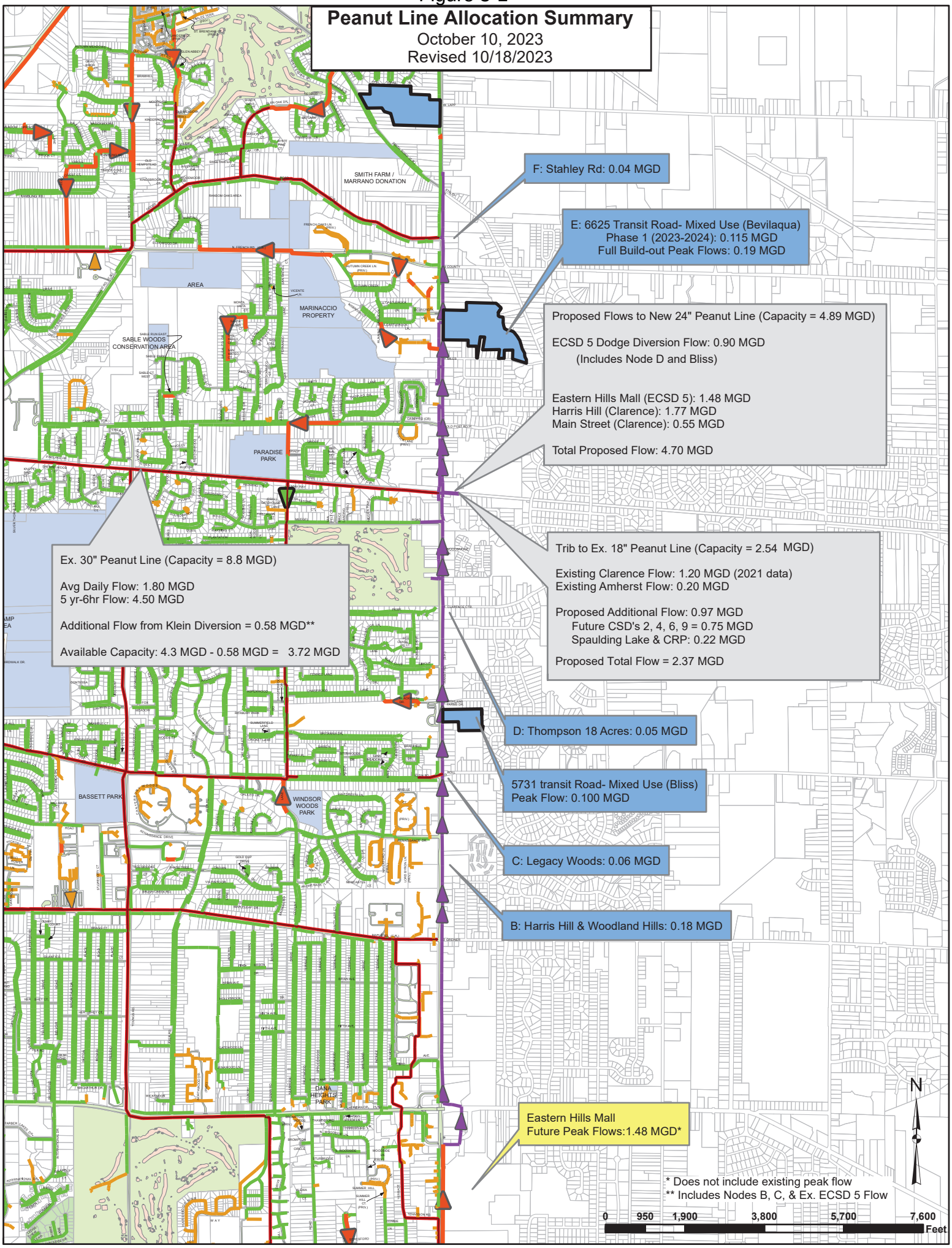
	Flows from Table 3-1	Flows to Peanut Line Sewers (Existing 18" and Parallel 24")	NOTES
Town of Amherst	**Flow (MGD)**	**Flow (MGD)**	
Dodge Flow diversion	0.9	0.9	
AMHERST TOTAL	**0.9**	**0.9**	
Town of Clarence			
Available lots in CSD 2, 4, 6, 9	0.51	0.51	
CSD 9 Phase 2	0.24	0.24	
ECSD No. 5 Node B	0.18	--	Accounted for in Klein Diversion
Main Street	0.55	0.55	
Harris Hill	1.77	1.77	
Spaulding Lake	0.16	0.16	
CLARENCE TOTAL	**3.41**	**3.23**	
ECSD No. 5			
Node A (Eastern Hills Mall Redevelopment)	1.48	1.48	
Node B (HHC / Woodland Hills)	0	0	
Node C (Legacy Woods)	0.06	--	Accounted for in Klein Diversion
Node D (Bliss/Thompson)	0.15 [1]	--	Accounted for in Dodge Diversion
Node E (Bevilaqua)	0.19	--	Accounted for in Dodge Diversion
Node F (Stahley)	0.04	--	North of Peanut Line; accounted for in Dodge Diversion
Node G (between Stahley and Lapp Roads east of Transit)	0.36	Not included in evaluation	North of Peanut Line; Dodge Road Interceptor does not currently have capacity for Node G flows.
Node H (north of Lapp Road east of Transit)	0.25	Not included in evaluation	North of Peanut Line; Dodge Road Interceptor does not currently have capacity for Node H flows.
Clarence Research Park	0.06 [2]	0.06	Includes plant expansion from 0.02 MGD to 0.06 MGD
ECSD5 TOTAL	**2.59**	**1.54**	
TOTAL FOR ALL MUNICIPALITIES	**6.90**	**5.67**	

	Flow (MGD)		Flow (MGD)	
Town of Amherst	0.9	13.0%	0.9	15.9%
Town of Clarence	3.41	49.4%	3.23	57.0%
ECSD No. 5	2.59	37.%	1.54	27.2%
TOTAL	**6.90**	**100.0%**	**5.67**	**100.0%**

Source: J. Fiegl email of October 10, 2023, and updated with J. Boudreau email of October 18, 2023.

Notes: 1. Node D was not originally included in Table 3-1 as it was originally accounted for under the Town of Amherst's flow diversion
2. Value was originally shown as 0.03 MGD in Fiegl email; but was modified to 0.06 MGD to reflect full buildout of Clarence Research Park.

Figure 3-1



Amherst Engineering JLB

4 Initial Option and Scenario Identification

4.1 Summary of Design Flows

4.1.1 Existing Flows

Existing flows with the CSDs and ECSD5 were collected in 2019 as part of the development of the *Flow Monitoring and Inflow and Infiltration (I/I) Quantification Report*, prepared and submitted by Arcadis in April 2021. The major goal of that monitoring program and subsequent report was to quantify the amount of I/I that resulted from six months of flow monitoring within the various sub-basins. A schematic of the relationship of the sixteen temporary meters installed relative to the pump stations in ECSD5 and the CSDs, as well as the flow meters located at Dodge Road, Klein Road, and the Peanut Line sewer, is provided in Figure 4-1. Table 4-1 presents a summary of flows represented by the 16 temporary flow meters and three billing meters (Dodge Road, Klein Road, and Peanut Line meters), as well as the tabular format of the relationships between the flow meters shown pictorially in Figure 4-1. Flow metering data were collected in five-minute intervals throughout the course of the metering period. The full data set of flows over the 6-month monitoring period was used to calibrate the collection system model. Those meters shown in bold italics in Table 4-1 represent those meters not downstream of any other meter, whereas the notes for the other meters contain descriptions of what upstream meters and/or pump stations are represented in that meter's flow.

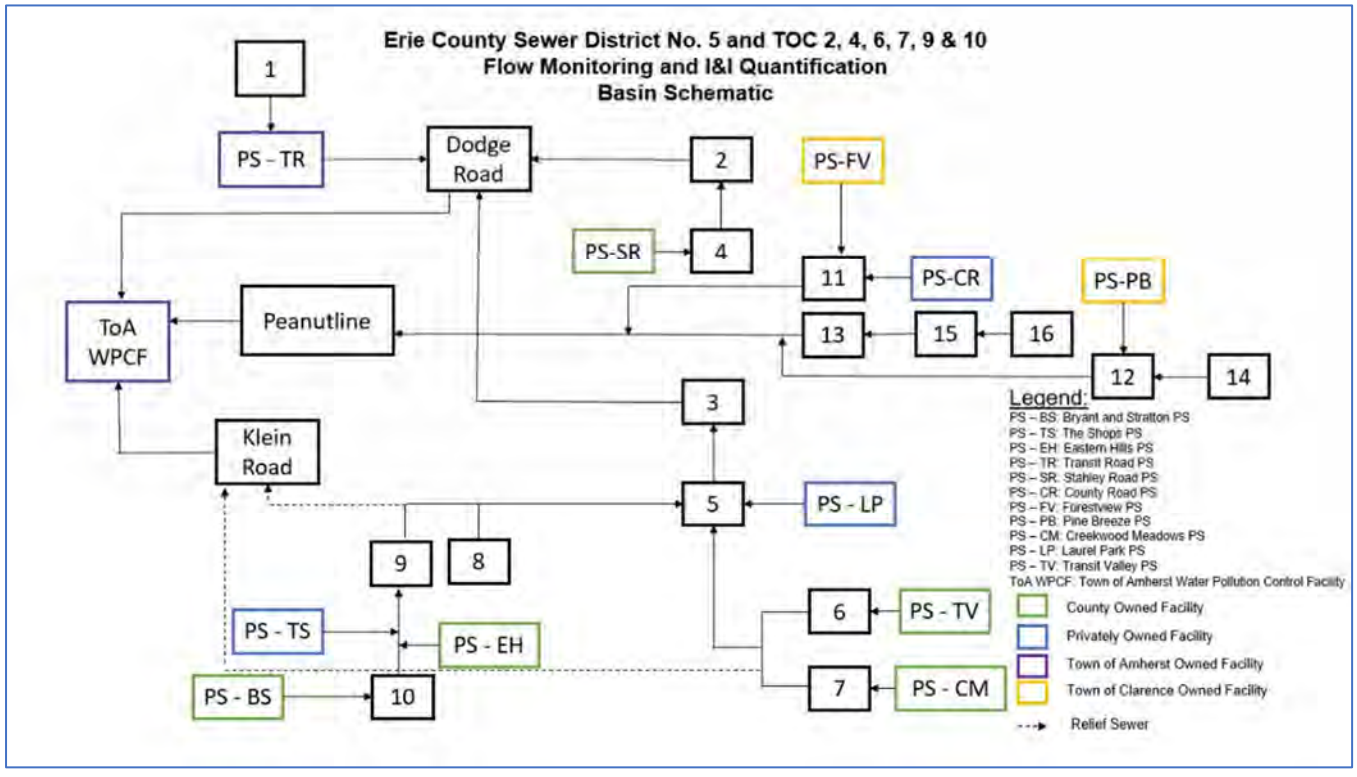


Figure 4-1: Schematic of 2019 Metering Locations

Source: Flow Monitoring and Inflow and Infiltration Report (Erie County Sewer District No. 5 and Town of Clarence Sewer Districts 2, 4, 6, 7, 9, and 10), Arcadis, April 2021

Table 4-1: Summary of Average, Peak, and Calculated 99.9 Percentile Flows (in MGD) from 2019 Monitoring Period

	Average	Peak	99.9 perc
Dodge Road = 1 + 2 + 3	1.44	3.61	--
Clarence Peanut Line = 11 + 13 + 12	0.56	1.99	--
Klein Road = diversion from (9 + 8) + diversion from (6+7)*	0.09	~9.00	--
Meter 1 = 1	***0.03***	***0.37***	***0.22***
Meter 2 = 4 + nearby gravity flow	0.40	2.86	2.30
Meter 3 = 5 + nearby gravity flow	1.07	2.92	2.73
Meter 4 = Stahley Rd PS + nearby gravity flow	0.09	0.56	0.40
Meter 5 = Laurel Park PS + 6 + 7 + 8 + 9	0.90	2.48	2.26
Meter 6 = Transit Valley PS + nearby gravity flow	0.34	1.63	1.49
Meter 7 = Creekwood Meadow PS + nearby gravity flow	0.19	0.90	0.82
Meter 8 = 8	***0.37***	***1.37***	***1.22***
Meter 9 = 10 + The Shops PS + Eastern Hills PS	0.14	1.07	0.94
Meter 10 = Bryant and Stratton PS + nearby gravity flow	0.11	0.52	0.33
Meter 11 = Forestview PS + County Road PS + nearby gravity flow	0.12	0.59	0.37
Meter 12 = Pine Breeze PS + 14 + nearby gravity flow	0.24	0.86	0.68
Meter 13 = 15 + nearby gravity flow	0.04	0.35	0.22
Meter 14 = 14	***0.17***	***0.56***	***0.45***
Meter 15 = 16 + nearby gravity flow	0.20	0.81	0.61
Meter 16 = 16	***0.12***	***0.49***	***0.32***

Note: *Little to no flow in the Klein Road Sewer during the flow monitoring period led to skewed results and these data were deemed unreliable. The 2021 Flow Monitoring and Inflow and Infiltration Quantification Report indicated that the gate limiter position allowed a maximum of 0.3 MGD to be diverted to the Klein Road sewer.

4.1.2 Proposed Flows

Design flows from the areas under consideration were obtained from information provided by the Town of Amherst, the Town of Clarence, and ECSD5. Development flows were discussed and verified through Workshop 1 and the subsequent October 18, 2023, discussion that resulted in Tables 3-1 and 3-2. In those tables, the additional flows were grouped by municipality. These flows are summarized again in Table 4-2, but instead grouped by which Peanut Line sewer would potentially receive the flows from each existing and proposed area under consideration.

Information obtained from the Town of Amherst noted the capacities of the existing 18-inch diameter sewer and proposed 24-inch diameter sewer are 2.78 MGD and 4.89 MGD, respectively (Table 4-3). JMD calculated slightly different numbers (2.43 MGD and 5.22 MGD). However, both entities estimated a total capacity through the Amherst Peanut Line corridor between Transit and Paradise Road of approximately 7.65 MGD. The capacity of 2.43 MGD for the existing 18-inch Amherst Peanut Line sewer should be sufficient for the 1.4 + 0.97 (=2.37) mgd flows projected, using the point values given in Table 4-2. Additionally, the 24-inch Parallel Peanut Line sewer should be able to handle the estimated peak flows of 4.7 MGD with a 4.89 MGD capacity. Subsequent collection system modeling was used to input the additional flows accordingly to identify viable flow distribution scenarios with the goal of not surcharging either the Peanut Line sewers or the pipes upstream from the Peanut Line Corridor. The model was then used to test different scenarios to see the effects on upstream and downstream pipe segments and how those effects may increase or decrease capacities of individual pipe segments.

Table 4-2: Summary of Basis of Evaluation Flows

Description	Type of Flow Data	Existing Flow (MGD)	Proj. Additional Flow (MGD)
30" dia. Peanut Line (west of Paradise)			
Existing Flow (includes existing 18" PL flow)	Measured (5 yr, 6-hr)	4.5	
Klein Diversion	Nodes B + C + D + E		
Node B (Harris Hill and Woodland Hills)			0.18
Node C (Legacy Woods)			0.06
Node D (Thompson) + Bliss	Proposed Future		0.15
Node E (Bevilaqua)	Proposed Future		0.19
	Total	**4.5**	**0.58**
18" Peanut Line (existing)			
Existing Clarence Flow	Measured	1.2	
Existing Amherst Flow	Measured	0.2	
Available lots in CSD 2, 4, 6, 9	Proposed Future		0.51
CSD 9 Phase 2	Proposed Future		0.24
Spaulding Lake	Proposed Future		0.16
Clarence Research Park	Proposed Future		0.06
	Total	**1.4**	**0.97**
24" Peanut Line (proposed parallel sewer)			
Harris Hill	Proposed Future		1.77
Main Street	Proposed Future		0.55
Node A (Eastern Hills Mall Redevelopment)	Proposed Future		1.48
Dodge Diversion	Proposed Future		0.9
	Total	**0**	**4.7**

Table 4-3: Summary of Estimated Capacity of Main Line Sewers

Description	Location	Sewer Capacity (MGD)
30" Peanut Line (west of Paradise)	Amherst	8.8*
18" Peanut Line (existing)	Amherst	2.54*/2.43**
24" Peanut Line (proposed parallel sewer)	Amherst	4.89*/5.22**
24" Peanut Line **	Clarence	5.27**
18" Peanut Line**	Clarence	4.13**
18" Heise Brookhaven Trunk Sewer**	Clarence	3.00 (Ph1)**/2.74 (Ph2)**
12" Heise Brookhaven Trunk Sewer**	Clarence	1.14 (Ph2)**

Notes: *Capacity estimate provided by Town of Amherst.
** Capacity estimate calculated by JMD using materials of construction, and slopes from record drawings.

For the 30-inch Peanut sewer line downstream of Paradise Road, the Town of Amherst indicates a sewer capacity of 8.8 MGD, using a 5-year, 6-hour storm in the collection system model. Based on peak existing point flows of 4.5 MGD, and 0.58 MGD of additional estimated flow from the Klein Diversion as shown on Table 4-2, the total point flow through the 30-inch Peanut Line sewer would be 5.08 MGD, excluding the Peanut Line sewer flows upstream

of Paradise Road. Thus, 3.72 MGD of capacity should theoretically remain to accommodate the 18-inch and 24-inch Peanut Line future sewer flows. However, the projected flow from these two sewers equates to 5.67 MGD (0.97 + 4.7 MGD), which results in a capacity deficit of 1.95 MGD that would ultimately need to be conveyed if all proposed development areas were added to the public sewer system, using point flows. This indicates that once the 24-inch Parallel Amherst Peanut Line Sewer is built, the next challenge limiting potential future development is encountered in the capacity of the 30-inch Peanut Line sewer west of Paradise Road. The Towns have already indicated that upsizing of the 30-inch line or installing a parallel sewer to the 30-inch line would most likely be required in a future project, but the consideration and timing of that expansion would need to be coordinated with the sequencing and timing of implementing future sewer district expansions.

4.2 Collection System Model Review and Development

4.2.1 Town of Amherst Collection System Model

The Town of Amherst provided their collection system model, which was previously developed in PC-SWMM. However, because the intent of the original model was only to provide information on Town of Amherst sewers, this model needed to be expanded to include relevant areas of the Town of Clarence and ECSD5.

As part of the work, the JMD/Arcadis team:

- Reviewed the setup of the model and resolved discrepancies through communication with the Town of Amherst.
- Used data from the ECSD5 GIS and collection system drawings and Town of Clarence collection system drawings to develop a skeleton model that includes representations of the existing gravity sewers along Transit Road, the nearby pumping stations and force mains, and the larger diameter pipes within ECSD5.
- Used the flow and rain data previously collected by the ECSD5 and the Town of Clarence to calibrate the model to available data. Both dry weather and wet weather calibrations were performed using the available data.
- Ran the model to simulate several scenarios using the calibrated model to evaluate their feasibility.

4.2.2 Model Modifications for this Evaluation

As indicated, the model was expanded by including the following pipes within the Town of Clarence:

- The 24-inch and 21-inch sections of the Clarence Peanut Line Sewer
- The 18-inch and 12-inch portions of the Heise-Brookhaven Trunk Sewer
- The existing 10-inch local gravity sewer that runs parallel to the Clarence Peanut Line Sewer. While not considered a major sewer, its proximity to the Clarence Peanut Line Sewer suggests that levels in the Peanut Line sewer(s) may affect levels in this sewer.
- The existing 12-inch Clarence Center Road Sewer
- The existing 15-inch Roll Road Sewer
- The existing 12-inch and 18-inch Greiner Road Sewer
- Additional sewers were added as needed to encapsulate those flow meter locations used during calibration.

In addition, the following pump stations were included in the model expansion:

- Bryant & Stratton
- Creekwood Meadows
- Eastern Hills
- Pine Breeze
- Stahley Road
- Transit Valley

The resulting extents of the expanded model are shown in Figure 4-2.

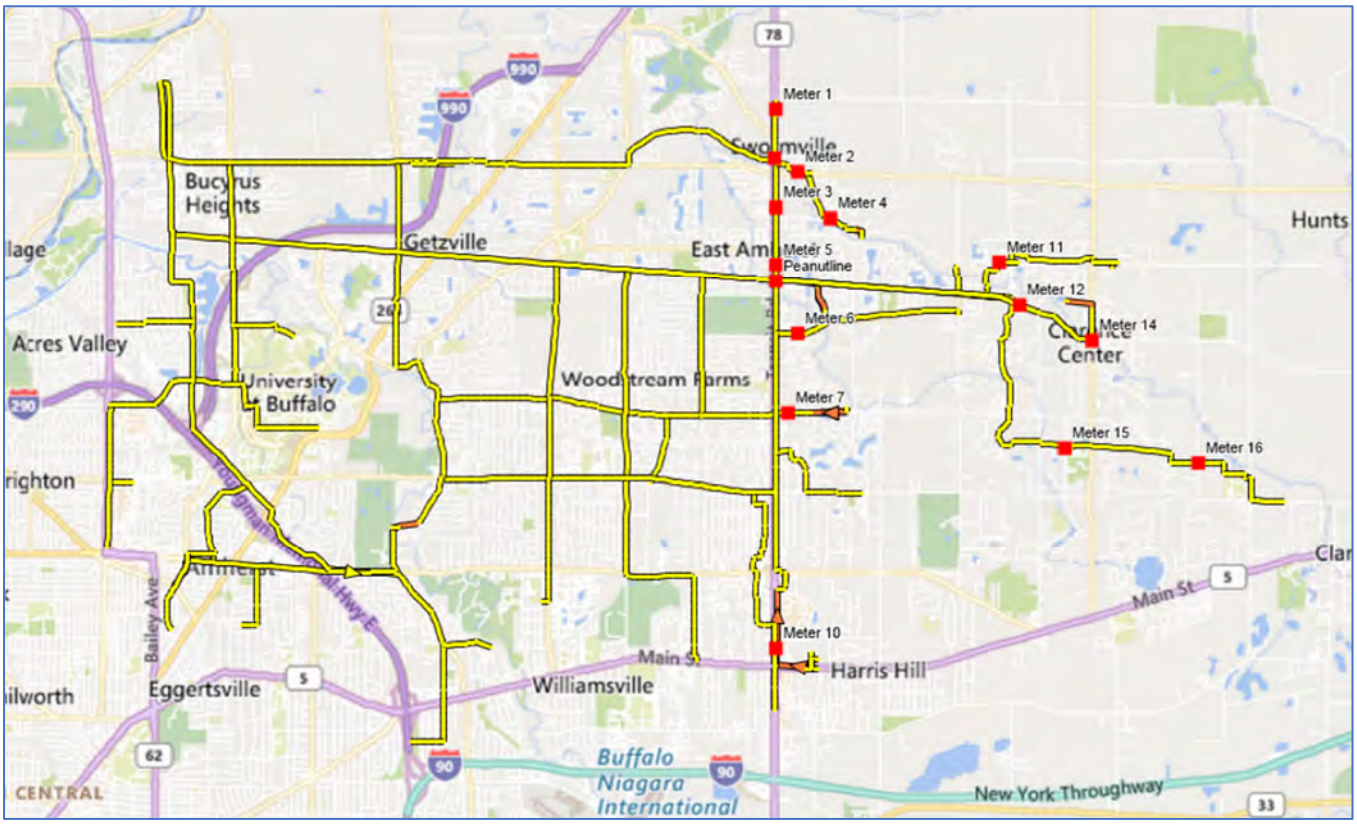


Figure 4-2: Extents of Expanded Collection System Model

Once the extents of the hydraulic model were established, the hydrologic model was then developed by first delineating subcatchments to each sewer tie-in point along the modeled sewers. This resulted in a total of 165 subcatchments being delineated (Figure 4-3).

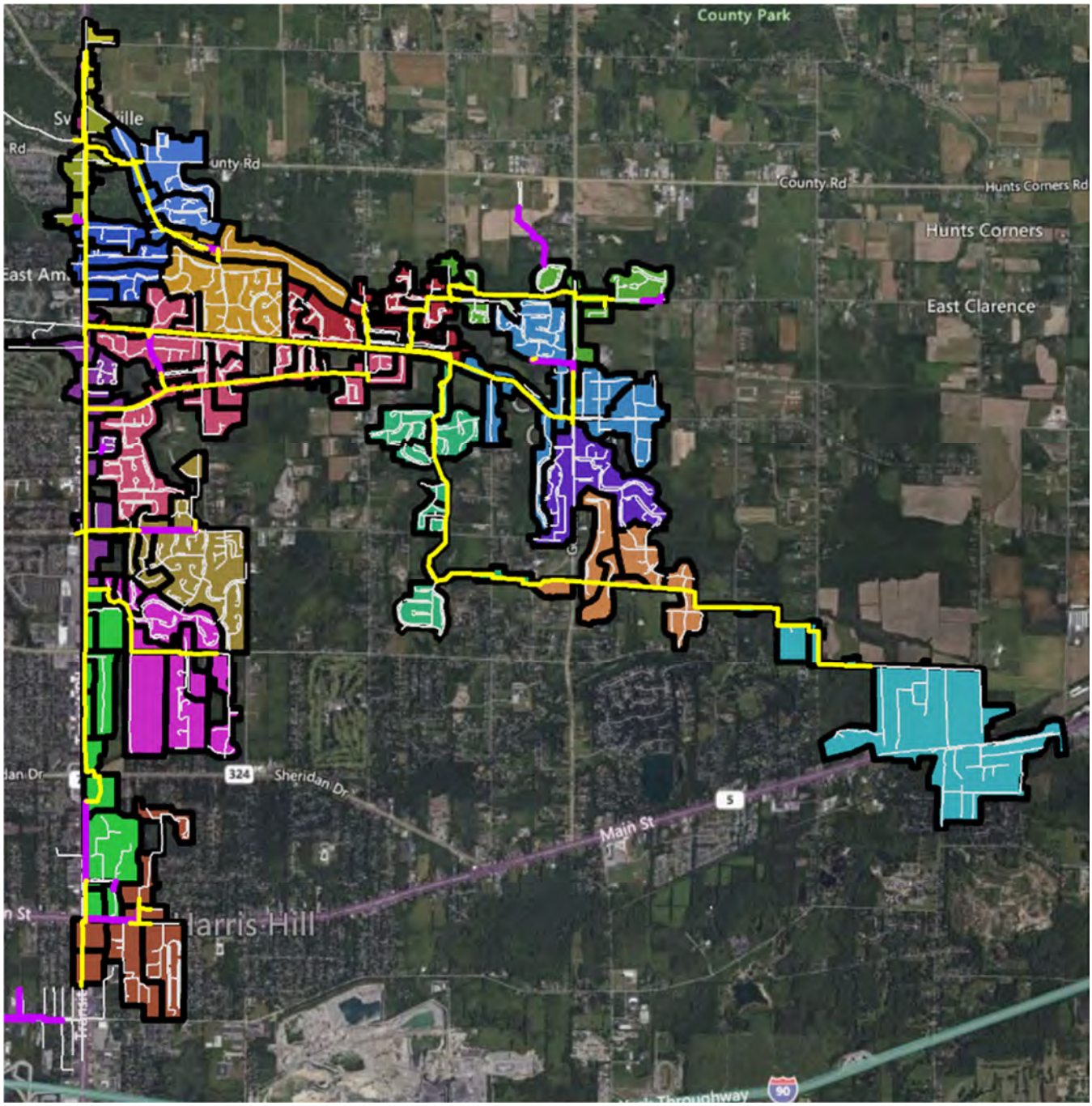


Figure 4-3: Delineated Subcatchments for the Model Expansion

To model the Rainfall-Derived Inflow and Infiltration (RDII) response captured during rainfall events, the standard RTK approach was used. Each subcatchment was assigned to a meter basin based on the flow meters used during the calibration, with RTK parameter values defined for each meter basin. The seasonality of the RDII response was accounted for by defining three unique sets of RTK parameter values for each meter based on the time of the year:

- Summer months (June-August)
- Winter months (November-March)
- Transitional Months (April-May, September-October)

Flow data collected as part of the ECDSM's and the Town of Clarence's Inflow and Infiltration Evaluation in 2019 were used to calibrate the model. During calibration, thirteen of the sixteen meters installed as part of the 2019 monitoring effort were used, along with data from the permanent billing meters at Dodge Road and the Peanut Line. The following temporary meters were not used for calibration due to inconsistent and unreliable data:

- Meter 8
- Meter 9
- Meter 13

The locations of the meters used during the calibration are shown on Figure 4-2.

As an example of the model calibration, Figure 4-4 depicts the modeled (blue) vs. monitored (red) calibration results for one of the meters – Meter 3 (the downstream meter on the Transit Road Sewer).

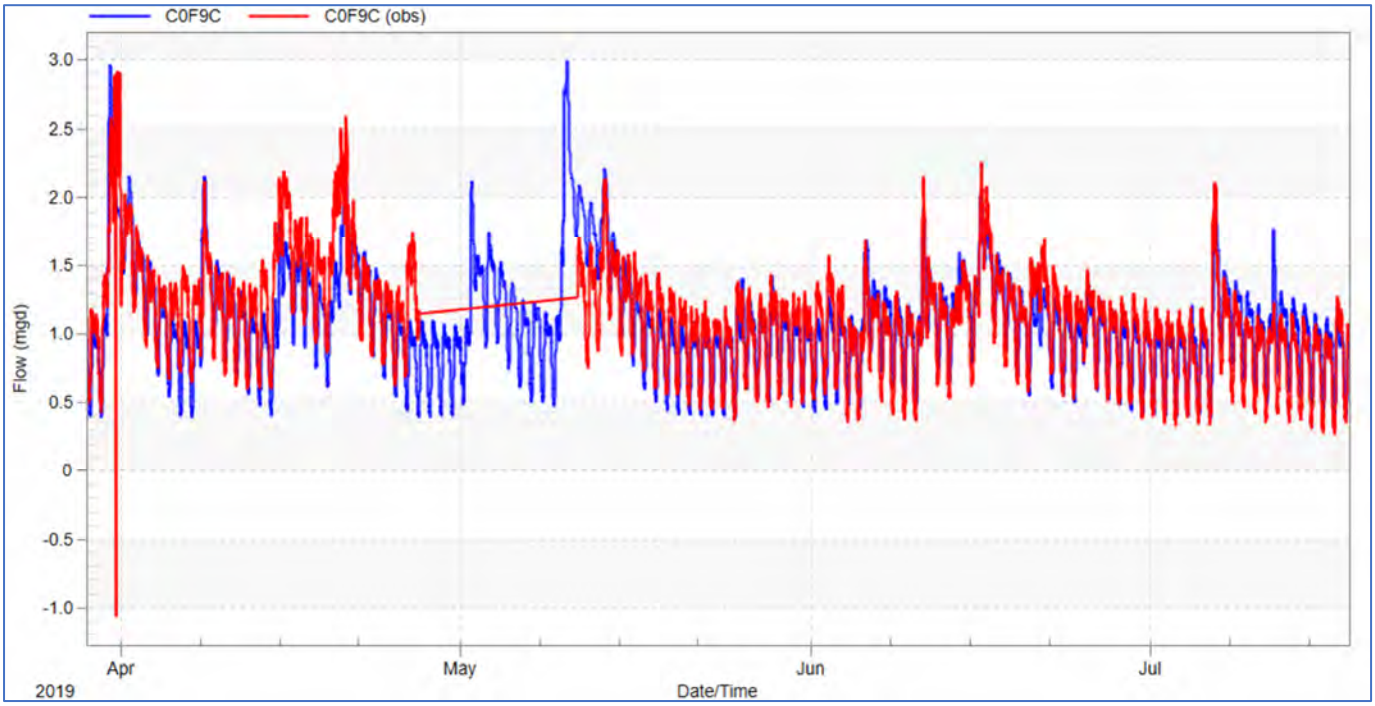


Figure 4-4: Calibration Results for Meter 3

Note that calibration of the model was completed for the time period prior to the removal of the Klein/Transit weir in August 2022, as the original weir position was in place during the 2019 monitoring. The additional flow resulting from the weir removal is accounted for in the Town of Amherst's model and impacts the existing 30-inch diameter Peanut Line sewer west of Paradise Road. The removal of the weir was, in part, to allow for various proposed / in-progress developments in the Transit Road corridor to alleviate capacity concerns with the Dodge Road Interceptor.

After the model was calibrated, a 5-year, 6-hour SCS Type II design storm was used to evaluate conditions within the collection system, as that was the basis for the Town of Amherst in determining the 8.8 MGD capacity of the 30-inch diameter Peanut Line sewer. As indicated previously, any flows beyond 8.8 MGD were deemed previously by the Town of Amherst to cause surcharging issues further downstream in their collection system.

Model results are discussed in various locations in the report.

4.3 Critical Factors Affecting Scenario and Option Identification

The following section covers considerations used in identifying and further evaluating potential options and scenarios for optimizing the extension of public sanitary sewers, while still trying to avoid and/or mitigate adverse effects elsewhere. These factors are discussed individually below and include:

- Calibrated Model Considerations
- Dodge Road Interceptor Overloading
- Elevation Differences between the Existing 18-inch Peanut Line Sewer and the new 24-inch Parallel Peanut Line Sewer
- Eastern Hills Mall Redevelopment Options
- Utility Conflicts
- Potential Transit Road Capacity Restrictions
- Connection of Outlying Potential Future Town Districts' extension to Heise Brookhaven Trunk Sewer

4.3.1 Calibrated Model Considerations

While Section 4.1 discussed the basis of evaluation flows in a general sense, the use of a collection system model calibrated with Erie County data measured continuously over 6 months resulted in simulations in which flows were adjusted on a dynamic basis to minimize the potential for surcharging that cannot be fully captured by using the single peak flows noted in Tables 4-1 and 4-2. Therefore, many preliminary model runs were initially completed that are not included within this report for the purposes of "balancing" both existing and estimated future flows to prevent surcharging before arriving at more viable scenarios. However, it is noted that some of the discussions later in this report do involve solutions that are not completely viable, but are discussed to show the evolution from unfeasible to feasible solutions and how various "tweaks" can affect the viability of the proposed improvements. Some scenarios were also identified and evaluated that give insight as to what modifications may be required in the future to accommodate development areas that are not accommodated currently.

A dynamic collection system model and point flow values represent different approaches to analyzing and managing data. A dynamic collection system model incorporates:

- Handling of system complexities by considering the dynamic nature of systems over time. It often involves considering variables that change or evolve, such as instantaneous flow conditions and time of travel calculations within the collection system.

- Interdependencies among various elements within the system and how these relationships evolve over time. For instance, how flows in one stretch of pipe affect the flows within another pipe, especially where hydraulic conditions in one pipe may result in surcharging of an adjacent pipe.

- Adaptability and flexibility in response to changes and uncertainties. It might use simulations, algorithms, or dynamic optimization techniques to adjust strategies based on real-time or predicted changes.

- Feedback loops and improvements to adapt to changing conditions.

In contrast, point flow values:

- Focus on specific instances or points in a system at a particular moment. They capture the flow at a specific time and location without considering broader dynamics or changes over time.

- Provide a snapshot of a system offering insights into the rate of flow passing through specific points or nodes at a given time.
- Are useful for immediate assessment or analysis of a system's state at a fixed moment. For example, they might represent the average flow passing through the collection system over a day.
- May not inherently incorporate ongoing changes or adaptability needed to handle evolving scenarios or long-term trends.

In essence, while point flow values provide a static snapshot of quantities at a given time and place, a dynamic collection system model encompasses a more holistic and adaptable view of how various portions of collection systems evolve and interact over time, considering various interdependencies and adaptability to changing conditions. It is for this reason that JMD used a collection system model to assess pipe conditions more appropriately under varying flow scenarios. More discussion on how the model was configured and calibrated is presented in Section 5.

4.3.2 Dodge Road Interceptor Overloading

The Dodge Road Interceptor is at capacity due to substandard slopes and surcharges during peak conditions, as reported by the Town of Amherst. One driver behind construction of the proposed 24-inch parallel Peanut Line Sewer was to remove a portion of the flow from these sewer reaches via an adjustable 24-inch diameter gate valve (Figure 4-5) and redirect it to the new 24-inch parallel Peanut Line Sewer to mitigate against excessive surcharge conditions. Based on the point values discussed in Section 4.1 and listed in Table 4-2 (Dodge Diversion), The Town of Amherst anticipated that approximately 0.9 MGD will be diverted from the Transit Road sewer to the Parallel Peanut Line Sewer at the proposed valve chamber once it is installed.

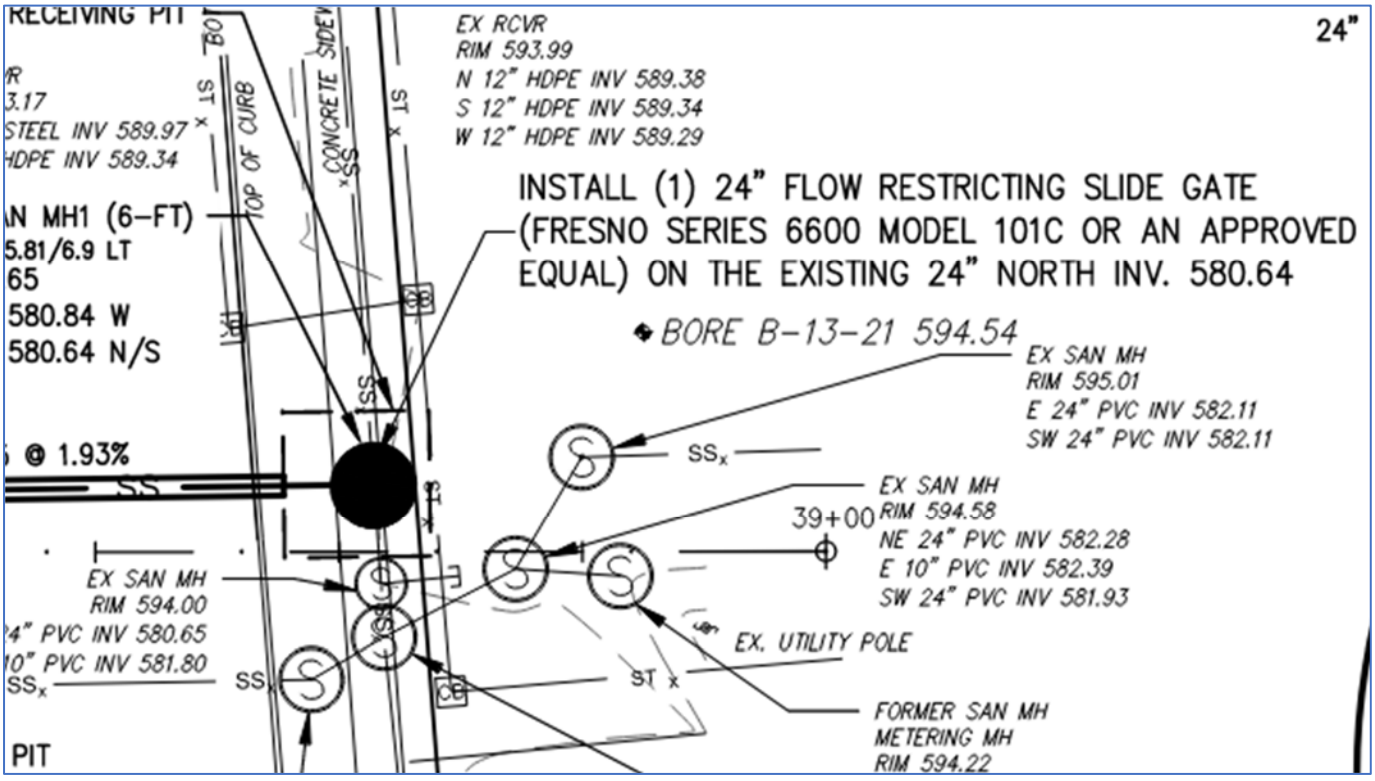


Figure 4-5: Proposed Flow Diversion Manhole on the Transit Line Sewer at the Peanut Line

As part of the modeling effort completed for this project, the project team looked at the existing Dodge Road Interceptor and the Transit Road Sewer upstream of Dodge Road under various scenarios, both with and without the Parallel Peanut Line sewer in service, to confirm the suspected capacity constraints and determine the impact the Parallel Peanut Line sewer will have on alleviating this issue. The following three model scenarios related to the Dodge Road Interceptor are shown in Figure 4-6:

1. When only existing flows are considered and the Parallel Peanut Line sewer is not included in the modeled scenario, the hydraulic grade line is higher than the sewer crown, as shown by the blue line. This indicates surcharging and confirms the Town of Amherst's observations.

2. The green line indicates the position of the hydraulic grade line in the Dodge Road Interceptor when only existing flows are considered, the Parallel Peanut Line sewer has been constructed, and a peak flow of approximately 2.6 MGD of flow is diverted by the Transit Road valve at 11% open. This is equivalent to an 8-inch diameter orifice and was the default setting when the model was received from the Town of Amherst. This results in a total flow in the 24-inch Parallel Peanut Line sewer of 3.9 MGD.

3. If the Parallel Peanut Line sewer is included in the model and all proposed new development flows are added, the hydraulic grade line, shown in red, also indicates surcharging. While adjusting the gate valve to restrict flow to the Dodge Road Interceptor would relieve its surcharging, those flows (approximately 4.1 MGD) would be diverted to the Parallel Peanut Line sewer for a total flow of 5.7 MGD within the Parallel Peanut Line.

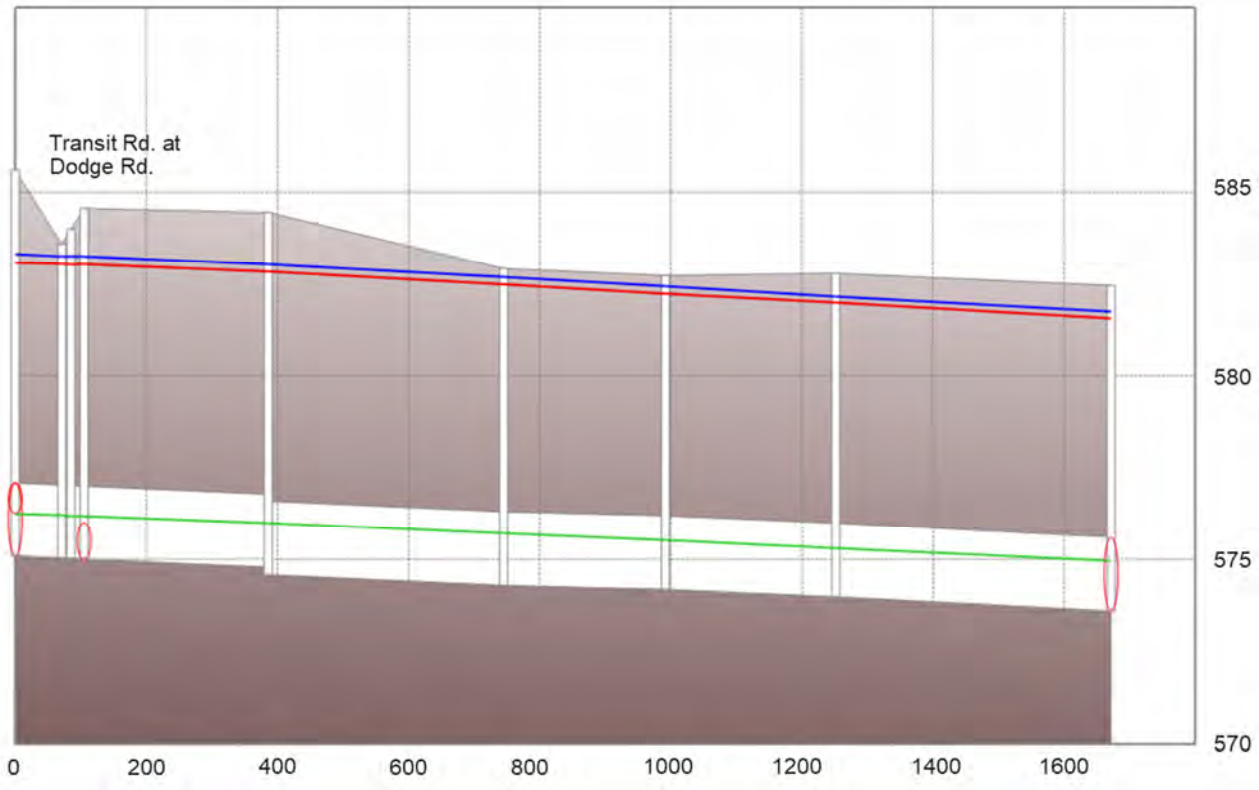


Figure 4-6: Peak Hydraulic Grade Line for Dodge Road Interceptor West of Transit Road

Note: Hydraulic Grade Line shown for Existing Conditions without the Parallel Peanut Line (blue), Proposed Diversion with Parallel Peanut Line with no other flows (green), and for Proposed Conditions with all projected additional flows (red).

The same effect happens with the Transit Road sewer upstream of the Dodge Road Interceptor, as shown at the far right in Figure 4-7. Without the parallel Peanut Line implementation, hydraulic restrictions remain even with existing flows as indicated by the blue hydraulic grade line. With the construction of the Parallel Peanut Line sewer, significant relief of surcharging in this section of sewer is expected to occur, as shown by the green line. However, when flows other than the Dodge Road diversion are added to the Parallel Peanut Line sewer (Harris Hill, Main Street, Eastern Hills Mall Redevelopment, etc.), surcharging of both the Dodge Road Interceptor and the Transit Road sewer upstream of the Dodge Road Interceptor may still occur.

Regardless of how much flow from the proposed developments is added to the Peanut Line Sewers, diversion of flow at the Parallel Peanut Line Sewer (or elsewhere) is still necessary to mitigate surcharging of the Dodge Road Interceptor.

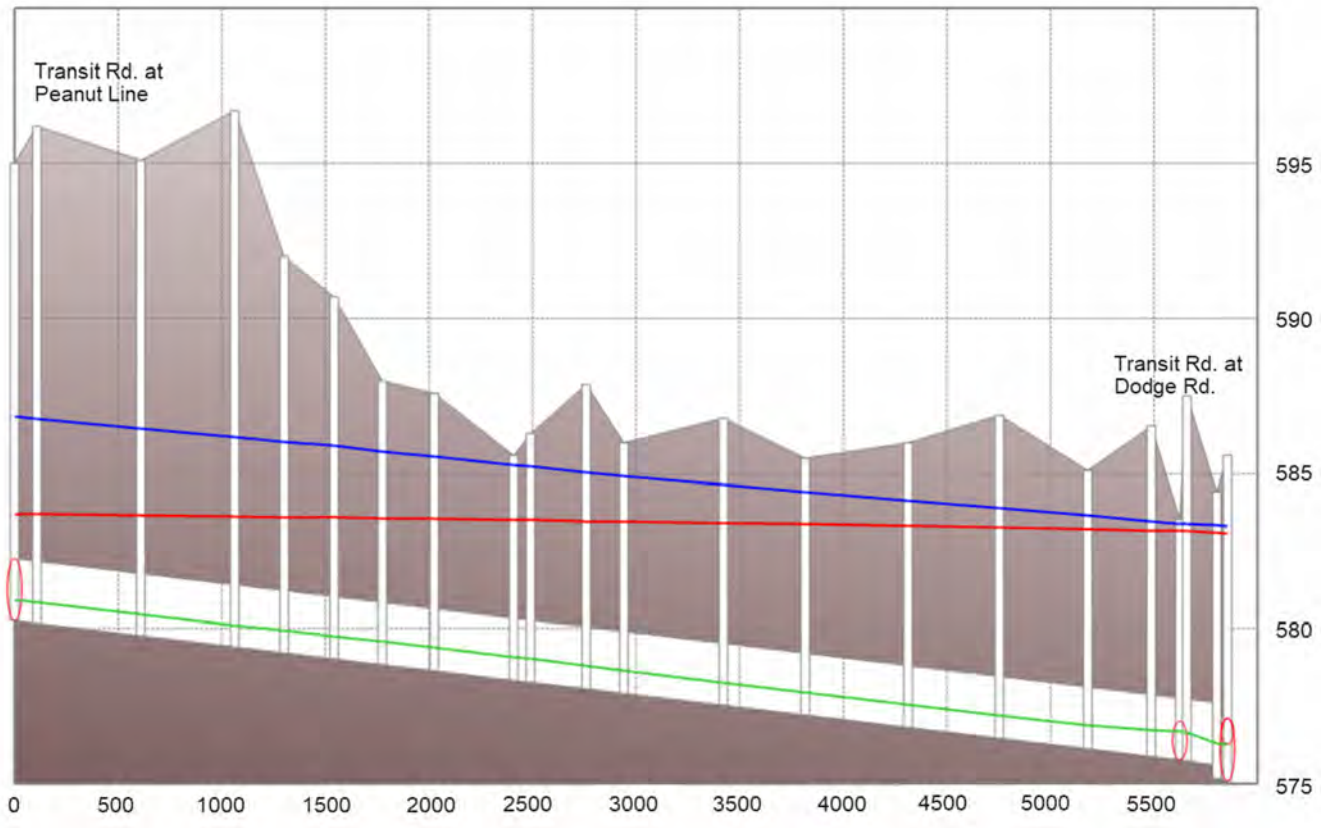


Figure 4-7: Peak HGL for Transit Road Sewer Upstream of Dodge Road

Note: Hydraulic Grade Line shown for Existing Conditions without the Parallel Peanut Line (blue line), Existing Conditions with the Parallel Peanut line (green line), and for Proposed Conditions with the Parallel Peanut Line (red line).

4.3.3 Klein Road Diversion

As indicated previously, the weir formerly located within a chamber at the intersection of Klein Road and Transit Road was removed to allow more flow from the Transit Road sewer to be diverted down Klein Road directly to the 30-inch Peanut Line Sewer without passing through either the existing 18-inch Peanut Line or the proposed 24-inch Parallel Peanut Line. Figure 4-8 shows that currently, for the 5-year, 6-hr. storm event, flows are easily accommodated within the Klein Road Diversion Sewer without surcharging. If the flow within the sewer system is

increased to accommodate all anticipated future flows as shown in Table 4-2, there is some surcharging of the pipe, but only a foot or two above the crown of the pipe, and well below grade. Therefore, no significant adverse effects are anticipated.

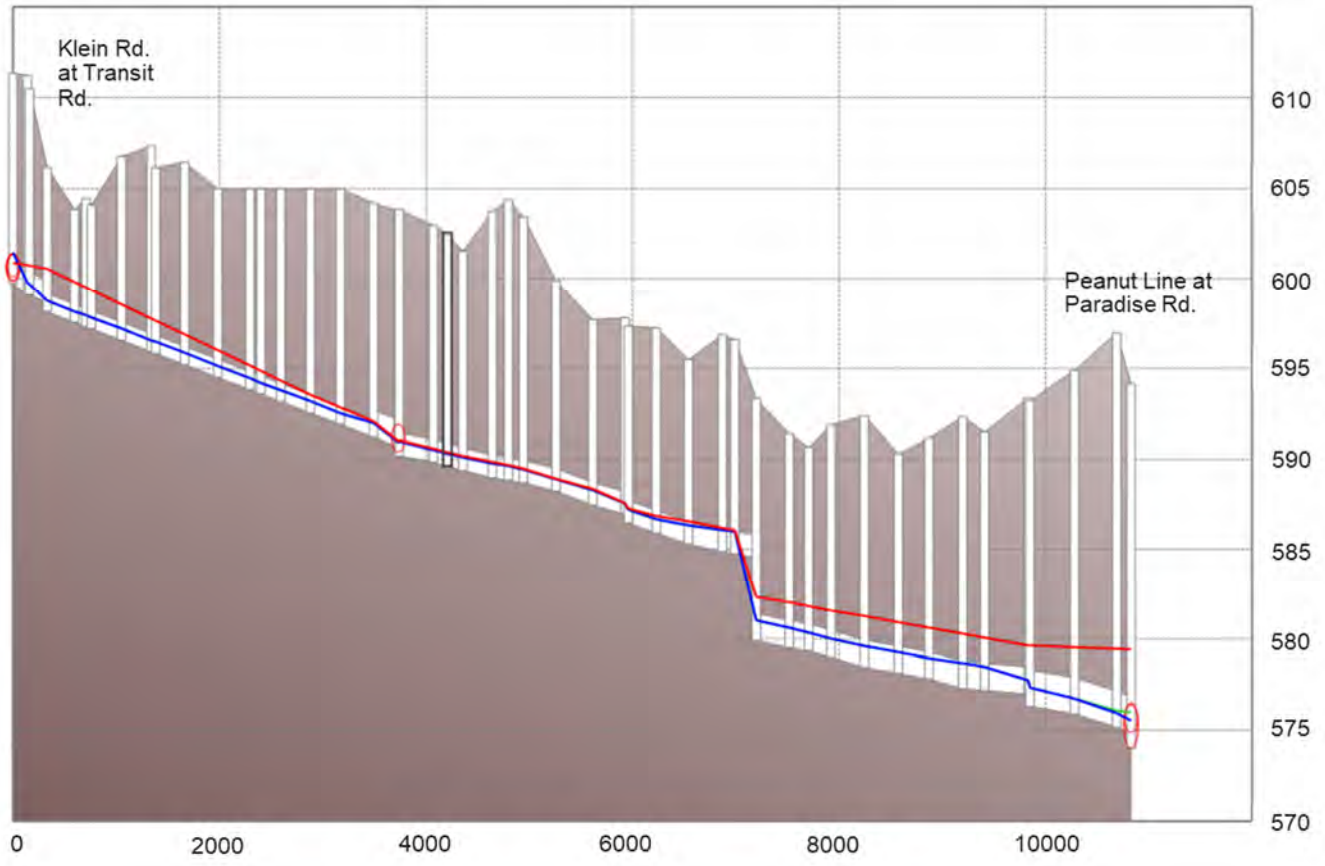


Figure 4-8: Peak HGL for Klein Road Sewer Upstream of the 30-inch Peanut Line sewer

Note: Hydraulic Grade Line shown for Existing Flow Conditions (blue line) and Proposed Conditions with all Future Flows considered (red line).

4.3.4 Elevation Differences between the Existing 18-inch Peanut Line Sewer and the New 24-inch Parallel Peanut Line Sewer

The design of the new 24-inch Parallel Peanut Line Sewer sets it at a lower elevation (invert 578.54) than the existing 18-inch Peanut Line Sewer (invert 581.29), by ~2.75 feet, as shown in Figure 4-9. This was done to 1) allow the Parallel Peanut Line Sewer to receive flow from the Transit Sewer to relieve the Dodge Road Interceptor as discussed above, and 2) allow for flow from the existing 18-inch Peanut Line Sewer to be diverted to the 24-inch Parallel Peanut Line Sewer to provide additional flexibility in system operation. The proposed interconnection between the existing 18-inch and proposed 24-inch Peanut Line Sewer is shown in Figure 4-10. This interconnection is to be controlled by an 18-inch diameter gate valve installed on the west invert of the intersection manhole to allow flow from the 18-inch to be restricted or completely shut off and flow diverted to the 24-inch Parallel Peanut Line Sewer.

During the evaluation of scenarios using the collection system model, this interconnection was used in certain scenarios to maintain appropriate hydraulic grade lines both in the Peanut Line Sewers and the downstream 30-inch Peanut Line Sewer, while not surcharging upstream sewers.

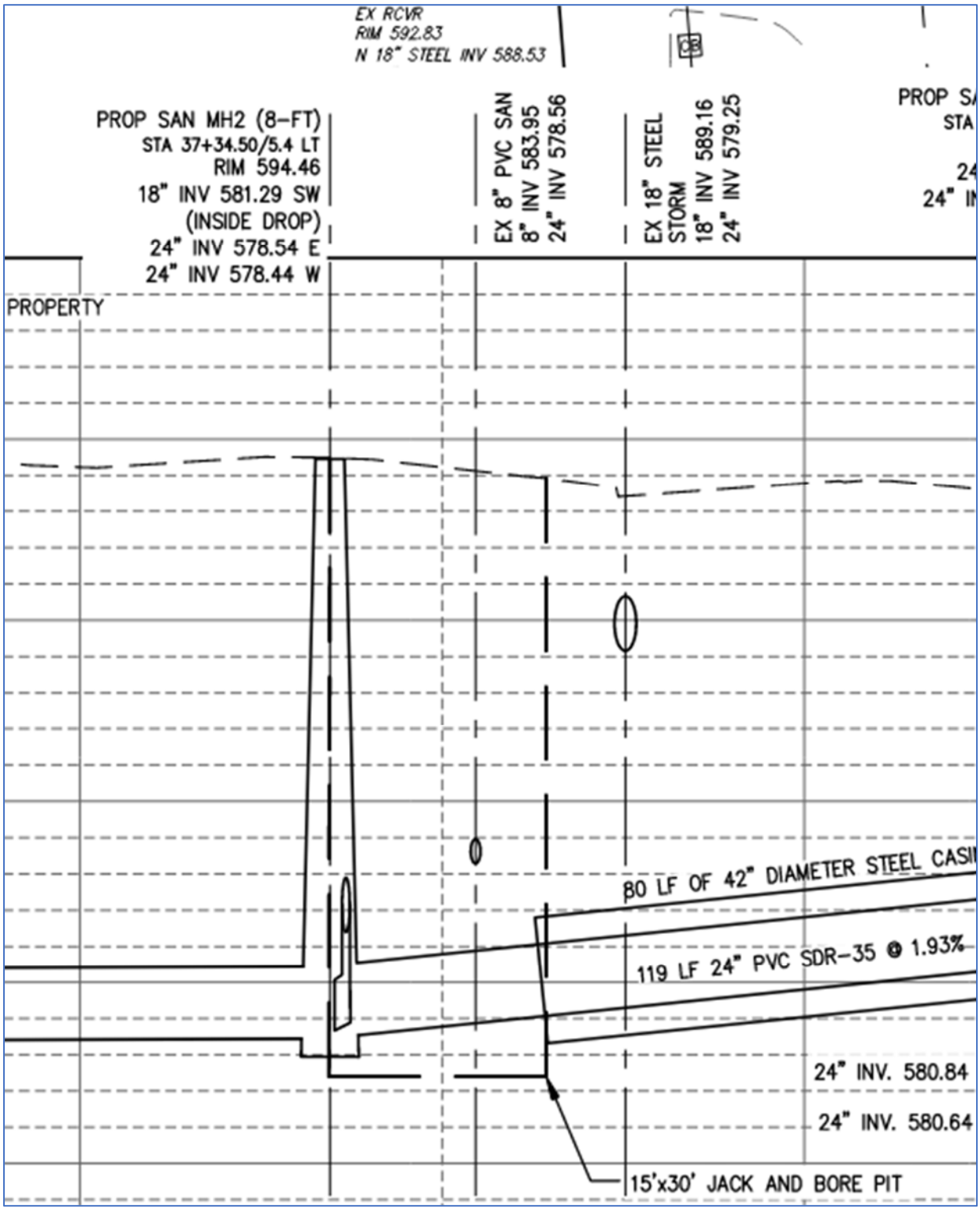


Figure 4-9: Profile of interconnection Line at Proposed MH2

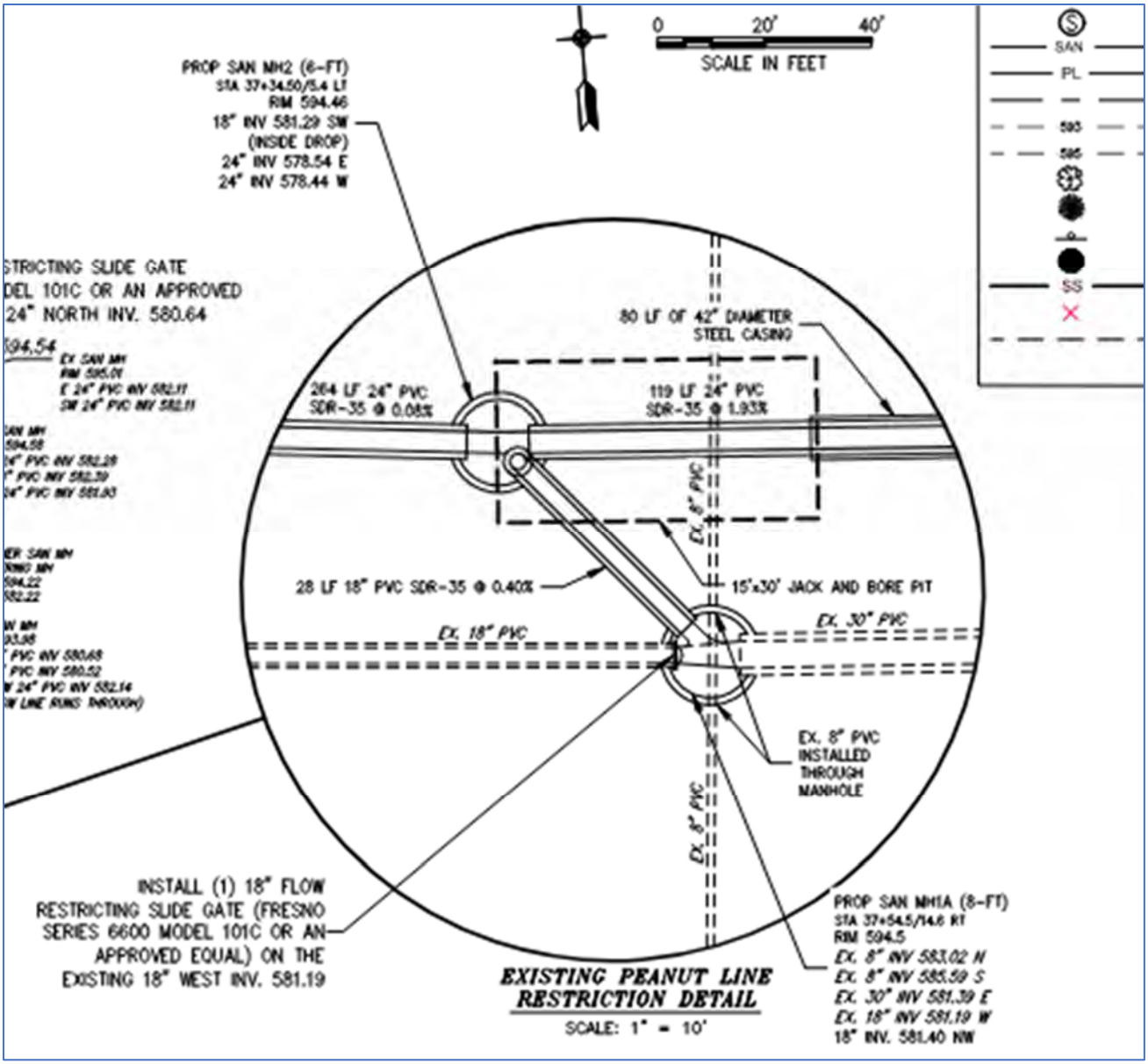


Figure 4-10: Plan of the Peanut Line Interconnection

4.3.5 Eastern Hills Mall Redevelopment Options

Options generated for conveying flow from the new Eastern Hills Mall Redevelopment Project consider both gravity and pumping station / force main options and include a mix of either a new enlarged EHPS located adjacent to the existing one, or a new EHPS located near the corner of Sheridan Drive and Harris Hill Road. However, the fate of the EHPS also affects the fate of the BSPS, which services the neighborhood in ECSD5 near Transit Road between Main Street and Wehrle Drive, and therefore, several options were identified as shown on Figure 4-11 and discussed in the following pages. These alternatives are:

- Option 1A – Elimination of the EHPS and the BSPS and installation of gravity sewers from the location of each pump station to the Harris Hill Road/Sheridan Drive intersection

- Option 1B – Replacement of the EHPS and install a new 12-inch diameter force main to the Harris Hill Road/ Sheridan Drive intersection. Under this option, the BSPS would continue to operate as it currently does, conveying flow to the gravity sewers upstream of the EHPS.
- Option 2 – Installation of a new gravity sewer from the Harris Hill Road/Sheridan Drive intersection through the Gypsum Property to the existing 24-inch Clarence Peanut Line.
- Option 3 – Construction of a new pump station at the Harris Hill Road/ Sheridan Drive intersection to convey all flows generated south of Sheridan Drive via a new 15-inch diameter force main to the 24-inch Clarence Peanut Line Sewer
- Option 4- Installation of a new pump station at the Eastern Hills Mall site and a new 12-inch diameter force main north along Transit Road to the 24-inch Parallel Peanut Line.

There are some interdependencies among the options which include:

- If Option 1A or Option 1B is selected, Option 2 or Option 3 would also have to be selected.
- If Option 4 is selected, no other option for serving the Eastern Hills Mall Redevelopment is necessary. Other sewer infrastructure could still be built to benefit the other sewer improvements proposed as part of the Clarence Sewer Master Plan, but that work would be independent from the timeline for the Eastern Hills Mall Redevelopment Project.

In addition to the Eastern Hills Mall Redevelopment sewer flows, additional sewer flow from the improvements proposed by the Town of Clarence in their Sewer Master Plan for the Harris Hill / Main Street area are also taken into consideration as part of the sizing for Options 2 and 3 (refer to flow projections in Table 4-2). The Sheridan Drive and Harris Hill Road intersection was selected as a break point between Options 1A/1B and Options 2/3 because this is the location where the 2013 study prepared for the Harris Hill / Main Street area identified sewer flows that would outlet to a future Harris Hill Road interceptor sewer for final conveyance to the Peanut Line sewer. Options 2 and 3 would serve as this future conveyance and could offer benefits to both the Eastern Hills Mall Redevelopment Project and Harris Hill / Main Street area sewer improvements project. Alternatively, the Eastern Hills Mall Redevelopment flows could be conveyed to the Peanut Line sewers separately from the Harris Hill / Main Street flows. It is noted that the 24-inch Clarence Peanut Line Sewer currently has future allocations for the Harris Hill / Main Street flows but does not have sufficient capacity for the Eastern Hills Mall Redevelopment flows.

Note that all options for the Eastern Hills Mall Redevelopment assume conveyance of sewer flows for the full buildout of all three phases of the project. Approximately 60% of the full buildout sewer flow comes from the implementation of Phase 1 of the project. Phase 2 will contribute an additional 10% of the full buildout flow, and the final buildout represents the last 30% of the full buildout flow. Given that most of the flow capacity of the project is required with the implementation of Phase 1, options to phase capacity or size conveyance to the phases of the development project would likely require significant re-work of newly installed components and hence were not considered.

For the gravity sewer options, pipe diameter and slopes were selected to convey the required tributary flows while following the existing topography of the sewer route and achieving minimum cover over the pipe as it crosses under drainage features and existing sewer infrastructure along the way.

30"
18"
24"
24"
12"
12"
24"
CLARENCE CENTER RD
18"
PARADISE RD
18"
15"
KLEIN RD
ROLL RD
RENAISSANCE DR
TRANSIT RD
OPTION 4 - 12" FORCEMAIN DOWN TRANSIT ROAD TRAVEL LANE
OPTION 2 - GRAVITY FROM HARRIS HILL INTERSECTION PEANUT LINE THROUGH GYPSUM PROPERTY
18"
MAPLE RD
12"
GREINER RD
12"
HARRIS HILL RD
SHERIDAN DR
SHERIDAN DR
15"
OPTION 3 - NEW PS AT HARRIS HILL / SHERIDAN DR AND 15" FORCE MAIN TO PEANUT LINE
OPTION 1A - ELIMINATE EHPS AND BSPS AND INSTALL GRAVITY SEWERS FROM EACH TO HARRIS HILL / SHERIDAN DR INTERSECTION
OPTION 1B - REPLACE EASTERN HILLS PUMP STATION AND INSTALL NEW 12" FORCE MAIN TO HARRIS HILL / SHERIDAN DR INTERSECTION
15"
12"
MAIN ST
12"

LEGEND

- Option 1A Eastern Hills Gravity Sewer
- Option 1B Eastern Hills Force Main
- Option 2 Harris Hill Gravity Sewer
- Option 3 Harris Hill Force Main
- Option 4 Transit Force Main
- Existing Gravity Sewers >= 12 in Diameter
- New Pump Station

0 0.5 1 mi

FIGURE 4-11

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

TRANSIT ROAD AREA SEWER OPTIONS

JMDavidson Engineering, D.P.C.

4.3.5.1 Option 1 – Convey Flows from Existing EHPS and BSPS by gravity to Harris Hill Road/Sheridan Drive Intersection

Option 1A – Eliminate both pump stations and convey flow by gravity sewer from existing pump stations to Harris Hill Road/Sheridan Drive intersection

Under this option, it is assumed that flows tributary to the EHPS and BSPS would continue to flow by gravity to the existing pump stations' locations. The pump stations would then be eliminated and flows from both stations would be conveyed by gravity to the Harris Hill Road/Sheridan Drive intersection. The basic concept is shown on the left side of Figure 4-12.

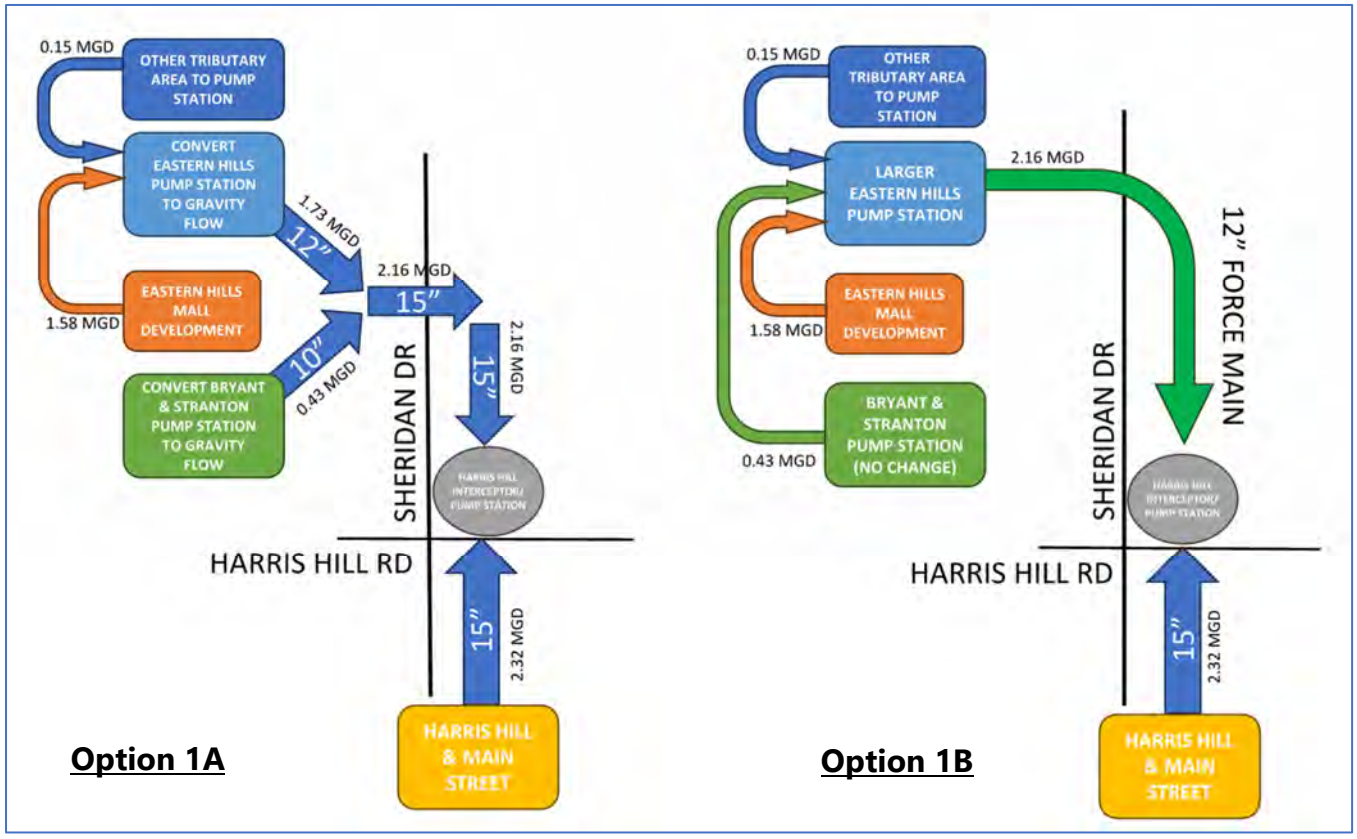


Figure 4-12: Schematic Showing Option 1A (left) and Option 1B (right)

Whereas new flows from the Eastern Hills Mall Development and the tributary neighborhood would continue to flow to the existing EHPS site as a point of collection, a new 12-inch gravity sewer would convey flow from there to the northern portion of the existing Eastern Hills Mall Site. A separate 10-inch gravity sewer from the existing BSPS location would also convey flows from the BSPS tributary area to the northern portion of the mall site. Flow would then be combined at a common manhole and conveyed via a 15-inch diameter gravity sewer to the Harris Hill Road/Sheridan Drive intersection.

The proposed invert at Harris Hill Road and Sheridan Drive was set in the 2013 Harris Hill Sanitary Sewer Cost Analysis, which completed the preliminary design of a sanitary sewer collection system to serve the Harris Hill Road/Main Street Area and is controlled by the inlet sewer coming from the east in the proposed Harris Hill collection system. That analysis contemplated a mainly gravity sanitary sewer collection system, with a small pump station to convey a portion of the flow near the intersection of Harris Hill Road and Wehrle Drive, with a 15-inch

gravity sewer conveying flow to the Harris Hill Road/Sheridan Drive intersection. As indicated previously, it is the intent of the Town of Clarence to provide public sanitary sewer service to the Harris Hill/Main Street area in the future to eliminate numerous, aged private septic systems.

As noted in Section 4.3.4, Options 1A and 1B only consider the cost and constructability to get flows to the intersection of Sheridan Drive and Harris Hill Road, at which point Option 2 or Option 3 would then have to be implemented to continue conveying flow from the Harris Hill Road/Sheridan Drive intersection to the 24-inch Parallel Peanut Line Sewer. Option 1A is possible because the proposed invert elevation at the corner of Harris Hill and Sheridan Drive is approximately 25 feet lower than the invert elevations of both the EHPS and ESPS. However, as shown on Figure 4-13, the depth of gravity sewers would be significant, with the deepest portions over 40 feet below grade.

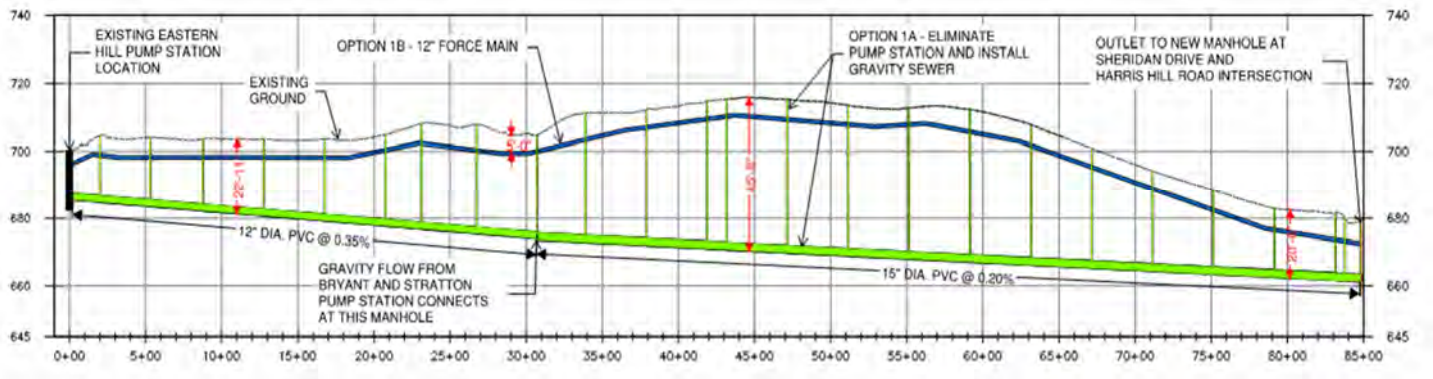


Figure 4-13: Profile of Option 1A - Proposed Gravity Sewer (green) and Option 1B - Force Main Sewer (blue) from EHPS

Advantages of Option 1A include:

- Elimination of two pump stations within ECSD5, leading to decreased O&M costs, mainly in terms of energy use and staff labor in maintaining the pump stations.
- Still allows for the gravity collection of flows in the neighborhoods upstream of the pump stations to the existing station sites, resulting in little or no realignment of existing upstream gravity collector sewers.
- Allows for the flows from BSPS and EHPS to be conveyed into a new sewer corridor along Harris Hill Road that could also function to serve the Harris Hill/Main Street area in the future.

Disadvantages of Option 1A include:

- Construction of deep gravity sewers in rock with depths over 40 feet, which make for challenging construction and difficult access in the future. Costs for rock trenching or tunneling would make the effort extremely expensive.
- Constructability will be a challenge especially from the perspective of handling groundwater, as the 40-foot rock trench will function like a large underdrain. Clay dams could be used to mitigate some of the water movement but managing all the problems associated with the deep excavation work will add substantial cost to the option.

Option 1B – BSPS would continue operation to convey flow to EHPS and the EHPS will be replaced and enlarged to handle existing flows plus the flows from the Eastern Hills Mall Redevelopment

Option 1B would maintain the existing BSPS in operation and continue to convey flows to the gravity system upstream of the EHPS. A new upsized EHPS would be constructed close to the location of the existing pump station

to convey the existing BSPS/EHPS tributary flows plus the additional flows required by the Eastern Hills Mall Redevelopment project. A schematic of this option is included in Figure 4-11.

The routing of the proposed force main would follow the same routing as the gravity sewer routing in Option 1A but would result in much less rock excavation, as the force main would only need a minimum five feet of cover as shown in Figure 4-13, making the trenches shallower and therefore less costly than the gravity sewer. However, this option does not eliminate the pump stations and ECSD5 would need to continue maintaining both the BSPS and EHPS.

A modification of this alternative could also be considered to eliminate the BSPS (Option 1B.Alt), if the new sewer system for the Eastern Hills Mall Redevelopment were designed deep enough by the property developer to capture flows from the gravity system upstream of the BSPS for conveyance to the new EHPS wet well. However, this would require the installation of fairly deep gravity sewers (similar to those projected for Option 1A) from the BSPS location to the new EHPS wet well. However, the total length of gravity sewer from the existing BSPS location to the EHPS (~2,670 feet) would be shorter than that envisioned for Option 1A.

The proposed EHPS wet well and force main would be sized to allow for the full buildout of all three phases of the Eastern Hills Mall Redevelopment, but the station could be adapted for the varying flows estimated from the three phases through the use of three or more pumps with variable speed controls, or the provision of two pumps initially to handle Phase 1 flows, with replacement of the pumps if and when Phases 2 and 3 are implemented. The proposed operating points of the pumps are provided in Table 4-4 for two different force main sizes and account for existing flows from the BHPS, the neighborhood near Transit Road between Main Street and Wehrle Drive, and the projected Eastern Hill Mall Redevelopment flows and longer force main.

