Engineering and Land Surveying, P.C.

TOWN OF QUEENSBURY

WARREN COUNTY, NEW YORK

Capacity Analysis for Bay Road Sewer System

August, 2016

MJ Project #960.02

EXECUTIVE SUMMARY

- The Town of Queensbury (Town) in Warren County, New York owns and operates existing sanitary sewer infrastructure along Bay Road (County Road 7). The expansion of sanitary sewer in this area of the Town has occurred over the last 20 years through the creation of various sewer districts.

- The Town contracted with MJ Engineering and Land Surveying, P.C. (MJ) in November 2014 to conduct a capacity study, including the build-out of parcels which contribute sanitary sewer flows to the Bay Road sewer system.

- While performing the build-out study, environmental constraints (wetlands) were not taken into account when determining the allowable buildable area.

- The results of the 2014 build-out study yielded flows which were determined to be too conservative and required major sewer infrastructure upgrades.

- In July 2015, the build-out study was refined to include constrained lands. The flows developed were more accurate due to the reduction of buildable area.

- The Town has recently updated its' zoning code within the study area and has requested MJ to analyze five (5) new scenarios.

- The scenarios to be analyzed are as follows:
    - Scenario 1 - All residential with no setbacks.
    - Scenarios 2 & 3 - Build-out as zoned when applying 600 & 1,000-foot residential setbacks.
    - Scenarios 4 & 5 - Build-out in accordance with current development trends when applying 600 & 1,000-foot residential setback.

- A factor of 3,300 SF/Acre was used pursuant to the Town's request when performing the non-residential build-out in accordance with current development trends, a factor of 3,300 SF/Acre was used.

- The build-out performed for this analysis, in particular the density calculations for residential and non-residential properties, were performed as directed by the Town.

- The Town requested that the area included in the density calculations under each scenario be the area within or outside of the proposed set-back. The current Town zoning code does not state which portion of the property should be used when performing density calculations. Based on the results of this Study the Town may want to adjust the language in the zoning code as it pertains to the areas used when performing density calculations.

- 30 parcels were reorganized as undeveloped or underutilized.

- The build-out of properties located on Bay Road under each modeled scenario yielded similar results due to the size of the parcels, as well as the location of the wetlands on the particular parcel.

- The peak hourly flow to the Willowbrook pump station, when modeling Scenario 5, produced the lowest peak hourly flow, of 410 gallons per minute (GPM).

- The peak hourly flow to the Willowbrook pump station, when modeling Scenario 1, produced the highest peak hourly flow, of 462 gallons per minute (GPM).

- The estimated peak hourly flow when modeling all Scenarios is above the current pumping capacity of the Willowbrook pump station of 333 GPM.

- Upgrades are needed at the Willowbrook pump station in order to accommodate the projected peak flows for all modeled scenarios.

- In previous reports, upgrades of the Willowbrook pump station had been limited to 425 GPM based on the infrastructure and reserved capacities for other tributaries on Cronin Road.

- Due to changes in the build-out criteria described above, sewer flows from Glenwood Avenue have decreased. Based on the revised build-out criteria the infrastructure on Cronin Road has capacity to accept more flows from a larger upgrade to the Willowbrook pump station.

- However, if the Willowbrook pump station is upgraded above 425 GPM, which represents an average daily flow of 190,000 gallons per day, sewer capacities reserved for other tributaries would be impacted.

- In order to accommodate the projected peak flows, the Willowbrook pump station would need to be upgraded to pump 525 GPM.

- Upgrades are needed for the Bay Road sewer infrastructure to accommodate flows from the build-out area under all modeled scenarios.

- In order to adequately convey the projected build-out flows from all scenarios, with the Willowbrook pump station being upgraded to 425 GPM, a new manhole will be installed and a new sanitary sewer pipe will be bored under Bay Road in order to separate flows from Bay Road and Glenwood Ave.

- In order to adequately convey the projected build-out flows, with the Willowbrook pump station being upgraded to 525 GPM, three (3) pipes will need to be upgraded, in addition to the proposed improvements previously mentioned.

- The opinion of probable cost to upgrade the Willowbrook pump to 425 GPM and upgrade infrastructure in Bay Road is approximately $160,000.

- The opinion of probable cost to upgrade the Willowbrook pump to 525 GPM and upgrade infrastructure in Bay Road is approximately $436,000.

Future Conditions Capacity Analysis the Bay Road Sewer System
Town of Queensbury
MJ Project No. 960.02

Capacity Analysis for Bay Road Sewer System
August 9, 2016

To: Christopher Harrington, PE

From: Joel Bianchi, PE – MJ Engineering and Land Surveying, P.C.

PROJECT OBJECTIVE:

The Town of Queensbury (Town) in Warren County, New York owns and operates existing sanitary sewer infrastructure along Bay Road (County Road 7). The Bay Road area, as shown in Figure 1, includes multiple offices and is considered an important business corridor in the community. As such, sanitary sewer along Bay Road is vital to the operation of current and future businesses.

Sewer hydraulic studies for the Bay Road area were performed by MJ Engineering & Land Surveying, P.C. (MJ) in November of 2014 and late in 2015. The 2014 build-out study was performed assuming that there were no environmental constraints within the study area. Based on this and other assumptions made during the build-out study, flows from vacant and underutilized properties were deemed too conservative and required major updates along Bay Road.

In July 2015 the build-out study was refined and included environmental constraints. The flows developed for the 2015 build-out study were more accurate due to including environmental constraints. The results of this build-out study indicated that minimal infrastructure and pump station upgrades would be needed.

The Town has recently updated zoning within the study area and MJ was tasked with reviewing five (5) new scenarios. The scenarios which this analysis cover is as follows:

- Full build-out as zoned – sewer output impacts with all residential and no setbacks
- Full build-out as zoned – sewer output impacts with 600-foot non-residential setback.
- Full build-out in accord with current development trends – sewer output impact with 600-foot non-residential setback
- Full build-out as zoned – sewer output impact with 1,000-foot non-residential setback.
- Full build-out in accord with current development trends – sewer output impact with 1,000-foot non-residential setback.

BUILD-OUT ANALYSIS:

There are parcels within the study area, which are either vacant or potentially underutilized. In order to determine the development potential of the parcels located in the study area, a build-out analysis was completed utilizing current zoning-district bulk lot criteria. No consideration was given to theoretical planned unit developments (PUD). Figure 2 depicts the properties included in the study area, 600 and 1,000-foot setbacks, and the environmental constraints.

Per the request of the Town, five (5) build-out scenarios were performed for the properties located within the Bay Road sewer service area. Properties which are not located on Bay Road, yet contribute flows to the Bay Road infrastructure, were built-out per the existing zoning code. Properties located on Bay Road were built-out as follows:

1. Allow for full residential build-out with no setbacks.

2. Apply a 600-foot setback to all properties. Within the 600-foot setback ONLY non-residential development is allowed (Current Zoning). Beyond the 600-setback, residential development is allowed.

3. Apply a 1,000-foot setback to all properties. Within the 1,000-foot setback ONLY non-residential development is allowed (Current Zoning). Beyond the 1,000-setback, residential development is allowed.

4. Apply a 600-foot setback to all properties. Within the 600-foot setback, based on current development trends a build-out factor of 3,300 square feet per acre will be used. Beyond the 600-setback residential development is allowed.

5. Apply a 1,000-foot setback to all properties. Within the 1,000-foot setback, based on current development trends a build-out factor of 3,300 square feet per acre will be used. Beyond the 1,000-setback residential development is allowed.

A summary of each build-out scenario, including tax parcel ID, parcel size, buildable area, and projected flows, has been included as Appendix A. The following methodology and assumptions were made for each build-out scenario:

Included In All Scenarios - Commercial Intensive District Parcels (3 Parcels) - Methodology

1. The minimum lot size requirements were applied to the total area of each parcel during each scenario per the 2014 Table 1 – Area requirements in the Town of Queensbury Zoning Ordinance. Only those parcels meeting minimum lot size were advanced. All three (3) parcels were advanced in both scenarios.

2. Per direction received from the Town, the floor-to-area ratio (FAR) was then applied in order to obtain Parcel Buildable Area.
    a. Parcel Building Area = (Total Parcel Square Footage) * (FAR)

3. Per direction received from the Town, the permeability requirement was then applied in order to calculate a more accurate Parcel Buildable Area.
    a. CI District
        i. Minimum percent permeable = 30%
        ii. Maximum percent build out = 70%
        iii. Refined Parcel Buildable Area = (Parcel Buildable Area) * (70%)

4. The gross buildable area for each parcel was calculated by multiplying the maximum height allowed divided by 12.5 ft (3 floors) by the net buildable area.
    a. Within the CI District, the maximum building height is 40 ft.
    b. An assumption was made, per direction received from the Town, that there are 3 floors present in each building.
    c. Per direction received from the Town, each floor is assumed to be 12.5 feet high.

i. Gross Buildable Square Footage = (40ft/12.5ft)*(Net Buildable Area)

5. The projected maximum day flow was calculated by multiplying the gross buildable square footage by a sewage generation of 0.01 gallons per day per square foot. This rate was developed based on existing water usage data from properties within the district and of similar size. This methodology is consistent with method 3 of Section B.6.b in the latest NYSDEC Design Standards for Intermediate Wastewater Treatment Systems.
    a. Projected Max Flow = Allowable Building Floor Area * 0.01 gpd

6. The projected peak flow was calculated by multiplying the projected peak flow by the previously calculated peaking factor of 3.25.
    a. Projected Peak Flow = (Projected Max Flow)*(3.25)

Commercial Intensive District Parcels - Assumptions

1. Per direction received from the Town, no constrained lands (wetlands present including a 100-foot buffer) were applied to the commercial intensive build out calculations.

2. Per direction received from the Town, no density calculation is applicable for commercial intensive parcels, however a FAR was applied per this zoning district's bulk lot requirements.

3. Parcels with existing structures included.

4. The gross buildable square footage calculation assumes 12.5 ft per floor (3 floors) per structure.

5. The gross buildable square footage excludes streets and utilities.

6. Any parcel with a negative gross buildable area (square feet) is assumed to have a gross buildable area of zero.

Included In All Scenarios - Office District Parcels (5 Parcels) - Methodology

Application of Residential and Non-Residential Density to parcels not located along Bay Road.

Residential Density Application

1. Two build outs were performed on five (5) Office (O) District parcels identified by the Town. The first build out applied a residential density calculation and is described below.

2. Per direction received from the Town, the buildable square footage was calculated by removing the respective environmental constraints (wetlands with a 100-foot buffer) from the total parcel square footage.

3. The landscaped area requirement was applied to the buildable square footage. The landscaped area requirement is 15%.

4. Per the zoning district's density application found in the 2014 Table 1 – Area requirements in the Town of Queensbury Zoning Ordinance, 1 acre may contain 8 dwelling units. The number of dwelling units is then calculated by multiplying the number of acres available by the number eight (8).

5. Next, the total number of bedrooms found on the parcel was applied. An assumption was made, per direction received from the Town, that there are 3 bedrooms per dwelling.

6. The projected maximum day flow was calculated by multiplying the number of bedrooms by a sewage generation factor of 80 gallons per day per bedroom. NYSDEC allows for a 20% reduction in flow for establishments equipped with water saving plumbing fixtures.

    a. Projected Max Flow = Number of Bedrooms * 80 gpd

7. The projected peak flow was calculated by multiplying the projected peak flow by the previously calculated peaking factor of 3.25.
    a. Projected Peak Flow = (Projected Max Flow/1440 min/day)*(3.25)

Office District Parcels -Assumptions

1. Parcel, federal and state wetland data was provided by the Town. It was assumed that this is the most current and accurate data. Please note that no wetland delineation was conducted as a part of this effort.

2. Parcels with existing structures were included.

3. The gross buildable square footage excludes streets and utilities.

4. Any parcel with constrained lands (square feet) greater than the gross buildable area footprint (square feet) is assumed to have a net buildable area of zero.

5. Constrained lands include wetlands, 100-foot wetland buffer, and setback.

Scenario 1 - Office District Parcels, All Residential, No Setback Applied (As Zoned) - Methodology
Per the Town of Queensbury's zoning, residential density was applied to entire parcel.

1. A build out was performed on twenty two (22) Office (O) District parcels identified by the Town.

2. Per direction received from the Town, the buildable square footage was calculated by removing the respective environmental constraints (wetlands with a 100-foot buffer) from the total parcel square footage.

3. The landscaped area requirement was applied to the buildable square footage. The landscaped area requirement is 15%.

4. Per the zoning district's density application found in the 2014 Table 1 – Area requirements in the Town of Queensbury Zoning Ordinance, 1 acre may contain 8 dwelling units. The number of dwelling units is then calculated by multiplying the number of acres available by the number eight (8).

5. Next, the total number of bedrooms found on the parcel was applied. An assumption was made, per direction received from the Town, that there are 3 bedrooms per dwelling.

6. The projected maximum day flow was calculated by multiplying the number of bedrooms by a sewage generation factor of 80 gallons per day per bedroom. NYSDEC allows for a 20% reduction in flow for establishments equipped with water saving plumbing fixtures.

    a. Projected Max Flow = Number of Bedrooms * 80 gpd

7. The projected peak flow was calculated by multiplying the projected peak flow by the previously calculated peaking factor of 3.25.
    a. Projected Peak Flow = (Projected Max Flow/1440 min/day)*(3.25)

Scenario 2/Scenario 3 - Office District Parcels with 600/1,000-foot Setback Applied (As Zoned) - Methodology

Per the Town of Queensbury's zoning, residential density was applied to parcel area beyond 600/1,000-foot and non-residential density was applied to parcel area within the 600/1,000-foot setback.

Residential Beyond 600-Foot Setback Application

1. A build out was performed on fourteen (14) Office (O) District parcels identified by the Town.

2. Per directions received from the Town, the buildable square footage was calculated by using the parcel square footage outside of the 600/1,000-foot setback. Environmental constraints (wetlands with a 100-foot buffer) located beyond the 600/1,000-foot setback were removed to produce the gross buildable area beyond the 600/1,000-foot setback.

3. The landscaped area requirement was applied to the buildable square footage. The landscaped area requirement is 15%..

4. Per the zoning district's density application found in the 2014 Table 1 – Area requirements in the Town of Queensbury Zoning Ordinance, 1 acre may contain 8 dwelling units. The number of dwelling units is then calculated by multiplying the net buildable area, in acres, by 8 units per acre.

5. Next, the total number of bedrooms found on the parcel was applied. An assumption was made per direction received from the Town, that there are 3 bedrooms per dwelling unit.

6. The projected maximum daily flow was calculated by multiplying the number of bedrooms by a sewage generation factor of 80 gallons per day per bedroom. NYSDEC allows for a 20% reduction in flow for establishments equipped with water saving plumbing fixtures.
    b. Projected Max Flow = Number of Bedrooms * 80 gpd

7. The projected peak flow was calculated by multiplying the projected peak flow by the previously calculated peaking factor of 3.25.
    c. Projected Peak Flow = (Projected Max Flow)*(3.25)

Non-Residential Within 600/1,000-Foot Setback Application

1. A build out was performed on seventeen (17) Office (O) District parcels identified by the Town.

2. Per direction received from the Town, the buildable square footage was calculated by using the parcel square footage within the 600/1,000-foot setback. Environmental constraints (wetlands with a 100-foot buffer) located within the 600/1,000-foot setback were removed to produce the gross buildable area within the 600/1,000-foot setback.

3. The landscaped area requirement was applied to the buildable square footage. The landscaped area requirement is 15%.

4. The non-residential density was applied to each of the nine (9) parcels. Per the zoning district's density application found in the 2014 Table 1 – Area requirements in the Town of Queensbury Zoning Ordinance, 7,000 square feet of floor area is allowed to be developed every 0.5 acres. This calculation netted the allowable building floor area.

5. The projected maximum day flow was calculated by determining the number of employees which would occupy the building. Per the direction from the Town a factor of 1 employee per 347 ft^2, and a sewage generation of 12 gallons per day per employee was used. This methodology is consistent with method 3 of Section B.6.b in the latest NYSDEC Design Standards for Intermediate Wastewater Treatment Systems.
    b. Projected Max Flow = Number of Employees * 12 gpd

6. The projected peak flow was calculated by multiplying the projected max flow by the previously calculated peaking factor of 3.25.
    a. Projected Peak Flow = (Projected Max Flow/1,440)*(3.25)

Office District Parcels with 600/1,000-foot Setback Applied - Assumptions

1. Parcel, federal and state wetland data was provided by the Town. It was assumed that this is the most current and accurate data. Please note that no wetland delineation was conducted as a part of this effort.

2. Parcels with existing structures were included.

3. Allowable building floor area based on density of 7,000 SF of building area per 0.5 acres for non-residential density application.

4. Allowable building floor area based on density of 1 acre per 8 dwelling units for residential density application.

5. The gross buildable square footage excludes streets and utilities.

6. Any parcel with constrained lands (square feet) greater than the gross buildable area footprint (square feet) is assumed to have a net buildable area of zero.

7. Constrained lands include wetlands, 100-foot wetland buffer, and setback.

Scenario 4/Scenario 5 - Office District Parcels with 600/1,000-foot Setback Applied (Current Development Trends) - Methodology
Per the Town of Queensbury's zoning, residential density was applied to parcel area beyond 600/1,000-foot and based on current development trends for non-residential areas inside of the setback a build-out factor of 3,300 SF/Acre was used.

Residential Beyond 600/1,000 Foot Setback Application

1. The same procedure as previously described was used.

Non-Residential Within 600/1,000-Foot Setback Application

1. The same procedure as previously described was used, however based on current development trends a build-out factor of 3,300 SF/Acre was applied to the parcel square footage within the setback and not within the wetland buffer.

BUILD-OUT FLOWS:

For each build-out scenario, only peak hourly sewer flows were calculated for the area.

A summary of these flows are outlined in the following Tables 1 - 5. A detailed summary of each scenario and associated flows has been included in Appendix B and is depicted in Figures 3-1 to 3-3. It should be noted that both residential and non-residential flows were developed for properties zoned as Office and not located on Bay Road. However, only residential flows were modeled due to the residential build-out producing higher flows.

