westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

REPORT

April 2020

TOWN OF
Nantucket
MASSACHUSETTS

Town Sewer District
Sewer Master Plan

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LIST OF ABBREVIATIONS

ASCE – American Society of Civil Engineers

BOD – Biochemical Oxygen Demand

CDT – Commercial Downtown

CHI – Computational Hydraulics International

CI Pipe – Cast Iron Pipe

CI – Commercial Industrial

CN – Commercial Neighborhood

CMI – Commercial Mid-Island

CMOM – Capacity, Management, Operations & Maintenance

CTEC – Commercial Trade Entrepreneurial Craft

CWMP – Comprehensive Wastewater Management Plan

d/D – Depth of flow to diameter of pipe ratio

DI – Ductile Iron

DPW – Department of Public Works

EL. - Elevation

EPA – Environmental Protection Agency

FM – Force Main

ft. - feet

gal - gallon

gpd – gallons per day

gpdim – gallons per day per inch-diameter mile

gpm – gallons per minute

GIS – Geographic Information System

HDPE – High-Density Polyethylene

HTL – High Tide Level

ID - Identification

LIST OF ABBREVIATIONS (CONTINUED)

In-Di-Mi – Inch-Diameter-Mile

I/A – Innovative/Alternative

I/I – Infiltration/ Inflow

LUG -1 – Limited Use 1

LUG-2 – Limited Use 2

LUG-3 – Limited Use 3

MGD – Million Gallons Per Day

MLW – Mean Low Water

MMD – Moorlands Management

NAVD – North American Vertical Datum

O&M – Operation & Maintenance

PCSWMM – Personal Computer Storm Water Management Model

PS – Pump Station

QA – Quality Assurance

QC – Quality Control

R-1 – Residential 1

R-5 – Residential 5

R-5L – Residential 5 Limited

R-10 – Residential 10

R-10L – Residential 10 Limited

R-20 – Residential 20

R-40 – Residential 40

RC – Residential Commercial

RC-2 – Residential Commercial 2

ROH – Residential Old Historic

SOH – Sconset Old Historic

LIST OF ABBREVIATIONS (CONTINUED)

Sq. ft. – Square Feet

SR-1 – Sconset Residential 1

SR-10 – Sconset Residential 10

SR-20 – Sconset Residential 20

STA - Station

SWMM – Stormwater Management Model

TDH – Total Dynamic Head

TN – Total Nitrogen

TR-16 – New England Interstate Water Pollution Control Commission Guidelines for Design of Wastewater Treatment Works

TSS – Total Suspended Solids

VN – Village Neighborhood

VR – Village Residential

VTEC – Village Trade Entrepreneurial Craft

WPZ – Well Head Protection Zone

WWTF – Wastewater Treatment Facility

GLOSSARY OF TERMS

BOD - Biochemical Oxygen Demand is the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedure in five days at 20° C., expressed in milligrams per liter.

Build-Out: An analysis that determines what it would look like if all undeveloped land in a community were built to the extent allowed under its existing zoning regulations.

Cavitation: The formation and collapse of a gas pocket or bubble on the blade of a pump impeller. The collapse of this gas pocket or bubble drives water into the impeller with enough force to knock metal particles off and cause pitting on the impeller.

Check Valve: A valve with a hinged disk or flap that opens in the direction of normal flow and is forced shut when flows go in the opposite direction of normal flow.

Datum: A reference system against which elevations are measured.

Downstream Capacity Analysis: The analysis to determine if the sewer system downstream of an area has the capacity to receive the wastewater flow from that area.

Drawdown: The vertical drop in the height of the water level pumped out of a tank.

Dynamic Head: The amount of pressure differential created by a pump while in operation.

Easement: A legal right to use another's land for a specific limited purpose. Sewer easement give the town the right to access the property for the installation and maintenance of sewer lines.

Flow Metering: The measurement of flow past a selected point. Usually consisting of time, velocity, and amount with maximum and minimum rates as well as the total amount over a given period of time.

Force Main: A pressurized sewer pipe that conveys wastewater in a situation where gravity sewage flow is not possible. Pumps push the sewage through the pipe from lower to higher elevations.

Gravity Sewer System: Gravity sewer systems consist of a network of underground sewer pipes that rely on gravity (a higher elevation to a lower elevation) to convey wastewater.

Grinder Pump: A grinder pump receives wastewater from a home or business and pumps it into a low-pressure or gravity sewer line. As its name suggests, the grinder pump macerates the solids present in the wastewater to a slurry in the manner of a kitchen sink garbage grinder.