Table 4-4: Summary of Design Points for Expanded Eastern Hills Pump Station and Longer Force Main under Option 1B

Phase	Flow		Total Discharge Head (12-inch force main)		Total Discharge Head (14-inch force main)	
Phase 1	1597	gpm	90.3	ft TDH	57.9	ft TDH
Phase 2	1770	gpm	103.2	ft TDH	64.0	ft TDH
Phase 3	2251	gpm	144.8	ft TDH	83.6	ft TDH

Note: Flows from Uniland Redevelopment Master Plan, Appendix C3.

Advantages of Option 1B include:

- Existing BSPS will remain the same, with no changes to operations and maintenance, unless the developer of the Eastern Hills Mall Redevelopment builds collection sewers deep enough to convey flow from both the redevelopment site and the BSPS tributary flows to the new EHPS wet well. If the sewers at the Eastern Hills Mall Redevelopment are designed and constructed deep enough, the BSPS could be eliminated.
- Still allows for the gravity collection of flows in the neighborhoods upstream of the pump stations to the existing station sites, resulting in little or no realignment of existing upstream gravity collector sewers.
- Installation of a new EHPS force main would be easier with shallower pipe trenches than the gravity sewer option, resulting in lower overall costs.

Disadvantages of Option 1B include:

- There is no potential for elimination of the EHPS under this option.
- EHPS would need to be enlarged to handle not only present-day flows, but also to convey the greater flows expected from the Eastern Hills Mall Redevelopment.

- Force mains would occasionally require pigging to maintain reliable working conditions, as a general best practice.
- The portion of force main along Sheridan Drive would potentially need to be installed along the shoulder of the road to avoid existing utilities already occupying the space between the pavement and right of way.

Alternatively, the EHPS could be relocated to the northern portion of the existing Eastern Hills Mall site, but as with Option 1A, new gravity sewers would be required from the existing EHPS and BSPS, which would involve fairly deep (~30-ft) excavation of pipe trenches in rock. Therefore, keeping the EHPS near its current location may result in the least amount of rock excavation and construction cost.

4.3.5.2 Option 2 – Convey flow from the Harris Hill Road/Sheridan Drive intersection to the 24-inch Parallel Peanut Line using a gravity sewer

This option involves the construction of a new gravity sewer from the corner of the Harris Hill Road/Sheridan Drive intersection to the 24-inch parallel Peanut Line Sewer, as shown in Figure 4-14 and the yellow line in Figure 4-11. The new gravity sewer would be comprised of 18-inch and 24-inch pipe (sized to ultimately handle both the Eastern Hills Mall Redevelopment Flows and the future peak flows from the Harris Hill/Main Street area) and would head north along Harris Hill Road up to Roll Road, and then would turn east and then north to avoid existing buildings. The sewer would generally follow the edge of existing parcels between Roll Road and Clarence Center Road to minimize impacts to the private lots. It would cross Clarence Center Road and then follow along the western property line of the Clarence Town Park and then finally head west along the existing 24-inch diameter Clarence Peanut Line Sewer in a parallel pipe, ending ultimately in the 24-inch Parallel Peanut Line Sewer. Alternatively, the Town of Clarence has indicated that space has always been allocated in the Clarence Peanut Line for future flows from Harris Hill and Main Street; however, capacity is not available in the Clarence Peanut Line for the Eastern Hills Mall Redevelopment flows in addition to those flows expected from the Harris Hill and Main Street areas. Therefore, if this alternative is implemented, separate gravity sewers may be required; one to carry flows from the Eastern Hills Mall Redevelopment directly to the 24-inch Parallel Peanut Line Sewer and a second to carry flows from the Harris Hill and Main Street areas to the existing 24-inch Clarence Peanut Line Sewer.

Installing gravity sewers on the east side of Harris Hill Road avoids the federal wetland on the northwest corner of the intersection with Sheridan Drive, as well as conflicts with other utilities such as water lines. However, it should be noted that there are overhead electric lines along portions of the east side of Harris Hill Road that would need to be considered during construction.

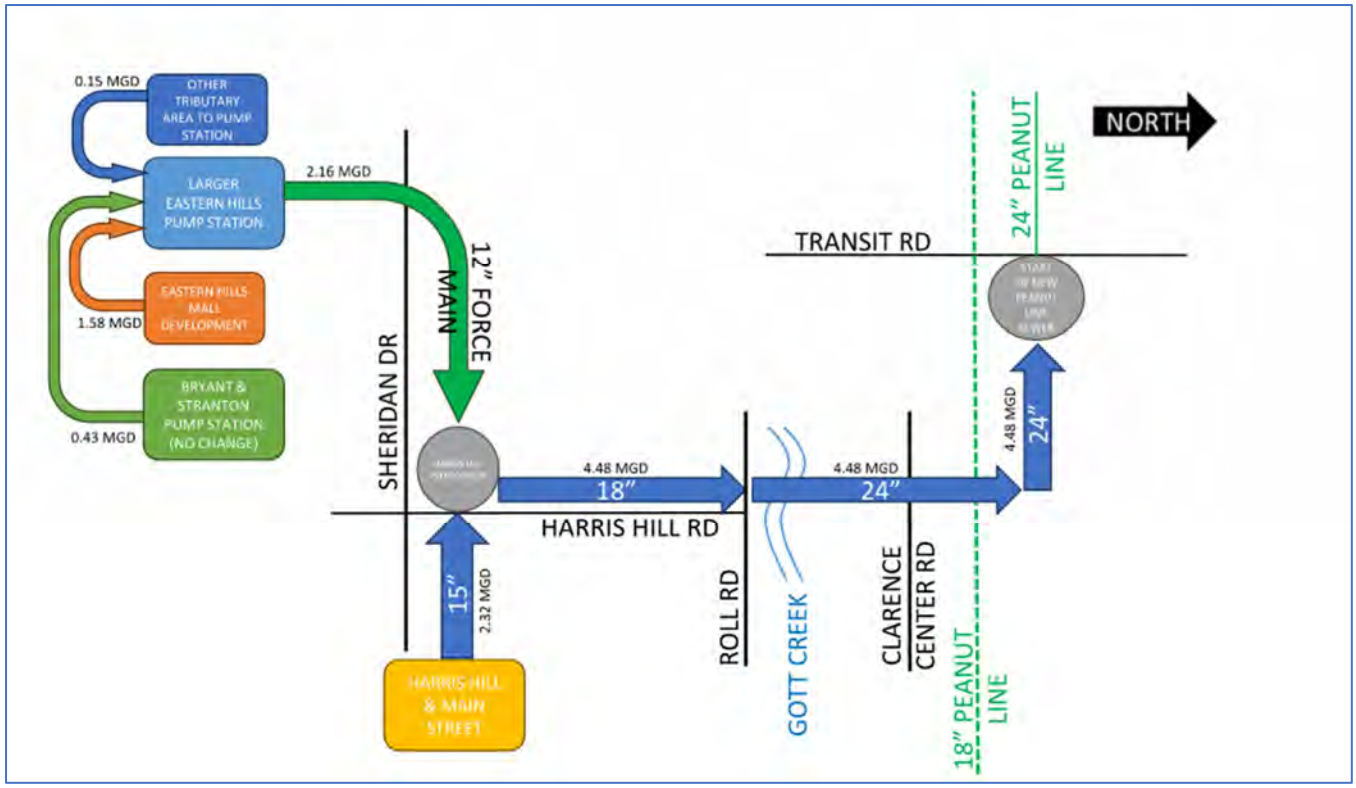


Figure 4-14: Schematic Showing Option 1B + Option 2

Other routes between Roll Road and the existing Peanut Line corridor were considered, including going north along Newhouse Road and snaking through the Highland Farms and Transit Valley Acres neighborhoods. However, the additional sewer lengths involved and the lack of cover at the crossing of Gott Creek made these routes less desirable. In general, any routing of sewers north from Harris Hill Road and Sheridan Drive to the Peanut Line Corridor will be impacted by a crossing with Gott Creek. The current routing shown as Option 2 was the only route that could accommodate a gravity sewer under the creek while still providing adequate soil cover and maintaining the appropriate elevations to ultimately connect to the 24-inch parallel Peanut Line sewer. A profile of Gott Creek that was prepared for a floodplain study is provided in Figure 4-15. As can be seen in this figure, any stream crossing with a gravity sewer west of Newhouse Road faces challenges with getting adequate cover, as the creek bed elevation drops significantly as it flows to the west. The gravity sewer in Option 2 was evaluated using LIDAR elevation data and found to be able to clear the creek crossing with enough soil cover to not require a pumping station. Other routes through the residential area to the west that were considered would have required a pumping station to convey flow across the creek, as the gravity sewer would have only had approximately one to two feet of cover, as shown in Figure 4-16.

Note that Option 2 would have to be implemented in conjunction with Option 1A or Option 1B.

Option 2 advantages include:

- Gravity sewers will result in minimal additional O&M costs, which would primarily include cleaning of the gravity sewers every few years, as may be necessary, and monitoring the system for leaks.

- The piping is sized for both the flows expected from the Eastern Hills Mall Redevelopment and for the future addition of the Harris Hill/Main Street Area flows, thereby providing additional benefit to the surrounding community and supporting the Town of Clarence Sewer Master Plan.
- Sewer vertical alignment follows grade, resulting in sewer depths that are much less than the gravity sewers of Option 1A. Also, as pipe installation moves from south to north, it is expected that rock depths will increase considerably, resulting in less rock excavation.

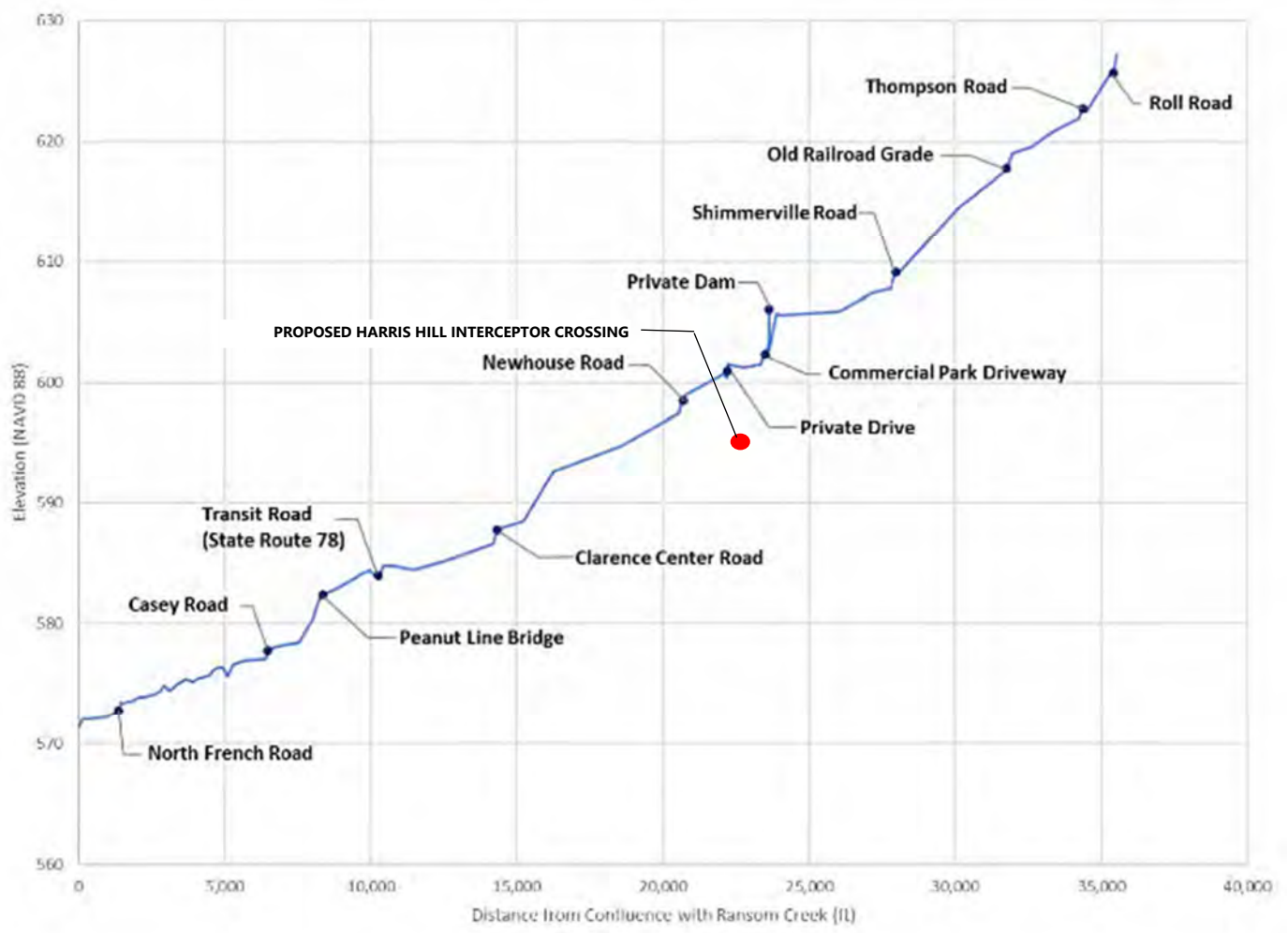


Figure 4-15: Gott Creek Area profile of Stream Bed Elevation and Channel Distance.

Source: Resilient New York Flood Mitigation, Gott Creek, New York, reported prepared by OBG and Gomez and Sullivan, 2021.

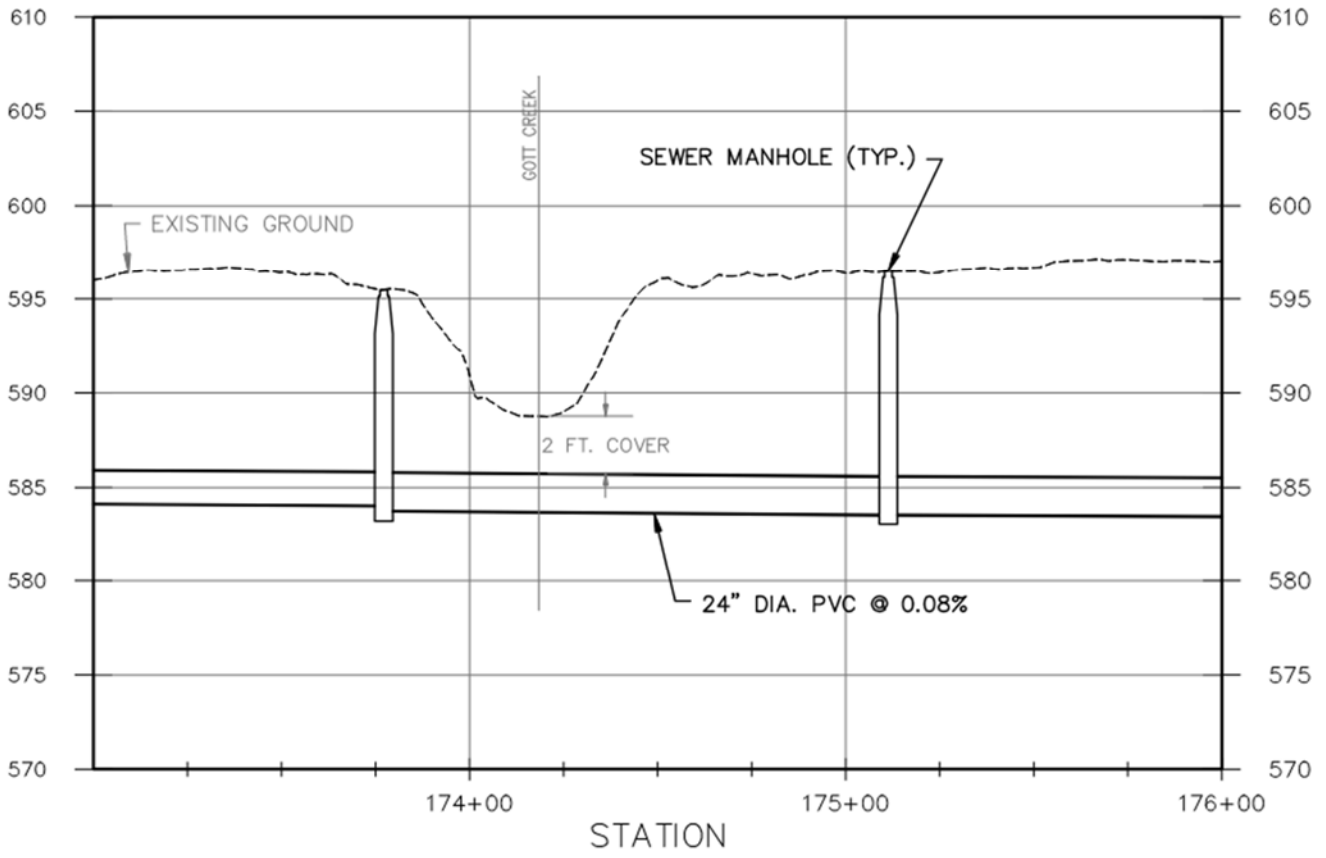


Figure 4-16: Typical Crossing of Gott Creek on Other Gravity Sewer Routes Considered Between Harris Hill Road and Transit Road

Option 2 disadvantages are:

- Significant upfront capital costs may be necessary to install the gravity sewer to handle not only the immediate future conditions, but also to add the Harris Hill/Main Street area in the long-term.
- Construction on the east side of the Harris Hill Road avoids water lines and local sewers on the west side of the road, but overhead electric lines will likely need to be supported during construction to allow for pipe installation.

4.3.5.3 Option 3 - Construct a New Pump Station at the Harris Hill Road/Sheridan Drive intersection and convey flow to the 24-inch Parallel Peanut Line in a force main

This option would involve the construction of a new pump station near the Harris Hill Road/Sheridan Drive intersection, which would then convey flow via a 16-inch force main to the parallel Peanut Line Sewer. The proposed pump station (estimated to convey peak flows of 4,827 gpm at 275-ft TDH) would receive flows from the existing EHPS tributary area either via gravity (Option 1A) or via force main (Option 1B), including flows from the BSPS, and would convey flow via force main to the Parallel Peanut Line Sewer at Transit Road, as shown in Figure 4-17. The force main would follow the same route as proposed for the gravity sewer option (Option 2), running along the east side of Harris Hill Road.

For the purposes of this evaluation, the proposed 16-inch force main was chosen to provide velocities of at least 2.55 fps (with implementation the first phase of the Eastern Hills Mall Redevelopment) to 7.7 fps (with the addition of the Harris Hill/Main Street flows in the future) at peak flow. These velocities fall within the preferred velocity ranges for force mains prescribed by Ten States Standards of 2 – 9 fps.

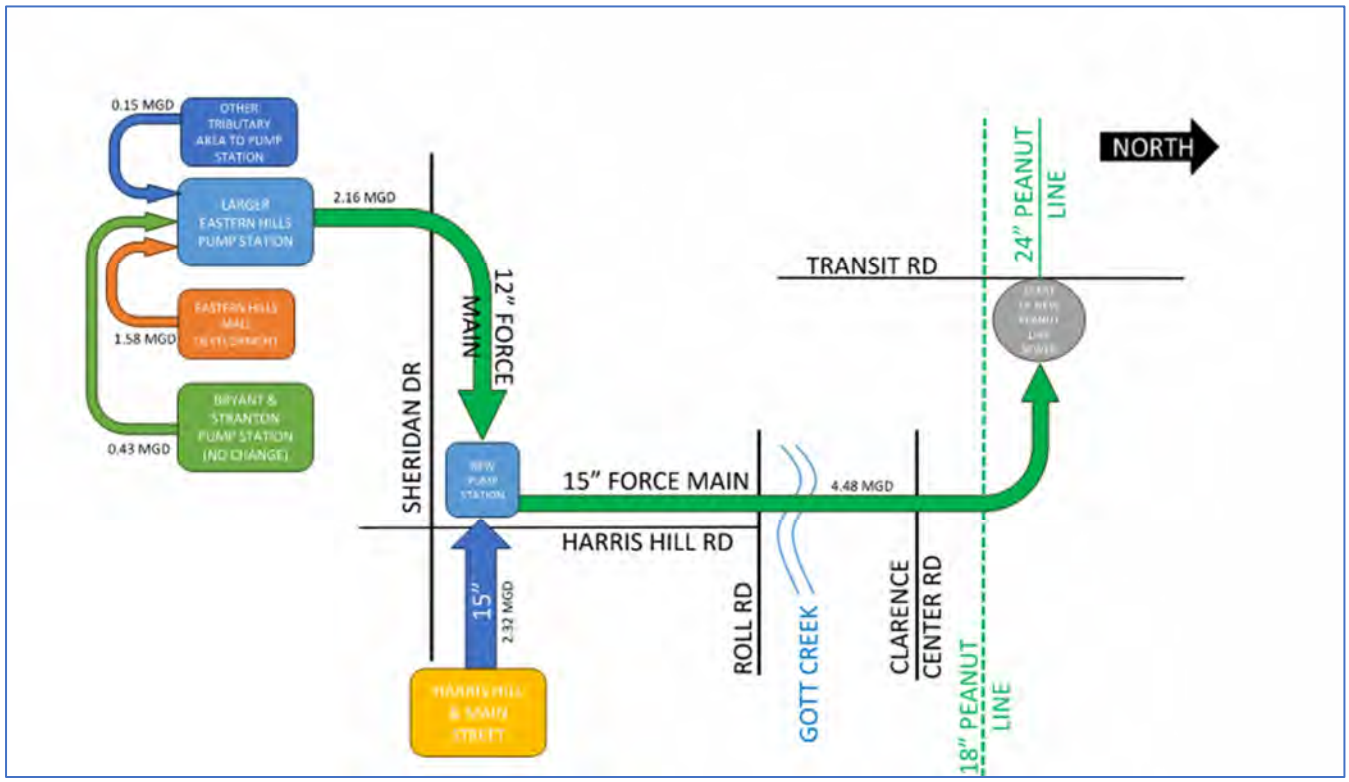


Figure 4-17: Schematic of Option 3: New EHPS to convey flow to Harris Hill Road/Sheridan Drive Intersection

While other nearby locations can also be used, the northwest corner of the intersection should be avoided as much of the property is designated as a federal wetland. Also note that Option 3 would have to be implemented in conjunction with Option 1A or Option 1B.

Advantages of adding a pump station at a new location under Option 3 include:

- The new pump station would be sized to handle the existing and projected future flows, with additional room for expansion, if necessary. This would be accomplished by adding several constant speed pumps to allow for variations in flows, as well as designing extra space within the pump station to accommodate additional pumps in the future, especially when adding flows from the Harris Hill/Main Street area. Alternatively, the station could be designed with fewer pumps, but with variable frequency drives, to convey a wide range of flows. The force main has been sized to maintain adequate velocities over the full range of expected flows, both with just the Eastern Hills tributary flows (existing and projected) as well as the projected flows from the Harris Hill/Main Street area in the future.
- The installation of a force main instead of gravity sewer results in some cost savings, as the pipe trenches do not have to be as deep. As indicated previously, the depth to rock drops off gradually north of Sheridan Drive, so it is likely that very little rock excavation will be necessary, which also minimizes overall construction costs.

Disadvantages of Option 3 include:

- Installation of a new pump station, which would be in addition to the existing pump stations (EHPS and BSPS) if Option 1B is chosen. This would result in additional operations and maintenance expenditures to ECSD5 in maintaining all three pump stations.
- Construction on the east side of the Harris Hill Road avoids water lines and local sewers on the west side of the road but overhead electric lines will likely need to be supported during construction to allow for pipe installation.

4.3.5.4 Option 4 – Upsize EHPS at or near its existing location and construct a new 12-inch diameter force main north on Transit Road to the 24-inch Parallel Peanut Line Sewer

Option 4 will replace the existing EHPS with a new larger pump station at or near its current location and a new 16-inch diameter force main along Transit Road to the 24-inch Parallel Peanut line sewer, as shown in Figure 4-18. This force main would be constructed in the alignment shown in Figure 4-19.

Because of the much longer force main route, the total discharge head required for the pumps is significantly higher than the existing EHPS total discharge head, as well as the discharge head(s) projected for Option 1B. A summary of the flow and estimated total discharge heads for implementation of the three phases of the Eastern Hills Mall Redevelopment Project is provided in Table 4-5.

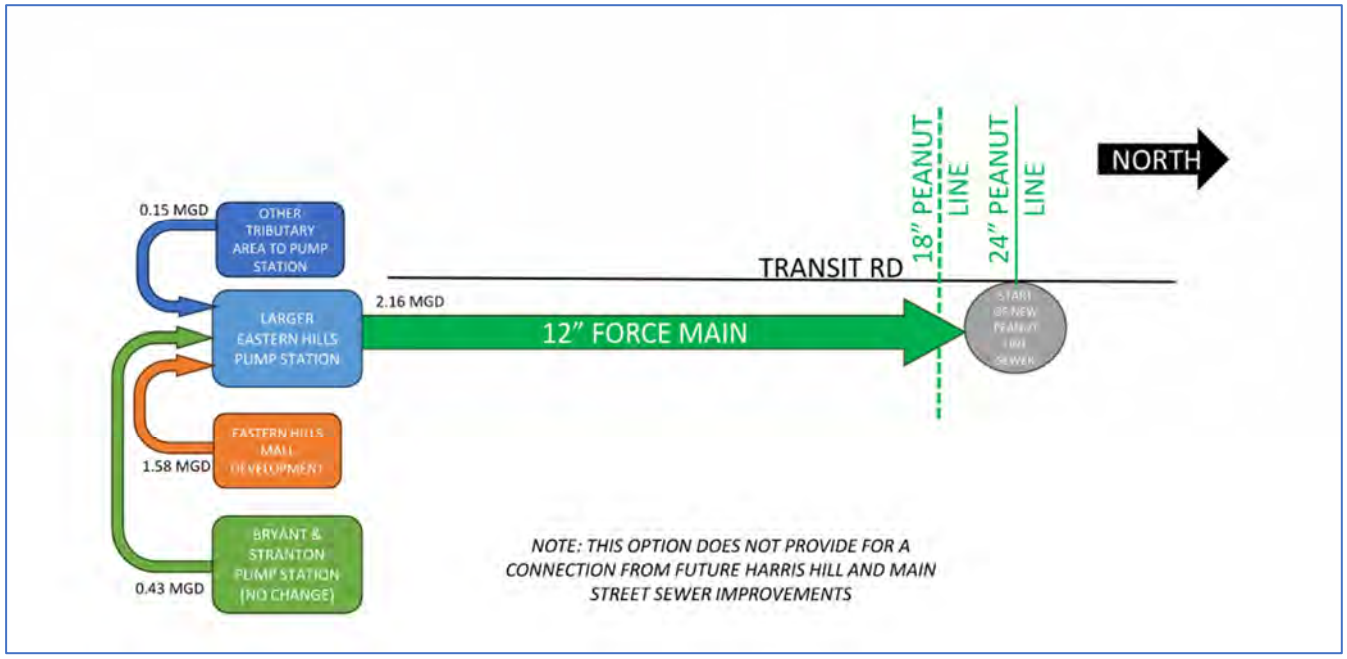


Figure 4-18: Schematic of Option 4 – New Pump station and Force Main Sewer from Eastern Hills Mall Site to New Peanut Line Sewer via Transit Road

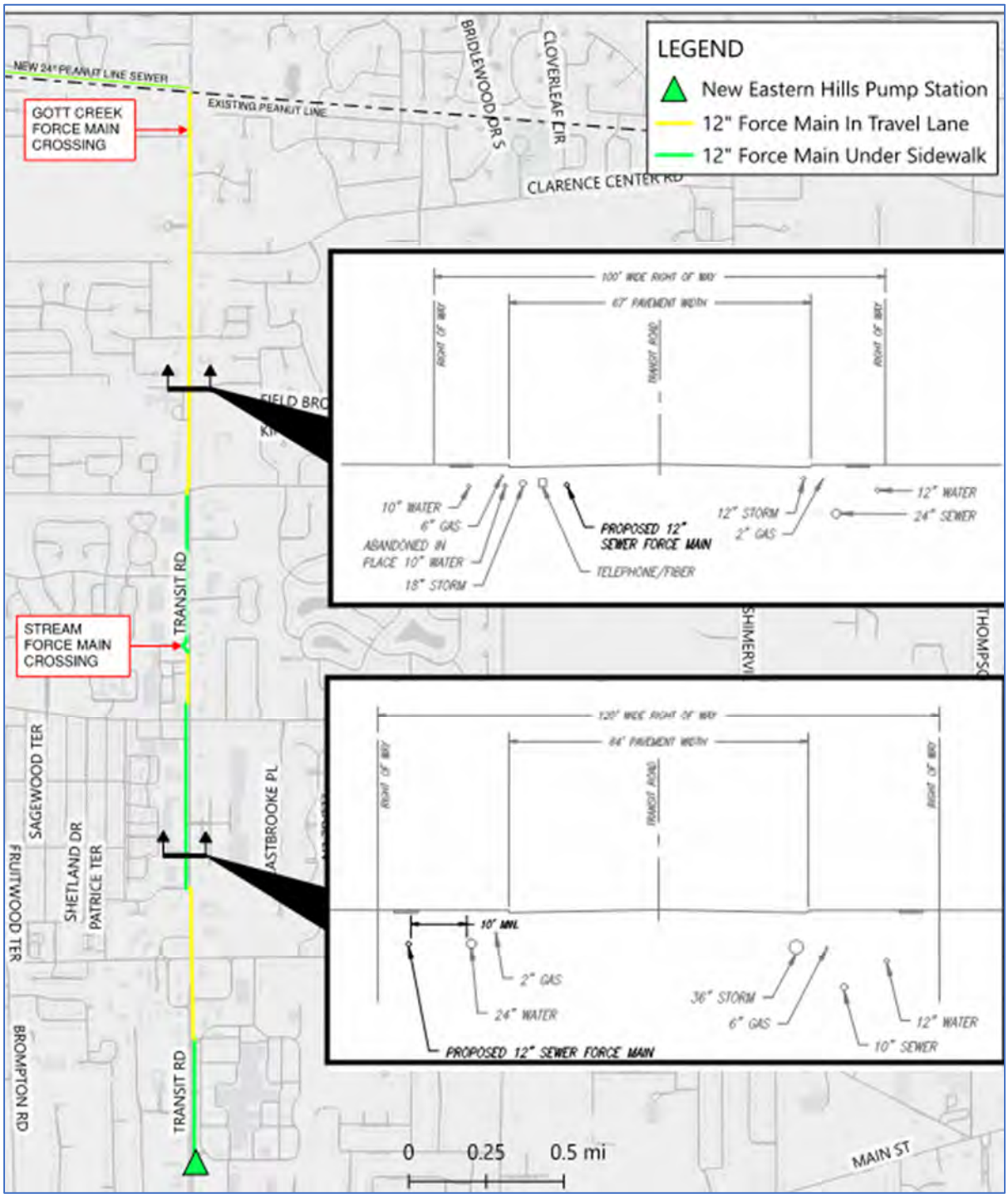


Figure 4-19: Option 4 – Transit Road Force Main Route

Table 4-5: Summary of Design Points for Expanded Eastern Hills Pump Station and Force Main to Parallel Peanut Line

Phase	Flow	Total Discharge Head (16-inch force main)
Phase 1	1597 gpm	60.0 ft TDH
Phase 2	1770 gpm	67.5 ft TDH
Phase 3	2251 gpm	91.6 ft TDH

Some portions of the proposed force main alignment depicted in Figure 4-18 are located under the sidewalk, where the location of utilities will permit doing so, while still allowing the 10-ft minimum horizontal distance between a new sewer force main and the water main, as required by Ten States Standards. Where utility density is high outside of the pavement of Transit Road, the force main will have to utilize a route along a travel lane of the roadway.

This option does not include capacity for the future addition of the Harris Hill/Main Street area. If that area is included in the future, additional evaluations would be required to identify potential routing options for new gravity sewers and/or pump stations and force mains that would ultimately accommodate the flows from that area to the Parallel Peanut Line sewer. One such routing option for servicing the Harris Hill and Main Street areas is given in the Town of Clarence Master Sewer Plan.

Advantages of Option 4 include:

- Would utilize a new expanded EHPS in the same area as the existing EHPS; however, the pumps would be larger than existing to not only handle the higher flows associated with the Eastern Hills Mall Redevelopment, but also the increased head associated with the much longer force main.

Disadvantages of Option 4 include:

- High costs associated with installing a force main along Transit Road with the various utility interferences and extensive work zone traffic control that would be required. See Section 4.3.5 for more information on potential utility conflicts.
- Construction of the force main will require lane closures along Transit Road and, due to the high traffic volumes, most work will likely need to be completed at nighttime to minimize traffic impacts, which would be an added cost to the project.
- Does not accommodate the future addition of the Harris Hill/Main Street area sewer flows.

4.3.6 Utility Conflicts

4.3.6.1 Harris Hill Road

Harris Hill Road has a distribution waterline and local gravity collector sewer located along the west side of the right-of-way. Distribution gas lines exist along the length of roadway and shift from the east to west side of road based on customer locations. Overhead wood utility poles carry power and telecommunications along stretches of the east side of the road. Given that a distribution waterline and gravity sewer is already present along the west side of the road, occupying most of the area outside of the pavement section, it was determined that the ideal location for the new interceptor sewer would be along the east side of the road to minimize utility conflicts. Also, the gas line is located far from the pavement and behind the wood utility poles, and as the sewer is not especially deep, the wood utility poles could be temporarily supported during construction when the sewer trench is excavated near them, thereby posing no serious impediment to construction.

4.3.6.2 Sheridan Drive

Sheridan Drive, between Transit Road and Harris Hill Road, generally has all existing utilities located within the front yards of residents along that stretch of highway. Overhead power lines, a 12-inch storm sewer and a distribution gas line are located along the south highway boundary. A 36-inch storm pipe and a waterline are in the grass area north of the pavement, leaving no room for utilities north of the highway. Any sewer improvements installed along Sheridan Drive will likely need to occupy a travel lane or shoulder of the highway to fit within the existing highway right of way.

The Town of Clarence has indicated that they will be undertaking sidewalk work in this area and therefore, any work in the future to install a new gravity sewer and/or force main would likely result in the removal and replacement of a portion of the sidewalk.

4.3.6.3 Transit Road

As discussed during the workshops described in Section 3.2, while Transit Road is the most direct route between the Eastern Hills Mall Pump Station and the Peanut Line Sewer, it also poses the greatest challenges from a constructability perspective. As shown in Figure 4-19, the right-of-way for Transit Road contains nearly every public utility. Over the full length of the project study corridor, there are small diameter water distribution mains, gas distribution mains, buried telecommunications, storm sewers between 12-inch and 42-inch diameter, and gravity sewers. These utilities are located along the snow storage and sidewalk areas of the roadway, meaning any new sewer infrastructure would likely need to be installed under a travel lane of the highway to keep clear of utility conflicts. The New York State Department of Transportation also has a buried fiber optic line, as part of their intelligent traffic management system, located longitudinally throughout the corridor. Further complicating the maze of existing utilities is a 36-inch water transmission main within part of the corridor and a 6-inch diameter high pressure gas transmission line on one side of road throughout the corridor.

A combination of downstream limitations on sewer capacity and challenges with having enough clearance to other utilities result in limited options for upsizing of the existing gravity sewer to obtain additional system capacity, as most of the gravity system along Transit Road is already 18-inch to 24-inch diameter. It was determined that a sewer force main would be the best solution for transporting additional sewer flows north along Transit Road, as the force main will minimize the footprint and depth necessary for the new sewage infrastructure, can be routed around existing utilities unlike gravity sewer systems, and can navigate under the stream and creek crossings with adequate cover for protection along the way. The approximate route a force main could take along Transit Road to avoid utility conflicts is shown in Figure 4-19.

Also of note, any sewer construction along Transit Road will also be further complicated because of the traffic volume within the study corridor. Transit Road is a four-lane principal arterial state highway with approximately 35,900 vehicles a day passing through, which means any solution constructed along the highway will require additional cost to accommodate work zone traffic control, nighttime work, and access limitations posed by the high volume of traffic.

4.3.7 Transit Road Potential Capacity Restrictions

The Eastern Hills Pump Station currently discharges via an 8-inch ductile iron force main to a manhole on the southeast corner of the ramp onto Sheridan Drive from the Transit Road northbound lanes. Flow proceeds via a 15-inch diameter gravity sewer, then a 10-inch gravity sewer and a few sections of 8-inch gravity sewer. Past the Eastgate Plaza, the sewer increases to a 10-inch and then a 12-inch sewer. The sewer increases to 18-inch past Greiner Road until the Transit/Klein intersection.

At that intersection, there is a weir chamber that allows most of the flow to continue northerly in the 18-inch gravity sewer along Transit Road, with some flow diverted to the Klein Road 15-inch sewer. Most flow was conveyed north along Transit Road until August 2022, at which time the weir height was removed to allow more flow to be diverted via the Klein Road sewer directly to the 30-inch Peanut Line Sewer west of Paradise Road, and less flow to be conveyed ultimately to the Dodge Road Interceptor. The reduction of flow within the Transit Road sewer was performed to relieve some surcharging of flow at the Dodge Road Interceptor.

Downstream of the Klein Road Weir Chamber, flow continues north along Transit Road via gravity within an 18-inch sewer, until just south of Clarence Center Road, where it increases to 24 inches in diameter. It then passes the Peanut Line Sewer and continues as a 24-inch sewer until Dodge Road. The 24-inch diameter Transit Road sewer then discharges into the 24-inch Dodge Road Interceptor within the Town of Amherst.

Based on operational experience, the existing sewer system along Transit Road is of sufficient size for existing flows. However, there are several locations along Transit Road in which some surcharging is predicted to occur during higher-flow events based on limited collection system hydraulic modeling under existing conditions, as can be seen in Figure 4-20 (as shown by the green line). The hydraulic modeling is likely conservative. The sections of pipe in Figure 4-20 showing the potential for surcharging are those where the sewer size drops to 8 inches. While the system is adequate for current conditions, the modeling confirms the 8-inch sections would not have sufficient capacity to convey the additional peak flows expected from the Eastern Hills Mall Redevelopment without upsizing of the gravity sewers in this area.

Therefore, it is assumed that adding flows in this area to serve the Eastern Hills Mall Redevelopment using the existing gravity sewers is not possible without upsizing of the gravity sewers along this entire stretch.

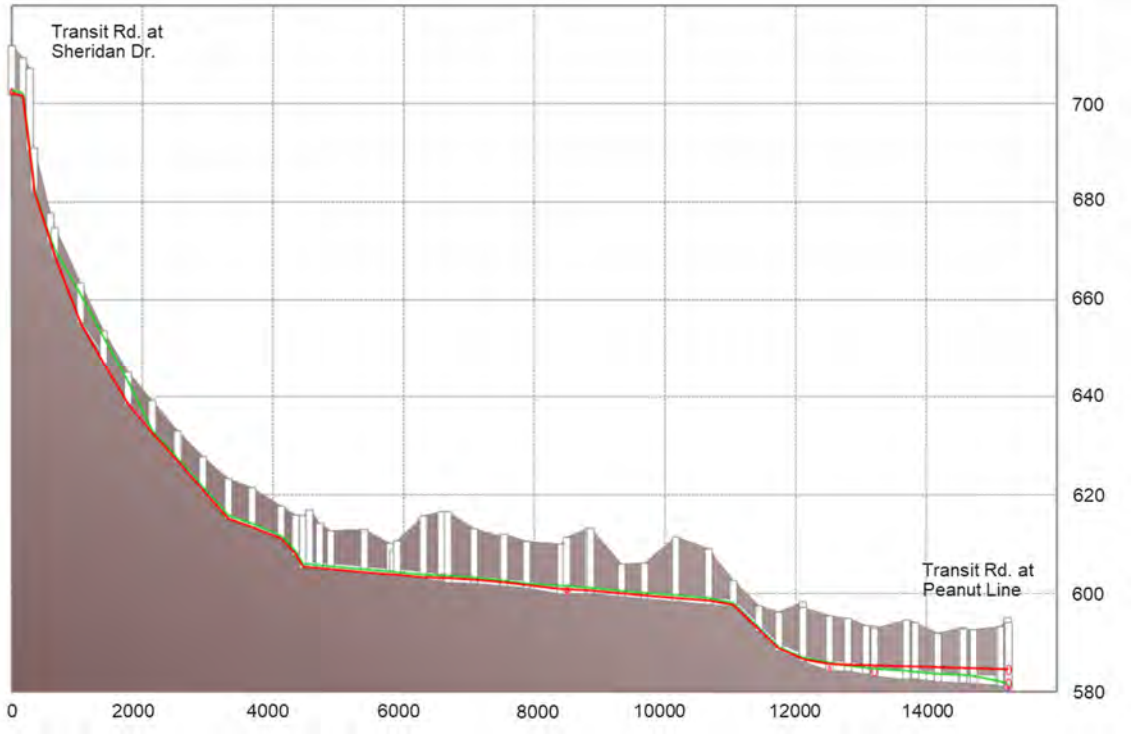


Figure 4-20: Peak HGL for Transit Road Sewer from the first manhole where the EHPS force main discharges (on the left) to the intersection with Klein Road (on the right)

Note: green line shows existing conditions under current peak flows, while the red line show conditions with expected current and future flows south of Sheridan Drive removed from the Transit Road Sewer and added into the system near the Transit Road crossing with the Peanut Line Sewer.

Similarly, surcharging is also projected to occur in the Transit Road sewer just upstream of the Dodge Road Interceptor. In that area, the Transit Road sewer is 24 inches in diameter, but the downstream Dodge Road Interceptor is also 24 inches in diameter, so any upsizing of the Transit Road sewer would likely require upsizing of the Dodge Road Interceptor.

4.3.8 Connection of Outlying Potential Future Districts to Heise Brookhaven Trunk Sewer

The various development opportunities that the Town of Clarence would like to pursue are described in Section 2.2.4, and the estimated peak flows from each of the opportunities are presented in Section 4.1. It is recognized that connecting all these areas to the public sanitary sewer system is not currently feasible due to limitations with the capacity of the Amherst collection system downstream of the 18-inch diameter Peanut Line sewer. Notably, some limitations are predicted even with the addition of the 24-inch Parallel Peanut Line sewer. However, as flow distribution scenarios were developed, consideration was given to potential locations for adding flows from the various areas into the existing sewer infrastructure and, if required, determining if additional infrastructure beyond what was already contemplated in the previous studies and reports was needed.

As a result, it was determined that the physical provisions for connecting each of the development areas would be as follows:

- **Eastern Hills Mall Redevelopment** – As discussed in Section 4.3.4
- **Harris Hill/ Main Street area** – The previously completed Harris Hill sewer analysis contemplated a gravity collection system that discharged to a manhole at the corner of Main Street and Harris Hill Road, with a 15-inch diameter trunk sewer up to a manhole at the intersection of Harris Hill Road and Sheridan Drive. The intent in the Harris Hill sewer analysis and subsequent Clarence Sewer Master Plan would be to install a new gravity sewer from this location to the 24-inch Clarence Peanut Line to serve the Harris Hill and Main Street areas only. However, under this project, combining the flows from the Eastern Hills Mall Redevelopment and the Harris Hill/ Main Street areas and conveying wastewater from the manhole at the intersection of Harris Hill Road and Sheridan Drive through a single pipe to the Peanut Line sewers was evaluated under Options 2 and 3 discussed in Section 4.3.4.
- **Spaulding Lake** - Elimination of the Spaulding Lake WWTP was contemplated within the previously completed Spaulding Lake sewer evaluation. The costs presented in that evaluation included decommissioning the existing WWTP and converting it to a new pumping station. A new force main would be installed to convey flow to the HBTS at the intersection of Spaulding Green Parkway with Goodrich Road. The costs in the 2014 evaluation included the interconnection of the Spaulding Lake existing gravity sewers to the HBTS.
- **Clarence Research Park** – As part of the Spaulding Lake Evaluation, it was determined that the CRP WWTP could also be eliminated and converted to a pumping station to convey wastewater to the HBTS, at the same location as the Spaulding Lake flow contribution.
- **Available Lots in CSD 2, 4, 6, and 9** – Since the flows in these sewer districts currently are conveyed either to the HBTS or directly into the Clarence Peanut Line sewer downstream of the HBTS, any infill within these

areas would use the existing neighborhood collection systems to convey flow to the HBTS or the Clarence Peanut Line Sewer.

- **CSD9 Expansion (Phase 2)** – While plans or profiles of the expansion of CSD9 were not previously developed, it was assumed that any flows collected would pass through the CSD9 Phase I collection system, with eventual discharge into the HBTS at the corner of Strickler Road and Greiner Road.

When modeling the impact of the additional flows on the collection system, the above-noted locations were used to input the additional flows into the collection system model. These efforts are further described in the remaining subsections of Section 4 and Section 5 of this report.

The following scenarios were developed and run within the PC-SWMM collection system model. The results of each scenario were then used to develop a further scenario that would maximize the distribution of flows from the defined development areas. While select hydraulic profiles are shown in the following sections, the model results are included in **Appendix G** as well.

4.4 Scenario 1 – Status Quo

As required by the New York State Environmental Facilities Corporation (EFC), project reports must include discussion of a do-nothing, or status quo, scenario. Under this scenario, the existing collection system will remain as-is and the proposed Parallel Peanut Line Sewer would not be constructed. The do-nothing scenario will result in:

- No new developments being allowed in the Transit Corridor, which could adversely affect economic activity in the area, especially by causing developers and potential residents and business owners to take their business elsewhere, where sanitary sewer collection system conditions are more favorable.
- No alleviation of surcharging of the sanitary sewer system in the area near the intersection of Dodge Road and Transit Road, especially during periods of higher groundwater and rain. The collection system model has confirmed that under existing conditions, the area is prone to significant surcharging both in the Dodge Road Interceptor and in the Transit Road Sewer immediately upstream of the Dodge Road Interceptor. This surcharging at Transit Road and Dodge Road has also been verified by the Town of Amherst.
- No elimination of aging septic systems.

Note that this scenario does not relieve capacity issues currently limiting development within the Town of Clarence and, to some extent, the Town of Amherst. The Towns have previously had to deny some development opportunities due to insufficient sewer capacity; so, if nothing was done, the municipalities would continue to limit development and prevent significant population and business growth. Notwithstanding the sewer capacity limitations, the areas considered in this report are strong candidates for infill development. Under the status quo, however, growth is more likely to take place as "sprawl" into previously undeveloped areas elsewhere in the region.

The impact on existing facilities, for the most part, will be unchanged. The EHPS and BSPS and other pump stations and wastewater treatment facilities in ECSD5 and the CSDs would continue to operate as they do currently. However, the frequency and severity of surcharging in the Town of Amherst and in the Transit Road sewer is expected to increase, especially as sewers age and climate change produces more significant weather events.

4.5 Scenario 2 – Adding All Identified Sewer Expansion Areas to the Collection System

4.5.1 Description of Scenario

This scenario contemplated the addition of all projected future flows as defined in Table 4-2 and Figure 3-1 to the existing collection system. While Section 4.1 indicated that the capacity of the existing 30-inch Peanut Line sewer most likely is not adequate to convey existing and all proposed additional flows, the purpose of Scenario 2 was to determine the effects of the flow overages on the rest of the system and better understand what additional flows could be potentially further evaluated or deferred to later phases in the future. Therefore, peak flows were added into the collection system model under this scenario as shown in Figure 4-21. Improvements associated with this scenario include:

- Construction of the 24-inch Parallel Peanut Line Sewer.
- Construction of new gravity sewers in the CSD9 sewer district expansion (CSD9 Phase 2) that would ultimately connect to the Heise-Brookhaven Trunk Sewer through the previously installed CSD9 Phase 1 sewers. While evaluations conducted to date have not detailed the proposed layout of the CSD9 expansion, JMD developed a rough estimate of the total linear footage and number of manholes necessary to serve this area for use in subsequent cost estimating. We assumed that approximately 17,300 linear feet of 8-inch sewer and 69 manholes are required, at depths of up to 12 feet.
- Elimination of the existing Spaulding Lake WWTP and replacement with a new pump station to convey flows to the HBTS at Goodrich Road. This plan was discussed with accompanying cost estimates in the 2014 Spaulding Lake Sewer District Feasibility Study.
- Conversion of the Clarence Research Park Treatment Plant into a pump station with force main (4-inch diameter) to ultimately convey flows to the Heise Brookhaven Trunk Sewer, likely in conjunction with an extension to service Spaulding Lake and Main Street. This work was also outlined in the 2014 Spaulding Lake Study.
- Connection of additional services within existing CSDs 2, 4, 6, and 9 through the existing collection systems into the HBTS and Clarence 24-inch Peanut Line Sewer. Collector sewers are already present in these areas and any additional flows represent new service connections in established sewer districts.
- Addition of flows from both the Eastern Hills Mall Redevelopment and the existing EHPS service area, which would be conveyed to the Parallel Peanut Line Sewer. For the purposes of this scenario, it was assumed that Option 1B and Option 2 would be implemented to convey the flow from this area to connect directly with the Parallel Peanut Line Sewer at Transit Road; however, any of the options discussed for the Eastern Hills Mall Redevelopment are suitable for conveying flow, as long as this flow is discharged directly into the 24-inch Parallel Peanut Line Sewer.
- Addition of flows from the Harris Hill/Main Street area using the approach discussed in the 2013 Harris Hill Sanitary Sewer Cost Analysis. The scope of work outlined in the 2013 analysis included the installation of gravity sewers up to the intersection of Harris Hill and Sheridan Drive. For purposes of modeling, flows from this area were combined with the flows from the EHPS tributary area and directed into the proposed Harris Hill gravity sewer (Option 2) or force main (Option 3).

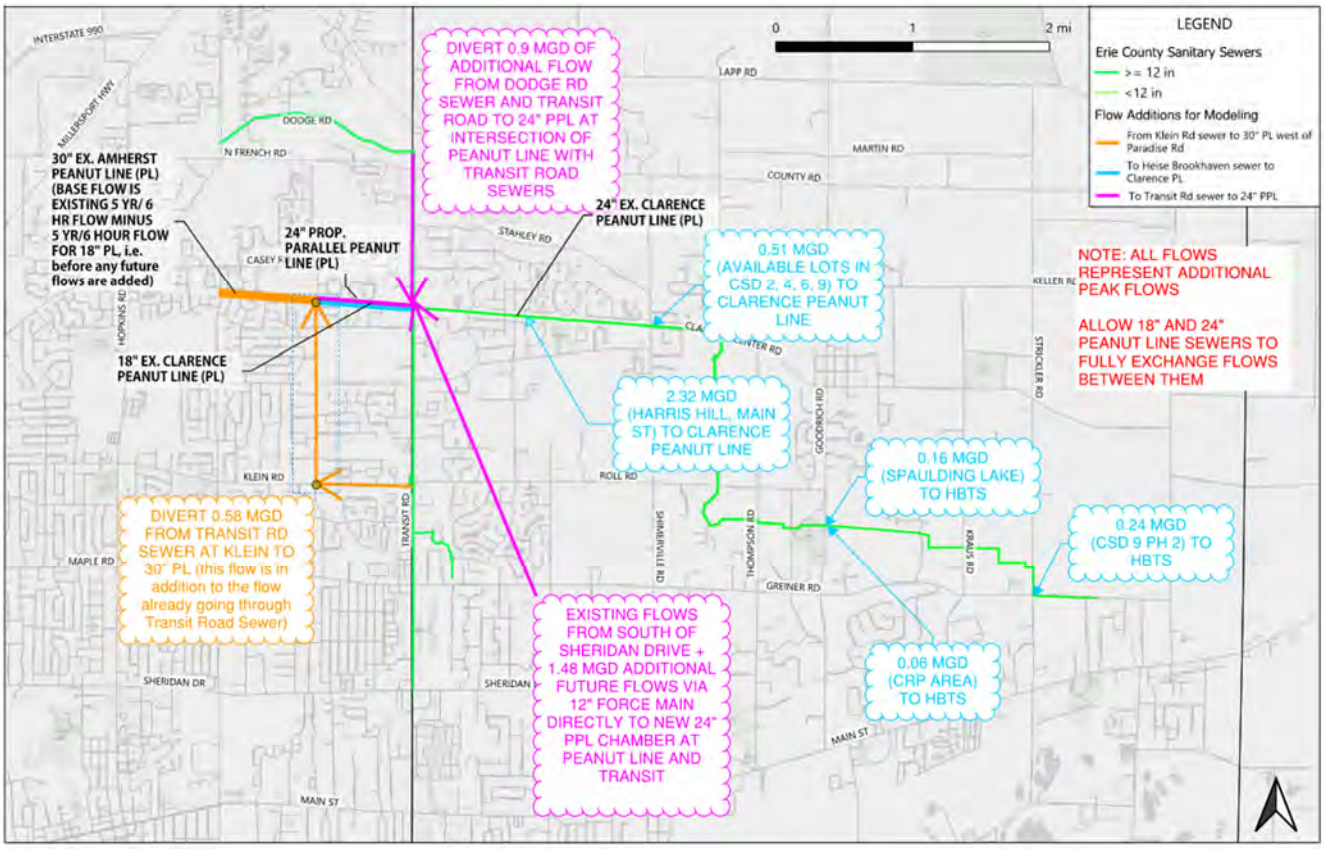


Figure 4-21: Distribution of Additional Flows in the Collection System Model under Scenario 2

- Continued diversion of the flows from the Transit Road sewer at Klein Road and at the proposed Parallel Peanut Line Sewer. As indicated previously, the amount of available flow capacity in the Parallel Peanut Line Sewer is dictated by the position of the proposed 24-inch diversion gate within the Transit Road Sewer. While 0.9 MGD was prescribed as the flow for the Dodge Diversion based on initial evaluations, model runs showed that flow diversions greater than 2 MGD are possible if the gate valve was partially closed. As the gate closes, more flow is diverted from the Transit Road sewer into the Parallel Peanut Line Sewer. Of course, greater flow diversion at this gate chamber reduces the remaining capacity in the Peanut Line sewers available to flows coming from other areas of the collection system.

4.5.2 Impact on Existing Facilities

This scenario had the largest impact on the Peanut Line Sewers and those sewers immediately upstream of the Peanut Line Sewers. It was noted that the addition of flows from the proposed development areas in the eastern portion of the Town of Clarence to the HBTS had little to no effect on the hydraulic grade line in the HBTS, as the hydraulic profile within the HBTS indicates the pipe would be flowing approximately half-full even when adding the projected flows from CRP, Spaulding Lake and CSD9 Phase 2.

Therefore, the HBTS appears to have capacity to accept the additional flows from Clarence Research Park, CSD9 Phase 2, Spaulding Lake collection system, and additional flows from available lots in CSDs 2, 4, 6, and 9. Furthermore, the model runs indicate that the water levels within the HBTS are not affected by downstream conditions in the Clarence Peanut Line Sewer.

However, it was noted that the downstream end of the 24-inch Clarence Peanut Line Sewer east of Transit Road exhibits full-pipe conditions under the 5-year, six-hour storm, as shown in Figure 4-23, with the red line denoting proposed conditions. Evaluation of the hydraulic grade lines within the downstream Peanut Line Sewers shows that the full-pipe conditions in the Clarence Peanut Line sewer in the model is the result of surcharging of approximately 3 ft above the crowns of the existing 18-inch Peanut Line sewer and the proposed 24-inch Parallel Peanut Line sewer, as shown in Figures 4-25 and 4-27, which are, in turn, affected by surcharging within the 30-inch Peanut Line sewer (Figure 4-29) at Paradise Road. While the portion of 30-in Peanut Line sewer near Youngs Road appears to be within its capacity, its upstream end connecting to the existing and Parallel Peanut Line sewers represents a bottleneck within the system when all additional flows shown in Figure 4-21 are introduced into the system. In addition to receiving the upstream Peanut Line flows in this location, the upstream Klein diversion flows are also introduced into the 30-inch Peanut Line sewer along with flows from local sewers within the Town of Amherst. However, downstream of Youngs Road, the 30-in Peanut Line Sewer becomes a 48-inch sewer, which appears to have sufficient capacity for all flows, as the hydraulic grade line drops down to only fill 50 to 60 percent of the total pipe depth as shown in Figure 4-29.

With all proposed future flows entering the collection system, surcharging within the Transit Road sewer immediately upstream of Dodge Road and the Dodge Road Interceptor itself is not resolved, as shown in Figures 4-31 and 4-33, respectively. While surcharging is lessened at the Peanut Line end of the Transit Road sewer, the hydraulic grade line approaches surface grade level at Dodge Road, resulting in little to no change in the hydraulic grade line at Dodge Road between existing and proposed conditions.

Therefore, the collection system model results for Scenario 2 confirms that the existing 30-inch Peanut Line sewer does not have sufficient capacity to receive all the additional flows conveyed to it without surcharging, although the extent of surcharging should not adversely affect properties along the Peanut Line Sewer. However, the potential for surcharging at Dodge Road and in the Transit Road sewer upstream from the Dodge Road Interceptor is not resolved under this scenario. Subsequent model runs and scenarios were constructed to relieve surcharging within these sewers while still aiming to optimize the additional flows that could be conveyed from the Town of Clarence.

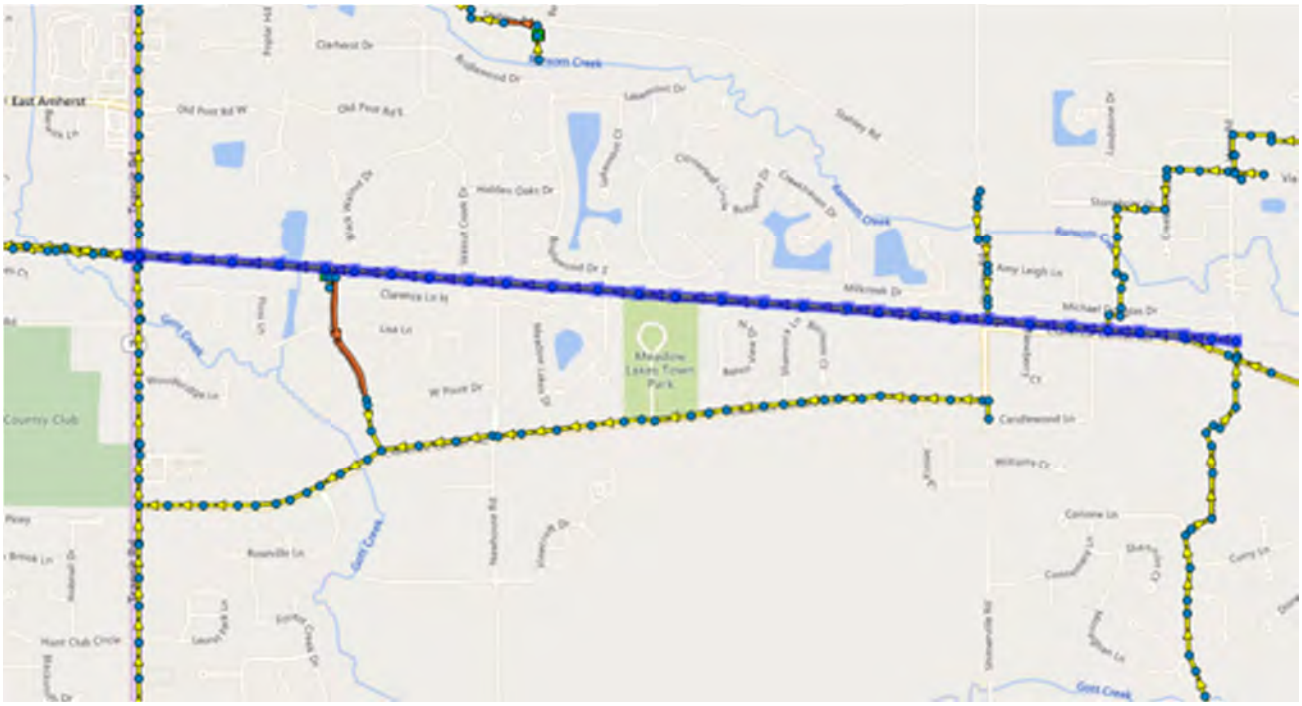


Figure 4-22: Clarence Peanut Line Sewer from HBTS to Transit Road

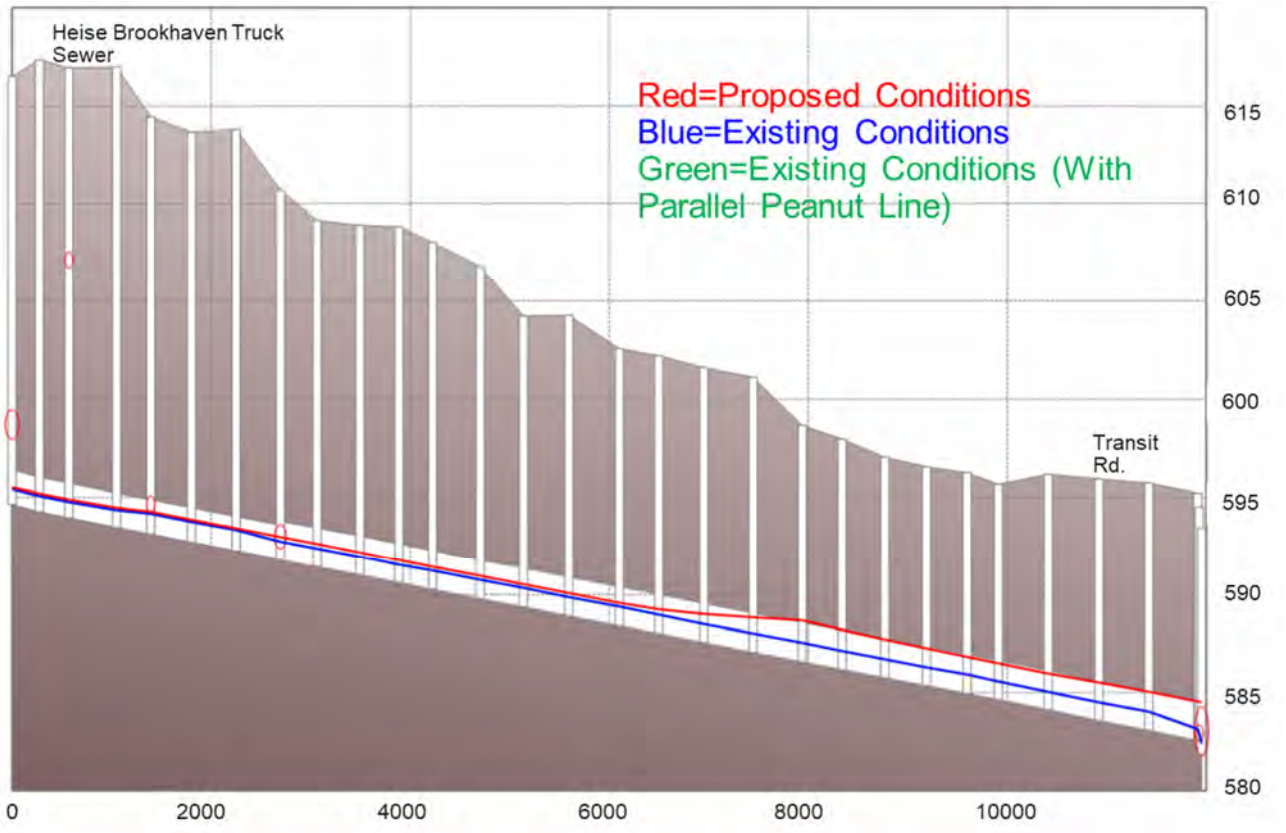


Figure 4-23: Peak Hydraulic Grade Line for Existing Clarence Peanut Line– Scenario 2

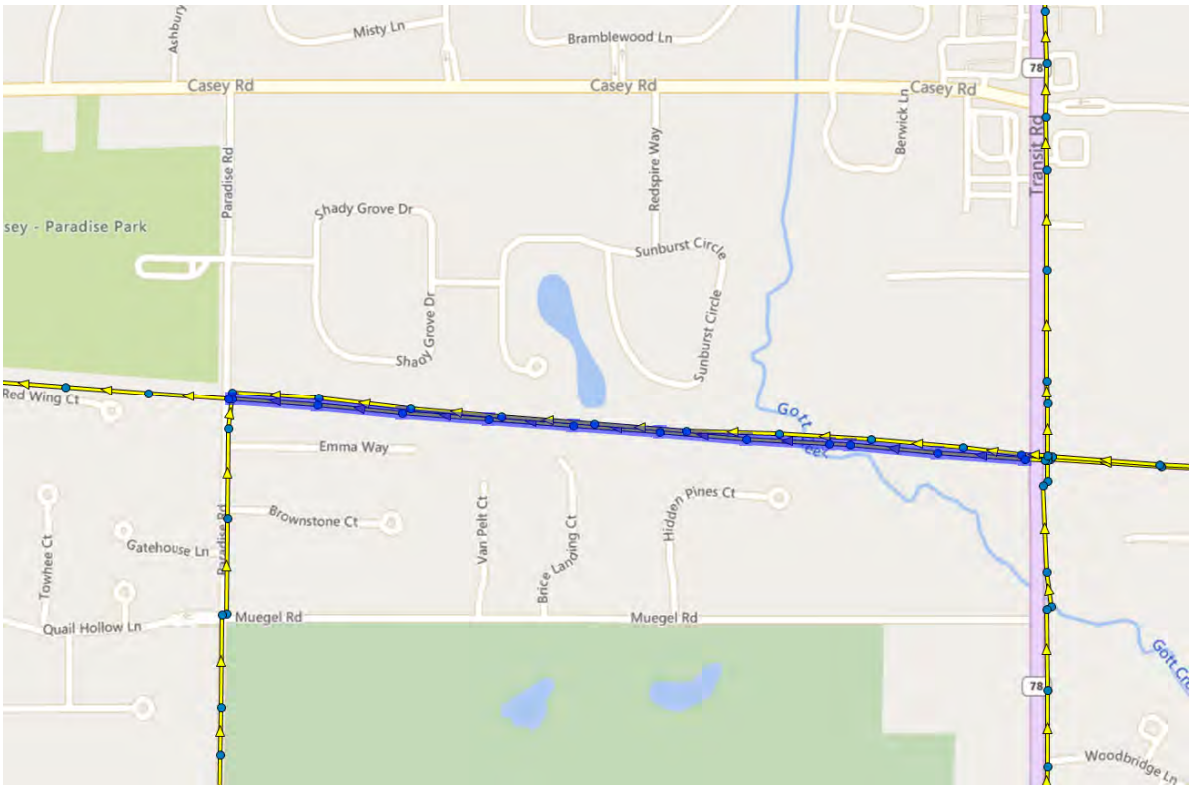


Figure 4-24: 18-Inch Peanut Line from Transit Road to Paradise Road

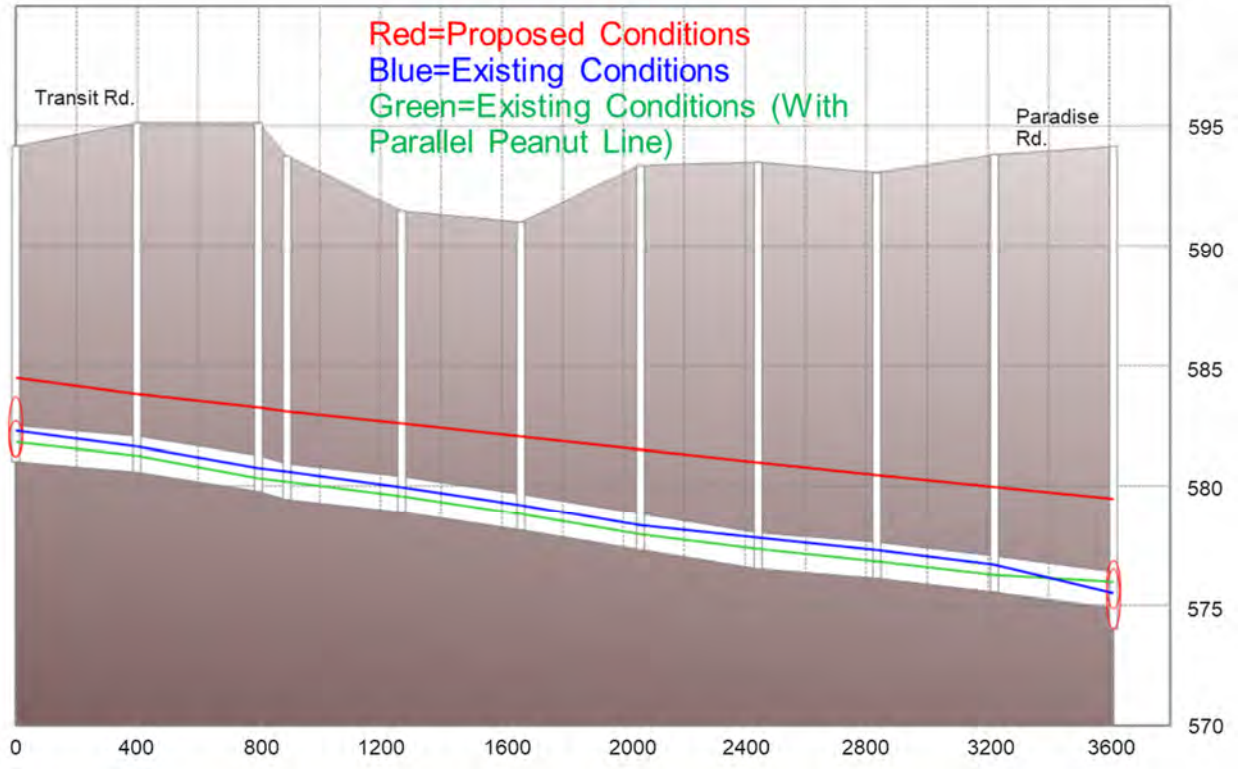


Figure 4-25: Peak Hydraulic Grade Line for Existing 18-inch Peanut Line– Scenario 2

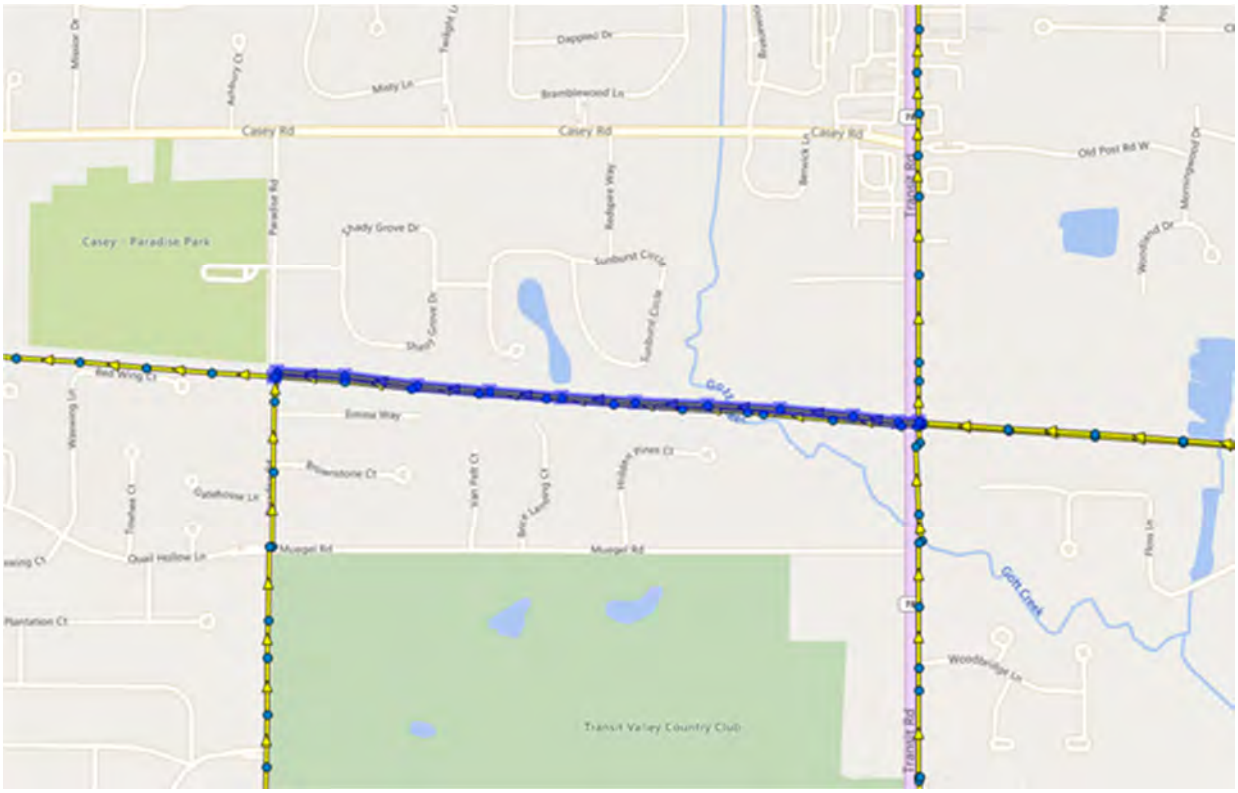


Figure 4-26: 24-inch Parallel Peanut Line from Transit Road to Paradise Road

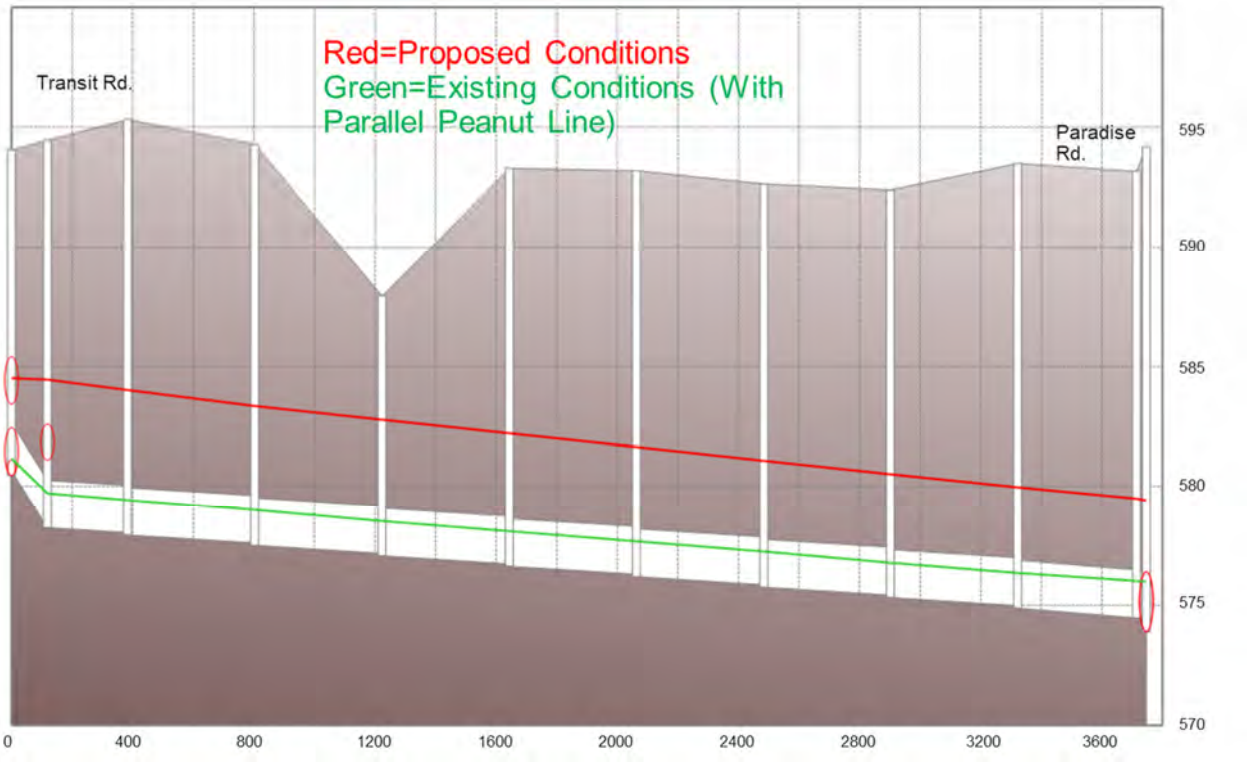


Figure 4-27: Peak Hydraulic Grade Line for Parallel Peanut Line– Scenario 2

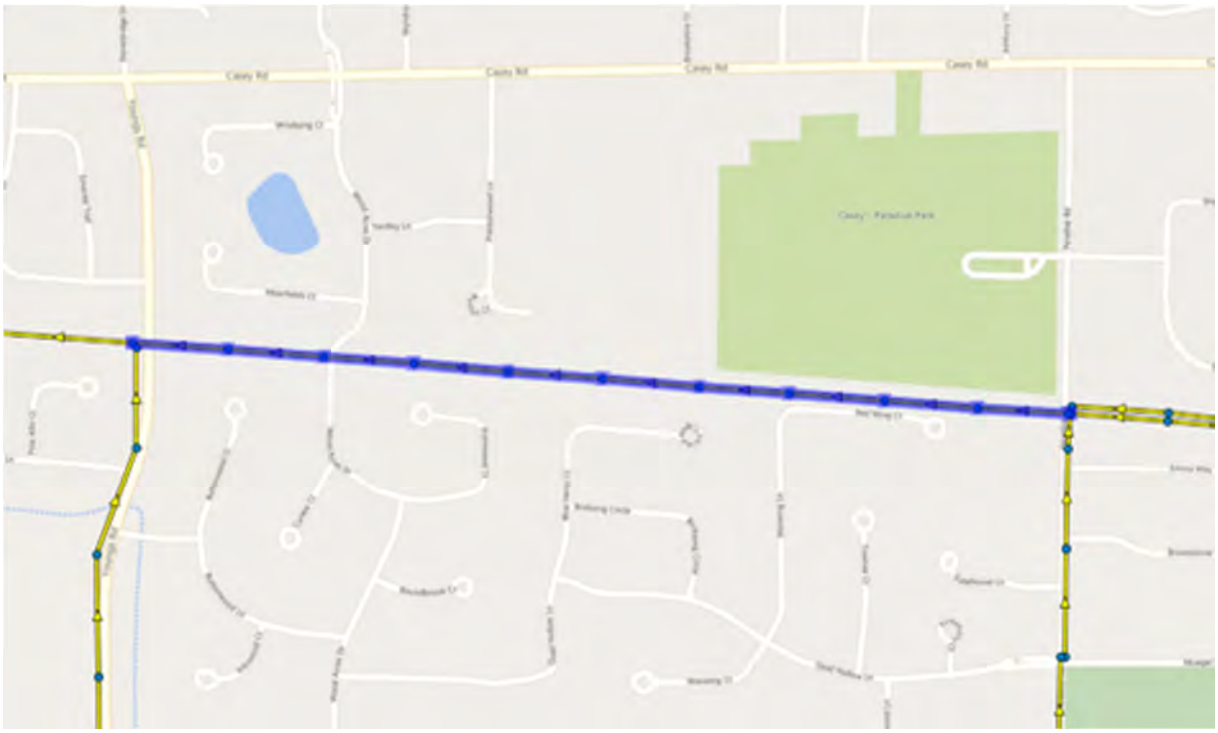


Figure 4-28: 30-inch Peanut Line Sewer west of Paradise Road

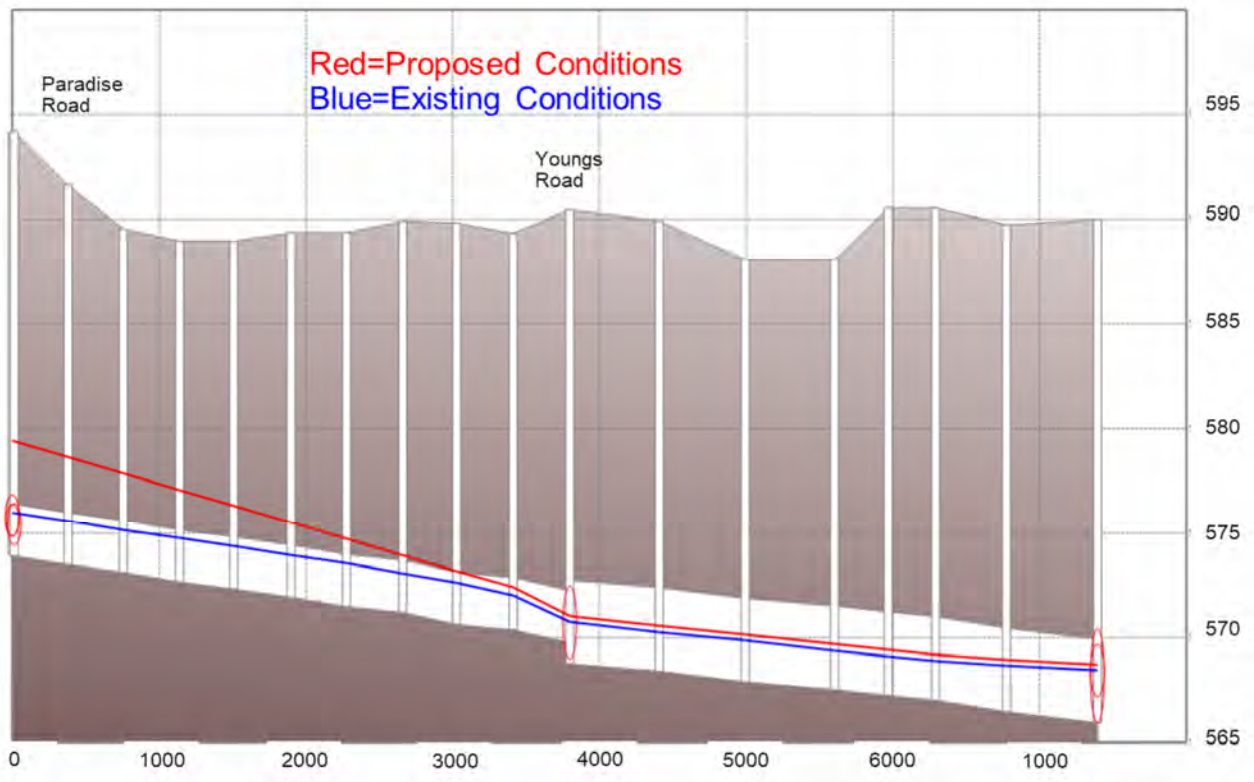


Figure 4-29: Peak Hydraulic Grade Line for the Existing 30-inch Peanut Line Sewer West of Transit Road– Scenario 2