TABLE 1
SUMMARY OF SCENARIO 1 FLOWS (ALL RESIDENTIAL, NO SETBACKS – CURRENT ZONING)

Zoning Classification	Projected Peak Flow (gpm)
Commercial District	6.22
Residential Office (Not along Bay Road)	65.54
Office (Residential)	83.39
Office (Non-Residential)	NA

TABLE 2
SUMMARY OF SCENARIO 2 FLOWS (600-FOOT SETBACK – CURRENT ZONING)

Zoning Classification	Projected Peak Flow (gpm)
Commercial District	6.22
Residential Office (Not along Bay Road)	65.54
Office (Residential)	41.57
Office (Non-Residential)	10.60

TABLE 3
SUMMARY OF SCENARIO 3 FLOWS (1,000-FOOT SETBACK – CURRENT ZONING)

Zoning Classification	Projected Peak Flow (gpm)
Commercial District	6.22
Residential Office (Not along Bay Road)	65.54
Office (Residential)	13.48
Office (Non-Residential)	17.69

TABLE 4
SUMMARY OF SCENARIO 4 FLOWS (600-FOOT SETBACK – TRENDING ZONING)

Zoning Classification	Projected Peak Flow (gpm)
Commercial District	6.22
Residential Office (Not along Bay Road)	65.54
Office (Residential)	41.57
Office (Non-Residential)	2.94

TABLE 5
SUMMARY OF SCENARIO 5 FLOWS (1,000-FOOT SETBACK – TRENDING ZONING)

Zoning Classification	Projected Peak Flow (gpm)
Commercial District	6.22
Residential Office (Not along Bay Road)	65.54
Office (Residential)	13.48
Office (Non-Residential)	4.90

HYDRAULIC MODEL:

A hydraulic model of the properties along Bay Road sanitary sewer system was developed using SewerGEMS for the previous reports in 2014 and 2015. Each scenario requested by the Town for this build-out study was analyzed using the developed model. The previous modeling procedures were used for evaluating the five (5) new build-out scenarios with one exception. As directed by the Town, the existing pump stations along Bay Road were no longer modeled as an absolute worst case condition with all pump stations operating simultaneously. Rather than each pump station in operation, flows from the individual properties which contribute flows to these pump stations were used. Based on the water data provided by the Town, an average daily flow was calculated. The average daily flows were then multiplied by the previously determined peaking factor of 3.25, which produced a peak hourly flow from each property. The calculated peak hourly flows were included in the model instead of the individual pump

station flows as in previous reports. Table 6 is a summary of the projected peak hourly flows to the Willowbrook pump station under each scenario. A breakdown of the flows for each scenario is included in Appendix B.

TABLE 6

SUMMARY OF PEAK HOURLY FLOWS TO THE WILLOWBROOK PUMP STATION

Scenario	Pumped Flow (GPM)
Scenario 1	462
Scenario 2	439
Scenario 3	417
Scenario 4	434
Scenario 5	410

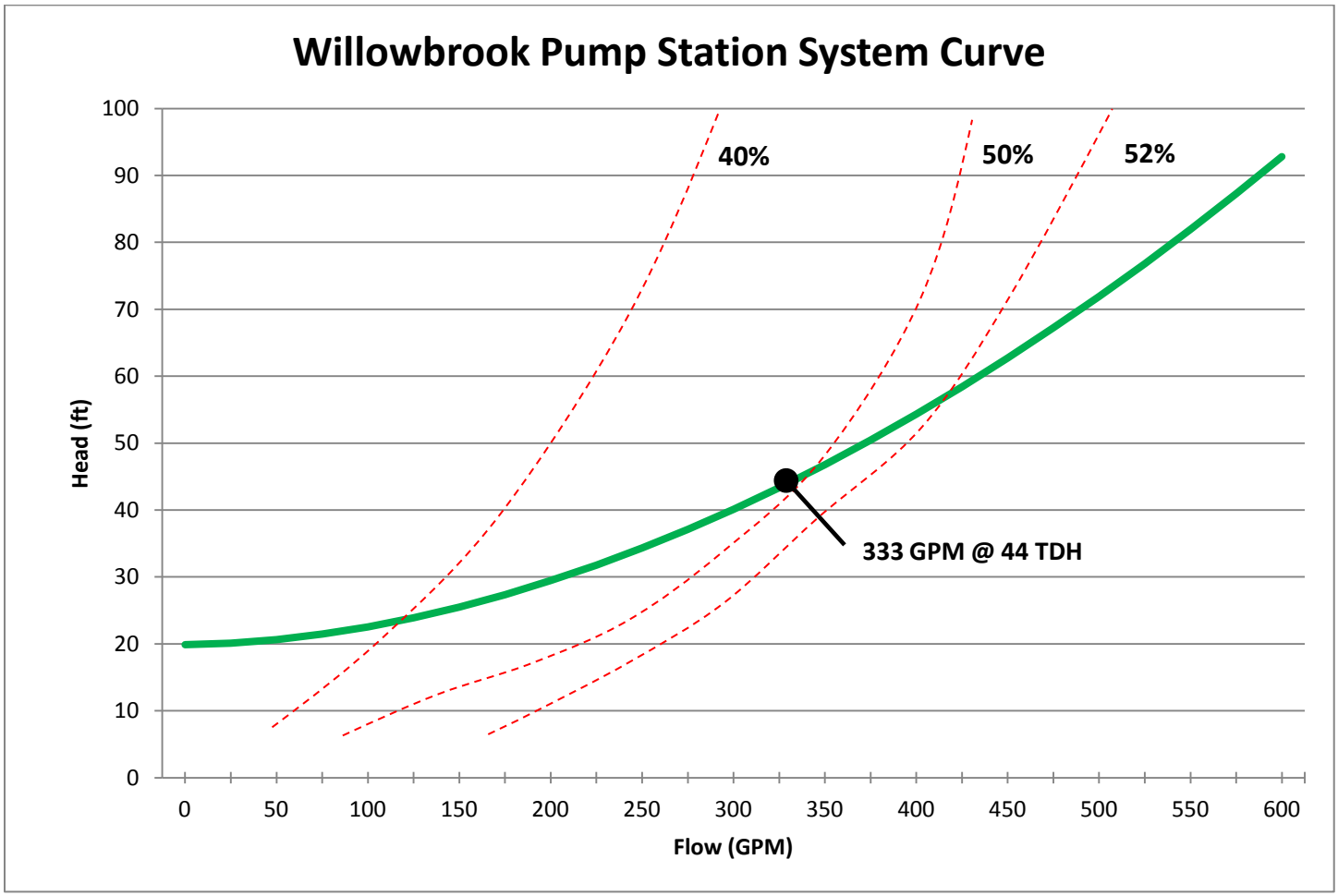
SYSTEM CURVE:

A system-head curve is a graphical representation of the relationship between flow and hydraulic losses in a given piping system. In order to determine the system curve for the Willowbrook pump station, the total dynamic head was calculated over varying flow rates. Based on drawdown tests performed by the Town in September of 2014, the Willowbrook pump station has a pumping capacity of 333 GPM.

The operating point for the existing pumps is 333 GPM @ 44.4 TDH. The manufacturer efficiency range was obtained and shown on the system curve to determine whether the pump operating point is within the acceptable ranges. Chart 1 illustrates the system curve and operating point with the efficiency for the current pump model. The existing pump station calculations have been included in Appendix C.

CHART 1

WILLOWBROOK PUMP STATION SYSTEM CURVE



Key:

Pump Efficiency

System Head Curve

Based upon the hydraulic analysis the Willowbrook Pump Station, the pumps are operating at close to maximum pump efficiency (52%). As such, they are operating within the recommended performance ranges.

SANITARY SEWER ANALYSIS:

Model output from the SewerGEMS software including conduit number, velocity, capacity, and flow/capacity percentage were exported, tabulated, and included within Appendix D. Modeling of each scenario yielded similar results. The results of each modeled scenario were similar due to the majority of the properties which were built-out are located north of the pump station. Therefore the difference in flows does not impact the sewer infrastructure downstream of the pump station.

Based on discussions with the Wastewater Director, it is understood that there are capacities reserved for other pump stations/sewer shed areas in the system that limit the upgrade of the Willowbrook pump station. In order to limit the impact on the reserved capacity, upgrades to the Willowbrook pump station would be limited to 425 GPM. However, upgrading the Willowbrook pump station to 425 GPM would not accommodate the projected peak flows. In order to adequately convey the projected flows the Willowbrook pump station would need to be upgraded to 525 GPM. Therefore for the purpose of this report both scenarios were modeled.

Several of the pipe networks in the existing sewer district area were found to have velocities below the required velocity of 2.0 ft/s per the *Recommended Standards for Wastewater Facilities.* One (1) pipe conduit is over capacity and two (2) pipes are nearing capacity when modeling all five (5) scenarios. The noted deficiencies are listed in Table 7 and Table 8 and depicted in Figure 4.

TABLE 7
SCENARIO 1 – FLOW DEFICIENT AREAS (PUMP STATION UPGRADED TO 425 GPM)

Pipe ID	Existing Pipe Size (INCH)	Existing Capacity (GPM)	Projected Flow (GPM)	% Capacity[1]
P43	8	432	505	117

1. Pipe yields its highest % Capacity when Scenario 1 is modeled.

TABLE 8
SCENARIO 1 – FLOW DEFICIENT AREAS (PUMP STATION UPGRADED TO 525 GPM)

Pipe ID	Existing Pipe Size (INCH)	Existing Capacity (GPM)	Projected Flow (GPM)	% Capacity[1]
P21	8	557	540	97
P22	8	557	552	99
P43	8	432	657	152

1. Pipes yield highest % Capacity when Scenario 1 is modeled.

SANITARY SEWER IMPROVEMENTS:

The sanitary sewer model results from the previous reports indicate that the existing system is currently capable of serving the existing users, as well as properties included in the Town accepted map, plans, and reports. Once each scenario build-out was applied to vacant or underutilized properties in the model, one pipe conduit (P-43) indicated capacity deficiencies. To alleviate the capacity issue, the following improvements have been identified.

Pump Station Upgraded to 425 GPM - Pipe Replacement

Under the modeled scenarios for this analysis, new infrastructure would be needed prior to accepting additional flows from the Willowbrook pump station. In order to accept the upgraded flow of 425 GPM, a new manhole is needed along sanitary sewer pipe P23. From this manhole, a new 8-inch sanitary pipe would be bored under Bay Road and connected to the existing manhole (4-22)

on Cronin Road. When completed, this new infrastructure would separate Glenwood Avenue flows from flows which originate from properties north of Cronin Road. Figure 5 and Table 9 outlines the proposed infrastructure improvements.

TABLE 9
PROPOSED INFRASTRUCTURE – FULL BUILD-OUT (WILLOWBROOK @ 425 GPM)

Pipe ID	Proposed Pipe Size (IN)	Proposed Capacity (GPM)	Proposed Flow (GPM)	Capacity (%)
P23A	8	685	425	63

Installation of the new section of pipe would reduce the flows conveyed through pipes P43. By separating the flows from Glenwood Avenue and Bay Road, the existing piping (P-43) would be adequate to handle the projected flows.

Pump Station Upgraded to 525 GPM - Pipe Replacement

Under the modeled scenarios for this analysis, new infrastructure would be needed prior to accepting additional flows from Willowbrook pump station. In order to accept the upgraded flow of 525 GPM, pipes P21 and P22 would need to be upgraded. P23 should also be upgraded to avoid a larger sewer pipe discharging to a smaller pipe. In addition, the upgrades previously mentioned in order to accommodate the Willowbrook pump station being upgraded to 425 GPM would also need to be completed. Figure 5 and Table 10 outlines the proposed infrastructure improvements.

TABLE 10
PROPOSED INFRASTRUCTURE – FULL BUILD-OUT (WILLOWBROOK @ 525 GPM)

Pipe ID	Proposed Pipe Size (IN)	Proposed Capacity (GPM)	Proposed Flow (GPM)	Capacity (%)
P21	10	1,011	540	54
P22	10	1,011	552	55

Pump Station Upgrades

As discussed in previous reports, upgrades to the Willowbrook pump station would be needed to accommodate for projected peak flows. In previous reports, upgrades have been limited to 425 GPM due to the limited capacity on Cronin Road. However, with the adjustments made to the build-out, which has reduced sewer flows from properties along Glenwood Road, Cronin Road now has the excess capacity to accommodate a larger pump station. In order to adequately convey the projected peak sanitary sewer flows, the Willowbrook pump station would need to be upgraded to 525 GPM.

To increase the pumping capacity of the Willowbrook pump station to 525 GPM, the existing station would need to be removed and replaced with a new T6 Gorman Rupp pump station. The pump horsepower would be increased to 30 horsepower.

In addition, the existing 35 KW emergency standby generator is no longer adequate. The generator would need to be upgraded to a 80 KW in order to properly operate the proposed 30 HP pumps.

OPINION OF PROBABLE COSTS

The hydraulic model was analyzed with the upgraded 525 GPM pump station. When applying the higher capacity pumps in the model, two (2) additional pipes (P21 & P22) were noted to be nearing their capacity. The costs to upgrade these pipes are included in the cost estimate associated with upgrading the pump station to 525 GPM.

For the purpose of this report, the cost to upgrade the pumps to 425 GPM has also been included. Upgrading the pump station to 425 GPM would require no additional pipe improvements other than the improvements outlined in the Pipe Replacement section of this report.

Capital costs include labor and material for the physical installation of proposed facilities, professional consultation (i.e. engineering, legal, administration). The opinion of probable project costs were developed anticipating construction by competitive bid and utilizing posted wage rates for construction in accordance with the NYS Municipal Law. Table 11 & Table 12 summarize the Opinion of Probable Costs for the recommended improvements to the Bay Road Sewer infrastructure and the Willowbrook pump station for the modeled revised build-out. An itemized cost breakdown has been included in Appendix E.

TABLE 11

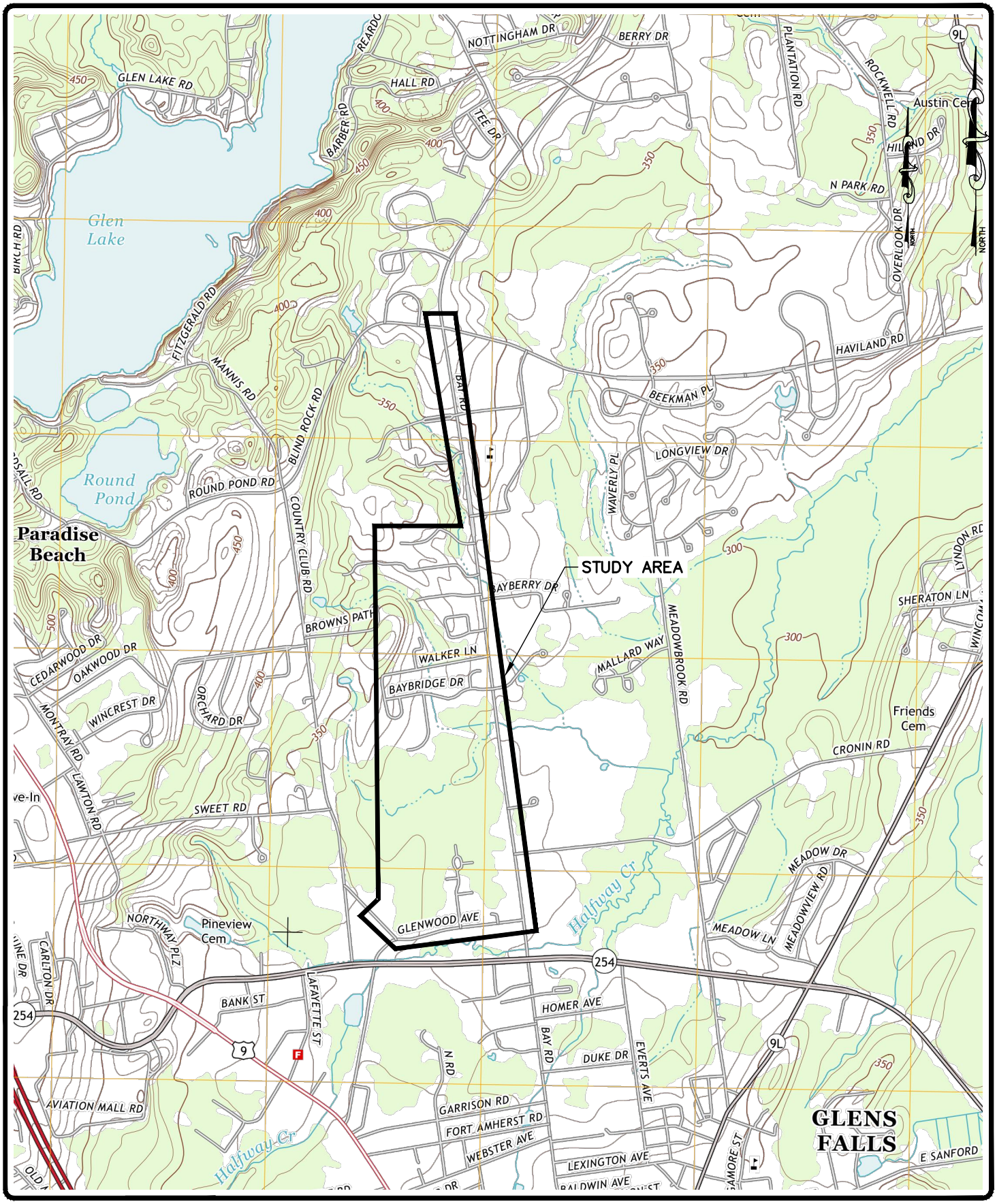
Opinion of Probable Costs – Full Build-Out Improvements (425 GPM Pump Station)

Project	Bay Road Sewer Infrastructure Replacement	Willowbrook Pump Station Upgrades
Direct Costs		
Construction	$35,700	$59,500
Bonds & Insurance (4%)	$1,600	$2,500
Contingency (30%)	$10,800	$17,900
Direct Costs Sub-total:	$48,100	$79,900
Indirect Costs:		
Engineering & Construction Administration (20%)	$9,700	$16,100
Legal, Fiscal & Administration (4%)	$2,100	$3,200
Permit Allowance (0.5%)	$400	$500
Indirect Costs Sub-total:	$12,200	$19,800
Opinion of Probable Project Costs (2016 Dollars):	**$60,300**	**$99,700**
	$160,000	