Head Loss: The pressure lost by water flowing in a pipe as a result of turbulence caused by the velocity of the flowing water and the roughness of the pipe. Water flowing in a pipe loses head as a result of friction losses.

GLOSSARY OF TERMS (CONTINUED)

Headworks: The preliminary treatment stage at the wastewater treatment facility which includes screening and grit removal to remove larger debris and inorganic material such as sand.

Hydraulic Grade Line (HGL): The surface of water flowing in an open channel or a pipe flowing partially full. For a pipe flowing under pressure, the hydraulic grade line is the level that water would rise in vertical tube open to atmospheric pressure at any point along the pipe.

Hydraulic Model: A mathematical model of the flow of wastewater in the sewer system used to analyze changing conditions in the system.

Infiltration: Water other than sanitary flow that enters a sewer system from the ground through means which include, but are not limited to, defective pipes, pipe joints, connections, or manholes. Infiltration does not include and is distinguished from inflow.

Infiltration/Inflow (I/I): The quantity of infiltration and inflow (I/I) without distinguishing a source.

Inflow: Water other than sanitary flow that enters a sewer system from sources which included but are not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm waters, surface runoff, street wash waters, sump pump discharges, or drainage. Inflow does not include, and is distinguished from, infiltration. The total amount of inflow is equal to the sum of the delayed inflow and direct inflow.

Innovative/Alternative (I/A): A type of advanced septic system that includes components to reduce the amount of excess nutrients (typically nitrogen) from wastewater that are discharged to the groundwater.

Invert: The bottom of a pipe or manhole.

Low Pressure Sewer System: A low pressure sewer system uses small-diameter pipes and grinder pumps to transmit the flow from a lower elevation to a higher elevation.

Manifold: A pipe to which the ends of a series of pipes are connected.

Peak Flow: Ratio of a maximum flow to the average flow, such as maximum hourly flow or maximum daily flow to the average daily flow.

Per Capita: Per person.

Pump Curve: Data showing a pump's ability to produce flow against certain head.

Pump Station: A station with pumps to mechanically lift wastewater from a lower elevation to a higher elevation.

GLOSSARY OF TERMS (CONTINUED)

Record Drawings: Drawings prepared that reflect the final location, dimensions, and elevations of the work completed.

Resistance Coefficient: Abbreviated as K, a dimensionless number, represents how much resistance to flow an obstruction presents.

Septage Management Plan: The town's plan to manage the on-site wastewater disposal (septic) systems.

Sewer Service Connection Fee: A fee assessed by the Town for each dwelling that connects to the town sewer, which covers the cost to review the plans for and inspect the installation of each new connection.
Sewer Routing: Planning the layout of a pipeline.

Solids Handling: The process of handling and treating waste sludge at the WWTF.

Stationing (STA): A point of reference or location along the sewer line.

Sump: Pit or tank that catches liquid runoff for drainage or disposal.

Surcharging: When an entrance or exit of a pipe are submerged in water and the pipe is flowing full.

Suspended Solids: Small solid particles which remain in suspension in, water, wastewater, or other liquids, and that is removable by laboratory filtering as prescribed in "Standard Methods for the Examination of Water and Wastewater".

Title 5: The State Environmental Code, the department's regulation for the siting, construction, inspection, upgrade and expansion of on-site sewage treatment and disposal systems and for the transport and disposal of septage.

Topographic Survey: A survey that gathers data about the elevation of points on a piece of land and presents them as contour lines on a plan.

Tributary Area: The area from which all wastewater flows to the same receiving pipe.

Wastewater Loads: The amount of BOD, TSS and Nitrogen in the wastewater being treated at the WWTF.

Wet Well: A wet well is a holding tank for wastewater at the pump station. As wastewater enters the wet well and the water level rises, pumps are engaged to pump out the wastewater to a force main.

WWTF: A facility containing a series of physical, chemical and biological processes by which pollutants are removed from wastewater prior to discharge to either ground water or surface water.

EXECUTIVE SUMMARY

Weston & Sampson, on behalf of the Town of Nantucket, MA, completed the development of the Sewer Master Plan for the Town Sewer District wastewater collection system, which is the collection system tributary to the Surfside Wastewater Treatment Facility (WWTF). The sewer master planning for the Siasconset Sewer District wastewater collection system is being developed by Weston & Sampson as part of the 2020 Siasconset Comprehensive Wastewater Management Plan (CWMP) Update.