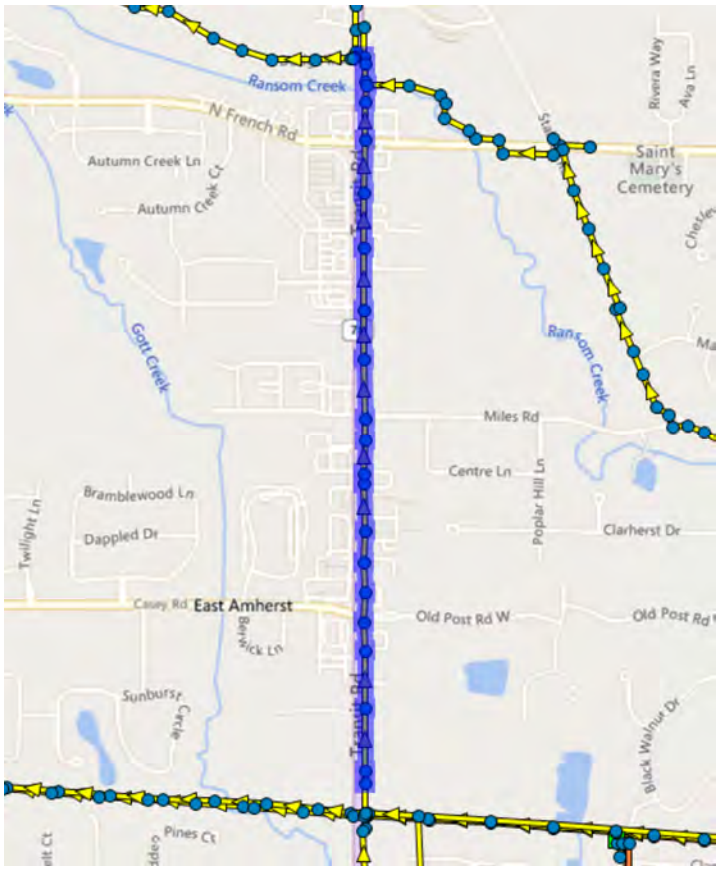


Figure 4-30: Transit Road from Peanut Line to Dodge Road

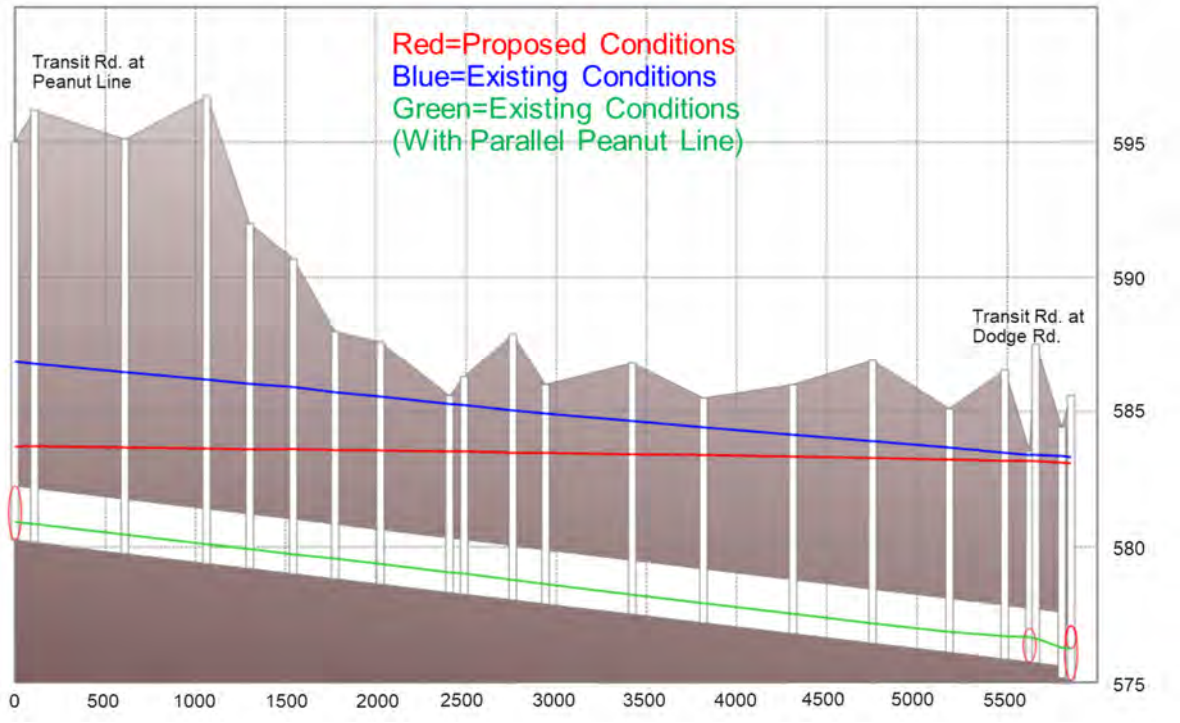


Figure 4-31: Peak Hydraulic Grade Line for the Transit Road Sewers between the Peanut Line and Dodge Road– Scenario 2

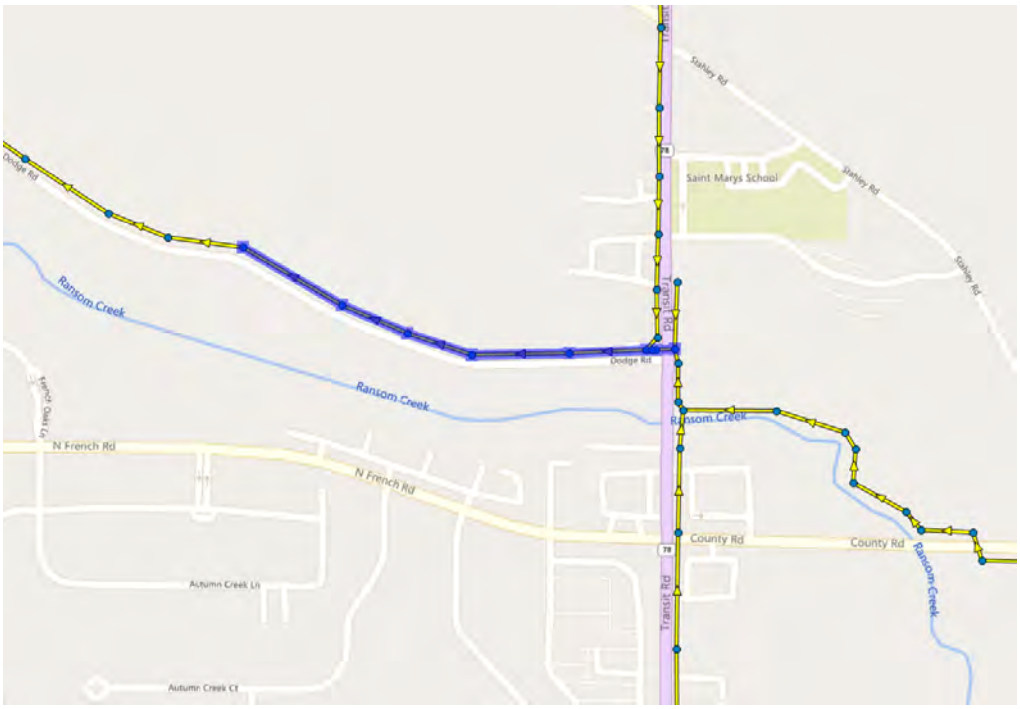


Figure 4-32: Dodge Road Interceptor west of Transit Road

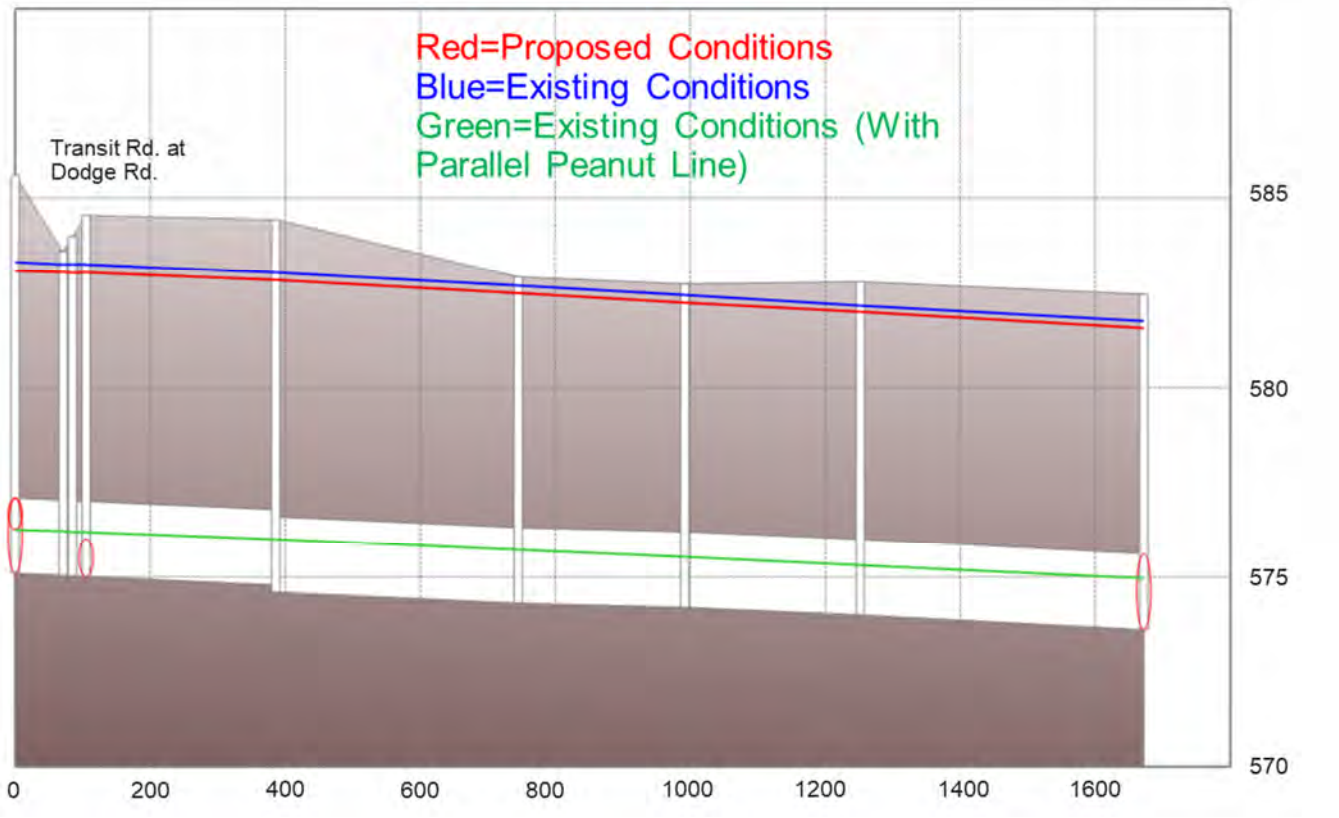


Figure 4-33: Peak Hydraulic Grade Line for the Dodge Road Interceptor– Scenario 2

It should be noted that within the model runs under this scenario, the connection between the 18-inch existing Peanut Line Sewer and the proposed 24-inch Parallel Peanut Line Sewer downstream of Transit Road was modeled as fully open. With the difference in elevation between the two sewers, any surcharging of the 30-inch downstream sewer would affect the 24-inch Parallel Peanut Line Sewer first, as it is at a lower elevation than the existing 18-in Peanut Line Sewer.

Several new facilities or expansions of existing facilities are required under this scenario including:

- New gravity sewers in various locations for the addition and/or expansion of sewer districts – Additional gravity sewers would need to be properly maintained, including periodic cleaning and repairs such as manhole and/or pipe relining as the pipe ages and experiences normal wear and tear.
- Expanded EHPS and new force main (unless gravity sewers are installed to replace the EHPS and BSPS under Eastern Hills Mall Redevelopment Option 1A) – Expanding the EHPS and constructing a new force main most likely will result in a minimal impact on the amount of labor required to operate and maintain the expanded station. ECSD5 typically visits their pump stations several times a week to monitor performance, and visits as needed to address alarm conditions. It is expected that this same protocol would be used for a new, larger EHPS.
- Conversion of Spaulding Lake WWTP to a pumping station – It is likely that conversion of this WWTP to a pumping station would decrease overall operations and maintenance, as site visits to monitor performance could be reduced from every day to every few days. In addition, there will be a significant decrease in the amount of mechanical equipment to maintain if the WWTP is converted to a pump station.
- Conversion of Clarence Research Park WWTP – Similar to the conversion of the Spaulding Lake WWTP, the conversion of the CRP WWTP would likely result in lower operations and maintenance costs.

This scenario confirms that the proposed Parallel Peanut Line Sewer and the existing Peanut Line Sewer between Transit Road and Paradise Road are properly sized for the projected future flows. However, the existing 30-inch diameter sewer immediately west of Paradise Road appears to be capacity limited in the future if all additional flows from all proposed development areas and projected relief of surcharging at Dodge Road is implemented. As a result, improvements further downstream in the Amherst collection system, including the upsizing of the 30-inch downstream Parallel Peanut Line or at the very least, the addition of a parallel pipe to the existing 30-inch Parallel Peanut Line, may be required.

4.5.3 Land Requirements

Scenario 2 involves significant land acquisition, including:

- Additional easements necessary for the construction of a larger EHPS, which would likely be adjacent to its current location to minimize relocation of gravity sewers upstream of the exiting EHPS.
- Easements along Sheridan Drive, Harris Hill Road, and properties north of Roll Road for the installation of a new force main and/or gravity sewers.
- Easements on individual properties within the Harris Hill and CSD9 extension areas as needed for either force main or gravity sewer alignments.

It was assumed that the Parallel Peanut Line Sewer would be installed within the existing easement for the original 18-inch diameter Peanut Line Sewer, so no further land acquisition would be necessary.

4.5.4 Environmental Impact

In most cases, the proposed trunk sewer lines and new force mains will be installed within the existing public right of way, especially along Sheridan Drive, Harris Hill, and the Clarence Peanut Line corridor. These areas have been previously disturbed, and some are under existing sidewalks and road pavement. Otherwise, there may be some impacts with the routing of either a gravity sewer or force main through undeveloped land north of Roll Road, extending north to the Clarence Peanut Line Sewer, including the area of Meadow Lakes Park as shown in Figure 4-28. This area appears to be a mix of forested and agricultural land and the environmental impact of installing a pipe through this area needs to be considered further, based on a more defined route during design. This area may have also been previously affected by the nearby gypsum mining activities, which would need to be further evaluated as to impacts. As discussed previously, alternate routes through the Highland Farms neighborhood and along Newhouse Road were evaluated, but ultimately rejected because another pump station would be required to convey flow across Gott Creek to achieve adequate soil cover over the pipe, while not compromising the future integrity of the pipe. There have been several other instances within Erie County where gravity sewers at stream crossings have been exposed due to erosion in the streamway over time and have required remediation.

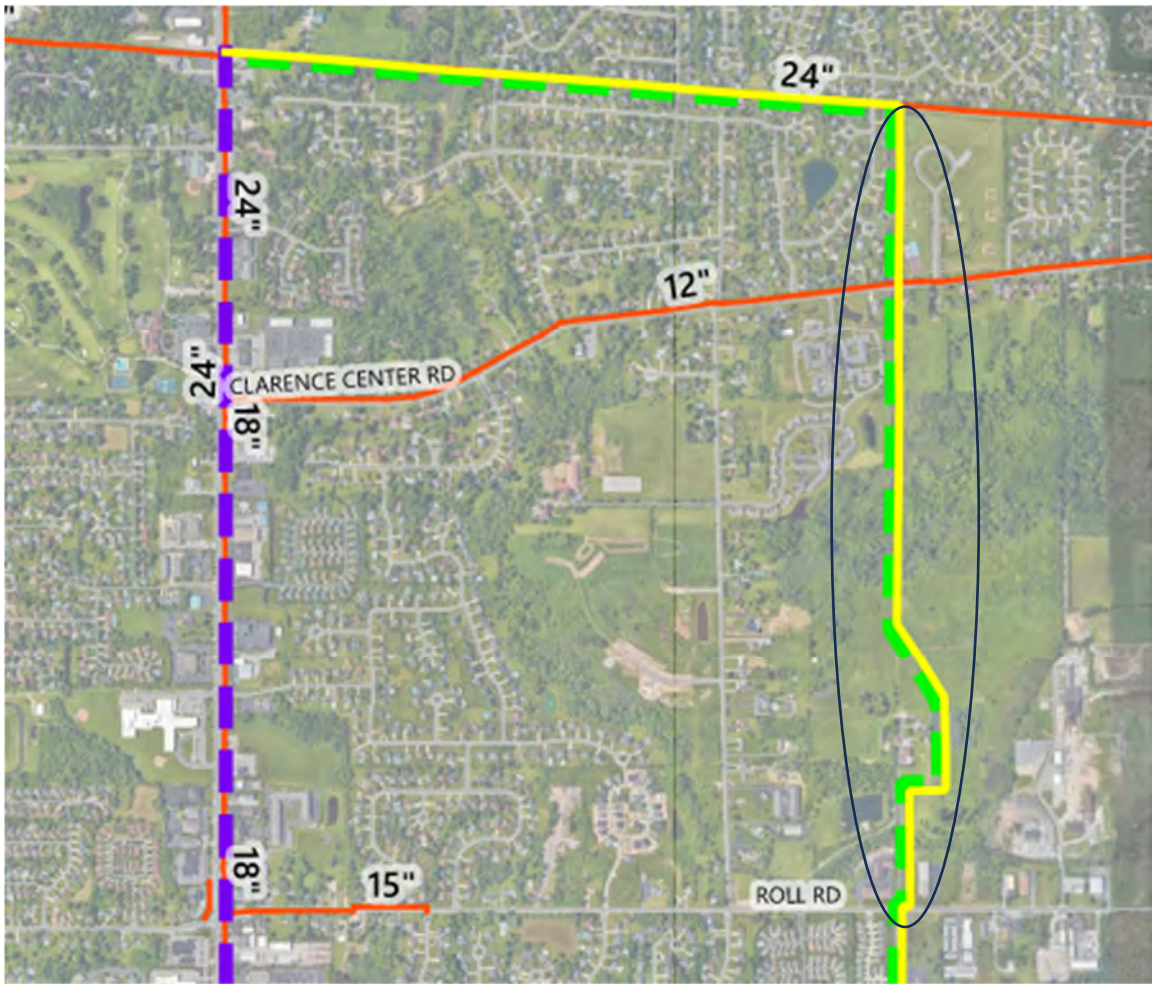


Figure 4-34: Area of Potential Environmental Impacts

Once the individual components of the overall project have been designed, including the final routing, the SEQR process should be followed to identify environmental impacts and develop site-specific mitigation measures that are applicable to the refined project scope and location.

During construction of any of the components under this option, it is anticipated that there will be increased truck and heavy equipment traffic, which could result in noise and/or dust control issues. While temporary, these impacts should be minimized by specifying limits within the design specifications, such as measures for controlling dust and limits on working hours to mitigate the adverse impacts.

Traffic impacts would be most noticeable for improvements along Transit Road. While installation of most of the Parallel Peanut Line Sewer would be within an existing easement, connection to the existing Transit Road sewer will involve boring under a state highway (NY Route 78) and the installation of the new manholes, which will be in the road shoulder. These activities will require traffic control plans to safely move traffic through the area during construction.

4.5.5 Energy Efficient Measures Used

Given that most of the proposed improvements do not require electrical power, they will not need to consider energy savings. However, several options involve pump stations, for which it is now common practice to use premium-efficiency motors for pump operations and variable frequency drives to optimize flows, especially when high fluctuations between low and high flows occur. In addition, pump stations can be designed with optimized HVAC systems, which can achieve energy savings by reducing air flow when the pump station is not occupied. ECSD5 typically visits their pump stations several times a week for an hour or two for each visit to monitor equipment performance and perform maintenance duties, so the pump stations will be unoccupied most of the time.

4.6 Scenario 3 – Eastern Hills Mall Redevelopment Flows + Klein and Dodge Road Diversions

4.6.1 Description of Scenario

Scenario 3 reflects the conditions shown in Figure 4-35. Its purpose was to evaluate the impact of the Dodge Road Diversion and Eastern Hills Mall Redevelopment flows on capacity within the Peanut Line sewers. Consequently, it includes the following components:

- Construction of the Parallel 24-inch Peanut Line Sewer
- Diverting 0.58 MGD from the Transit Road Sewer through the Klein Road Diversion.
- Diversion of the flows from the Dodge Road Interceptor and from the Transit Road sewer north of Dodge at the proposed Parallel Peanut Line Sewer, as indicated in Figure 4-35. The amount of flow diverted is controlled by the percentage that the gate valve at the proposed Parallel Peanut Line sewer is open. The graphs shown in this Section assume that the gate valve is approximately 11% open, sending a peak flow of approximately 0.8 MGD north to Dodge Road and the remainder to the Peanut Line Sewer. Appendix G also contains the results of a model run that assumes that the gate is 100% open, which increases the flow in the next immediate downstream pipe reach to 1.02 MGD under the conditions in this scenario.
- All existing flow from the EHPS tributary area plus the additional flow from Phases 1 through 3 of the Eastern Hills Mall Redevelopment. These flows were added directly to the 24-inch Parallel Peanut Line Sewer.

Note that flows from Harris Hill/Main Street, Spaulding Lake, Clarence Research Park, CSD9 Phase 2, and Available Lots in CSDs (i.e. additional flows to the HBTS) were not included in this scenario.

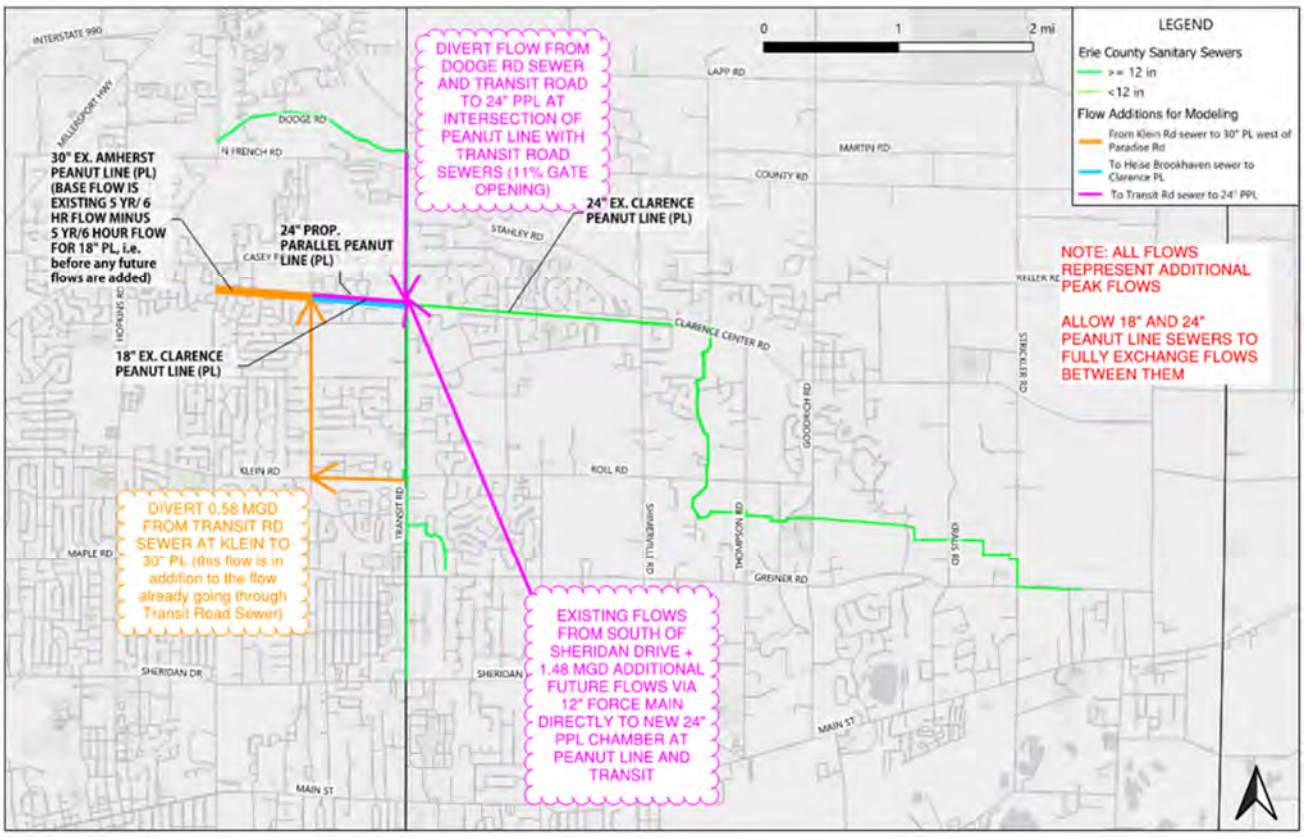


Figure 4-35: Distribution of Additional Flows in the Collection System Model under Scenario 3

4.6.2 Impact on Existing Facilities

The model results for this scenario, as shown in Figures 4-36 through 4-40, indicate that the Parallel Peanut Line will be operating completely full, with the hydraulic grade line slightly above the crown of the pipe, while the 18-in Peanut Line water surface is expected to be below the crown of the pipe for much of its length, as the proposed 24-in Parallel Peanut Line is expected to be at a lower elevation than the existing 18-in Parallel Peanut Line. While initial estimates by the Town of Amherst indicated only 0.9 MGD was originally planned to be diverted from the Dodge Road Interceptor, the hydraulic modeling shows that with the proposed diversion gate on Transit Road at the Parallel Peanut Line, flows diverted from Dodge Road can be as much as 2.2 to 2.6 MGD during the 5-year, 6-hr storm, based on a gate opening equivalent to an 8-in diameter orifice (or 11% open). As shown in Figures 4-39 and 4-40, by diverting more flow from the Transit Road Sewer to the Parallel Peanut Line, the potential for surcharging in the Dodge Road Interceptor and in the Transit Road sewer just upstream from the Dodge Road Interceptor can be significantly lessened. However, the more flow diverted from the Dodge Road Interceptor, the less capacity is available in the Peanut Line Sewers to be used for flows from other developments envisioned for the Town of Clarence. The model results suggest that a balance can be achieved by adjusting the flow diversion from the Dodge Road Interceptor to flows between 0.9 MGD (full open valve) and 2.2 MGD (11% open valve), depending on how much additional flow needs to be accommodated from areas elsewhere in the Town of Clarence. This would allow

for the capacity of the Peanut Line Sewers to be optimized, while reducing the hydraulic grade line within the Dodge Road Interceptor and upstream sewers.

It is noted from the hydraulic grade that the 30-inch downstream Peanut Line sewer appears to be operating near full capacity through much of its length under this scenario, as is the 24-in Parallel Peanut Line sewer. Under this scenario, Figure 4-36 suggests that the 30-inch Peanut Line has additional capacity at its downstream end near Youngs Road due to a steeper pipe slope before it transitions into a 48-in gravity sewer.

This scenario is associated with the following new facilities or expansions of existing facilities:

- Expanded EHPS and new force main (unless gravity sewers are installed to replace the EHPS and BSPS under Option 1A) to convey all existing flow from the EHPS tributary area plus the additional flows from the Eastern Hills Mall Redevelopment Phases 1 through 3. It is expected that if a new, expanded EHPS is constructed, operations and maintenance labor would remain similar to existing; however, electric use will increase with the larger pumps required.
- Note that flows from Harris Hill/Main Street, Spaulding Lake, Clarence Research Park, CSD9 Phase 2, and Available Lots in CSDs (i.e. additional flows to the HBTS) were not included in this scenario.
- Potentially a new pump station at Harris Hill Road/Sheridan Drive (under Eastern Hills Mall Redevelopment Option 3). ECSD5 has spent many years trying to eliminate pump stations across their districts and using this option would result in another pump station to operate and maintain, thus increasing costs.

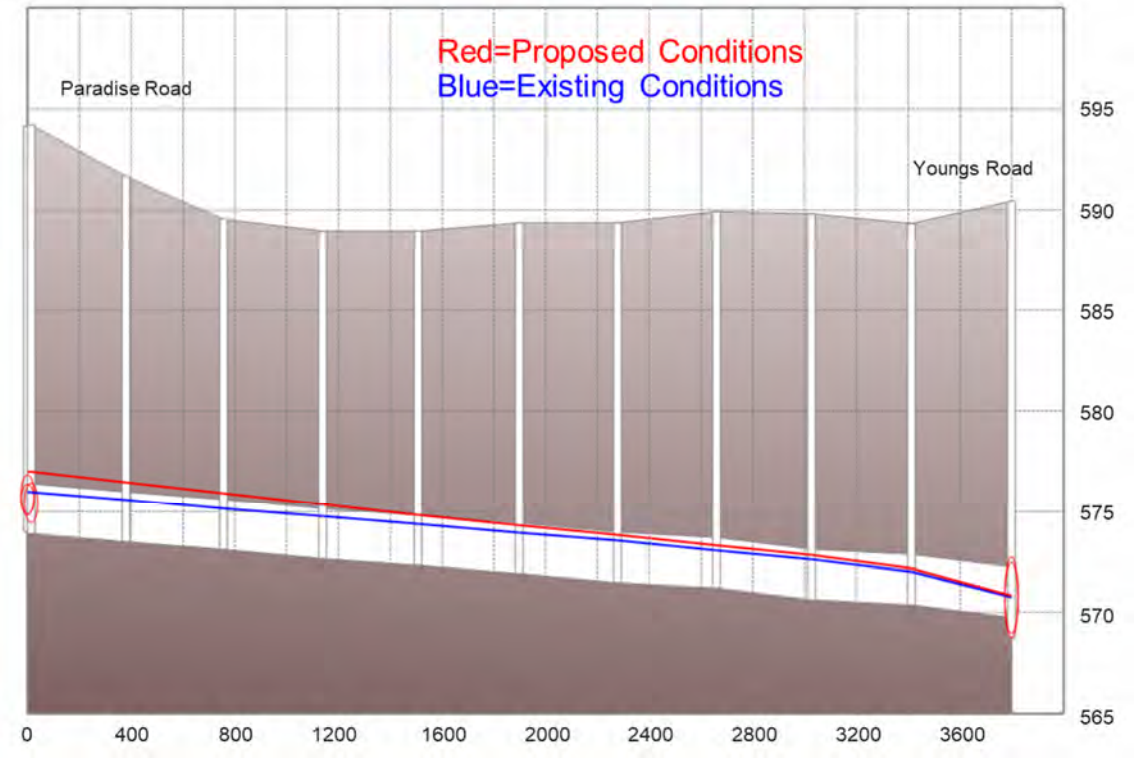


Figure 4-36: Peak Hydraulic Grade Line for 30-inch Peanut Line Sewer – Scenario 3

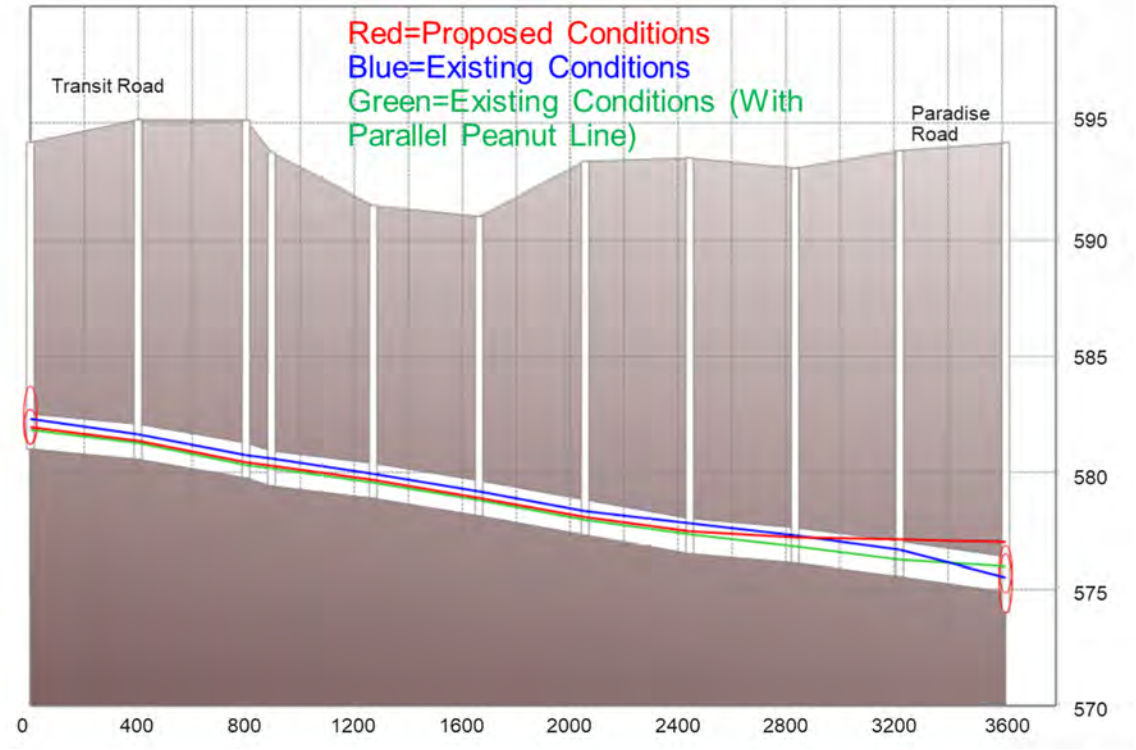


Figure 4-37: Peak Hydraulic Grade Line for Existing 18-inch Peanut Line Sewer – Scenario 3

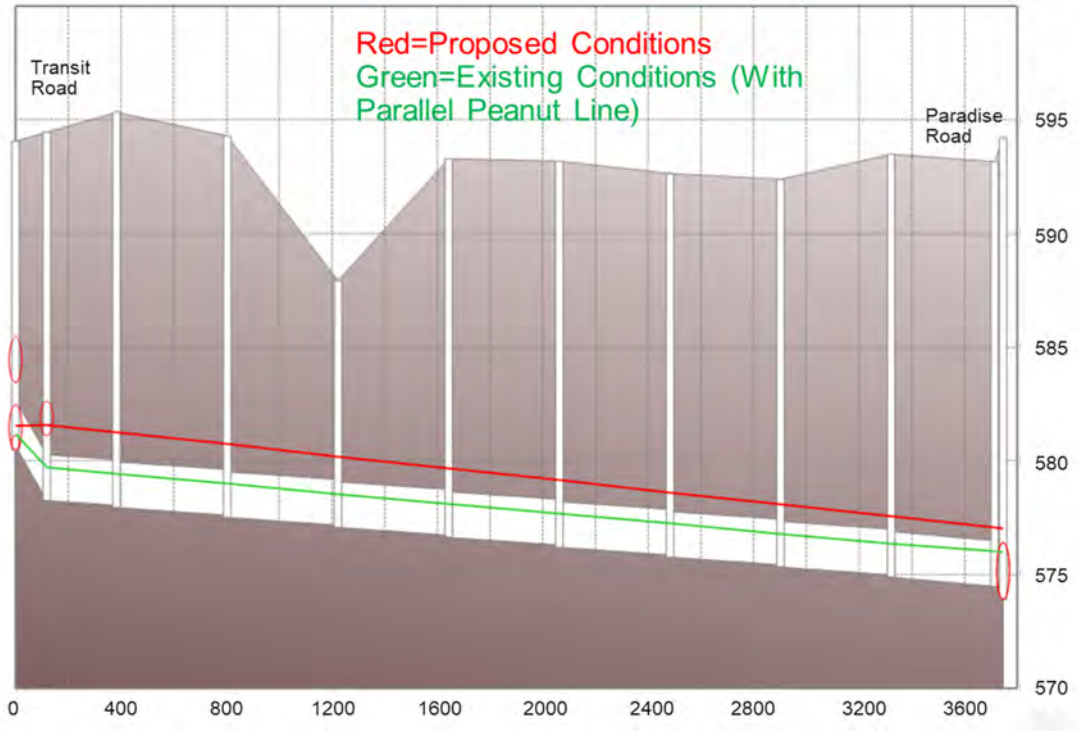


Figure 4-38: Peak Hydraulic Grade Line for 24-inch Parallel Peanut Line Sewer – Scenario 3

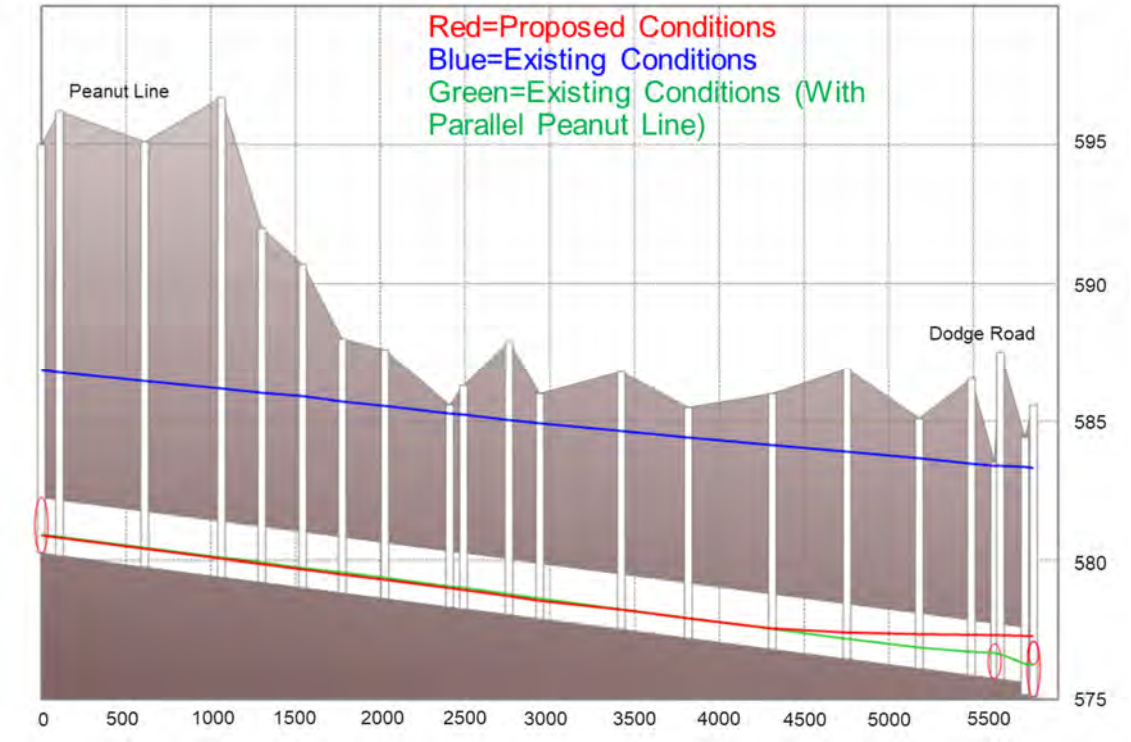


Figure 4-39: Peak Hydraulic Grade Line for Transit Road sewer upstream of the Dodge Road Interceptor– Scenario 3

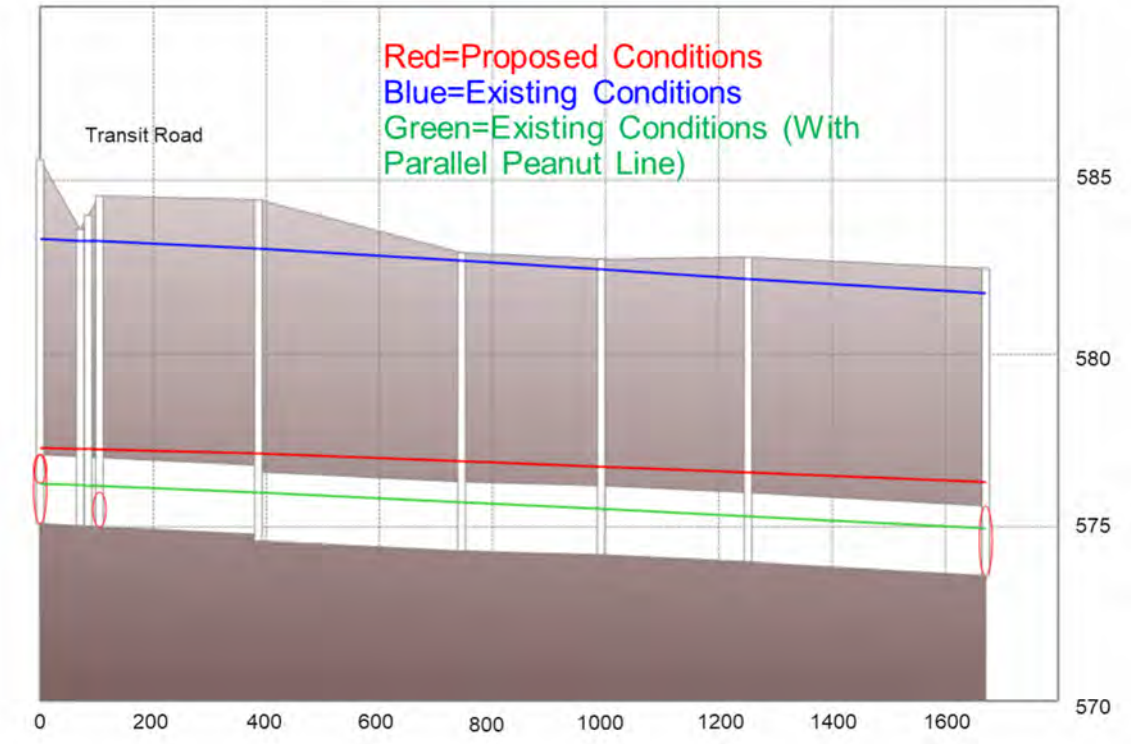


Figure 4-40: Peak Hydraulic Grade Line for Dodge Road Interceptor immediately downstream of Transit Road – Scenario 3

4.6.3 Land Requirements

Because this scenario does not involve the installation of all the proposed development opportunities that were included in Scenario 2, land requirements are much less. Easements for either an expanded EHPS and/or a new EHPS would be required, as well as easements along Harris Hill Road and along the proposed pipe route between Roll Road and the Parallel Peanut Line Sewer under Options 2 and/or 3; or along Transit Road under Option 4.

4.6.4 Environmental Impact

Like Scenario 2, the new Harris Hill sewer can be installed within the existing public right of way, especially along Sheridan Drive, Harris Hill, and along the Clarence Peanut Line corridor. Otherwise, there may be some impacts with the routing of either a gravity sewer or force main through undeveloped land north of Roll Road extending north to the Clarence Peanut Line Sewer, including the area of Meadow Lakes Park. Similar to Scenario 2, this area may have also been previously affected by the nearby gypsum mining activities, which would need to be further evaluated as to impacts. This area appears to be a mix of forested and agricultural land and the environmental impact of installing a pipe through this area needs to be considered further, based on a more defined route during design. The SEQR process should be followed during the design process to identify environmental impacts both during construction and during the operational phases of the project based on a more refined project scope and location.

4.6.5 Energy Efficient Measures Used

The pump stations would be designed with premium efficiency motors and optimized HVAC design to minimize energy use, especially when the pump station is unoccupied.

4.7 Scenario 4 – All Proposed Additional Flows to Collection System minus Harris Hill/Main Street Flows

4.7.1 Description of Scenario

Providing sewer service to the Harris Hill/Main Street area is a future priority for the Town of Clarence. However, considering it is not presently a pressing need and the sizable cost to implement, extending service to this area is likely several decades away. Considering these factors, this scenario contemplated the addition of flows from all proposed development areas, except from the Harris Hill/ Main Street area, as shown in Figure 4-41.

This scenario includes:

- Construction of the Parallel Peanut Line Sewer.
- Construction of Spaulding Lake, CSD9 Phase 2 and Clarence Research Park Connections to the HBTS.
- Provision for up to an additional 0.51 MGD for available lots in CSDs 2, 4, 6, and 9, added into the HBTS and the Clarence Peanut Line Sewer.
- Redirecting existing flow south of Sheridan (existing EHPS tributary area plus additional flows from all three phases of the Eastern Hills Mall Redevelopment) directly to the 24-inch Parallel Peanut Line Sewer.
- Connection between 18-inch Peanut Line sewer and the 24-inch Parallel Peanut Line sewer is closed.
- Diversion of 0.58 MGD from the Transit Road sewers directly to the 30-inch Peanut Line Sewer via the Klein Road sewer.

- Diversion of ~0.9 MGD from Dodge Road to the 24-inch Parallel Peanut Line sewer (i.e., Transit Road diversion gate fully open).

Projected flows from the Harris Hill/Main Street area are excluded from this scenario.

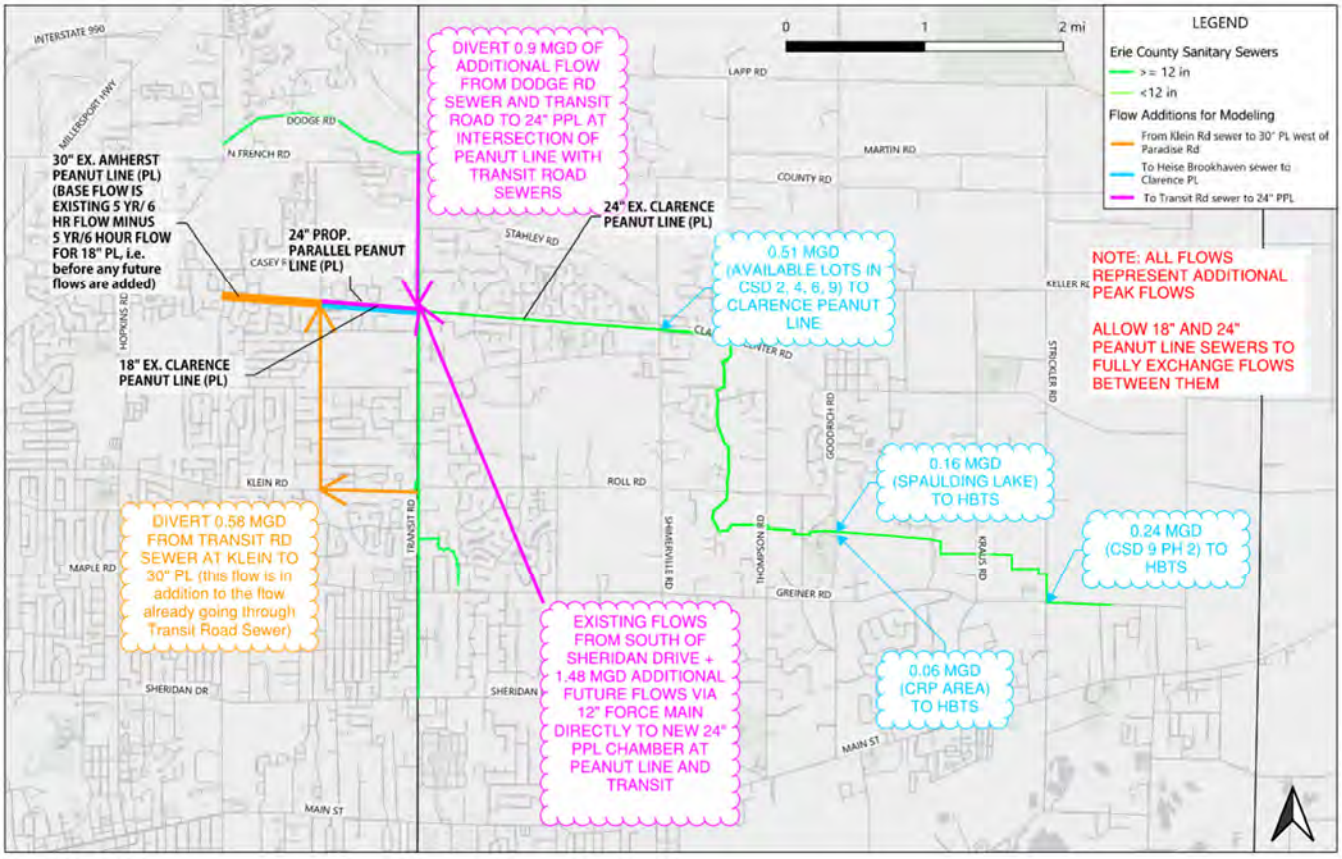


Figure 4-41: Distribution of Additional Flows in the Collection System Model under Scenario 4

4.7.2 Impact on Existing Facilities

The modeling results from this scenario are provided in Figures 4-42 through 4-46. As indicated in prior sections, previous model runs focused on optimizing the capacity of the Peanut Line sewers to enable conveyance of additional flows from development areas within the Town of Clarence. To limit the flows of the Dodge Diversion to 0.9 MGD as indicated by the Towns and ECSD5 and allow for Peanut Line capacity to be available to other areas, the 24-inch diameter gate valve in Transit Road sewer must be fully open. If the gate is partially closed, more flow is diverted to the Parallel Peanut Line Sewer, taking up valuable capacity, but the extent of surcharging at Dodge Road is reduced.

In the following figures, blue represents existing conditions, green represents the conditions that would be expected under current flows if the Parallel Peanut Line were constructed and red represents the proposed conditions with adding all projected future flow from the Town of Clarence, except from the Harris Hill and Main Street areas. As observed in Figures 4-42 and 4-43, the Dodge Road Interceptor and the Transit Road sewer reaches immediately upstream of Dodge Road exhibit a hydraulic grade line higher than the crown of the pipe under the proposed conditions but not as high as existing conditions, which should reduce the potential for surcharging within this area.

As can be seen in Figures 4-44 through 4-46, the Peanut Line Sewers are operating near capacity or slightly surcharged over the crown of the pipe under this scenario.

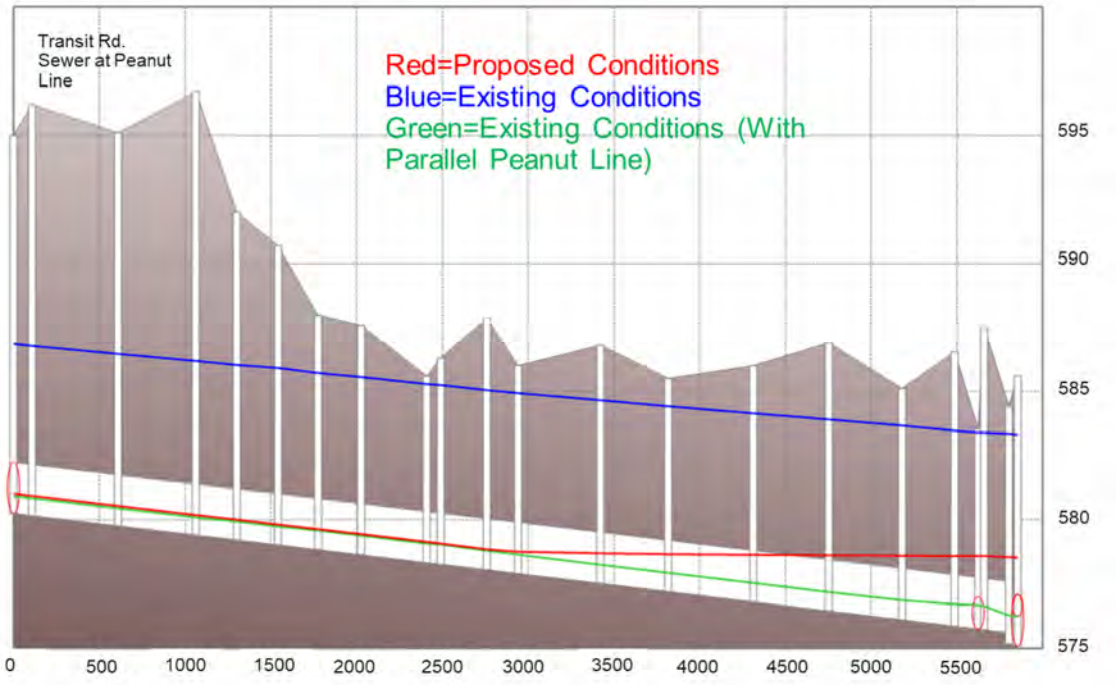


Figure 4-42: Peak Hydraulic Grade Line for Transit Road sewer from Peanut Line to Dodge – Scenario 4

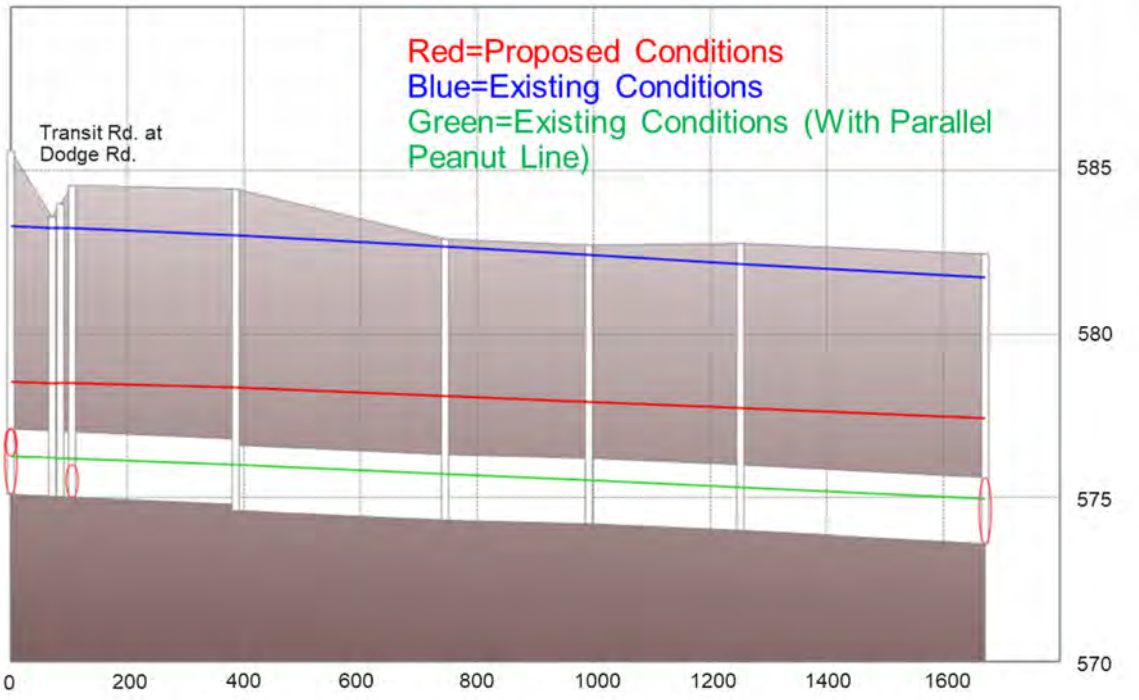


Figure 4-43: Peak Hydraulic Grade Line for Dodge Road Interceptor – Scenario 4

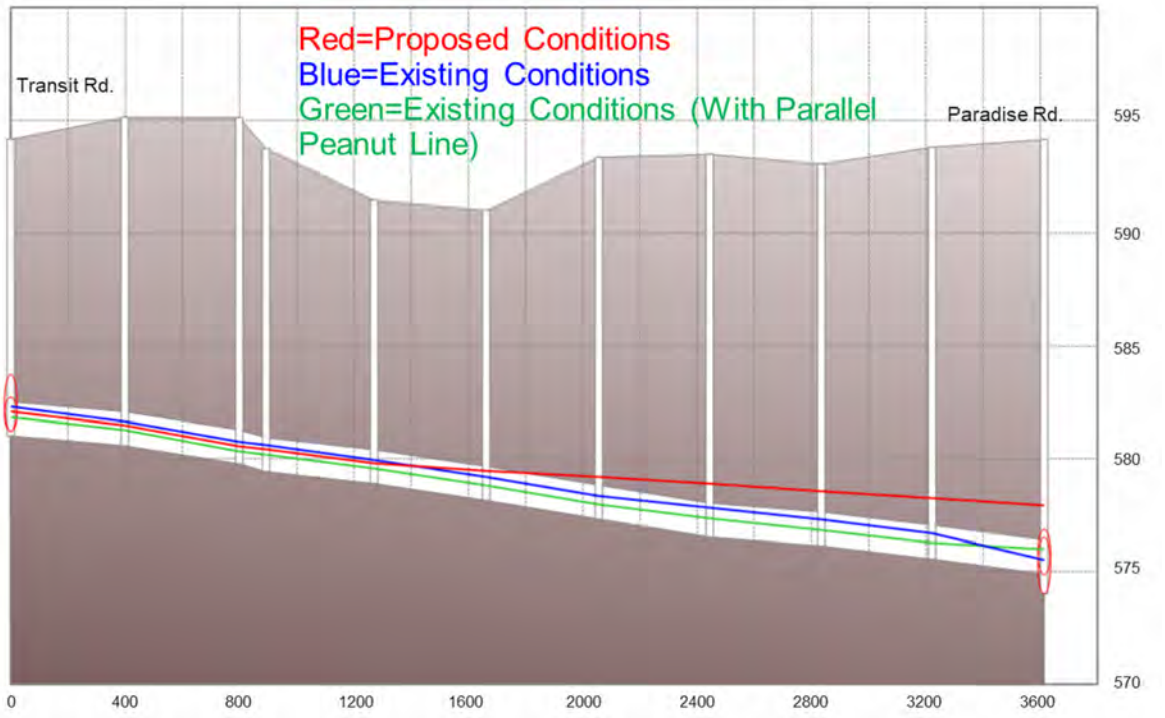


Figure 4-44: Peak Hydraulic Grade Line for Existing 18-inch Peanut Line – Scenario 4

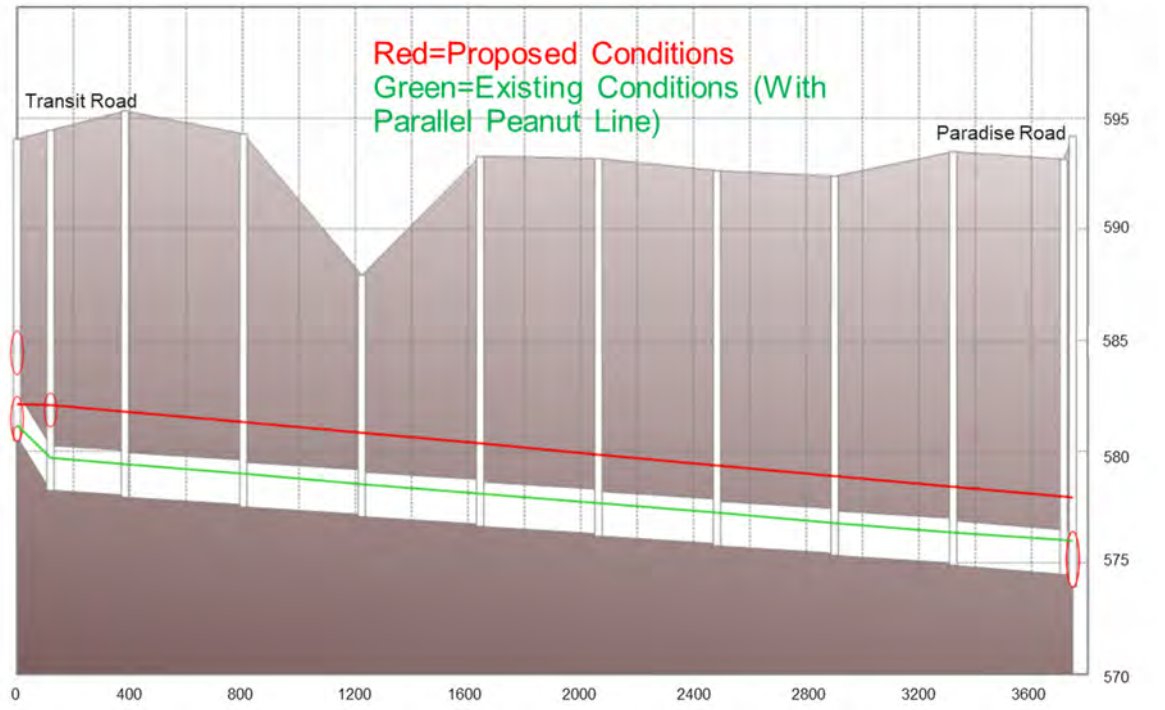


Figure 4-45: Peak Hydraulic Grade Line for 24-inch Parallel Peanut Line – Scenario 4

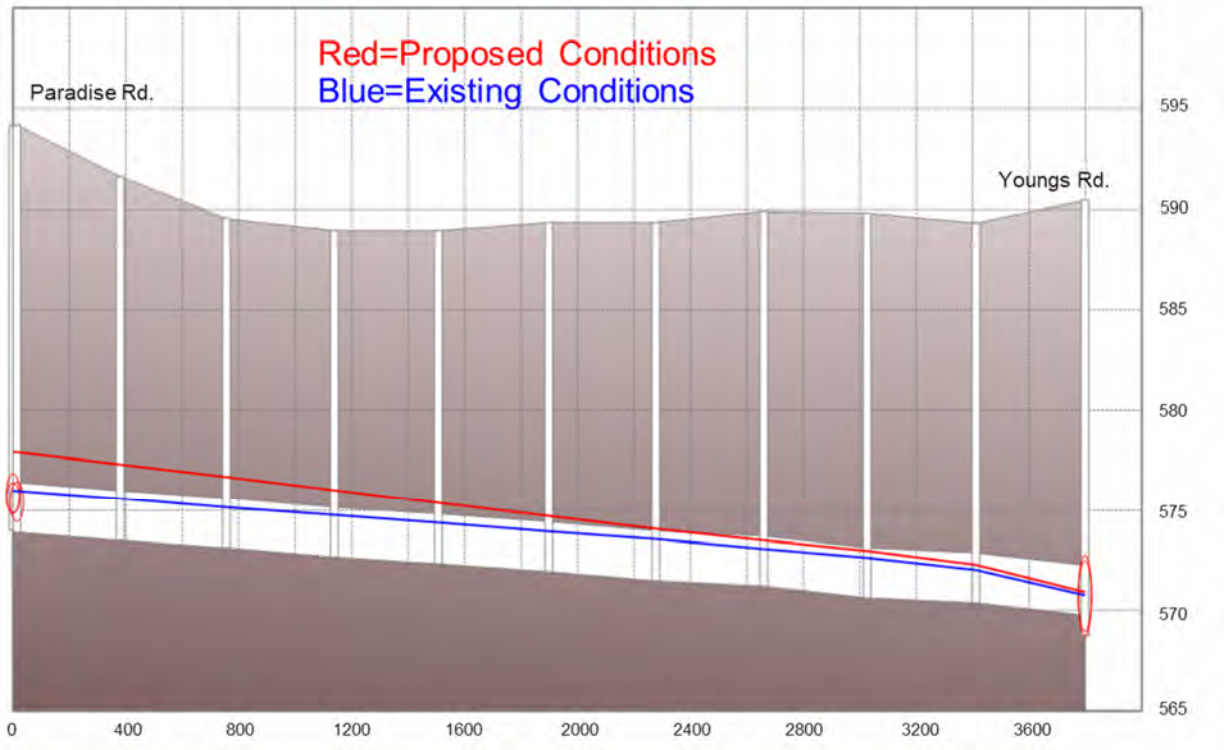


Figure 4-46: Peak Hydraulic Grade Line for Existing 30-inch Peanut Line – Scenario 4

From this scenario, it appears that the Peanut Line sewer line capacity is optimized while significantly decreasing the hydraulic grade line at Dodge Road and along Transit Road to lessen the potential for surcharging and is preferable to the hydraulic grade lines generated under Scenario 2.

4.7.3 Land Requirements

The land requirements under this scenario are similar to Scenario 2, except that the Harris Hill/Main Street collection system would not be included in the project until additional capacity is made available in the downstream Amherst collection system. However, there exists the potential for the Harris Hill trunk sewer or force main to be constructed under either Options 2 or 3 to enable the Harris Hill/Main Street to be added in the future with minimal additional construction.

4.7.4 Environmental Impact

Environmental impacts are similar to those outlined for Scenario 2. Both construction and ongoing operation of the improvements have potential for environmental impacts. The exact impacts highly depend on what type of sewer is implemented (gravity vs. force main) which affects the depth, the presence of rock, and routing of the sewer pipes. As indicated with other scenarios, the SEQR process will need to be followed during the design process to identify and mitigate potential environmental impacts.

4.7.5 Energy Efficient Measures Used

Pump stations will be designed with premium efficiency motors and optimized HVAC systems.

4.8 Scenario 5 – All Additional Flows to Collection System plus Upsizing of 30-inch diameter Peanut Line Sewer to 36-inches or Installation of a Parallel Sewer

4.8.1 Description of Scenario

The purpose of the final scenario run within the collection system model was to determine the impact of upsizing the 30-inch Peanut Line Sewer to 36 inches or installing a parallel sewer to the 30-inch Peanut Line Sewer. While not part of the current project, the Town of Amherst had indicated that capacity downstream of the 30-inch sewer may become an issue if additional flows to be added beyond what was described in Scenario 4 were to occur. The JMD team did not evaluate conditions downstream of the 30-inch sewer, as it was outside the scope of this project; however, Figure 4-29 suggests that the 48-inch gravity sewer downstream of Youngs Road has sufficient capacity for all future flows from the Town of Clarence. However, this also assumes that the flows within the Amherst collection system from the Town of Amherst are represented adequately in the hydraulic model provided for our use in this project. If flows in excess of those shown for Scenario 4 are added to the system, additional flow monitoring and collection system modeling may be required at that time to verify peak flows from the Amherst tributary area prior to upsizing the existing 30-inch sewer and those gravity sewers further downstream.

This scenario considered:

- Construction of the Parallel Peanut Line Sewer.
- Upsizing of the 30-inch Peanut Line Sewer to 36 inches or installing a parallel sewer to the existing 30-inch section of the Peanut Line Sewer.
- Construction of Spaulding Lake, CSD9 Phase 2 and Clarence Research Park connections to the HBTS.
- Provision for up to 0.51 MGD additional flow from available lots in CSDs 2, 4, 6, and 9, added into the HBTS and the Clarence Peanut Line Sewer.
- Redirecting existing and proposed flows from south of Sheridan (namely, the existing EHPS tributary area plus additional flows from the all three phases of the Eastern Hills Mall Redevelopment) directly to the 24-inch Parallel Peanut Line Sewer.
- Diversion of 0.58 MGD from the Transit Road sewers directly to the upsized 36-inch Peanut Line Sewer via the Klein Road sewer.
- Diversion of ~2.2 MGD from Dodge Road to the 24-inch Parallel Peanut Line sewer (i.e., Transit Road diversion gate at 11% open).

4.8.2 Impact on Existing Facilities

The effect of the upsizing of the 30-inch Peanut Line sewer to 36 inches is noticeable in Figure 4-47. The pipe is no longer at capacity and appears to be only 66 – 75% full along most of its length. More importantly, the impact that this available capacity has on the existing 18-inch and 24-inch Parallel Peanut Line sewers is significant (Figures 4-48 and 4-49, respectively) as compared to the hydraulic profiles generated under Scenario 2. The 18-inch Peanut Line sewer is no longer surcharged and is running slightly under capacity (Figure 4-48). The 24-inch Peanut Line (Figure 4-49) shows a hydraulic grade line lower than what was generated under Scenario 2. The hydraulic grade

lines at the upstream of both pipes indicate that the pipes upstream of the Peanut Line sewers are also not surcharged.

The lower hydraulic grade lines within the Peanut Line sewers also contributed to lower hydraulic grade lines in the Transit Road Sewer upstream of Dodge Road (Figure 4-50) and in the Dodge Road Interceptor (Figure 4-51); however, hydraulic grade lines above the crown of the pipes were still observed. The model runs completed for this Scenario only considered upsizing the 30-inch diameter Peanut Line sewer to 36-inches and improvements within the critical Peanut Line and Dodge Road sewers were observed, but it does not totally resolve the surcharging issue. It is recommended that the system be analyzed further through flow monitoring and additional collection system model calibration once some of these development projects within the Town of Clarence have been added to the collection system, but before implementing the addition of flows from the Harris Hill and Main Street areas. This additional analysis will further develop the most appropriate sizing for improvements in the upstream Amherst collection system.

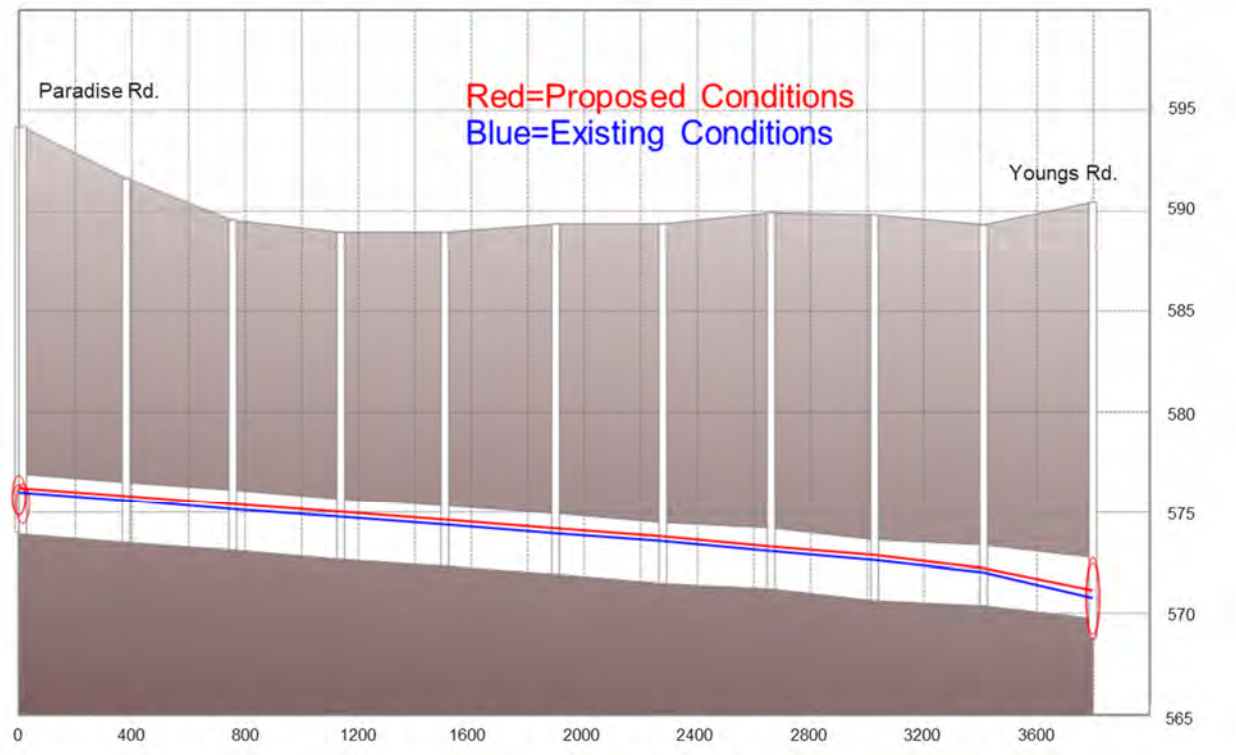


Figure 4-47: Peak Hydraulic Grade Line for Upsized 36-inch Peanut Line Sewer – Scenario 5

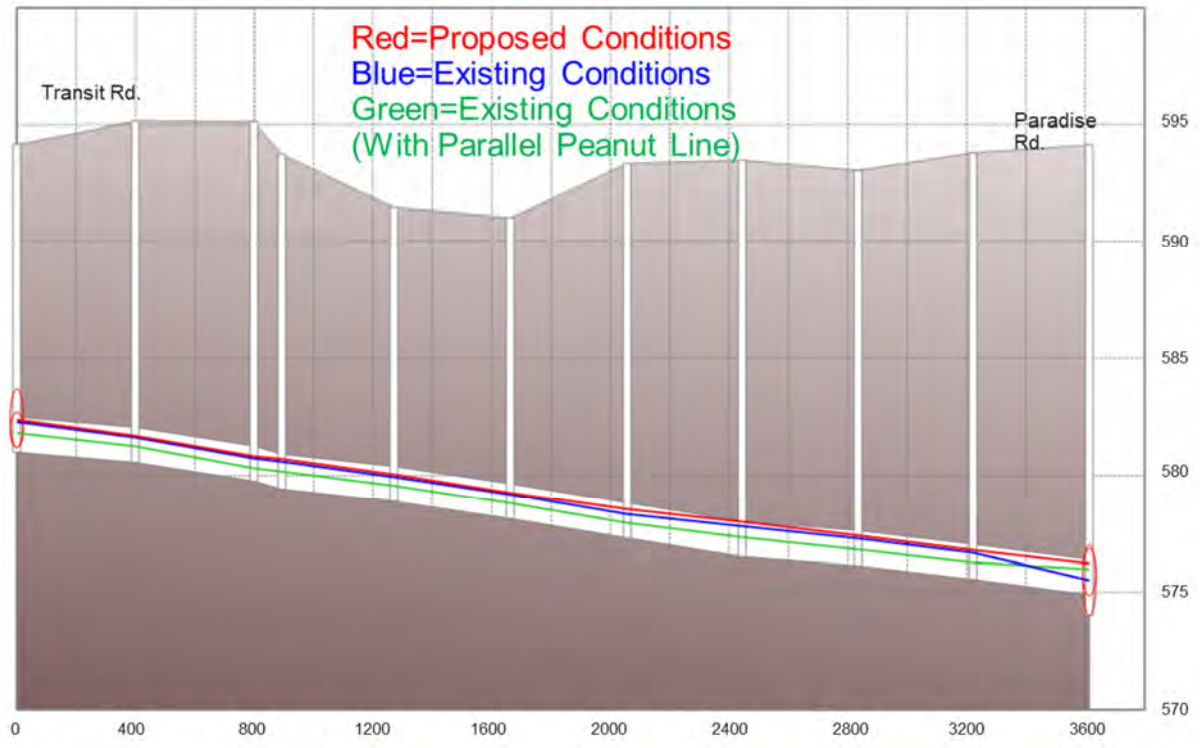


Figure 4-48: Peak Hydraulic Grade Line for 18-inch Peanut Line Sewer – Scenario 5

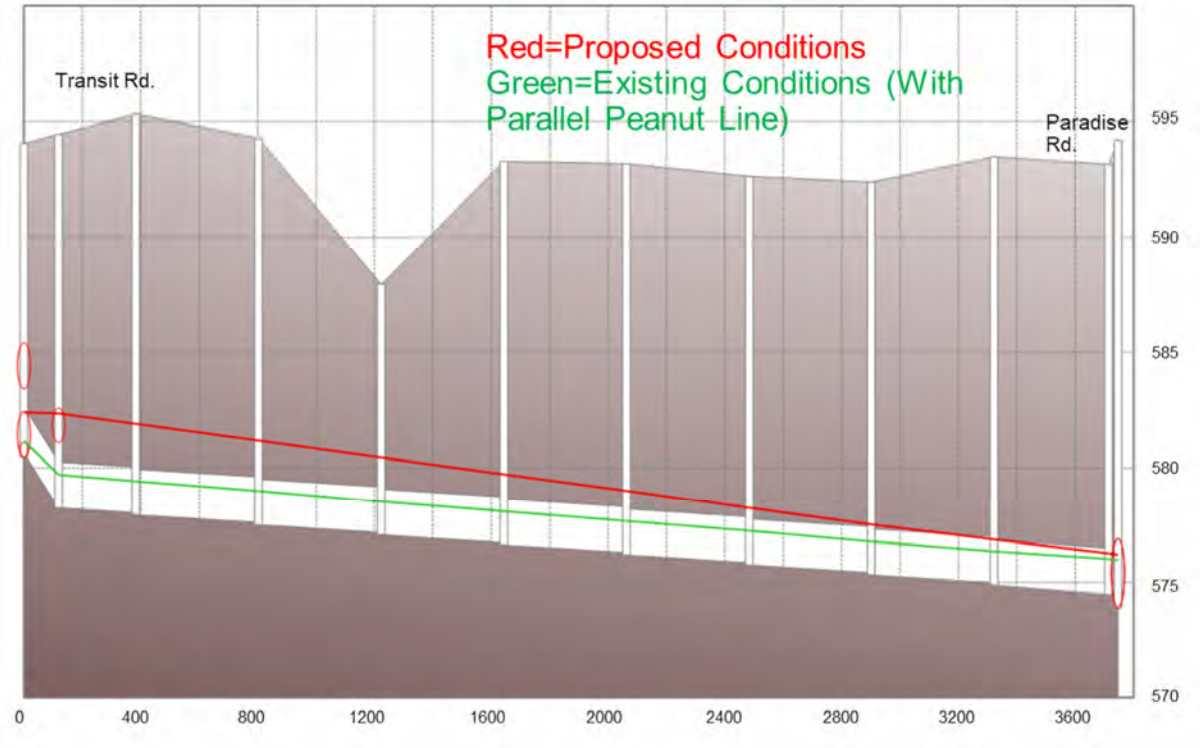


Figure 4-49: Peak Hydraulic Grade Line for 24-inch Parallel Peanut Line Sewer – Scenario 5

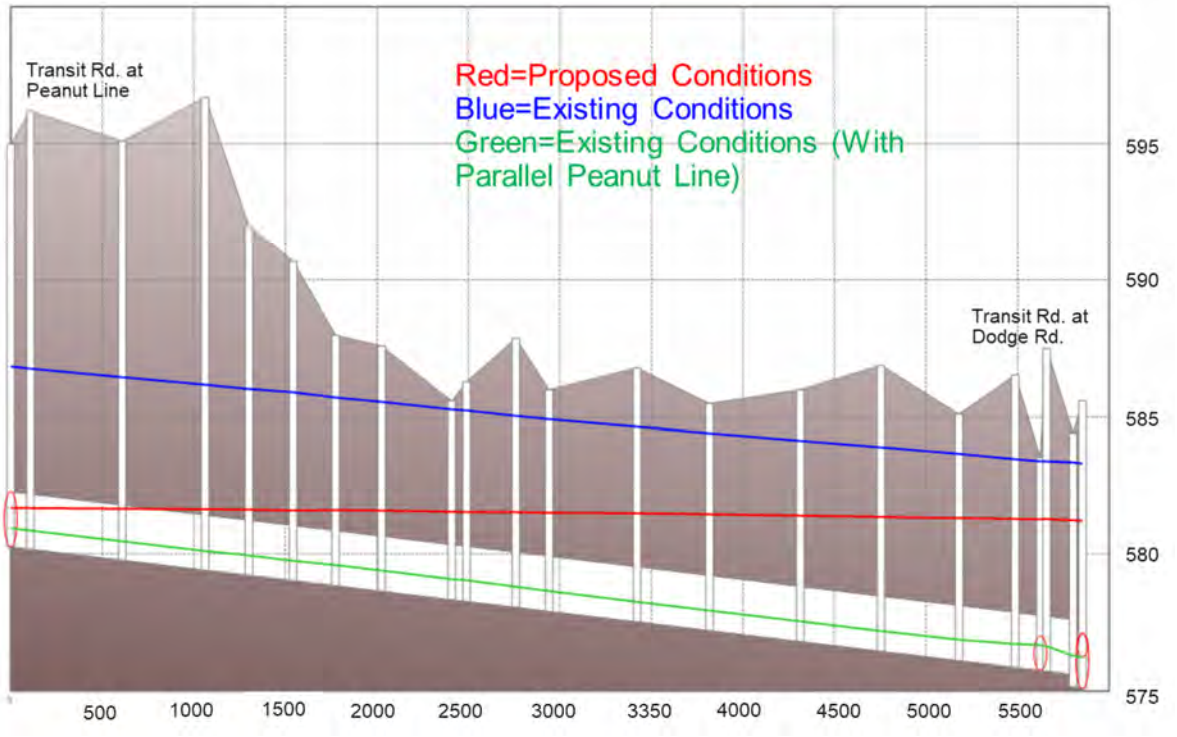


Figure 4-50: Peak Hydraulic Grade Line for Transit Road Sewer Upstream from Dodge Road – Scenario 5

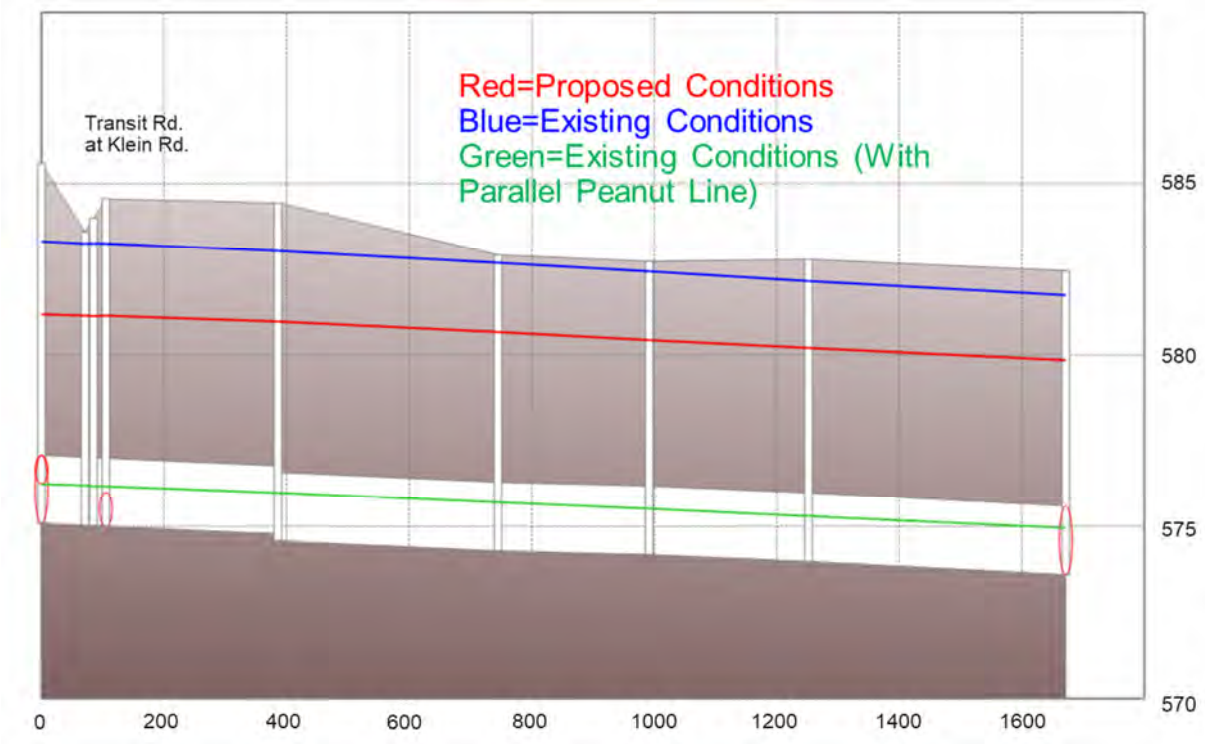


Figure 4-51: Peak Hydraulic Grade Line for Dodge Road Sewer – Scenario 5

4.8.1 Land Requirements

No additional land requirements beyond that needed for Scenario 2 are associated with this scenario, as upsizing of the 30-inch Peanut Line Sewer would be completed in the same easement as the existing.