TABLE 12

Opinion of Probable Costs – Full Build-Out Improvements (525 GPM Pump Station)

Project	Bay Road Sewer Infrastructure Replacement	Willowbrook Pump Station Upgrades
Direct Costs		
Construction	$104,000	$157,400
Bonds & Insurance (4%)	$4,100	$6,300
Contingency (30%)	$31,000	$47,220
Direct Costs Sub-total:	$139,100	$211,000
Indirect Costs:		
Engineering & Construction Administration (20%)	$27,600	$42,200
Legal, Fiscal & Administration (4%)	$5,400	$8,500
Permit Allowance (0.5%)	$700	$1,100
Indirect Costs Sub-total:	$33,700	$51,700
Opinion of Probable Project Costs (2016 Dollars):	**$172,800**	**$263,200**
	$436,000	



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TOWN OF QUEENSBURY

SITE LOCATION MAP

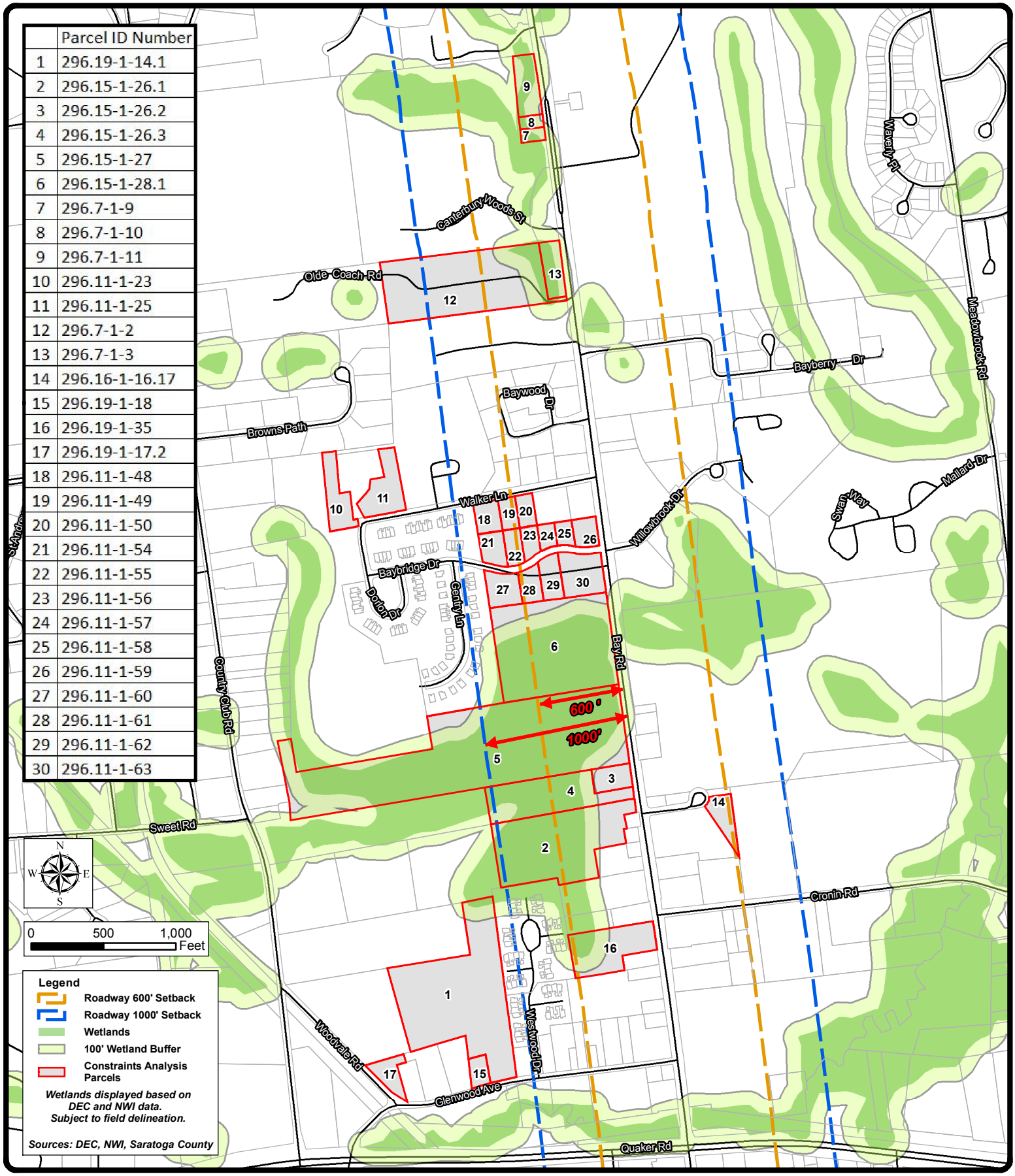
CAPACITY ANALYSIS FOR THE BAY ROAD SEWER SYSTEM

QUEENSBURY NEW YORK

SCALE:	N.T.S.
CONTRACT No.:	-
MJ PROJ. No.:	960.02
DATE:	MAY, 2016

FIG 1

File Name: L:\Projects\MJ960.01 T. Queensbury Bay Road Sewer Study\3 - Future Conditions Capacity Analysis\ENG\Report\Figures\Figure 1 - Site Location Map.dwg (Layout: FIG 1)
Date: Wed, May 04, 2016 - 11:09 AM (Name: shouser)



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TOWN OF QUEENSBURY

EXISTING ENVIRONMENTAL CONSTRAINTS

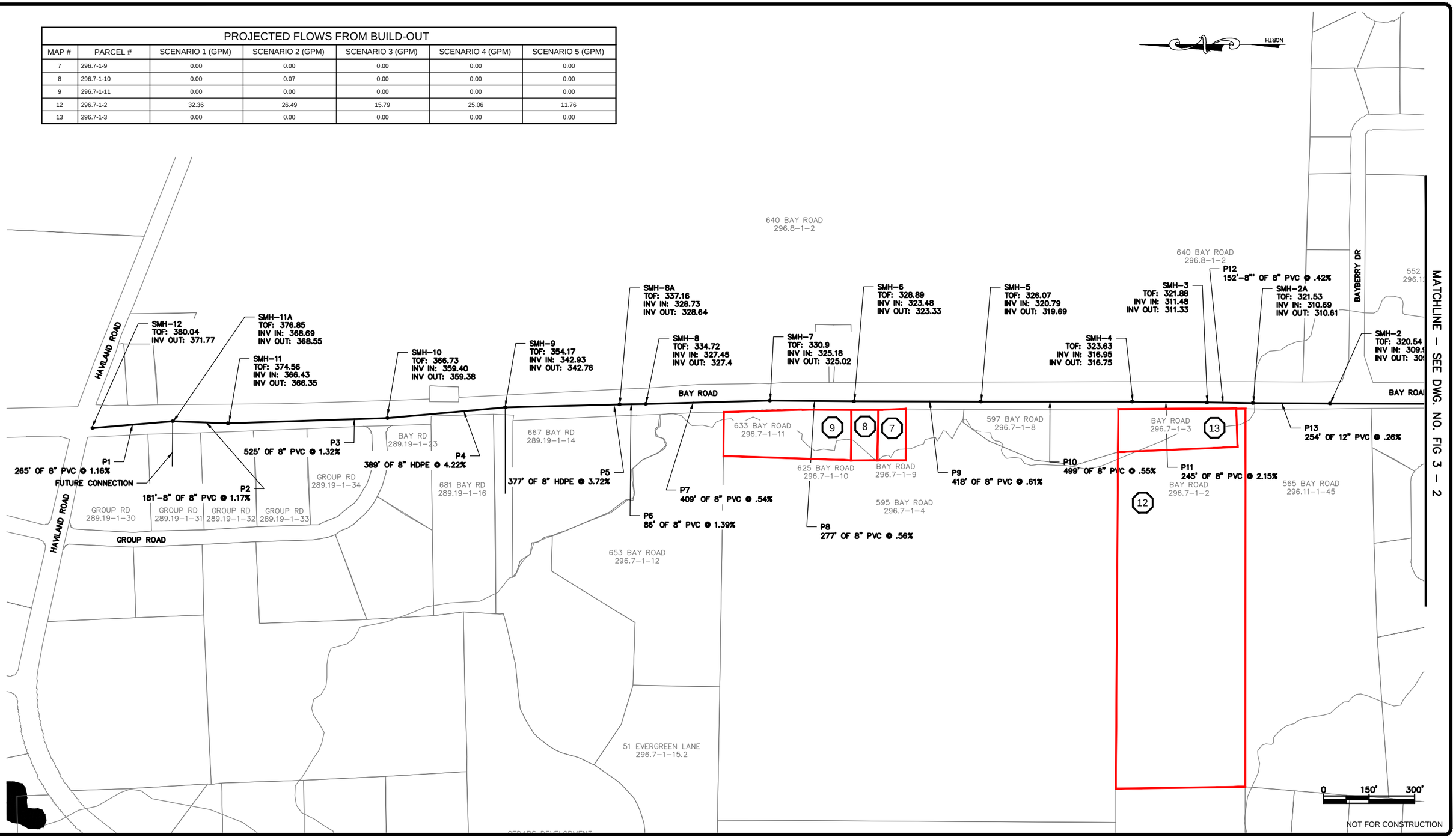
CAPACITY ANALYSIS FOR THE BAY ROAD SEWER SYSTEM

QUEENSBURY NEW YORK

SCALE: NOTED
CONTRACT No.: -
MJ PROJ. No.: 960.02
DATE: AUGUST, 2016

FIG 2

PROJECTED FLOWS FROM BUILD-OUT						
MAP #	PARCEL #	SCENARIO 1 (GPM)	SCENARIO 2 (GPM)	SCENARIO 3 (GPM)	SCENARIO 4 (GPM)	SCENARIO 5 (GPM)
7	296.7-1-9	0.00	0.00	0.00	0.00	0.00
8	296.7-1-10	0.00	0.07	0.00	0.00	0.00
9	296.7-1-11	0.00	0.00	0.00	0.00	0.00
12	296.7-1-2	32.36	26.49	15.79	25.06	11.76
13	296.7-1-3	0.00	0.00	0.00	0.00	0.00



MATCHLINE – SEE DWG. NO. FIG 3 – 2

SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE
-	-	-	-	-	-

PROJ. MANAGER:	CLD
CHIEF DESIGNER:	SDH
DESIGNED BY:	SDH
DRAWN BY:	SDH
CHECKED BY:	CLD

SEAL

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TOWN OF QUEENSBURY

SEWER INFRASTRUCTURE WITH PROJECTED BUILD-OUT FLOWS

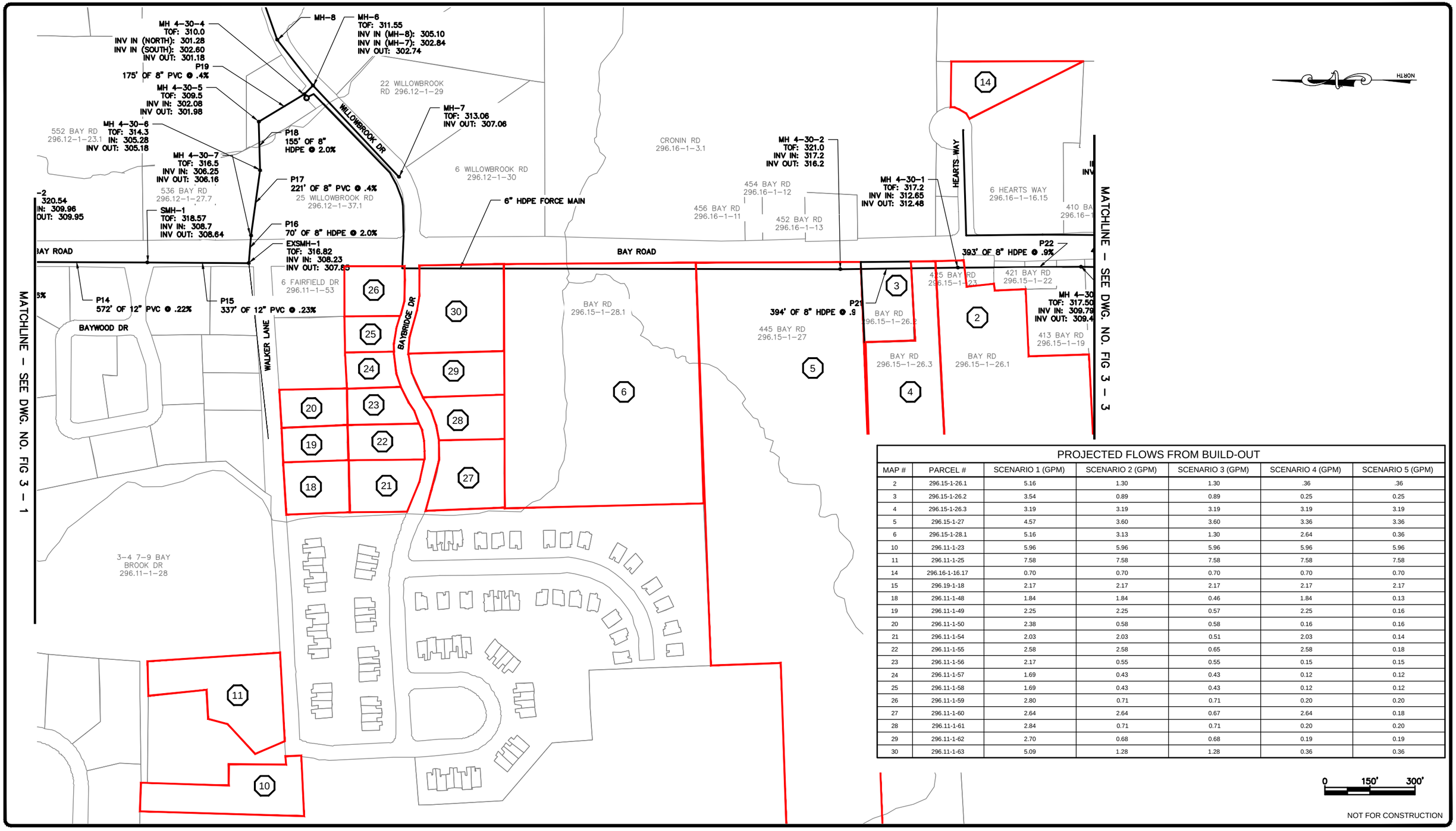
CAPACITY ANALYSIS FOR THE BAY ROAD SEWER SYSTEM

QUEENSBURY NEW YORK

SCALE:	AS SHOWN
CONTRACT No.:	-
MJ PROJ. No.:	960.02
DATE:	AUGUST, 2016

FIG 3 - 1

File Name: F:\mj\960.01\Bay Road Sewer Capacity\Queensbury Sewer Map.dwg (Layout: FIG 3 - 1)
Date: Wed, Aug 10, 2016 - 9:23 AM (Name: shouser)



PROJECTED FLOWS FROM BUILD-OUT

MAP #	PARCEL #	SCENARIO 1 (GPM)	SCENARIO 2 (GPM)	SCENARIO 3 (GPM)	SCENARIO 4 (GPM)	SCENARIO 5 (GPM)
2	296.15-1-26.1	5.16	1.30	1.30	.36	.36
3	296.15-1-26.2	3.54	0.89	0.89	0.25	0.25
4	296.15-1-26.3	3.19	3.19	3.19	3.19	3.19
5	296.15-1-27	4.57	3.60	3.60	3.36	3.36
6	296.15-1-28.1	5.16	3.13	1.30	2.64	0.36
10	296.11-1-23	5.96	5.96	5.96	5.96	5.96
11	296.11-1-25	7.58	7.58	7.58	7.58	7.58
14	296.16-1-16.17	0.70	0.70	0.70	0.70	0.70
15	296.19-1-18	2.17	2.17	2.17	2.17	2.17
18	296.11-1-48	1.84	1.84	0.46	1.84	0.13
19	296.11-1-49	2.25	2.25	0.57	2.25	0.16
20	296.11-1-50	2.38	0.58	0.58	0.16	0.16
21	296.11-1-54	2.03	2.03	0.51	2.03	0.14
22	296.11-1-55	2.58	2.58	0.65	2.58	0.18
23	296.11-1-56	2.17	0.55	0.55	0.15	0.15
24	296.11-1-57	1.69	0.43	0.43	0.12	0.12
25	296.11-1-58	1.69	0.43	0.43	0.12	0.12
26	296.11-1-59	2.80	0.71	0.71	0.20	0.20
27	296.11-1-60	2.64	2.64	0.67	2.64	0.18
28	296.11-1-61	2.84	0.71	0.71	0.20	0.20
29	296.11-1-62	2.70	0.68	0.68	0.19	0.19
30	296.11-1-63	5.09	1.28	1.28	0.36	0.36