The purpose of the Sewer Master Plan is to help the Town determine where and how to connect and route future wastewater flows into the existing wastewater collection system. The sewer master planning effort builds upon the work completed in the 2014 CWMP, which updated the original 2004 CWMP. It should be noted that the 2014 CWMP only updated the Town Sewer District portion of the 2004 CWMP. The 2014 CWMP further identified Needs Areas, which are those areas recommended to be connected to the sewer system. The sewer master planning effort is not intended to reevaluate the Needs Areas, but to update and confirm which properties within the Needs Areas will contribute future flow (and to confirm the anticipated flows). Routing alternatives for connecting each of the Needs Areas into the existing collection system were identified and evaluated as part of the Sewer Master Plan. This effort included evaluating the downstream collection system capacity to identify the downstream system upgrades needed to convey the future wastewater flows to the Surfside WWTF and to allow the system upgrades to be properly planned and sequenced.

Throughout the planning process, Weston & Sampson held work sessions and progress meetings with the Town staff, including the Sewer Department, Planning and Land Use Services, Health Department, Natural Resources, Wannacomet Water, Public Works and Town Administration. These work sessions and progress meetings were very valuable during the planning process, as they provided scheduled opportunities for the group to communicate and provide necessary information to review the technical aspects of the work at appropriate intervals. The communication and commitment from the town staff was essential in our ability to successfully complete the Sewer Master Plan. Planning efforts associated with the pump station evaluations, the force main modeling, and the Surfside WWTF flow and loading review required several field investigations at the WWTF and the various pump stations. The assistance provided by the Sewer Department staff during these investigations was invaluable, and the support efforts were greatly appreciated.

Background

The wastewater in the Town Sewer District collection system is pumped to the Surfside WWTF via the Sea Street Pump Station, the Surfside Road Pump Station, the South Valley Pump Station, and the new Monomoy South Pump Station (recently completed as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project). The Town Sewer District collection system consists of four (4) separate sub-systems which are tributary to the individual pump stations noted above and as shown on Figure 1-1. The wastewater is pumped to the Surfside WWTF via three (3) long force mains that manifold together just prior to the WWTF headworks. The force mains include the 20-inch DI force main from the Sea Street Pump Station, the 16-inch HDPE force main from the Sea Street Pump Station and the 12-inch PVC force main from the South Valley Pump Station. The Surfside Road Pump Station force main is configured so that it can discharge into either the 20-inch DI Sea Street Pump Station force main or the 16-inch HDPE Sea Street Pump Station force main. The Monomoy South Pump Station force main is manifolded into the 12-inch PVC South Valley Pump Station force main.