4.8.2 Environmental Impact

Upsizing of the sewer should have very little environmental impact as the installation will occur in the same easement as the existing 30-inch sewer.

4.8.3 Energy Efficient Measures Used

No energy efficiency measures beyond those described in Scenario 2 apply to this scenario.

5 Analysis

5.1 Summary of Modeling Results

Section 4 outlined the considerations required to evaluate options for conveying flow from the Town of Clarence and ECSD5 to the Town of Amherst's collection system. Several key points emerged from the evaluation:

- The use of the collection system model provided valuable information not captured in point values, such as the time of travel of flow within the collection system and the subsequent timing of peak flows. The model also used six months' worth of data to provide a dynamic simulation of conditions, which considered upstream and downstream effects on pipe capacity and the ability to convey flows without surcharging.
- The model calibration used previously collected data collected in ECSD5 and the CSDs in 2019 was used to project rainfall associated with a 5-year, 6-hour storm event that was used to estimate peak flows and determine system capacity.
- All proposed development areas and associated flows discussed in Section 4.2 cannot be accommodated within the existing infrastructure. Based on Scenario 4, surcharging can be limited while maximizing the flows conveyed to the Peanut Line Sewers. This scenario showed that construction of the Parallel Peanut Line sewer is properly sized to accommodate all existing and proposed flows. However, the capacity of the 30-inch Peanut Line Sewer is the next limiting factor, causing potential surcharge issues within the existing 18-inch and 24-inch Parallel Peanut Line sewers. To accommodate additional flows beyond its current capacity, this pipe will need to be upsized as shown in Scenario 5. Upsizing of the 30-inch sewer or installation of a parallel sewer to the existing 30-inch Peanut Line sewer in the future will be required to handle all projected additional flows evaluated in this study.
- Peak water surface levels in the Dodge Road Interceptor and the Transit Road sewer upstream of the Dodge Road Interceptor are highly sensitive to the amount of flow that can be diverted to the Parallel Peanut Line Sewer. Even without the flows from proposed development, the Parallel Peanut Line Sewer is necessary to relieve the Dodge Road Interceptor.
- Diversion of flows greater than what is achievable with the Transit Gate fully open is necessary to relieve the Dodge Interceptor. It appears that ~2.2 MGD diversion is necessary to drop the water surface elevation to non-surcharging levels during peak flows.
- The Heise Brookhaven Trunk Sewer appears to be well within capacity even with the proposed addition of flows from CSD9 Phase 2, Clarence Research Park, and Spaulding Lake developments, with the pipe showing as running at half capacity under this scenario. While not fully discussed, most scenarios were run with additional flows to the Clarence Peanut Line Sewer of 0.51 MGD, attributed to future flows from unsewered properties that may eventually be added to existing sewer districts. This addition of services will happen over time and may open up opportunities for increased diversions from Transit Road to the Peanut Line sewers in the shorter term.
- The timeframes for implementing the new development opportunities may provide some flexibility in the future. For example, if Clarence Research Park flows are never expanded to 0.06 MGD or only one or two phases of the Eastern Hills Mall Redevelopment is implemented, some capacity envisioned for full buildout of these areas may be reallocated towards other areas.

5.2 Scoring Methodology

Based on the modeled scenarios discussed in Section 4, Scenario 4 provided the best combination of additional flows while still controlling surcharging. This scenario included the following:

- Construction of the Parallel Peanut Line Sewer, which is currently in design.
- Construction of Spaulding Lake, CSD9 Phase 2 and Clarence Research Park connections to the HBTS. Preliminary evaluations for Spaulding Lake and Clarence Research Park have been completed that outline the scope of the work. Additional design is required to develop shovel-ready projects in these areas. In the case of CSD9 Phase 2, it does not appear that any preliminary design has been completed, so no general sewer layouts are available. The sewer layout for this area would need to be developed and progressed in the design phase.
- Provision for up to an additional 0.51 MGD for available lots in, and extensions of, CSDs 2, 4, 6, and 9, added into the HBTS and the Clarence Peanut Line Sewer. Connecting lots into the sewer infrastructure in existing sewer districts involves tying in new laterals to the collection system, as well as extension of the existing sewers through sewer district extensions to accommodate new subdivisions.
- Redirecting existing flow south of Sheridan Drive (existing EHPS tributary area plus additional flows from the three phases of implementation of the Eastern Hills Mall Redevelopment) directly to the 24-inch Parallel Peanut Line Sewer.
- Diversion of 0.58 MGD from the Transit Road sewers directly to the 30-inch Peanut Line Sewer via the Klein Road sewer.
- Diversion of ~2.2 MGD from Dodge Road to the 24-inch Parallel Peanut Line sewer (i.e., Transit Road diversion gate 11% open). With the construction of the Parallel Peanut Line Sewer and valve chamber, flows can be diverted from the Dodge Road Interceptor.

Because the existing EHPS, force main, and Transit Road sewers do not have the capacity to handle the additional flow from the redevelopment project, providing a means for flow to get from the Eastern Hills Mall site to the Parallel Peanut Line Sewer is necessary. Therefore, the scoring methodology described in the following subsections was used to rate the options for the Eastern Hills Mall Redevelopment flow conveyance to the Parallel Peanut Line Sewer. These options were described in Section 4.3 and can be combined into the following:

- Options 1A + 2 – Eliminate the EHPS and the BSPS and convey flow by gravity from existing pump stations to the Harris Hill Road/Sheridan Drive intersection. Construct a new gravity sewer from the intersection to convey flow to the Parallel Peanut Line Sewer.
- Options 1B + 2 – Replace the EHPS with a larger EHPS at its current location and construct a new gravity sewer from the Harris Hill Road/Sheridan Drive intersection to convey flow to the Parallel Peanut Line Sewer.
- Options 1A + 3 - Eliminate the EHPS and the BSPS and convey flow by gravity from existing pump stations to a new pump station at the Harris Hill Road/Sheridan Drive intersection. The new pump station would convey flow to the 24-inch Parallel Peanut Line Sewer in a new force main.

- Options 1B+ 3 - Replace the EHPS with a larger EHPS at its current location and convey flow to a new pump station at the Harris Hill Road/Sheridan Drive intersection that would send flow to the 24-inch Parallel Peanut Line Sewer in a new force main.
- Option 4 - Upsize EHPS at or near its existing location and construct a new force main up Transit Road to the 24-inch Parallel Peanut Line Sewer.

These options were evaluated based on costs and non-cost criteria, as described below.

5.2.1 Non-Cost Identifiable Criteria

While costs (both capital and operations and maintenance) are an important consideration in any project, other non-cost criteria are also important in selecting the most appropriate option for implementation. The list of non-cost criteria considered is provided in Table 5-1.

Scoring of the non-cost criteria was completed using the Quality Function Deployment (QFD) approach, which evaluates project options by comparing specific attributes on a relative and absolute basis. Weighting factors for each criterion were developed by comparing the criteria against each other (refer to Table 5-2). The criterion contributing more to project success is selected for each pair (for example, in Table 5-2, #1 Long Range Planning outweighs #2 Public Inconvenience, so a #1 is put in the box between them). When two criteria were considered equal, both were selected. Once the analysis for each option was complete, the number of times each criterion was selected was totaled to represent the criteria weight (for example, #1 Long Range Planning appears in 7 boxes, so the weight in the final row of the table is 7).

Secondly, each criterion is ranked for each option under evaluation using a scale of 1 to 4, as follows:

- Rank 1 (Poor): A score of 1 indicates that the criterion negatively impacts selection of the option.
- Rank 2 (Fair): A score of 2 indicates that the criterion is neutral to the selection of the option.
- Rank 3 (Good): A score of 3 indicates that the criterion moderately supports selection of the option.
- Rank 4 (Excellent): A score of 4 indicates that the criterion distinctly supports selection of the option.

The criteria, descriptions, weights, and rankings of the five option combinations considered are provided in Tables 5-3 through 5-7. Based on the QFD analysis, the combinations involving Option 1B (Replacing the EHPS with a larger EHPS at its current location) scored highest with Option 4 (Upsizing the EHPS and building a new force main along Transit Road to the Parallel Peanut Line Sewer) scoring the worst.

Table 5-1: List of Non-Cost Criteria

Non-Cost Impact	Description
1. Long Range Planning	- Increasing public sanitary sewer service
	- Increasing town taxpayer base
	- Consistency with Master Plans
2. Public Inconvenience	- Tranquility of life (i.e., noise, dust, vibration)
	- Pavement replacement area
	- Commuting time and costs
3. Major Crossings	- Road, utility and stream crossings
	- Duration of construction, consequence of failures
	- Permitting required
	- Future maintenance inaccessibility
4. Geotechnical Considerations	- Dewatering, construction duration and difficulty
	- Construction contingency cost
	- Bedrock
	- Inaccessible land
5. Permitting/Implementation	- Construction scheduling and sequencing
	- Agency review, community resistance
	- Public notifications
6. Right-of-Way/ Easement Availability	- Potential lawsuits and legal issues
	- Land acquisitions
	- Design and bidding schedules
	- Existing easements in place
7. Operation and Maintenance (O&M) **Accessibility**	- O&M convenience and effectiveness
	- Number of assets to maintain
	- Level of effort for O&M
8. Environmental Impact	- Long term mitigation/monitoring responsibility
	- Design and bidding schedules
	- Design and construction complexity
	- Wetland locations
	- Critical stream crossings
9. Special Construction Requirements	- Duration of construction
	- Constructability
	- Resiliency

Table 5-2: Development of Weighting Factors by Pair-wise Comparison

	1. Long Range Planning	2. Public Inconvenience	3. Major Crossings	4. Geotechnical Considerations	5. Permitting/ Implementation	6. Right of Way/ Easement Availability	7. Operation and Maintenance Accessibility	8. Environmental Impact	9. Special Construction Requirements
1. Long Range Planning		1	1	4	1	1	1	1	1
2. Public Inconvenience			2	4	2	2	2	8	2
3. Major Crossings				4	5	6	7	9	3
4. Geotechnical Considerations					4	4 AND 6	4	8	4
5. Permitting/ Implementation						5	5	8	5
6. Right of Way/ Easement Availability							6	8	6
7. Operation and Maintenance Accessibility								8	8
8. Environmental Impact									8
9. Special Construction Requirements									
WEIGHTING FACTORS	**7**	**5**	**1**	**7**	**4**	**4**	**1**	**7**	**1**

Table 5-3: Non-Cost Criteria Scoring for Options 1A + 2

Options 1A + 2 – Eliminate the EHPS and the BSPS and convey flow by gravity from existing pump stations to Harris Hill Road/Sheridan Drive intersection. Construct a new gravity sewer from the intersection to convey flow to the Parallel Peanut Line.				
Non-Cost Impact	**Description**	**Weight**	**Rank**	**Score**
1. Long Range Planning	Provides capacity for future Harris Hill/Main St. area sewer connection Provides capacity for Eastern Hills Mall Redevelopment Consistent with previous sewer masterplans	7	4	28
2. Public Inconvenience	Significant rock excavation/blasting during construction Work near/on Sheridan Drive and Harris Hill Road Sheridan Drive traffic control likely to require nighttime work	5	1	5
3. Major Crossings	Crossing of Sheridan Drive with new gravity sewers Crossing of Gott Creek	1	2	2
4. Geotechnical Considerations	Deep gravity sewers in rock Gravity sewer larger than force main equivalent so option has wider trenches	7	1	7
5. Permitting/Implementation	Community approval most likely needed Need backing of Eastern Hills Mall developer Army Corp. / NYSDEC permits for work adjacent to wetlands and creek crossing	4	3	12
6. Right of Way/ Easement Availability	Easements required between Roll Road and Clarence Center Road Obtaining easements could delay construction Use existing right of way for portion of new sewer parallel to the Peanut Line	4	2	8
7. Operation and Maintenance Accessibility	Eliminates both EHPS and BHPS Reduces number of assets to maintain	1	4	4
8. Environmental Impact	Significant deep rock excavation Sewer crossing at Gott Creek Unknown impacts on portion of sewer route between Roll Road and Peanut Line Avoid federal wetland at Sheridan/Harris Hill Rd	7	2	14
9. Special Construction Requirements	Difficult management of groundwater in rock trenches Difficult rock excavation due to depth	1	1	1
			TOTAL SCORE:	**81**

Table 5-4: Non-Cost Criteria Scoring for Options 1A + 3

Option 1A + 3 - Eliminate the EHPS and the BSPS and convey flow by gravity from existing pump stations to a new pump station at the Harris Hill Road/Sheridan Drive intersection. The new pump station would convey flow to the 24-inch Parallel Peanut Line in a new force main.				
Non-Cost Impact	**Description**	**Weight**	**Rank**	**Score**
1. Long Range Planning	Provides capacity for future Harris Hill/Main St. area sewer connection Provides capacity for Eastern Hills Mall Redevelopment Consistent with previous sewer masterplans	7	4	28
2. Public Inconvenience	Significant rock excavation/blasting during construction Work near/on Sheridan Drive and Harris Hill Road Sheridan Drive Traffic Control Likely Require Night Work	5	1	5
3. Major Crossings	Crossing of Sheridan Drive with new gravity sewers Crossing of Gott Creek easier with force main	1	2	2
4. Geotechnical Considerations	Deep gravity sewers in rock Gravity sewer larger than force main equivalent so gravity portion has wider trenches	7	1	7
5. Permitting/Implementation	Community approval most likely needed Need backing of Eastern Hills Mall developer Army Corp. / NYSDEC permits for work adjacent to wetlands and creek crossing	4	3	12
6. Right of Way/ Easement Availability	Easements required between Roll Road and Clarence Center Road Obtaining easements could delay construction Use existing right of way for portion of new sewer parallel to the Peanut Line	4	2	8
7. Operation and Maintenance Accessibility	Eliminates both EHPS and BHPS, but adds new station Reduces number of assets to maintain	1	2	2
8. Environmental Impact	Significant deep rock excavation Easier installation of force main at Gott Creek Unknown impacts between Roll Road and Peanut Line Avoid federal wetland at Sheridan/Harris Hill Rd	7	2	14
9. Special Construction Requirements	Difficult management of groundwater in rock trenches Difficult rock excavation due to depth	1	1	1
			TOTAL SCORE:	**79**

Table 5-5: Non-Cost Criteria for Options 1B + 2

Options 1B + 2 – Replace the EHPS with a larger EHPS at its current location and construct a new gravity sewer from the Harris Hill Road/Sheridan Drive intersection to convey flow to the Parallel Peanut Line.				
Non-Cost Impact	**Description**	**Weight**	**Rank**	**Score**
1. Long Range Planning	Provides capacity for future Harris Hill/Main St. area sewer connection	7	4	28
	Provides capacity for Eastern Hills Mall Redevelopment			
	Consistent with previous sewer masterplans			
2. Public Inconvenience	Work near/on Sheridan Drive and Harris Hill Road	5	2	10
	Sheridan Drive Traffic Control Likely Require Night Work			
	New EHPS can be built off-line near existing location			
3. Major Crossings	Crossing of Gott Creek	1	2	2
	Crossing of Sheridan Drive with force main			
4. Geotechnical Considerations	Less excavation in rock with force main compared to gravity sewer	7	2	14
5. Permitting/Implementation	Community approval most likely needed	4	3	12
	Need backing of Eastern Hills Mall developer			
	Easements required between Roll Road and Clarence Center Road			
	Army Corp. / NYSDEC permits for work adjacent to wetlands and creek crossing			
6. Right of Way/ Easement Availability	Obtaining easements could delay construction	4	2	8
	Use existing right of way for portion of new sewer parallel to the Peanut Line			
7. Operation and Maintenance Accessibility	Maintains both EHPS and BSPS.	1	2	2
8. Environmental Impact	Sewer crossing at Gott Creek	7	2	14
	Unknown impacts on portion of sewer route between Roll Road and Peanut Line			
	Avoid federal wetland at Sheridan Dr./Harris Hill Rd intersection			
9. Special Construction Requirements	Long construction duration anticipated	1	2	2
	Rock excavation much less than gravity sewer options			
			TOTAL SCORE:	**92**

Table 5-6: Non-Cost Criteria for Options 1B + 3

Options 1B + 3 - Replace the EHPS with a larger EHPS at its current location and convey flow to a new pump station at the Harris Hill Road/Sheridan Drive intersection that would then convey flow to the 24-inch Parallel Peanut Line in a new force main.				
Non-Cost Impact	**Description**	**Weight**	**Rank**	**Score**
1. Long Range Planning	Provides capacity for future Harris Hill/Main St. area sewer connection	7	4	28
	Provides capacity for Eastern Hills Mall Redevelopment			
	Consistent with previous sewer masterplans			
2. Public Inconvenience	Work near/on Sheridan Drive and Harris Hill Road	5	1	5
	Sheridan Drive Traffic Control Likely Require Night Work			
3. Major Crossings	Crossing roads with force main easier than with gravity due to depth	1	3	3
	Crossing of Gott Creek easier with force main			
4. Geotechnical Considerations	Shallower trenches than for gravity sewers	7	3	21
	Rock may only be an issue in Eastern Hills area			
5. Permitting/Implementation	Community approval most likely needed	4	3	12
	Need backing of Eastern Hills Mall developer			
	Easements required between Roll Road and Clarence Center Road			
	Army Corp. / NYSDEC permits for work adjacent to wetlands and creek crossing			
6. Right of Way/ Easement Availability	Easement needed for new station	4	1	4
	Use existing right of way for portion of new sewer parallel to the Peanut Line			
7. Operation and Maintenance Accessibility	One additional pump station for ECSD5 to maintain	1	1	1
8. Environmental Impact	Unknown impacts between Roll Road and Peanut Line	7	2	14
	Avoid federal wetland at Sheridan/Harris Hill Rd			
9. Special Construction Requirements	Long construction anticipated	1	2	2
			TOTAL SCORE:	**90**

Table 5-7: Non-Cost Criteria for Option 4

Option 4 - Upsize EHPS at or near its existing location and construct a new 12-inch diameter force main on Transit Road to the 24-inch Parallel Peanut Line Sewer				
Non-Cost Impact	**Description**	**Weight**	**Rank**	**Score**
1. Long Range Planning	Does NOT provide capacity for future Harris Hill/Main St. area sewer connection	7	3	21
	Provides capacity for Eastern Hills Mall Redevelopment			
	Not entirely consistent with previous sewer master plans			
2. Public Inconvenience	Work along Transit Road corridor in sidewalk/ pavement	5	1	5
	Traffic Control Required; likely lane closures; night work			
	Potential to affect access to many businesses			
3. Major Crossings	Creek and stream crossings easier with force main	1	2	2
	Force main depth makes road crossings easier			
	Significant coordination with utility crossings required			
4. Geotechnical Considerations	Most work in already disturbed soil	7	2	14
	Rock should only be issue in area near Eastern Hills			
5. Permitting/Implementation	Community approval most likely needed	4	1	4
	Need backing of Eastern Hills Mall developer			
	Need NYSDOT utility occupancy approval for portion in Transit Rd right of way			
	Army Corp. / NYSDEC permits for stream and creek crossing			
6. Right of Way/ Easement Availability	Use existing NYSDOT right of way for majority of route	4	2	8
	Need easements to route force main around bridges at 2 locations			
7. Operation and Maintenance Accessibility	No pump stations eliminated	1	2	2
8. Environmental Impact	Installed in mostly already disturbed soils	7	2	14
	Installed along major thoroughfare			
	Stream and creek crossings			
9. Special Construction Requirements	Nighttime construction may be required along Transit Road	1	1	1
	Various utility interferences along Transit Road to route around			
			TOTAL SCORE:	**71**

5.2.2 Cost Criteria

Capital costs were developed for each project component (even those that may not be implemented in the short-term) and are presented in 2023 dollars. Costs from previous reports for future sewer development to existing unsewered areas, such as the Spaulding Lake, Harris Hill, and Clarence Research Park were used and updated to 2023 dollars using the Engineering News Record (ENR) Construction Cost Index (CCI). The previously presented costs for the parallel Peanut Line Sewer were also escalated to 2023 dollars using the CCI.

For new sewers and pumping facilities, such as CSD9 Phase 2 gravity sewers, the Harris Road Trunk Sewer, and new pumping stations, opinions of probable construction costs (OPCC) are consistent with Class IV estimates as defined by the Association for the Advancement of Cost Engineering (AACE). Class IV estimates are typically -30 percent to +50 percent accurate (AACE, 2012) and are estimated when the project is only approximately 0 to 2 percent defined. This level of accuracy is typically considered sufficient for strategic planning purposes such as assessment of initial viability, evaluation of alternate schemes, project screening, and long-range capital planning. Capital (project) costs for the components that could be included as part of this project are shown in Table 5-8, and backup for these costs is provided in Appendix H.

This table serves as a "menu" for pricing out various options. The OPCC for a particular set of projects can be generated by picking the relevant components out of the list in Table 5-8. A 30% contingency is added to the option costs and then additional costs added for contractor mobilization; general conditions, bonds, and insurances; and engineering, legal, and administration at the percentages shown.

Note that the estimates of construction costs for the pump stations within the various options are for basic pump station structures, and do not include costs for any architectural enhancements. It is recognized that in some of these areas, nearby residences and commercial enterprises may desire a more architectural appearance for the pump stations to blend in with the neighborhood. These additional costs would depend greatly on the preferences of the relevant stakeholders for each project.

Using the estimates in Table 5-8, the OPCCs for the Eastern Hills Mall Redevelopment options are shown in Table 5-9. These costs include the costs for constructing the Parallel Peanut Line Sewer, because the Parallel Peanut Line Sewer needs to be implemented for any of the options. Based solely on cost, Option 4 (Upgraded EHPS and Force Main along Transit) was the least costly, while the combination of Options 1A +2 (Replacement of EHPS and BSPS with gravity sewers and all gravity sewers to Parallel Peanut Line Sewer) was most expensive.

It should be understood that the project costs may be distributed differently between ECSD5, the Town of Clarence, the Town of Amherst, and/or individual site development companies depending on the approach taken. While Table 5-9 shows the costs only for what would be required to convey the projected flows from the Eastern Hills Mall Redevelopment Project, the distribution of the costs among the various stakeholders would need to be considered during project implementation. In addition, the distribution of costs for projects not associated with the Eastern Hills Mall Redevelopment Project would need to be agreed upon by relevant stakeholders at the time of project implementation.

Table 5-8: Summary of Opinions of Probable Construction Costs for the Various Project Components

Item		Summary of Individual Construction Costs[7]
Parallel Peanut Line Costs[1]		$ 1,818,195
Upsizing of Eastern Hills Pump Station [5]		$ 2,530,000
Harris Hill Gravity Sewers[4]		$ 46,392,035
Spaulding Lake Sewer District[2]		$ 4,452,318
Clarence Research Park WWTP[3]		$ 548,618
Opt 1A - Eliminate PSs and Install Gravity		$ 21,330,000
Opt 1B - Replace EHPS and FM to Harris Hill/Sheridan		$ 5,000,000
Opt 2 - Harris Hill Gravity to Peanut Line		$ 17,430,000
Opt 3 - Harris Hill Force Main to Peanut Line [5]		$ 10,230,000
Opt 4 - Transit Rd Force Main		$ 11,550,000
CSD9 Connection [6]		$ 7,680,000
Option Total Cost		**n/a**
Contingency	30%	n/a
SUBTOTAL		
Contractor Mobilization	3%	n/a
General Conditions, Bonds, and Insurances	3%	n/a
SUBTOTAL		
Engineering, Legal, and Administration	20%	n/a

Notes:

1. Costs from GHD September 2023 cost estimate for Parallel Peanut Line, required for all options.
2. Costs from 2014 Spaulding Lake Sewer District Feasibility Study for Spaulding Lake Sewer District Collection System, updated to 2023 costs using ENR CCI values.
3. Costs from 2014 Spaulding Lake Sewer District Feasibility Study for Clarence Research Park, updated to 2023 costs using ENR CCI values.
4. Costs from 2013 Harris Hill Sanitary Sewer Cost Analysis (GPI), updated to 2023 costs using ENR CCI values.
5. Costs for Option 3 pump station are more expensive because it includes costs for EHPS upsizing + Costs for new PS at Harris Hill Road/Sheridan Drive.
6. CSD9 Expansion not previously detailed in any reports, JMD estimated costs based on existing residences.
7. Costs are consistent with an AACE Class IV estimate which are typically -30 percent to +50 percent accurate.

Table 5-9: Summary of OPCCs for Eastern Hills Mall Redevelopment Options

Item		OPTIONS 1A +2	OPTIONS 1B +2	OPTIONS 1A +3	OPTIONS 1B +3	OPTION 4
Parallel Peanut Line Costs[1]		$ 3,818,195	$ 3,818,195	$ 3,818,195	$ 3,818,195	$ 3,818,195
Upsizing of Eastern Hills Pump Station [5]		$ -	$ 2,530,000	$ -	$ 7,120,000	$ 2,530,000
Harris Hill Gravity Sewers[4]		$ -	$ -	$ -	$ -	$ -
Spaulding Lake Sewer District[2]		$ -	$ -	$ -	$ -	$ -
Clarence Research Park WWTP[3]		$ -	$ -	$ -	$ -	$ -
Opt 1A - Eliminate PSs and Install Gravity		$ 21,330,000	$ -	$ 21,330,000	$ -	$ -
Opt 1B - Replace EHPS and FM to Harris Hill/Sheridan		$ -	$ 5,000,000	$ -	$ 5,000,000	$ -
Opt 2 - Harris Hill Gravity to Peanut Line		$ 17,430,000	$ 17,430,000	$ -	$ -	$ -
Opt 3 - Harris Hill Force Main to Peanut Line [5]		$ -	$ -	$ 10,230,000	$ 10,230,000	$ -
Opt 4 - Transit Rd Force Main		$ -	$ -	$ -	$ -	$ 11,550,000
CSD9 Connection [6]		$ -	$ -	$ -	$ -	$ -
Option Total Cost		**$ 42,578,195**	**$ 28,778,195**	**$ 35,378,195**	**$ 26,168,195**	**$ 17,898,195**
Contingency	30%	$ 12,773,459	$ 8,633,459	$ 10,613,459	$ 7,850,459	$ 5,369,459
SUBTOTAL		**$ 55,351,654**	**$ 37,411,654**	**$ 45,991,654**	**$ 34,018,654**	**$ 23,267,654**
Contractor Mobilization	3%	$ 1,660,600	$ 1,122,400	$ 1,379,800	$ 1,020,600	$ 698,100
General Conditions, Bonds, and Insurances	3%	$ 1,660,600	$ 1,122,400	$ 1,379,800	$ 1,020,600	$ 698,100
SUBTOTAL		**$ 58,672,854**	**$ 39,656,454**	**$ 48,751,254**	**$ 36,059,854**	**$ 24,663,854**
Engineering, Legal, and Administration	20%	$ 11,734,600	$ 7,931,300	$ 9,750,300	$ 7,212,000	$ 4,932,800
TOTAL PROJECT COST (2023) [7]		**$ 70,500,000**	**$ 47,600,000**	**$ 58,600,000**	**$ 43,300,000**	**$ 29,600,000**

Notes:
1. Costs from GHD September 2023 cost estimate for PPL, required for all options
2. Costs from 2014 Spaulding Lake Sewer District Feasibility Study for Spaulding Lake Sewer District Collection System, updated to 2023 costs using ENR CCI values
3. Costs from 2014 Spaulding Lake Sewer District Feasibility Study for Clarence Research Park, updated to 2023 costs using ENR CCI values
4. Costs from 2013 Harris Hill Sanitary Sewer Cost Analysis (GPI), updated to 2023 costs using ENR CCI values
5. Costs for Option 3 pump station are more expensive because it includes costs for EHPS upsizing + Costs for new PS at Harris Hill Road/Sheridan Drive
6. CSD9 Expansion not previously detailed in any reports, JMD estimated costs based on existing residences.
7. Costs are consistent with an AACE Class IV estimate which are typically -30 percent to +50 percent accurate.

Operations and maintenance costs were also developed for the implementation of each option and consist of electric use, site operations/monitoring labor, and ongoing pipe maintenance and cleaning. Note that these costs do not include costs for maintaining the existing facilities such as the BSPS and the ESPS, except in the case where the existing facilities will be eliminated or replaced. For those cases, the O&M costs will be the differential between estimated current O&M costs and projected future O&M costs. Assumptions made in developing these costs include:

- Electric costs assumed at $0.08 per kWh.
- Electric costs for pump stations are primarily due to pump operation, but an additional 5% has been added to pump electrical costs for miscellaneous electric costs, such as those for lighting, HVAC, and instrumentation. Electrical costs assume all three phases of the Eastern Hills Mall Redevelopment are implemented and for Options 1B+3 that Harris Hill/Main Street flows will be added into the system in the future.
- O&M costs for pump station equipment refurbishment/ replacement included as an annual pump station maintenance cost.
- Pigging of the force mains is assumed to be completed every 10 years.
- Jet cleaning of gravity sewers is assumed to be completed every 5 years.
- Major manhole maintenance assumed to occur every 25 years, with minor grouting of manholes occurring every 10 years.

The OPCCs and the O&M costs were then used to develop life cycle costs over the period of the next 50 years. Fifty years was chosen as the life cycle as it would include most maintenance activities indicated above to get a more accurate representation of long-term costs. Life cycle costs were developed assuming an interest rate of 4% and an inflation rate of 3%. Calculations of O&M costs are included in Appendix G. Note that the O&M costs only account for the differential in O&M costs and are not representative of total O&M costs in the district. For example, in the options where the EHPS is replaced with a larger station, the O&M costs were calculated by subtracting the estimate of current O&M costs and adding the O&M costs of the upgraded station.

5.2.3 Summary of Costs and Non-Cost Factors

Table 5-10 summarizes the cost and non-cost factors associated with the project.

Table 5-10: Comparison of Options using both Cost Criteria and Non-Cost Criteria

	OPTIONS 1A +2	OPTIONS 1B +2	OPTIONS 1A +3	OPTIONS 1B +3	OPTION 4
Opinion of Probable Project Cost* (2023 dollars)	70,500,000	47,600,000	58,600,000	43,300,000	29,600,000
50-yr Present Worth of Differential O&M Costs**	(4,000,000)	1,382,000	213,000	3,662,000	656,000
50-yr Present Worth, including OPCC	66,500,000	48,982,000	58,813,000	46,922,000	30,256,000
Non-Cost Criteria Score	81	92	79	90	71

Notes: *Capital costs are consistent with an AACE Class IV estimate which are typically -30 percent to +50 percent accurate.
**50-year Present Worth of O&M represents the differential O&M costs between operations today and operations in implementing the improvements.

Based on the comparison, the following two option combinations are fairly equal in terms of 50-year present worth and non-cost criteria score:

- Options 1B + 2 - Replace the EHPS with a larger EHPS at its current location and construct a new gravity sewer from the Harris Hill Road/Sheridan Drive intersection to convey flow to the Parallel Peanut Line Sewer.
- Options 1B + 3 - Replace the EHPS with a larger EHPS at its current location and convey flow to a new pump station at the Harris Hill Road/Sheridan Drive intersection that would then convey flow to the 24-inch Parallel Peanut Line Sewer in a new force main.

Both options avoid the very deep gravity sewer installation between existing EHPS and BSPS and the Harris Hill Road/ Sheridan Drive intersection. However, Options 1B + 3 has a larger 50-year present worth differential O&M cost, primarily because a new pump station is being added. Currently, present worth costs for this option combination are based on the full flow in the future (all three phases of the Eastern Hills Mall Redevelopment plus the Harris Hill/Main Street flows) even though the Eastern Hills Mall Redevelopment Phase 3 and Harris Hill/Main Street flows cannot be added until additional capacity is made available in the downstream Amherst collection system.

Both option combinations presented above involve a certain level of risk on the part of ECSD5 and the Clarence Sewer Districts in terms of implementation, as the timing for capacity increases within the Amherst collection system and the connection of other development areas such as the Spaulding Lake neighborhood and CSD9 Phase 2 expansion are unknown. As it is currently impossible to predict the implementation of any of these projects or whether or not all phases of the projects will ultimately be implemented, the pipe sizing for conveyance of flows from the Eastern Hills Mall area to the Parallel Peanut Line Sewer should be adequate to not only handle the expected future phases in the long-term future, but will be readily able to handle the expected shorter-term flows in the meantime. In addition, because of the distance between the Harris Hill Road/ Sheridan Drive intersection and the Peanut Line sewers (~ 3 mi.), construction of one pipe that will accommodate both near-term and longer-term conditions was targeted to minimize overall construction and the need to redo work at a later date.

6 Recommendations

6.1 Summary of Evaluations

As ECSD5, the Town of Amherst, and the Town of Clarence have experienced for many years, the addition of sewer capacity to enable future development in the Town of Clarence has proved to be a challenging endeavor. The main conclusions reached through this evaluation include:

- Surcharging at Dodge Road and Transit Road sewers upstream of Dodge Road has limited development, even smaller developments of less than 10 homes, within the Town of Clarence and/or the Town of Amherst.
- Removal of the weir at the Klein Road and Transit Road has provided relief to the Dodge Road Interceptor and the Transit Road sewers just upstream of the Dodge Road Interceptor under existing flow conditions and is expected to continue to provide some relief as additional flows from the Town of Clarence are incorporated into the system.
- The existing 18-inch Amherst Peanut Line Sewer has limited capacity and was only intended to convey flows from designated areas within the Town of Clarence. The additional flows projected for the existing 18-inch Peanut Line Sewer are relatively minimal and because the 18-inch pipe is above the proposed 24-inch Parallel Peanut Line Sewer, it is less affected by surcharging of the 30-inch pipe downstream than the 24-inch sewer.
- Hydraulic modeling provided during this evaluation used flow data from 2019 collected by ECSD5 under a separate project to construct and calibrate a "skeleton" model of the expanded collection system to evaluate conditions under which the projected future flows from the identified development areas were incorporated. However, it was noted that the wet weather events noted during the 2019 flow monitoring were all less than one-year storms. This evaluation used a 5-year, 6-hour storm within the calibrated skeleton model to identify peak flows that were in excess of the flow events occurring during the 2019 flow monitoring.
- The 24-inch Parallel Peanut Line Sewer was designed, in part, to relieve the Dodge Road Interceptor in addition to solving various environmental issues and providing service for buildout in existing Town of Clarence sewer districts. The collection system model used during this project shows that increasing the amount of flow diverted from the Dodge Road Interceptor into the Parallel Peanut Line by closing the valve in the proposed chamber at Transit Road reduces the potential for Dodge Road surcharging. However, greater Dodge Road diversion quantities will consume capacity in the Parallel Peanut Line Sewer that could otherwise be allocated to the proposed development and redevelopment areas. As a result, the most critical factor affecting surcharging at the Dodge Road Interceptor is the amount to be diverted to the Parallel Peanut Line.
- Projected additional peak flows from the Spaulding Lake Area, CSD9 Phase 2 Expansion, and the Clarence Research Park are minimal, only contributing an additional 460,000 gallons to the HBTS, which is currently operating at only half-capacity. The collection system model confirmed that the additional flows from these areas could be easily accommodated in the near future with no significant effects on the downstream collection system.

- The cumulative projected flows from all areas are significant. The new Parallel Peanut Line sewer is sized properly for future flows; however, surcharge will occur unless capacity is added in the Amherst collection system downstream of the Parallel Peanut Line Sewer, as shown by Scenario 5, in which the 30-inch Peanut Line sewer is upsized or a parallel sewer to the 30-inch Peanut Line is constructed. The timing of when the 30-inch Peanut Line sewer needs to be addressed will depend on the sequencing of projects. It is recognized that if any of the projected development flows do not materialize or are less than anticipated, there is the potential these improvements to the 30-inch Peanut Line Sewer downstream of Paradise Road will not be required. It is recommended that the Towns and ECSD5 continue to use the model along with updated flow information to inform future development decision making.

6.2 Recommended Scenario

This study evaluated different options and scenarios for fully incorporating the projected future development flows from the Town of Clarence into the existing public sanitary sewer collection system. Given the configuration of the existing collection system within the Town of the Amherst and the distribution of flows from the Town of Clarence and ECSD5 into the Town of Amherst's collection system, "flow balancing" of future projected flows can be complicated. Previous to this evaluation, the need for the Parallel Peanut Line Sewer was identified in planning documents and the concept was further refined to allow for the diversion of flows from the Transit Road sewer, upstream of the Dodge Road Interceptor, to relieve the potential surcharging at Dodge Road in peak flow conditions during large wet weather events. The modeling conducted under this project identified that additional improvements are required to convey flows in excess of what was previously identified in the Town of Clarence's Master Plan, such as the Eastern Hills Mall Redevelopment project.

While this evaluation examined the ability of the system to convey the flows from expected future development areas as a wholistic, interconnected system, it is understood that the recommendations for implementation of collection system improvements may vary depending on the stakeholder(s) considered. For instance, while all options may technically be feasible, the recommended alternative for ECSD5 may not be the recommended alternative for the Town of Clarence or for the developer of specific projects.

With this in mind and based on input from meetings with ECSD5, the Town of Amherst, and the Town of Clarence, along with the cost and non-cost criteria discussed in Section 5 and the collection system modeling results from the scenarios evaluated in Section 4, the following is recommended for shorter-term implementation in alignment with Scenario 4 (Figure 6-1) to provide the infrastructure necessary to implement improvements to service all future needs:

- Construction of the new 24-inch diameter Amherst Parallel Peanut Line Sewer. This project has been in the design process for several years, even without the contemplation of newer developments such as the Eastern Hills Mall Redevelopment project.
- Adjustment of the Transit Road gate in the short-term at the new parallel Peanut Line Sewer to provide adequate relief to the Dodge Road Interceptor.
- Design and installation of a new EHPS at or near its current location to continue receiving flows from the upstream tributary area, which includes the Main/Wehrle/Transit neighborhood and the area tributary to the BSPS and construction of a new force main north along the Transit Road alignment to the new 24-inch Parallel Peanut Line. The existing force main could potentially be retained as a backup force main for lower flows, especially if the EHPS remains in nearly the same location as it is presently.

- Continued diversion of flows from the Transit Road sewer to the Klein Road sewer.
- Working with the developer of the Eastern Hills Mall Redevelopment project to determine if new sewers on the Eastern Hills Mall site can be designed and constructed to potentially eliminate the BSPS and centralize pumping operations in this area at the new EHPS.

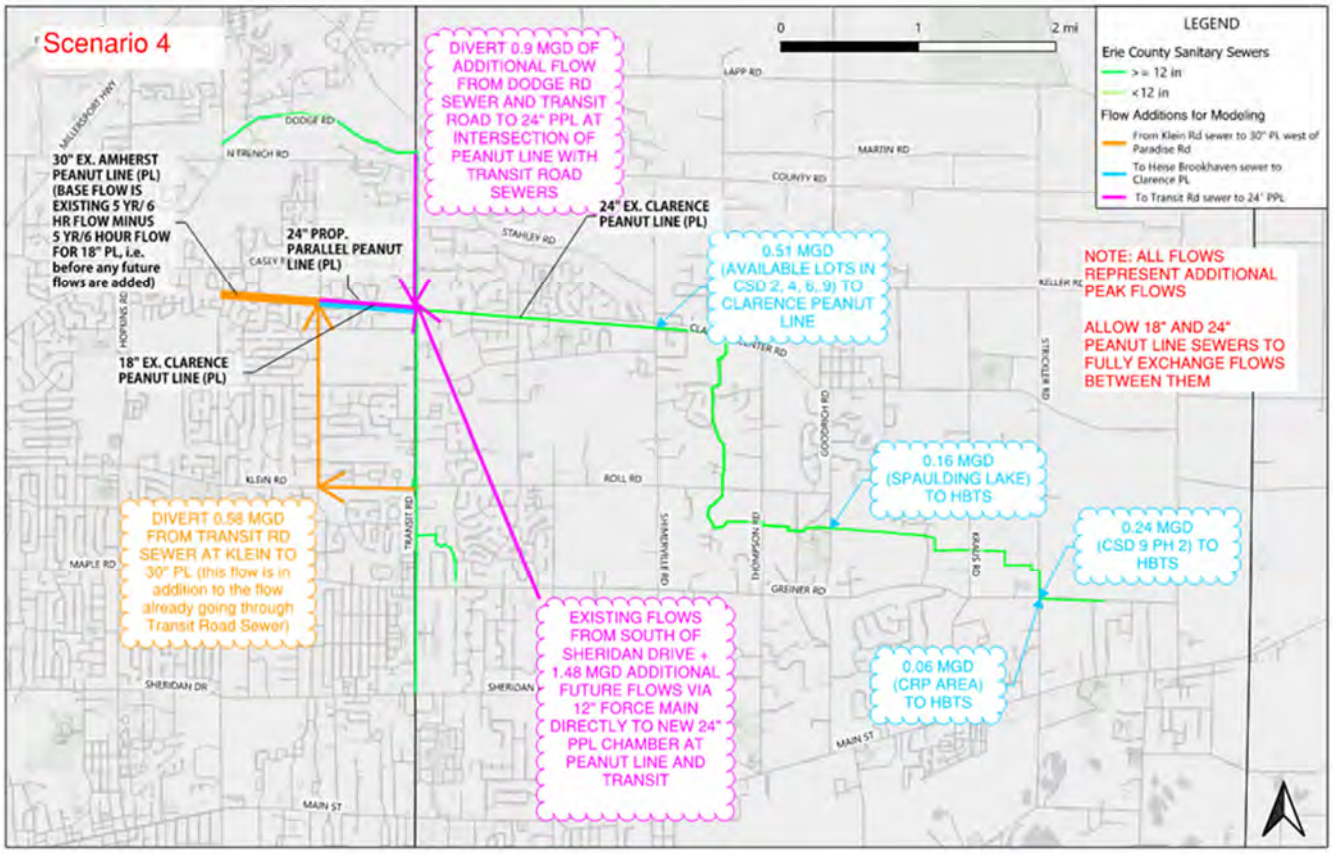


Figure 6-1: Flow Distribution for Recommended Scenario 4 and Option 4 for new EHPS tributary conveyance

While this alternative is the most cost-effective as determined in Section 5, it was also the lowest-ranking in terms of non-cost criteria. That is because while this alternative is advantageous to the Eastern Hills Mall Redevelopment project, it does not provide any infrastructure that could easily accept flows from other areas within Clarence in the future, which is what the non-cost criteria focused on. For example, if the Town were to pursue adding the Harris Hill/Main Street area, the Town of Clarence would then be responsible for building not only the collection system in the neighborhood, but also the gravity sewers / pump stations/ force mains to convey the flow to the 24-inch Clarence Peanut Line Sewer. Similarly, the Town of Clarence may choose to undergo design and construction of the Spaulding Lake, CSD9 Phase 2, and Clarence Research Park sewer projects to convey flow to the HBTS when funding is available and the timing is appropriate. Ultimately the other Options evaluated as part of this study included too many unknowns to recommend, particularly when considering the sizable additional costs. The various initiatives included in the Town of Clarence master planning documents are still viable with the implementation of Option 4, but the major Option 4 components such as the new EHPS and force main will operate independently of the infrastructure required for these long-term planning needs.

Regardless of the timing and sequencing implementation of these projects, the following activities would need to be completed during the pre-design, design, and construction phases of the project(s).

Pre-design Phase:

- Develop budgets for project implementation and the cost share between the Towns, ECSD5, or the developers, as the project may warrant.
- Negotiate cost sharing agreements among stakeholders for each project.
- Work with various neighborhoods to develop extensions to existing sewer districts (i.e., expansion of CSD9) or create new sewer districts (i.e., Harris Hill/Main Street), which would involve stakeholder engagement with developers and/or residents, along with significant coordination between legal, engineering, and regulatory departments. This may also require updates to existing contracts between the municipalities for ownership, operation and maintenance of the expanded or new sewer districts.

Design Phase:

- State Environmental Quality Review (SEQR) Act – this review would include completing the appropriate Environmental Assessment forms to gauge the impact to various environmental elements, developing plans for mitigating adverse impacts, and balancing the environmental concerns with social, economic, and other factors when making decisions about projects. To qualify for federal funding through the New York State Environmental Facilities Corporation (NYSEFC), the project will need to be identified as Type I (a project that is likely to have significant environmental impacts and likely to require an Environmental Impact Statement) or Type II (for projects that are deemed to not have significant environmental impact) projects, as the federal government does not have an "Unlisted" project category within SEQR. In NYS, an "Unlisted" project falls in between Type I and Type II, where they are not easily put into the categories of projects likely to have significant impacts (Type I) or unlikely to have such impacts (Type II). Unlisted projects require further evaluation to determine their potential environmental effects. A Lead Agency would need to be determined under SEQR and would typically be the Towns or Erie County. If the Lead Agency determines that no significant adverse impacts will be associated with the project, they will issue a Negative Declaration meaning that no further environmental review is required. If a positive Declaration is issued by the Lead Agency, more extensive efforts, including an Environmental Impact Statement (EIS), may be required. For the set of projects recommended, it is likely that all projects would be Type I or Unlisted Projects, which may require additional environmental evaluations.
- Determination of Impact on Historic and Archeological Resources – to be evaluated as part of environmental reviews under SEQR. A preliminary search of the Office of Cultural Resource Information System (CRIS) does not indicate that there are currently any historical or archeological resources that may be impacted by any of the projects recommended, but a search of each project area should be completed as it is designed to ensure that no impacts exist.
- Engineering Plan Approval – Prior to bid, engineering plans will need to be submitted to the Town of Amherst, the Town of Clarence, ECSD5, NYSDEC, and NYSEFC. NYSDEC and NYSEFC review is required as a condition for obtaining EFC funding. Initial contact with NYSDEC and NYSEFC early in the preliminary engineering phase is encouraged to assist them in understanding the project and allowing for more timely turnarounds on required reviews.

Construction Phase:

- Building Permits – Prior to construction, building permits will need to be obtained from the Erie County Department of Public Works for construction of improvements to County-owned pumping stations.
- Highway Permits: Any construction within the right of way of Transit Road will require a Highway Work Permit for Utility Work be issued by the New York State Dept. of Transportation (NYSDOT) who owns and maintains the highway. Before submitting final plans for the permit application, interim submissions at preliminary and detailed design should be made to NYSDOT to get concurrence on the force main pipe or gravity sewer alignment, identify potential impacts to NYSDOT owned facilities such as traffic signals and intelligent traffic management systems, and direction regarding restoration limits for pavement, sidewalk, and landscaping.
- Stormwater Pollution Prevention Plan (SWPPP) development – a plan that outlines the scope and location of the project, applicable stormwater control measures to prevent or minimize pollutants from entering stormwater practices, listing of expected pollutants, procedures for evaluating the effectiveness of the measures, training of workers on procedures, emergency response planning, and recordkeeping/ compliance documentation protocols will need to be created.

6.3 Proposed Schedule for Implementation of Recommended Alternative

Table 6-1 presents a suggested sequencing for the proposed improvements for Option 4. Given that most of the wastewater flow generated in the project is estimated to be associated with the Eastern Hills Mall Redevelopment Phase 1, with additional smaller incremental amounts in Phases 2 and 3, it is recommended that sizing of the enlarged EHPS and the force main be targeted towards the full buildout of the redevelopment initially, rather than resizing at each phase.

However, this sequencing can be open to modification as may be required by ECSD5 or the Towns, as long as the 24-inch Parallel Peanut Line sewer is constructed before any other improvements are made.

Table 6-1: High-Level Implementation Schedule for Eastern Hills Mall Redevelopment Project

Project	Timeframe from Start of Project	Opportunities/ Constraints
Parallel Peanut Line Sewer Design Completion and Bid	Year 1	--
Parallel Peanut Line Sewer Construction	Year 2	Can be constructed as soon as design is completed
EHPS and Force Main Preliminary Design and SEQR	Years 3 and 4	Schedule can be consolidated into shorter time period, if necessary
EHPS and Force Main Final Design/Permitting	Years 5 and 6	Schedule can be consolidated into shorter time period, if necessary
EHPS and Force Main Bid	Year 7	Schedule can be consolidated into shorter time period, if necessary
EHPS and Force Main Construction	Years 7, 8, and 9	--
EHPS and Force Main Startup	Years 9 and 10	Requires that Parallel Peanut Line be constructed and in operation.

This schedule recognizes that some development opportunities are more imminent than others, such as the timeframe proposed by Uniland, the developer of the Eastern Hills Mall Redevelopment project, which indicated that Phase 1 would be implemented within years 5-10, Phase 2 within years 10-15, and Phase 3 in years 15-20. There are many factors outside of the Towns' or ECSD5's control that may adversely impact this schedule

Subsequently, the following projects can be implemented anytime, as the need may arise and funding becomes available:

- Connection of Spaulding Lake and CRP tributary areas to the sewer system. These systems would be connected to the HBTS.
- CSD9 Phase 2 extension. These sewers will tie into the existing sewers in CSD9, which are tributary to the HBTS.
- Connection of Available lots in CSDs 2, 4, 6, and 9 into the HBTS and 24-inch Clarence Peanut Line.
- New routing for either gravity sewers or a force main from the Harris Hill/ Main Street areas, following the Harris Hill routing as discussed earlier in this document, with the extension of service to properties in the vicinity.

However, it is recognized should all projected development flows be realized, there is the potential that the upsizing of the 30-inch Peanut Line Sewer or construction of a parallel sewer to the 30-inch Peanut Line will be required at some point. It is recommended that the Towns and ECSD5 continue to use the model along with updated flow information to inform future development decision making.

6.4 Present Worth Costs of Recommended Alternative

Table 6-2 summarizes the capital costs for the recommended implementation for Option 4, including the costs for construction of the parallel Peanut Line, and Table 6-3 summarizes the 50-year present value for the recommended alternatives

Table 6-2: Summary of Capital Costs for Selected Eastern Hills Mall Redevelopment Alternative.

Item		OPTION 4
Parallel Peanut Line Costs		$ 3,818,195
Upsizing of Eastern Hills Pump Station		$ 2,530,000
Opt 4 - Transit Rd Force Main		$ 11,550,000
Option Total Cost		**$ 17,898,195**
Contingency	30%	$ 5,369,459
SUBTOTAL		**$ 23,267,654**
Contractor Mobilization	3%	$ 698,100
General Conditions, Bonds, and Insurances	3%	$ 698,100
SUBTOTAL		**$ 24,663,854**
Engineering, Legal, and Administration	20%	$ 4,932,800
TOTAL PROJECT COST (2023)		**$ 29,600,000**

Note: Capital costs are consistent with an AACE Class IV estimate which are typically -30 percent to +50 percent accurate.

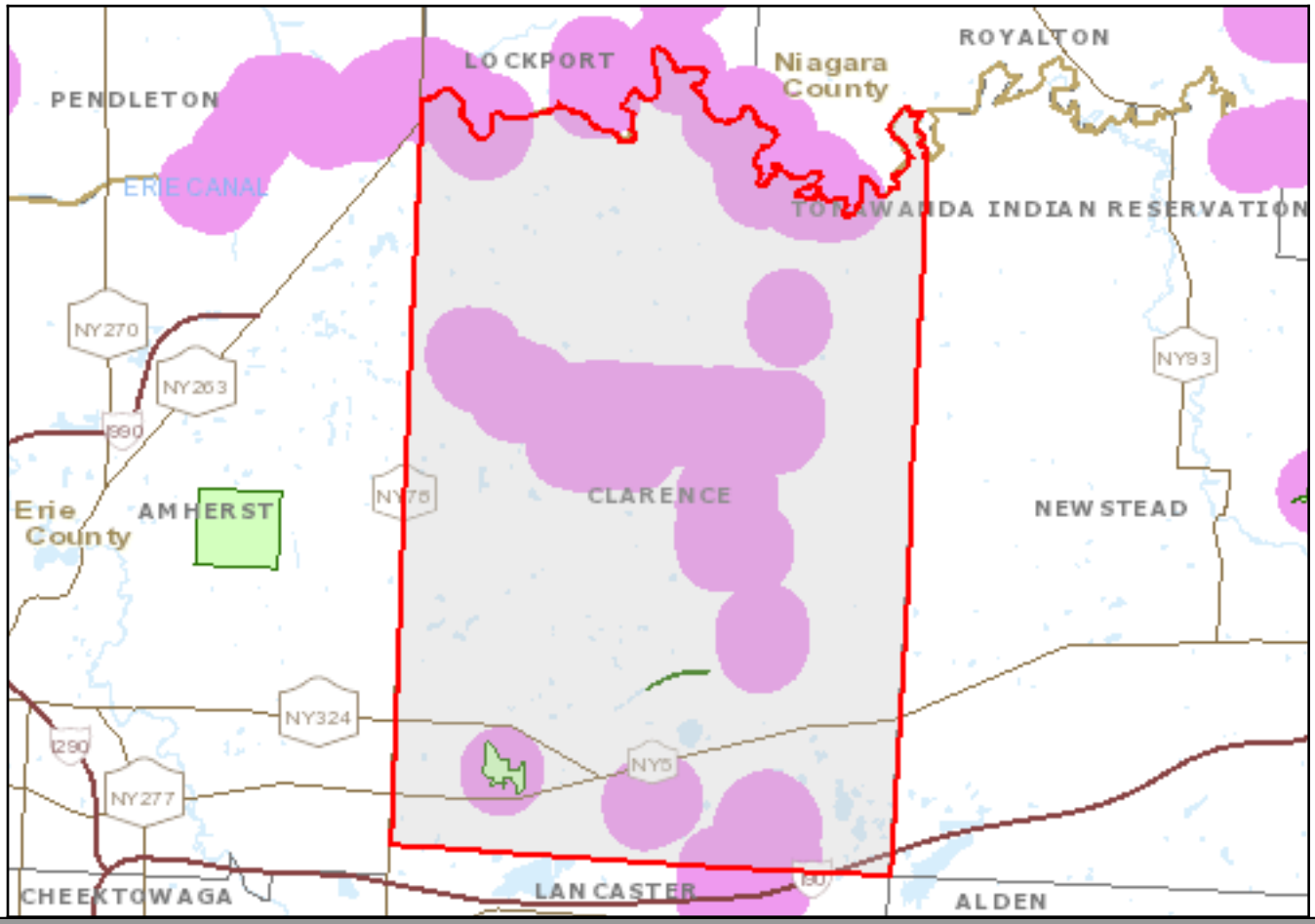
Table 6-3: Summary of 50-year Present Worth Costs

	Cost
Recommended Scenario Capital Cost	$ 29,600,000
50-year Present Worth of Eastern Hills Mall Redevelopment Option	$ 656,000
50-year Present Worth (TOTAL)	$ 30,256,000

Appendix A: EFC-Specific Documentation

New York Nature Explorer
Town Results Report

Criteria: Town: Clarence



Common Name	Subgroup	Distribution Status	Year Last Documente	Protection Status		Conservation Rank	
				State	Federal	State	Global
Town: Clarence							
Animal: Birds							
Great Blue Heron *Ardea herodias*	Herons, Bitterns, Egrets, Pelicans	Historically Confirmed	1990	Protected Bird		S5	G5
Animal: Fish							
Bigmouth Shiner *Notropis dorsalis*	Minnows, Shiners, Suckers	Recently Confirmed	1998			S2	G5
Black Redhorse *Moxostoma duquesnei*	Minnows, Shiners, Suckers	Recently Confirmed	2011	Special Concern		S2	G5

New York Nature Explorer

Common Name	Subgroup	Distribution Status	Year Last Documente	Protection Status		Conservation Rank	
				State	Federal	State	Global
Redfin Shiner *Lythrurus umbratilis*	Minnows, Shiners, Suckers	Recently Confirmed	2012	Special Concern		S1S2	G5

Animal: Mussels and Clams

Black Sandshell *Ligumia recta*	Freshwater Mussels	Recently Confirmed	2018			S2	G4G5
Deertoe *Truncilla truncata*	Freshwater Mussels	Recently Confirmed	2018			S1S2	G5
Fragile Papershell *Leptodea fragilis*	Freshwater Mussels	Recently Confirmed	2018			S2S3	G5
Kidneyshell *Ptychobranchus fasciolaris*	Freshwater Mussels	Recently Confirmed	2018			S2	G4G5
Lilliput *Toxolasma parvum*	Freshwater Mussels	Recently Confirmed	2018			S2	G5
Pink Heelsplitter *Potamilus alatus*	Freshwater Mussels	Recently Confirmed	2018			S2	G5
Pocketbook *Lampsilis ovata*	Freshwater Mussels	Recently Confirmed	2011			S2	G5
Rainbow *Villosa iris*	Freshwater Mussels	Recently Confirmed	2018			S2S3	G5
Round Pigtoe *Pleurobema sintoxia*	Freshwater Mussels	Recently Confirmed	2017			S2	G4G5
Slippershell Mussel *Alasmidonta viridis*	Freshwater Mussels	Recently Confirmed	1998			S1?	G4G5
Threeridge *Amblema plicata*	Freshwater Mussels	Recently Confirmed	2018			S1S2	G5
Wabash Pigtoe *Fusconaia flava*	Freshwater Mussels	Recently Confirmed	2018			S2	G5

Plant: Flowering Plants

Marsh Lousewort *Pedicularis lanceolata*	Other Flowering Plants	Recently Confirmed	1994	Threatened		S2S3	G5

New York Nature Explorer

Common Name	Subgroup	Distribution Status	Year Last Documente	Protection Status		Conservation Rank	
				State	Federal	State	Global
Northern Tansy Mustard *Descurainia pinnata ssp. brachycarpa*	Other Flowering Plants	Historically Confirmed	1937	Endangered		S1	G5T5
Stiff Flat-topped Goldenrod *Solidago rigida var. rigida*	Asters, Goldenrods and Daisies	Extirpated	1994	Threatened		S2	G5T5

Natural Community: Uplands

Calcareous Talus Slope Woodland *Calcareous talus slope woodland*	Barrens and Woodlands	Historically Confirmed	1985			S3	G3G4
Oak Openings *Oak openings*	Barrens and Woodlands	Historically Confirmed	1990			S1	G2

Note: Restricted plants and animals may also have also been documented in one or more of these Towns or Cities, but are not listed in these results. This application does not provide information at the level of Town or City on state-listed animals and on other sensitive animals and plants. A list of the restricted animals and plants documented in the corresponding county (or counties) can be obtained via the County link(s) on the original Town Search Results page. Any individual plant or animal on this county's restricted list may or may not occur in this particular Town or City.

This list only includes records of rare species and significant natural communities from the databases of the NY Natural Heritage Program. This list is not a definitive statement about the presence or absence of all plants and animals, including rare or state-listed species, or of all significant natural communities. For most areas, comprehensive field surveys have not been conducted, and this list should not be considered a substitute for on-site surveys.

Appendix B: Development Area Maps

SHERIDAN DR

TRANSIT RD

15"

8"

TRANSIT RD

15"

12"

6"

MAIN ST

WESTWOOD RD

LEGEND

Building Footprints

- Proposed Residential
- Proposed Commercial
- Proposed Office

Erie County Sewers

- Manhole
- Pressurized Mains
- Pump Station

Sewer Lines

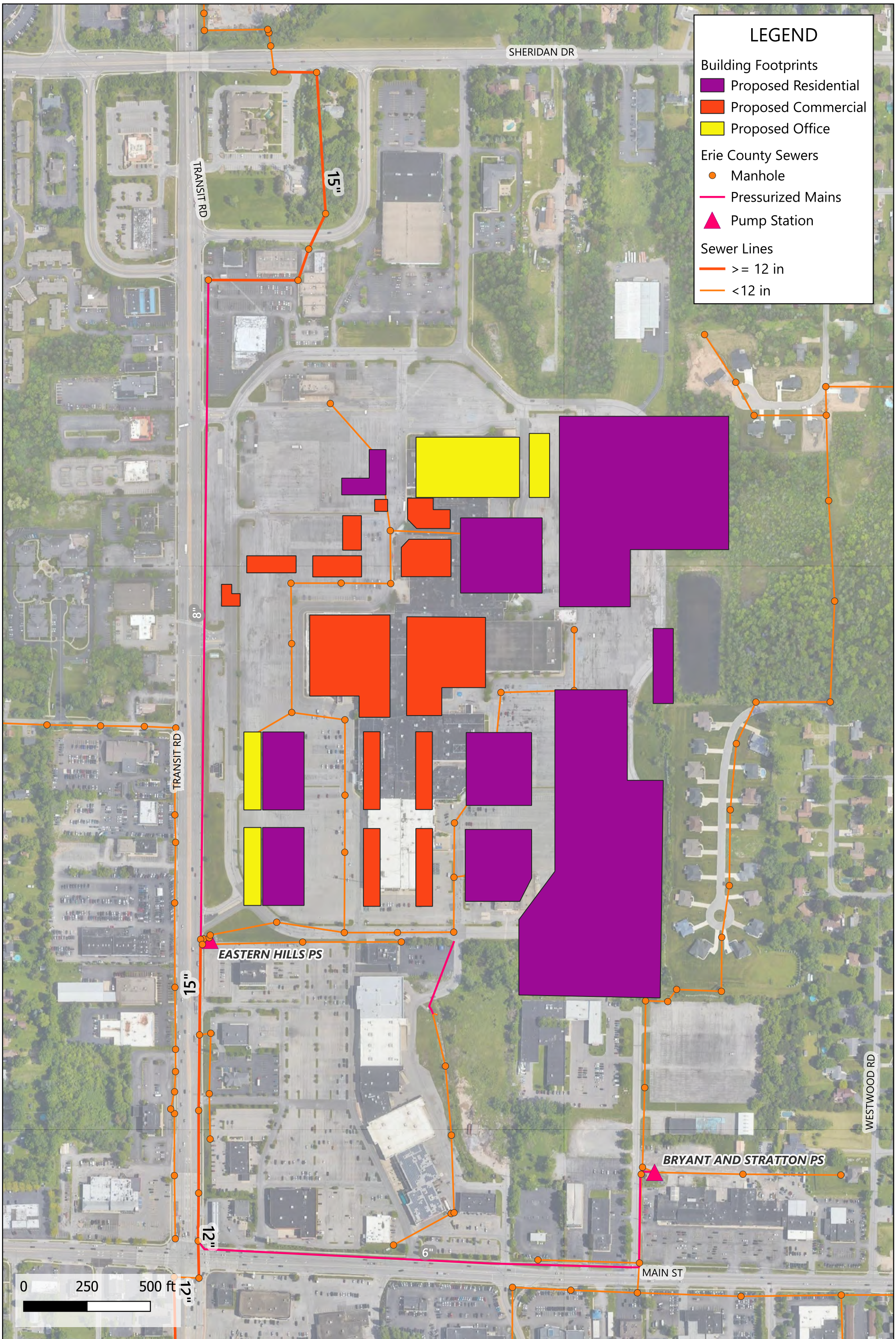
- >= 12 in
- <12 in

0 250 500 ft

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

EH DEVELOPMENT CONCEPT PHASES 1 AND 2

JMDavidson Engineering, D.P.C.



TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

EH DEVELOPMENT CONCEPT FULL BUILDOUT

JMDavidson Engineering, D.P.C.

HARRIS HILL AREA SEWER CONCEPT

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

LEGEND

EC DSM Sewerlines
- >= 12 in
- < 12 in
- Pump Station
- Pressurized Mains

Harris Hill Sanitary Sewer Concept
- Proposed Force Main
- Proposed Pump Station
- Proposed Gravity
- Proposed Trunk

SHERIDAN DR
HEDGEWOOD DR
HARRIS HILL RD
SHIMERVILLE RD
BARTON RD
BRYANT AND STRATTON PS
MAIN ST
HOWARD DR
WEHRLE DR
COVENTRY GREEN CIR
FOXWOOD LN
SUSAN DR
WEHRLE DR

0 1,000 2,000 ft

JMDavidson Engineering, D.P.C.

HEISE-BROOKHAVEN TRUNK SEWER

LEGEND

- Spaulding Lake WWTP
- Lift Stations Concept
  - Existing
  - Proposed
- Force Main Concept
  - Existing
  - Proposed
- Gravity Sewer Concept
  - Priority
  - Phase 1
  - Phase 2
- DSM Facilities
- DSM Pump Station
- Pressurized_Mains
- Existing Sewer Lines
  - <12 in

ROLL RD
OLD GOODRICH RD
GOODRICH RD
10"
GREINER RD
THOMPSON RD
COBBLESTONE DR
LIFT STATION #1
8"
EXISTING PS
SPAULDING DR
SPAULDING LAKES WWTP
10"
LIFT STATION #2
MAIN ST
CLARENCE RESEARCH PARK WRRF
LIFT STATION #3
GUNNVILLE RD
WEHRLE DR

0 0.1 0.2 mi

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

SPAULDING LAKE SEWER CONCEPT

JMDavidson Engineering, D.P.C.

Appendix C: Existing Facility Maps and Calculations

SYSTEM HEAD CURVE DETERMINATION

ERIE COUNTY SEWER DISTRICT NO. 5
BRYANT AND STRATTON PUMP STATION CAPACITY EVALUATION
JMD Project No. 472302

JMDavidson Engineering, D.P.C.

The following formulas and assumptions were used in the calculations contained in this spreadsheet:

1. Pump operation scenarios: From Bryant and Stratton PS to discharge point at gravity sewer collection system on Main St near Transit Rd, one pump in operation, second pump is spare.

2. Information on pumps, force main alignment and proposed flows provided by Erie County personnel in June 2023

3. Piping head loss calculations use Hazen-Williams Formula for Water (green text)

   $h=[(4.73*Q^{1.85})*L]/(C^{1.85}*D^{4.87})$

   where: h = Head Loss
   Q = Flow (cfs)
   C = Roughness Coefficient
   D = Pipe Diameter (ft.)
   L = Pipe Length (ft.)

4. Fitting, entrance, and exit head loss calculations for water (red text)

   $h=KV^2/2g$

   where: h = Head Loss
   K = Resistance Coefficient
   V = Flow Velocity (Q/A)
   g = Gravity (32.2 ft/sec^2)

K-values were obtained from "Cameron Hydraulic Data Handbook, 18th Edition" (1998) by Ingersoll-Dresser Pumps
For reducers, velocity of smaller end is used and for increasers the difference between the small and large end square velocities is used .
For tees with different inlet and outlet diameters, velocity in smaller diameter pipe is used.

A. HEAD LOSS OF SUCTION WELL TO PUMP (SUBMERSIBLE, NO SUCTION PIPE)

Fitting	No.	Inlet Dia.	Outlet Dia,	Length ft	C	K	(GPM) 0	100	200	300	400	500	600	700	800	900	1,400
N/A																	
						Subtotal:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

B. HEAD LOSS CALCULATION FOR PUMP DISCHARGE TO GRAVITY SEWER SYSTEM AT MAIN AND TRANSIT

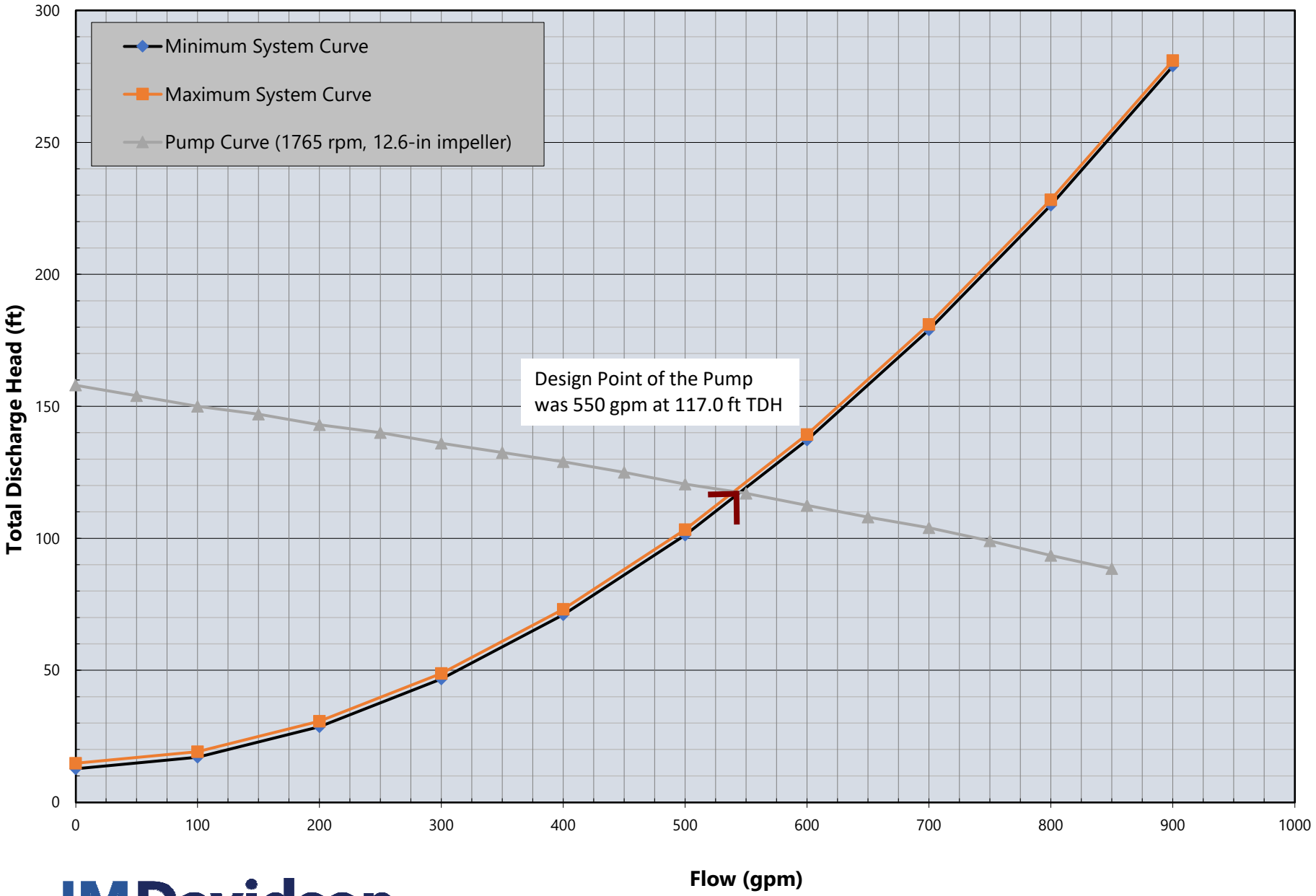
Fitting	No.	Inlet Dia.*	Outlet Dia,*	Length ft	C	K	(GPM) 0	100	200	300	400	500	600	700	800	900
90 deg bend (elbow)	1	-	4	-	-	0.51	0.00	0.05	0.21	0.46	0.83	1.29	1.86	2.53	3.30	4.18
Piping Friction	-	-	4	20	100	-	0.00	0.25	0.89	1.89	3.21	4.86	6.80	9.05	11.58	14.41
90 deg bend	1	-	4	-	-	0.51	0.00	0.05	0.21	0.46	0.83	1.29	1.86	2.53	3.30	4.18
Check Valve	1	-	4	-	-	1.70	0.00	0.17	0.69	1.55	2.75	4.30	6.20	8.43	11.01	13.94
Plug Valve	1	-	4	-	-	0.31	0.00	0.03	0.13	0.28	0.50	0.78	1.13	1.54	2.01	2.54
90 deg bend	1	-	4	-	-	0.51	0.00	0.05	0.21	0.46	0.83	1.29	1.86	2.53	3.30	4.18
Cross	1	4	6	-	-	0.90	0.00	0.09	0.36	0.82	1.46	2.28	3.28	4.46	5.83	7.38
Piping Friction	-	-	6	2	100	-	0.00	0.00	0.01	0.03	0.04	0.07	0.09	0.13	0.16	0.20
Air release valve	1															
Check Valve	1		6			1.50	0.00	0.03	0.12	0.27	0.48	0.75	1.08	1.47	1.92	2.43
90 deg bend	1	-	6	-	-	0.45	0.00	0.01	0.04	0.08	0.14	0.22	0.32	0.44	0.58	0.73
Piping Friction	-	-	6	2090	100	-	0.00	3.59	12.93	27.38	46.62	70.44	98.70	131.27	168.05	208.97
90 deg bend	2	-	6	-	-	0.45	0.00	0.02	0.07	0.16	0.29	0.45	0.65	0.88	1.15	1.46
Pipe Exit	1	-	6	-	-	1.00	0.00	0.02	0.08	0.18	0.32	0.50	0.72	0.98	1.28	1.62
Subtotal (for total force main length):							**0.00**	**4.36**	**15.94**	**34.03**	**58.30**	**88.52**	**124.55**	**166.24**	**213.49**	**266.21**

SUMMARY TABLE

FLOW (GPM)			0	100	200	300	400	500	600	700	800	900
PUMP STATION												
WET WELL LOW WATER LEVEL (from drawing)			687.20	687.20	687.20	687.20	687.20	687.20	687.20	687.20	687.20	687.20
WET WELL HIGH WATER LEVEL (from drawing)			689.30	689.30	689.30	689.30	689.30	689.30	689.30	689.30	689.30	689.30
FORCE MAIN												
VELOCITY IN FORCE MAIN (fps)*	DIAMETER (inch):	6	0.00	1.14	2.27	3.41	4.55	5.68	6.82	7.95	9.09	10.23
(recommended to operate between 2 and 10 fps per 10SS)												
HEAD LOSSES IN FORCE MAIN (sum of suction losses and discharge losses)			0.00	4.36	15.94	34.03	58.30	88.52	124.55	166.24	213.49	266.21
Discharge Pressure (assumes free discharge)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LOW WATER LEVEL AT DISCHARGE IN CHANNEL			597.13	597.13	597.13	597.13	597.13	597.13	597.13	597.13	597.13	597.13
MIN SYSTEM CURVE			12.7	17.1	28.6	46.7	71.0	101.2	137.2	178.9	226.2	278.9
MAX SYSTEM CURVE			14.8	19.2	30.7	48.8	73.1	103.3	139.3	181.0	228.3	281.0

Calculations Completed 6/22/2023 *by* C. Goerss-Murphy
Calculations Checked 6/23/2023 *by* A. Hintz

*Red highlighted cells indicate those velocities outside of the normal operating range of 2-8 fps.