NOT FOR CONSTRUCTION

SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE
-	-	-	-	-	-

PROJ. MANAGER:	CLD
CHIEF DESIGNER:	SDH
DESIGNED BY:	SDH
DRAWN BY:	SDH
CHECKED BY:	CLD

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TOWN OF QUEENSBURY

SEWER INFRASTRUCTURE WITH PROJECTED BUILD-OUT FLOWS

CAPACITY ANALYSIS FOR THE BAY ROAD SEWER SYSTEM

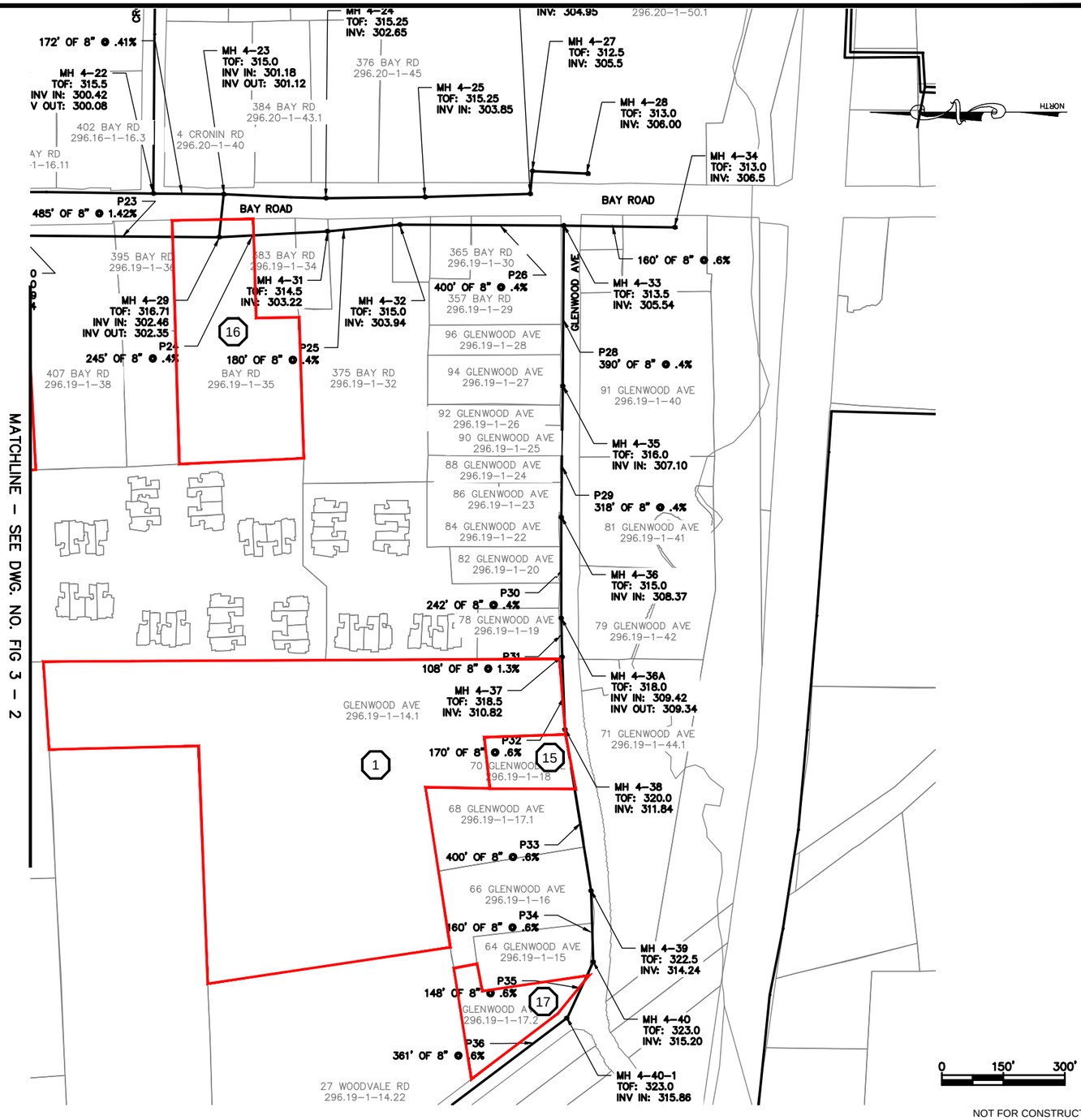
QUEENSBURY NEW YORK

SCALE: AS SHOWN
CONTRACT No.: -
MJ PROJ. No.: 960.02
DATE: AUGUST, 2016

FIG 3 - 2

File Name: F:\mj\960.01\Bay Road Sewer Capacity\Queensbury Sewer Map.dwg (Layout: FIG 3 - 2)
Date: Wed, Aug 10, 2016 - 9:23 AM (Name: shouser)

PROJECTED FLOWS FROM BUILD-OUT						
MAP #	PARCEL #	SCENARIO 1 (GPM)	SCENARIO 2 (GPM)	SCENARIO 3 (GPM)	SCENARIO 4 (GPM)	SCENARIO 5 (GPM)
1	296.19-1-14.1	46.40	46.40	46.40	46.40	46.40
15	296.19-1-18	2.17	2.17	2.17	2.17	2.17
16	196.19-1-35	2.33	2.33	2.33	2.33	2.33
17	296.19-1-17.2	3.43	3.43	3.43	3.43	3.43



NOT FOR CONSTRUCTION

File Name: F:\mj\960.01\Bay Road Sewer Capacity\Queensbury Sewer Map.dwg (Layout: FIG 3 - 3)
Date: Wed, Aug 10, 2016 - 9:23 AM (Name: shouser)

SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE
-	-	-	-	-	-

PROJ. MANAGER:	CLD
CHIEF DESIGNER:	SDH
DESIGNED BY:	SDH
DRAWN BY:	SDH
CHECKED BY:	CLD

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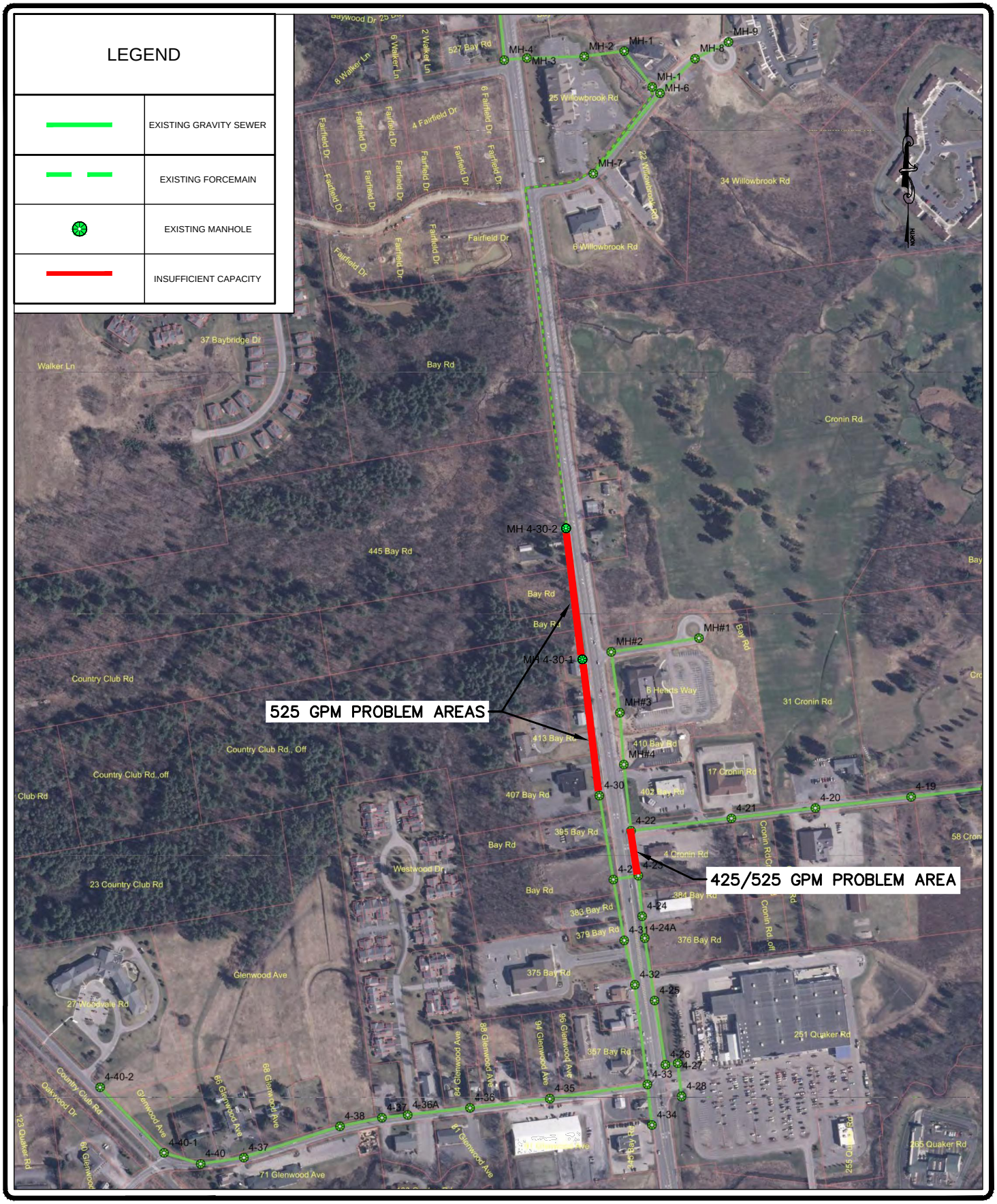
TOWN OF QUEENSBURY
SEWER INFRASTRUCTURE
WITH PROJECTED BUILD-OUT FLOWS
CAPACITY ANALYSIS FOR THE
BAY ROAD SEWER SYSTEM
QUEENSBURY NEW YORK

SCALE: AS SHOWN
CONTRACT No.: -
MJ PROJ. No.: 960.02
DATE: AUGUST, 2016

FIG 3 - 3



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TOWN OF QUEENSBURY

SEWER SYSTEM DEFICIENCIES

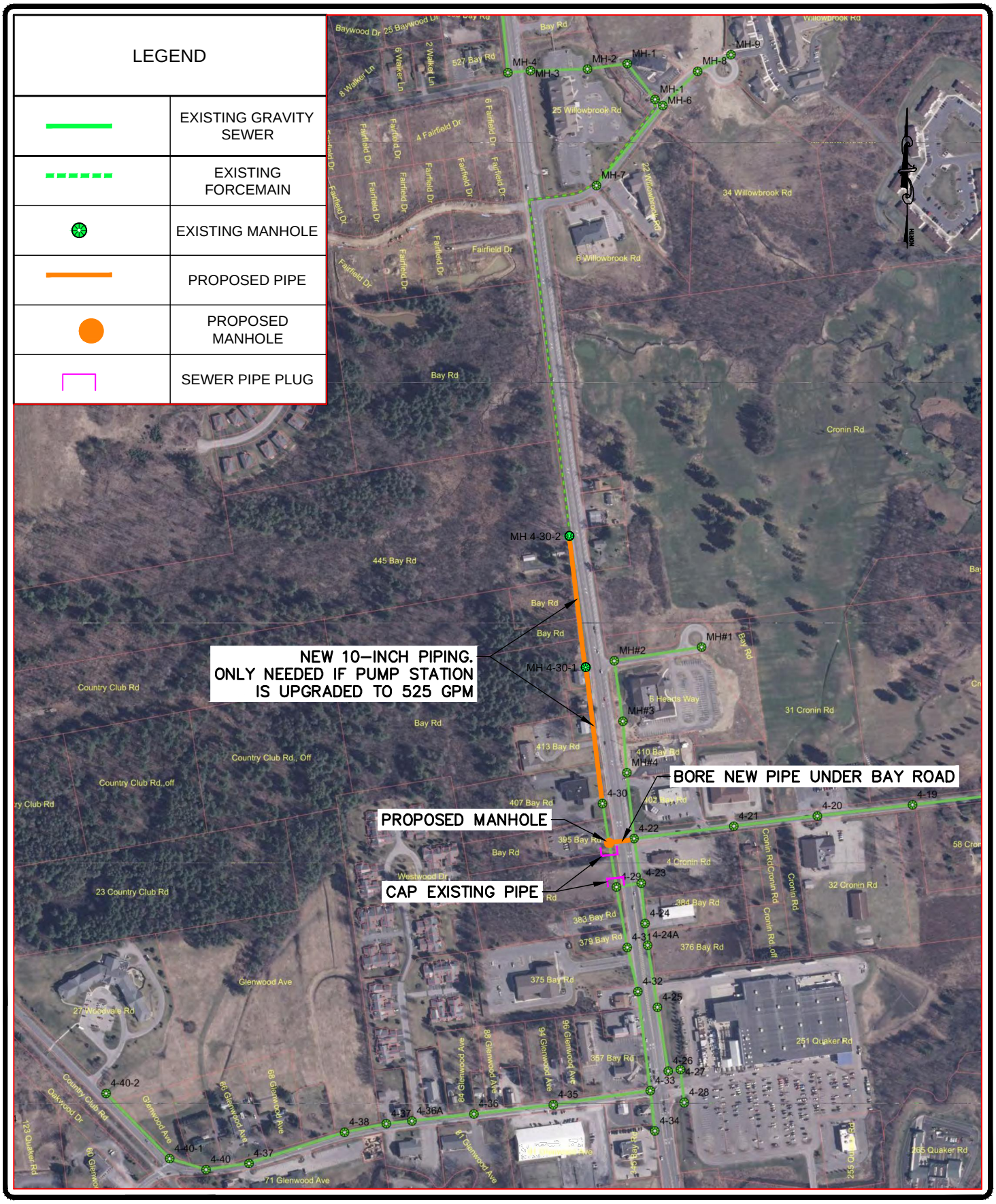
CAPACITY ANALYSIS FOR THE BAY ROAD SEWER SYSTEM

QUEENSBURY NEW YORK

SCALE:	N.T.S.
CONTRACT No.:	-
MJ PROJ. No.:	960.02
DATE:	AUGUST, 2016

FIG 4

File Name: L:\Projects\MJ960.01 T. Queensbury Bay Road Sewer Study\3 - Future Conditions Capacity Analysis\ENG\Report\Figures\Figure 2 - Problem Areas.dwg (Layout: FIG 4)
Date: Wed, Aug 10, 2016 - 10:59 AM (Name: shouser)



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TOWN OF QUEENSBURY

PROPOSED IMPROVEMENTS

CAPACITY ANALYSIS FOR THE BAY ROAD SEWER SYSTEM

QUEENSBURY NEW YORK

SCALE:	N.T.S.
CONTRACT No.:	-
MJ PROJ. No.:	960.02
DATE:	AUGUST, 2016

FIG 5

File Name: L:\Projects\MJ960.01 T. Queensbury Bay Road Sewer Study\3 - Future Conditions Capacity Analysis\ENG\Report\Figures\FIG - 3 - PROP - IMPROV.dwg (Layout: FIG 5)
Date: Wed, Aug 10, 2016 - 11:09 AM (Name: shouser)

Appendix A
Build-Out Summary

Town of Queensbury - Capacity Analysis for Bay Road
Commercial Intensive Build-Out

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Does the Parcel Meet Min Lot Size?	Floor to Area Ratio	Parcel Buildable Area (sf)	Permeability	Parcel Buildable Area (sf)	Maximum Building Height (ft)	Gross Buildable Area (sf)	Projected Max Flow (GPD)	Projected Peak Flow (GPM)
4	296.15-1-26.3	Commercial Intensive (CI)	4.829357	210,366.79	TRUE	0.3	63,110.04	0.70	44,177.03	40	141,366	1,413.66	3.19
14	296.16-1-16.17	Commercial Intensive (CI)	1.054315	45,925.96	TRUE	0.3	13,777.79	0.70	9,644.45	40	30,862	308.62	0.70
16	296.19-1-35	Commercial Intensive (CI)	3.524484	153,526.52	TRUE	0.3	46,057.96	0.70	32,240.57	40	103,170	1,031.70	2.33
												Total Projected Flow:	**6.22**

Town of Queensbury - Capacity Analysis for Bay Road
Office (Properties not located on Bay Road) Build-Out

Office Residential - Parcels Not Located on Bay Road

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Constrained Acreage	Constrained Square Footage	Buildable Square Footage	Application of Landscaped Area (15%)	Density Application[1] - # of Dwelling Units	Bedroom Factor	Total # of Bedrooms	Projected Max Flow (GPD)	Projected Peak Flow (GPM)
1	296.19-1-14.1	Office (O)	13.31	579,829.10	0.71	30,927.60	548,901.50	466,566.28	85.69	3.0	257	20,560.00	46.40
10	296.11-1-23	Office (O)	1.62	70,731.80	0.00	0.00	70,731.80	60,122.03	11.04	3.0	33	2,640.00	5.96
11	296.11-1-25	Office (O)	2.07	90,101.60	0.00	0.00	90,101.60	76,586.36	14.07	3.0	42	3,360.00	7.58
15	296.19-1-18	Office (O)	0.60	26,071.80	0.00	0.00	26,071.80	22,161.03	4.07	3.0	12	960.00	2.17
17	296.19-1-17.2	Office (O)	0.96	41,824.50	0.00	0.00	41,824.50	35,550.83	6.53	3.0	19	1,520.00	3.43
											Total Project Residential Flow:		**65.54**

Office Non-Residential - Parcels Not Located on Bay Road

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Constrained Acreage	Constrained Square Footage	Buildable Square Footage	Application of Landscaped Area (15%)	Density Application[2] - Floor Area SF	Projected Max Flow (GPM)	Projected Peak Flow (GPM)
1	296.19-1-14.1	Office (O)	13.31	579,829.10	0.71	30,927.60	548,901.50	466,566.28	149,952.43	14,995.24	33.84
10	296.11-1-23	Office (O)	1.62	70,731.80	0.00	0.00	70,731.80	60,122.03	19,322.97	1,932.30	4.36
11	296.11-1-25	Office (O)	2.07	90,101.60	0.00	0.00	90,101.60	76,586.36	24,614.53	2,461.45	5.56
15	296.19-1-18	Office (O)	0.60	26,071.80	0.00	0.00	26,071.80	22,161.03	7,122.46	712.25	1.61
17	296.19-1-17.2	Office (O)	0.96	41,824.50	0.00	0.00	41,824.50	35,550.83	11,425.88	1,142.59	2.58
									Total Project Non-Residential Flow:		**47.95**

1. Based on Current Zoning laws, residential density factor of 1.0 acre per 8 residential dwelling units is allowed.
2. Based on Current Zoning laws, non-residential density factor of 0.5 acre per 7,000 square feet of floor area is allowed.