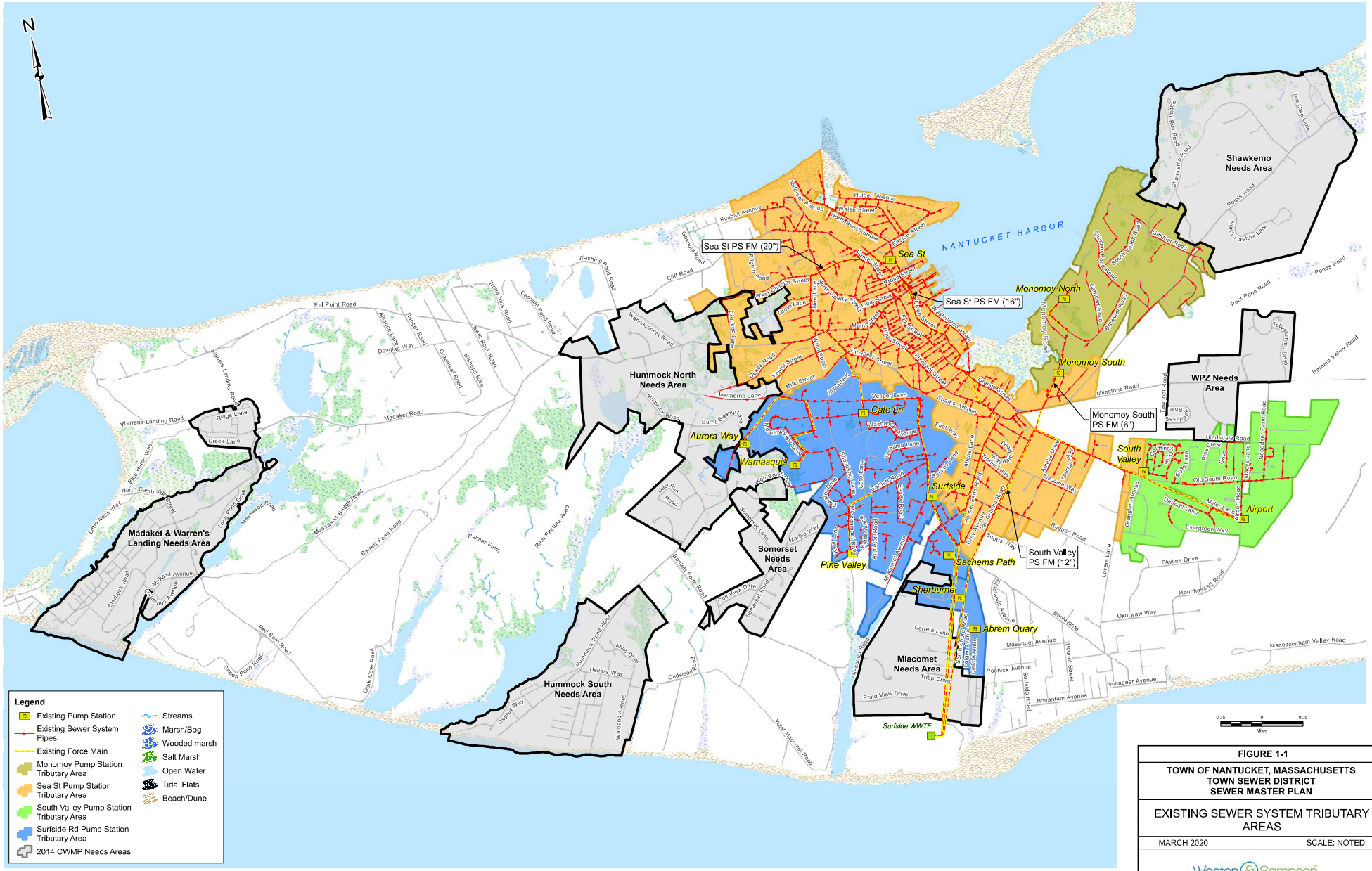


FIGURE 1-1

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

EXISTING SEWER SYSTEM TRIBUTARY AREAS

MARCH 2020 SCALE: NOTED

Weston & Sampson

Development of Future Wastewater Flows

Through multiple work sessions, Weston & Sampson and the town staff met to review and identify the areas of future wastewater flow, which include:

- Needs Areas identified in the 2014 CWMP. Figure 1-1 shows the location of the Needs Areas in relation to the existing Town Sewer District collection system.
- Planned development and redevelopment within the existing Town Sewer District
- Allowance for additional building construction based on current zoning regulations

The town's GIS and Assessor's data was used to determine which properties in the Needs Areas should be included in the calculation of future wastewater flows as well as the potential build out of properties based on current zoning and an allowance for the construction of future secondary dwellings on a property. Once the properties to be sewered were identified and the potential build out of properties was determined, the future wastewater flows were estimated for each of the Needs Areas. Table 2-9 in Section 2 of the report provides a summary of the Needs Area future wastewater flows. The property listing and future wastewater flow calculation spreadsheets for each Needs Area are included in Appendix A of the report.

A similar flow assessment was completed for the areas tributary to the South Valley Pump Station and the Airport Pump Station. Table 2-10 in Section 2 of the report provides a summary of the future wastewater flows for these areas, as well as the Wellhead Protection Zone (WPZ) future Needs Area which is tributary to the Airport Pump Station. The property listing and future wastewater flow calculation spreadsheets for each of the tributary areas is included in Appendix B of the report.

Evaluation of Routing Alternatives

Routing alternatives for connecting each of the future wastewater needs areas to the existing wastewater collection system were evaluated. The preliminary sewer system layouts and recommended routing for each of the Needs Areas are shown on Figures 3-1 through 3-8 in Section 3 of the report. It should be noted that the sewer system layouts are preliminary and subject to change during the actual design of the sewer system, as a detailed and more accurate topographic survey will be completed. The ability for the town to acquire sewer easements, as well as property for proposed pump stations will be a major factor in the type of collection system that can be designed for each of the Needs Areas. The recommended routing for the Needs Areas is as follows:

- Hummock North, Hummock South and Somerset Needs Areas will be tributary to the Surfside Road Pump Station collection system
- Madaket and Warren's Landing Needs Areas will be pumped directly to the Surfside WWTF
- Miacomet Needs Area will be pumped directly to the Surfside WWTF
- Shawkemo Needs Area will be tributary to the Monomoy South Pump Station collection system
- WPZ Needs Area will be tributary to the Airport Pump Station collection system

Downstream Collection System Capacity Analysis

Based on the recommended routing alternatives, a capacity analysis of the downstream collection system was completed to identify downstream system improvements needed to convey the future wastewater flows to the Surfside WWTF.