JM Davidson Engineering, D.P.C.

PUMP DATA SHEET

Design Point listed as 550 gpm at 117 ft TDH

Ebara Model , 1765 rpm

Impeller size 12.60 in (Pump curve shows range of 12.60 / 9.37 in; Doug of DSM said impellers are full-s

CONSTANT SPEED PUMP

Wire to Water Efficiency	RATED FLOW RATE (gpm)		
	1 Pump	2 Pumps	Head (ft)
	0	0	158
12%	50	100	154
22%	100	200	150
31%	150	300	147
38%	200	400	143
45%	250	500	140
50%	300	600	136
54%	350	700	133
58%	400	800	129
60%	450	900	125
63%	500	1000	121
64%	550	1100	117
65%	600	1200	113
66%	650	1300	108
67%	700	1400	104
66%	750	1500	99
65%	800	1600	94
64%	850	1700	89

SYSTEM HEAD CURVE DETERMINATION

ERIE COUNTY SEWER DISTRICT NO. 5
EASTERN HILLS PUMP STATION CAPACITY EVALUATION
JMD Project No. 472302

JM Davidson Engineering, D.P.C.

The following formulas and assumptions were used in the calculations contained in this spreadsheet:

1. Pump operation scenarios: From Eastern Hills PS to discharge point at gravity sewer collection system on Transit Rd near Sheridan Ramp (one pump in operation)

2. Information on pumps, force main alignment and proposed flows provided by Erie County personnel in June 2023

3. Piping head loss calculations use Hazen-Williams Formula for Water (in green text)

   $h=[(4.73*Q^{1.85})*L]/(C^{1.85}*D^{4.87})$

   where: h = Head Loss
   Q = Flow (cfs)
   C = Roughness Coefficient
   D = Pipe Diameter (ft.)
   L = Pipe Length (ft.)

4. Fitting, entrance, and exit head loss calculations for water (red text)

   $h=KV^2/2g$

   where: h = Head Loss
   K = Resistance Coefficient
   V = Flow Velocity (Q/A)
   g = Gravity (32.2 ft/sec^2)

K-values were obtained from "Cameron Hydraulic Data Handbook, 18th Edition" (1998) by Ingersoll-Dresser Pumps
For reducers, velocity of smaller end is used and for increasers the difference between the small and large end square velocities is used .
For tees with different inlet and outlet diameters, velocity in smaller diameter pipe is used.

A. HEAD LOSS OF SUCTION WELL TO PUMP (SUBMERSIBLE, NO SUCTION PIPE)

Fitting	No.	Inlet Dia.	Outlet Dia,	Length ft	C	K	(GPM) 0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400
Entrance Loss	0	-	15	-	-	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Piping Friction	-	-	1	0	100	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pump																					
						Subtotal:	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

B. HEAD LOSS CALCULATION FOR PUMP DISCHARGE TO GRAVITY SEWER SYSTEM ON TRANSIT RD

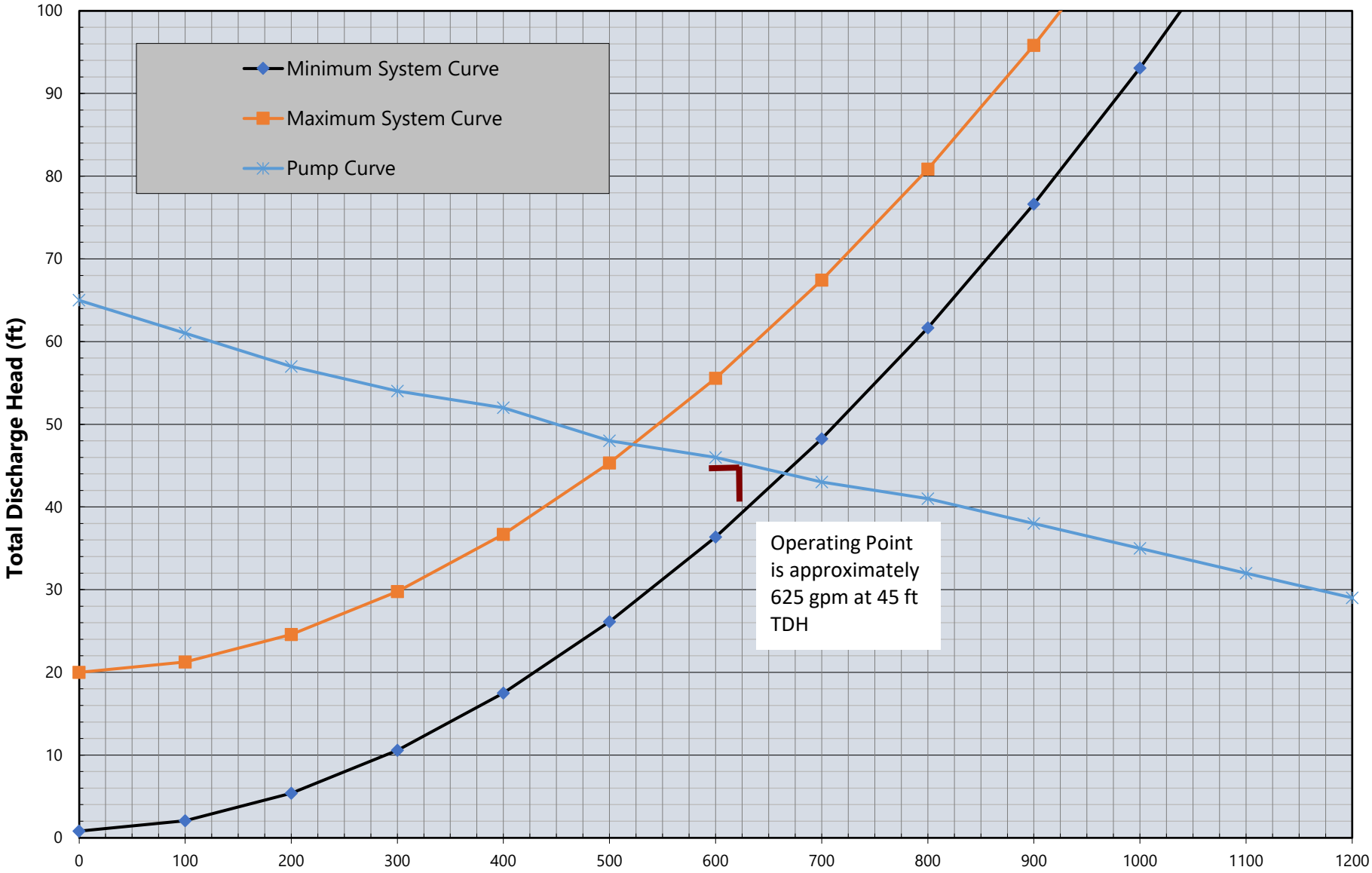
Fitting	No.	Inlet Dia.*	Outlet Dia,*	Length ft	C	K	(GPM) 0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400
Increaser	1	4	6	0.75	-	0.254	0.00	0.02	0.08	0.19	0.33	0.52	0.74	1.01	1.32	1.67	2.06	2.50	2.97	3.49	4.04
90 deg bend	1	-	6	-	-	0.45	0.00	0.01	0.04	0.08	0.14	0.22	0.32	0.44	0.58	0.73	0.90	1.09	1.30	1.52	1.76
Piping Friction	-	-	6	12	100	-	0.00	0.02	0.07	0.16	0.27	0.40	0.57	0.75	0.96	1.20	1.46	1.74	2.04	2.37	2.72
45 deg bend	1	-	6	-	-	0.24	0.00	0.00	0.02	0.04	0.08	0.12	0.17	0.24	0.31	0.39	0.48	0.58	0.69	0.81	0.94
Piping Friction	-	-	6	17.6	100	-	0.00	0.03	0.11	0.23	0.39	0.59	0.83	1.11	1.42	1.76	2.14	2.55	3.00	3.47	3.99
Swing Check Valve	1	-	6	-	-	1.50	0.00	0.03	0.12	0.27	0.48	0.75	1.08	1.47	1.92	2.43	3.00	3.63	4.32	5.07	5.88
Plug Valve Straightaway	1	-	6	-	-	0.27	0.00	0.01	0.02	0.05	0.09	0.13	0.19	0.26	0.35	0.44	0.54	0.65	0.78	0.91	1.06
90 deg bend	1	-	6	-	-	0.45	0.00	0.01	0.04	0.08	0.14	0.22	0.32	0.44	0.58	0.73	0.90	1.09	1.30	1.52	1.76
Tee (through)	1	-	6	-	-	0.90	0.00	0.02	0.07	0.16	0.29	0.45	0.65	0.88	1.15	1.46	1.80	2.18	2.59	3.04	3.53
Piping Friction (incl. cross)	-	-	6	2.63	100	-	0.00	0.00	0.02	0.03	0.06	0.09	0.12	0.17	0.21	0.26	0.32	0.38	0.45	0.52	0.60
Increaser	1	6	8	1	-	0.041	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.11
Piping Friction	-	-	8	2606	100	-	0.00	1.10	3.97	8.41	14.32	21.64	30.32	40.32	51.62	64.19	78.00	93.04	109.29	126.74	145.36
Pipe Exit	1	-	8	-	-	1.00	0.00	0.01	0.03	0.06	0.10	0.16	0.23	0.31	0.40	0.51	0.63	0.77	0.91	1.07	1.24
Subtotal (for total force main length):							**0.00**	**1.26**	**4.59**	**9.77**	**16.70**	**25.32**	**35.57**	**47.43**	**60.85**	**75.81**	**92.29**	**110.26**	**129.71**	**150.62**	**172.98**

SUMMARY TABLE

FLOW (GPM)			0	100	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400
PUMP STATION																	
WET WELL LOW WATER LEVEL (estimated from drawing)			681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00	681.00
WET WELL HIGH WATER LEVEL (from drawing)			700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20	700.20
FORCE MAIN																	
VELOCITY IN FORCE MAIN (fps)*	DIAMETER (inch):	8	0.00	0.64	1.28	1.92	2.56	3.20	3.84	4.47	5.11	5.75	6.39	7.03	7.67	8.31	8.95
(recommended to operate between 2 and 10 fps per 10SS)																	
HEAD LOSSES IN FORCE MAIN (sum of suction losses and discharge losses)			0.00	1.26	4.59	9.77	16.70	25.32	35.57	47.43	60.85	75.81	92.29	110.26	129.71	150.62	172.98
Discharge Pressure (assumes free discharge)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PUMP DISCHARGE PIPE EXIT ELEVATION			701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00	701.00
MIN SYSTEM CURVE			0.8	2.1	5.4	10.6	17.5	26.1	36.4	48.2	61.6	76.6	93.1	111.1	130.5	151.4	173.8
MAX SYSTEM CURVE			20.0	21.3	24.6	29.8	36.7	45.3	55.6	67.4	80.8	95.8	112.3	130.3	149.7	170.6	193.0

Calculations Completed 6/22/2023 *by* AAS
Calculations Checked 6/23/2023 *by* CGM

*Red highlighted cells indicate those velocities outside of the normal operating range of 2-10 fps.



JM Davidson Engineering, D.P.C.

EasternHillsPS System and Pump Curves

JM Davidson Engineering, D.P.C.

PUMP DATA SHEET

Design Point listed as 400 gpm at 44 ft TDH

FLYGT Model NP 3153 MT 3~436, 1755 rpm

8 1/16" impeller per xylem specs

CONSTANT SPEED PUMP

Wire to Water Effic'n'cy	RATED FLOW RATE (gpm) 1 Pump	2 Pumps	Head (ft)
0%	0	0	65.0
16%	100	200	61.0
30%	200	400	57.0
42%	300	600	54.0
53%	400	800	52.0
60%	500	1000	48.0
65%	600	1200	46.0
70%	700	1400	43.0
74%	800	1600	41.0
76%	900	1800	38.0
76%	1000	2000	35.0
75%	1100	2200	32.0
72%	1200	2400	29.0
68%	1300	2600	25.0
63%	1400	2800	22.0
56%	1500	3000	19.0
52%	1600	3200	16.0
46%	1700	3400	11.0
38%	1800	3600	10.0
30%	1900	3800	5.0

Appendix D: Meeting/ Workshop Documentation

JM Davidson Engineering, D.P.C.

935 Sheridan Drive, Suite 120
Tonawanda, New York 14150
Phone: 716.453.1646

Project Kick-Off Meeting Minutes

Date: Friday, June 2, 2023

Subject: Erie County Sewer District No. 5 Transit Road Corridor Sanitary Sewer Service Evaluation Report
ECDEP Project No. 5.3.2.TR
JMD Project No. 472302

Time: 09:00 AM

Location: Northern Sewer Districts Conference Room, 3789 Walden Avenue

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1. **Introductions & Responsibilities**
    a. Erie County Sewer District No. 5 (ECSD5 or County)
        i. Joe Fiegl – Deputy Commissioner, Dept. of Sewerage Management
        ii. Matt Salah – Project Manager and Lead Contact, Dept. of Sewerage Management
        iii. Bill Strzeszynski – Sewer District Manager, ECSD5
    b. Town of Amherst
        i. Jeff Burroughs – Town Engineer (attended via phone)
    c. Town of Clarence
        i. Tim Lavocat – Town Engineer
    d. JM Davidson Engineering (JMD)
        i. Jaime Davidson – Project Manager
        ii. Angela Hintz – Technical Lead
        iii. Mike Terrana, Cati Knab, Catherine Goerss-Murphy – Other JMD staff (not in attendance) also involved in the project.
    e. Arcadis
        i. John Salvagno – Technical Lead
        ii. Jon Hothem – Lead Modeler (not in attendance)
    f. Others as may be present – No others were present and it was indicated that the personnel present for this meeting were the people who should continue to be involved during the course of the project. JMD asked if any developers should be involved and the County preferred to keep it to the group in the room and that any correspondence with them should be through T. Lavocat or the County.

2. **Project Scope**
    a. Data Review – JMD indicated that they have reviewed the materials already given by ECSD5, Amherst, and Clarence during the proposal phase. Additional materials were requested (see Item 5 below).

935 Sheridan Drive, Suite 120
Tonawanda, New York 14150
Phone: 716.453.1646

i. Schedule site visit for JMD team
    1. Area of sewers (EC not required to attend) – JMD and Arcadis can attend anytime and will schedule a visit soon.
    2. Eastern Hills Pump Station (EC required) – JMD will schedule a site visit directly with B. Strzeszynski (with cc to Matt Salah) after pump station information has been received and reviewed. B. Strzeszynski indicated that a 1–2-day notice prior to the site visit is acceptable.
    3. Bryant and Stratton Pump Station (EC required) – same as Eastern Hills PS.

b. Stakeholder Workshops and Goal Definition – Two workshops were indicated within our scope.
    i. Entities at each workshop
        1. Workshop 1 – comprised of the same personnel currently in the room; however, if there are others from ECSD5 and/or the towns that may need to attend, they can be invited.
        2. Workshop 2 – attendees will be focused on utility and traffic coordination. It is recognized that not all utilities may be available for this workshop, but JMD has had success with communicating with utilities on recent projects and will attempt to get their participation.
    ii. Timing of each workshop
        1. Workshop 1 – early in the project once JMD has had the chance to review information.
        2. Workshop 2 – Once alternatives have been narrowed down.
    iii. Goal of each workshop
        1. Workshop 1 is anticipated to be a brainstorming session with the Towns and the County to identify options as well as alignments that may not work for other reasons other than flow.
        2. Workshop 2 is meant to identify what may be required to negotiate utilities and traffic for the shortlisted alternatives. Transit Road and Sheridan Drive are both NYSDOT roadways and alternatives will likely require significant coordination for implementation. NYSDOT and applicable utilities will be invited to this second workshop.

c. Identification of Alternatives for Gravity Sewers and Pumping Stations/ Force Mains

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Tonawanda, New York 14150
Phone: 716.453.1646

i. Brainstorming of alternatives – Below are some alternatives that may be considered, but the brainstorming will be highly influenced by the discussions at Workshop 1 as well as review of all data requested.
    1. Eastern Hills PS for full buildout of tributary basin to Peanut line (pumped/gravity flow)
    2. Eastern Hills PS for full buildout of tributary basin to Peanut line (pumped flow)
    3. Eastern Hills PS to other sewers outside of Transit Road corridor
    4. New gravity or force mains to Klein and/or Dodge Roads
    5. Others

ii. Vetting of Alternatives using other factors
    1. Transit Road Traffic
    2. Existing Utilities
    3. Nearby properties

d. Collection System Model Development and Alternative Iteration
    i. Review existing model to get an understanding. J. Hothem of Arcadis will be doing this work once the model has been received from the Town of Amherst
    ii. Use model to input flows in various locations. Note that a full model will NOT be built under this project, but only those pipes required will be added to the Amherst model and flows added in certain locations. Flow data from the previous Arcadis I/I study will be used along with flow data received from the permanent meters.

e. Report development – report development will take place throughout the course of the project to fully document evaluations.

3. Progress Updates

a. Monthly reporting emails are not required.
b. Meetings frequency was discussed; however, this is a short duration project, so workshops and maybe one or two other meetings will likely suffice.

4. Invoicing

a. Discuss specific format/forms required – JMD will provide standard Erie County invoice format.

5. Additional Data Requests – JMD to provide a DropBox and/or SharePoint site to facilitate file transfer *(DropBox and a Cloud-based Sharing site were subsequently shared with meeting attendees on Monday, June 5, 2023)*

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a. Confirm most up-to-date configuration and flow data – It was noted that the developers had submitted an updated development plan for the Eastern Hills site in January 2023; JMD requested that updated flow values and calculations be provided. Clarence will provide.
b. Basis of design for parallel Peanut Line – Amherst indicated that no official Basis of Design was completed, but Amherst's modeler (Jessica Boudreau) had provided information to the design team during construction. Amherst also indicated that J. Hothem of Arcadis could contact J. Boudreau directly for any questions. J. Burroughs indicated he would give J. Boudreau a heads-up on this contact.
c. Town of Amherst Collection System Model – Amherst will provide this model.
d. Available GIS of Sewer District and Town of Clarence systems to include sewer lines, storm sewers and other utilities (if shown) – County will provide updated GIS. It was noted that the County's GIS does not include storm sewers in this area.
e. Collection System Drawings for area – County will provide drawings (plans and profiles)
    i. Transit Road from site to Main Street
    ii. Transit Road from site to Klein Road
    iii. Transit Road from Dodge Road to Klein Road
f. Pump Station Information – County will provide.
    i. Force main alignments for both Eastern Hills and Bryant & Stratton Pump Stations
    ii. Drawings for both pump stations
    iii. Pump curves
    iv. Description of mode of operation (how many pumps operate at a time?)
g. Previous sewer capacity reports that may have been completed – Specific reports noted during the meeting include:
    i. Spaulding Lake study
    ii. Harris Hill study
    iii. Several downstream capacity evaluations prepared by private entities

6. Clarence Master and Comprehensive Plans

a. T. Lavocat confirmed that 2030 Master Plan should be the plan that is used. Brief discussion was held on the flow allotments shown in the Master Plan; T. Lavocat will provide backup information of those flows that show how they were developed.

7. Open Discussion

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a. This study should be a holistic view of the Transit Road Corridor to support current and future development and should not be targeted to focus on one development.
b. Uniland's engineer for the Eastern Hills site is C&S Engineers. It is estimated that the peak flows projected from this development is 1.6 MGD, which is more than all the Clarence Sewer Districts combined, so will end up being a considerable amount of flow to handle. JMD did request average flows to also be provided for the analysis.
c. Based on the information reviewed, J. Burroughs confirmed JMD's statement that Dodge and Klein Road sewers are currently maxed out; however, there may be some way to shift flows between Dodge, Klein, and a parallel Peanut Line sewer.
d. The County has indicated that they were interested in eliminating the Bryant & Stratton PS, perhaps with a larger, relocated Eastern Hills PS.
e. The Peanut Line parallel sewer preliminary design is currently able to address all the flows from Clarence (under current scenario), but additional flows would require additional upsizing of the sewers in Amherst downstream of the Peanut line at Paradise Road. There has been some consideration of a Phase 2 Peanut Line expansion from Paradise Road to Youngs Road (currently a 30" diameter sewer); however, no timeline for implementation of Phase 2 has been established.
f. Conversation was held about the need to have allocations for the Harris Hill area as public sewer service has been "floated" for many years to area residents and therefore there is some expectation that public sewer service would be available to replace aging septic systems in the future. It was noted that there are currently no environmental concerns with these systems.
g. J. Burroughs requested that consideration of H2S generation be considered during alternative development. Amherst has already experienced significant issues with H2S corrosion in the Peanut Line.
h. It was noted that Amherst's model does include the modification of the weir structure located at Klein and Transit Roads. Weir structure was completely removed and replaced with a manhole. This modification allows the flow to go either north or west. There is still a crescent restriction plate (3-inches off invert) on the first manhole west of Transit on Klein, however. The plate restricts flow to 0.8 to 1.0 MGD. If the County could provide sketches of this modification, that would be helpful to the JMD team.
i. The County noted that many sewers along Transit Road had been relined in recent years, and that relining information is included as a GIS layer.

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j. Schedule for report was discussed and a draft report will be submitted to the County and the Towns for review by the end of 2023.

8. Action Items

a. JMD
   i. Provide mechanism for file transfer to attendees *(completed)*
   ii. Provide W. Strzeszynski with dates for visiting pump stations

b. Town of Amherst
   i. Provide collection system model.
   ii. J. Burroughs to contact J. Boudreau regarding coordination with J. Hothem of Arcadis.
   iii. Provide privately-developed downstream sewer capacity reports.

c. Town of Clarence
   i. Provide most recent development plans within the Town, including the most recent Uniland proposal from January 2023.
   ii. Provide updated calculations for projected sewer allotments for various developments.
   iii. Provide Harris Hill, Spaulding Lake, and other sewer capacity studies, as may be available.

d. County/ ECSD 5
   i. Provide updated GIS for the area.
   ii. Provide flow data for the three permanent meters at Peanut Line, Dodge Road, and Klein Road.
   iii. Provide pump station drawings and pump curves as noted.
   iv. Provide sewer drawings (plans and profiles) of sewers along Transit Road.

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Meeting Minutes

Date:	Wednesday, August 30, 2023	
Subject:	Transit Road Corridor Sanitary Sewer Evaluation Study Workshop 1	
Time:	8:00 AM	
Location:	Erie County Division of Sewerage Management Northern Offices 3789 Walden Ave Lancaster, NY 14086	
Attendees:	ECDEP:	Dan Castle, AICP, Commissioner, ECDEP Joe Fiegl, PE, Deputy Commissioner, ECDEP Matt Salah, Sr. Coordinator, Sewer Construction Projects Bill Strzeszynski, Sewer District Manager
	Town of Amherst:	Jeff Burroughs, Town Engineer
	Town of Clarence:	Tim Lavocat, Town Engineer
	Engineering Design Team:	Jaime Davidson, PE, JM Davidson Engineering Angela Hintz, PE, JM Davidson Engineering Michael Terrana, PE, JM Davidson Engineering Catherine Goerss-Murphy, EIT, JM Davidson Engineering Cameron Daley, EIT, Arcadis

1. General Discussion

1.1. Self-introductions were made by each attendee listed above.

1.2. The goals of the workshop were summarized and printed agendas were distributed.

2. Review and Discussion of Information Gathered to Date

2.1. A tremendous amount of information was provided by the team members. JMD has reviewed everything provided and sought to understand it fully, but some questions remain, and those matters are targeted for discussion in this workshop.

2.2. Jon Hothem has expanded the Amherst collection system hydraulic model with the relevant sewersheds in Clarence using the provided GIS data, record drawings, and flow data.

a. Thirteen of the sixteen meters installed during Arcadis' past I/I study were used in the calibration; three (8, 9, and 13) were not used due to inconsistent and unreliable data. The permanent billing meters at Klein, Dodge, and Peanut Line were also used. The three meters that were not used were temporary meters.

b. The dry weather calibration is complete, and the wet weather calibration is nearly complete.

c. The model was calibrated with the weir structure in place at Klein Rd. because it was present during the time that the flow data was collected, but it is acknowledged that the chamber was modified in the last few years. Previously, there were stop logs installed above the existing weir (located 13-inches above the chamber invert) that created a 2-inch "gap" above the weir. The stop logs extended from 15 inches to 30 inches above the weir. Flows through the opening created by the weir and stop logs and flow overtopping the stop logs were restricted in the Klein Road sewer by the orifice place located downstream of the weir. Scenarios under this project will be run with the stop logs removed and the orifice within the Klein Road sewer adjusted.

2.3. A spreadsheet titled "Summary of Future Flows and Allocations" showing different scenarios was discussed.

a. Jeff Burroughs informed the group that the plan is for the existing 18" Peanut Line to stay in place and receive the same flows it does currently. The existing Peanut Line will operate in parallel with the proposed 24" Peanut Line. This will be confirmed by JMD and the Town of Clarence.

i. Tim Lavocat stated that the proposed 24" parallel Peanut Line would take any new flows. The two Peanut Lines are not interchangeable hydraulically due to the difference in elevation. The existing Peanut Line is deeper and flows could not readily be switched from this Peanut Line to the newer, higher one. TOA to confirm depths.

1. The existing Peanut Line's crossing at Transit Rd passes through the Transit Road sewer, and its invert is higher than the Transit Rd invert. As a result, Transit can take flow from the Peanut Line, but the reverse is not possible.

a. R&D drawings show this crossing. Schutt's drawings show the upstream portion to Clarence and also have a detail showing the crossing.

b. A gate structure is desired that would enable some of the Transit Road flows to be directed to the parallel Peanut Line and potentially relieve the Dodge Road sewer.

ii. Angela Hintz adjusted the spreadsheet accordingly to reflect that the 18" Peanut Line's flows will not be sent to the parallel Peanut Line.

1. This spreadsheet will be revised and provided as an appendix to these minutes.

b. The allocation for Harris Hill was discussed, as the values used in the Clarence 2030 Master Plan and the GPI report differed from each other. 1.77 MGD is in the 2030 Master Plan and may also be discussed in Nussbaumer and Clarke's Spaulding Lakes study; this

value should be used for Harris Hill planning purposes as opposed to the value in the GPI report.

i. Angela Hintz asked if the 1.77 MGD can be split into phases.

c. Angela Hintz stated that the capacity of the parallel Peanut Line is given as 4.6 MGD in some studies but could be even higher if a different Manning's *n* value is used. JMD varied the *n* value in their calculations in accordance with the pipe material indicated on the drawings.

i. Town of Amherst (TOA) uses a capacity of 4.13 MGD for the Parallel Peanut Line, which came from its model. The model uses an *n* value of 0.013.

1. Tim Lavocat stated that this *n* value has been required by DEC in the past.

2. JMD will initiate a general conversation with DEC, not specific to this project, regarding the use of lower *n* values for PVC pipe, which has *n* values of 0.009 to 0.011 in design guidance documents.

3. Joe Fiegl stated that part of Transit Rd has been lined and there is engineering justification for the *n* value to reflect that.

a. He also stated that DSM has used 0.013 in its latest reports to DEC, but only because there was no need to make a case for a more precise number.

b. EFC funding can be jeopardized if the NYSDEC disagrees with the design (for example, this occurred in the past due to the upsizing of a section of sewer on Transit Road).

ii. Joe Fiegl pointed out the need to cross-reference and standardize the stated capacities of the original and parallel Peanut Lines across the various sources.

1. Jeff Burroughs indicated that the TOA will look at this, especially for the parallel Peanut Line, so that everyone is using the same values in their analyses.

2. This discrepancy underscores the need for definitive guidance from DEC as to whether a Manning's *n* value smaller than 0.013 can be used. Using an overly conservative number can result in excess capacity being constructed, which can in turn cause harmful effects such as hydrogen sulfide gas.

iii. Angela Hintz asked if the capacity of the 30" sewer at Paradise Rd was used to inform the sizing of the 24" parallel Peanut Line. The basis of design for the 24" size is unclear.

1. Jeff Burroughs stated that the capacity is influenced by TOA's strong desire for the pipe not to surcharge on them. After Phase 2 is complete,

the capacity limitation will be in the 30" pipe from Paradise to Youngs. The material for this pipe section is ACP.

iv. Jon Hothem will talk to Jessica at TOA to determine intended capacity for parallel Peanut Line.

v. Tim Lavocat stated that the Spaulding Lakes priority area and Phase 1 area must be included in the allocation for Peanut Line Phase 2, and it is also extremely important that Spaulding Lakes Phase 2 be accommodated within the study, as it includes the Rock Oak development which has hundreds of mobile homes currently on a large septic system.

d. The group agreed that no specific recommendations would be made as to the balance among the types of property development (such as fewer restaurants in favor of more residential, for example.)

i. Currently 1.58 MGD is the projected final capacity needed at full buildout (i.e., at the end of Phase 3). The developers indicated that full buildout is estimated over 15-20 years.

e. Tim Lavocat stated that if new sewers are constructed to enable the Eastern Hills development, these will be public sewers, Eastern Hills cannot monopolize the capacity. Some capacity should be retained for future developments. It was noted that sewer capacity is on a first-come, first-served basis; however, this project will consider the full-buildout projected for the Eastern Hills Mall redevelopment.

f. Jeff Burroughs stated that it should be assumed that the pipe segment on Transit Road between the proposed and existing Peanut Lines' crossings will be upsized. JMD will confirm the need for upsizing as part of running the hydraulic model.

2.4. The Eastern Hills pump station (EHPS) was discussed.

a. The existing EHPS was originally designed for 400 gpm pumping capacity. The wet well and pumps were replaced in 1992; the pumps were upsized to 525 gpm at that time The pumps were upsized to 600-625 gpm in 2016, and would require a pumping capacity of 1600 gpm following full buildout per the Eastern Hills development study. Note that the developer estimated the pumping capacity based on 2 times the peak flow per ECDEP, but Matt Salah indicated for a development of this size, the peak factor becomes 1.7. For the existing peak pumping capacity of 625 gpm, the existing peak flow of the EHPS watershed can only be 625/1.7 or 367 gpm (0.53 mgd).

b. Angela Hintz reported that JMD visited the site and concluded that the wet well likely cannot accommodate larger pumps. Likewise, the valve vault cannot accommodate larger fittings or pipes, but the force main would need to be upsized.

c. Joe Fiegl and Matt Salah mentioned that it would likely make more sense to start fresh and build a new pump station, as the EHPS would need electrical upgrades and an enlarged building. The genset, which is already a known source of issues, would need a larger natural gas line as well.

i. Starting fresh would also give more flexibility on relocating the pump station.

ii. Angela Hintz mentioned that moving the pump station further onto the site might facilitate elimination of the Bryant and Stratton pump station (BSPS).

2.5. The Bryant and Stratton pump station (BSPS) was discussed.

a. Angela Hintz discussed the results of JMD's site visit and stated that this pump station has more room than EHPS but likely still not enough for the flows anticipated from the mall redevelopment.

b. Joe Fiegl added that the County has evaluated eliminating the Bryant and Stratton Pump Station in the past via a gravity sewer to EHPS. While this may be a feasible option, a major challenge is the shallow rock, but given that the developer needs to build new sewers within the site, along with a new pump station, these collectors could be sized to eliminate the BSPS.

c. Matt Salah added that he sees the ideal solution as the Eastern Hills Mall redevelopment having a dedicated force main all the way to the Peanut Line.

2.6. The Harris Hill, Spaulding Lakes, and Clarence Hollow areas were discussed.

a. Tim Lavocat mentioned that the plan has always been for Spaulding Lakes and Clarence Hollow to go to the Heise-Brookhaven Trunk Sewer (HBTS) and the Peanut Line.

i. The Peanut Line in Clarence is still owned by the Peanut Line Sewer Corporation, but Clarence is in the process of having it transferred to the town.

ii. The Town of Clarence has taken over management of the HBTS and is just finalizing the legal aspects of the transfer.

iii. It is safe to assume for the purposes of this study that the Peanut Line in Clarence and the HBTS will be publicly owned and that the Town of Clarence will have responsibility toward the allocation of flows to the HBTS.

iv. Angela Hintz noted that the HBTS has a limiting section due to shallow slope near Thompson Road but additional capacity can be gained by upsizing the pipe in that location from 12" to 15".

1. Tim Lavocat stated that the intent in the Master Plan was to extend the HBTS all the way to Main Street.

2.7. Joe Fiegl asked what was intended to be a leading question regarding if the capacity of the Dodge Rd sewer is a concern.

a. Jeff Burroughs said yes, the capacity is under 3 MGD and development has been shut down in the area, even for as few as eight lots. He added that the Town of Amherst plans to put a permanent meter near Old Oak Post Rd.

3. Challenges

3.1. Rock is known to be shallow in this area, so reusing existing alignments and sharing trenches should be considered as much as possible to minimize construction complexity and overall costs.

3.2. The gravity sewer along Transit Rd north of Sheridan Dr presently has current capacity but will be undersized and need to be replaced to increase capacity.

3.3. Mike Terrana presented figures showing the crowded utility corridors on Transit Rd; the only open corridor is in the travel lanes.

a. Utilities such as gas, water, and fiber optic used to be outside the road but are now in the road or at the curb due to DOT widening efforts.

b. Even if the enlarged sewer followed the existing one, it would involve snaking in and out of these other utilities.

i. Accessing them would be challenging due to the proximity to the gas and water lines.

ii. Matt Salah stated that the EHPS force main was moved when it was upsized. Mike Terrana offered to look for DOT record drawings that might show this. Angela Hintz noted that the placement of the existing valve chamber for the EHPS suggests that the force main is either in or very close to the right most lane of Transit Road going northbound.

c. Several other factors would increase the likely cost of using this corridor for upgraded sewers:

i. A large quantity of sidewalk and curb replacement would be needed.

ii. The work would need to be done at night and Transit Road would need to be restored to serviceable conditions each morning.

iii. Construction within the Transit Road right-of-way would likely require extensive traffic control planning. In addition, bypass pumping along Transit Road may also inhibit access to various properties along the sewer route.

d. Jeff Burroughs suggesting looking into utility easements elsewhere, as the Town of Amherst is doing with work near Niagara Falls Boulevard.

e. Angela Hintz stated that she is assuming that Transit Road will not be used due to the challenges listed above.

4. Discussion of Potential Alternatives

4.1. Alternatives referred to as JMD-1 and JMD-2 were sketched by Angela Hintz on GIS maps combining aerial views of the area, the existing sewer infrastructure, and the proposed Eastern Hills development.

a. Alternative JMD-1 would involve upsizing the EHPS in its existing location and upsizing various stretches of pipe along Transit Road from EHPS to the Peanut Line and assuming

that something else would need to be done in the future (i.e., gravity line) to accommodate flow from Harris Hill.

i. This option is likely very expensive, especially with construction along Transit Road to upsize the pipe.

ii. , considering that a new EHPS and sewers would likely be required to handle additional flows from the Eastern Hill redevelopment, there may be opportunities to eliminate the BSPS under certain scenarios The County desires to have only one pumping station in the area, if possible.

b. This option involves moving the pump station eastward or further into the site. The goal would be to use the 15" sewer near Sheridan Dr, cross Sheridan Dr directly, and then cross into the Eastgate Plaza and go through back lots to the Peanut Line in Clarence. This option would facilitate construction by moving sewers off Transit Road

i. Matt Salah and Jeff Burroughs mentioned that this area has very steep slopes (on Ledge Lane, for example), so it would be difficult to construct and maintain sewers there

ii. Tim Lavocat asked if the Harris Hill route had been considered.

1. This has been considered by the Town of Clarence but the presence of the gypsum mines may be an issue..

2. Sidewalks will soon be added to Sheridan Drive through a DOT grant, further restricting access.

3. Jeff Burroughs mentioned that the houses are set back on Harris Hill, facilitating easements in the front yards.

a. Mike Terrana indicated that he would investigate the ROW width on Harris Hill.

4. Contractually, could flows from District 5 come into Clarence and then go back out? ECDSM indicates that this may be considered, as there are other locations within the Sewer Districts where this scenario occurs.

5. Joe Fiegl stated that during the development of the RFP Harris Hill was contemplated as an option, but that they recognize that it is a lot of pipe to be installed.

iii. Other possible routes and related concerns were discussed.

1. Angela Hintz suggested snaking around Loch Lea to Roll Rd.

2. Tim Lavocat urged the group to avoid Newhouse Road if possible

a. He also reiterated that any route through the gypsum mine property could result in added development pressure.

b. Going to Shimerville Road would be too far east, but he is not opposed to using Greiner Rd or Roll Rd to get back to Transit or another route north.

3. Spaulding Lakes and Clarence Hollow are anticipated to go to HBTS.

    a. Spaulding Lakes would go straight down Goodrich Road.

    b. Clarence Hollow Phase 2 is southeast of CSD No. 9.

4. Harris Hill sewers are envisioned as using gravity sewers, except for the southmost portion, which may require a small pumping station.

4.2. Regarding JMD-3, Angela Hintz remarked that bypass pumping would be required as work progresses up Transit.

a. A gravity sewer here would be very deep. EHPS is currently 20 feet deep.

4.3. Angela Hintz explained that Option JMD-4 would involve splitting the flows in different directions, with a mix of force mains and gravity sewers. Splitting flows may be the key to obtaining the full capacity needed and provide flexibility in the meantime.

a. Joe Fiegl added that adding sewer capacity in phases would enable the developer to get the development going while they figure out the funding aspects for the sewer upgrades.

b. Joe Fiegl stated that everything south of Sheridan goes the EHPS.. The EHPS does not service only the Eastern Hills site.

c. Angela Hintz mentioned that a phased approach might mean that only a portion of Harris Hill or Clarence Hollow is added at a time. These options will be refined once the model and numbers are finalized.

4.4. Angela Hintz shared that the JMD team would also like to look into an attenuation tank, similar to the setup at the Bills stadium.

a. Joe Fiegl has heard of industrial customers and office parks doing this, but not residential. Matt Salah shared this impression.

    i. Joe Fiegl expressed appreciation for the out-of-the-box thinking and considered the tank to be akin to a large wet well. Odors may be an issue.

    ii. Matt Salah mentioned that the Clarence High School had a 50,000(?)-gallon tank of this nature, and the Angola rest stop has one as well.

    iii. Jeff Burroughs stated that the Westwood developer wanted to try this approach, and the Town of Amherst would not allow it. They believed DEC would not like it, and they were also concerned about hydrogen sulfide gas production, as it is especially harmful to their RCP pipe.

    iv. Angela Hintz asked if there are any industrial customers in District 5 who could go on an attenuation tank to free up capacity for residential users.

1. Joe Fiegl stated that there were not any; the vast majority of District 5 is residential. With mixed-use commercial, it is hard to separate different types of flow.

b. Tim Lavocat asked what type of flow is anticipated; Angela Hintz said it is impossible to say currently, without use of the model. The purpose would be to shave off the peaks, while slowly bleeding flow back to the collection system.

c. Dan Castle stated that it could be years before the full-size tank is needed, as the project has been pitched as a 20-year buildout.

   i. Joe Fiegl added that the infrastructure could be put in the ground and then the plan could totally change, similar to the 2011 buildout study which anticipated residential construction but turned out to be quite different. Angela Hintz indicated that phased development is being looked at to provide re-work at a later date, while not overbuilding in the event that not all phases of the development are ultimately implemented.

   ii. Dan Castle asked if dewatering would be an option to reduce flow volumes; Angela Hintz replied that wastewater is very low in solids and it would be quite expensive to concentrate this type of waste stream.

4.5. Miscellaneous discussion items concluded the meeting.

a. Angela Hintz confirmed that the flows are modeled dynamically.

b. Joe Fiegl indicated that the RFP had contemplated three main routes that the County hoped to have vetted, as well as any other ideas the consultants have.

   i. Impacts of development on the Dodge Road sewer capacity still need to be evaluated to ascertain whether or not flow could be directed to Dodge Road and other flow reallocated to the Peanut Line.

c. Town of Clarence indicated that the developers for the Eastern Hills Mall site would prefer to solve the sewer issues first rather than be required to develop an Environmental Impact Statement.

d. Regardless of which option is pursued, Tim Lavocat stated that a phased approach of some sort would be ideal, as they do not want to put in a trunk line for one development.

e. Joe Fiegl stated that they had looked into going west and then north through Amherst, but nothing was readily apparent, and that approach would not help with Harris Hill flows.

   i. Getting to Youngs Road is not an option. According to Jeff Burroughs, the Maple Road sewer has no capacity, is made with RCP from the 1960's and non-standard slopes, and its manhole surcharges in the Lowe's parking lot.

f. The group noted that going north may involve crossing creeks such as Gott Creek, which is becoming a more involved process from DEC, requiring elements such as mussel surveys.

g. Dan Castle inquired as to how flows are developed for the model. Angela Hintz explained that the developers stated their assumptions, and she verified those estimates were reasonable. Jaime Davidson added that flow monitoring data was also used for modeling flows from existing users.

h. Angela Hintz indicated the project is on schedule for delivering a draft report by the end of the year. The report structure follows EFC guidelines.

i. Workshop 2 is anticipated to take place in October and will include utilities.

    i. Dan Castle mentioned that it can be difficult to get on DOT's calendar.

        1. Mike Terrana indicated that he will reach out to Ron and anticipates that he will be responsive.

    ii. Tim Lavocat stated that Harris Hill Road belongs to the County and they would need to be consulted about any proposed work there.

5. Next Steps/Action Items

Action Item	Responsible Party	Targeted Completion Date
Confirm capacity of parallel Peanut Line to use in modeling	Town of Amherst	9/15/2023
Confirm Harris Hill allocation and share reports relevant to that value	Town of Clarence	9/15/2023 *(completed per T. Lavocat email of 9/1/2023)*
Invite utilities to Workshop 2	Mike Terrana/JMD	9/29/2023
Initiate general discussion with DEC regarding Manning's *n* value	Angela Hintz/JMD	9/9/2023 *(A. Hintz spoke with Molly Bebak of DEC on 9/13/2023, where Ms. Bebak indicated an n-value of 0.011 could be used for PVC pipe)*
Send draft Table of Contents for report to group	Angela Hintz/JMD	9/15/2023
Send revised spreadsheet of flow scenarios to group	Angela Hintz/JMD	9/9/2023 (sent to group on 9/7/2023 along with the draft meeting minutes)
Research attenuation tank examples	Catherine Goers-Murphy/JMD	9/15/2023
Investigate ROW width on Harris Hill Road	Mike Terrana/JMD	9/15/2023 *(drawings were requested by JMD, but none of*

		the drawings received show Harris Hill ROW; requested design ticket in the area)
Request Transit Road record drawings from NYSDOT to confirm EHPS force main location	Mike Terrana/JMD	9/15/2023 *(drawings received from NYSDOT)*

Prepared By: Catherine Goerss-Murphy

Date: August 31, 2023

Distributed for Review: September 7, 2023

Revised: September 18, 2023

This confirms and records JM Davidson Engineering, D.P.C.'s interpretation of the discussions that occurred and our understanding reached during this meeting. Unless notified in writing within 7 days of the date issued, we will assume that this recorded interpretation or description is complete and accurate.

JM Davidson Engineering, D.P.C.

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Meeting Minutes

Date:	Wednesday, October 18, 2023	
Subject:	Transit Road Corridor Sanitary Sewer Evaluation Study Flow Allocation	
Time:	1:30 PM	
Location:	Microsoft Teams	
Attendees:	ECDEP:	Joe Fiegl, PE, Deputy Commissioner, ECDEP
	Town of Amherst:	Jeff Burroughs, Town Engineer Jess Boudreau, PE, Project Manager
	Engineering Design Team:	Angela Hintz, PE, JM Davidson Engineering Catherine Goerss-Murphy, EIT, JM Davidson Engineering Jon Hothem, PE, Arcadis

1. General Discussion

1.1. Angela Hintz thanked Joe Fiegl for his efforts to spearhead discussions regarding flow allocations with the Towns of Amherst and Clarence and for all team members for their contributions.

1.2. JMD had created its own version of the flow allocation spreadsheet, and Angela Hintz asked if our breakdown of flows in the existing 30" Peanut Line west of Paradise Road is correct. Jess Boudreau indicated that it was.

1.3. Angela asked what n-value had been used to determine the capacity of the existing 30" Peanut Line and indicated that DEC had approved a value of 0.011 for Jon Hothem to use.

   a. Angela asked a similar question regarding the capacity of the existing 18" Peanut Line. Jess indicated that she would confirm the capacity and the n-value used.

1.4. Angela asked what basis was used to determine the flow allocation for the existing lots in Clarence Town Sewer Districts 2, 4, 6, and 9. The group indicated that the value was provided by Tim Lavocat of Clarence, who was not in attendance.

1.5. Angela noted that the flow allocation for Spaulding Lake had been revised and inquired about its basis; the group indicated that this change also originated with Tim Lavocat.

1.6. The group noted that the flow value allocated for the Eastern Hills Mall area represents new peak flows, and existing flows are accounted for in the ECSD5 flow data. Currently, the existing flow goes to Dodge Rd.

1.7. The remainder of flow in the Dodge diversion comes from existing ECSD5 flow. This diversion exists to relieve the surcharge issues on Dodge Rd mentioned in the August meeting.

Prepared By: Catherine Goerss-Murphy

Date: October 18, 2023

TRANSIT ROAD CORRIDOR SANITARY SEWER FLOWS
Confirmed 10/18/2023 with ECDSM and Amherst

	Description	Type of Flow Data	Flow (mgd)	Subflow 1 (mgd)	Subflow 2 (mgd)	Source	JMD notes
1	*30" dia. Peanut Line (west of Paradise)*	*Capacity*	*8.8*			per Fiegl email of 10/10/2023, figure	*30" RCP @ 0.11%, n = 0.013*
	Existing Flow	Measured (5 yr, 6-hr)		4.5		per Fiegl email of 10/10/2023, figure	in flow monitoring data
	Klein Diversion	Node B + C + Existing ECSD5 Flow		0.58		per Fiegl email of 10/10/2023, figure	EC noted already accounted for in the model
	Node B				0.18	per Fiegl email of 10/10/2023, figure	Part of Klein Diversion
	Node C				0.06	per Fiegl email of 10/10/2023, figure	Part of Klein Diversion
	Existing ECSD5 Flow				0.34	Calculated (Klein Diversion - Node B - Node C)	From along Transit Rd, currently going to Klein
		Current Total		**5.08**	**0.58**		
		Available Capacity w/o Addl Flows	**3.72**				
	18" Peanut Line (existing)	*Capacity*	*2.54*			per Fiegl email of 10/10/2023, figure	*18" RCP @ 0.14%, n = 0.013*
2	Existing Clarence Flow	Measured		1.2		per Fiegl email of 10/10/2023, figure	should be in flow monitoring data
	Existing Amherst Flow	Measured		0.2		per Fiegl email of 10/10/2023, figure	should be in flow monitoring data
	Available lots in CSD 2, 4, 6, 9	Proposed Future		0.51		per Fiegl email of 10/10/2023, table	Info provided by Town of Clarence
	CSD 9 Phase 2	Proposed Future		0.24		per Fiegl email of 10/10/2023, table	matches JMD value
	Spaulding Lake	Proposed Future		0.16		per Fiegl email of 10/10/2023, table	Info provided by Town of Clarence
	Clarence Research Park	Proposed Future		0.06		per Fiegl email of 10/10/2023, table	not included in JMD's previous table, but info provided in Fiegl email.
		Total		**2.37**			
		Available Capacity	**0.17**				
	24" Peanut Line (proposed parallel sewer)	*Capacity*	*4.89*			*per Fiegl email of 10/10/2023*	*24" PVC @ 0.08%, n = 0.011*
3	Harris Hill	Proposed Future		1.77		per Fiegl email of 10/10/2023, table and figure	matches JMD value
	Main Street	Proposed Future		0.55		per Fiegl email of 10/10/2023, table and figure	matches JMD value
	Node A (Eastern Hills Mall)	Proposed Future		1.48		per Fiegl email of 10/10/2023, table and figure	Does not include existing ECSD 5 flow, existing flow currently goes to Dodge and is accounted for elsehwere
	Dodge Diversion			0.9		per Fiegl email of 10/10/2023, table	
	Node D (Thompson) + Bliss	Proposed Future			0.15	per Fiegl email of 10/10/2023, figure	Part of Dodge Rd Diversion
	Node E (Bevilaqua)	Proposed Future			0.19	per Fiegl email of 10/10/2023, figure	Part of Dodge Rd Diversion
	Node F (Stahley Road)	Proposed Future			0.04	per Fiegl email of 10/10/2023, figure	Part of Dodge Rd Diversion
	Remainder of Dodge Diversion?	Proposed Future			0.52	Calculated (Dodge Div - Node D - Node E - Node F)	Existing flow from ECSD5.
		Total		**4.7**	**0.9**		
		Available Capacity	**0.19**				
4	TOTAL Peanut Line Corridor Flows	Capacity	7.43			given by Amherst above	
	(btw Transit and Paradise)	Calculated	7.07			sum of flows from 18" + 24" PL	
		Existing Flows	1.4			Existing Clarence and Amherst flow from above	
		Future Flows	5.67			Sum of flows - Existing flows	
5	TOTAL Peanut Line Corridor Flows	Capacity	8.8			given by Amherst above	
	(west of Paradise)	Existing Flow	4.5			given by Amherst above	
		Klein Road Diversion	0.58			given by Amherst above	
		Future Additional Flow	5.67			future flows in 18" + 24" PL sewers	
		Deficit	-1.95				Additional capacity that may have to be expanded in Phase 2 Peanut Line

Appendix E: Flow Calculations

EASTERN HILLS PUMP STATION

Historical flows to Eastern Hills PS - from Downstream Capacity Evaluation Report

	Pump Hrs	hrs/day	gpm	gph	month gallons	daily gallons	Pump Run %
Jan-21	140	4.5	**625**	37,500	5,250,000	169,355	19%
Dec-20	169	5.5	**625**	37,500	6,337,500	204,435	23%
Nov-20	114	3.8	**625**	37,500	4,275,000	142,500	16%
Max Daily Flow	169	5.6	**625**	37,500	6,337,500	211,250	23%
Estimated Existing Daily flow from EH Mall	N/A	24.0	**20**	1,195	860,070	28,669	N/A
Estimated Flow from U/S of EH Mall*	N/A	24.0	**127**	7,608	5,477,430	182,581	N/A

Note: * Calculated using max daily flow at EHPS, spread over 24 hours

From ECSD5 report for October 2023 ECSD5 Quarterly Meeting

Eastern Hills PS	Hrs Op	Flow (gpm)	Mo. Gallons	Daily gallons	Pump Run %	Estimated Peak Flows
Jun-23	142	625	5,325,000	177,500	20%	710,000
Jul-23	156	625	5,850,000	188,710	21%	754,839
Aug-23	170.5	625	6,393,750	206,250	23%	825,000

Capacity of EHPS	**Hr/day**	**Pump Rate**		**gpd**		
	24	625		900,000		
	129	gpm	ADF	185,714	gpd	average of daily gallons from DCA report and October 2023 report
	426	gpm	PF	612,857	gpd	Peaking factor of 3.3 for a conservative upstream population of 4000

68% of total pumping capacity

BRYANT & STRATTON PUMP STATION

From ECSD5 report for October 2023 ECSD5 Quarterly Meeting

	Hrs Op	Flow (gpm)	Mo. Gallons	Daily gallons		Estimated Peak Flows
Jun-23	118	550	3,894,000	129,800	16%	519,200
Jul-23	data error	N/A	N/A	N/A	N/A	N/A
Aug-23	86.8	550	2,864,400	95,480	12%	381,920

.

Capacity of BSPS	**Hr/day**	**Pump Rate**		**gpd**		
	24	550		792,000		
	78.22	gpm	ADF	112,640	gpd	average of daily gallons
	297.24	gpm	PF	428,032	gpd	Peaking factor of 3.8 for a conservative upstream population of 1000

54% of total pumping capacity

If Eastern Hills Flows is Separated from Bryant and Stratton

Eastern Hills Required Flows	Ph 1+2+3	Ph 1+2	Ph 1	
Existing Peak Flows	612,857 gpd	612,857 gpd	612,857 gpd	(includes Bryant and Stratton Flows, using Peak Flow above)
BSPS Peak Flows	428,032 gpd	428,032 gpd	428,032 gpd	
Existing Flows Minus BSPS	184,825 gpd	184,825 gpd	184,825 gpd	(using Peaking Factor of 4)
Current Flows for Mall (from GPI)	28,669 gpd	28,669 gpd	28,669 gpd	(given in Downstream Capacity Analysis Report)
Calc. Flows for rest of Serv. Area	156,156 gpd	156,156 gpd	156,156 gpd	(calculated)
Future EH Development Flows	1,580,000 gpd	1,108,000 gpd	935,900 gpd	
Maximum Flow	1,736,156 gpd	1,264,156 gpd	1,092,056 gpd	
	1,206 gpm	878 gpm	758 gpm	
Peak Pumping Flow	1,869 gpm	1,361 gpm	1,175 gpm	use value of Peak pumping capacity of 1.55 per DCA and ECDSM guid
	2,691,042 gpd	1,959,442 gpd	1,692,687 gpd	

If BSPS Flows still going to EHPS

Eastern Hills Required Flows	Ph 1+2+3	Ph 1+2	Ph 1	
Existing Flows	612,857 gpd	612,857 gpd	612,857 gpd	(includes Bryant and Stratton Flows, using Peak Flow above)
Current Flows for Mall (from GPI)	28,669 gpd	28,669 gpd	28,669 gpd	
Calc. Flows for rest of Serv. Area	584,188 gpd	584,188 gpd	584,188 gpd	
Future EH Development Flows	1,580,000 gpd	1,108,000 gpd	935,900 gpd	
Maximum Flow	2,164,188 gpd	1,692,188 gpd	1,520,088 gpd	
	1,503 gpm	1,175 gpm	1,056 gpm	
Peak Pumping Flow	2,330 gpm	1,821 gpm	1,636 gpm	use value of Peak pumping capacity of 1.55 per DCA and ECDSM guid
	3,354,492 gpd	2,622,892 gpd	2,356,137 gpd	

If adding in Harris Hill/Main Street in the Future

Peak Flows - Harris Hill	1770000 gpd
Peak Flows - Main Street	550000 gpd
Total Peak Gravity Flow	4,484,188 gpd

Gravity Sewers - Full Buildout without BSPS

Inputs	Flow Needed			1,736,156 gpd
Diameter	in	10	12	15
Diameter	ft	0.8	1.0	1.3
Radius	ft	0.417	0.500	0.625
theta	radians	5.28	5.28	5.28
Flow depth, y	in	9.38	11.26	14.08
Percent full		93.8%	93.8%	93.8%
Qmax occurs at y = 0.938 D and theta = 5.28				
Area of flow, A	ft^2	0.532	0.765	1.196
Wetted Perimeter, P	ft	2.2	2.64	3.3
Hydraulic radius, R_h	ft	0.242	0.290	0.362
10SS Slope	ft/ft	0.01	0.0041	0.0015
		slope required to meet flow	slope required to meet flow	oversized at min. clope
Mannings "n"		0.011	0.011	0.011
k		1.49	1.49	1.49
Max Flow	cfs	2.79	2.91	3.19
	gpm	1254	1305	1431
	gpd	1,805,086	1,879,490	2,061,201
	MGD	1.81	1.88	2.06
Velocity at Max Flow	ft/s	5.3	3.8	2.7
Sufficient for flow		yes	yes	yes

Use this sizing for Eastern Hills Mall Expanded with BSPS Flows

Gravity Sewers - Only Phase 1 + 2

Inputs	Flow Needed			1,264,156 gpd
Diameter	in	10	12	
Diameter	ft	0.8	1.0	
Radius	ft	0.417	0.500	
theta	radians	5.28	5.28	
Flow depth, y	in	9.38	11.26	
Percent full		93.8%	93.8%	
Qmax occurs at y = 0.938 D and theta = 5.28				
Area of flow, A	ft^2	0.532	0.765	
Wetted Perimeter, P	ft	2.2	2.64	
Hydraulic radius, R_h	ft	0.242	0.290	
10SS Slope	ft/ft	0.01	0.0041	
			needed slope to get capacity	
Mannings "n"		0.011	0.011	
k		1.49	1.49	
Max Flow	cfs	2.79	2.91	
	gpm	1254	1305	
	gpd	1,805,086	1,879,490	
	MGD	1.81	1.88	
Velocity at Max Flow	ft/s	5.3	3.8	
Sufficient for flow		yes	yes	

Gravity Sewers - Only Phase 1

Inputs	Flow Needed			1,092,056 gpd
Diameter	in	10	12	
Diameter	ft	0.83	1.00	
Radius	ft	0.417	0.500	
theta	radians	5.28	5.28	
Flow depth, y	in	9.38	11.26	
Percent full		93.8%	93.8%	
Qmax occurs at y = 0.938 D and theta = 5.28				
Area of flow, A	ft^2	0.532	0.765	
Wetted Perimeter, P	ft	2.2	2.64	
Hydraulic radius, R_h	ft	0.242	0.290	
10SS Slope	ft/ft	0.01	0.0041	
		effect of going down a pipe size	needed slope to get capacity	
Mannings "n"		0.011	0.011	
k		1.49	1.49	
Max Flow	cfs	2.79	2.91	
	gpm	1254	1305	
	gpd	1,805,086	1,879,490	
	MGD	1.81	1.88	
Velocity at Max Flow	ft/s	5.3	3.8	
Sufficient for flow		yes	yes	

Pressure Sewers from EHPS to north of Eastern Hills Mall Property

Maximum Pump Station Capacity 2,691,042 gpd

Pipe size	8	10	12
Area	0.349	0.545	0.785
Velocity	11.47	7.34	5.10
		use this one	

Maximum Pump Station Capacity 1,959,442 gpd

Pipe size	8	10	12
Area	0.349	0.545	0.785
Velocity	8.35	5.34	3.71
		use this one	

Maximum Pump Station Capacity 1,692,687 gpd

Pipe size	8	10	12
Area	0.349	0.545	0.785
Velocity	7.21	4.62	3.21
		use this one	

Gravity Sewers - Full Buildout with BSPS

Inputs	Flow Needed			2,164,188 gpd
Diameter	in	12	12	15
Diameter	ft	1.0	1.0	1.3
Radius	ft	0.500	0.500	0.625
theta	radians	5.28	5.28	5.28
Flow depth, y	in	11.26	11.26	14.08
Percent full		93.8%	93.8%	93.8%
Qmax occurs at y = 0.938 D and theta = 5.28				
Area of flow, A	ft^2	0.765	0.765	1.196
Wetted Perimeter, P	ft	2.64	2.64	3.3
Hydraulic radius, R_h	ft	0.290	0.290	0.362
10SS Slope	ft/ft	0.0022	0.0065	0.0015
		min. slope (10SS)	needed slope to get capacity	min. slope (10SS)
Mannings "n"		0.011	0.011	0.011
k		1.49	1.49	1.49
Max Flow	cfs	2.13	3.66	3.19
	gpm	956	1643	1431
	gpd	1,376,763	2,366,490	2,061,201
	MGD	1.38	2.37	2.06
Velocity at Max Flow	ft/s	2.8	4.8	2.7
Sufficient for flow		no	yes	no

Use this sizing for Eastern Hills Mall Expanded with BSPS Flows

Gravity Sewers - Only Phase 1 + 2

Inputs	Flow Needed			1,692,188 gpd
Diameter	in	10	12	15
Diameter	ft	0.8	1.0	1.3
Radius	ft	0.417	0.500	0.625
theta	radians	5.28	5.28	5.28
Flow depth, y	in	9.38	11.26	14.08
Percent full		93.8%	93.8%	93.8%
Qmax occurs at y = 0.938 D and theta = 5.28				
Area of flow, A	ft^2	0.532	0.765	1.196
Wetted Perimeter, P	ft	2.2	2.64	3.3
Hydraulic radius, R_h	ft	0.242	0.290	0.362
10SS Slope	ft/ft	0.0054	0.0054	0.0015
		effect of going down a pipe size	needed slope to get capacity	min. slope (10SS)
Mannings "n"		0.011	0.011	0.011
k		1.49	1.49	1.49
Max Flow	cfs	2.05	3.34	3.19
	gpm	921	1498	1431
	gpd	1,326,462	2,156,974	2,061,201
	MGD	1.33	2.16	2.06
Velocity at Max Flow	ft/s	3.9	4.4	2.7
Sufficient for flow		no	yes	yes

Gravity Sewers - Only Phase 1

Inputs	Flow Needed			1,520,088 gpd
Diameter	in	10	12	15
Diameter	ft	0.83	1.00	1.25
Radius	ft	0.417	0.500	0.625
theta	radians	5.28	5.28	5.28
Flow depth, y	in	9.38	11.26	14.08
Percent full		93.8%	93.8%	93.8%
Qmax occurs at y = 0.938 D and theta = 5.28				
Area of flow, A	ft^2	0.532	0.765	1.196
Wetted Perimeter, P	ft	2.2	2.64	3.3
Hydraulic radius, R_h	ft	0.242	0.290	0.362
10SS Slope	ft/ft	0.0054	0.0054	0.0015
		min. slope (10SS)	needed slope to get capacity	min. slope (10SS)
Mannings "n"		0.011	0.011	0.011
k		1.49	1.49	1.49
Max Flow	cfs	2.05	3.34	3.19
	gpm	921	1498	1431
	gpd	1,326,462	2,156,974	2,061,201
	MGD	1.33	2.16	2.06
Velocity at Max Flow	ft/s	3.9	4.4	2.7
Sufficient for flow		no	yes	yes

Pressure Sewers - Full Buildout with BSPS

Maximum Pump Station Capacity 3,354,492 gpd

Pipe size	8	10	12
Area	0.349	0.545	0.785
Velocity	14.30	9.15	6.35
		use this one	

Maximum Pump Station Capacity 2,622,892 gpd

Pipe size	8	10	12
Area	0.349	0.545	0.785
Velocity	11.18	7.15	4.97
		use this one	

Maximum Pump Station Capacity 2,356,137 gpd

Pipe size	8	10	12
Area	0.349	0.545	0.785
Velocity	10.04	6.43	4.46
		use this one	

Gravity Sewers from BSPS to north of Eastern Hills Mall Property- Mannings Equation

Inputs	Flow Needed				
			428032 gpd		
Diameter	in	8	10		
Diameter	ft	0.7	0.8		
Radius	ft	0.333	0.417		
theta	radians	5.28	5.28		
Flow depth, y	in	7.51	9.38		
Percent full		93.8%	93.8%		
Qmax occurs at y = 0.938 D and theta = 5.28					
Area of flow, A	ft^2	0.340	0.532		
Wetted Perimeter, P	ft	1.76	2.2		
Hydraulic radius, R_h	ft	0.193	0.242		
10SS Slope	ft/ft	0.004	0.0028		
		min. slope (10SS)	needed slope to get capacity		
Mannings "n"		0.011	0.011		
k		1.49	1.49		
Max Flow	cfs	0.97	1.48		
	gpm	437	663		
	gpd	629,653	955,162		
	MGD	0.63	0.96		
Velocity at Max Flow	ft/s	2.9	2.8		
Sufficient for flow		yes	yes		
			use this sizing		

Pressure Sewers from BSPS to north of Eastern Hills Mall Property

Maximum Pump Station Capacity 663,450 gpd

Pipe size	4	6	8
Area	0.087	0.196	0.349
Velocity	13.50157615	6.000700511	3.375394037
		use this one	

Gravity Sewers = EHPS + BSPS + Harris Hill + Main Street

Inputs	Flow Needed			4484188.1 gpd	
Diameter	in	15	18	21	24
Diameter	ft	1.3	1.5	1.8	2.0
Radius	ft	0.625	0.750	0.875	1.000
theta	radians	5.28	5.28	5.28	5.28
Flow depth, y	in	14.08	16.89	19.71	22.52
Percent full		93.8%	93.8%	93.8%	93.8%
Qmax occurs at y = 0.938 D and theta = 5.28					
Area of flow, A	ft^2	1.196	1.722	2.344	3.062
Wetted Perimeter, P	ft	3.3	3.96	4.62	5.28
Hydraulic radius, R_h	ft	0.362	0.435	0.507	0.580
10SS Slope	ft/ft	0.0015	0.0012	0.0016	0.0008
		min. slope (10SS)	needed slope to get capacity	needed slope to get capacity	min. slope (10SS)
Mannings "n"		0.011	0.011	0.011	0.011
k		1.49	1.49	1.49	1.49
Max Flow	cfs	3.19	4.64	8.08	8.16
	gpm	1431	2082	3626	3661
	gpd	2,061,201	2,997,887	5,221,670	5,271,566
	MGD	2.06	3.00	5.22	5.27
Velocity at Max Flow	ft/s	2.7	2.7	3.4	2.7
Sufficient for flow		no	no	yes	yes

use this sizing

Pressure Sewers = EHPS + BSPS + Harris Hill + Main Street

Maximum Pump Station Capacity 6,950,492 gpd

4,826.73 gpm

Pipe size	10	12	15
Area	0.545	0.785	1.227
Velocity	18.96	13.17	8.43

Appendix F: Sewer Option Maps

30"
18"
24"
24"
12"
12"
24"
18"
CLARENCE CENTER RD
PARADISE RD
18"
15"
KLEIN RD
ROLL RD
RENAISSANCE DR
TRANSIT RD
OPTION 4 - 12" FORCEMAIN DOWN TRANSIT ROAD TRAVEL LANE
18"
OPTION 2 - GRAVITY FROM HARRIS HILL INTERSECTION PEANUT LINE THROUGH GYPSUM PROPERTY
MAPLE RD
12"
GREINER RD
12"
HARRIS HILL RD
SHERIDAN DR
SHERIDAN DR
15"
OPTION 3 - NEW PS AT HARRIS HILL / SHERIDAN DR AND 15" FORCE MAIN TO PEANUT LINE
OPTION 1B - REPLACE EASTERN HILLS PUMP STATION AND INSTALL NEW 12" FORCE MAIN TO HARRIS HILL / SHERIDAN DR INTERSECTION
OPTION 1A - ELIMINATE EHPS AND BSPS AND INSTALL GRAVITY SEWERS FROM EACH TO HARRIS HILL / SHERIDAN DR INTERSECTION
15"
12"
MAIN ST
12"

LEGEND

- Option 1A Eastern Hills Gravity Sewer
- Option 1B Eastern Hills Force Main
- Option 2 Harris Hill Gravity Sewer
- Option 3 Harris Hill Force Main
- Option 4 Transit Force Main
- Existing Gravity Sewer >= 12 in Diameter
- New Eastern Hills Pump Station
- New Harris Hill Pump Station

0 0.5 1 mi

APPENDIX E

TRANSIT ROAD CORRIDOR SANITARY SEWER STUDY

TRANSIT ROAD AREA SEWER OPTIONS

JMDavidson Engineering, D.P.C.