Town of Quensbury - Capacity Analysis for Bay Road
Office Build-out - No Setbacks - Scenario 1

Residential - No Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Area of Wetlands (SF)	Buildable Parcel Square Footage	Application of Landscaped Area (15%)	Density Application[1] - # of Dwelling Units	Bedroom Factor[2]	Total # of Bedrooms	Projected Max Flow[3] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	332,879.00	61,049.10	51,891.74	9.53	3	28.59	2,287.24	5.16
3	296.15-1-26.2	Office (O)	1.01	43,875.80	1,972.00	41,903.80	35,618.23	6.54	3	19.62	1,569.95	3.54
5	296.15-1-27	Office (O)	25.08	1,092,655.10	1,038,635.00	54,020.10	45,917.09	8.43	3	25.30	2,023.89	4.57
6	296.15-1-28.1	Office (O)	12.07	525,681.10	464,677.00	61,004.10	51,853.49	9.52	3	28.57	2,285.55	5.16
7	296.7-1-9	Office (O)	0.35	15,267.85	15,267.85	0.00	0.00	0.00	3	0.00	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	14,776.73	0.00	0.00	0.00	3	0.00	0.00	0.00
9	296.7-1-11	Office (O)	1.53	66,733.36	66,733.36	0.00	0.00	0.00	3	0.00	0.00	0.00
12	296.7-1-2	Office (O)	10.87	473,601.16	90,955.35	382,645.81	325,248.94	59.73	3	179.20	14,336.04	32.36
13	296.7-1-3	Office (O)	1.20	52,389.77	52,389.77	0.00	0.00	0.00	3	0.00	0.00	0.00
18	296.11-1-48	Office (O)	0.84	36,590.40	14,845.16	21,745.24	18,483.45	3.39	3	10.18	814.70	1.84
19	296.11-1-49	Office (O)	0.61	26,571.60	0.00	26,571.60	22,585.86	4.15	3	12.44	995.52	2.25
20	296.11-1-50	Office (O)	0.62	27,007.20	0.00	27,007.20	22,956.12	4.22	3	12.65	1,011.84	2.28
21	296.11-1-54	Office (O)	0.89	38,768.40	14,726.69	24,041.71	20,435.45	3.75	3	11.26	900.74	2.03
22	296.11-1-55	Office (O)	0.7	30,492.00	0.00	30,492.00	25,918.20	4.76	3	14.28	1,142.40	2.58
23	296.11-1-56	Office (O)	0.59	25,700.40	0.00	25,700.40	21,845.34	4.01	3	12.04	962.88	2.17
24	296.11-1-57	Office (O)	0.46	20,037.60	0.00	20,037.60	17,031.96	3.13	3	9.38	750.72	1.69
25	296.11-1-58	Office (O)	0.46	20,037.60	0.00	20,037.60	17,031.96	3.13	3	9.38	750.72	1.69
26	296.11-1-59	Office (O)	0.76	33,105.60	0.00	33,105.60	28,139.76	5.17	3	15.50	1,240.32	2.80
27	296.11-1-60	Office (O)	1.23	53,578.80	22,368.23	31,210.57	26,528.98	4.87	3	14.62	1,169.32	2.64
28	296.11-1-61	Office (O)	0.79	34,412.40	882.89	33,529.51	28,500.08	5.23	3	15.70	1,256.20	2.84
29	296.11-1-62	Office (O)	1.01	43,995.60	12,030.13	31,965.47	27,170.65	4.99	3	14.97	1,197.60	2.70
30	296.11-1-63	Office (O)	1.96	85,377.60	25,235.12	60,142.48	51,121.11	9.39	3	28.17	2,253.27	5.09
										Total Residential Projected Flow:		**83.39**

1. Based on Current Zoning laws, residential density factor of 1.0 acre per 8 residential dwelling units is allowed.
2. Assuming 3 bedrooms per dwelling unit.
3. Sewage generation factor of 80 GPD/Bedroom.

Town of Quensbury - Capacity Analysis for Bay Road
Office Build-out - 600-Foot Setbacks - Scenario 2

Residential Beyond 600 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Pacel Acreage within Setback	Parcel Square Footage Beyond Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Beyond Setback and Wetlands	Application of Landscaped Area (15%)	Density Application[1] - # of Dwelling Units	Bedroom Factor[2]	Total # of Bedrooms	Projected Max Flow[3] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	196,607.27	197,320.83	197,320.83	0.00	0.00	0.00	3	0.00	0.00	0
3	296.15-1-26.2	Office (O)	1.01	43,875.80	43,875.80	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0
5	296.15-1-27	Office (O)	25.08	1,092,655.10	314,939.14	777,715.96	739,026.42	38,689.54	32,886.11	6.04	3	18.12	1,449.53	3
6	296.15-1-28.1	Office (O)	12.07	525,681.10	368,743.49	156,937.61	128,018.85	28,918.76	24,580.95	4.51	3	13.54	1,083.46	2
7	296.7-1-9	Office (O)	0.35	15,267.85	15,267.85	0.00	15,267.85	0.00	0.00	0.00	3	0.00	0.00	0
8	296.7-1-10	Office (O)	0.34	14,776.73	14,776.73	0.00	13,685.84	0.00	0.00	0.00	3	0.00	0.00	0
9	296.7-1-11	Office (O)	1.53	66,733.36	66,733.36	0.00	65,192.35	0.00	0.00	0.00	3	0.00	0.00	0
12	296.7-1-2	Office (O)	10.87	473,601.16	183,679.60	289,921.56	0.00	289,921.56	246,433.33	45.26	3	135.78	10,862.07	25
13	296.7-1-3	Office (O)	1.20	52,389.77	52,389.77	0.00	52,389.77	0.00	0.00	0.00	3	0.00	0.00	0
18	296.11-1-48	Office (O)	0.84	36,590.40	0.00	36,590.40	14,845.16	21,745.24	18,483.45	3.39	3	10.18	814.70	2
19	296.11-1-49	Office (O)	0.61	26,571.60	0.00	26,571.60	0.00	26,571.60	22,585.86	4.15	3	12.44	995.52	2
21	296.11-1-54	Office (O)	0.89	38,768.40	0.00	38,768.40	14,726.69	24,041.71	20,435.45	3.75	3	11.26	900.74	2
22	296.11-1-55	Office (O)	0.7	30,492.00	0.00	30,492.00	0.00	30,492.00	25,918.20	4.76	3	14.28	1,142.40	3
27	296.11-1-60	Office (O)	1.23	53,578.80	0.00	53,578.80	22,368.23	31,210.57	26,528.98	4.87	3	14.62	1,169.32	3
												Total Project Residential Flow:		**41.57**

1. Based on Current Zoning laws, residential density factor of 1.0 acre per 8 residential dwelling units is allowed.
2. Assuming 3 bedrooms per dwelling unit.
3. Sewage generation factor of 80 GPD/Bedroom.

Non-Residential Within the 600 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Parcel Acreage Beyond Setback	Parcel Square Footage Within Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Within Setback and Minus Wetlands	Application of Landscaped Area (15%)	Density Application[1] - Floor Area SF	# of Employees[2]	Projected Max Flow[3] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	197,320.83	196,607.27	135,558.17	61,049.10	51,891.73	16,677.78	48	576.75	1.30
3	296.15-1-26.2	Office (O)	1.01	43,875.80	0.00	43,875.80	1,972.00	41,903.80	35,618.23	11,447.55	33	395.88	0.89
5	296.15-1-27	Office (O)	25.08	1,092,655.10	777,715.96	314,939.14	299,608.77	15,330.37	13,030.81	4,188.05	12	144.83	0.33
6	296.15-1-28.1	Office (O)	12.07	525,681.10	156,937.61	368,743.49	336,656.05	32,087.44	27,274.32	8,765.85	25	303.14	0.68
7	296.7-1-9	Office (O)	0.35	15,267.85	0.00	15,267.85	15,267.85	0.00	0.00	0.00	0	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	0.00	14,776.73	13,685.84	1,090.89	927.26	298.02	1	10.31	0.02
9	296.7-1-11	Office (O)	1.53	66,733.36	0.00	66,733.36	65,192.35	1,541.01	1,309.86	420.98	1	14.56	0.03
12	296.7-1-2	Office (O)	10.87	473,601.16	289,921.56	183,679.60	90,955.35	92,724.25	78,815.61	25,331.00	73	876.00	1.98
13	296.7-1-3	Office (O)	1.20	52,389.77	0.00	52,389.77	52,389.77	0.00	0.00	0.00	0	0.00	0.00
20	296.11-1-50	Office (O)	0.62	27,007.20	0.00	27,007.20	0.00	27,007.20	22,956.12	7,378.00	21	255.15	0.58
23	296.11-1-56	Office (O)	0.59	25,700.40	0.00	25,700.40	0.00	25,700.40	21,845.34	7,021.00	20	242.80	0.55
24	296.11-1-57	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	17,031.96	5,474.00	16	189.30	0.43
25	296.11-1-58	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	17,031.96	5,474.00	16	189.30	0.43
26	296.11-1-59	Office (O)	0.76	33,105.60	0.00	33,105.60	0.00	33,105.60	28,139.76	9,044.00	26	312.76	0.71
28	296.11-1-61	Office (O)	0.79	34,412.40	0.00	34,412.40	882.89	33,529.51	28,500.08	9,159.81	26	316.77	0.71
29	296.11-1-62	Office (O)	1.01	43,995.60	0.00	43,995.60	12,030.13	31,965.47	27,170.65	8,732.53	25	301.99	0.68
30	296.11-1-63	Office (O)	1.96	85,377.60	0.00	85,377.60	25,235.12	60,142.48	51,121.11	16,430.11	47	568.19	1.28
												Total Non-Residential Projected Flow:	**10.60**

1. Based on Current Zoning laws, non-residential density factor of 0.5 acre per 7,000 square feet of floor area is allowed.
2. Assume 1 employee per 347 sq. ft.
3. Sewage Generation rate of 12 GPD/Employee.

Town of Quensbury - Capacity Analysis for Bay Road
Office Build-out - 1,000-Foot Setbacks - Scenario 3

Residential Beyond 1,000 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Pacel Square Footage within Setback	Parcel Acreage Beyond Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Beyond Setback and Wetlands	Application of Landscaped Area (15%)	Density Application[1] - # of Dwelling Units	Bedroom Factor[2]	Total # of Bedrooms	Projected Max Flow[3] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	376,521.03	17,407.07	17,407.07	0.00	0.00	0.00	3	0.00	0.00	0.00
3	296.15-1-26.2	Office (O)	1.01	43,875.80	43,875.80	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
5	296.15-1-27	Office (O)	25.08	1,092,655.10	536,959.73	555,695.37	517,005.88	38,689.49	32,886.06	6.04	3	18.12	1,449.52	3.27
6	296.15-1-28.1	Office (O)	12.07	525,681.10	525,681.10	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
7	296.7-1-9	Office (O)	0.35	15,267.85	15,267.85	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	14,776.73	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
9	296.7-1-11	Office (O)	1.53	66,733.36	66,733.36	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
12	296.7-1-2	Office (O)	10.87	473,601.16	352,883.62	120,717.54	0.00	120,717.54	102,609.91	18.84	3	56.53	4,522.75	10.21
13	296.7-1-3	Office (O)	1.20	52,389.77	52,389.77	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
												Total Project Residential Flow:		**13.48**

1. Based on Current Zoning laws, residential density factor of 1.0 acre per 8 residential dwelling units is allowed.
2. Assuming 3 bedrooms per dwelling unit.
3. Sewage generation factor of 80 GPD/Bedroom.

Non-Residential Within the 1,000 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Parcel Square Footage Beyond Setback	Parcel Acreage Within Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Within Setback and Minus Wetlands	Application of Landscaped Area (15%)	Density Application[1] - Floor Area SF	# of Employees[2]	Projected Max Flow[2] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	17,407.07	376,521.03	315,471.98	61,049.05	51,891.70	16,677.77	48.06	576.75	1.30
3	296.15-1-26.2	Office (O)	1.01	43,875.80	0.00	43,875.80	1,972.22	41,903.58	35,618.04	11,447.49	32.99	395.88	0.89
5	296.15-1-27	Office (O)	25.08	1,092,655.10	555,695.37	536,959.73	521,629.37	15,330.37	13,030.81	4,188.05	12.07	144.83	0.33
6	296.15-1-28.1	Office (O)	12.07	525,681.10	0.00	525,681.10	464,676.89	61,004.21	51,853.58	16,665.52	48.03	576.33	1.30
7	296.7-1-9	Office (O)	0.35	15,267.85	0.00	15,267.85	15,267.85	0.00	0.00	0.00	0.00	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	0.00	14,776.73	13,685.84	1,090.89	927.26	298.02	0.86	10.31	0.02
9	296.7-1-11	Office (O)	1.53	66,733.36	0.00	66,733.36	65,192.35	1,541.01	1,309.86	420.98	1.21	14.56	0.03
12	296.7-1-2	Office (O)	10.87	473,601.16	120,717.54	352,883.62	90,955.35	261,928.27	222,639.03	71,555.24	206.21	2,474.53	5.58
13	296.7-1-3	Office (O)	1.20	52,389.77	0.00	52,389.77	52,389.77	0.00	0.00	0.00	0.00	0.00	0.00
18	296.11-1-48	Office (O)	0.84	36,590.40	0.00	36,590.40	14,845.16	21,745.24	18,483.45	5,940.50	17.12	205.44	0.46
19	296.11-1-49	Office (O)	0.61	26,571.60	0.00	26,571.60	0.00	26,571.60	22,585.86	7,259.00	20.92	251.03	0.57
20	296.11-1-50	Office (O)	0.62	27,007.20	0.00	27,007.20	0.00	27,007.20	22,956.12	7,378.00	21.26	255.15	0.58
21	296.11-1-54	Office (O)	0.89	38,768.40	0.00	38,768.40	14,726.69	24,041.71	20,435.45	6,567.87	18.93	227.13	0.51
22	296.11-1-55	Office (O)	0.7	30,492.00	0.00	30,492.00	0.00	30,492.00	25,918.20	8,330.00	24.01	288.07	0.65
23	296.11-1-56	Office (O)	0.59	25,700.40	0.00	25,700.40	0.00	25,700.40	21,845.34	7,021.00	20.23	242.80	0.55
24	296.11-1-57	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	17,031.96	5,474.00	15.78	189.30	0.43
25	296.11-1-58	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	17,031.96	5,474.00	15.78	189.30	0.43
26	296.11-1-59	Office (O)	0.76	33,105.60	0.00	33,105.60	0.00	33,105.60	28,139.76	9,044.00	26.06	312.76	0.71
27	296.11-1-60	Office (O)	1.23	53,578.80	0.00	53,578.80	22,368.23	31,210.57	26,528.98	8,526.30	24.57	294.86	0.67
28	296.11-1-61	Office (O)	0.79	34,412.40	0.00	34,412.40	882.89	33,529.51	28,500.08	9,159.81	26.40	316.77	0.71
29	296.11-1-62	Office (O)	1.01	43,995.60	0.00	43,995.60	12,030.13	31,965.47	27,170.65	8,732.53	25.17	301.99	0.68
30	296.11-1-63	Office (O)	1.96	85,377.60	0.00	85,377.60	25,235.12	60,142.48	51,121.11	16,430.11	47.35	568.19	1.28
												Total Non-Residential Projected Flow:	**17.69**

1. Based on Current Zoning laws, non-residential density factor of 0.5 acre per 7,000 square feet of floor area is allowed.
2. Assume 1 employee per 347 sq. ft.
3. Sewage Generation rate of 12 GPD/Employee.

Town of Quensbury - Capacity Analysis for Bay Road
Office Build-out - 600-Foot Setbacks - Trending Zoning - Scenario 4

Residential Beyond 600 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Pacel Square Footage within Setback	Parcel Square Footage Beyond Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Beyond Setback and Wetlands	Application of Landscaped Area (15%)	Density Application[1] - # of Dwelling Units	Bedroom Factor[2]	Total # of Bedrooms	Projected Max Flow[3] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	196,607.27	197,320.83	197,320.83	0.00	0.00	0.00	3	0.00	0.00	0.00
3	296.15-1-26.2	Office (O)	1.01	43,875.80	43,875.80	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
5	296.15-1-27	Office (O)	25.08	1,092,655.10	314,939.14	777,715.96	739,026.42	38,689.54	32,886.11	6.04	3	18.12	1,449.53	3.27
6	296.15-1-28.1	Office (O)	12.07	525,681.10	368,743.49	156,937.61	128,018.85	28,918.76	24,580.95	4.51	3	13.54	1,083.46	2.45
7	296.7-1-9	Office (O)	0.35	15,267.85	15,267.85	0.00	15,267.85	0.00	0.00	0.00	3	0.00	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	14,776.73	0.00	13,685.84	0.00	0.00	0.00	3	0.00	0.00	0.00
9	296.7-1-11	Office (O)	1.53	66,733.36	66,733.36	0.00	65,192.35	0.00	0.00	0.00	3	0.00	0.00	0.00
12	296.7-1-2	Office (O)	10.87	473,601.16	183,679.60	289,921.56	0.00	289,921.56	246,433.33	45.26	3	135.78	10,862.07	24.52
13	296.7-1-3	Office (O)	1.20	52,389.77	52,389.77	0.00	52,389.77	0.00	0.00	0.00	3	0.00	0.00	0.00
18	296.11-1-48	Office (O)	0.84	36,590.40	0.00	36,590.40	14,845.16	21,745.24	18,483.45	3.39	3	10.18	814.70	1.84
19	296.11-1-49	Office (O)	0.61	26,571.60	0.00	26,571.60	0.00	26,571.60	22,585.86	4.15	3	12.44	995.52	2.25
21	296.11-1-54	Office (O)	0.89	38,768.40	0.00	38,768.40	14,726.69	24,041.71	20,435.45	3.75	3	11.26	900.74	2.03
22	296.11-1-55	Office (O)	0.7	30,492.00	0.00	30,492.00	0.00	30,492.00	25,918.20	4.76	3	14.28	1,142.40	2.58
27	296.11-1-60	Office (O)	1.23	53,578.80	0.00	53,578.80	22,368.23	31,210.57	26,528.98	4.87	3	14.62	1,169.32	2.64
												Total Projected Residential Peak Hourly Flow:		**41.57**

1. Based on Current Zoning laws, residential density factor of 1.0 acre per 8 residential dwelling units is allowed.
2. Assuming 3 bedrooms per dwelling unit.
3. Sewage generation factor of 80 GPD/Bedroom.