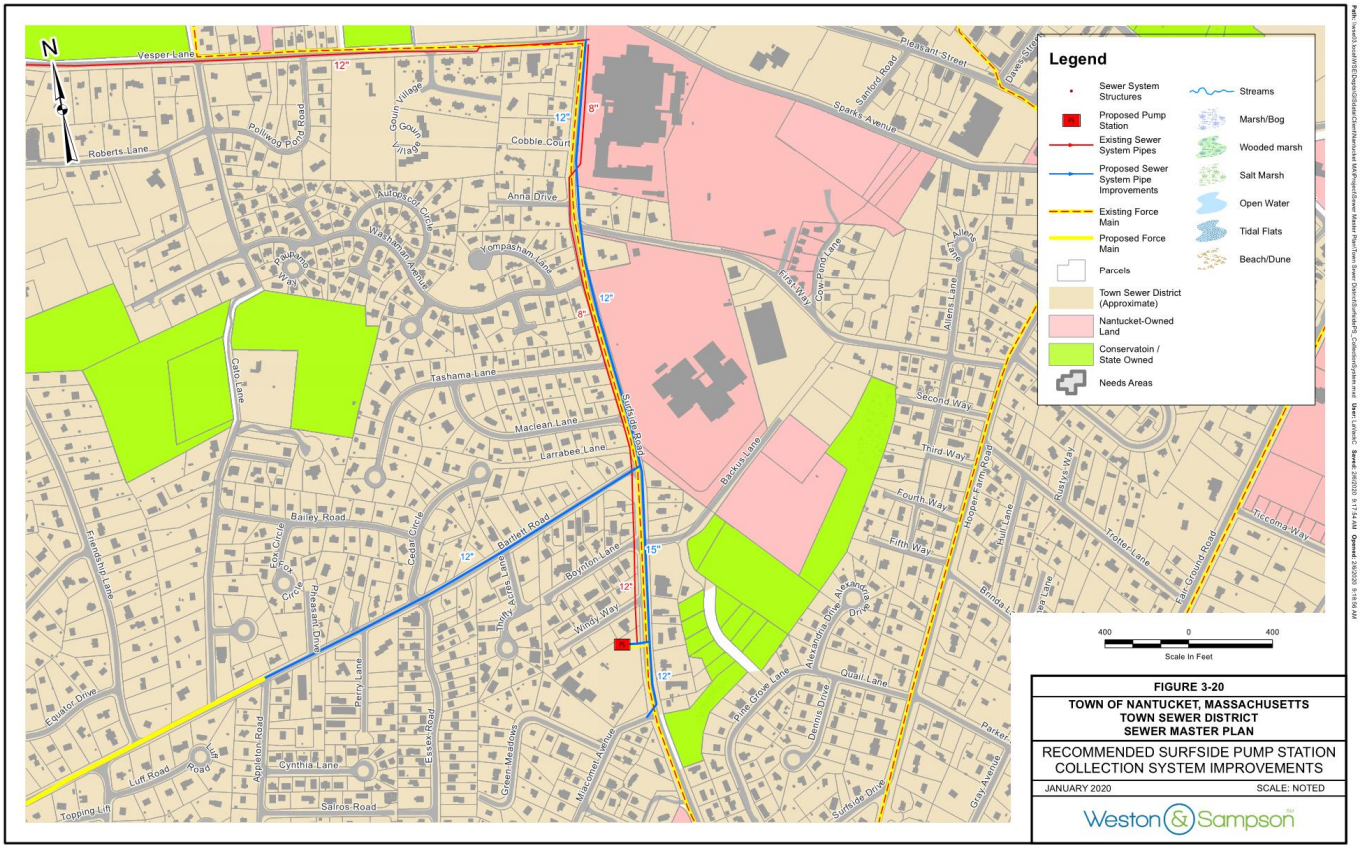
The downstream capacity analysis of the Surfside Road Pump Station collection system was completed by developing a hydraulic model of the collection system based on the future wastewater flows tributary

to the Surfside Road Pump Station. In addition to the Hummock North, Hummock South, and Somerset Needs Areas, the future flows include build out of the existing Surfside Pump Station tributary area, which is the area shaded in blue on Figure 1-1. The hydraulic modeling showed that the existing Surfside Pump Station collection system does not have capacity to handle the future wastewater flow. Five (5) flow scenarios were modeled to establish a recommended plan for Surfside Road Area sewer system improvements. The recommended improvements include a new 12-inch and 15-inch gravity sewer on Surfside Road, a new 12-inch sewer on Bartlett Road, and a new 4 MGD Surfside Road Pump Station. A larger 12-inch sewer was recently installed on Vesper Lane (as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project). This new sewer on Vesper Lane is part of the capacity improvements to handle the future flows. A plan of the recommended Surfside Road Pump Station collection system improvements is shown on Figure 3-20.