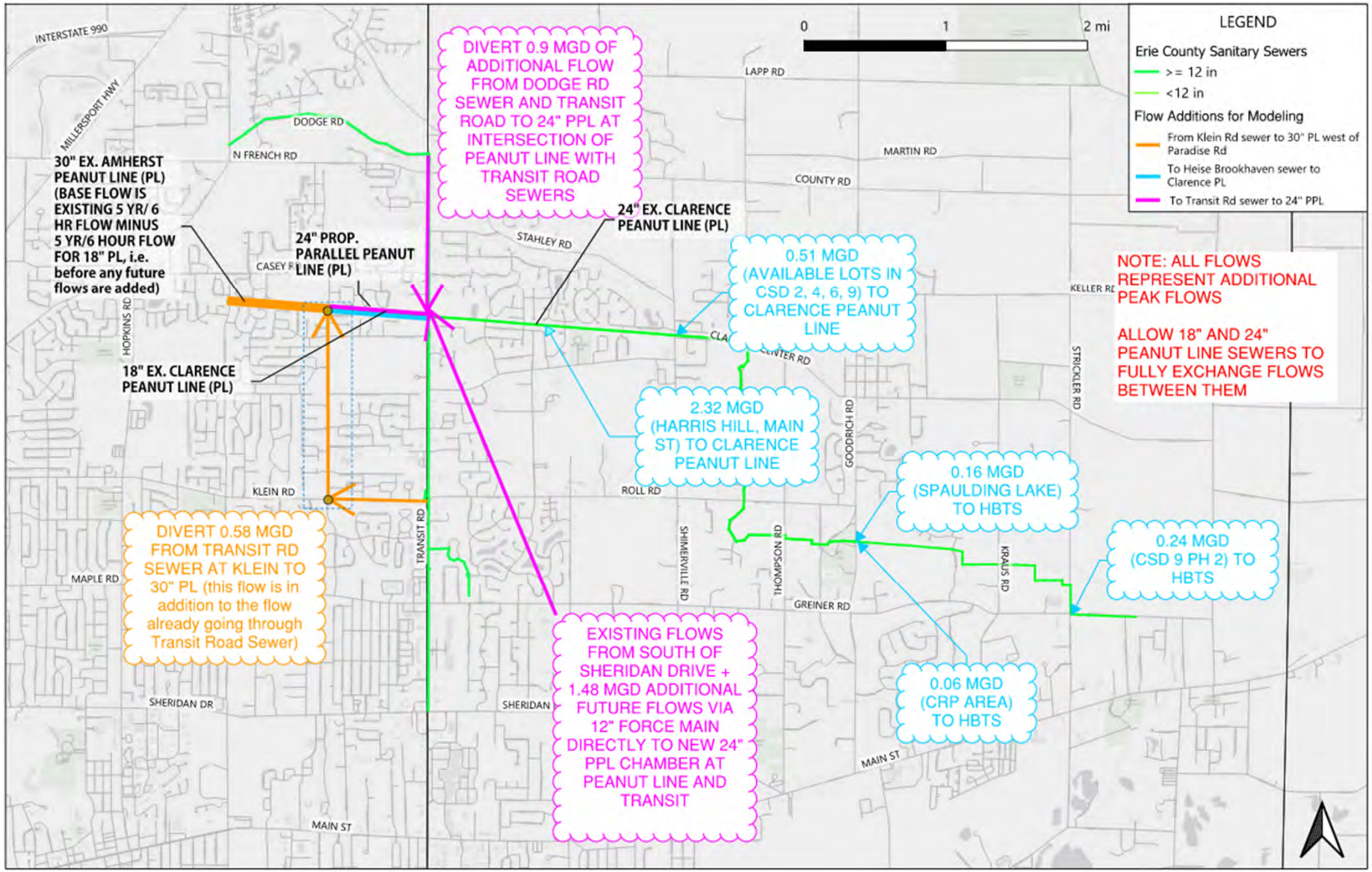
Appendix G: Summary of Modeling Results

ARCADIS Design & Consultancy for natural and built assets

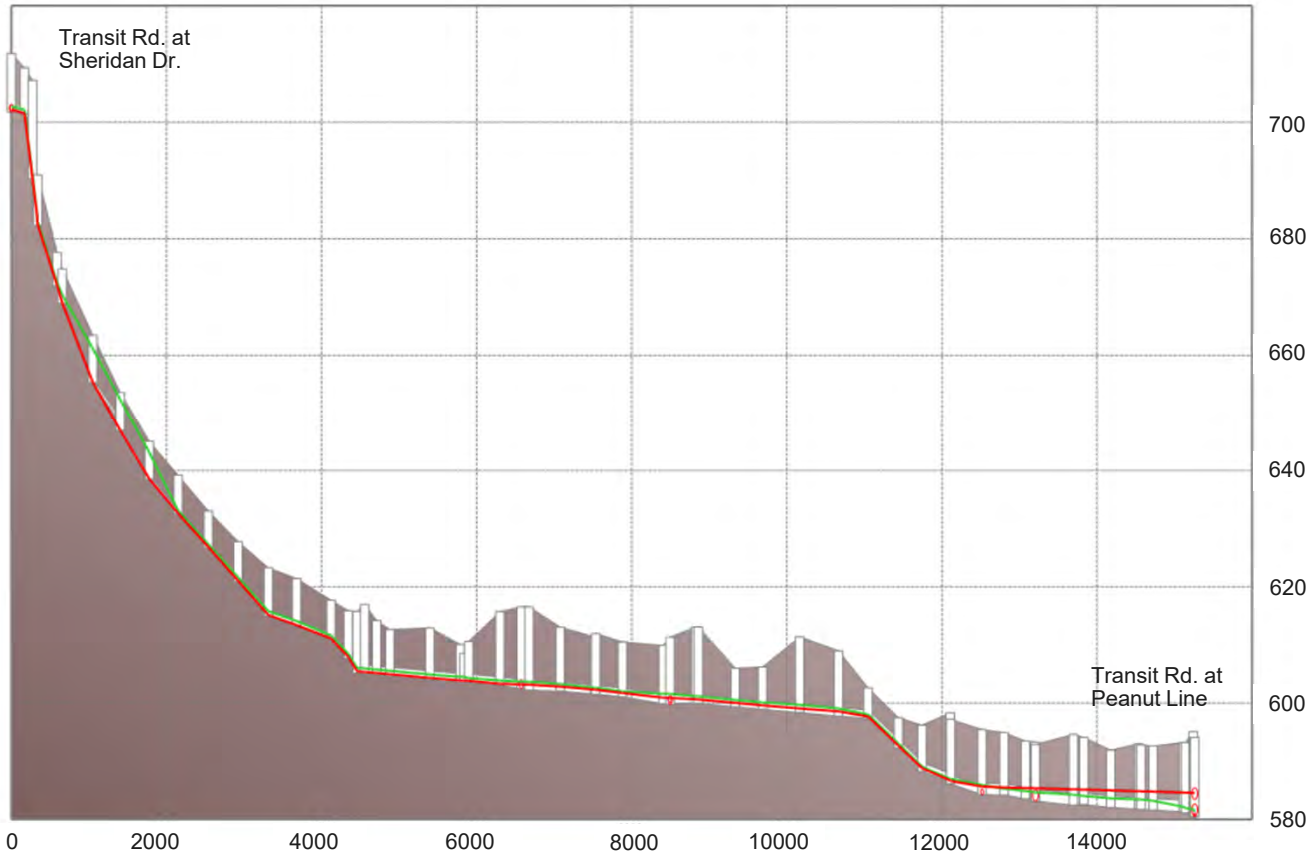
ECSD5 TRANSIT ROAD ANALYSIS PEAK HGL PROFILES FOR 5YR6HR DESIGN STORM – 4/30/24 SCENARIO #2 (ALL FLOWS WITH EXISTING AND PARALLEL PEANUT LINE)

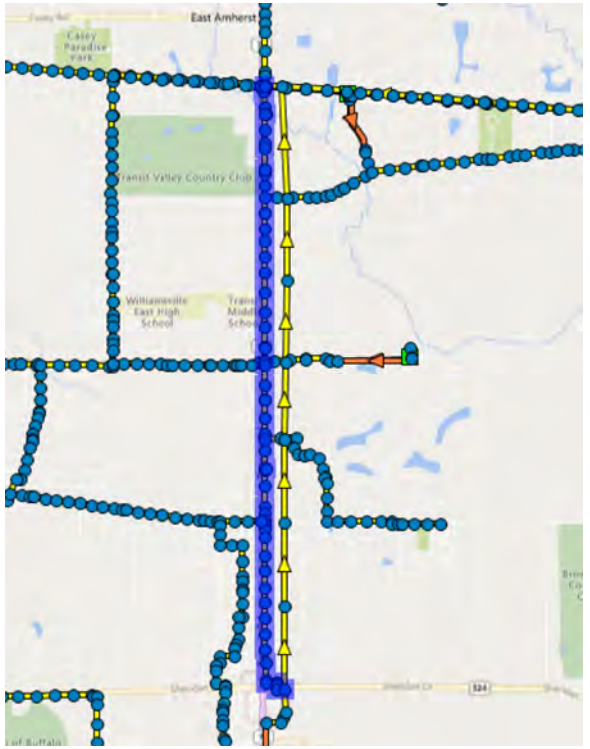
May 6, 2024

SCENARIO 2 IN SECTION 4 OF REPORT


INTERSTATE 990
MILLERSPORT HWY
DODGE RD
N FRENCH RD
30" EX. AMHERST PEANUT LINE (PL) (BASE FLOW IS EXISTING 5 YR/ 6 HR FLOW MINUS 5 YR/6 HOUR FLOW FOR 18" PL, i.e. before any future flows are added)
24" PROP. PARALLEL PEANUT LINE (PL)
18" EX. CLARENCE PEANUT LINE (PL)
HOPKINS RD
KLEIN RD
DIVERT 0.58 MGD FROM TRANSIT RD SEWER AT KLEIN TO 30" PL (this flow is in addition to the flow already going through Transit Road Sewer)
TRANSIT RD
MAPLE RD
SHERIDAN DR
MAIN ST
DIVERT 0.9 MGD OF ADDITIONAL FLOW FROM DODGE RD SEWER AND TRANSIT ROAD TO 24" PPL AT INTERSECTION OF PEANUT LINE WITH TRANSIT ROAD SEWERS
24" EX. CLARENCE PEANUT LINE (PL)
STAHLEY RD
0.51 MGD (AVAILABLE LOTS IN CSD 2, 4, 6, 9) TO CLARENCE PEANUT LINE
2.32 MGD (HARRIS HILL, MAIN ST) TO CLARENCE PEANUT LINE
ROLL RD
SHIMERVILLE RD
SHERIDAN
EXISTING FLOWS FROM SOUTH OF SHERIDAN DRIVE + 1.48 MGD ADDITIONAL FUTURE FLOWS VIA 12" FORCE MAIN DIRECTLY TO NEW 24" PPL CHAMBER AT PEANUT LINE AND TRANSIT
0 1 2 mi
LAPP RD
MARTIN RD
COUNTY RD
KELLER RD
STRICKLER RD
GOODRICH RD
THOMPSON RD
KRAUS RD
GREINER RD
0.16 MGD (SPAULDING LAKE) TO HBTS
0.24 MGD (CSD 9 PH 2) TO HBTS
0.06 MGD (CRP AREA) TO HBTS
NOTE: ALL FLOWS REPRESENT ADDITIONAL PEAK FLOWS
ALLOW 18" AND 24" PEANUT LINE SEWERS TO FULLY EXCHANGE FLOWS BETWEEN THEM
LEGEND
Erie County Sanitary Sewers
>= 12 in
<12 in
Flow Additions for Modeling
From Klein Rd sewer to 30" PL west of Paradise Rd
To Heise Brookhaven sewer to Clarence PL
To Transit Rd sewer to 24" PPL

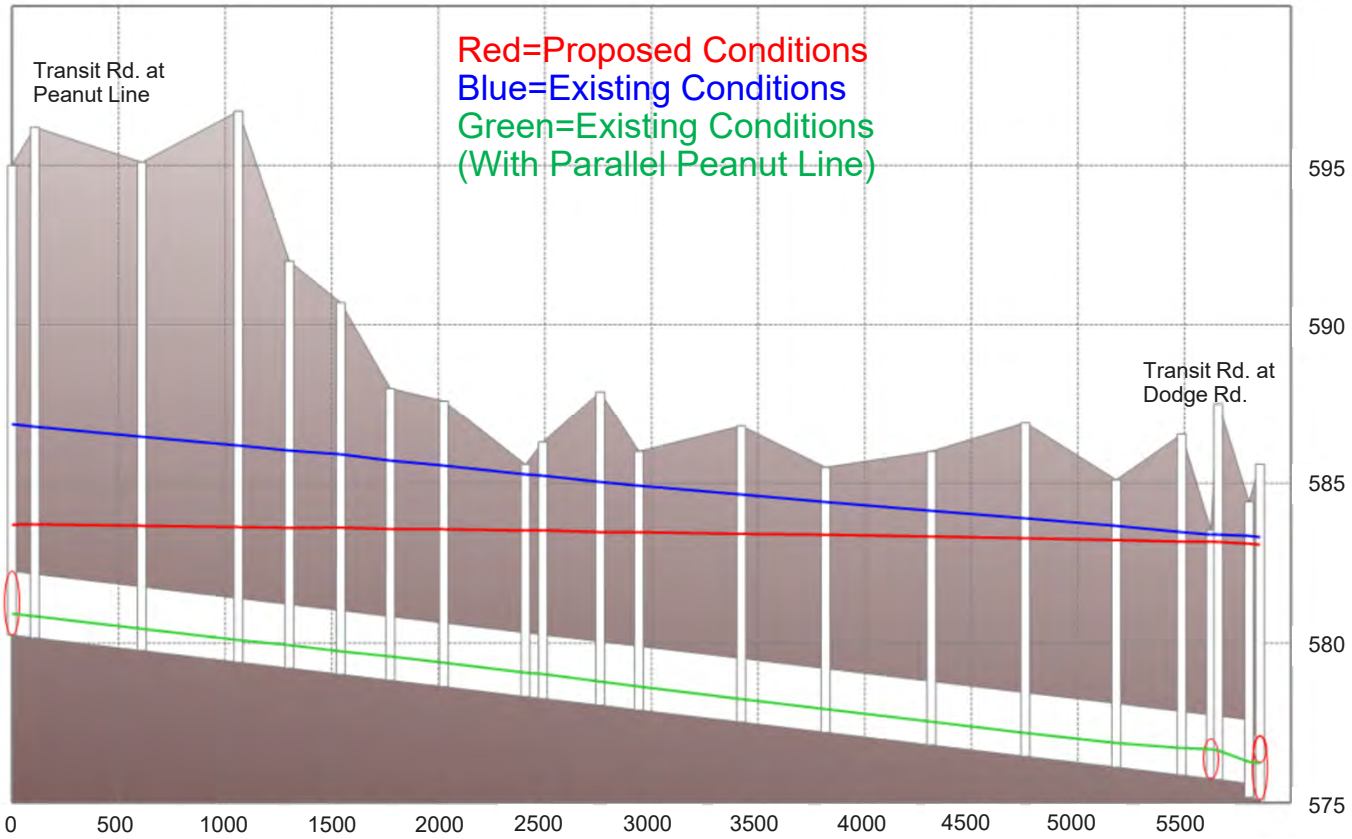
Peak HGL for Transit Road Sewer (Sheridan to Peanut Line)

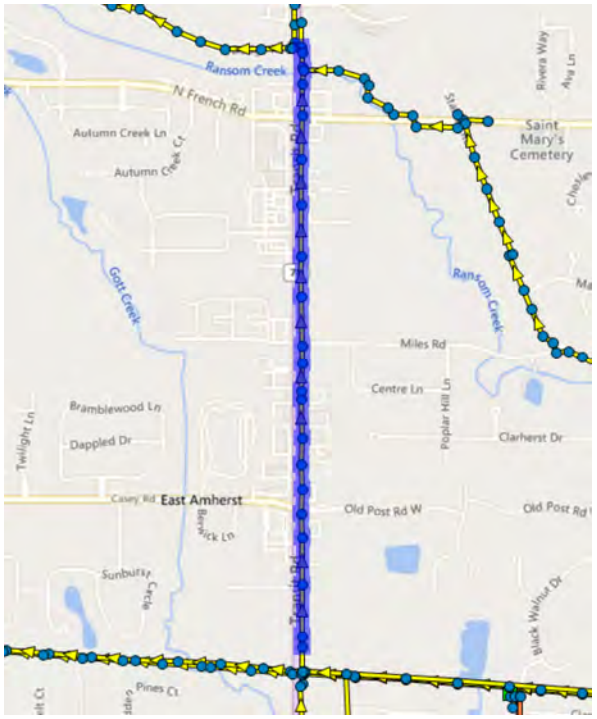




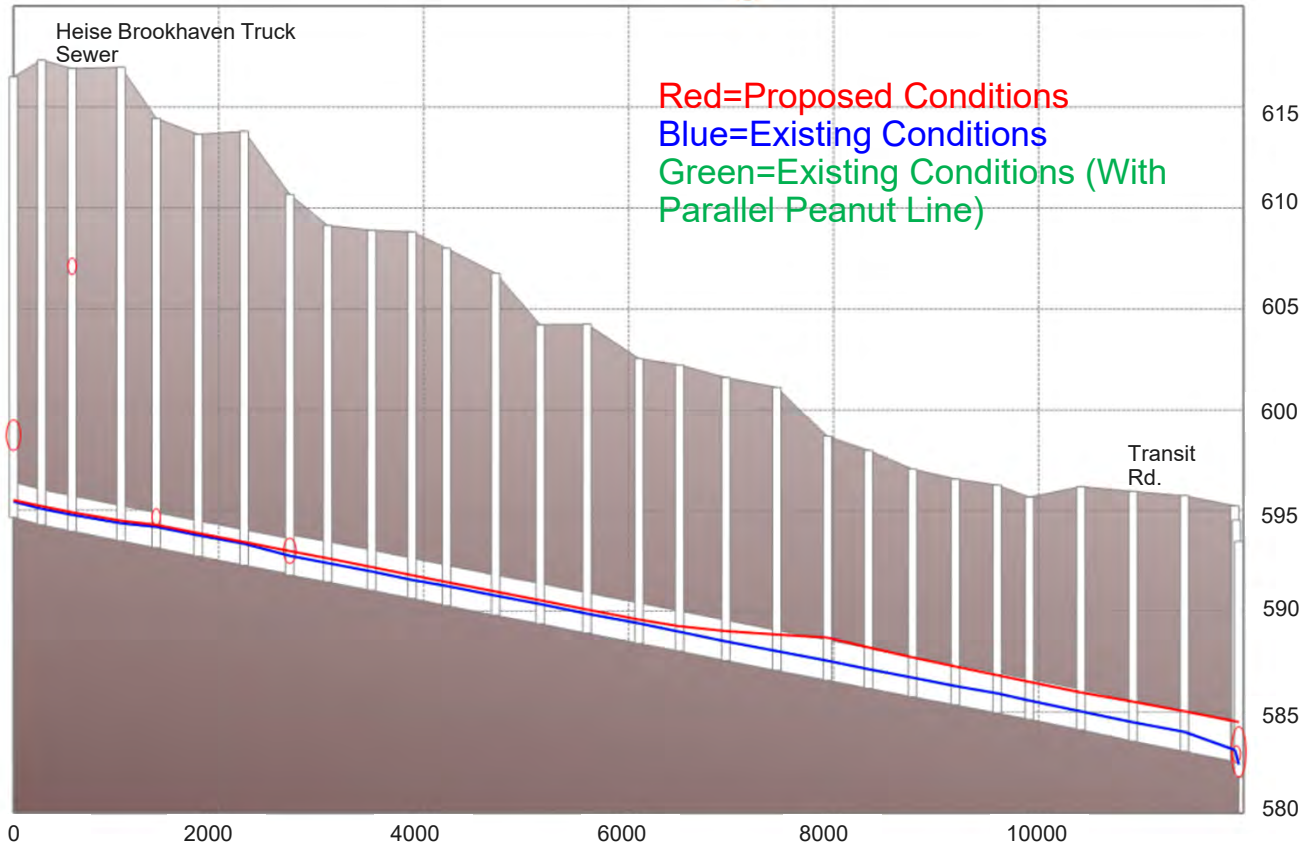
Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

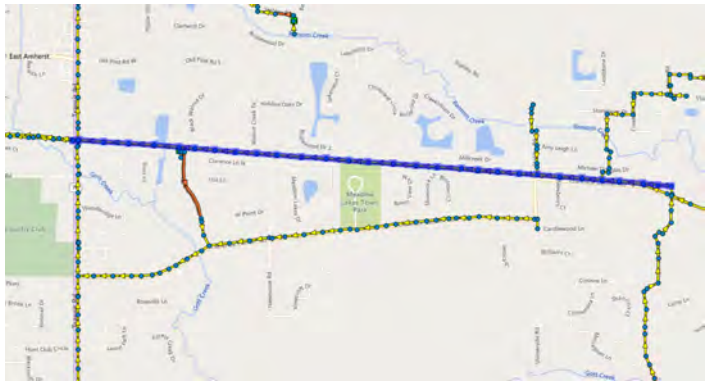
Peak HGL for Transit Road Sewer (Peanut Line to Dodge)



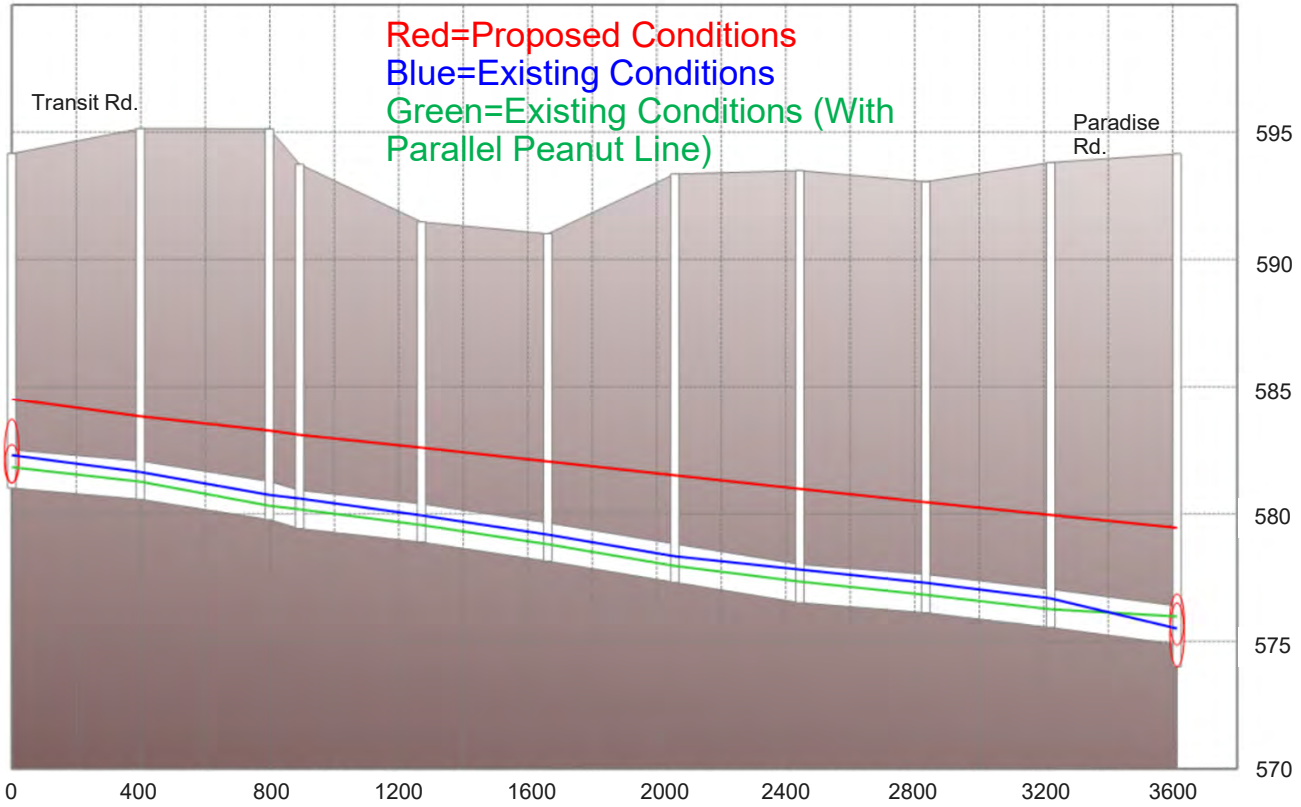


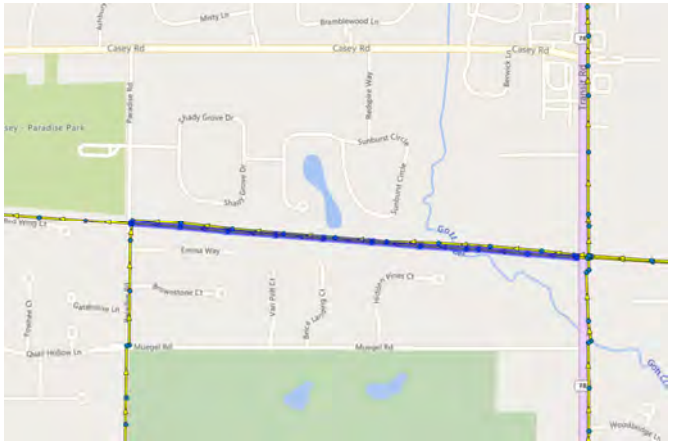
Peak HGL for Existing Peanut Line East of Transit Road



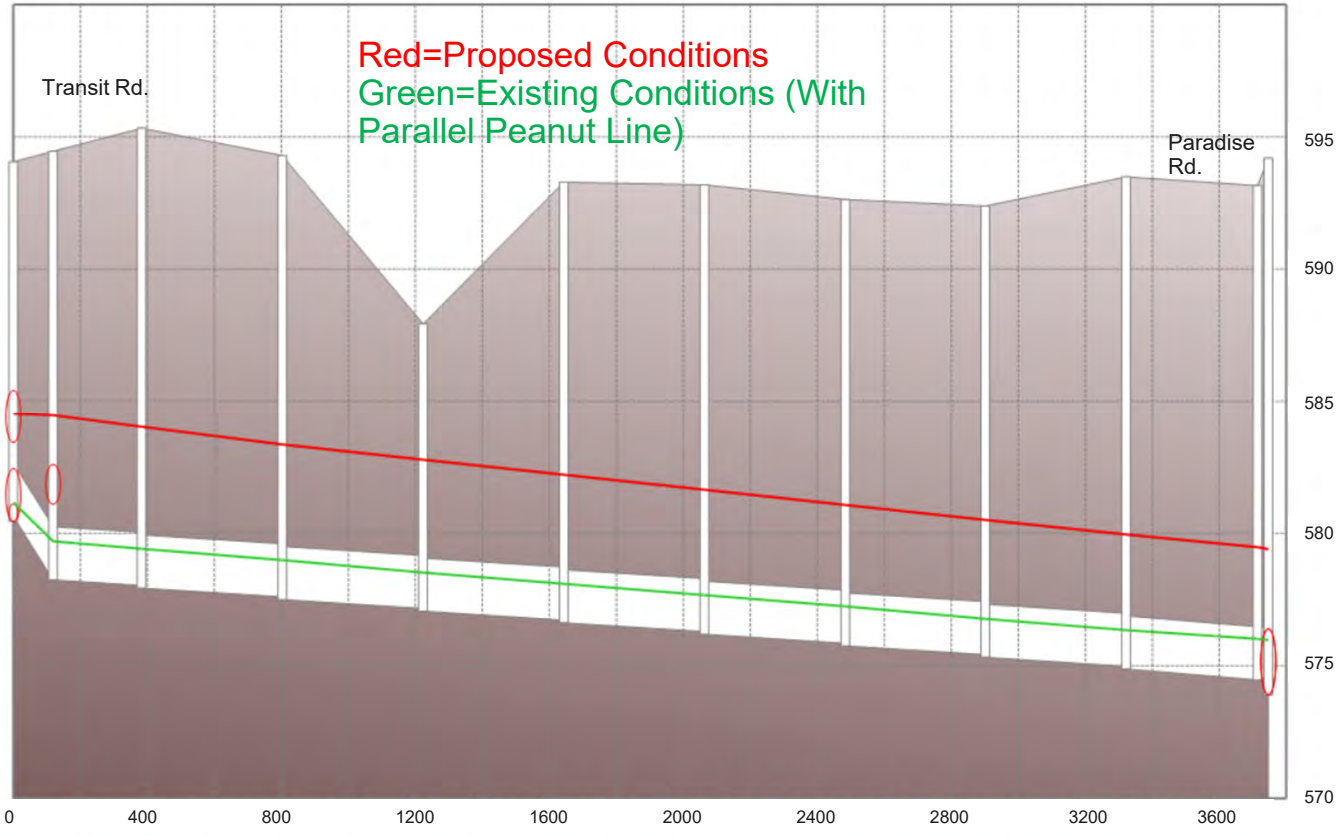


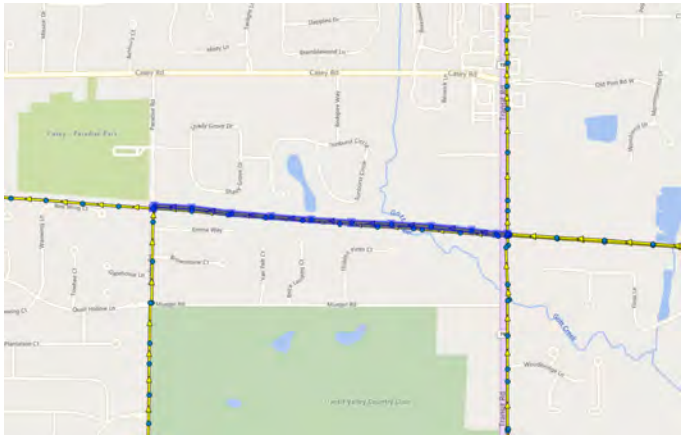
Peak HGL for Existing 18" Peanut Line West of Transit Road



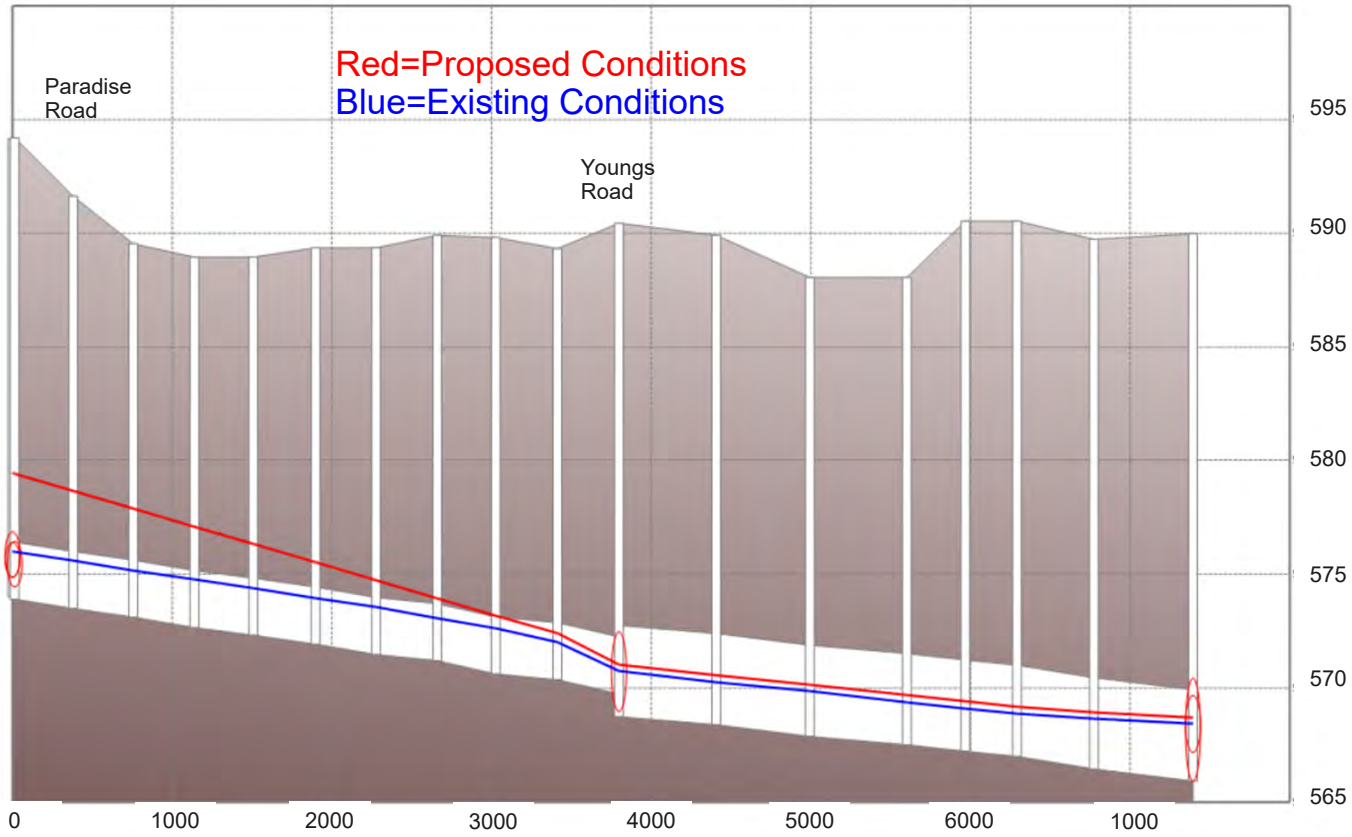


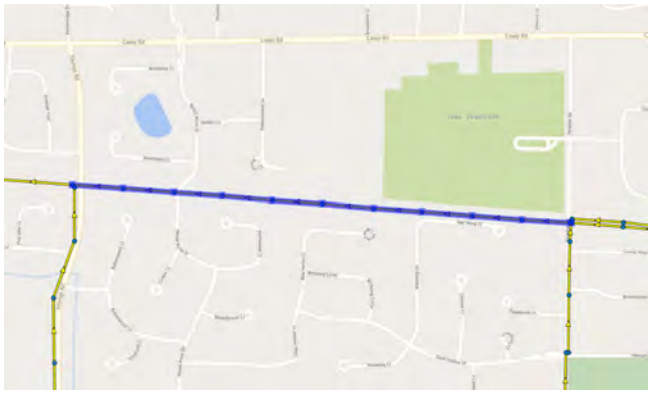
Peak HGL for Proposed 24" Peanut Line West of Transit Road



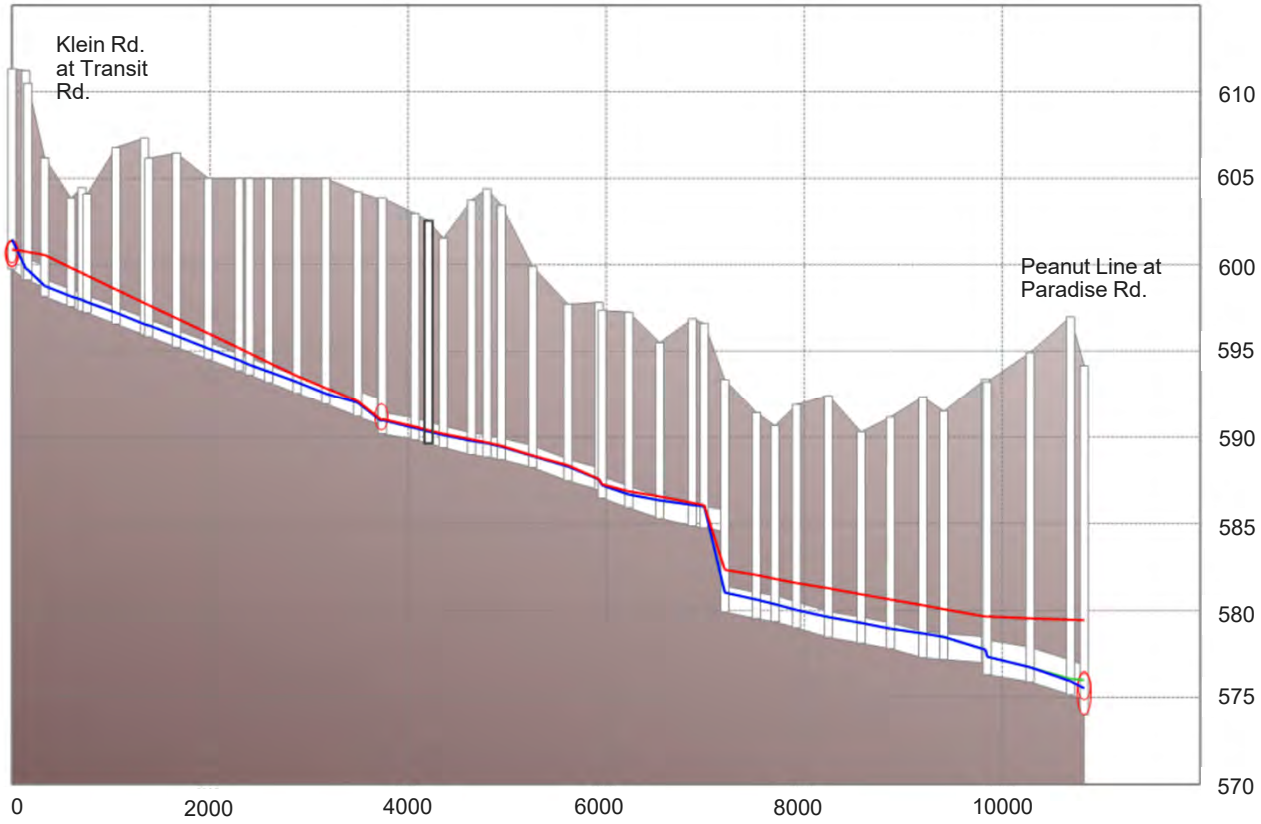


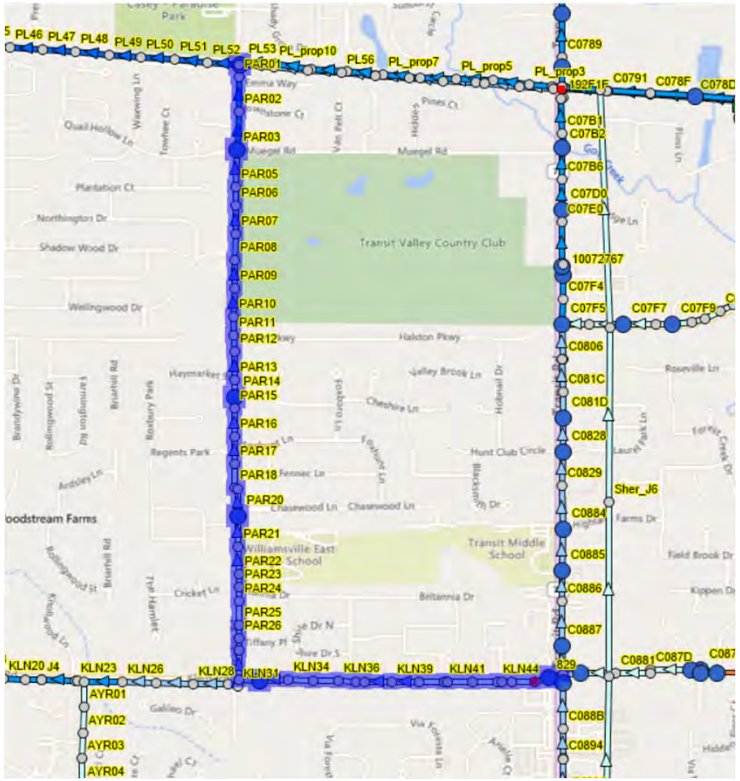
Peak HGL for Existing 30" Peanut Line West of Transit Road





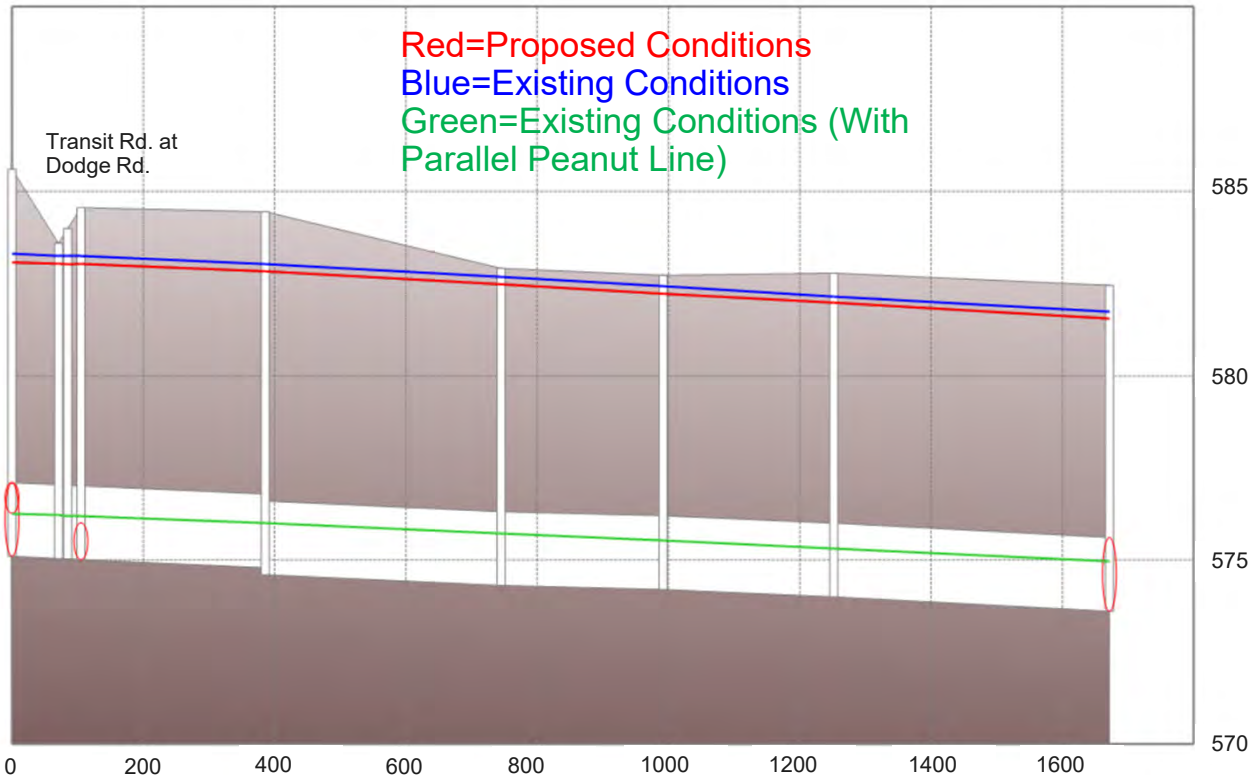
Peak HGL for Klein Road Sewer

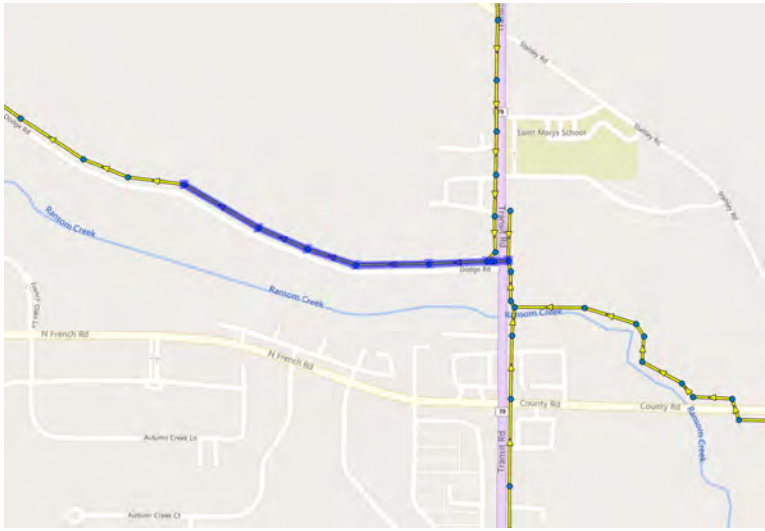




Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

Peak HGL for Dodge Road Sewer West of Transit Road



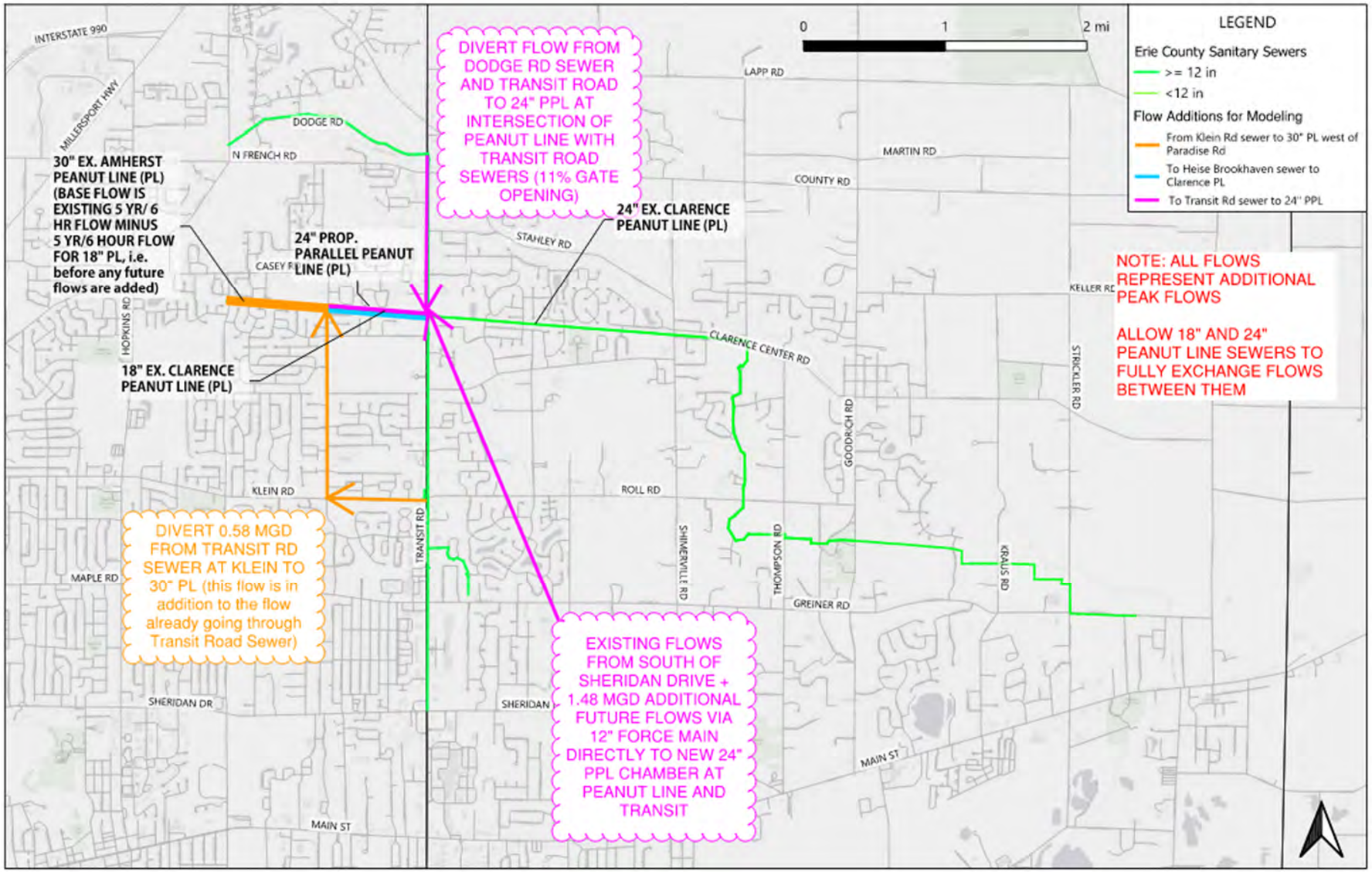


ARCADIS Design & Consultancy for natural and built assets

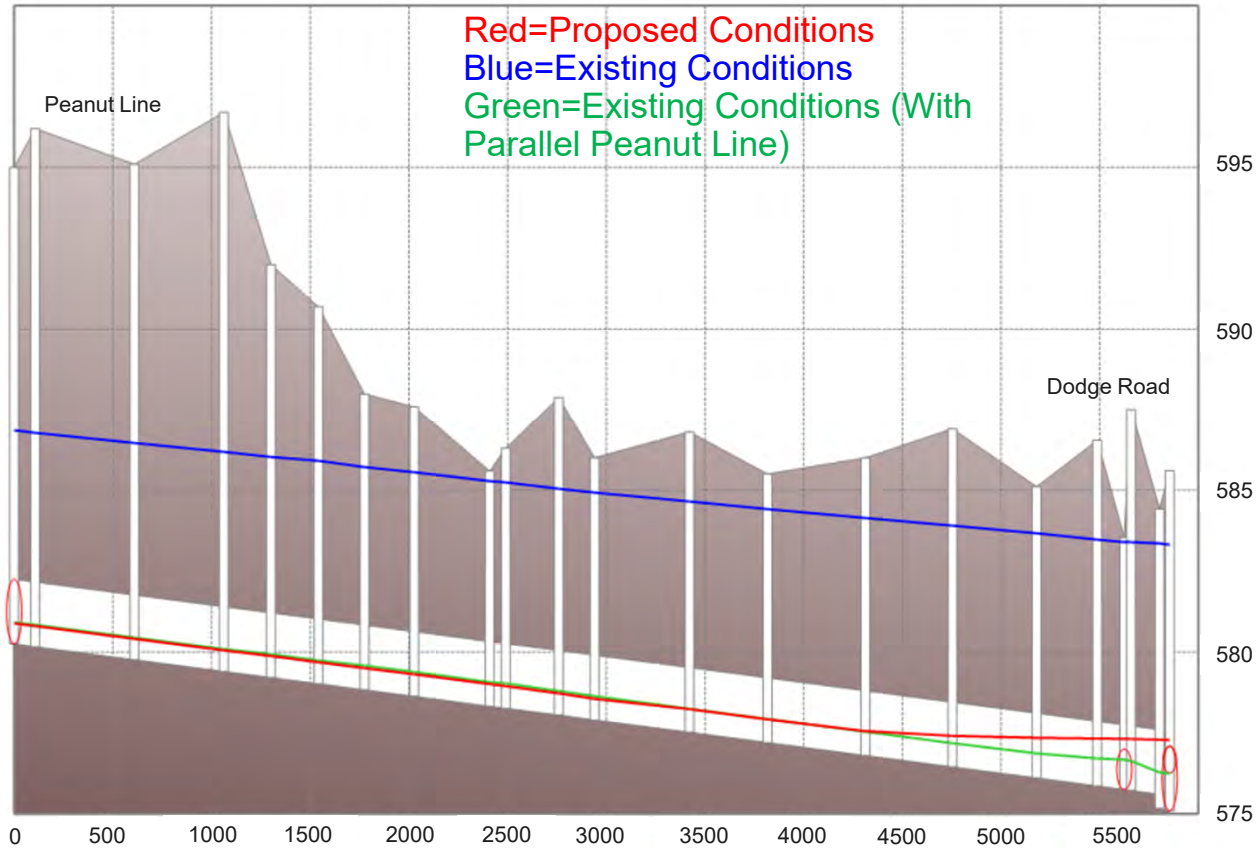
ECSD5 TRANSIT ROAD ANALYSIS PEAK HGL PROFILES FOR 5YR6HR DESIGN STORM – 6/17/24 SCENARIO #1 (EASTERN HILLS FUTURE FLOWS + KLEIN DIVERSION + DODGE DIVERSION) - 8-IN GATE DIAMETER OPENING AT PPL

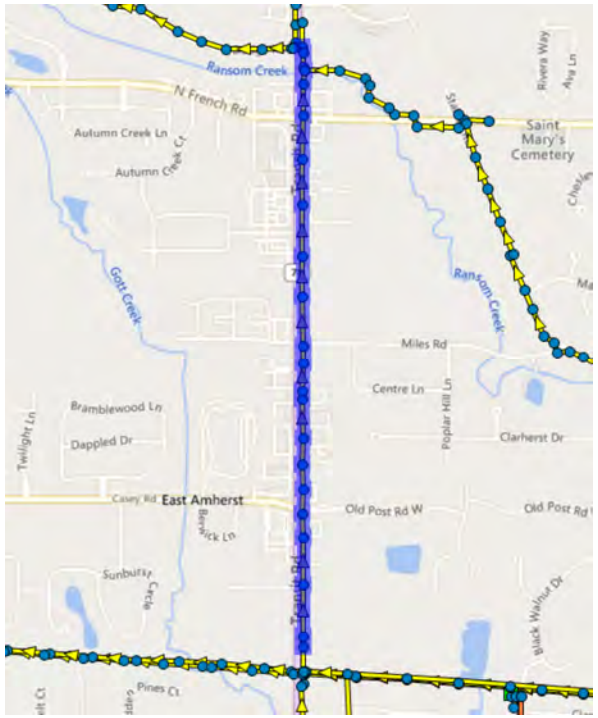
June 17, 2024

SCENARIO 3 IN SECTION 4 OF REPORT

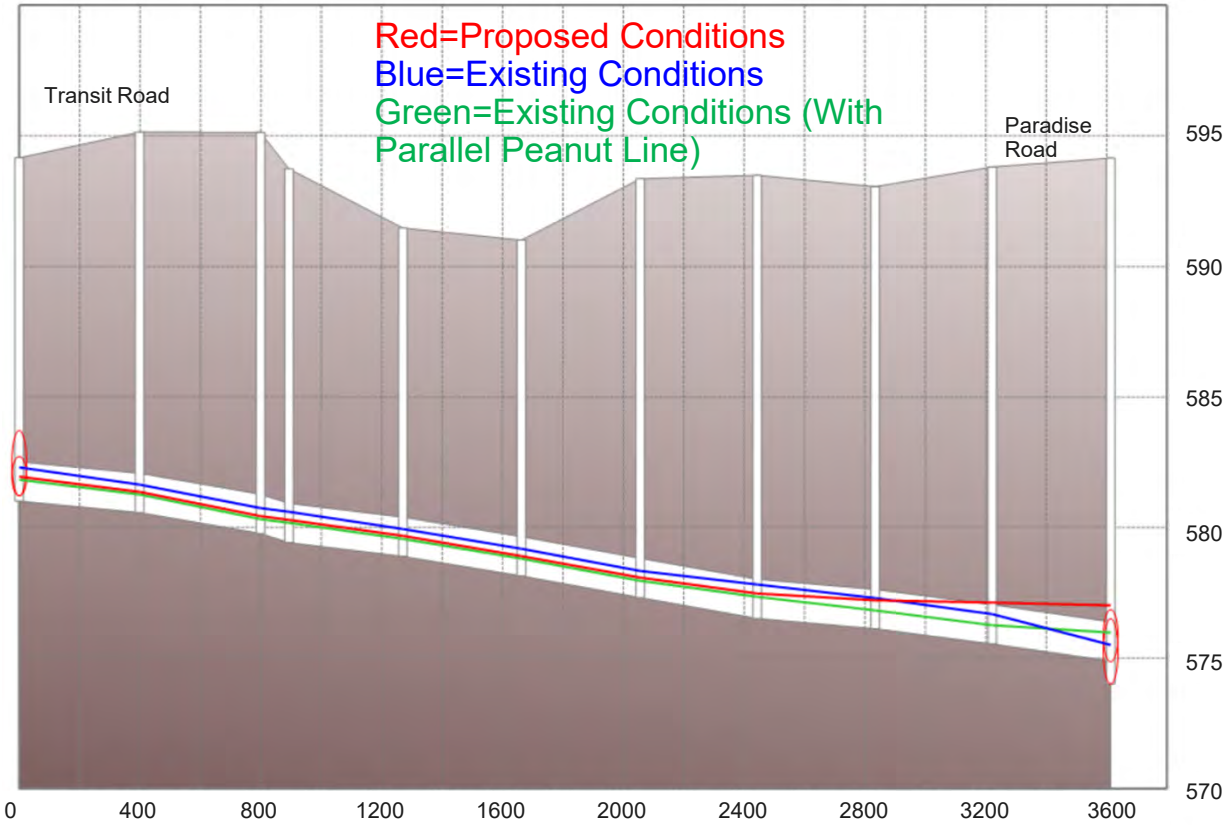

INTERSTATE 990
MILLERSPORT HWY
DODGE RD
N FRENCH RD
30" EX. AMHERST PEANUT LINE (PL) (BASE FLOW IS EXISTING 5 YR/ 6 HR FLOW MINUS 5 YR/6 HOUR FLOW FOR 18" PL, i.e. before any future flows are added)
HOPKINS RD
18" EX. CLARENCE PEANUT LINE (PL)
24" PROP. PARALLEL PEANUT LINE (PL)
DIVERT FLOW FROM DODGE RD SEWER AND TRANSIT ROAD TO 24" PPL AT INTERSECTION OF PEANUT LINE WITH TRANSIT ROAD SEWERS (11% GATE OPENING)
24" EX. CLARENCE PEANUT LINE (PL)
STAHLEY RD
CLARENCE CENTER RD
LAPP RD
MARTIN RD
COUNTY RD
KELLER RD
STRICKLER RD
GOODRICH RD
ROLL RD
KLEIN RD
TRANSIT RD
SHIMERVILLE RD
THOMPSON RD
KRAUS RD
GREINER RD
MAPLE RD
DIVERT 0.58 MGD FROM TRANSIT RD SEWER AT KLEIN TO 30" PL (this flow is in addition to the flow already going through Transit Road Sewer)
SHERIDAN DR
SHERIDAN
EXISTING FLOWS FROM SOUTH OF SHERIDAN DRIVE + 1.48 MGD ADDITIONAL FUTURE FLOWS VIA 12" FORCE MAIN DIRECTLY TO NEW 24" PPL CHAMBER AT PEANUT LINE AND TRANSIT
MAIN ST
MAIN ST
0
1
2 mi
LEGEND
Erie County Sanitary Sewers
>= 12 in
<12 in
Flow Additions for Modeling
From Klein Rd sewer to 30" PL west of Paradise Rd
To Heise Brookhaven sewer to Clarence PL
To Transit Rd sewer to 24" PPL
NOTE: ALL FLOWS REPRESENT ADDITIONAL PEAK FLOWS
ALLOW 18" AND 24" PEANUT LINE SEWERS TO FULLY EXCHANGE FLOWS BETWEEN THEM

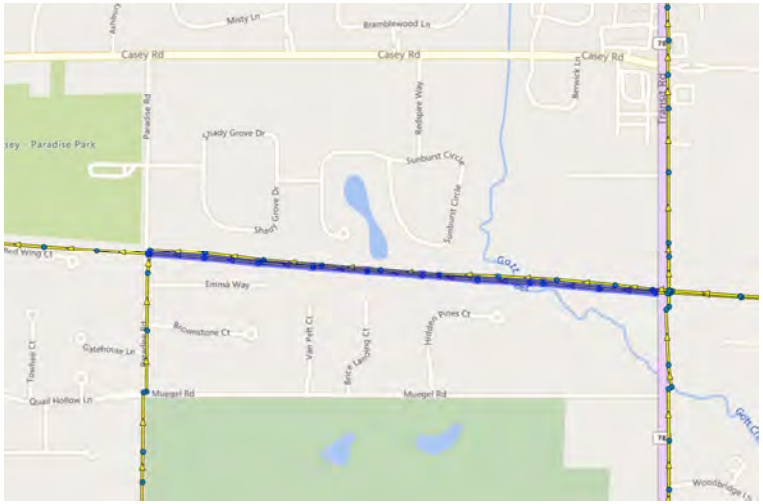
Peak HGL for Transit Road Sewer (Peanut Line to Dodge)



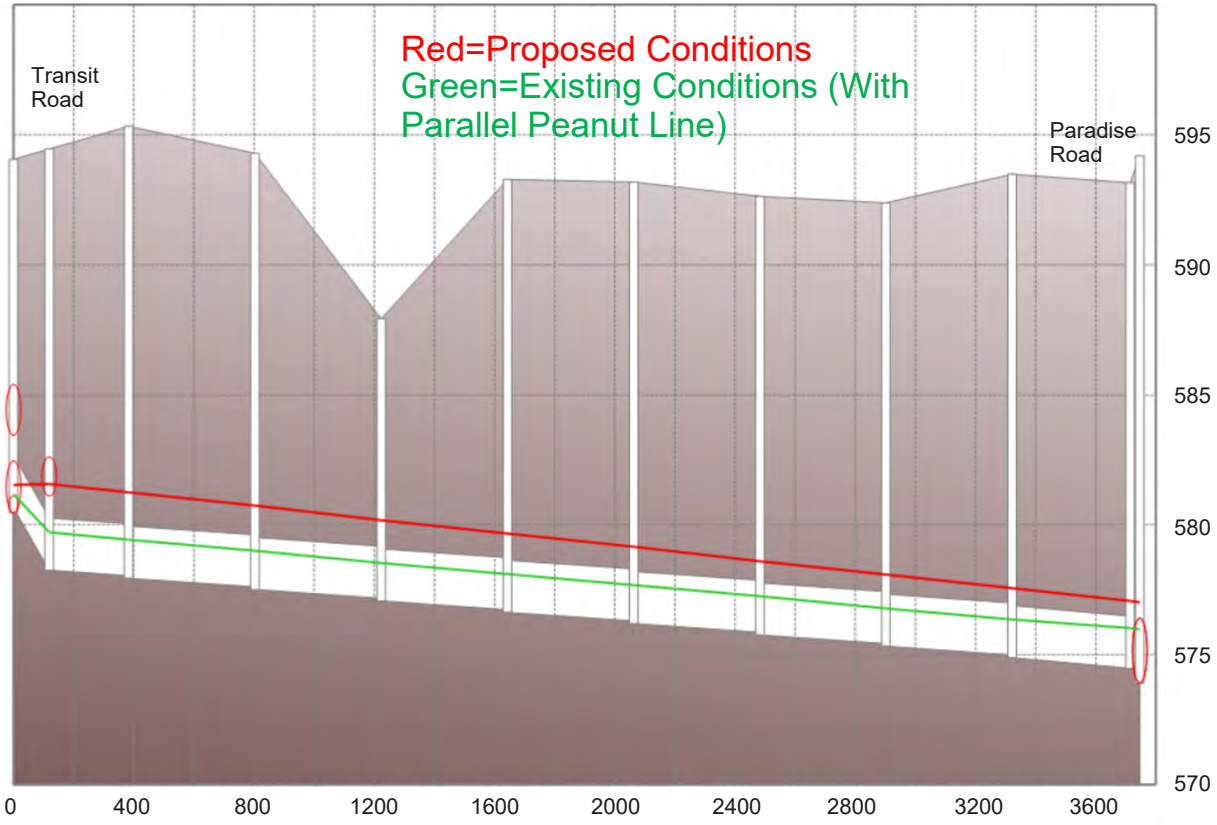


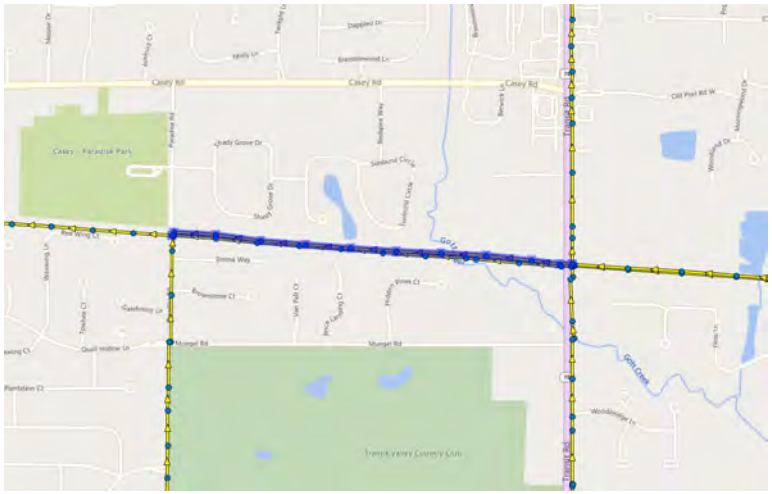
Peak HGL for Existing 18" Peanut Line West of Transit Road



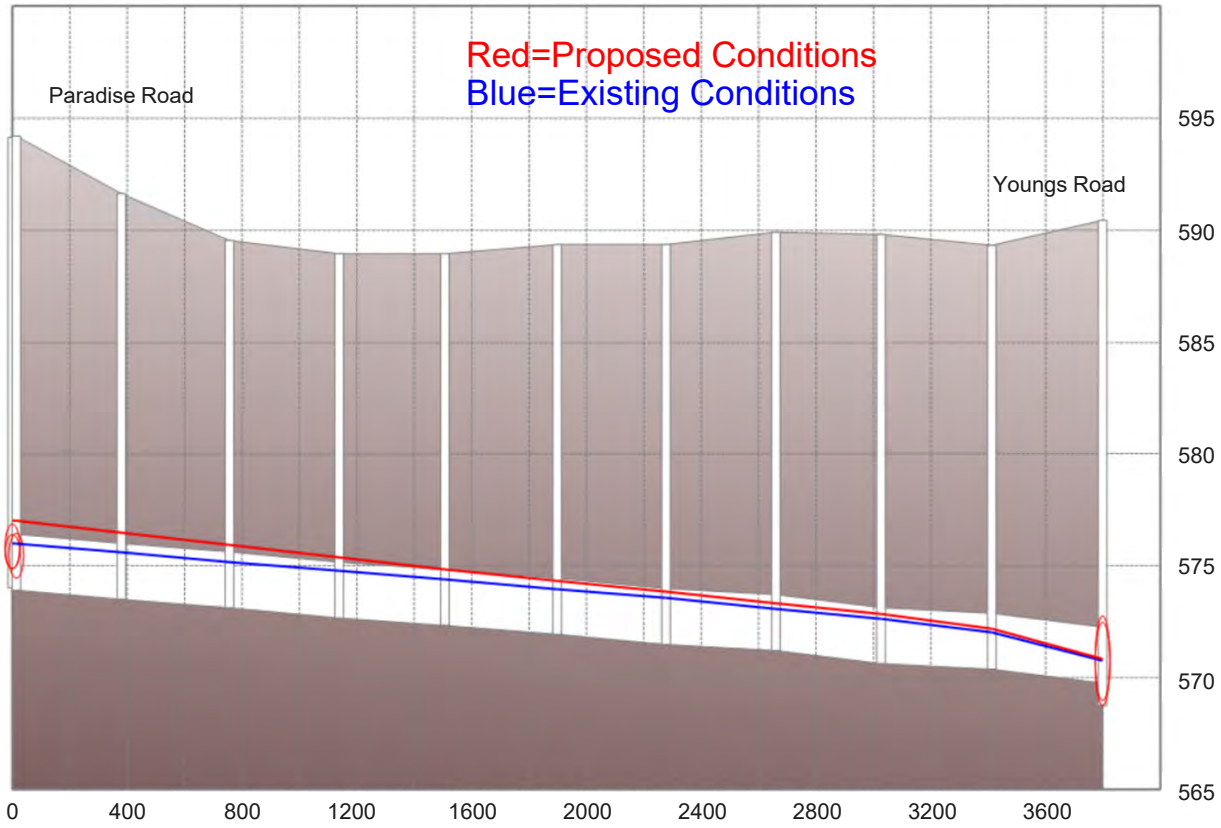


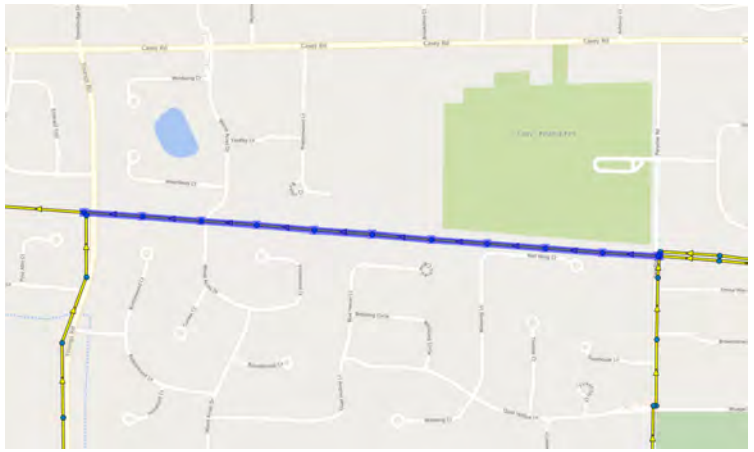
Peak HGL for Proposed 24" Peanut Line West of Transit Road



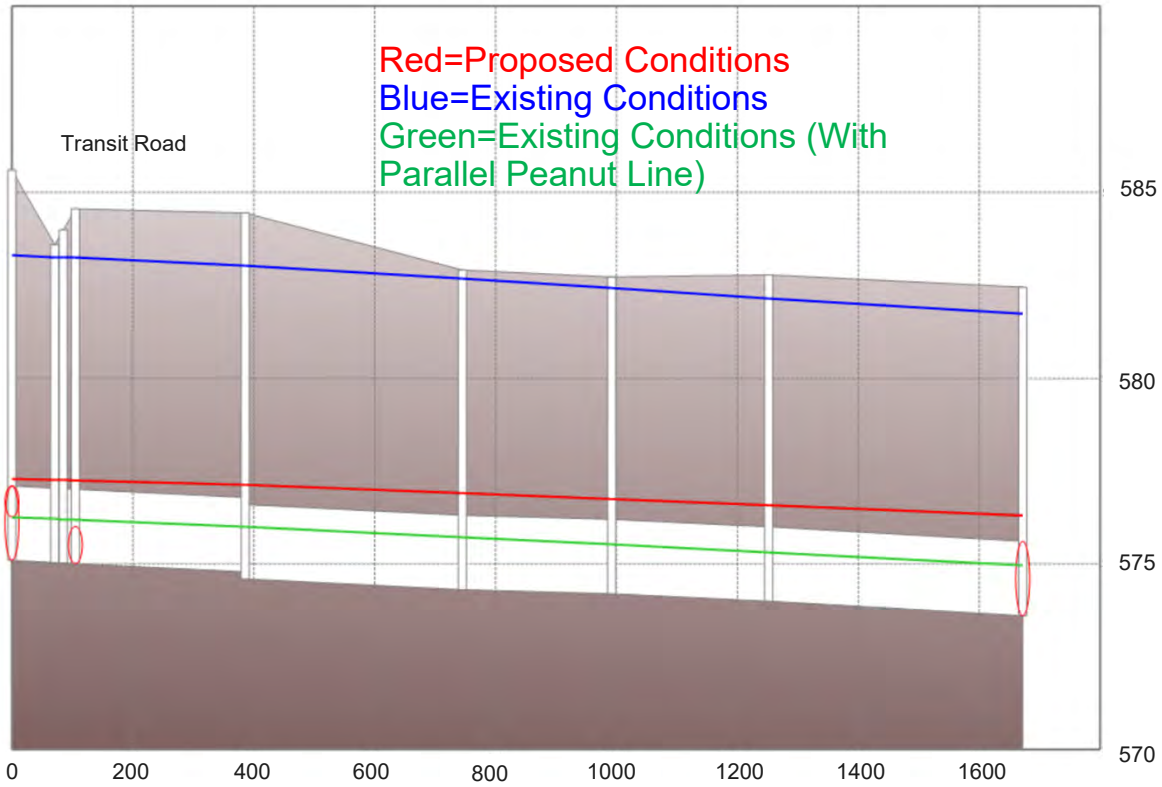


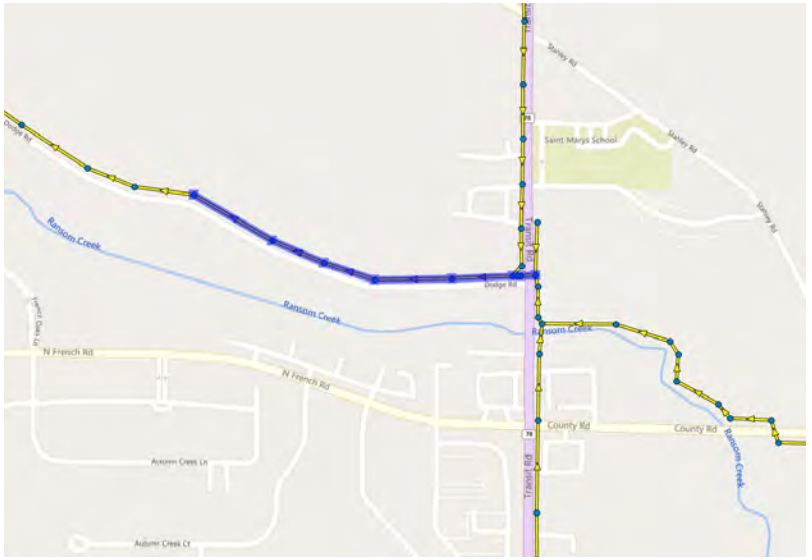
Peak HGL for Existing 30" Peanut Line West of Transit Road





Peak HGL for Dodge Road Sewer West of Transit Road



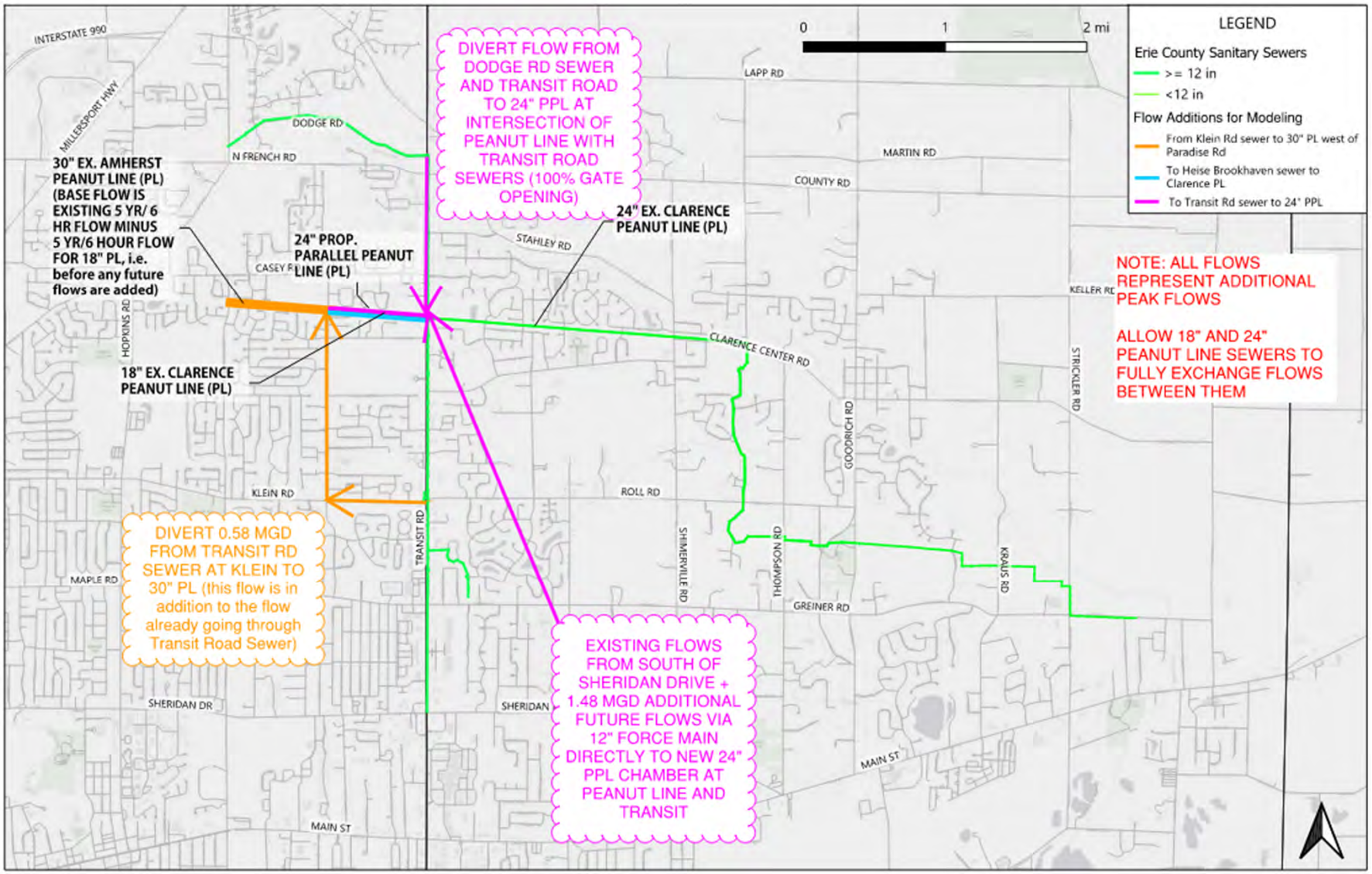


ARCADIS Design & Consultancy for natural and built assets

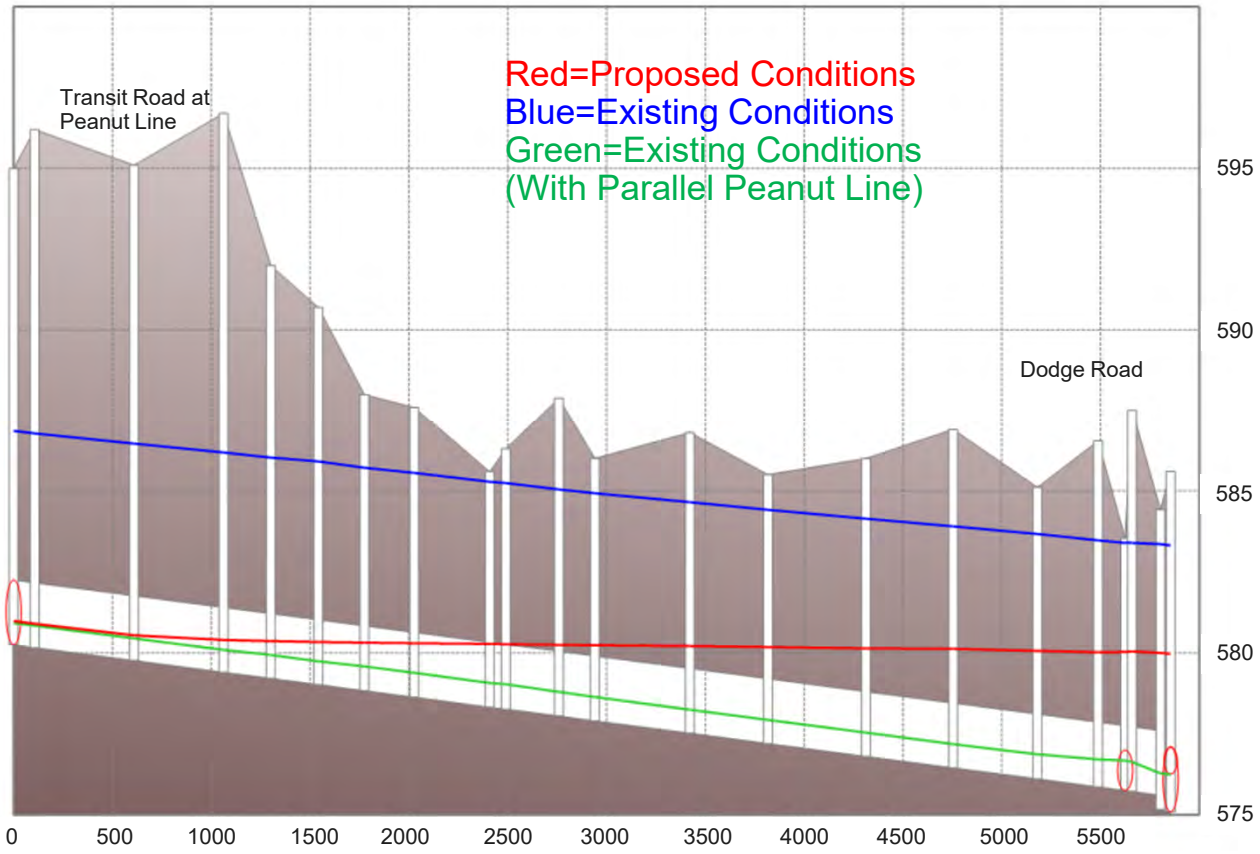
ECSD5 TRANSIT ROAD ANALYSIS PEAK HGL PROFILES FOR 5YR6HR DESIGN STORM – 6/17/24 SCENARIO #2 (EASTERN HILLS FUTURE FLOWS + KLEIN DIVERSION + DODGE DIVERSION) – 2-FT GATE DIAMETER OPENING AT PPL

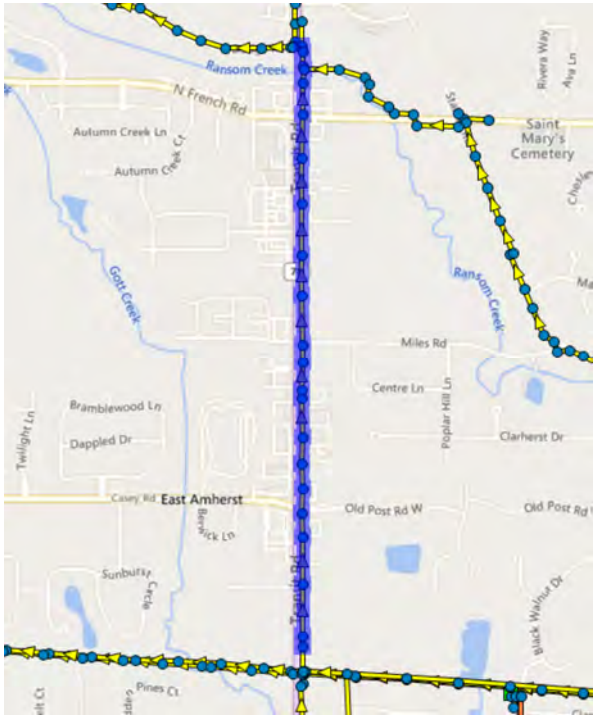
June 20, 2024

SCENARIO 3 IN SECTION 4 OF REPORT

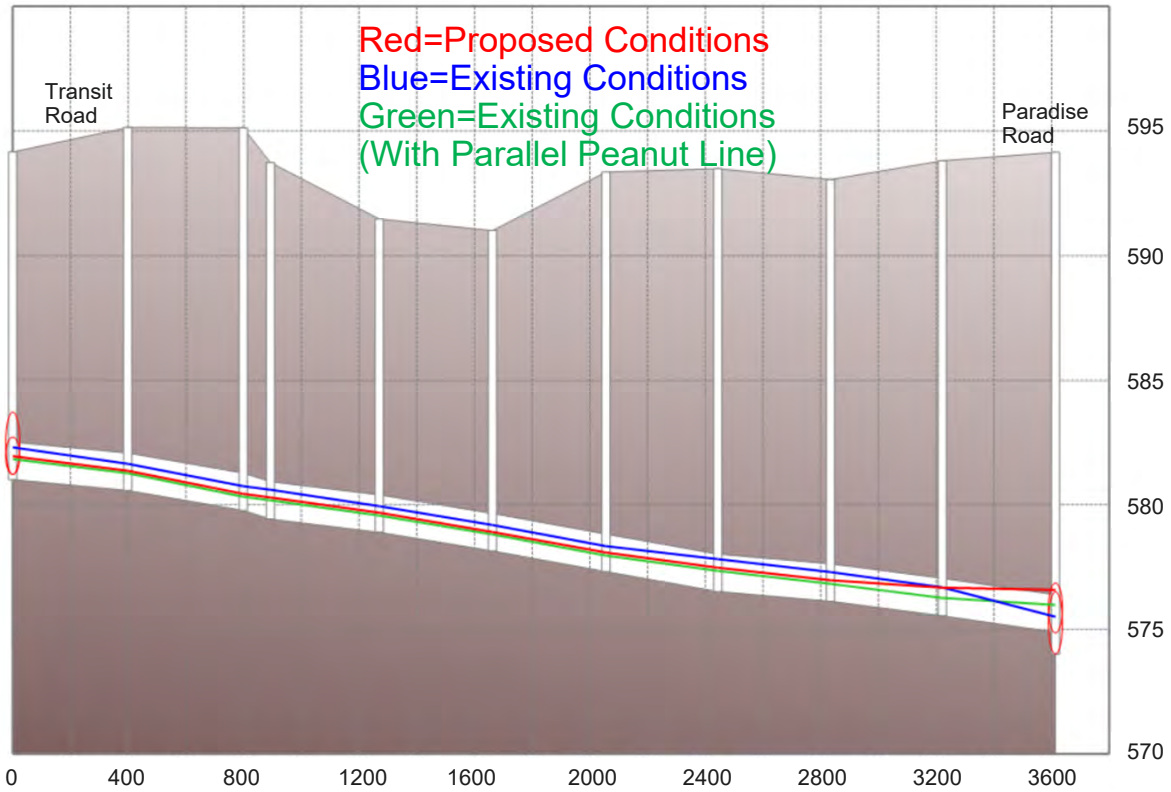

LEGEND
Erie County Sanitary Sewers
>= 12 in
<12 in
Flow Additions for Modeling
From Klein Rd sewer to 30" PL west of Paradise Rd
To Heise Brookhaven sewer to Clarence PL
To Transit Rd sewer to 24" PPL
0
1
2 mi
DIVERT FLOW FROM DODGE RD SEWER AND TRANSIT ROAD TO 24" PPL AT INTERSECTION OF PEANUT LINE WITH TRANSIT ROAD SEWERS (100% GATE OPENING)
30" EX. AMHERST PEANUT LINE (PL) (BASE FLOW IS EXISTING 5 YR/ 6 HR FLOW MINUS 5 YR/6 HOUR FLOW FOR 18" PL, i.e. before any future flows are added)
24" PROP. PARALLEL PEANUT LINE (PL)
24" EX. CLARENCE PEANUT LINE (PL)
18" EX. CLARENCE PEANUT LINE (PL)
NOTE: ALL FLOWS REPRESENT ADDITIONAL PEAK FLOWS
ALLOW 18" AND 24" PEANUT LINE SEWERS TO FULLY EXCHANGE FLOWS BETWEEN THEM
DIVERT 0.58 MGD FROM TRANSIT RD SEWER AT KLEIN TO 30" PL (this flow is in addition to the flow already going through Transit Road Sewer)
EXISTING FLOWS FROM SOUTH OF SHERIDAN DRIVE + 1.48 MGD ADDITIONAL FUTURE FLOWS VIA 12" FORCE MAIN DIRECTLY TO NEW 24" PPL CHAMBER AT PEANUT LINE AND TRANSIT
INTERSTATE 990
MILLERSPORT HWY
DODGE RD
N FRENCH RD
LAPP RD
MARTIN RD
COUNTY RD
STAHLEY RD
CASEY RD
HOPKINS RD
CLARENCE CENTER RD
KELLER RD
STRICKLER RD
GOODRICH RD
KLEIN RD
ROLL RD
TRANSIT RD
SHIMERVILLE RD
THOMPSON RD
KRAUS RD
GREINER RD
MAPLE RD
SHERIDAN DR
SHERIDAN
MAIN ST
MAIN ST

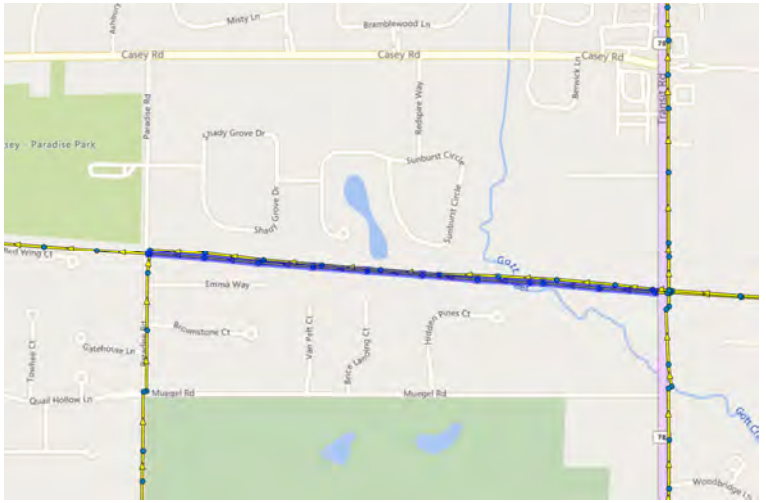
Peak HGL for Transit Road Sewer (Peanut Line to Dodge)