Non-Residential Within 600 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Parcel Square Footage Beyond Setback	Parcel Square Footage Within Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Within Setback and Minus Wetlands	Parcel Acreage Within Setback and Minus Wetlands	Current Trending Application[1]	Total Building Floor Area Square Footage	# of Employees[2]	Projected Max Flow (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	197,320.83	196,607.27	135,558.17	61,049.10	1.40	3,300	4,625	13	160	0.36
3	296.15-1-26.2	Office (O)	1.01	43,875.80	0.00	43,875.80	1,972.00	41,903.80	0.96	3,300	3,175	9	110	0.25
5	296.15-1-27	Office (O)	25.08	1,092,655.10	777,715.96	314,939.14	299,608.77	15,330.37	0.35	3,300	1,161	3	40	0.09
6	296.15-1-28.1	Office (O)	12.07	525,681.10	156,937.61	368,743.49	336,656.05	32,087.44	0.74	3,300	2,431	7	84	0.19
7	296.7-1-9	Office (O)	0.35	15,267.85	0.00	15,267.85	15,267.85	0.00	0.00	3,300	0	0	0	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	0.00	14,776.73	13,685.84	1,090.89	0.03	3,300	83	0	3	0.01
9	296.7-1-11	Office (O)	1.53	66,733.36	0.00	66,733.36	65,192.35	1,541.01	0.04	3,300	117	0	4	0.01
12	296.7-1-2	Office (O)	10.87	473,601.16	289,921.56	183,679.60	90,955.35	92,724.25	2.13	3,300	7,025	20	243	0.55
13	296.7-1-3	Office (O)	1.20	52,389.77	0.00	52,389.77	52,389.77	0.00	0.00	3,300	0	0	0	0.00
20	296.11-1-50	Office (O)	0.62	27,007.20	0.00	27,007.20	0.00	27,007.20	0.62	3,300	2,046	6	71	0.16
23	296.11-1-56	Office (O)	0.59	25,700.40	0.00	25,700.40	0.00	25,700.40	0.59	3,300	1,947	6	67	0.15
24	296.11-1-57	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	0.46	3,300	1,518	4	52	0.12
25	296.11-1-58	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	0.46	3,300	1,518	4	52	0.12
26	296.11-1-59	Office (O)	0.76	33,105.60	0.00	33,105.60	0.00	33,105.60	0.76	3,300	2,508	7	87	0.20
28	296.11-1-61	Office (O)	0.79	34,412.40	0.00	34,412.40	882.89	33,529.51	0.77	3,300	2,540	7	88	0.20
29	296.11-1-62	Office (O)	1.01	43,995.60	0.00	43,995.60	12,030.13	31,965.47	0.73	3,300	2,422	7	84	0.19
30	296.11-1-63	Office (O)	1.96	85,377.60	0.00	85,377.60	25,235.12	60,142.48	1.38	3,300	4,556	13	158	0.36
												Total Projected Non-Residential Peak Hourly Flow:		**2.94**

1. Current development trending factor of 3,300 SF/Acre for the non-residential portion of the build-out.
2. Current trending application of 3,300 ft^2 / Acre
3. Sewage Generation rate of 12 GPD/Employee.

Town of Quensbury - Capacity Analysis for Bay Road
Office Build-out - 1,000-Foot Setbacks - Trending Zoning - Scenario 5

Residential Beyond 1,000 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Pacel Square Footage within Setback	Parcel Square Footage Beyond Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Beyond Setback and Wetlands	Application of Landscaped Area (15%)	Density Application[1] - # of Dwelling Units	Bedroom Factor[2]	Total # of Bedrooms	Projected Max Flow[3] (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	376,521.03	17,407.07	17,407.07	0.00	0.00	0.00	3	0.00	0.00	0.00
3	296.15-1-26.2	Office (O)	1.01	43,875.80	43,875.80	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
5	296.15-1-27	Office (O)	25.08	1,092,655.10	536,959.73	555,695.37	517,005.88	38,689.49	32,886.06	6.04	3	18.12	1,449.52	3.27
6	296.15-1-28.1	Office (O)	12.07	525,681.10	525,681.10	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
7	296.7-1-9	Office (O)	0.35	15,267.85	15,267.85	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	14,776.73	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
9	296.7-1-11	Office (O)	1.53	66,733.36	66,733.36	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
12	296.7-1-2	Office (O)	10.87	473,601.16	352,883.62	120,717.54	0.00	120,717.54	102,609.91	18.84	3	56.53	4,522.75	10.21
13	296.7-1-3	Office (O)	1.20	52,389.77	52,389.77	0.00	0.00	0.00	0.00	0.00	3	0.00	0.00	0.00
												Total Projected Residential Peak Hourly Flow:		**13.48**

1. Based on Current Zoning laws, residential density factor of 1.0 acre per 8 residential dwelling units is allowed.
2. Assuming 3 bedrooms per dwelling unit.
3. Sewage generation factor of 80 GPD/Bedroom.

Non-Residential Within 1,000 Foot Setback

Map ID Number	Tax Parcel ID	Zoning	Total Parcel Acreage	Total Parcel Square Footage	Parcel Square Footage Beyond Setback	Parcel Acreage Within Setback	Constrained Area Square Footage (wetlands)	Parcel Square Footage Within Setback and Minus Wetlands	Parcel Acreage Within Setback and Minus Wetlands	Current Trending Application[2]	Total Building Floor Area Square Footage	# of Employees[2]	Projected Max Flow (GPD)	Projected Peak Flow (GPM)
2	296.15-1-26.1	Office (O)	9.04	393,928.10	17,407.07	376,521.03	315,471.98	61,049.05	1.40	3,300	4,625	13	159.94	0.36
3	296.15-1-26.2	Office (O)	1.01	43,875.80	0.00	43,875.80	1,972.22	41,903.58	0.96	3,300	3,175	9	109.78	0.25
5	296.15-1-27	Office (O)	25.08	1,092,655.10	555,695.37	536,959.73	521,629.37	15,330.37	0.35	3,300	1,161	3	40.16	0.09
6	296.15-1-28.1	Office (O)	12.07	525,681.10	0.00	525,681.10	464,676.89	61,004.21	1.40	3,300	4,622	13	159.82	0.36
7	296.7-1-9	Office (O)	0.35	15,267.85	0.00	15,267.85	15,267.85	0.00	0.00	3,300	0	0	0.00	0.00
8	296.7-1-10	Office (O)	0.34	14,776.73	0.00	14,776.73	13,685.84	1,090.89	0.03	3,300	83	0	2.86	0.01
9	296.7-1-11	Office (O)	1.53	66,733.36	0.00	66,733.36	65,192.35	1,541.01	0.04	3,300	117	0	4.04	0.01
12	296.7-1-2	Office (O)	10.87	473,601.16	120,717.54	352,883.62	90,955.35	261,928.27	6.01	3,300	19,843	57	686.22	1.55
13	296.7-1-3	Office (O)	1.20	52,389.77	0.00	52,389.77	52,389.77	0.00	0.00	3,300	0	0	0.00	0.00
18	296.11-1-48	Office (O)	0.84	36,590.40	0.00	36,590.40	14,845.16	21,745.24	0.50	3,300	1,647	5	56.97	0.13
19	296.11-1-49	Office (O)	0.61	26,571.60	0.00	26,571.60	0.00	26,571.60	0.61	3,300	2,013	6	69.61	0.16
20	296.11-1-50	Office (O)	0.62	27,007.20	0.00	27,007.20	0.00	27,007.20	0.62	3,300	2,046	6	70.76	0.16
21	296.11-1-54	Office (O)	0.89	38,768.40	0.00	38,768.40	14,726.69	24,041.71	0.55	3,300	1,821	5	62.99	0.14
22	296.11-1-55	Office (O)	0.7	30,492.00	0.00	30,492.00	0.00	30,492.00	0.70	3,300	2,310	7	79.88	0.18
23	296.11-1-56	Office (O)	0.59	25,700.40	0.00	25,700.40	0.00	25,700.40	0.59	3,300	1,947	6	67.33	0.15
24	296.11-1-57	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	0.46	3,300	1,518	4	52.50	0.12
25	296.11-1-58	Office (O)	0.46	20,037.60	0.00	20,037.60	0.00	20,037.60	0.46	3,300	1,518	4	52.50	0.12
26	296.11-1-59	Office (O)	0.76	33,105.60	0.00	33,105.60	0.00	33,105.60	0.76	3,300	2,508	7	86.73	0.20
27	296.11-1-60	Office (O)	1.23	53,578.80	0.00	53,578.80	22,368.23	31,210.57	0.72	3,300	2,364	7	81.77	0.18
28	296.11-1-61	Office (O)	0.79	34,412.40	0.00	34,412.40	882.89	33,529.51	0.77	3,300	2,540	7	87.84	0.20
29	296.11-1-62	Office (O)	1.01	43,995.60	0.00	43,995.60	12,030.13	31,965.47	0.73	3,300	2,422	7	83.75	0.19
30	296.11-1-63	Office (O)	1.96	85,377.60	0.00	85,377.60	25,235.12	60,142.48	1.38	3,300	4,556	13	157.56	0.36
												Total Projected Non-Residential Peak Hourly Flow:		**4.90**

1. Current development trending factor of 3,300 SF/Acre for the non-residential portion of the build-out
2. Current trending application of 3,300 ft^2 / Acre
3. Sewage Generation rate of 12 GPD/Employee.

Appendix B
Flow Summary

Town of Queensbury - Capacity Analysis for Bay Road
Summary of Flows to be Pumped by the Willowbrook P.S.

Discharge MH	Property ID	Average Daily Flow Rate (gpd)	Build-out Avg Flow Rate (gpm)	Build-out Peak Flow Rate (gpm) Scenario 1	Build-out Peak Flow Rate (gpm) Scenario 2	Build-out Peak Flow Rate (gpm) Scenario 3	Build-out Peak Flow Rate (gpm) Scenario 4	Build-out Peak Flow Rate (gpm) Scenario 5
MH - 12	Town Hall	1,408	0.98	3.18	3.18	3.18	3.18	3.18
	Hunter Brook Lane	8,000	5.56	18.06	18.06	18.06	18.06	18.06
	Cedar Court	4,678	3.25	10.56	10.56	10.56	10.56	10.56
	Surrey Fields	4,061	2.82	9.17	9.17	9.17	9.17	9.17
SMH - 11A	Fowler Square	37,000	25.69	83.51	83.51	83.51	83.51	83.51
SMH - 9	681 Bay Rd. 289.19-1-16	99	0.07	0.22	0.22	0.22	0.22	0.22
	Cedars Development - 296.7-15.1	3,624	2.52	8.18	8.18	8.18	8.18	8.18
	51 Evergreen Lane - 296.7-1-15.2	3,624	2.52	8.18	8.18	8.18	8.18	8.18
SMH - 8	667 Bay Rd - 289.19-1-14	80	0.06	0.18	0.18	0.18	0.18	0.18
	653 Bay Rd - 296.7-1-12	4,010	2.78	9.05	9.05	9.05	9.05	9.05
SMH - 6	**633 Bay Rd - 296.7-1-11**	**0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	625 Bay Rd - 296.7-1-10	**0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Bay Rd - 267.7-1-9	**0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
SMH - 5	595 Bay Rd - 296.7-1-4	6,200	4.31	13.99	13.99	13.99	13.99	13.99
	597 Bay Rd - 296.7-1-8	450	0.31	1.02	1.02	1.02	1.02	1.02
SMH - 3	**Bay Rd - 296.7-1-3**	**0**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
	Bay Rd - 296.7-1-2	**14,338**	**9.96**	**32.36**	**26.49**	**15.79**	**25.06**	**11.76**
SMH - 2	565 Bay Rd - 296.11-1-45	4,400	3.06	9.93	9.93	9.93	9.93	9.93
	Homes on Bayberry Dr/Ct	2,838	1.97	6.41	6.41	6.41	6.41	6.41
SMH - 1	Offices on Baywood Dr.	2,412	1.68	5.44	5.44	5.44	5.44	5.44
EX SMH - 1	**Walker Lane, 296.11-1-25**	**3,359**	**2.33**	**7.58**	**7.58**	**7.58**	**7.58**	**7.58**
	Walker Lane, 296.11-1-23	**2,641**	**1.83**	**5.96**	**5.96**	**5.96**	**5.96**	**5.96**
	60 Walker Ln, 296.11-1-24	330	0.23	0.74	0.74	0.74	0.74	0.74
	Town Homes on Walker Lane and Baybridge Dr	8,642	6.00	19.50	19.50	19.50	19.50	19.50
	Fairfield Drive, 296.11-1-48	250	0.17	1.84	1.84	0.46	1.84	0.13
	Fairfield Drive, 296.11-1-49	306	0.21	2.25	2.25	0.57	2.25	0.16
	Fairfield Drive, 296.11-1-50	311	0.22	2.28	0.58	0.58	0.16	0.16
	4 Fairfield Drive, 296.11-1-52	315	0.22	0.71	0.71	0.71	0.71	0.71
	6 Fairfield Drive, 296.11-1-53	44	0.03	0.10	0.10	0.10	0.10	0.10
	Fairfield Drive, 296.11-1-54	277	0.19	2.03	2.03	0.51	2.03	0.14
	Fairfield Drive, 296.11-1-55	352	0.24	2.58	2.58	0.65	2.58	0.18
	Fairfield Drive, 296.11-1-56	296	0.21	2.17	0.55	0.55	0.15	0.15
	Fairfield Drive, 296.11-1-57	231	0.16	1.69	0.43	0.43	0.12	0.12
	Fairfield Drive, 296.11-1-58	231	0.16	1.69	0.43	0.43	0.12	0.12
	Fairfield Drive, 296.11-1-59	382	0.27	2.80	0.71	0.71	0.20	0.20
	Fairfield Drive, 296.11-1-60	360	0.25	2.64	2.64	0.67	2.64	0.18
	Fairfield Drive, 296.11-1-61	387	0.27	2.84	0.71	0.71	0.20	0.20
	Fairfield Drive, 296.11-1-62	368	0.26	2.70	0.68	0.68	0.19	0.19
	Fairfield Drive, 296.11-1-63	693	0.48	5.09	1.28	1.28	0.36	0.36
	3-4, 7-9 Bay Brook Drive - 296.11-1-28	20,251	14.06	45.71	45.71	45.71	45.71	45.71
MH - 7	Walker Lane - 296.15-1-2	29,000	20.14	65.45	65.45	65.45	65.45	65.45
	6 Willowbrook Rd - 296.12-1-30	749	0.52	1.69	1.69	1.69	1.69	1.69
	0	605	0.42	1.37	1.37	1.37	1.37	1.37
	22 Willowbrook Rd - 296.12-1-29	188	0.13	0.42	0.42	0.42	0.42	0.42
MH-6	Willowbrook Rd - 296.12-1-27.3	7,560	5.25	17.06	17.06	17.06	17.06	17.06
	34 Willowbrook, 296.12-1-27.2	10,000	6.94	22.57	22.57	22.57	22.57	22.57
	Sage Dr - 296.12-1-27.5	9,051	6.29	20.43	20.43	20.43	20.43	20.43
	31 Willowbrook Rd - 296.12-1-27.6	88	0.06	0.20	0.20	0.20	0.20	0.20
			Total Peak Flow to P.S. (GPM)	**461.52**	**439.76**	**420.58**	**434.46**	**410.61**

Property ID - Property Subject to build-out and setbacks

Property ID - Property subject to build-out but not setbacks

Town of Queensbury - Capacity Analysis for Bay Road
Summary of Flows NOT Pumped by the Willowbrook P.S.

Discharge MH	Property ID	Average Daily Flow Rate (gpd)	Build-out Avg Flow Rate (gpm)	Build-out Peak Flow Rate (gpm) Scenario 1	Build-out Peak Flow Rate (gpm) Scenario 2	Build-out Peak Flow Rate (gpm) Scenario 3	Build-out Peak Flow Rate (gpm) Scenario 4	Build-out Peak Flow Rate (gpm) Scenario 5
MH 4-30-2	**Bay Rd - 296.15-1-28.1**	**2,286**	**1.59**	**5.16**	**3.13**	**1.30**	**2.64**	**0.36**
	445 Bay Rd - 296.15-1-27	**2,025**	**1.41**	**4.57**	**3.60**	**3.60**	**3.36**	**3.36**
	454 Bay Rd - 296.16-1-12	220	0.15	0.50	0.50	0.50	0.50	0.50
	452 Bay Rd - 296.16-1-13	220	0.15	0.50	0.50	0.50	0.50	0.50
MH 4-30-1	**Bay Rd - 296.15-1-26.2**	**1,568**	**1.09**	**3.54**	**0.89**	**0.89**	**0.25**	**0.25**
	Bay Rd - 296.15-1-26.3	**707**	**0.49**	**3.19**	**3.19**	**3.19**	**3.19**	**3.19**
	Bay Rd- 296.15-1-26.1	**2,286**	**1.59**	**5.16**	**1.30**	**1.30**	**0.36**	**0.36**
MH 4-30	425 Bay Rd - 296.15-1-23	18	0.01	0.04	0.04	0.04	0.04	0.04
	421 Bay Rd - 296.15-1-22	128	0.09	0.29	0.29	0.29	0.29	0.29
	415 Bay Rd - 296.15-1-20	112	0.08	0.25	0.25	0.25	0.25	0.25
	413 Bay Rd - 296.15-1-19	60	0.04	0.14	0.14	0.14	0.14	0.14
MH 4-28	251 Quaker Rd - 296.20-1-50.1	1,066	0.74	2.41	2.41	2.41	2.41	2.41
MH 4-22	402 Bay Rd - 296.16-1-16.3	663	0.46	1.50	1.50	1.50	1.50	1.50
	410 Bay Rd - 296.16-1-16.11	130	0.09	0.29	0.29	0.29	0.29	0.29
	6 Hearts Way - 296.16-1-16.15	554	0.38	1.25	1.25	1.25	1.25	1.25
	Bay Rd - 296.16-1-16.17	**154**	**0.11**	**0.70**	**0.70**	**0.70**	**0.70**	**0.70**
MH 4-23	4 Cronin Rd - 296.20-1-40	2,012	1.40	4.54	4.54	4.54	4.54	4.54
MH 4-24	384 Bay Rd - 296.20-1-43.1	187	0.13	0.42	0.42	0.42	0.42	0.42
MH 4-25	376 Bay Rd - 296.20-1-45	1,475	1.02	3.33	3.33	3.33	3.33	3.33
MH 4-29	407 Bay Rd - 296.19-1-38	189	0.13	0.43	0.43	0.43	0.43	0.43
	395 Bay Rd - 296.19-1-36	226	0.16	0.51	0.51	0.51	0.51	0.51
	Bay Rd - 296.19-1-35	**519**	**0.36**	**2.33**	**2.33**	**2.33**	**2.33**	**2.33**
	383 Bay Rd - 296.19-1-34	393	0.27	0.89	0.89	0.89	0.89	0.89
	379 Bay Rd - 296.19-1-33	65	0.05	0.15	0.15	0.15	0.15	0.15
MH 4-32	375 Bay Rd - 296.19-1-32	112	0.08	0.25	0.25	0.25	0.25	0.25
	369 Bay Rd - 296.19-1-31	364	0.25	0.82	0.82	0.82	0.82	0.82
	365 Bay Rd - 296.19-1-30	1,900	1.32	4.29	4.29	4.29	4.29	4.29
MH 4-33	357 Bay Rd - 296.19-1-29	416	0.29	0.94	0.94	0.94	0.94	0.94
	96 Glenwood Ave - 296.19-1-28	17	0.01	0.04	0.04	0.04	0.04	0.04
MH 4-34	351 Bay Rd - 296.20-1-55	363	0.25	0.82	0.82	0.82	0.82	0.82
	345 Bay Rd - 296.20-1-54	209	0.15	0.47	0.47	0.47	0.47	0.47
MH 4-35	94 Glenwood Ave - 296.19-1-27	72	0.05	0.16	0.16	0.16	0.16	0.16
	92 Glenwood Ave - 296.19-1-26	0	0.00	0.00	0.00	0.00	0.00	0.00
	90 Glenwood Ave - 296.19-1-25	256	0.18	0.58	0.58	0.58	0.58	0.58
	88 Glenwood Ave - 296.19-1-24	52	0.04	0.12	0.12	0.12	0.12	0.12
	97 Glenwood Ave - 296.20-1-56	13	0.01	0.03	0.03	0.03	0.03	0.03
	86 Glenwood Ave - 296.19-1-23	150	0.10	0.34	0.34	0.34	0.34	0.34
MH 4-36	84 Glenwood Ave - 296.19-1-22	319	0.22	0.72	0.72	0.72	0.72	0.72
	82 Glenwood Ave - 296.19-1-20	143	0.10	0.32	0.32	0.32	0.32	0.32
	Westwood Dr - 296.74-1-46	5,230	3.63	11.80	11.80	11.80	11.80	11.80
MH 4-36A	78 Glenwood Ave - 296.19-1-19	96	0.07	0.22	0.22	0.22	0.22	0.22
MH 4-37	79 Glenwood Ave - 296.19-1-42	229	0.16	0.52	0.52	0.52	0.52	0.52
	Glenwood Ave - 296.19-1-14.1	**20,559**	**14.28**	**46.40**	**46.40**	**46.40**	**46.40**	**46.40**
MH 4-38	**70 Glenwood Ave - 296.19-1-18**	**961**	**0.67**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**
	68 Glenwood Ave - 296.19-1-17.1	72	0.05	0.16	0.16	0.16	0.16	0.16
	Glenwood Ave - 296.19-1-44.2	0	0.00	0.00	0.00	0.00	0.00	0.00
	66 Glenwood Ave - 296.19-1-16	503	0.35	1.14	1.14	1.14	1.14	1.14
MH 4-39	64 Glenwood Ave - 296.19-1-15	213	0.15	0.48	0.48	0.48	0.48	0.48
	71 Glenwood Ave - 296.19-1-44.1	481	0.33	1.09	1.09	1.09	1.09	1.09
MH 4-40-1	**Glenwood Ave - 296.19-1-17.2**	**1,520**	**1.06**	**3.43**	**3.43**	**3.43**	**3.43**	**3.43**
MH 4-40-2	27 Woodvale Rd - 296.19-1-14.2	5,616	3.90	12.68	12.68	12.68	12.68	12.68
			Total Peak Flow (GPM)	**132.04**	**122.53**	**120.70**	**120.22**	**117.94**