The budgeted project cost for the Surfside Road Area Sewer Systems Improvements is $7,600,000. The breakdown of the project cost is as follows:

- Construction: $5,640,000
- Contingency: $ 550,000
- Engineering: $1,410,000

Figure 3-20 Recommended Surfside Pump Station Collection System Improvements



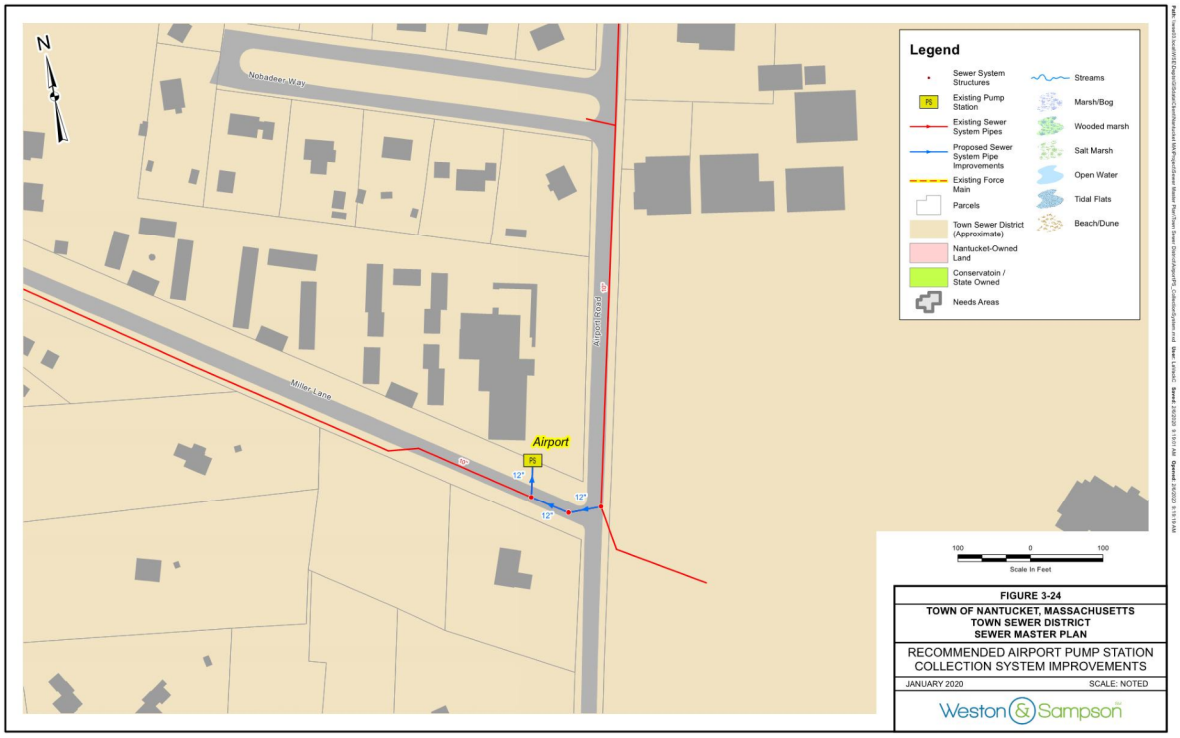
The downstream system capacity analysis for the Sea Street Pump Station collection system was not included in the Sewer Master Plan. This analysis will be completed as part of a future hydraulic modeling effort under the Capacity, Management, Operations & Maintenance (CMOM) Program. The Sea Street Pump Station was recently upgraded (completed in 2019), and the design of a new third force main from the Sea Street Pump Station to the Surfside WWTF will begin soon.

The downstream capacity analysis of the South Valley and Airport Pump Station collection system was completed by developing a hydraulic model of the collection system based on the future wastewater flows tributary to the South Valley and Airport Pump Stations. In addition to the WPZ Needs Area, the future flows include build out of the existing South Valley Pump Station tributary area, which is the area shaded in bright green on Figure 1-1. Three (3) flow scenarios were hydraulically modeled to establish a recommended plan for sewer system improvements for the Airport Pump Station collection system. The recommended system improvements include the replacement of approximately 130 feet of existing 10-inch sewer on Miller Lane to Airport Road with a new 12-inch sewer. A plan of the recommended Airport Pump Station collection system improvements is shown on Figure 3-24.