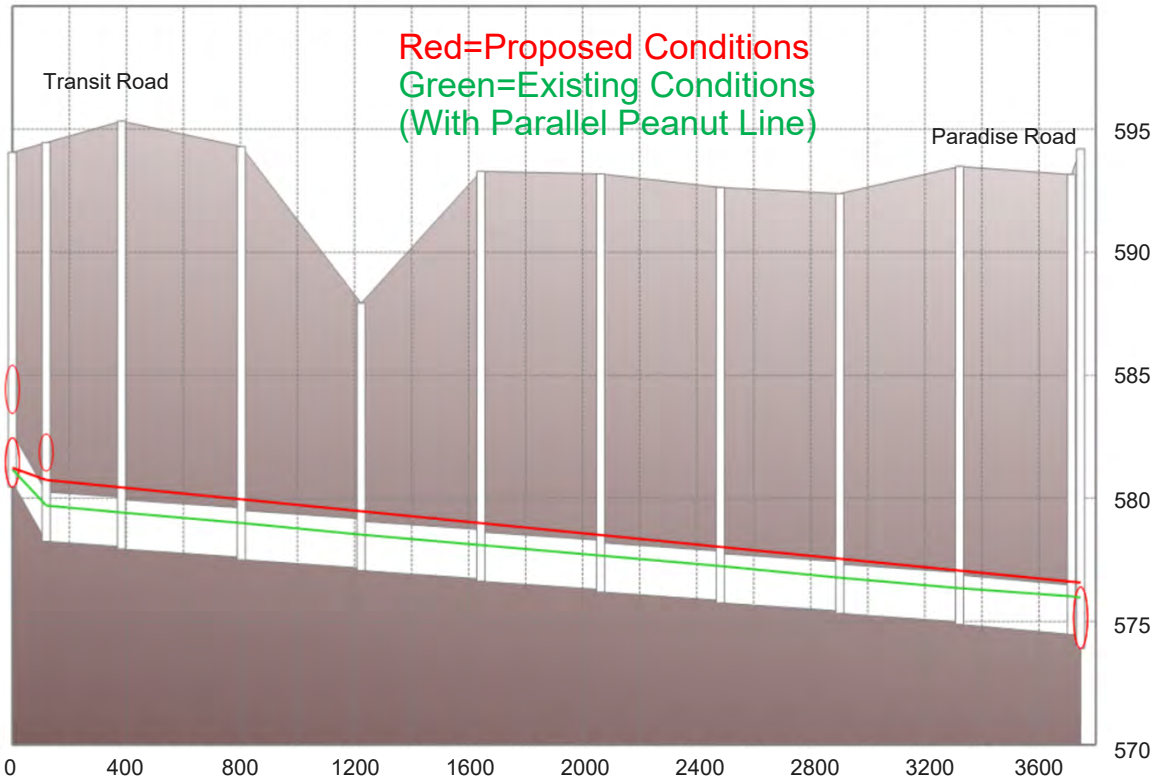


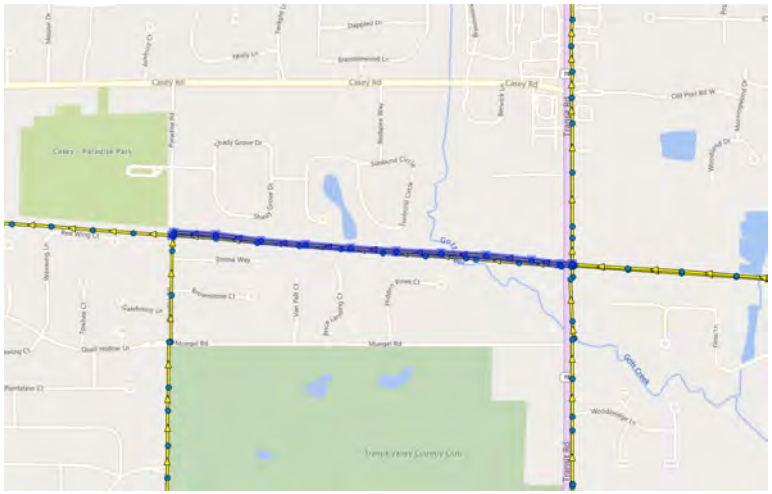
Peak HGL for Existing 18" Peanut Line West of Transit Road



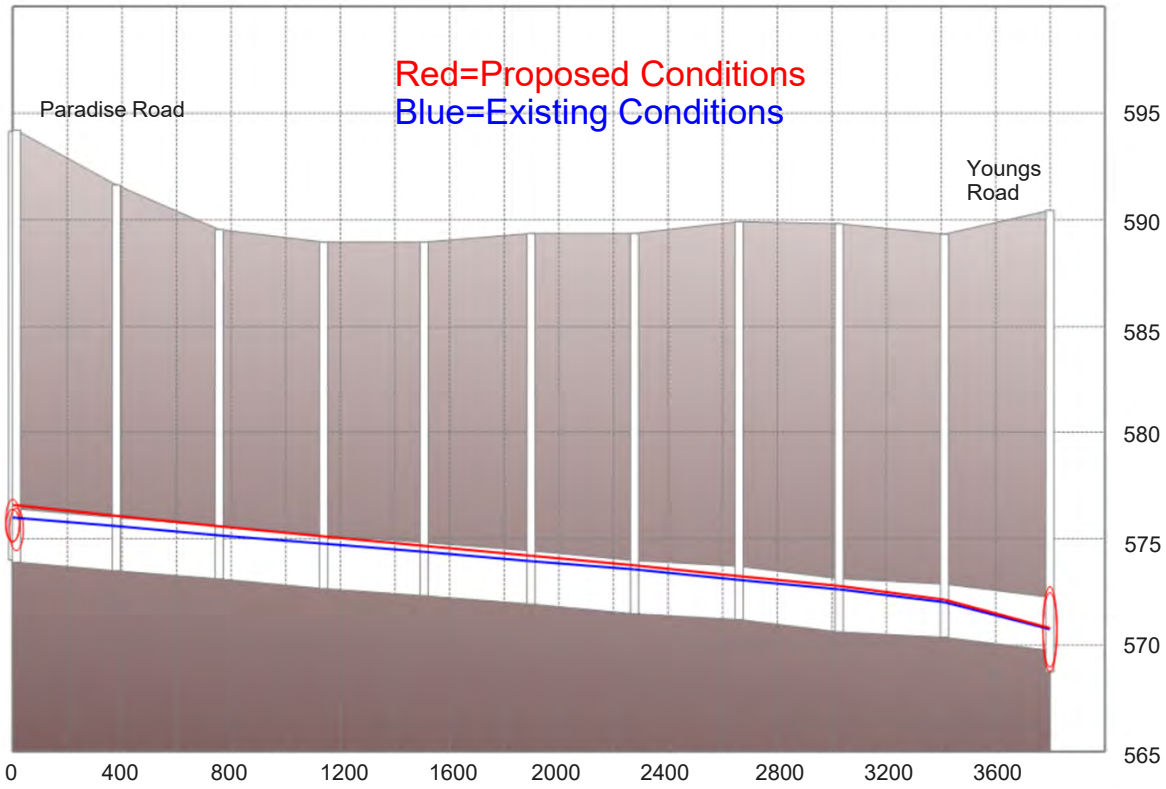


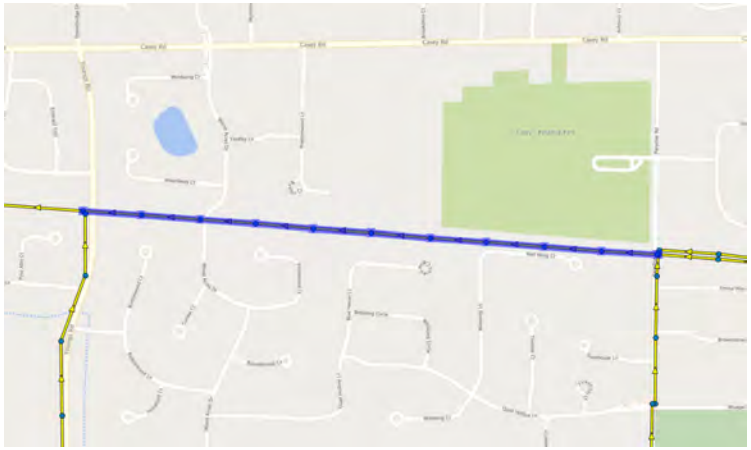
Peak HGL for Proposed 24" Peanut Line West of Transit Road



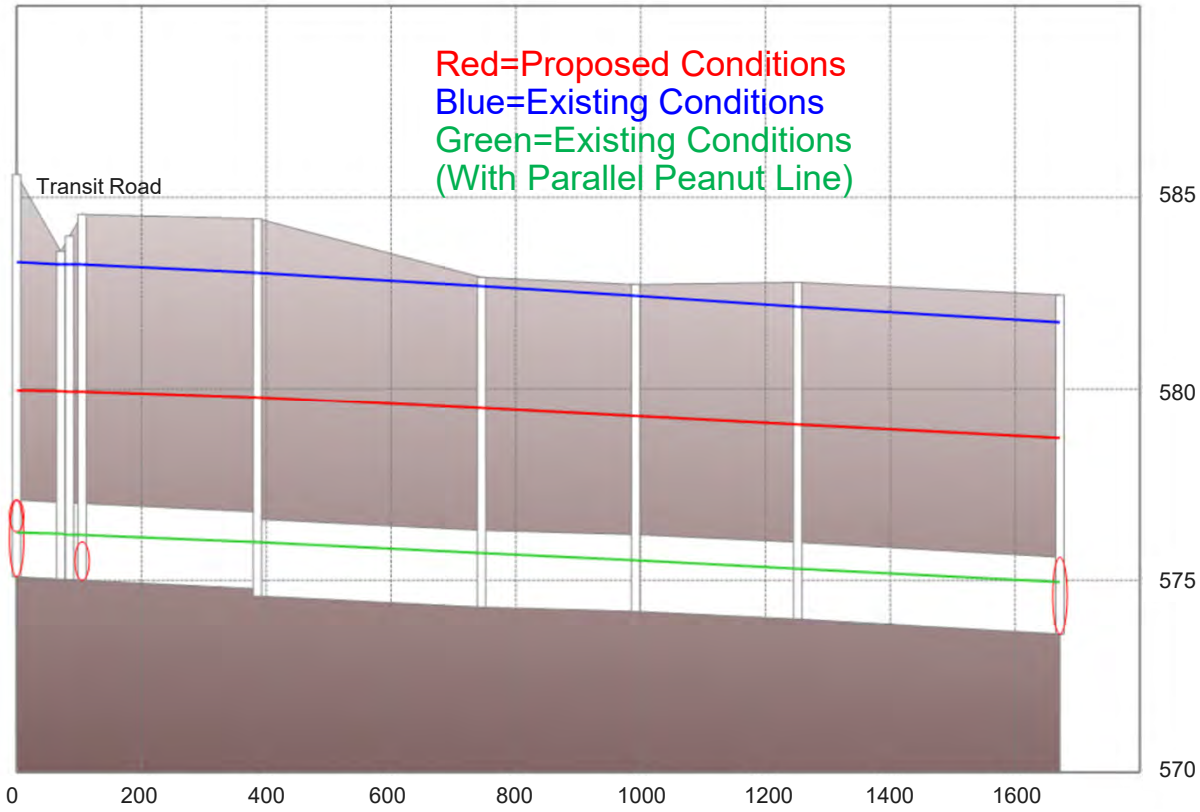


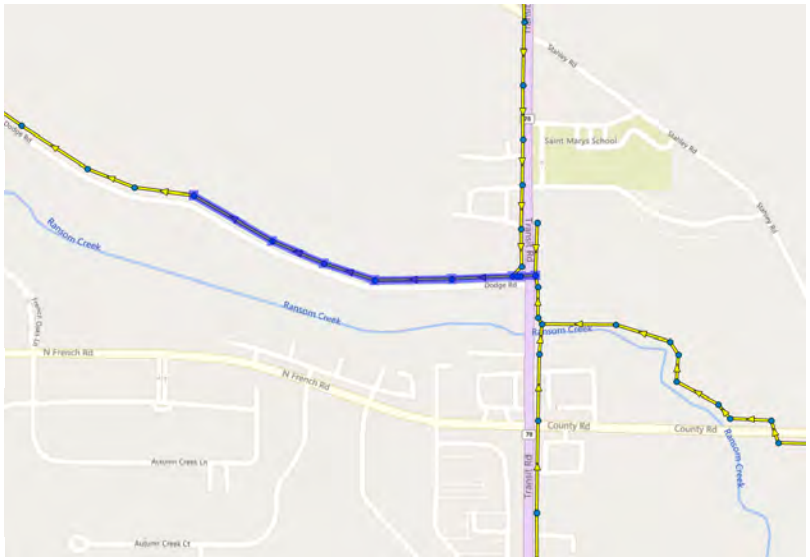
Peak HGL for Existing 30" Peanut Line West of Transit Road





Peak HGL for Dodge Road Sewer West of Transit Road



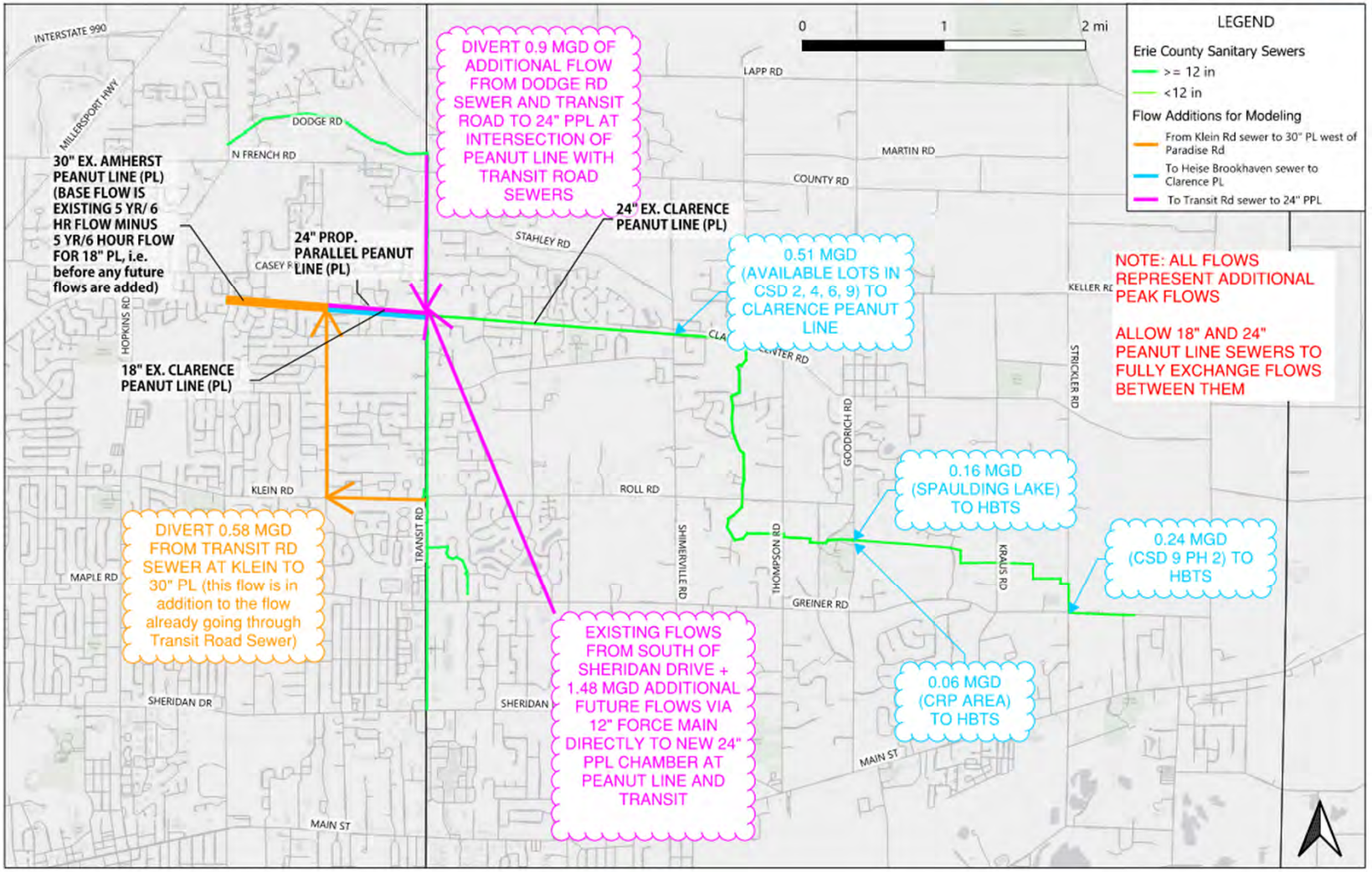


ARCADIS Design & Consultancy for natural and built assets

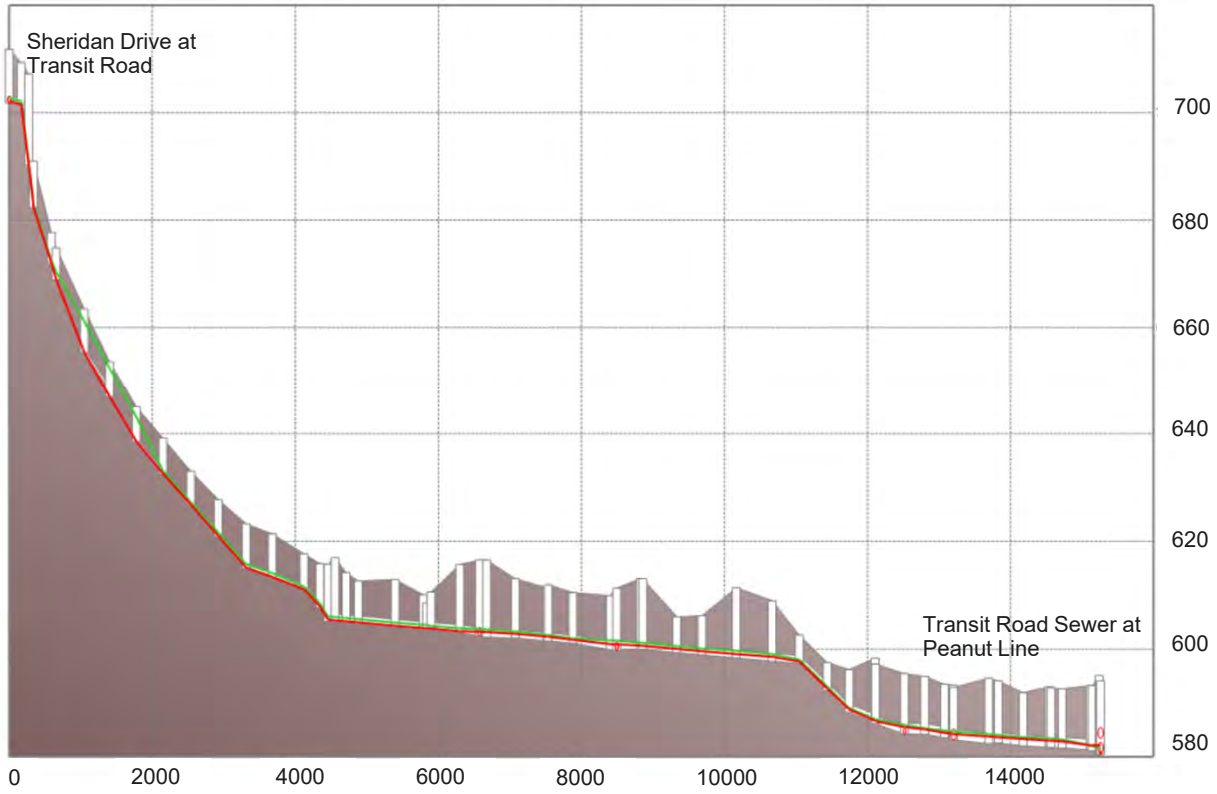
ECSD5 TRANSIT ROAD ANALYSIS PEAK HGL PROFILES FOR 5YR6HR DESIGN STORM – 4/30/24 SCENARIO #1 (ALL FLOWS MINUS HARRIS HILL AND MAIN STREET WITH EXISTING AND PARALLEL PEANUT LINES)

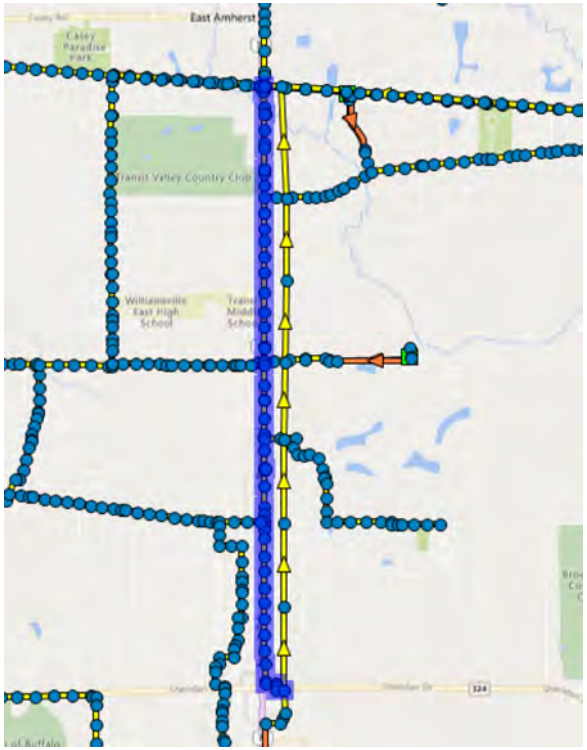
May 6, 2024

SCENARIO 4 IN SECTION 4 OF REPORT


INTERSTATE 990
MILLERSPORT HWY
DODGE RD
N FRENCH RD
30" EX. AMHERST PEANUT LINE (PL) (BASE FLOW IS EXISTING 5 YR/ 6 HR FLOW MINUS 5 YR/6 HOUR FLOW FOR 18" PL, i.e. before any future flows are added)
24" PROP. PARALLEL PEANUT LINE (PL)
18" EX. CLARENCE PEANUT LINE (PL)
HOPKINS RD
CASEY RD
DIVERT 0.9 MGD OF ADDITIONAL FLOW FROM DODGE RD SEWER AND TRANSIT ROAD TO 24" PPL AT INTERSECTION OF PEANUT LINE WITH TRANSIT ROAD SEWERS
24" EX. CLARENCE PEANUT LINE (PL)
STAHLEY RD
0.51 MGD (AVAILABLE LOTS IN CSD 2, 4, 6, 9) TO CLARENCE PEANUT LINE
LAPP RD
MARTIN RD
COUNTY RD
KELLER RD
STRICKLER RD
GOODRICH RD
CENTER RD
NOTE: ALL FLOWS REPRESENT ADDITIONAL PEAK FLOWS
ALLOW 18" AND 24" PEANUT LINE SEWERS TO FULLY EXCHANGE FLOWS BETWEEN THEM
0.16 MGD (SPAULDING LAKE) TO HBTS
0.24 MGD (CSD 9 PH 2) TO HBTS
KLEIN RD
ROLL RD
TRANSIT RD
SHIMERVILLE RD
THOMPSON RD
KRAUS RD
GREINER RD
MAPLE RD
DIVERT 0.58 MGD FROM TRANSIT RD SEWER AT KLEIN TO 30" PL (this flow is in addition to the flow already going through Transit Road Sewer)
EXISTING FLOWS FROM SOUTH OF SHERIDAN DRIVE + 1.48 MGD ADDITIONAL FUTURE FLOWS VIA 12" FORCE MAIN DIRECTLY TO NEW 24" PPL CHAMBER AT PEANUT LINE AND TRANSIT
0.06 MGD (CRP AREA) TO HBTS
SHERIDAN DR
SHERIDAN
MAIN ST
MAIN ST
0
1
2 mi
LEGEND
Erie County Sanitary Sewers
>= 12 in
<12 in
Flow Additions for Modeling
From Klein Rd sewer to 30" PL west of Paradise Rd
To Heise Brookhaven sewer to Clarence PL
To Transit Rd sewer to 24" PPL

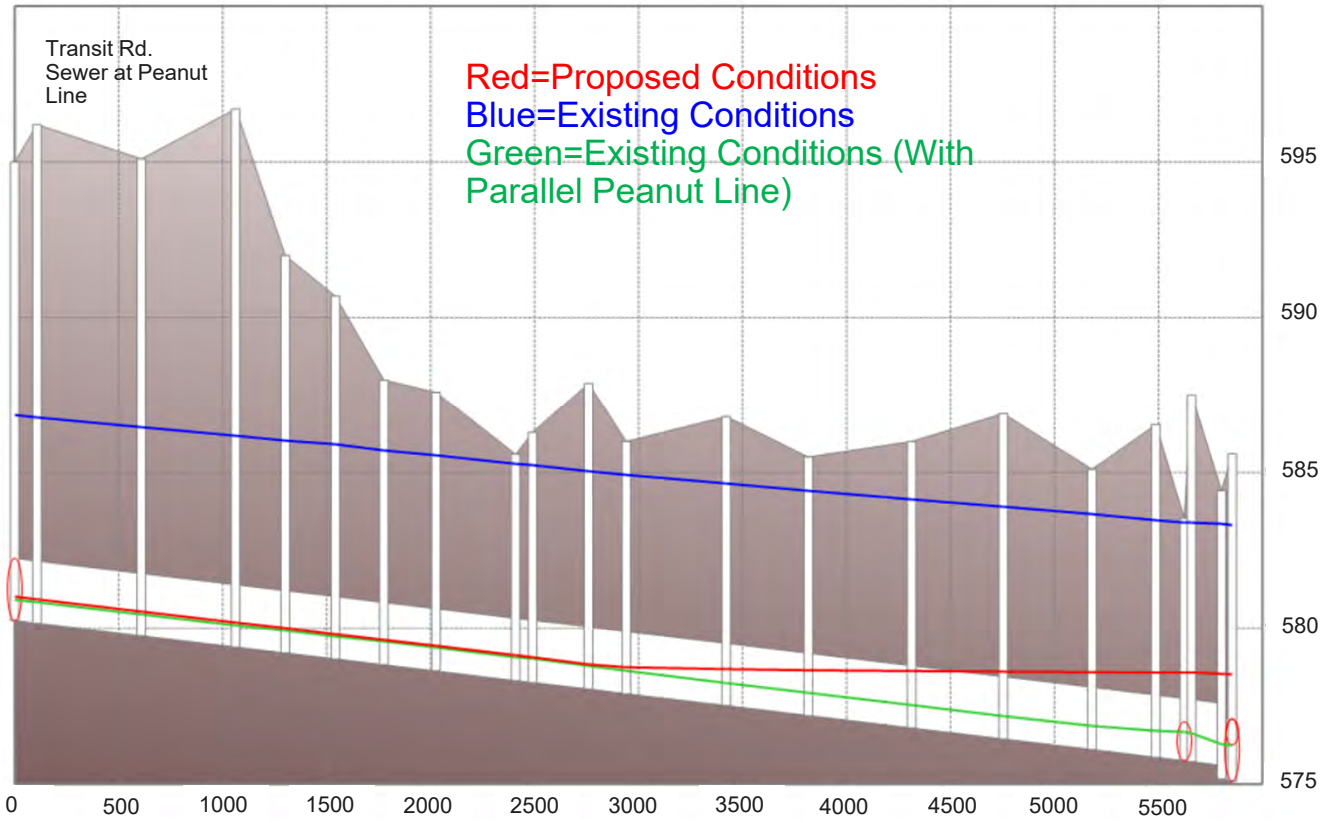
Peak HGL for Transit Road Sewer (Sheridan to Peanut Line)

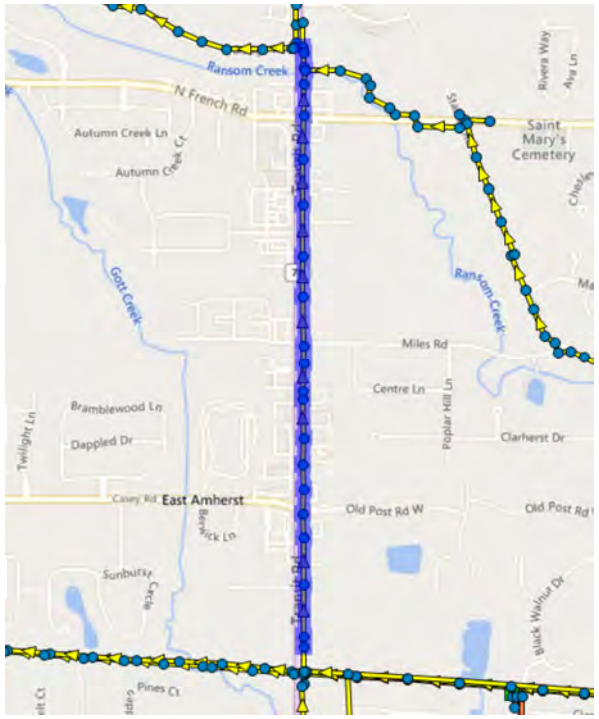




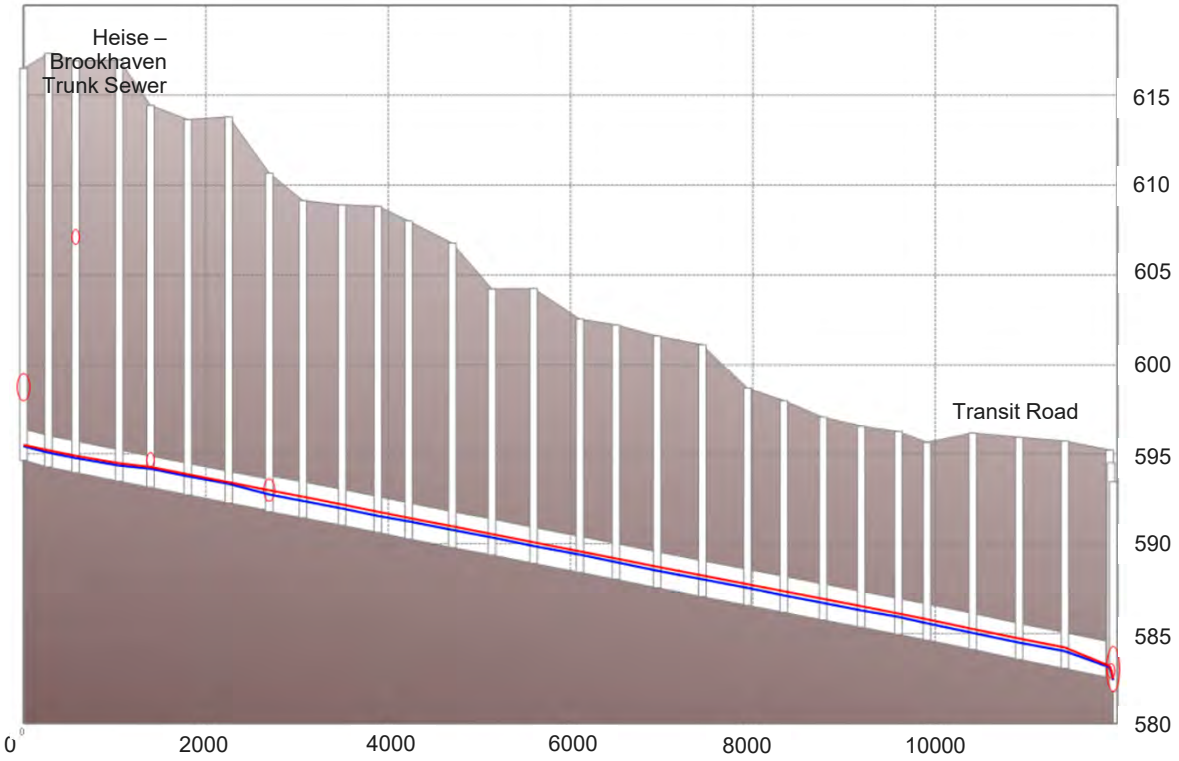
Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

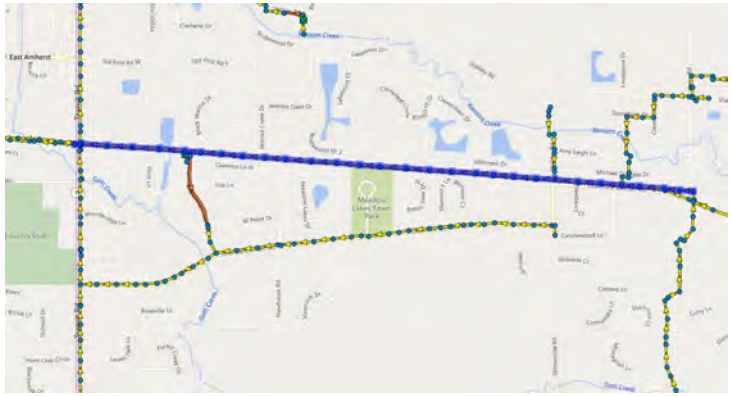
Peak HGL for Transit Road Sewer (Peanut Line to Dodge)





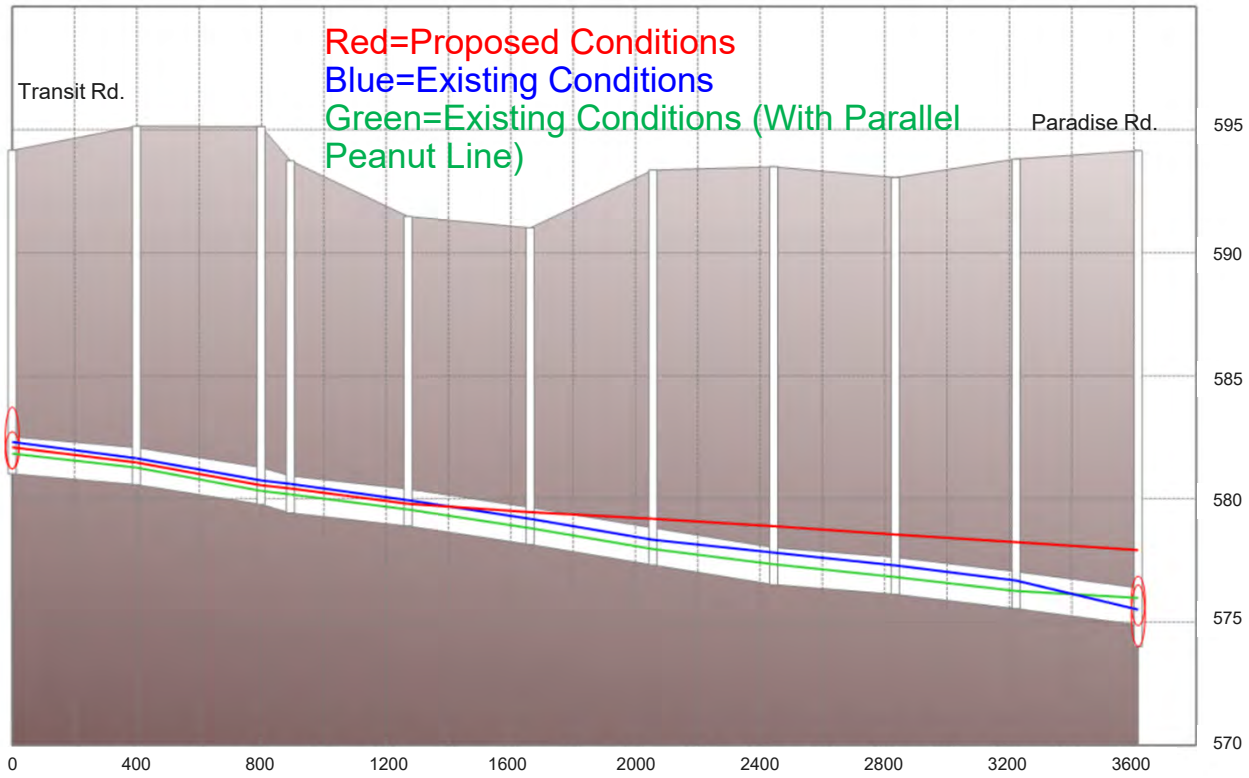
Peak HGL for Existing Peanut Line East of Transit Road

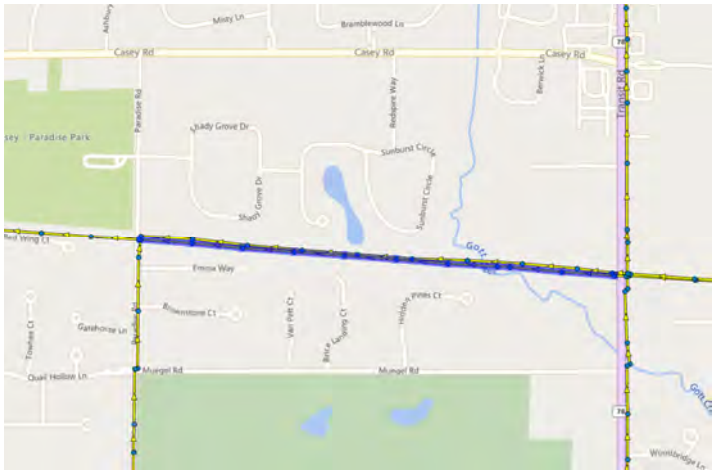




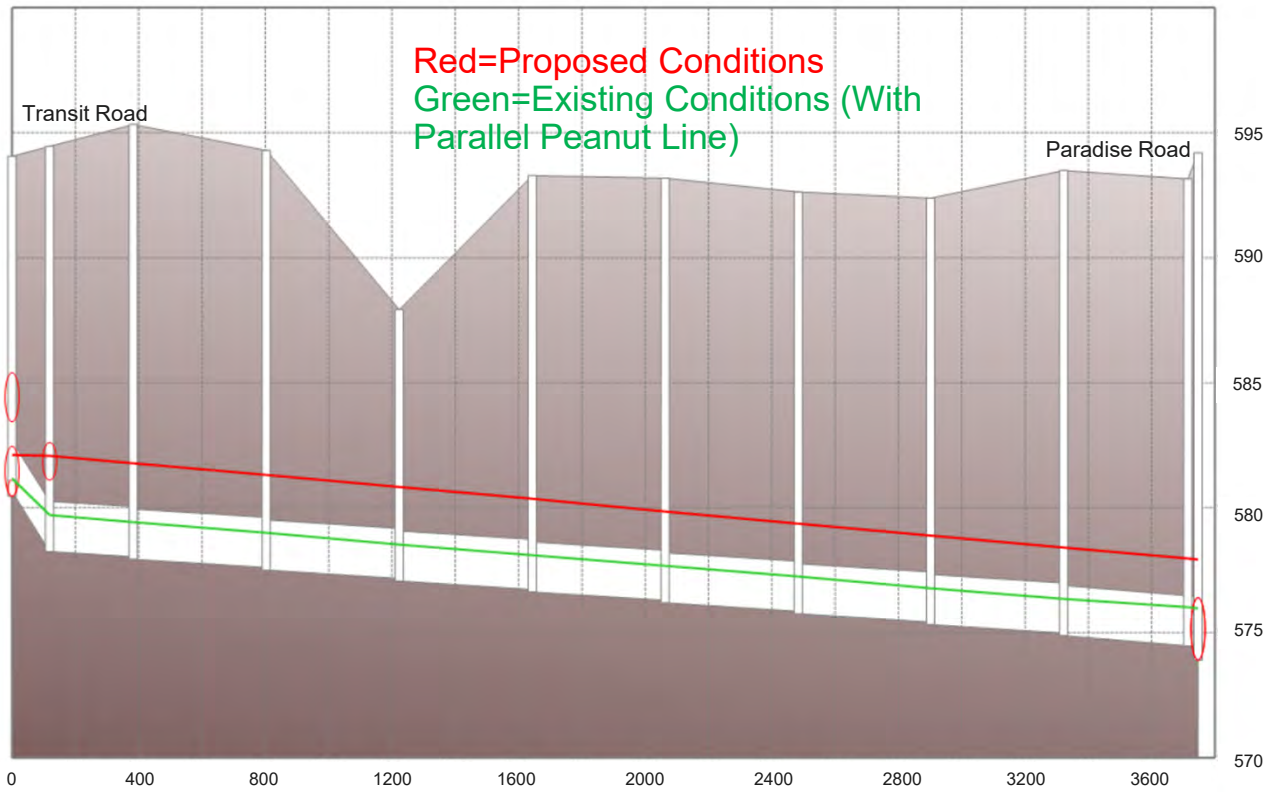
Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

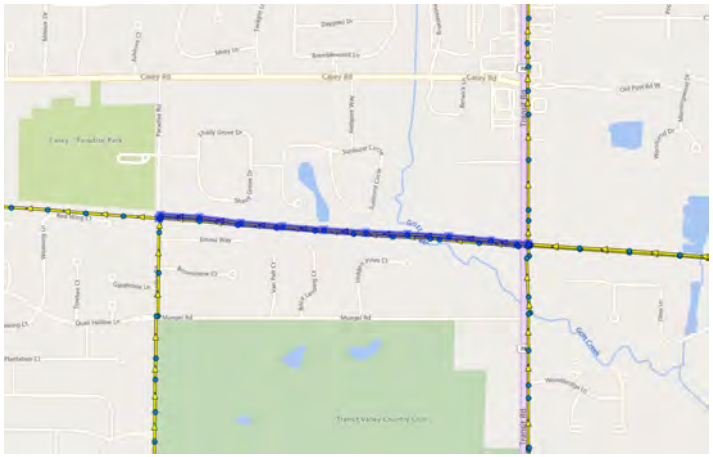
Peak HGL for Existing 18" Peanut Line West of Transit Road



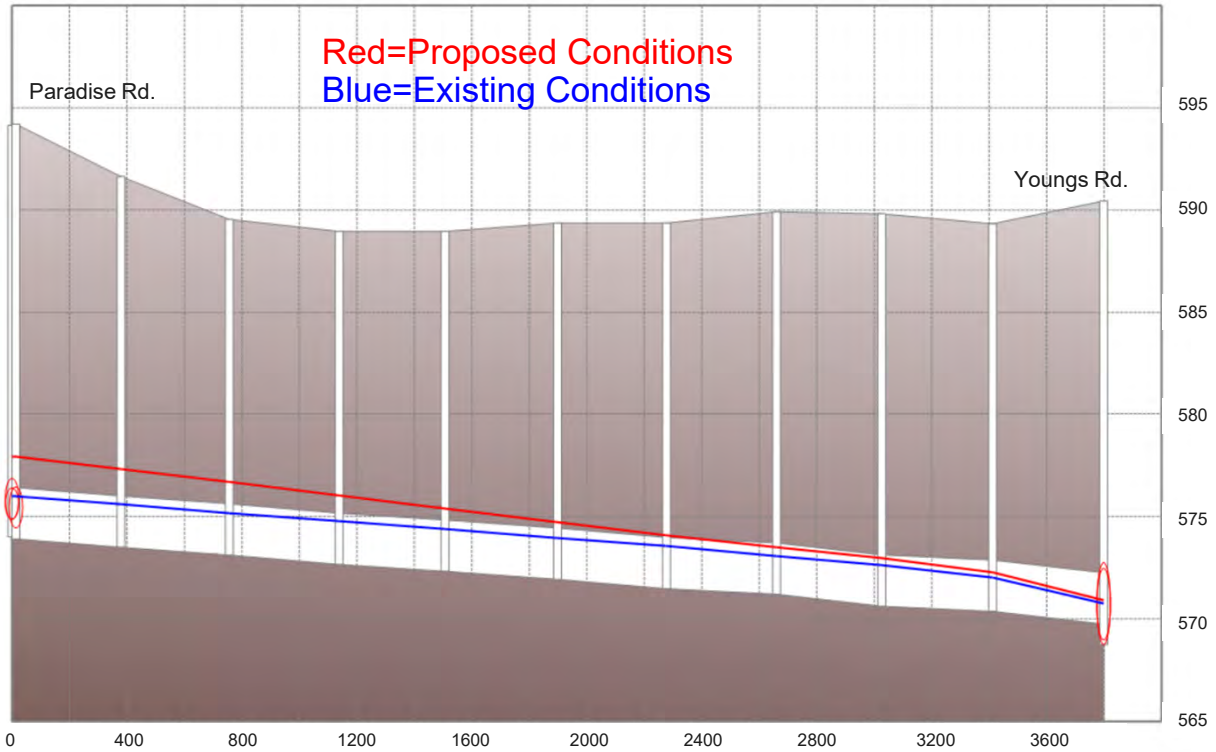


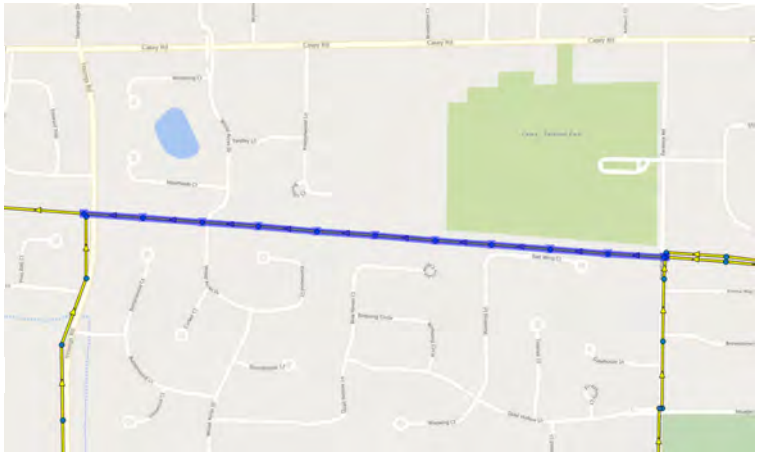
Peak HGL for Proposed 24" Peanut Line West of Transit Road



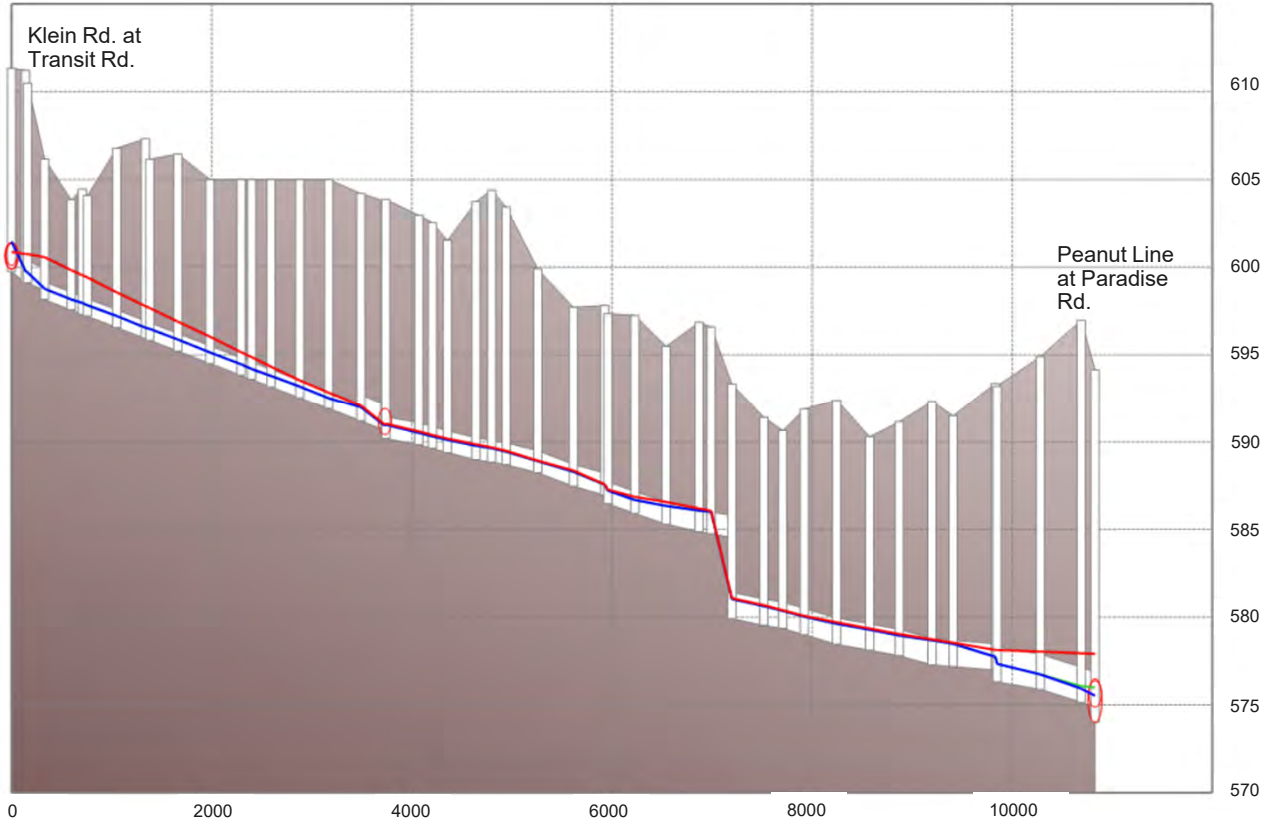


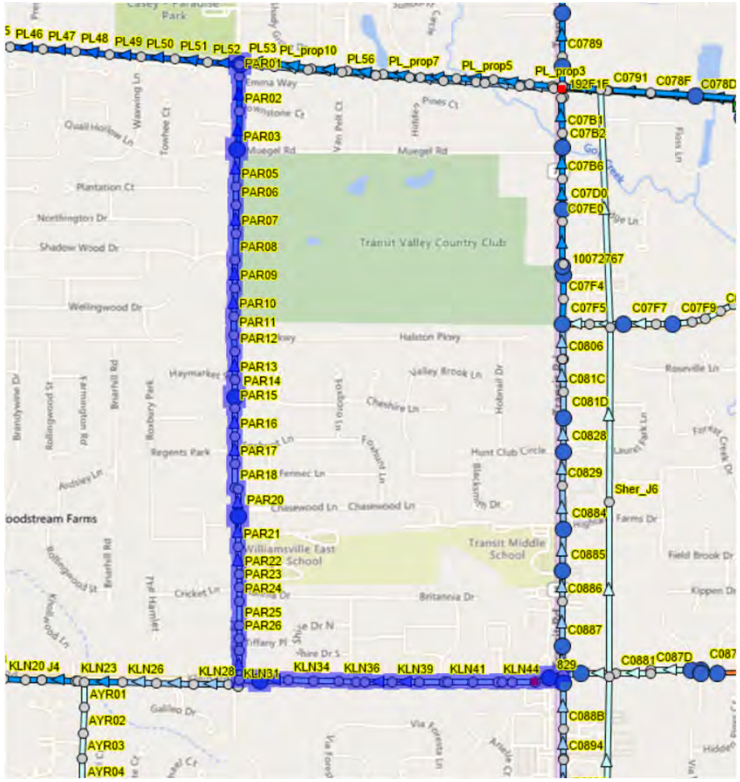
Peak HGL for Existing 30" Peanut Line West of Transit Road





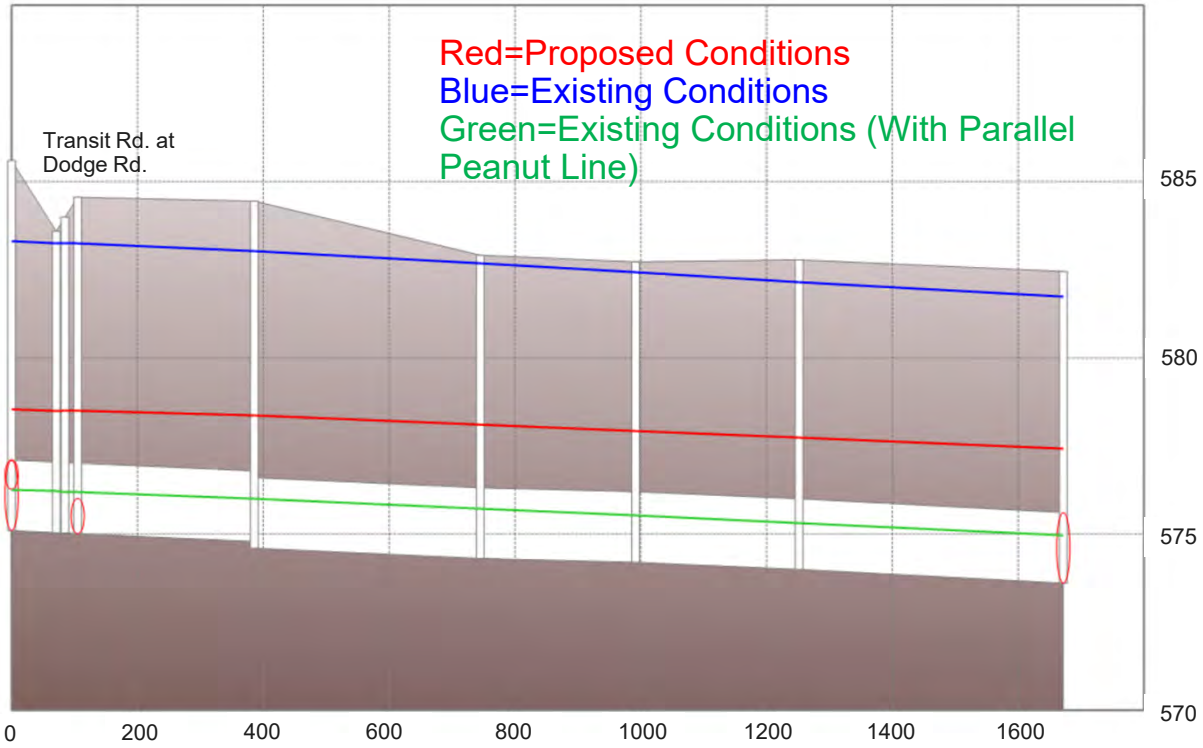
Peak HGL for Klein Road Sewer

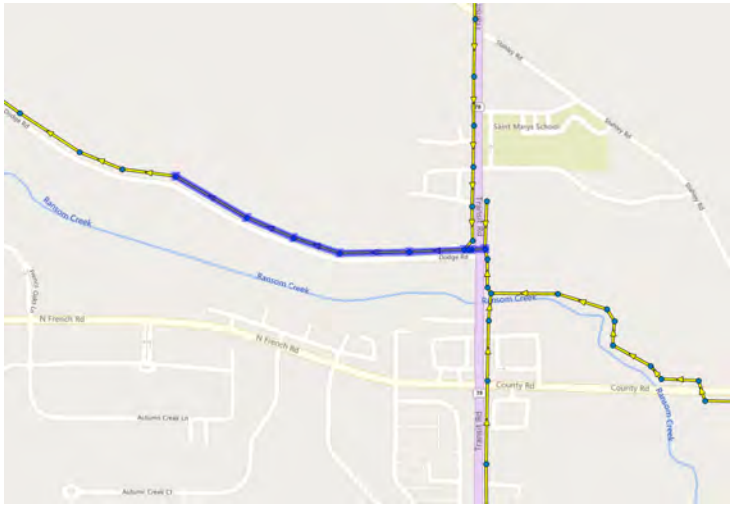




Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

Peak HGL for Dodge Road Sewer West of Transit Road



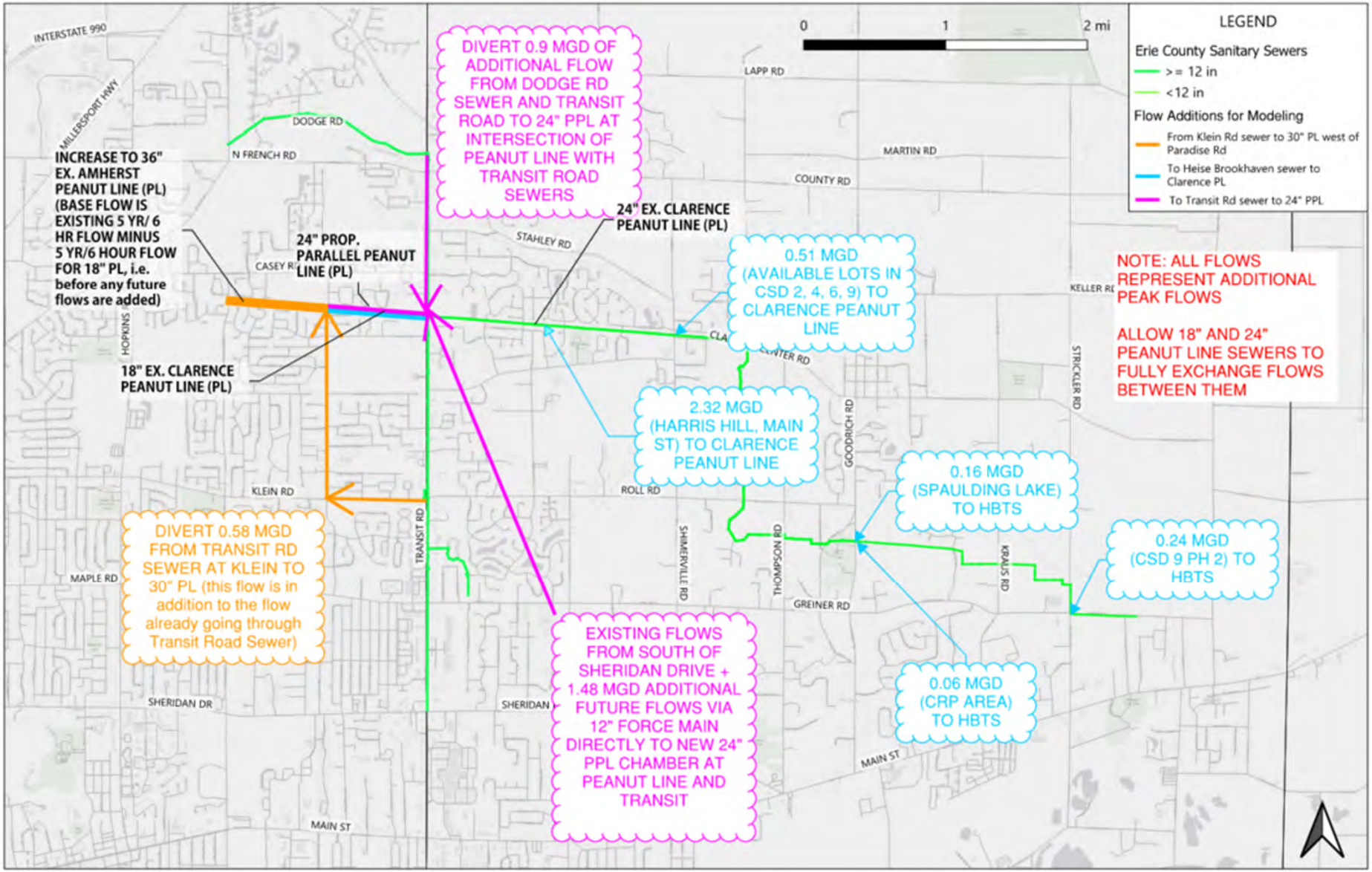


ARCADIS Design & Consultancy for natural and built assets

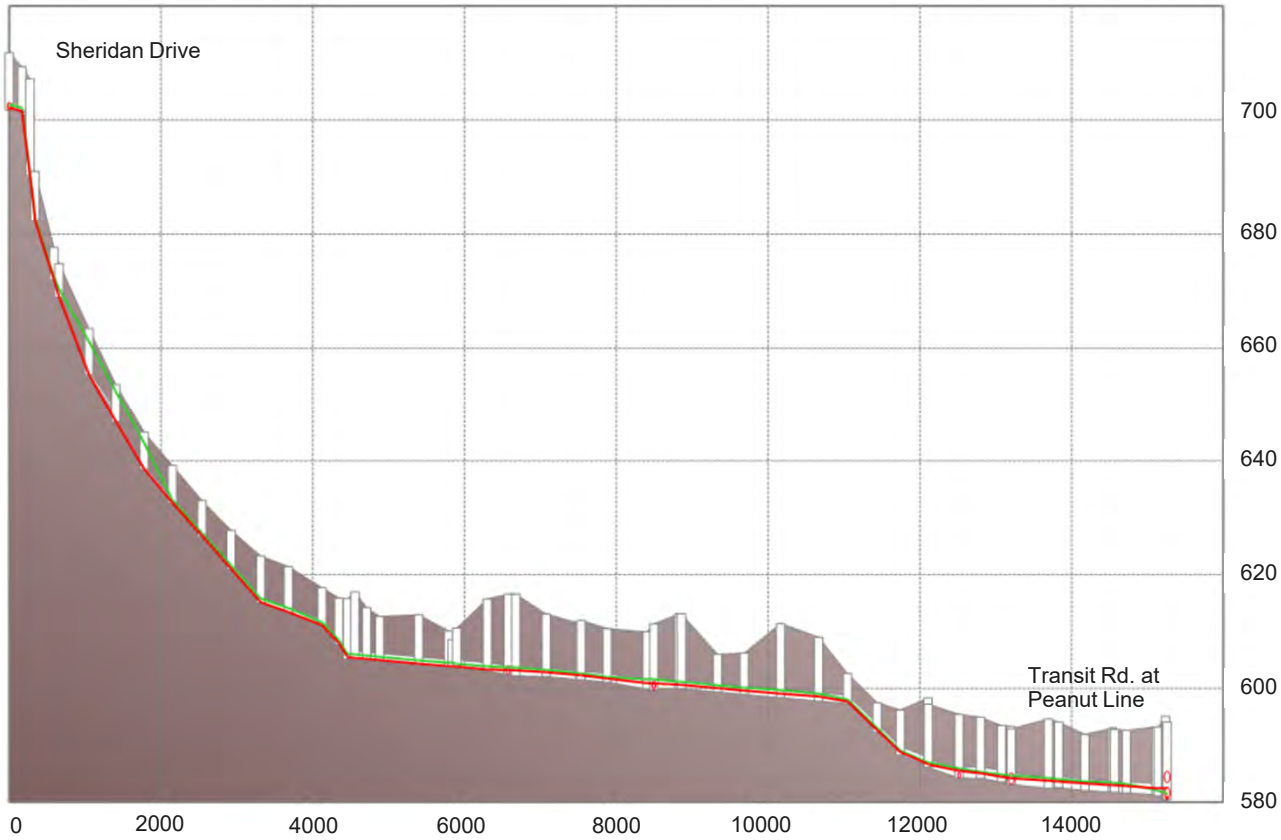
ECSD5 TRANSIT ROAD ANALYSIS PEAK HGL PROFILES FOR 5YR6HR DESIGN STORM – 4/30/24 SCENARIO #3 (ALL FLOWS BUT WITH 36-INCH PEANUT LINE SEWER)

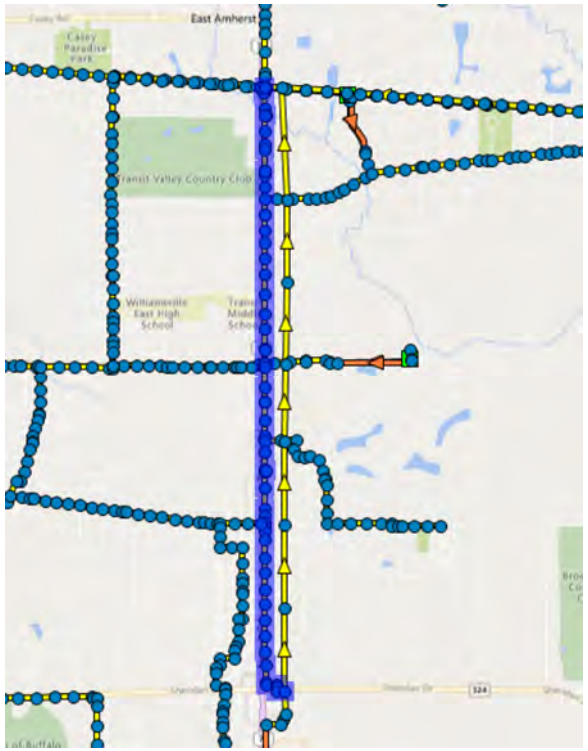
May 6, 2024

SCENARIO 5 IN SECTION 4 OF REPORT


INTERSTATE 990
MILLERSPORT HWY
DODGE RD
N FRENCH RD
INCREASE TO 36" EX. AMHERST PEANUT LINE (PL) (BASE FLOW IS EXISTING 5 YR/ 6 HR FLOW MINUS 5 YR/6 HOUR FLOW FOR 18" PL, i.e. before any future flows are added)
HOPKINS
CASEY RD
24" PROP. PARALLEL PEANUT LINE (PL)
18" EX. CLARENCE PEANUT LINE (PL)
KLEIN RD
DIVERT 0.58 MGD FROM TRANSIT RD SEWER AT KLEIN TO 30" PL (this flow is in addition to the flow already going through Transit Road Sewer)
MAPLE RD
SHERIDAN DR
MAIN ST
TRANSIT RD
DIVERT 0.9 MGD OF ADDITIONAL FLOW FROM DODGE RD SEWER AND TRANSIT ROAD TO 24" PPL AT INTERSECTION OF PEANUT LINE WITH TRANSIT ROAD SEWERS
24" EX. CLARENCE PEANUT LINE (PL)
STAHLEY RD
SHERIDAN
EXISTING FLOWS FROM SOUTH OF SHERIDAN DRIVE + 1.48 MGD ADDITIONAL FUTURE FLOWS VIA 12" FORCE MAIN DIRECTLY TO NEW 24" PPL CHAMBER AT PEANUT LINE AND TRANSIT
0 1 2 mi
LAPP RD
MARTIN RD
COUNTY RD
0.51 MGD (AVAILABLE LOTS IN CSD 2, 4, 6, 9) TO CLARENCE PEANUT LINE
CLARENCE CENTER RD
2.32 MGD (HARRIS HILL, MAIN ST) TO CLARENCE PEANUT LINE
ROLL RD
GOODRICH RD
SHIMERVILLE RD
THOMPSON RD
GREINER RD
KRAUS RD
0.16 MGD (SPAULDING LAKE) TO HBTS
0.24 MGD (CSD 9 PH 2) TO HBTS
0.06 MGD (CRP AREA) TO HBTS
MAIN ST
KELLER RD
STRICKLER RD
NOTE: ALL FLOWS REPRESENT ADDITIONAL PEAK FLOWS
ALLOW 18" AND 24" PEANUT LINE SEWERS TO FULLY EXCHANGE FLOWS BETWEEN THEM
LEGEND
Erie County Sanitary Sewers
>= 12 in
<12 in
Flow Additions for Modeling
From Klein Rd sewer to 30" PL west of Paradise Rd
To Heise Brookhaven sewer to Clarence PL
To Transit Rd sewer to 24" PPL

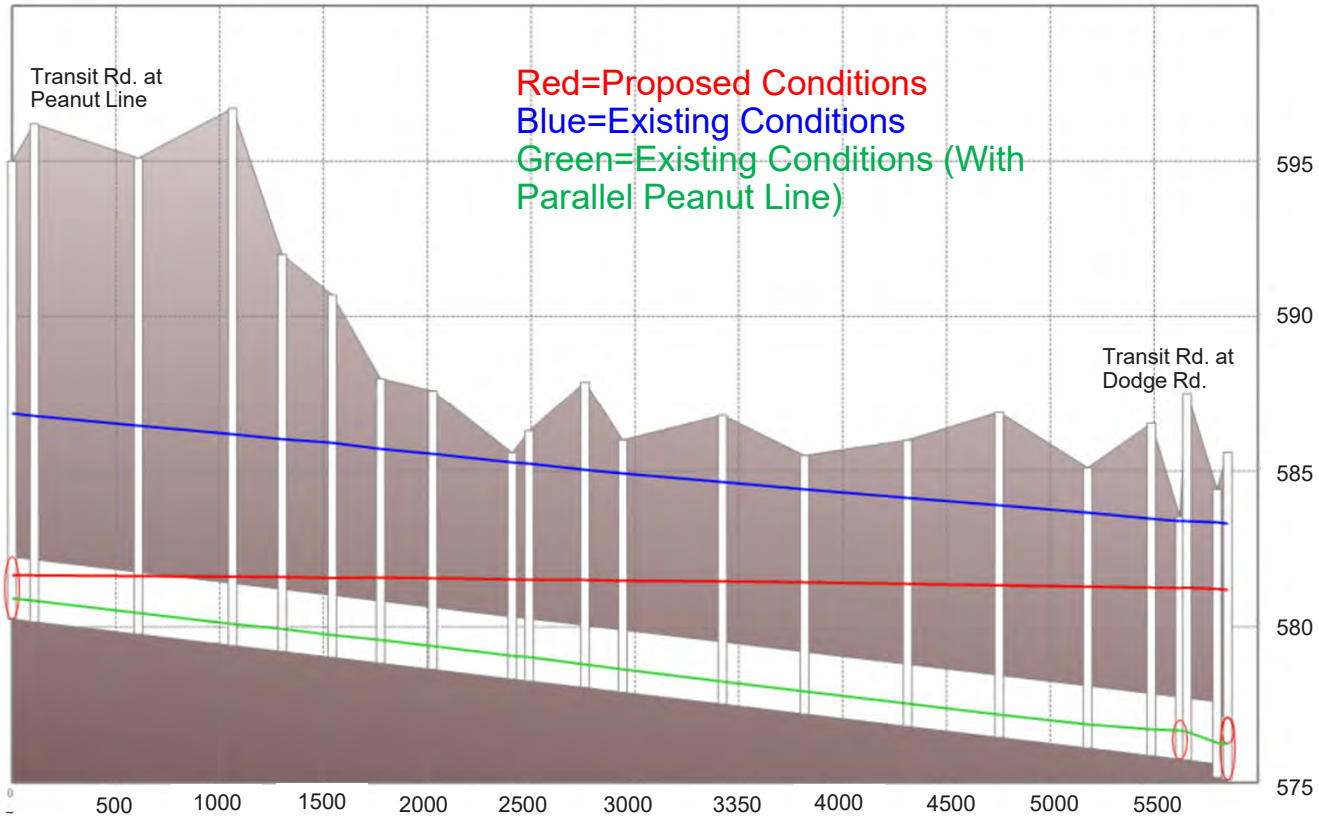
Peak HGL for Transit Road Sewer (Sheridan to Peanut Line)

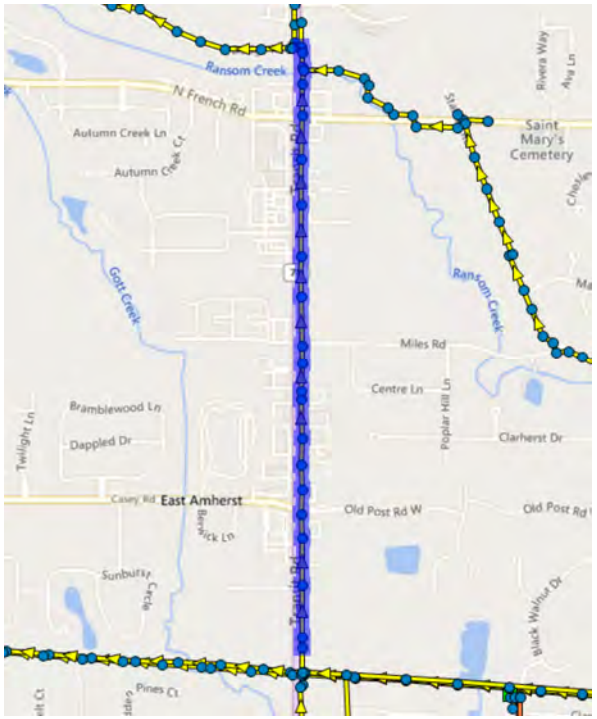




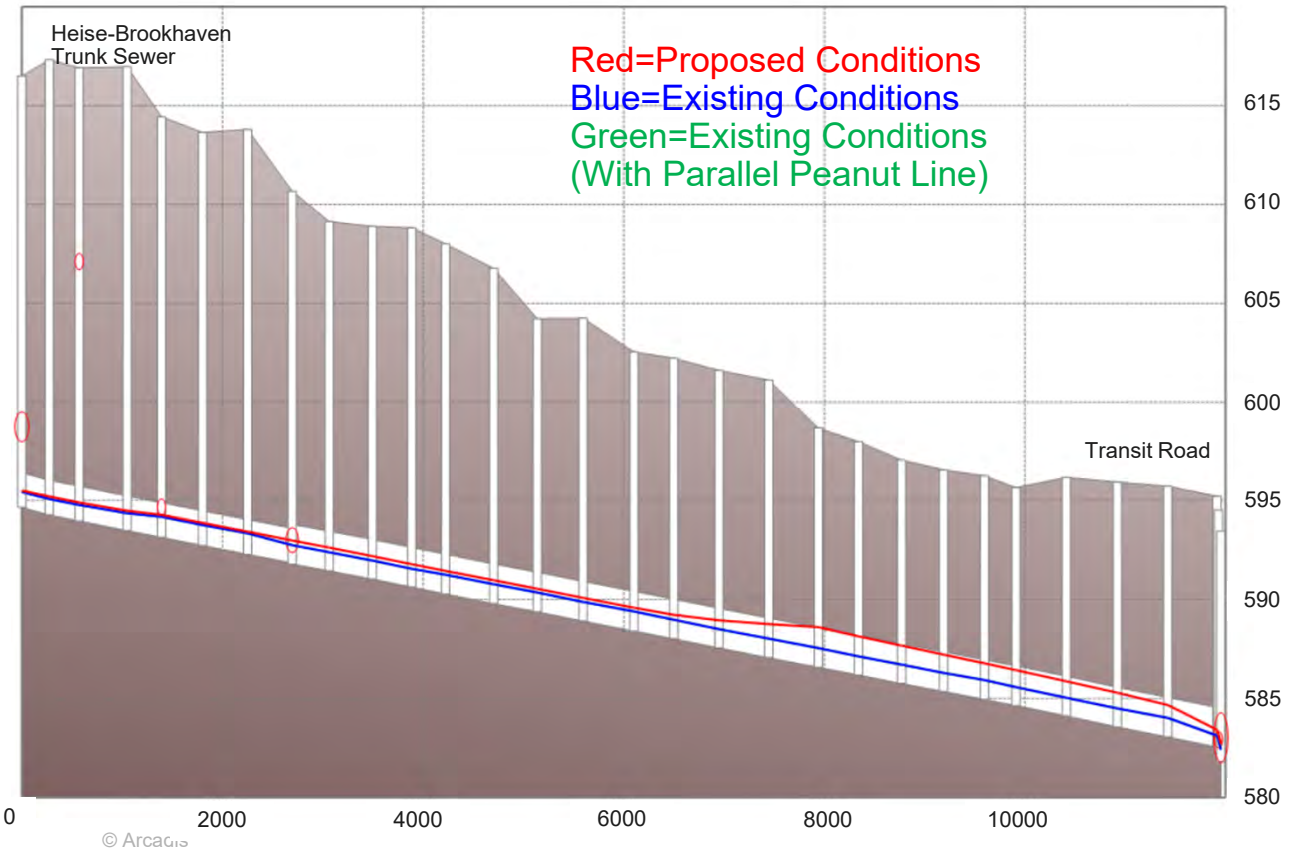
Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

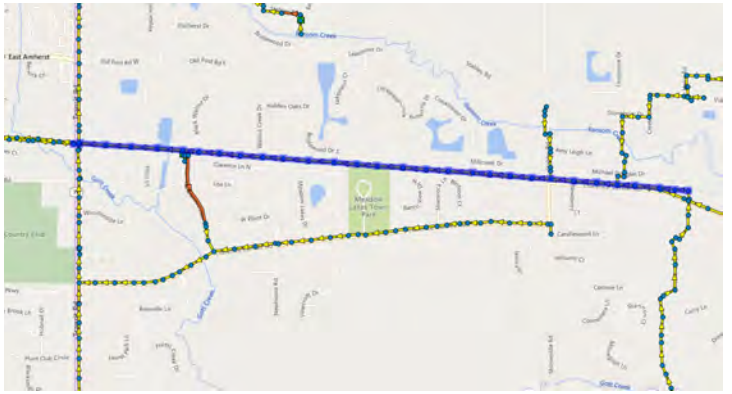
Peak HGL for Transit Road Sewer (Peanut Line to Dodge)



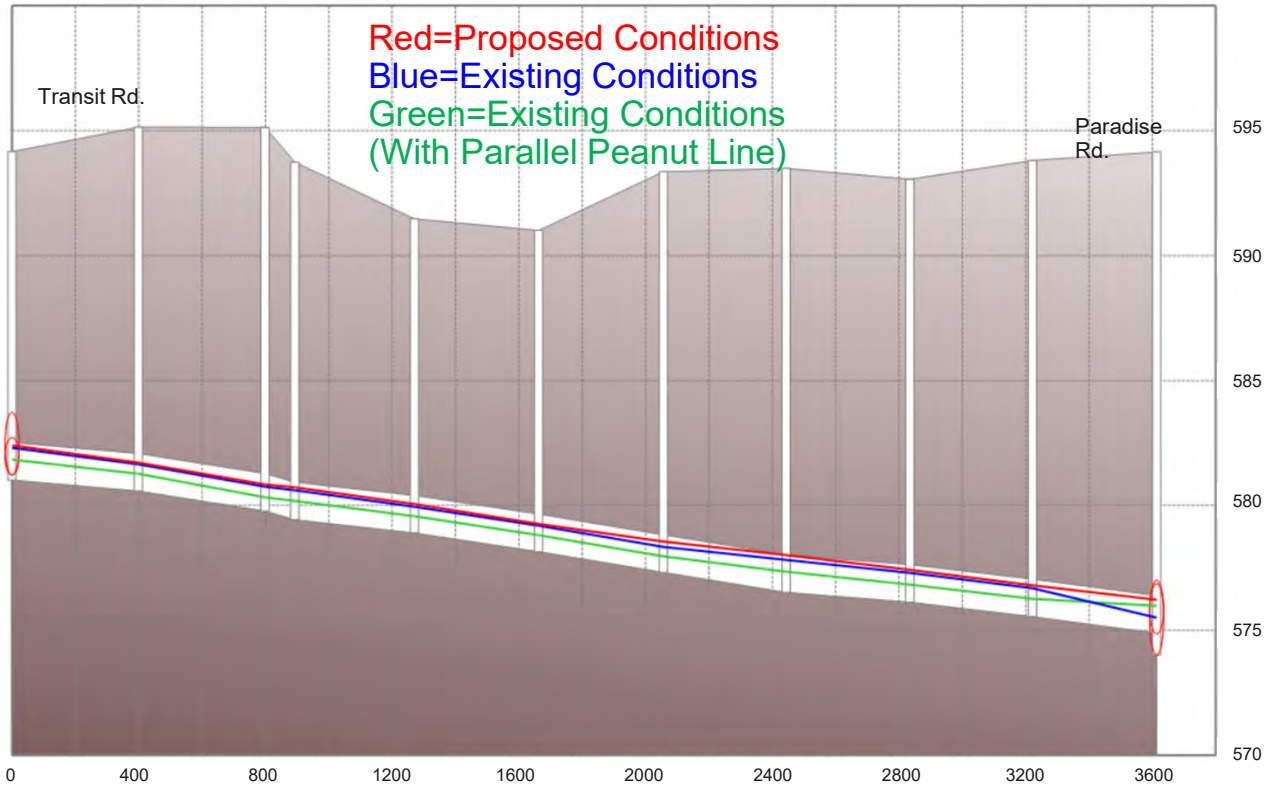


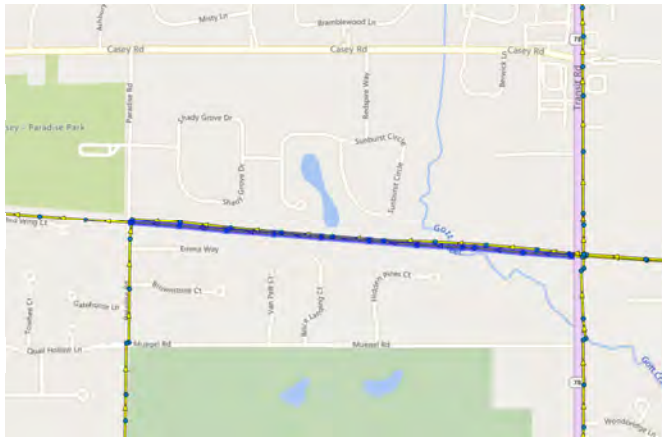
Peak HGL for Existing Peanut Line East of Transit Road