Property ID - Property Subject to build-out and setbacks

Property ID - Property subject to build-out but not setbacks

Appendix C
System Curve Calculations

M.J. Engineering & Land Surveying, P.C.
1533 Crescent Road - Clifton Park, N.Y. 12065
Phone: (518) 371-0799
Fax: (518) 371-0822

Project	**Willowbrook Pump Station**		
MJ No.	960.03	P.I.N.	
Sheet No.	1	of	1
Calculated By:	SDH	Date:	8/8/2016
Checked By:		Date:	

Subject: **Willowbrook Pump Station**

Wetwell Retrofit Evaluation:

Wetwell Diameter:	8.0	ft
Wetwell Area:	**50.27**	**ft²**

Top of Wetwell El. =	310.0	ft
Base El. =	295.30	ft
Inv. In El. =	301.1	ft
Pump Off El. =	297.30	ft

Min. Low Water Level El. =	297.30	ft	→ "Pumps Off"
High Water Level El. =	299.63	ft	→ "Lead Pump On"
Wetwell Filling Volume =	**876**	**gallons**	
Avg. Influent Flow Rate =	131	gpm	→ 425 GPM / Peaking Factor (3.25)
Wetwell Filling Time =	**7**	**minutes > 30 minutes (corrosive gasses could be an issue)**	

Existing Sewer Inv. In El. =	301.1	ft	
HWL Alarm El. =	299.9	ft	
Wetwell Base El. =	295.30	ft	
Wetwell Storage Volume =	**1,722**	**gal**	→ Based on Max.Fill Height to HWL Alarm Elevation

System Curve Evaluation:

Static Head:

Wetwell Low Water Level El. =	297.30	ft
MH 4-30-2 Discharge El. =	317.2	ft
Static Head =	19.90	ft

Frictional / Minor Losses:

Length of 4" Suction Pipe =	17	ft
4" - 90° Bend =	12	ft
4" - 90° Bend =	12	ft
4" Check Valve =	25	ft
4" Plug Valve =	3	ft
4" - 90° Bend =	12	ft
4"x4"x4" T	7	ft
4" x 6" - Reducer =	12	ft
6" - 90° Bend =	16	ft
6" PVC	750	ft
6" - 90° Bend =	15.2	ft
6" HDPE =	1550	ft
Sudden Enlarge (d/D < 1/4) =	5	ft

EQ Length 4" Pipe =	**88**	**ft**
EQ Length 6" Pipe =	**28**	**ft**
EQ Length 6" PVC Pipe =	**765**	**ft**
EQ Length 6" HDPE Pipe =	**1555**	**ft**

Friction Head Loss (Hazen-Williams Equation)

L (ft)	88	28	765	1,555
Q (gpm)	333	333	333	333
C	140	140	150	140
D (in)	4	6	6	6
Velocity (ft/s)	8.50	3.78	3.78	3.78
H_L, ft	5.371	0.238	5.717	13.198
Total H_L, ft	**24.523**			

TDH = 19.9 + 24.52 = **44.42** ft

Appendix D
Model Results

Town of Queensbury - Capacity Analysis for Bay Road
Model Results - Scenario 1

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Flow (gal/min)	Capacity (Full Flow) (gal/min)	Flow / Capacity (Design) (%)
P1	SMH-12	SMH-11A	0.012	8	0.01	2.59	40.97	760.67	5.4
P2	SMH-11A	SMH-11	0.012	8	0.01	3.58	124.48	761.36	16.3
P3	SMH-11	SMH-10	0.013	8	0.01	3.75	124.48	810.74	15.4
P4	SMH-10	SMH-9	0.042	8	0.01	4.97	124.48	1,207.44	10.3
P5	SMH-9	SMH-8A	0.037	8	0.01	4.94	141.06	1,132.68	12.5
P6	SMH-8A	SMH-8	0.014	8	0.01	3.96	141.06	831.78	17
P7	SMH-8	SMH-7	0.005	8	0.01	2.87	150.29	519.63	28.9
P8	SMH-7	SMH-6	0.006	8	0.01	2.9	150.29	526.08	28.6
P9	SMH-6	SMH-5	0.006	8	0.01	2.99	150.29	549.6	27.3
P10	SMH-5	SMH-4	0.005	8	0.01	2.96	165.3	522.71	31.6
P11	SMH-4	SMH-3	0.021	8	0.01	4.83	165.3	1,032.78	16
P12	SMH-3	SMH-2A	0.004	8	0.01	2.82	197.66	457.65	43.2
P13	SMH-2A	SMH-2	0.003	12	0.01	2.29	197.66	1,052.18	18.8
P14	SMH-2	SMH-1	0.002	12	0.01	2.21	214	972.42	22
P15	SMH-1	EXSMH-1	0.001	12	0.01	1.8	219.44	723.77	30.3
P16	EXSMH-1	MH 4-30-7	0.019	8	0.012	4.92	332.34	810.39	41
P17	MH 4-30-7	MH 4-30-6	0.004	8	0.01	3.11	332.34	444.9	74.7
P18	MH 4-30-6	MH 4-30-5	0.02	8	0.012	5.01	332.34	830.91	40
P19	MH 4-30-5	MH-4-30-4	0.004	8	0.01	3.12	332.34	445.91	74.5
P20	MH-6	MH-4-30-4	0.004	8	0.01	2.49	129.19	452.42	28.6
P21	MH-4-30-2	MH-4-30-1	0.009	8	0.012	3.85	387.77	557.7	69.5
P22	MH-4-30-1	MH-4-30	0.009	8	0.012	3.87	399.66	557.62	71.7
P23	MH-4-30	MH-4-29	0.014	8.5	0.012	4.63	400.38	825.58	48.5
P24	MH-4-31	MH-4-29	0.004	8.5	0.012	1.94	89.32	436.26	20.5
P25	MH-4-32	MH-4-31	0.004	8.5	0.012	1.94	89.32	436.07	20.5
P26	MH-4-33	MH-4-32	0.004	8.5	0.012	1.91	84.63	436.47	19.4
P27	MH-4-34	MH-4-33	0.006	8.5	0.012	0.63	1.29	533.96	0.2
P36	MH-4-40-2	MH-4-40-1	0.006	8	0.01	1.44	12.68	545.37	2.3
P35	MH-4-40-1	MH-4-40	0.007	8	0.01	1.66	16.11	603.84	2.7
P34	MH-4-40	MH-4-39	0.003	8.5	0.012	1.02	16.11	357.36	4.5
P33	MH-4-39	MH-4-38	0.006	8.5	0.012	1.39	17.68	534.56	3.3
P32	MH-4-38	MH-4-37	0.006	8.5	0.012	1.47	21.15	533.93	4
P31	MH-4-37	MH-4-36A	0.013	8.5	0.012	2.72	68.07	783.93	8.7
P30	MH-4-36A	MH-4-36	0.004	8.5	0.012	1.8	68.29	436.7	15.6
P29	MH-4-36	MH-4-35	0.004	8.5	0.012	1.88	81.13	436.04	18.6
P28	MH-4-35	MH-4-33	0.004	8.5	0.012	1.89	82.36	436.46	18.9
P37	MH-4-28	MH-4-27	0.004	8.5	0.012	0.66	2.41	435.75	0.6
P38	MH-4-27	MH-4-26	0.004	8.5	0.012	0.66	2.41	435.06	0.6
P39	MH-4-26	MH-4-25	0.004	8.5	0.012	0.66	2.41	436.32	0.6
P40	MH-4-25	MH-4-24A	0.004	8.5	0.012	0.87	5.74	436.14	1.3
P41	MH-4-24A	MH-4-24	0.004	8.5	0.012	0.87	5.74	436.79	1.3
P42	MH-4-24	MH-4-23	0.004	8.5	0.012	0.88	6.16	436.14	1.4
P43	MH-4-23	MH-4-22	0.004	8.5	0.01	2.85	504.71	432.3	**116.8**
P44	MH-4-29	MH-4-23	0.01	8.5	0.012	4.24	494.01	690.63	71.5
P45	MH-4-22	MH-4-21	0.004	12	0.013	2.93	508.45	1,035.76	49.1
PS	MH-4-30-4	W-4	0.01	8	0.013	3.89	461.53	542.34	85.1

Flow > Capacity

Town of Queensbury - Capacity Analysis for Bay Road
Model Results - Scenario 2

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Flow (gal/min)	Capacity (Full Flow) (gal/min)	Flow / Capacity (Design) (%)
P1	SMH-12	SMH-11A	0.012	8	0.01	2.59	40.97	760.67	5.4
P2	SMH-11A	SMH-11	0.012	8	0.01	3.58	124.48	761.36	16.3
P3	SMH-11	SMH-10	0.013	8	0.01	3.75	124.48	810.74	15.4
P4	SMH-10	SMH-9	0.042	8	0.01	4.97	124.48	1,207.44	10.3
P5	SMH-9	SMH-8A	0.037	8	0.01	4.94	141.06	1,132.68	12.5
P6	SMH-8A	SMH-8	0.014	8	0.01	3.96	141.06	831.78	17
P7	SMH-8	SMH-7	0.005	8	0.01	2.87	150.29	519.63	28.9
P8	SMH-7	SMH-6	0.006	8	0.01	2.9	150.29	526.08	28.6
P9	SMH-6	SMH-5	0.006	8	0.01	2.99	150.29	549.6	27.3
P10	SMH-5	SMH-4	0.005	8	0.01	2.96	165.3	522.71	31.6
P11	SMH-4	SMH-3	0.021	8	0.01	4.83	165.3	1,032.78	16
P12	SMH-3	SMH-2A	0.004	8	0.01	2.79	190.39	457.65	41.6
P13	SMH-2A	SMH-2	0.003	12	0.01	2.26	190.39	1,052.18	18.1
P14	SMH-2	SMH-1	0.002	12	0.01	2.19	206.73	972.42	21.3
P15	SMH-1	EXSMH-1	0.001	12	0.01	1.78	212.17	723.77	29.3
P16	EXSMH-1	MH 4-30-7	0.019	8	0.012	4.83	309.18	810.39	38.2
P17	MH 4-30-7	MH 4-30-6	0.004	8	0.01	3.07	309.18	444.9	69.5
P18	MH 4-30-6	MH 4-30-5	0.02	8	0.012	4.92	309.18	830.91	37.2
P19	MH 4-30-5	MH-4-30-4	0.004	8	0.01	3.07	309.18	445.91	69.3
P20	MH-6	MH-4-30-4	0.004	8	0.01	2.49	129.19	452.42	28.6
P21	MH-4-30-2	MH-4-30-1	0.009	8	0.012	3.84	384.05	557.7	68.9
P22	MH-4-30-1	MH-4-30	0.009	8	0.012	3.85	387.88	557.62	69.6
P23	MH-4-30	MH-4-29	0.014	8.5	0.012	4.6	388.6	825.58	47.1
P24	MH-4-31	MH-4-29	0.004	8.5	0.012	1.94	89.32	436.26	20.5
P25	MH-4-32	MH-4-31	0.004	8.5	0.012	1.94	89.32	436.07	20.5
P26	MH-4-33	MH-4-32	0.004	8.5	0.012	1.91	84.63	436.47	19.4
P27	MH-4-34	MH-4-33	0.006	8.5	0.012	0.63	1.29	533.96	0.2
P36	MH-4-40-2	MH-4-40-1	0.006	8	0.01	1.44	12.68	545.37	2.3
P35	MH-4-40-1	MH-4-40	0.007	8	0.01	1.66	16.11	603.84	2.7
P34	MH-4-40	MH-4-39	0.003	8.5	0.012	1.02	16.11	357.36	4.5
P33	MH-4-39	MH-4-38	0.006	8.5	0.012	1.39	17.68	534.56	3.3
P32	MH-4-38	MH-4-37	0.006	8.5	0.012	1.47	21.15	533.93	4
P31	MH-4-37	MH-4-36A	0.013	8.5	0.012	2.72	68.07	783.93	8.7
P30	MH-4-36A	MH-4-36	0.004	8.5	0.012	1.8	68.29	436.7	15.6
P29	MH-4-36	MH-4-35	0.004	8.5	0.012	1.88	81.13	436.04	18.6
P28	MH-4-35	MH-4-33	0.004	8.5	0.012	1.89	82.36	436.46	18.9
P37	MH-4-28	MH-4-27	0.004	8.5	0.012	0.66	2.41	435.75	0.6
P38	MH-4-27	MH-4-26	0.004	8.5	0.012	0.66	2.41	435.06	0.6
P39	MH-4-26	MH-4-25	0.004	8.5	0.012	0.66	2.41	436.32	0.6
P40	MH-4-25	MH-4-24A	0.004	8.5	0.012	0.87	5.74	436.14	1.3
P41	MH-4-24A	MH-4-24	0.004	8.5	0.012	0.87	5.74	436.79	1.3
P42	MH-4-24	MH-4-23	0.004	8.5	0.012	0.88	6.16	436.14	1.4
P43	MH-4-23	MH-4-22	0.004	8.5	0.01	2.79	492.93	432.3	**114**
P44	MH-4-29	MH-4-23	0.01	8.5	0.012	4.22	482.23	690.63	69.8
P45	MH-4-22	MH-4-21	0.004	12	0.013	2.91	496.67	1,035.76	48
PS	MH-4-30-4	W-4	0.01	8	0.013	3.85	438.37	542.34	80.8