The budgeted cost for the Airport Pump Station Collection System improvements, assuming the design and construction are included in the future Airport Pump Station Upgrade project, is $90,000. The breakdown of the project cost is as follows:

- Construction: $ 70,000
- Contingency: $ 5,000
- Engineering: $ 15,000

Figure 3-24 Recommended Airport Pump Station Collection System Improvements



Pump Station Evaluations

Evaluations of 10 of the Town's wastewater pump stations were conducted, including Abrem Quary, Airport Road, Aurora Way, Cato Lane, Monomoy North, Pine Valley, Sachems Path, Sherburne Commons, South Valley and Surfside Road. The Sea Street Pump Station was not included in the evaluation, as it was recently upgraded in 2019. Monomoy South and Wamasquid Pump Stations were not included in the evaluation, as they were recently installed in 2019 as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project. The locations of the pump stations are shown on Figure 1-1. A Pump Station Evaluation Memorandum was completed for each of the pump stations, copies of which are included in Appendix C of the report. Recommendations for improvements and upgrades are included for each of the pump stations.

The Sewer Department is currently planning upgrades for several of the existing pump stations including the Airport Pump Station, Aurora Way Pump Station, Cato Lane Pump Station, Pine Valley Pump Station, and South Valley Pump Station. The recommended improvements should be considered in the upgrade of these pump stations. The recommended sewer routing for the Miacomet Needs Area includes the installation of a proposed gravity sewer on South Shore Road. This gravity sewer would allow for the elimination of the Sachems Path Pump Station and the Sherburne Commons Pump Station, as well as any proposed pump stations along South Shore Road. The recommended plan for the Surfside Road Area sewer system improvements includes a new Surfside Road Pump Station to be constructed with capacity to handle the future tributary wastewater flow of approximately 4 MGD.

Development of Existing Force Main System Model

Weston & Sampson developed a force main system hydraulic model to identify the overall pump station and force main system hydraulics and capacity issues when the pump stations are operating individually or simultaneously. This model was utilized to determine the operating characteristics of the force main system during different pumping scenarios (i.e. multiple pump stations operating at different times within multiple force mains).

The force mains for the Sea Street Pump Station, Surfside Road Pump Station, South Valley Pump Station, and Monomoy South Pump Station all connect to the overall force main system at different locations. The output at each pump station will vary depending on which other pump stations are operating at the same time. In order to more fully understand the hydraulics, potential flow scenarios for each pump station running alone (without any other pump stations operating) and scenarios when all other pump stations in the system are running ("All Run" Scenario) were evaluated. The "All Run" scenario is based on the maximum design peak flow for each pump station with the required number of pumps operating to meet the design peak flow. The mostly theoretical "All Run" scenario is considered the 'worst-case' scenario where all pump stations are operating at peak flow and competing with all other pump stations to discharge flow into the force main system.

Future Proposed Force Main System Model

Extending sewer service to the CWMP Needs Areas will require additional pump stations with connections to the existing force main system. The recommended future connections include:

- The proposed Madaket and Warren's Landing Pump Station Force Main
- The new Surfside Road Pump Station Force Main
- The proposed Miacomet Pump Station Force Main

We modeled the peak flow from these force main connections into the existing force main system and the resulting impact on the operation of the existing pump stations. The modeling shows that the Sea Street Pump Station does not appear to have the capacity to meet the peak flow when operating in just the existing 20-inch force main under the "All Run" scenario. A second force main would need to be activated to provide capacity. The Town is planning for a new third force main for the Sea Street Pump Station. The design of this new force main, as well as the design of the Surfside Road Pump Station need to consider the future force main connections as well as the multiple pump station operations.

Coordination with Ongoing Infrastructure Projects

In order to complete the various sewer projects in a cost-effective manner and to minimize disruption (i.e. traffic) during construction, it is recommended that all utility (sewer, water and stormwater) replacement needs be installed together, instead of multiple projects. This would allow for paving the impacted roadways one time, which would be a significant cost savings for the town. In addition, with the schools and the hospital located in the project area, traffic congestion is an issue year-round, not just the summer months. Completing the pipeline work in one project, would minimize the disruption to a single season, not multiple years if the work is done as multiple projects.

Review of Surfside WWTF Capacity

The 2014 CWMP included an update of the 2004 CWMP wastewater flow and loads to the Surfside WWTF. The flow and loads were further refined in the May 2016 Design Basis Report for the design of the recently completed Surfside WWTF Upgrades project. As part of the development of the Sewer Master Plan, potential additional future sewer flow and loads were projected. These projections were combined with the results of the analysis of more recent reported flow and load data to establish updated estimates of future flow and loads to the WWTF.