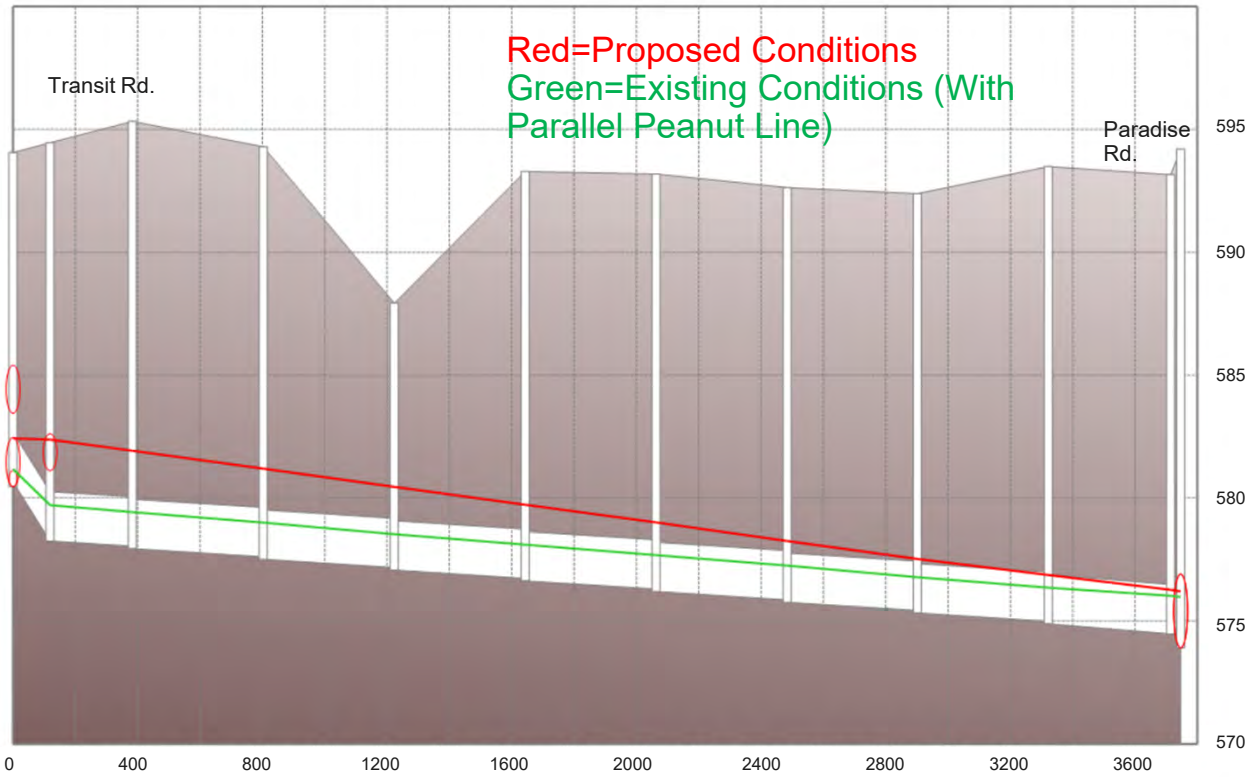


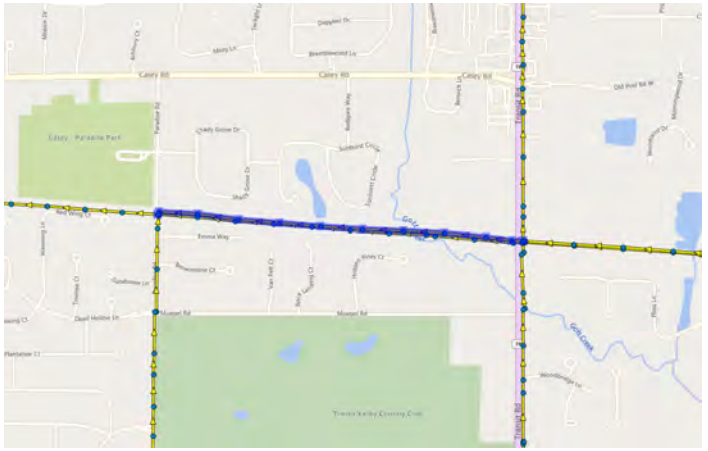
Peak HGL for Existing 18" Peanut Line West of Transit Road



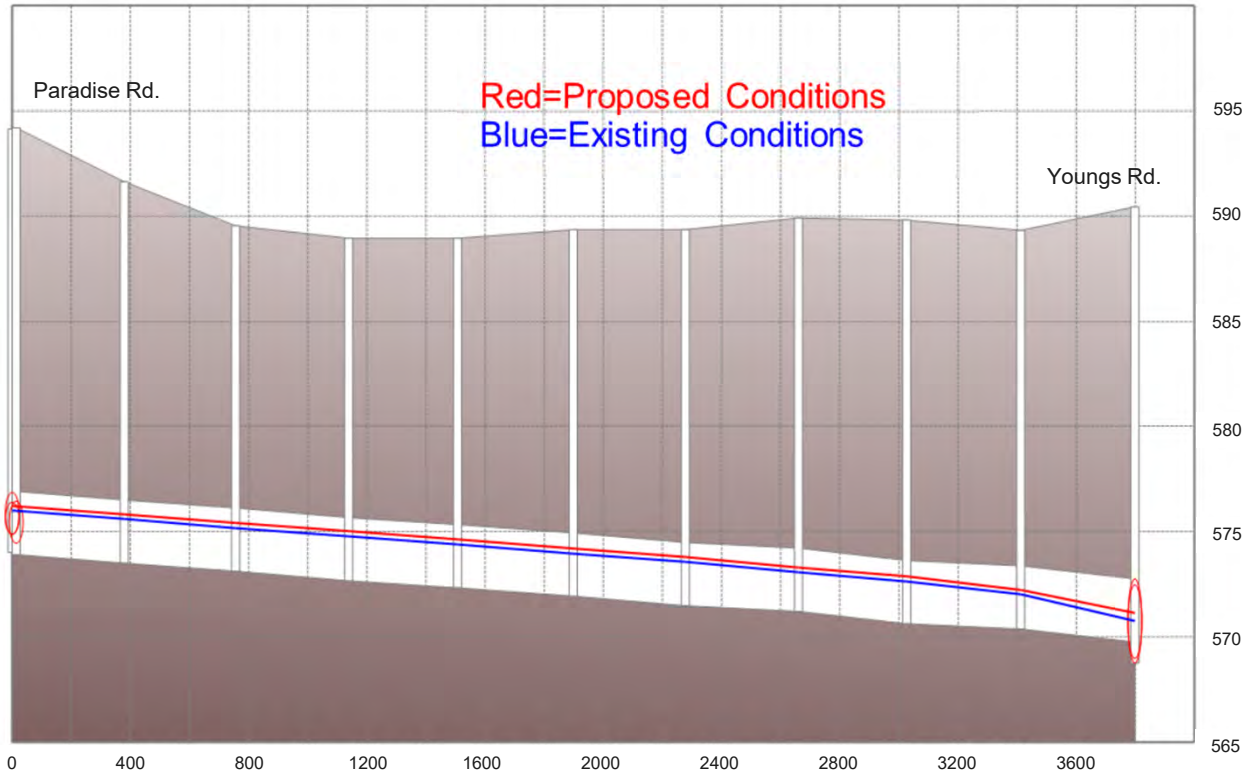


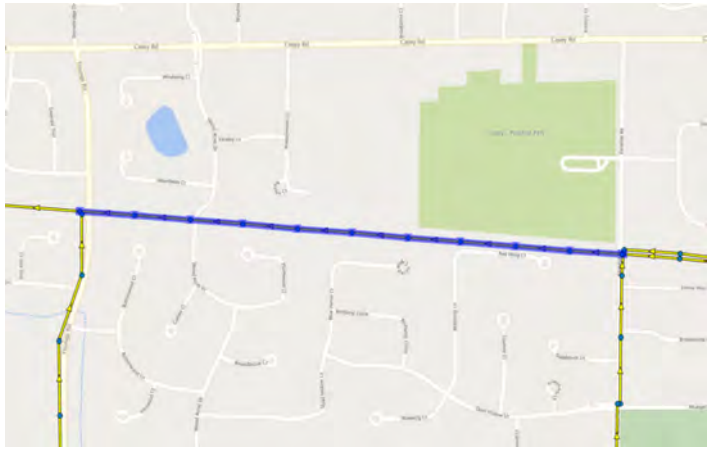
Peak HGL for Proposed 24" Peanut Line West of Transit Road



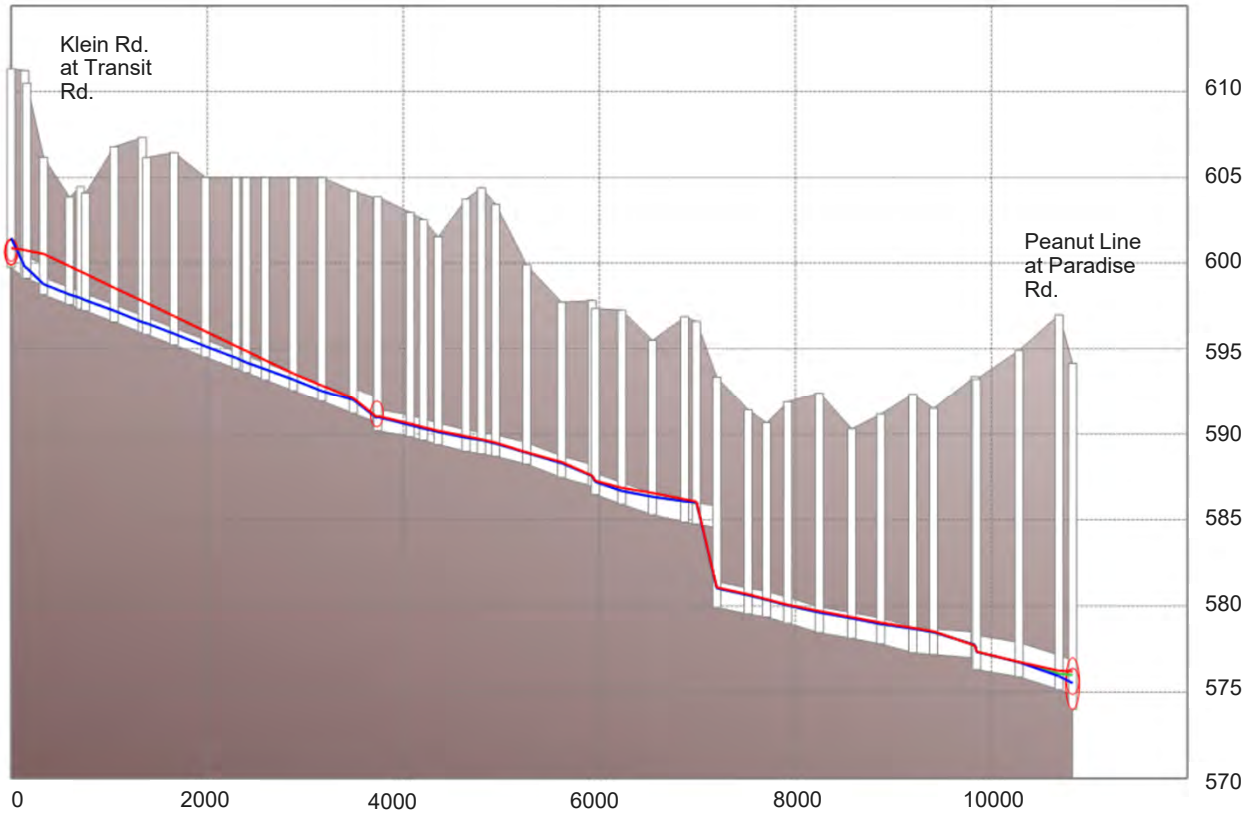


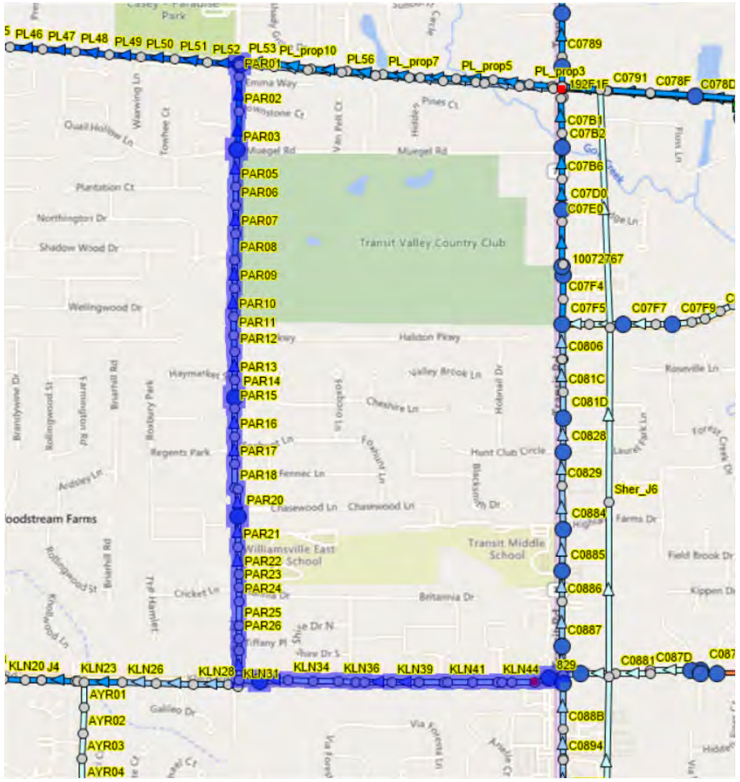
Peak HGL for Existing 30" Peanut Line (Upsized to 36”) West of Transit Road





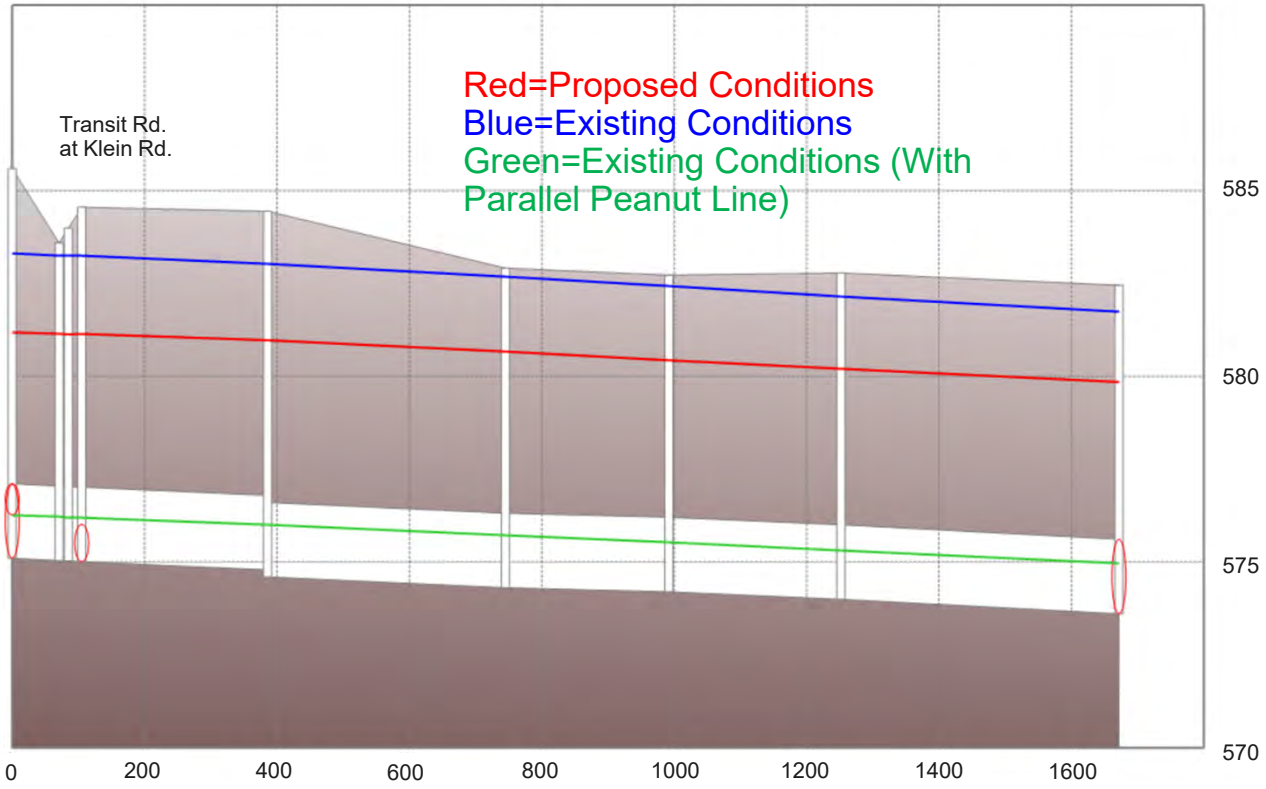
Peak HGL for Klein Road Sewer

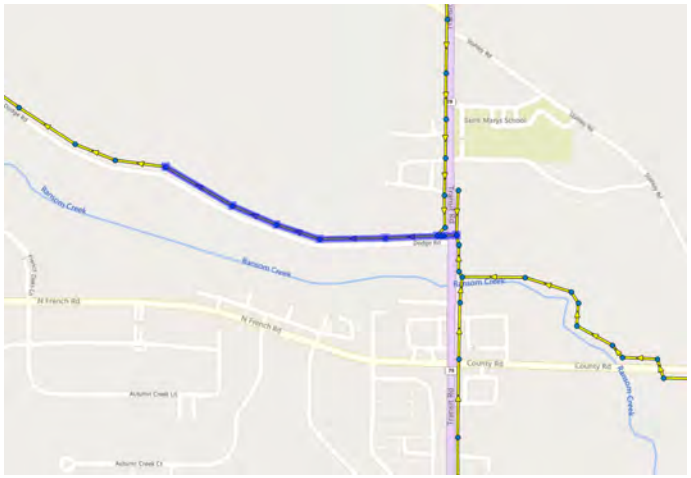




Red=Proposed Conditions Blue=Existing Conditions Green=Existing Conditions (With Parallel Peanut Line)

Peak HGL for Dodge Road Sewer West of Transit Road





Appendix H: Cost Estimates

50-YEAR LIFE CYCLE COSTS

OPTIONS 1A + 2

Interest Rate = 4.0%

Inflation Rate = 3.0%

Year (n)	Capital Cost	Energy Cost (annual)	PS Maint Cost (annual)	Force Main Pigging Cost (10 yr. maint.)	MH Repair Cost (10 year)	MH Repair Cost (25 yr. maint.)	Sewer flushing Cost (5 yr. maint.)	Wet Well Cleaning Cost (10 yr. maint.)	Total Annual Cost	PW Cost[3]
	Options 1A + 2 – Eliminate the EHPS and the BSPS and convey flow by gravity from existing pump stations to Harris Hill Road/Sheridan Drive intersection. Construct a new gravity sewer from the intersection to convey flow to the Parallel Peanut Line.									
0	$70,500,000									$ 70,500,000
1		$ (2,737)	$ (138,800)						$ (141,537)	$ (136,094)
2		$ (2,819)	$ (142,964)						$ (145,783)	$ (134,785)
3		$ (2,904)	$ (147,253)						$ (150,157)	$ (133,489)
4		$ (2,991)	$ (151,671)						$ (154,662)	$ (132,205)
5		$ (3,081)	$ (156,221)				$ 58,245		$ (101,057)	$ (83,061)
6		$ (3,173)	$ (160,907)						$ (164,081)	$ (129,675)
7		$ (3,268)	$ (165,734)						$ (169,003)	$ (128,428)
8		$ (3,367)	$ (170,706)						$ (174,073)	$ (127,193)
9		$ (3,468)	$ (175,828)						$ (179,295)	$ (125,970)
10		$ (3,572)	$ (181,103)	$ (1,265)	$ 49,233		$ 67,522	$ (8,340)	$ (77,525)	$ (52,373)
11		$ (3,679)	$ (186,536)						$ (190,214)	$ (123,560)
12		$ (3,789)	$ (192,132)						$ (195,921)	$ (122,372)
13		$ (3,903)	$ (197,896)						$ (201,798)	$ (121,195)
14		$ (4,020)	$ (203,832)						$ (207,852)	$ (120,030)
15		$ (4,140)	$ (209,947)				$ 78,276		$ (135,812)	$ (75,411)
16		$ (4,265)	$ (216,246)						$ (220,511)	$ (117,732)
17		$ (4,393)	$ (222,733)						$ (227,126)	$ (116,600)
18		$ (4,524)	$ (229,415)						$ (233,940)	$ (115,479)
19		$ (4,660)	$ (236,298)						$ (240,958)	$ (114,369)
20		$ (4,800)	$ (243,387)	$ (2,285)	$ 66,165		$ 90,744	$ (11,208)	$ (104,771)	$ (47,816)
21		$ (4,944)	$ (250,688)						$ (255,632)	$ (112,180)
22		$ (5,092)	$ (258,209)						$ (263,301)	$ (111,101)
23		$ (5,245)	$ (265,955)						$ (271,200)	$ (110,033)
24		$ (5,402)	$ (273,934)						$ (279,336)	$ (108,975)
25		$ (5,564)	$ (282,152)			$ 1,379,029	$ 105,197		$ 1,196,510	$ 448,831
26		$ (5,731)	$ (290,616)						$ (296,348)	$ (106,889)
27		$ (5,903)	$ (299,335)						$ (305,238)	$ (105,862)
28		$ (6,080)	$ (308,315)						$ (314,395)	$ (104,844)
29		$ (6,263)	$ (317,564)						$ (323,827)	$ (103,836)
30		$ (6,451)	$ (327,091)	$ (3,071)	$ 88,920		$ 121,952	$ (15,063)	$ (140,804)	$ (43,412)
31		$ (6,644)	$ (336,904)						$ (343,548)	$ (101,848)
32		$ (6,844)	$ (347,011)						$ (353,855)	$ (100,869)
33		$ (7,049)	$ (357,421)						$ (364,470)	$ (99,899)
34		$ (7,260)	$ (368,144)						$ (375,404)	$ (98,939)
35		$ (7,478)	$ (379,188)				$ 141,376		$ (245,291)	$ (62,160)
36		$ (7,702)	$ (390,564)						$ (398,267)	$ (97,045)
37		$ (7,934)	$ (402,281)						$ (410,215)	$ (96,112)
38		$ (8,172)	$ (414,349)						$ (422,521)	$ (95,188)
39		$ (8,417)	$ (426,780)						$ (435,197)	$ (94,273)
40		$ (8,669)	$ (439,583)	$ (4,128)	$ 119,501		$ 163,893	$ (20,243)	$ (189,229)	$ (39,414)
41		$ (8,929)	$ (452,771)						$ (461,700)	$ (92,468)
42		$ (9,197)	$ (466,354)						$ (475,551)	$ (91,579)
43		$ (9,473)	$ (480,345)						$ (489,818)	$ (90,699)
44		$ (9,757)	$ (494,755)						$ (504,512)	$ (89,827)
45		$ (10,050)	$ (509,598)				$ 189,997		$ (329,650)	$ (56,436)
46		$ (10,351)	$ (524,886)						$ (535,237)	$ (88,107)
47		$ (10,662)	$ (540,632)						$ (551,294)	$ (87,260)
48		$ (10,982)	$ (556,851)						$ (567,833)	$ (86,421)
49		$ (11,311)	$ (573,557)						$ (584,868)	$ (85,590)
50		$ (11,651)	$ (590,763)	$ (5,547)	$ 160,600	$ 2,887,381	$ 220,259	$ (27,205)	$ 2,633,073	$ 370,507
								TOTAL 50 -YEAR PRESENT WORTH		**$ 66,500,000**
								50-yr PW of O&M only		$ (4,000,000)

Notes:

1. O&M Costs are calculated on O&M Costs worksheet.
2. Future Annual Cost = Present Annual Cost x (1 + Inflation Rate)^{Year} = $A_o(1+I)^n$
3. Present Worth Cost = PW = Future Annual Cost / (1 + Interest Rate)^{Year} = $F / (1 + i)^n$
4. PW value rounded to nearest $1,000.

50-YEAR LIFE CYCLE COSTS

OPTIONS 1B + 2

Interest Rate = 4.0%

Inflation Rate = 3.0%

	Options 1B + 2 – Replace the EHPS with a larger EHPS at its current location and construct a new gravity sewer from the Harris Hill Road/Sheridan Drive intersection to convey flow to the Parallel Peanut Line.									
Year (n)	Capital Cost	Energy Cost (annual)	PS Maint Cost (annual)	Force Main Pigging Cost (10 yr. maint.)	MH Repair Cost (10 year)	MH Repair Cost (25 yr. maint.)	Sewer flushing Cost (5yr. maint.)	Wet Well Cleaning Cost (10 yr. maint.)	Total Annual Cost	PW Cost[3]
0	$47,600,000									$ 47,600,000
1		$ 5,991	$ 10,000						$ 15,991	$ 15,376
2		$ 6,170	$ 10,300						$ 16,470	$ 15,228
3		$ 6,355	$ 10,609						$ 16,964	$ 15,081
4		$ 6,546	$ 10,927						$ 17,473	$ 14,936
5		$ 6,742	$ 11,255				$ 36,044		$ 54,042	$ 44,418
6		$ 6,945	$ 11,593						$ 18,537	$ 14,650
7		$ 7,153	$ 11,941						$ 19,094	$ 14,510
8		$ 7,368	$ 12,299						$ 19,666	$ 14,370
9		$ 7,589	$ 12,668						$ 20,256	$ 14,232
10		$ 7,816	$ 13,048	$ 2,139	$ 30,175		$ 41,785	$ -	$ 94,963	$ 64,154
11		$ 8,051	$ 13,439						$ 21,490	$ 13,959
12		$ 8,292	$ 13,842						$ 22,135	$ 13,825
13		$ 8,541	$ 14,258						$ 22,799	$ 13,692
14		$ 8,797	$ 14,685						$ 23,483	$ 13,561
15		$ 9,061	$ 15,126				$ 48,440		$ 72,627	$ 40,327
16		$ 9,333	$ 15,580						$ 24,913	$ 13,301
17		$ 9,613	$ 16,047						$ 25,660	$ 13,173
18		$ 9,901	$ 16,528						$ 26,430	$ 13,047
19		$ 10,199	$ 17,024						$ 27,223	$ 12,921
20		$ 10,504	$ 17,535	$ 2,875	$ 40,553		$ 56,155	$ -	$ 127,623	$ 58,245
21		$ 10,820	$ 18,061						$ 28,881	$ 12,674
22		$ 11,144	$ 18,603						$ 29,747	$ 12,552
23		$ 11,479	$ 19,161						$ 30,640	$ 12,431
24		$ 11,823	$ 19,736						$ 31,559	$ 12,312
25		$ 12,178	$ 20,328			$ 653,558	$ 65,100		$ 751,163	$ 281,774
26		$ 12,543	$ 20,938						$ 33,481	$ 12,076
27		$ 12,919	$ 21,566						$ 34,485	$ 11,960
28		$ 13,307	$ 22,213						$ 35,520	$ 11,845
29		$ 13,706	$ 22,879						$ 36,585	$ 11,731
30		$ 14,117	$ 23,566	$ 3,864	$ 54,500		$ 75,468	$ -	$ 171,515	$ 52,881
31		$ 14,541	$ 24,273						$ 38,813	$ 11,507
32		$ 14,977	$ 25,001						$ 39,978	$ 11,396
33		$ 15,426	$ 25,751						$ 41,177	$ 11,286
34		$ 15,889	$ 26,523						$ 42,412	$ 11,178
35		$ 16,366	$ 27,319				$ 87,488		$ 131,173	$ 33,241
36		$ 16,857	$ 28,139						$ 44,995	$ 10,964
37		$ 17,362	$ 28,983						$ 46,345	$ 10,859
38		$ 17,883	$ 29,852						$ 47,735	$ 10,754
39		$ 18,420	$ 30,748						$ 49,168	$ 10,651
40		$ 18,972	$ 31,670	$ 5,193	$ 73,243		$ 101,423	$ -	$ 230,501	$ 48,011
41		$ 19,541	$ 32,620						$ 52,162	$ 10,447
42		$ 20,128	$ 33,599						$ 53,727	$ 10,346
43		$ 20,732	$ 34,607						$ 55,338	$ 10,247
44		$ 21,353	$ 35,645						$ 56,999	$ 10,148
45		$ 21,994	$ 36,715				$ 117,577		$ 176,286	$ 30,180
46		$ 22,654	$ 37,816						$ 60,470	$ 9,954
47		$ 23,334	$ 38,950						$ 62,284	$ 9,858
48		$ 24,034	$ 40,119						$ 64,152	$ 9,764
49		$ 24,755	$ 41,323						$ 66,077	$ 9,670
50		$ 25,497	$ 42,562	$ 6,979	$ 98,432	$ 1,368,406	$ 136,304	$ -	$ 1,678,180	$ 236,141
								TOTAL 50 -YEAR PRESENT WORTH		**$ 48,982,000**
								50-yr PW of O&M only		$ 1,382,000

Notes:

1. 5-and 20-yr O&M Costs are calculated on O&M Costs worksheet.
2. Future Annual Cost = Present Annual Cost x (1 + Inflation Rate)^{Year} = $A_o(1+I)^n$ (present annual costs located on the O&M Costs worksheet)
3. Present Worth Cost = PW = Future Annual Cost / (1 + Interest Rate)^{Year} = F / $(1 + i)^n$
4. PW value rounded to nearest $1,000.

50-YEAR LIFE CYCLE COSTS

OPTIONS 1A + 3

Interest Rate = 4.0%

Inflation Rate = 3.0%

	Option 1A + 3 - Eliminate the EHPS and the BSPS and convey flow by gravity from existing pump stations to a new pump station at the Harris Hill Road/Sheridan Drive intersection. The new pump station would convey flow to the 24-inch Parallel Peanut Line in a new force main.									
Year (n)	Capital Cost	Energy Cost (annual)	PS Maint Cost (annual)	Force Main Pigging Cost (10 yr. maint.)	MH Repair Cost (10 year)	MH Repair Cost (25 yr. maint.)	Sewer flushing Cost (5 yr. maint.)	Wet Well Cleaning Cost (10 yr. maint.)	Total Annual Cost	PW Cost[3]
0	$58,600,000									$ 58,600,000
1		$ 46,897	$ (59,400)						$ (12,503)	$ (12,023)
2		$ 48,303	$ (61,182)						$ (12,879)	$ (11,907)
3		$ 49,753	$ (63,017)						$ (13,265)	$ (11,792)
4		$ 51,245	$ (64,908)						$ (13,663)	$ (11,679)
5		$ 52,783	$ (66,855)				$ 22,201		$ 8,128	$ 6,681
6		$ 54,366	$ (68,861)						$ (14,495)	$ (11,456)
7		$ 55,997	$ (70,927)						$ (14,930)	$ (11,345)
8		$ 57,677	$ (73,055)						$ (15,378)	$ (11,236)
9		$ 59,407	$ (75,246)						$ (15,839)	$ (11,128)
10		$ 61,189	$ (77,504)	$ 5,570	$ 19,058		$ 25,737	$ (4,170)	$ 29,880	$ 20,186
11		$ 63,025	$ (79,829)						$ (16,804)	$ (10,915)
12		$ 64,916	$ (82,223)						$ (17,308)	$ (10,810)
13		$ 66,863	$ (84,690)						$ (17,827)	$ (10,706)
14		$ 68,869	$ (87,231)						$ (18,362)	$ (10,603)
15		$ 70,935	$ (89,848)				$ 29,836		$ 10,924	$ 6,065
16		$ 73,063	$ (92,543)						$ (19,480)	$ (10,400)
17		$ 75,255	$ (95,320)						$ (20,064)	$ (10,300)
18		$ 77,513	$ (98,179)						$ (20,666)	$ (10,201)
19		$ 79,838	$ (101,125)						$ (21,286)	$ (10,103)
20		$ 82,233	$ (104,158)	$ 7,485	$ 25,612		$ 34,588	$ (5,604)	$ 40,157	$ 18,327
21		$ 84,700	$ (107,283)						$ (22,583)	$ (9,910)
22		$ 87,241	$ (110,501)						$ (23,260)	$ (9,815)
23		$ 89,859	$ (113,817)						$ (23,958)	$ (9,720)
24		$ 92,554	$ (117,231)						$ (24,677)	$ (9,627)
25		$ 95,331	$ (120,748)			$ 725,471	$ 40,097		$ 740,151	$ 277,643
26		$ 98,191	$ (124,370)						$ (26,179)	$ (9,443)
27		$ 101,137	$ (128,102)						$ (26,965)	$ (9,352)
28		$ 104,171	$ (131,945)						$ (27,774)	$ (9,262)
29		$ 107,296	$ (135,903)						$ (28,607)	$ (9,173)
30		$ 110,515	$ (139,980)	$ 10,059	$ 34,421		$ 46,484	$ (7,531)	$ 53,967	$ 16,639
31		$ 113,830	$ (144,179)						$ (30,349)	$ (8,997)
32		$ 117,245	$ (148,505)						$ (31,260)	$ (8,911)
33		$ 120,763	$ (152,960)						$ (32,197)	$ (8,825)
34		$ 124,385	$ (157,549)						$ (33,163)	$ (8,740)
35		$ 128,117	$ (162,275)				$ 53,887		$ 19,729	$ 5,000
36		$ 131,961	$ (167,143)						$ (35,183)	$ (8,573)
37		$ 135,919	$ (172,158)						$ (36,238)	$ (8,491)
38		$ 139,997	$ (177,322)						$ (37,326)	$ (8,409)
39		$ 144,197	$ (182,642)						$ (38,445)	$ (8,328)
40		$ 148,523	$ (188,121)	$ 13,519	$ 46,259		$ 62,470	$ (10,122)	$ 72,528	$ 15,107
41		$ 152,978	$ (193,765)						$ (40,787)	$ (8,169)
42		$ 157,568	$ (199,578)						$ (42,010)	$ (8,090)
43		$ 162,295	$ (205,565)						$ (43,271)	$ (8,012)
44		$ 167,164	$ (211,732)						$ (44,569)	$ (7,935)
45		$ 172,179	$ (218,084)				$ 72,420		$ 26,514	$ 4,539
46		$ 177,344	$ (224,627)						$ (47,283)	$ (7,783)
47		$ 182,664	$ (231,366)						$ (48,701)	$ (7,709)
48		$ 188,144	$ (238,307)						$ (50,162)	$ (7,634)
49		$ 193,788	$ (245,456)						$ (51,667)	$ (7,561)
50		$ 199,602	$ (252,819)	$ 18,168	$ 62,168	$ 1,518,975	$ 83,955	$ (13,603)	$ 1,616,446	$ 227,454
									TOTAL 50 -YEAR PRESENT WORTH	**$ 58,813,000**
									50-yr PW of O&M only	$ 213,000

Notes:

1. 5-and 20-yr O&M Costs are calculated on O&M Costs worksheet.
2. Future Annual Cost = Present Annual Cost x $(1 + \text{Inflation Rate})^{\text{Year}} = A_o(1+I)^n$ (present annual costs located on the O&M Costs worksheet)
3. Present Worth Cost = PW = Future Annual Cost / $(1 + \text{Interest Rate})^{\text{Year}} = F / (1 + i)^n$
4. PW value rounded to nearest $1,000.

50-YEAR LIFE CYCLE COSTS

OPTION 1B + 3

Interest Rate = 4.0%

Inflation Rate = 3.0%

Year (n)	Capital Cost	Energy Cost (annual)	PS Maint Cost (annual)	Force Main Pigging Cost (10 yr. maint.)	MH Repair Cost (10 year)	MH Repair Cost (25 yr. maint.)	Sewer flushing Cost 5 yr. maint.)	Wet Well Cleaning Cost (10 yr. maint.)	Total Annual Cost	PW Cost[3]
	Options 1B + 3 - Replace the EHPS with a larger EHPS at its current location and convey flow to a new pump station at the Harris Hill Road/Sheridan Drive intersection that would then convey flow to the 24-inch Parallel Peanut Line in a new force main.									
0	$43,300,000									$ 43,300,000
1		$ 55,624	$ 37,920						$ 93,544	$ 89,947
2		$ 57,293	$ 39,058						$ 96,351	$ 89,082
3		$ 59,012	$ 40,229						$ 99,241	$ 88,225
4		$ 60,782	$ 41,436						$ 102,219	$ 87,377
5		$ 62,606	$ 42,679				$ -		$ 105,285	$ 86,537
6		$ 64,484	$ 43,960						$ 108,444	$ 85,705
7		$ 66,419	$ 45,278						$ 111,697	$ 84,881
8		$ 68,411	$ 46,637						$ 115,048	$ 84,064
9		$ 70,463	$ 48,036						$ 118,499	$ 83,256
10		$ 72,577	$ 49,477	$ 9,410	$ -		$ -	$ 4,170	$ 135,634	$ 91,629
11		$ 74,755	$ 50,961						$ 125,716	$ 81,663
12		$ 76,997	$ 52,490						$ 129,487	$ 80,877
13		$ 79,307	$ 54,065						$ 133,372	$ 80,100
14		$ 81,686	$ 55,687						$ 137,373	$ 79,330
15		$ 84,137	$ 57,357				$ -		$ 141,494	$ 78,567
16		$ 86,661	$ 59,078						$ 145,739	$ 77,811
17		$ 89,261	$ 60,850						$ 150,111	$ 77,063
18		$ 91,939	$ 62,676						$ 154,615	$ 76,322
19		$ 94,697	$ 64,556						$ 159,253	$ 75,588
20		$ 97,538	$ 66,493	$ 12,646	$ -		$ -	$ 5,604	$ 182,281	$ 83,190
21		$ 100,464	$ 68,488						$ 168,952	$ 74,142
22		$ 103,478	$ 70,542						$ 174,020	$ 73,429
23		$ 106,582	$ 72,659						$ 179,241	$ 72,723
24		$ 109,780	$ 74,838						$ 184,618	$ 72,023
25		$ 113,073	$ 77,084			$ -	$ -		$ 190,157	$ 71,331
26		$ 116,465	$ 79,396						$ 195,861	$ 70,645
27		$ 119,959	$ 81,778						$ 201,737	$ 69,966
28		$ 123,558	$ 84,231						$ 207,789	$ 69,293
29		$ 127,265	$ 86,758						$ 214,023	$ 68,627
30		$ 131,083	$ 89,361	$ 16,995	$ -		$ -	$ 7,531	$ 244,970	$ 75,529
31		$ 135,015	$ 92,042						$ 227,057	$ 67,313
32		$ 139,066	$ 94,803						$ 233,869	$ 66,666
33		$ 143,238	$ 97,647						$ 240,885	$ 66,025
34		$ 147,535	$ 100,577						$ 248,111	$ 65,390
35		$ 151,961	$ 103,594				$ -		$ 255,555	$ 64,761
36		$ 156,520	$ 106,702						$ 263,221	$ 64,139
37		$ 161,215	$ 109,903						$ 271,118	$ 63,522
38		$ 166,052	$ 113,200						$ 279,251	$ 62,911
39		$ 171,033	$ 116,596						$ 287,629	$ 62,306
40		$ 176,164	$ 120,094	$ 22,839	$ -		$ -	$ 10,122	$ 329,219	$ 68,573
41		$ 181,449	$ 123,696						$ 305,146	$ 61,114
42		$ 186,893	$ 127,407						$ 314,300	$ 60,526
43		$ 192,499	$ 131,230						$ 323,729	$ 59,944
44		$ 198,274	$ 135,166						$ 333,441	$ 59,368
45		$ 204,223	$ 139,221				$ -		$ 343,444	$ 58,797
46		$ 210,349	$ 143,398						$ 353,747	$ 58,232
47		$ 216,660	$ 147,700						$ 364,360	$ 57,672
48		$ 223,160	$ 152,131						$ 375,291	$ 57,117
49		$ 229,854	$ 156,695						$ 386,549	$ 56,568
50		$ 236,750	$ 161,396	$ 30,694	$ -	$ -	$ -	$ 13,603	$ 442,443	$ 62,257
									TOTAL 50 -YEAR PRESENT WORTH	**$ 46,922,000**
									50-yr PW of O&M only	$ 3,622,000

Notes:

1. 5-and 20-yr O&M Costs are calculated on O&M Costs worksheet.
2. Future Annual Cost = Present Annual Cost x $(1 + \text{Inflation Rate})^{\text{Year}} = A_o(1+I)^n$ (present annual costs located on the O&M Costs worksheet)
3. Present Worth Cost = PW = Future Annual Cost / $(1 + \text{Interest Rate})^{\text{Year}} = F / (1 + i)^n$
4. PW value rounded to nearest $1,000.

50-YEAR LIFE CYCLE COSTS

OPTION 4

Interest Rate = 4.0%

Inflation Rate = 3.0%

Year (n)	Capital Cost	Energy Cost (annual)	PS Maint Cost (annual)	Force Main Pigging Cost (10 yr. maint.)	MH Repair Cost (10 year)	MH Repair Cost (25 yr. maint.)	Sewer flushing Cost (5 yr. maint.)	Wet Well Cleaning Cost (10 yr. maint.)	Total Annual Cost	PW Cost[3]
	Option 4 - Upsize EHPS at or near its existing location and construct a new force main on Transit Road to the 24-inch Parallel Peanut Line Sewer									
0	$29,600,000									$ 29,600,000
1		$ 6,666	$ 10,000						$ 16,666	$ 16,025
2		$ 6,866	$ 10,300						$ 17,166	$ 15,871
3		$ 7,072	$ 10,609						$ 17,681	$ 15,718
4		$ 7,284	$ 10,927						$ 18,211	$ 15,567
5		$ 7,503	$ 11,255				$ -		$ 18,758	$ 15,418
6		$ 7,728	$ 11,593						$ 19,321	$ 15,269
7		$ 7,960	$ 11,941						$ 19,900	$ 15,122
8		$ 8,198	$ 12,299						$ 20,497	$ 14,977
9		$ 8,444	$ 12,668						$ 21,112	$ 14,833
10		$ 8,698	$ 13,048	$ 5,653	$ -		$ -	$ -	$ 27,399	$ 18,510
11		$ 8,959	$ 13,439						$ 22,398	$ 14,549
12		$ 9,227	$ 13,842						$ 23,070	$ 14,409
13		$ 9,504	$ 14,258						$ 23,762	$ 14,271
14		$ 9,789	$ 14,685						$ 24,475	$ 14,134
15		$ 10,083	$ 15,126				$ -		$ 25,209	$ 13,998
16		$ 10,386	$ 15,580						$ 25,965	$ 13,863
17		$ 10,697	$ 16,047						$ 26,744	$ 13,730
18		$ 11,018	$ 16,528						$ 27,546	$ 13,598
19		$ 11,349	$ 17,024						$ 28,373	$ 13,467
20		$ 11,689	$ 17,535	$ 7,598	$ -		$ -	$ -	$ 36,822	$ 16,805
21		$ 12,040	$ 18,061						$ 30,101	$ 13,209
22		$ 12,401	$ 18,603						$ 31,004	$ 13,082
23		$ 12,773	$ 19,161						$ 31,934	$ 12,956
24		$ 13,156	$ 19,736						$ 32,892	$ 12,832
25		$ 13,551	$ 20,328			$ -	$ -		$ 33,879	$ 12,708
26		$ 13,957	$ 20,938						$ 34,895	$ 12,586
27		$ 14,376	$ 21,566						$ 35,942	$ 12,465
28		$ 14,807	$ 22,213						$ 37,020	$ 12,345
29		$ 15,252	$ 22,879						$ 38,131	$ 12,227
30		$ 15,709	$ 23,566	$ 10,211	$ -		$ -	$ -	$ 49,485	$ 15,257
31		$ 16,180	$ 24,273						$ 40,453	$ 11,993
32		$ 16,666	$ 25,001						$ 41,667	$ 11,877
33		$ 17,166	$ 25,751						$ 42,917	$ 11,763
34		$ 17,681	$ 26,523						$ 44,204	$ 11,650
35		$ 18,211	$ 27,319				$ -		$ 45,530	$ 11,538
36		$ 18,757	$ 28,139						$ 46,896	$ 11,427
37		$ 19,320	$ 28,983						$ 48,303	$ 11,317
38		$ 19,900	$ 29,852						$ 49,752	$ 11,208
39		$ 20,497	$ 30,748						$ 51,245	$ 11,101
40		$ 21,112	$ 31,670	$ 13,722	$ -		$ -	$ -	$ 66,504	$ 13,852
41		$ 21,745	$ 32,620						$ 54,365	$ 10,888
42		$ 22,397	$ 33,599						$ 55,996	$ 10,783
43		$ 23,069	$ 34,607						$ 57,676	$ 10,680
44		$ 23,761	$ 35,645						$ 59,407	$ 10,577
45		$ 24,474	$ 36,715				$ -		$ 61,189	$ 10,475
46		$ 25,208	$ 37,816						$ 63,024	$ 10,375
47		$ 25,965	$ 38,950						$ 64,915	$ 10,275
48		$ 26,744	$ 40,119						$ 66,863	$ 10,176
49		$ 27,546	$ 41,323						$ 68,868	$ 10,078
50		$ 28,372	$ 42,562	$ 18,441	$ -	$ -	$ -	$ 13,603	$ 102,978	$ 14,490
									TOTAL 50 -YEAR PRESENT WORTH	**$ 30,256,000**
									50-yr PW of O&M only	$ 656,000

Notes:

1. 5-and 20-yr O&M Costs are calculated on O&M Costs worksheet.
2. Future Annual Cost = Present Annual Cost x $(1 + \text{Inflation Rate})^{\text{Year}} = A_o(1+I)^n$ (present annual costs located on the O&M Costs worksheet)
3. Present Worth Cost = PW = Future Annual Cost / $(1 + \text{Interest Rate})^{\text{Year}} = F / (1 + i)^n$
4. PW value rounded to nearest $1,000.

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS
ALTERNATE ANALYSIS

Item	Notes	Summary of Individual Construction Costs	OPTIONS 1A +2	OPTIONS 1B +2	OPTIONS 1A +3	OPTIONS 1B +3	OPTION 4
Parallel Peanut Line Costs	(1)	$ 3,818,195	$ 3,818,195	$ 3,818,195	$ 3,818,195	$ 3,818,195	$ 3,818,195
Upsizing of Eastern Hills Pump Station		$ 2,530,000	$ -	$ 2,530,000	$ -	$ 7,120,000	$ 2,530,000
Harris Hill Gravity Sewers	(4)	$ 46,392,035	$ -	$ -	$ -	$ -	$ -
Spaulding Lake Sewer District	(2)	$ 4,452,318	$ -		$ -	$ -	$ -
Clarence Research Park WWTP	(3)	$ 548,618	$ -	$ -	$ -	$ -	$ -
Opt 1A - Eliminate PSs and Install Gravity		$ 21,330,000	$ 21,330,000	$ -	$ 21,330,000	$ -	$ -
Opt 1B - Replace EHPS and FM to Harris Hill/Sheridan		$ 5,000,000	$ -	$ 5,000,000	$ -	$ 5,000,000	$ -
Opt 2 - Harris Hill Gravity to Peanut Line		$ 17,430,000	$ 17,430,000	$ 17,430,000	$ -	$ -	$ -
Opt 3 - Harris Hill Forcemain to Peanut Line	(5)	$ 10,230,000	$ -	$ -	$ 10,230,000	$ 10,230,000	$ -
Opt 4 - Transit Rd Forcemain		$ 11,550,000	$ -	$ -	$ -	$ -	$ 11,550,000
CSD9 Connection	(6)	$ 7,760,000	$ -	$ -	$ -	$ -	$ -
Option Total Cost		**n/a**	**$ 42,578,195**	**$ 28,778,195**	**$ 35,378,195**	**$ 26,168,195**	**$ 17,898,195**
Contingency	30%	n/a	$ 12,773,459	$ 8,633,459	$ 10,613,459	$ 7,850,459	$ 5,369,459
SUBTOTAL			**$ 55,351,654**	**$ 37,411,654**	**$ 45,991,654**	**$ 34,018,654**	**$ 23,267,654**
Contractor Mobilization	3%	n/a	$ 1,660,600	$ 1,122,400	$ 1,379,800	$ 1,020,600	$ 698,100
General Conditions, Bonds, and Insurances	3%	n/a	$ 1,660,600	$ 1,122,400	$ 1,379,800	$ 1,020,600	$ 698,100
SUBTOTAL			**$ 58,672,854**	**$ 39,656,454**	**$ 48,751,254**	**$ 36,059,854**	**$ 24,663,854**
Engineering, Legal, and Administration	20%	n/a	$ 11,734,600	$ 7,931,300	$ 9,750,300	$ 7,212,000	$ 4,932,800
TOTAL PROJECT COST (2023)			**$ 70,500,000**	**$ 47,600,000**	**$ 58,600,000**	**$ 43,300,000**	**$ 29,600,000**

Notes:
1. Costs from GHD September 2023 cost estimate for PPL, required for all options
2. Costs from 2014 Spaulding Lake Sewer District Feasibility Study for Spaulding Lake Sewer District Collection System, updated to 2023 costs using ENR CCI values
3. Costs from 2014 Spaulding Lake Sewer District Feasibility Study for Clarence Research Park, updated to 2023 costs using ENR CCI values
4. Costs from 2013 Harris Hill Sanitary Sewer Cost Analysis (GPI), updated to 2023 costs using ENR CCI values
5. Costs for Option 3 pump station is more expensive because it includes costs for EHPS upsizing + Costs for new PS at Harris Hill Road/Sheridan Drive
6. CSD9 Expansion not previously detailed in any reports, JMD estimated costs based on existing residences

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS

Option 1A - Eliminate EHPS and BSPS and install gravity sewers from each to Harris Hill / Sheridan Drive intersection

Item	Description	Quantity	Unit	Cost per Unit	Total
1	10" PVC and Pvmnt Restoration (12' to <20' deep)	1,600	LF	$ 470.00	$ 752,000.00
2	10" PVC and Pvmnt Restoration (20' to 35' deep)	2,262	LF	$ 700.00	$ 1,583,407.70
3	12" PVC and Pvmnt Restoration (12' to <20' deep)	876	LF	$ 500.00	$ 437,972.00
4	12" PVC and Pvmnt Restoration (20' to 35' deep)	2,196	LF	$ 740.00	$ 1,624,680.36
5	15" PVC and Pvmnt Restoration (12' to <20' deep)	567	LF	$ 650.00	$ 368,488.25
6	15" PVC and Pvmnt Restoration (20' to 35' deep)	1,518	LF	$ 900.00	$ 1,365,903.00
7	15" PVC and Pvmnt Restoration (35'+ deep)	3,326	LF	$ 1,050.00	$ 3,492,412.35
8	Rock Excavation	44,730	CY	$ 200.00	$ 8,945,944.79
9	Connection to Existing sewer	3	EA	$ 8,000.00	$ 24,000.00
10	5 Ft. Dia Precast Manhole	1,033	VLF	$ 450.00	$ 464,845.50
11	Manhole Frame and cover	36	EA	$ 1,183.00	$ 42,588.00
12	Mill one 12ft wide lane on Sheridan Drive	8,400	SY	$ 4.50	$ 37,800.00
13	Overly 2" top course one 12ft lane on Sheridan Drive	2,256	TON	$ 150.00	$ 338,333.33
				SUBTOTAL	$ 19,478,375.28
12	Work Zone Traffic Control	1	LS	$ 1,460,878.15	$ 1,460,878.15
13	Survey Operations (2% Construction Cost)	1	LS	$ 389,567.51	$ 389,567.51
				SUBTOTAL	*$ 21,328,820.93*
				ROUNDED	***$ 21,330,000.00***

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS

Option 1B - Replace EHPS and install foremain to Harris Hill / Sheridan Drive intersection

Item	Description	Quantity	Unit	Cost per Unit	Total
1	12" PVC and Pvmnt Restoration (<8' deep)	8,500	LF	$ 300.00	$ 2,550,000.00
2	Ductile Iron Fittings	17,000	LB	$ 22.00	$ 374,000.00
3	Pipe Interconnection at Pump Station	1	EA	$ 50,000.00	$ 50,000.00
4	Connection to Discharge Manhole	1	EA	$ 2,000.00	$ 2,000.00
5	Air release valve and chamber	2	EA	$ 32,500.00	$ 65,000.00
6	Rock Excavation	5,667	CY	$ 200.00	$ 1,133,333.33
7	Mill one 12ft wide lane on Sheridan Drive	8,400	SY	$ 4.50	$ 37,800.00
8	Overly 2" top course one 12ft lane on Sheridan Drive	2,333	TON	$ 150.00	$ 350,000.00
				SUBTOTAL	$ 4,562,133.33
7	Work Zone Traffic Control	1	LS	$ 342,160.00	$ 342,160.00
8	Survey Operations (2% Construction Cost)	1	LS	$ 91,242.67	$ 91,242.67
				SUBTOTAL	*$ 4,995,536.00*
				ROUNDED	***$ 5,000,000.00***

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS

Option 2 - HARRIS HILL GRAVITY LINE TO PEANUT LINE SEWER

Item	Description	Quantity	Unit	Cost per Unit	Total
1	18" PVC and Pvmnt Restoration (<8' deep)	3,278	LF	$ 380.00	$ 1,245,488.38
2	18" PVC and Pvmnt Restoration (8' to <12' deep)	3,588	LF	$ 450.00	$ 1,614,543.75
3	18" PVC and Pvmnt Restoration (12' to 20' deep)	1,617	LF	$ 590.00	$ 953,952.12
4	24" PVC and Lawn Restoration (<8' deep)	717	LF	$ 520.00	$ 372,840.00
5	24" PVC and Lawn Restoration (8' to <12' deep)	4,508	LF	$ 500.00	$ 2,254,199.00
6	24" PVC and Lawn Restoration (12' to <20' deep)	5,617	LF	$ 650.00	$ 3,650,764.65
7	24" PVC and Lawn Restoration (20' to 35' deep)	717	LF	$ 920.00	$ 660,028.24
8	Mill one 12ft wide lane on Harris Hill	10,700	SY	$ 4.50	$ 48,150.00
9	Overly 2" top course one 12ft lane on Harris Hill	1,204	TON	$ 150.00	$ 180,562.50
10	Rock Excavation	15,340	CY	$ 200.00	$ 3,067,980.21
11	Connection to Existing sewer	2	EA	$ 8,000.00	$ 16,000.00
12	6 Ft. Dia Precast Manhole	908	VLF	$ 480.00	$ 435,940.80
13	Manhole Frame and cover	57	EA	$ 1,183.00	$ 67,431.00
14	Gott Creek Crossing	120	LF	$ 900.00	$ 108,000.00
15	Tree Removal	200	EA	$ 1,500.00	$ 300,000.00
16	Tree Replacement	50	EA	$ 750.00	$ 37,500.00
17	Right-of-way accquisition	1	LS	$ 140,000.00	$ 140,000.00
				SUBTOTAL	$ 15,153,380.65
18	Work Zone Traffic Control	1	LS	$ 1,969,939.49	$ 1,969,939.49
19	Survey Operations	1	LS	$ 303,067.61	$ 303,067.61
				SUBTOTAL	*$ 17,426,387.75*
				ROUNDED	***$ 17,430,000.00***

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS

Option 3 - HARRIS HILL FORCE MAIN TO PEANUT LINE SEWER

Item	Description	Quantity	Unit	Cost per Unit	Total
1	18" PVC and Pvmnt Restoration (<8' deep)	8,100	LF	$ 380.00	$ 3,078,000.00
2	18" PVC and Lawn Restoration (<8' deep)	11,950	LF	$ 340.00	$ 4,063,000.00
3	Pipe Interconnection at Pump Station	1	EA	$ 25,000.00	$ 25,000.00
4	Connection to Discharge Manhole	1	EA	$ 10,000.00	$ 10,000.00
5	Air release valve and chamber	4	EA	$ 100,000.00	$ 400,000.00
6	Mill one 12ft wide lane on Harris Hill	10,700	SY	$ 4.50	$ 48,150.00
7	Overly 2" top course one 12ft lane on Harris Hill	1,204	TON	$ 150.00	$ 180,562.50
8	Rock Excavation	2,494	CY	$ 200.00	$ 498,750.00
9	Gott Creek Crossing	120	LF	$ 900.00	$ 108,000.00
10	Tree Removal	200	EA	$ 1,500.00	$ 300,000.00
11	Tree Replacement	50	EA	$ 750.00	$ 37,500.00
12	Right-of-way accquisition	1	LS	$ 140,000.00	$ 140,000.00
				SUBTOTAL	$ 8,888,962.50
18	Work Zone Traffic Control	1	LS	$ 1,155,565.13	$ 1,155,565.13
19	Survey Operations	1	LS	$ 177,779.25	$ 177,779.25
				SUBTOTAL	*$ 10,222,306.88*
				ROUNDED	***$ 10,230,000.00***

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS

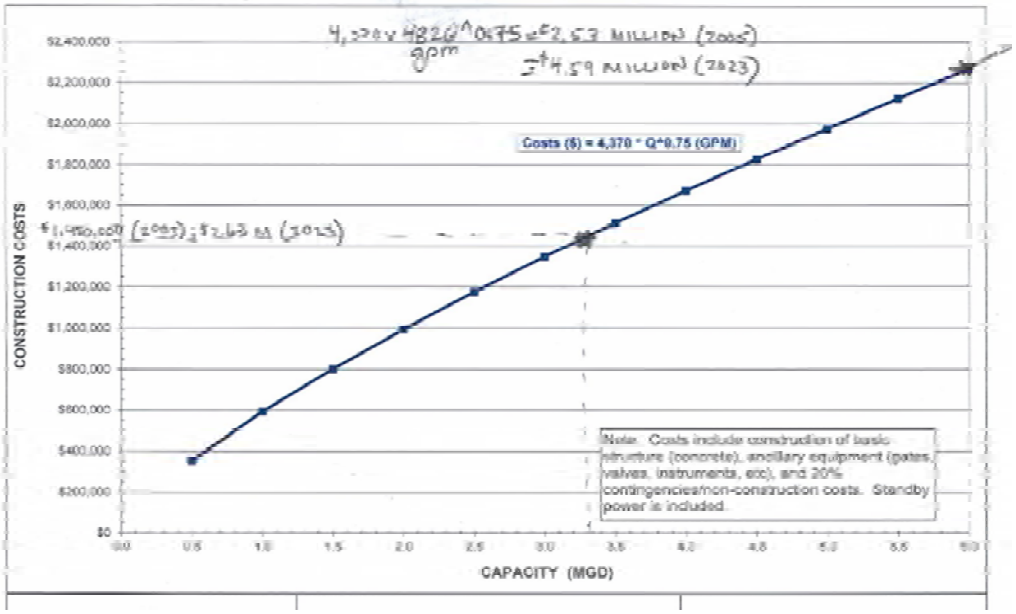
Option 4 - TRANSIT ROAD FORCEMAIN

Item	Description	Quantity	Unit	Cost per Unit	Total
1	16" PVC and Sidewalk Restoration (<8' deep)	7,871	LF	$ 320.00	$ 2,518,720.00
2	16" PVC and Pvmt Restoration (<8' deep)	10,320	LF	$ 360.00	$ 3,715,200.00
3	Ductile Iron Fittings	36,382	LB	$ 22.00	$ 800,404.00
4	Typical concrete driveway apron replacment	25	EA	$ 4,800.00	$ 120,000.00
5	Pipe Interconnection at Pump Station	1	EA	$ 25,000.00	$ 25,000.00
6	Connection to Discharge Manhole	1	EA	$ 10,000.00	$ 10,000.00
7	Air release valve and chamber	3	EA	$ 150,000.00	$ 450,000.00
8	Mill one 12ft wide lane on Transit Rd	33,000	SY	$ 4.50	$ 148,500.00
9	Tack Coat	3,300	Gallon	$ 6.00	$ 19,800.00
10	2" Asphalt Overlay	4,000	TON	$ 150.00	$ 600,000.00
11	Concrete Curb Replacement	500	LF	$ 40.00	$ 20,000.00
12	Replace Pavement Markings	1	LS	$ 45,000.00	$ 45,000.00
13	Replace Traffic Signal Detector Loops	1	LS	$ 50,000.00	$ 50,000.00
14	Commerical Driveway Replacement	17	EA	$ 10,000.00	$ 170,000.00
15	Rock Excavation	4,386	CY	$ 225.00	$ 986,805.56
16	Jack and Bore 24" Steel Casing Under Maple & Klein	235	LF	$ 1,500.00	$ 352,500.00
17	Boring Launch and Recieving Pits and Shoring	2	EA	$ 50,000.00	$ 100,000.00
18	Stream Crossings	175	LF	$600	$ 105,000.00
19	Tree Removal	50	EA	$ 1,500.00	$ 75,000.00
20	Tree Replacement	50	EA	$ 750.00	$ 37,500.00
21	Landscape Restoration	1	LS	$ 200,000.00	$ 200,000.00
22	Right-of-way accquisition	1	LS	$ 130,000.00	$ 130,000.00
				SUBTOTAL	$ 10,679,429.56
23	Work Zone Traffic Control	1	LS	$ 650,000.00	$ 650,000.00
24	Survey Operations	1	LS	$ 214,000.00	$ 214,000.00
				SUBTOTAL	*$ 11,543,429.56*
				ROUNDED	***$ 11,550,000.00***

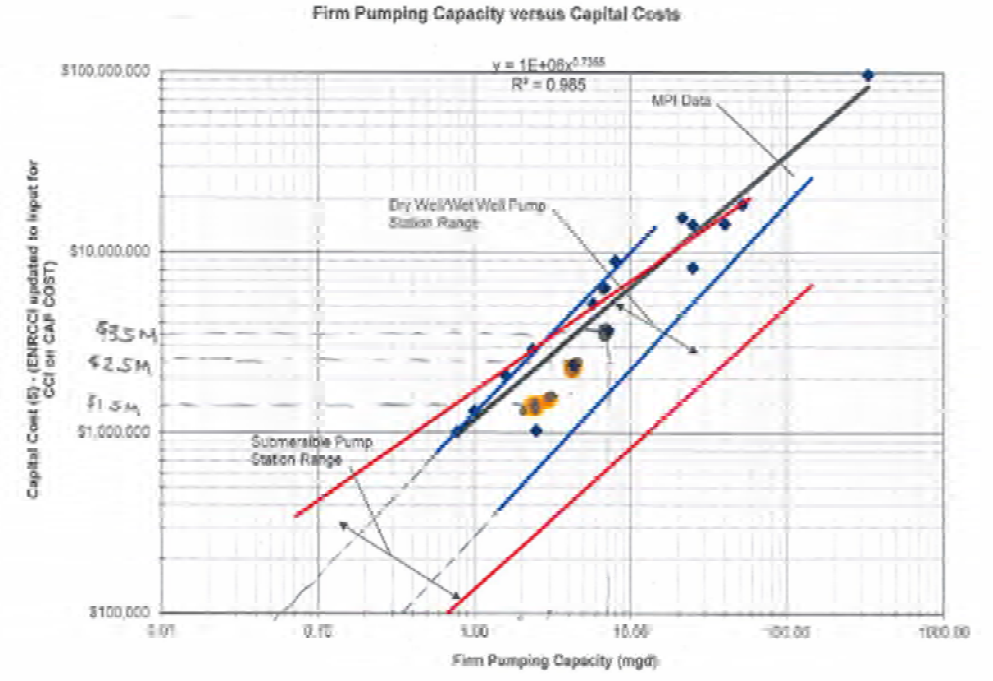
2005 ENR 7,445.98
2013 ENR 9540.59

2005 DOLLARS - EPA

4,370 x 820^0.75 = $2.53 MILLION (2005)
gpm
= $4.59 MILLION (2023)



2023 DOLLARS



November 13, 2017 Quote from Sewer Specialty Services Company, Inc. for 6-inch to 21-inch sanitary sewer pipe

					updated to 2023$		
10 hour day rate	$	3,200	per day	(includes cleaning, CCTV, Root and protruding tap removal)	$	388	per hour
traffic control	$	1,000	per day				
grout day rate	$	3,200	per day		$	388	per hour
chemical grout	$	10	per gal		$	12	per gallon
CIPP day rate	$	3,200	per day				
CIPP repair sleeve	$	1,100	ea	(8" x 48")			
CIPP repair sleeve	$	650	ea	(8" x 24")			

Can clean and televise between 2300 and 3000 LF per day

November 10, 2017 Quote from Pipe Eye Sewer for 6-inch to 21-inch sanitary sewer pipe

CCTV and light cleaning	$	0.93	per LF
havey jet/vac cleaning	$	295	per hour
Push camera work	$	235	per hour
smoke testing	$	0.74	per LF
Water for cleaning	$	12.00	per 1000 gallons
traffic control	$	1,800	total
	$	3,000	total

September 27, 2021 ECDSM Bid Tab for Contract No. 86

CCTV Inspection (8" - 12")	$	3	per LF	100 LF total length
	$	6	per LF	100 LF total length
	$	48	per LF	100 LF total length
CCTV Inspection (12" - 24")	$	4	per LF	50 LF total length
	$	9	per LF	50 LF total length
	$	86	per LF	50 LF total length

PERIODIC MAINTENANCE COSTS

Assumptions:

1. Assume pigging of force mains every 10 years
2. Assume 10- and 25-year manhole maintenance for gravity sewers
3. Assume jet cleaning of gravity sewers every 5 years

				EASTERN HILLS OPTIONS					
Quantities		**EHPS Existing**	**BSPS Existing**	**1A**	**1B**	**2**	**3**	**4**	**CSD9 PH 2**
	LF of force main	2600	2090	0	8500	0	20050	18191	0
	size of force main	8"	6"	N/A	12"	N/A	15"	12"	N/A
	LF of gravity sewer	0	1	12344	0	20041	0	0	14271
	size of gravity sewer	N/A	N/A	10", 12", 15"	N/A	18", 24"	N/A	N/A	8"
	# of sanitary manholes	0	0	36	0	57	0	0	69
	VLF of manholes	0	0	1033	0	908	0	0	553

Force Main Pigging

assume 1X per FM every 10 years									
Total footage of FM	LF	2600	2090	0	8500	0	20050	18191	0
No. of 8-hr days to complete	days	0.23	0.18	0	0.74	0.00	1.74	1.58	0
Cost per hour	$/hr	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388
Total cost per cleaning	**$**	**$ 702**	**$ 564**	**$ -**	**$ 2,293**	**$ -**	**$ 5,410**	**$ 4,908**	**$ -**

Manhole Repair - sealing of cracks and joints

assume 1X per MH every 10 years									
total number of MHs	#	0	0	36	0	57	0	0	69
No. of days to complete	days	0	0	4.5	0	7.125	0	0	8.625
Cost per hour	$/hr	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388
Labor Cost	$	$ -	$ -	$ 13,963	$ -	$ 22,108	$ -	$ -	$ 26,762
Grout quantity	gallons	0	0	18	0	28.5	0	0	34.5
Material Cost	$	$ -	$ -	$ 218	$ -	$ 345	$ -	$ -	$ 418
Total Estimated Cost	**$**	**$ -**	**$ -**	**$ 14,181**	**$ -**	**$ 22,453**	**$ -**	**$ -**	**$ 27,180**

Manhole Repair - cementitious/epoxy liner and chimney seal replacement

assume 1X per MH every 25 years									
total number of MHs	#	0	0	36	0	57	0	0	69
Cost per MH for chimney seal	$/MH	$ 299	$ 299	$ 299	$ 299	$ 299	$ 299	$ 299	$ 299
Chimney Seal Cost	$	$ -	$ -	$ 10,764	$ -	$ 17,043	$ -	$ -	$ 20,631
Cost per VLF for cementitious lining	$/VLF	$ 325	$ 325	$ 325	$ 325	$ 325	$ 325	$ 325	$ 325
Cementitious Lining Cost	$	$ -	$ -	$ 335,725	$ -	$ 295,100	$ -	$ -	$ 179,725
Total Estimated Cost	**$**	**$ -**	**$ -**	**$ 346,489**	**$ -**	**$ 312,143**	**$ -**	**$ -**	**$ 200,356**

Flushing Gravity Sewer

Assume flushing/jetting every 5 years									
Total footage of gravity sewer	LF	0	0	12344	0	20041	0	0	14271
No. of 8 hour days to complete	days	0.0	0.0	6.2	0.0	10.0	0.0	0.0	7.1
Cost per hour	$/hr	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388
Total Estimated Cost	**$**	**$ -**	**$ -**	**$ 19,151**	**$ -**	**$ 31,092**	**$ -**	**$ -**	**$ 22,140**

Cleaning PS wet well (assumed every 10 years)

Assume every 10 years									
Assume 8 hours, 2 man crew	$/hr	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388	$ 388
No. of hours to complete	hours	8	8	0	8	0	8	8	0
Total estimated cost per cleaning	$	$ 3,103	$ 3,103	$ -	$ 3,103	$ -	$ 3,103	$ 3,103	$ -

ENERGY USE CALCULATIONS

Option 1B - to Harris Hill

Option 4 to 24" Peanut Line sewer

Pumping Energy at EHPS, including flows from BSPS			**Existing**	**Proposed with Phase 1**	**Proposed with Phase 2**	**Proposed with Phase 3**	**Proposed with Phase 1**	**Proposed with Phase 2**	**Proposed with Phase 3**
Project Feed Rate		gpm	625	1597	1770	2251	1597	1770	2251
Feed Pressure		psi	19.5	25.1	27.7	36.2	26.0	29.2	39.7
		ft	45	57.91	63.99	83.63	59.99	67.47	91.65
No. of Pumps Operating		#	1	1	1	1	1	1	1
Pump Efficiency		%	76.4%	76.4%	76.4%	76.4%	76.4%	76.4%	76.4%
Motor Efficiency		%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%	97.0%
Water Horsepower (WHP)		hp	7	23	29	48	24	30	52
Brake Horsepower (BHP)		hp	9	31	37	62	32	39	68
Motor Horsepower		hp	10	32	39	64	33	41	70
Power Draw		kW	7	24	29	48	24	30	52
Hours of Operation per year		hrs/yr	1752	1752	1752	1752	1752	1752	1752
Power Consumption		kWh / yr	12,526	41,191	50,443	83,842	42,670	53,189	91,884
Misc Power Use (Lighting/HVAC)	5%	kWh / yr	626	2,060	2,522	4,192	2,133	2,659	4,594
Total Power Use		kWh / yr	13,152	43,250	52,965	88,034	44,803	55,848	96,478
Power Cost		per kWh	$0.08	$0.08	$0.08	$0.08	$0.08	$0.08	$0.08
Annual Power Cost		$/yr	**$ 1,052**	**$ 3,460**	**$ 4,237**	**$ 7,043**	**$ 3,584**	**$ 4,468**	**$ 7,718**

Pumping Energy at BSPS only (to be used to calculate savings with pump station elimination elimination)			**Existing**	
Project Feed Rate		gpm	550	BSPS Pump Curve
Feed Pressure		psi	50.6	Calculated
		ft	117	BSPS Pump Curve
No. of Pumps Operating		#	1	
Pump Efficiency		%	76.4%	Assumed, based on typical pump curve
Motor Efficiency		%	97.0%	assumed based on motor size
Water Horsepower (WHP)		hp	16	WHP = (flow in gpm) * (head in feet) / 3960 = water hp.
Brake Horsepower (BHP)		hp	21	BHP = (WHP) / (pump efficiency)) = brake horsepower
Motor Horsepower		hp	22	Motor hp = (BHP) / (motor efficiency)
Power Draw		kW	16	motor hp x 0.746 to convert to KW
Hours of Operation per year		hrs/yr	1226	Assumed similar to existing which is 14% of the time
Power Consumption		kWh / yr	20,061	calculation
Misc Power Use (Lighting/HVAC)	5%	kWh / yr	1,003	Assumed 5% of total costs to cover lights, instrumentation, etc.)
Total Power Use		kWh / yr	21,064	Power consumption + misc. power use
Power Cost		per kWh	$0.08	Assumed because Erie County gets discounted rate due to bulk purchase
Annual Power Cost		$/yr	**$ 1,685**	

ENERGY USE

Option 3 - New EHPS full buildout + Harris Hill

Pumping Energy at new Pump station, including Harris Hill flows			**Proposed**	
Project Feed Rate		gpm	4827	From "EH + BS + HH-M" tabl in "Flow Calculations" Spreadsheet", Cell L3
Feed Pressure		psi	119.0	calculated from the row below
		ft	274.86	Calculated to the right
No. of Pumps Operating		#	1	Assumed
Pump Efficiency		%	76.4%	Assumed
Motor Efficiency		%	97.0%	Assumed
Water Horsepower (WHP)		hp	335	WHP = (flow in gpm) * (head in feet) / 3960 = water hp.
Brake Horsepower (BHP)		hp	439	BHP = (WHP) / (pump efficiency)) = brake horsepower
Motor Horsepower		hp	452	Motor hp = (BHP) / (motor efficiency)
Power Draw		kW	337	motor hp x 0.746 to convert to KW
Hours of Operation per year		hrs/yr	1752	Assumed similar to existing at 20%
Power Consumption		kWh / yr	590,880	
Misc Power Use (Lighting/HVAC)	5%	kWh / yr	29,544	
Total Power Use		kWh / yr	620,424	
Power Cost		per kWh	$0.08	
Annual Power Cost		$/yr	**$ 49,634**	

Operations Labor per Pump Station (EHPS and BSPS)			
Visits per Week		3	
Hrs per Visit		2	
Men per Visit		2	
Total man-hours per year		624	
Hourly rate	$	82.50	Assumed salary + fringe benefits
Operations Labor Cost	$	51,480	

Annual Maintenance - Current Stations (EHPS+BSPS)			
Parts	$	10,000	
Labor Hours		96	8 hours per month on average
Labor Costs	$	7,920	
Total Maintenance	$	17,920	

Annual Maintenance - Expanded EHPS			
Parts	$	20,000	
Labor Hours		96	8 hours per month on average
Labor Costs	$	7,920	
Total Mainten	$	27,920	

CALCULATION OF PUMP TDH FOR VARIOUS FLOWS FOR USE IN ENERGY CALCULATIONS

Option 1B **Flow Rates from Uniland Development DSCA; TDH calculated below, New EHPS to corner of Sheridan and Harris Hill Road.**

Phase 1	1597 gpm	57.91 ft TDH	2.30 MGD	
Phase 2	1770 gpm	63.99 ft TDH	2.55 MGD	
Phase 3	2251 gpm	83.63 ft TDH	3.24 MGD	

Option 1B - New EHPS to corner of Sheridan and Harris Hill Road.

Phase 1	Force main size =	14 inches	As shown on Option 1B figure	Q=	3.56	cfs
	Length of force main=	8500 LF	determined on profile by Terrana	v=	3.33	fps
	Rim of Pump Station	700.7	Approximate			
	Pump off	681.08	from DSCA			
	Invert at highest point	710.00	from Terrana's Profile			
	Static head difference	28.92 ft	Calculation			
	Additional LF for fittings	212.5 ft (2.5%)	Assumptions			
	c-value	120	per Ten States Standards			
	headloss	**29.0 ft**	Calculated			
Phase 2	**headloss**	**35.07 ft**	Calculated using Phase 2 flow and same FM parameters as above			
			Q= 3.94 cfs	v=	3.69	fps
Phase 3	headloss	**54.71 ft**	ers as above			
			Q= 5.02 cfs	v=	4.69	fps

Option 4 - New EHPS with force main north along Transit Road

Phase 1	1597 gpm	59.99 ft TDH	Calculated below
Phase 2	1770 gpm	67.47 ft TDH	
Phase 3	2251 gpm	91.65 ft TDH	

Option 4

Phase 1	Force main size =	16	inches	As shown on Option 1B figure
	Length of force main=	20050	LF	determined on profile by Terrana
	Rim of Pump Station	700.7		Approximate
	Pump off	681.08		from DSCA
	Invert at highest point	705.38		from profile of existing force main
	Static head difference	24.30	ft	Calculation
	Additional LF for fittings	501.25	ft (2.5%)	Assumptions
	c-value	120		per Ten States Standards
	headloss	**35.69**	**ft**	Calculated
Phase 2	**headloss**	**43.17**	**ft**	Calculated using Phase 2 flow and same FM parameters as above
Phase 3	**headloss**	**67.35**	**ft**	Calculated using Phase 2 flow and same FM parameters as above

v=	2.55	fps
v=	2.82	fps
v=	3.59	fps

With Harris Hill and Main St. Area (Option 3)

Force main size =	16	inches	As shown on Option 1B figure
Length of force main=	18191	LF	determined on profile by Terrana
Rim of Pump Station	700.7		Approximate
Pump off	681.08		from DSCA
Invert at highest point	705.38		from profile of existing force main which should be highest point, after by which will flow by gravity
Static head difference	24.30	ft	Calculation
Additional LF for fittings	454.78	ft (2.5%)	Assumptions
c-value	120		per Ten States Standards
headloss + static head = TDH	**274.86**	**ft**	Calculated

Q=	6.95	MGD
	4826	gpm
	10.8	cfs

v=	7.70	fps

ECSD5 TRANSIT ROAD SANITARY SEWER COSTS

Clarence Sewer District 9 Phase 2 Connection

Item	Description	Quantity	Unit	Cost per Unit	Total
1	8" PVC and Pvmnt Restoration (<8' deep)	12,953	LF	$ 255.00	$ 3,303,078.75
2	8" PVC and Pvmnt Restoration (8 to <12' deep)	4,318	LF	$ 315.00	$ 1,360,091.25
3	House/Building lateral	184	EA	$ 2,000.00	$ 368,000.00
4	Rock Excavation	11,940	CY	$ 200.00	$ 2,388,088.89
5	Connection to Existing MH	5	EA	$ 2,000.00	$ 10,000.00
6	5 Ft. Dia Precast Manhole	553	VLF	$ 450.00	$ 248,702.40
7	Manhole Frame and cover	69	EA	$ 1,183.00	$ 81,726.37
				SUBTOTAL	*$ 7,759,687.66*
				ROUNDED	***$ 7,760,000.00***