Flow > Capacity

Town of Queensbury - Capacity Analysis for Bay Road
Model Results - Scenario 3

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Flow (gal/min)	Capacity (Full Flow) (gal/min)	Flow / Capacity (Design) (%)
P1	SMH-12	SMH-11A	0.012	8	0.01	2.59	40.97	760.67	5.4
P2	SMH-11A	SMH-11	0.012	8	0.01	3.58	124.48	761.36	16.3
P3	SMH-11	SMH-10	0.013	8	0.01	3.75	124.48	810.74	15.4
P4	SMH-10	SMH-9	0.042	8	0.01	4.97	124.48	1,207.44	10.3
P5	SMH-9	SMH-8A	0.037	8	0.01	4.94	141.06	1,132.68	12.5
P6	SMH-8A	SMH-8	0.014	8	0.01	3.96	141.06	831.78	17
P7	SMH-8	SMH-7	0.005	8	0.01	2.87	150.29	519.63	28.9
P8	SMH-7	SMH-6	0.006	8	0.01	2.9	150.29	526.08	28.6
P9	SMH-6	SMH-5	0.006	8	0.01	2.99	150.29	549.6	27.3
P10	SMH-5	SMH-4	0.005	8	0.01	2.96	165.3	522.71	31.6
P11	SMH-4	SMH-3	0.021	8	0.01	4.83	165.3	1,032.78	16
P12	SMH-3	SMH-2A	0.004	8	0.01	2.74	177.12	457.65	38.7
P13	SMH-2A	SMH-2	0.003	12	0.01	2.22	177.12	1,052.18	16.8
P14	SMH-2	SMH-1	0.002	12	0.01	2.15	193.46	972.42	19.9
P15	SMH-1	EXSMH-1	0.001	12	0.01	1.75	198.9	723.77	27.5
P16	EXSMH-1	MH 4-30-7	0.019	8	0.012	4.74	287.43	810.39	35.5
P17	MH 4-30-7	MH 4-30-6	0.004	8	0.01	3.02	287.43	444.9	64.6
P18	MH 4-30-6	MH 4-30-5	0.02	8	0.012	4.82	287.43	830.91	34.6
P19	MH 4-30-5	MH-4-30-4	0.004	8	0.01	3.02	287.43	445.91	64.5
P20	MH-6	MH-4-30-4	0.004	8	0.01	2.49	129.19	452.42	28.6
P21	MH-4-30-2	MH-4-30-1	0.009	8	0.012	3.83	381.79	557.7	68.5
P22	MH-4-30-1	MH-4-30	0.009	8	0.012	3.84	385.62	557.62	69.2
P23	MH-4-30	MH-4-29	0.014	8.5	0.012	4.59	386.34	825.58	46.8
P24	MH-4-31	MH-4-29	0.004	8.5	0.012	1.94	89.49	436.26	20.5
P25	MH-4-32	MH-4-31	0.004	8.5	0.012	1.94	89.49	436.07	20.5
P26	MH-4-33	MH-4-32	0.004	8.5	0.012	1.91	84.13	436.47	19.3
P27	MH-4-34	MH-4-33	0.006	8.5	0.012	0.63	1.29	533.96	0.2
P36	MH-4-40-2	MH-4-40-1	0.006	8	0.01	1.44	12.68	545.37	2.3
P35	MH-4-40-1	MH-4-40	0.007	8	0.01	1.66	16.11	603.84	2.7
P34	MH-4-40	MH-4-39	0.003	8.5	0.012	1.02	16.11	357.36	4.5
P33	MH-4-39	MH-4-38	0.006	8.5	0.012	1.39	17.68	534.56	3.3
P32	MH-4-38	MH-4-37	0.006	8.5	0.012	1.47	21.15	533.93	4
P31	MH-4-37	MH-4-36A	0.013	8.5	0.012	2.72	68.07	783.93	8.7
P30	MH-4-36A	MH-4-36	0.004	8.5	0.012	1.8	68.29	436.7	15.6
P29	MH-4-36	MH-4-35	0.004	8.5	0.012	1.88	80.63	436.04	18.5
P28	MH-4-35	MH-4-33	0.004	8.5	0.012	1.89	81.86	436.46	18.8
P37	MH-4-28	MH-4-27	0.004	8.5	0.012	0.66	2.41	435.75	0.6
P38	MH-4-27	MH-4-26	0.004	8.5	0.012	0.66	2.41	435.06	0.6
P39	MH-4-26	MH-4-25	0.004	8.5	0.012	0.66	2.41	436.32	0.6
P40	MH-4-25	MH-4-24A	0.004	8.5	0.012	0.87	5.74	436.14	1.3
P41	MH-4-24A	MH-4-24	0.004	8.5	0.012	0.87	5.74	436.79	1.3
P42	MH-4-24	MH-4-23	0.004	8.5	0.012	0.88	6.16	436.14	1.4
P43	MH-4-23	MH-4-22	0.004	8.5	0.01	2.78	490.84	432.3	**113.5**
P44	MH-4-29	MH-4-23	0.01	8.5	0.012	4.22	480.14	690.63	69.5
P45	MH-4-22	MH-4-21	0.004	12	0.013	2.91	494.58	1,035.76	47.8
PS	MH-4-30-4	W-4	0.01	8	0.013	3.82	416.62	542.34	76.8

Flow > Capacity

Town of Queensbury - Capacity Analysis for Bay Road
Model Results - Scenario 4

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Flow (gal/min)	Capacity (Full Flow) (gal/min)	Flow / Capacity (Design) (%)
P1	SMH-12	SMH-11A	0.012	8	0.01	2.59	40.97	760.67	5.4
P2	SMH-11A	SMH-11	0.012	8	0.01	3.58	124.48	761.36	16.3
P3	SMH-11	SMH-10	0.013	8	0.01	3.75	124.48	810.74	15.4
P4	SMH-10	SMH-9	0.042	8	0.01	4.97	124.48	1,207.44	10.3
P5	SMH-9	SMH-8A	0.037	8	0.01	4.94	141.06	1,132.68	12.5
P6	SMH-8A	SMH-8	0.014	8	0.01	3.96	141.06	831.78	17
P7	SMH-8	SMH-7	0.005	8	0.01	2.87	150.29	519.63	28.9
P8	SMH-7	SMH-6	0.006	8	0.01	2.9	150.29	526.08	28.6
P9	SMH-6	SMH-5	0.006	8	0.01	2.99	150.29	549.6	27.3
P10	SMH-5	SMH-4	0.005	8	0.01	2.96	165.3	522.71	31.6
P11	SMH-4	SMH-3	0.021	8	0.01	4.83	165.3	1,032.78	16
P12	SMH-3	SMH-2A	0.004	8	0.01	2.79	189.97	457.65	41.5
P13	SMH-2A	SMH-2	0.003	12	0.01	2.26	189.97	1,052.18	18.1
P14	SMH-2	SMH-1	0.002	12	0.01	2.19	206.31	972.42	21.2
P15	SMH-1	EXSMH-1	0.001	12	0.01	1.78	211.75	723.77	29.3
P16	EXSMH-1	MH 4-30-7	0.019	8	0.012	4.81	304.89	810.39	37.6
P17	MH 4-30-7	MH 4-30-6	0.004	8	0.01	3.06	304.89	444.9	68.5
P18	MH 4-30-6	MH 4-30-5	0.02	8	0.012	4.9	304.89	830.91	36.7
P19	MH 4-30-5	MH-4-30-4	0.004	8	0.01	3.06	304.89	445.91	68.4
P20	MH-6	MH-4-30-4	0.004	8	0.01	2.49	129.19	452.42	28.6
P21	MH-4-30-2	MH-4-30-1	0.009	8	0.012	3.84	383.84	557.7	68.8
P22	MH-4-30-1	MH-4-30	0.009	8	0.012	3.84	387.2	557.62	69.4
P23	MH-4-30	MH-4-29	0.014	8.5	0.012	4.6	387.92	825.58	47
P24	MH-4-31	MH-4-29	0.004	8.5	0.012	1.94	89.99	436.26	20.6
P25	MH-4-32	MH-4-31	0.004	8.5	0.012	1.94	89.99	436.07	20.6
P26	MH-4-33	MH-4-32	0.004	8.5	0.012	1.91	84.63	436.47	19.4
P27	MH-4-34	MH-4-33	0.006	8.5	0.012	0.63	1.29	533.96	0.2
P36	MH-4-40-2	MH-4-40-1	0.006	8	0.01	1.44	12.68	545.37	2.3
P35	MH-4-40-1	MH-4-40	0.007	8	0.01	1.66	16.11	603.84	2.7
P34	MH-4-40	MH-4-39	0.003	8.5	0.012	1.02	16.11	357.36	4.5
P33	MH-4-39	MH-4-38	0.006	8.5	0.012	1.39	17.68	534.56	3.3
P32	MH-4-38	MH-4-37	0.006	8.5	0.012	1.47	21.15	533.93	4
P31	MH-4-37	MH-4-36A	0.013	8.5	0.012	2.72	68.07	783.93	8.7
P30	MH-4-36A	MH-4-36	0.004	8.5	0.012	1.8	68.29	436.7	15.6
P29	MH-4-36	MH-4-35	0.004	8.5	0.012	1.88	81.13	436.04	18.6
P28	MH-4-35	MH-4-33	0.004	8.5	0.012	1.89	82.36	436.46	18.9
P37	MH-4-28	MH-4-27	0.004	8.5	0.012	0.66	2.41	435.75	0.6
P38	MH-4-27	MH-4-26	0.004	8.5	0.012	0.66	2.41	435.06	0.6
P39	MH-4-26	MH-4-25	0.004	8.5	0.012	0.66	2.41	436.32	0.6
P40	MH-4-25	MH-4-24A	0.004	8.5	0.012	0.87	5.74	436.14	1.3
P41	MH-4-24A	MH-4-24	0.004	8.5	0.012	0.87	5.74	436.79	1.3
P42	MH-4-24	MH-4-23	0.004	8.5	0.012	0.88	6.16	436.14	1.4
P43	MH-4-23	MH-4-22	0.004	8.5	0.01	2.79	492.92	432.3	**114**
P44	MH-4-29	MH-4-23	0.01	8.5	0.012	4.22	482.22	690.63	69.8
P45	MH-4-22	MH-4-21	0.004	12	0.013	2.91	496.66	1,035.76	48
PS	MH-4-30-4	W-4	0.01	8	0.013	3.84	434.08	542.34	80

Flow > Capacity

Town of Queensbury - Capacity Analysis for Bay Road
Model Results - Scenario 5

Label	Start Node	Stop Node	Slope (Calculated) (ft/ft)	Diameter (in)	Manning's n	Velocity (ft/s)	Flow (gal/min)	Capacity (Full Flow) (gal/min)	Flow / Capacity (Design) (%)
P1	SMH-12	SMH-11A	0.012	8	0.01	2.59	40.97	760.67	5.4
P2	SMH-11A	SMH-11	0.012	8	0.01	3.58	124.48	761.36	16.3
P3	SMH-11	SMH-10	0.013	8	0.01	3.75	124.48	810.74	15.4
P4	SMH-10	SMH-9	0.042	8	0.01	4.97	124.48	1,207.44	10.3
P5	SMH-9	SMH-8A	0.037	8	0.01	4.94	141.06	1,132.68	12.5
P6	SMH-8A	SMH-8	0.014	8	0.01	3.96	141.06	831.78	17
P7	SMH-8	SMH-7	0.005	8	0.01	2.87	150.29	519.63	28.9
P8	SMH-7	SMH-6	0.006	8	0.01	2.9	150.29	526.08	28.6
P9	SMH-6	SMH-5	0.006	8	0.01	2.99	150.29	549.6	27.3
P10	SMH-5	SMH-4	0.005	8	0.01	2.96	165.3	522.71	31.6
P11	SMH-4	SMH-3	0.021	8	0.01	4.83	165.3	1,032.78	16
P12	SMH-3	SMH-2A	0.004	8	0.01	2.73	175.96	457.65	38.4
P13	SMH-2A	SMH-2	0.003	12	0.01	2.21	175.96	1,052.18	16.7
P14	SMH-2	SMH-1	0.002	12	0.01	2.15	192.3	972.42	19.8
P15	SMH-1	EXSMH-1	0.001	12	0.01	1.75	197.74	723.77	27.3
P16	EXSMH-1	MH 4-30-7	0.019	8	0.012	4.7	280.33	810.39	34.6
P17	MH 4-30-7	MH 4-30-6	0.004	8	0.01	3	280.33	444.9	63
P18	MH 4-30-6	MH 4-30-5	0.02	8	0.012	4.78	280.33	830.91	33.7
P19	MH 4-30-5	MH-4-30-4	0.004	8	0.01	3.01	280.33	445.91	62.9
P20	MH-6	MH-4-30-4	0.004	8	0.01	2.49	129.19	452.42	28.6
P21	MH-4-30-2	MH-4-30-1	0.009	8	0.012	3.83	381.44	557.7	68.4
P22	MH-4-30-1	MH-4-30	0.009	8	0.012	3.84	384.8	557.62	69
P23	MH-4-30	MH-4-29	0.014	8.5	0.012	4.59	385.52	825.58	46.7
P24	MH-4-31	MH-4-29	0.004	8.5	0.012	1.94	89.98	436.26	20.6
P25	MH-4-32	MH-4-31	0.004	8.5	0.012	1.94	89.98	436.07	20.6
P26	MH-4-33	MH-4-32	0.004	8.5	0.012	1.91	84.62	436.47	19.4
P27	MH-4-34	MH-4-33	0.006	8.5	0.012	0.63	1.29	533.96	0.2
P36	MH-4-40-2	MH-4-40-1	0.006	8	0.01	1.44	12.68	545.37	2.3
P35	MH-4-40-1	MH-4-40	0.007	8	0.01	1.66	16.11	603.84	2.7
P34	MH-4-40	MH-4-39	0.003	8.5	0.012	1.02	16.11	357.36	4.5
P33	MH-4-39	MH-4-38	0.006	8.5	0.012	1.39	17.67	534.56	3.3
P32	MH-4-38	MH-4-37	0.006	8.5	0.012	1.47	21.14	533.93	4
P31	MH-4-37	MH-4-36A	0.013	8.5	0.012	2.72	68.06	783.93	8.7
P30	MH-4-36A	MH-4-36	0.004	8.5	0.012	1.8	68.28	436.7	15.6
P29	MH-4-36	MH-4-35	0.004	8.5	0.012	1.88	81.12	436.04	18.6
P28	MH-4-35	MH-4-33	0.004	8.5	0.012	1.89	82.35	436.46	18.9
P37	MH-4-28	MH-4-27	0.004	8.5	0.012	0.66	2.41	435.75	0.6
P38	MH-4-27	MH-4-26	0.004	8.5	0.012	0.66	2.41	435.06	0.6
P39	MH-4-26	MH-4-25	0.004	8.5	0.012	0.66	2.41	436.32	0.6
P40	MH-4-25	MH-4-24A	0.004	8.5	0.012	0.87	5.74	436.14	1.3
P41	MH-4-24A	MH-4-24	0.004	8.5	0.012	0.87	5.74	436.79	1.3
P42	MH-4-24	MH-4-23	0.004	8.5	0.012	0.88	6.16	436.14	1.4
P43	MH-4-23	MH-4-22	0.004	8.5	0.01	2.77	490.51	432.3	**113.5**
P44	MH-4-29	MH-4-23	0.01	8.5	0.012	4.22	479.81	690.63	69.5
P45	MH-4-22	MH-4-21	0.004	12	0.013	2.91	494.25	1,035.76	47.7
PS	MH-4-30-4	W-4	0.01	8	0.013	3.8	409.52	542.34	75.5

Flow > Capacity

Appendix E
Cost Estimate

Opinion of Probable Construction Cost - 425 GPM PS Upgrades

M.J. Engineering & Land Surveying, P.C.
Capacity Analysis for Bay Road Sewer
9-Aug-16

Item	Description	Unit	Total	Unit Price*	Total Price
	GENERAL REQUIREMENTS				
	Survey Stakeout	LS	1	$5,000	$5,000
	DEMOLITION AND REMOVALS				
	Classified Excavation	CY	100	$18	$1,800
	Pipe Removal	LF	10	$18	$200
	SEWER PIPE UPGRADES				
	Directional Drill 8-inch SDR35 Pipe Under Bay Road	LF	110	$105	$11,600
	Precast Concrete Manhole With Frame and Cover	EA	1	$3,100	$3,100
	Core Existing MHs	EA	1	$500	$500
	Bypass Pumping	D	2	$800	$1,600
	WILLOWBROOK PUMP STATION UPGRADES				
	Bypass Pumping	D	3	$800	$2,400
	Willowbrook Pump Station Upgrades	LS	1	$26,000	$26,000
	Standby Emergency Generator	LS	1	$31,000	$31,000
	SITE RESTORATION				
	12" Subbase	CY	6	$50	$300
	Asphalt Surface Course	SY	2	$70	$140
	Asphalt Binder Course	SY	2	$50	$100
	Topsoil, Seed & Mulch	SY	1	$25	$25
	TRAFFIC CONTROL				
	Maintenance and Protection of Traffic	D	10	$1,100	$11,000
	Construction Subtotal				**$95,000**
	Construction Bonds and Insurance (4%)	ALLOW			$3,800
	Design Contingency (30%)	ALLOW			$28,500
	Estimated Construction Cost				**$128,000**
	Engineering & Construction (20%)	ALLOW			$25,600
	Legal, Fiscal & Administration (4%)	ALLOW			$5,200
	Permit Allowance (0.5%)	ALLOW			$700

*Unit Price refers to a cost derived from Labor and Material expenditures.

All Unit Prices derived from RSMeans estimated costs.

Total Estimated Opinion of Probable Cost	**$160,000**

Opinion of Probable Construction Cost - 525 GPM PS Upgrades

M.J. Engineering & Land Surveying, P.C.
Capacity Analysis for Bay Road Sewer
9-Aug-16

Item	Description	Unit	Total	Unit Price*	Total Price
	GENERAL REQUIREMENTS				
	Survey Stakeout	LS	1	$5,000	$5,000
	DEMOLITION AND REMOVALS				
	Classified Excavation	CY	1,500	$18	$27,000
	Demo Existing Pump Station	LS	1	$15,000	$15,000
	Pipe Removal	LF	1,300	$18	$23,400
	SEWER PIPE UPGRADES				
	8-inch SDR35 Pipe	LF	1,300	$13	$16,900
	Directional Drill 8-inch SDR35 Pipe Under Bay Road	LF	110	$105	$11,600
	Precast Concrete Manhole With Frame and Cover	EA	1	$3,100	$3,100
	Core Existing MHs	EA	1	$500	$500
	Bypass Pumping	D	5	$800	$4,000
	WILLOWBROOK PUMP STATION UPGRADES				
	Bypass Pumping	D	3	$800	$2,400
	Willowbrook Pump Station Upgrades	LS	1	$100,000	$100,000
	Standby Emergency Generator	LS	1	$40,000	$40,000
	SITE RESTORATION				
	12" Subbase	CY	6	$50	$300
	Asphalt Surface Course	SY	2	$70	$140
	Asphalt Binder Course	SY	2	$50	$100
	Topsoil, Seed & Mulch	SY	1	$25	$25
	TRAFFIC CONTROL				
	Maintenance and Protection of Traffic	D	10	$1,100	$11,000
	Construction Subtotal				**$261,000**
	Construction Bonds and Insurance (4%)	ALLOW			$10,500
	Design Contingency (30%)	ALLOW			$78,300
	Estimated Construction Cost				**$350,000**
	Engineering & Construction (20%)	ALLOW			$70,000
	Legal, Fiscal & Administration (4%)	ALLOW			$14,000
	Permit Allowance (0.5%)	ALLOW			$1,800

*Unit Price refers to a cost derived from Labor and Material expenditures.

All Unit Prices derived from RSMeans estimated costs.

Total Estimated Opinion of Probable Cost	**$436,000**