The updated flow and loads are within typical variability of the different data sets used between 2014 and 2019. Based on the data, expansion of the existing process tankage (large underground concrete tanks) is not necessary. The support systems, such as solids handling and aeration system equipment, warrant further consideration and evaluation as part of the design of the Surfside WWTF Phase 2 Upgrades, for which the scoping is currently underway. Due to budgetary constraints, the solids handling, and portions of the aeration upgrades were removed from the recently completed WWTF (Phase 1) upgrade project. The needed improvements to the Surfside WWTF are expected to progress over the next several years.

Wastewater Collection System Resiliency

Managing a municipal wastewater system is just one of the critical aspects of resiliency for Nantucket. The wastewater collection system has many components which were built over a hundred years ago, and many of the original pipes remain in service. Driven by the island's desirability as a summer vacation spot, elevated property values drive a strong local building and development industry which results in constant changes to wastewater flows and loads, which challenge the capacity and condition of the sewer infrastructure. Nantucket has two separate municipal wastewater systems - the Town Sewer District system and the Siasconset Sewer District system. The Town Sewer District system, which is the subject of this Sewer Master Plan, serves the downtown, harbor and central developed areas of town. Major improvements to the sewer system, including the Surfside WWTF and the Sea Street Pump Station, were recently completed. The goals of these projects were to modernize the wastewater systems and improve system integrity and resiliency. The Sewer Department has a long-term infrastructure improvements and asset management plan to continue to improve the system resiliency.

1.0 INTRODUCTION

The Nantucket Sewer Department, in collaboration with other town departments, including Planning and Land Use Services, Health Department, Natural Resources, Wannacomet Water, Public Works and Town Administration worked with Weston & Sampson to develop the Sewer Master Plan for the Town Sewer District wastewater collection system, which is the collection system tributary to the Surfside Wastewater Treatment Facility (WWTF). The sewer master planning for the Siasconset Sewer District wastewater collection system is being developed by Weston & Sampson as part of the 2020 Siasconset Comprehensive Wastewater Management Plan (CWMP) Update

The purpose of the Sewer Master Plan is to help the Town determine where and how to connect and route future wastewater flows into the existing wastewater collection system. The sewer master planning effort builds upon the work completed in the 2014 CWMP, which updated the original 2004 CWMP. It should be noted that the 2014 CWMP only updated the Town Sewer District portion of the 2004 CWMP. The 2014 CWMP further identified Needs Areas, which are those areas recommended to be connected to the sewer system. The sewer master planning effort is not intended to reevaluate the Needs Areas, but to update and confirm which properties within the Needs Areas will contribute future flow (and to confirm the anticipated flows). Routing alternatives for connecting each of the Needs Areas into the existing collection system were identified and evaluated as part of the Sewer Master Plan. This effort included evaluating the downstream collection system capacity to identify the downstream system upgrades needed to convey the future wastewater flows to the Surfside WWTF and to allow the system upgrades to be properly planned and sequenced.

Ongoing infrastructure planning, such as a new Sea St Pump Station force main, water system upgrades, stormwater system upgrades, and transportation/roadway projects are being coordinated with the sewer master planning analysis. This coordination benefits the planning of the various department infrastructure projects which benefits the Town as a whole.

Throughout the planning process, Weston & Sampson held work sessions and progress meetings with the Town staff, including the Sewer Department, Planning and Land Use Services, Health Department, Natural Resources, Wannacomet Water, Public Works and Town Administration. These work sessions and progress meetings were very valuable during the planning process, as they provided scheduled opportunities for the group to communicate and provide necessary information to review the technical aspects of the work at appropriate intervals. The communication and commitment from the town staff was essential in our ability to successfully complete the Sewer Master Plan. Planning efforts associated with the pump station evaluations, the force main modeling, and the Surfside WWTF flow and loading review required several field investigations at the WWTF and the various pump stations. The assistance provided by the Sewer Department staff during these investigations was invaluable and greatly appreciated.

1.1 Background

The wastewater in the Town Sewer District collection system is pumped to the Surfside WWTF via the Sea Street Pump Station, the Surfside Road Pump Station, the South Valley Pump Station, and the new Monomoy South Pump Station recently completed as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project. The Town Sewer District collection system consists of four (4) separate sub-systems which are tributary to the individual pump stations noted above and as shown on Figure 1-1. The wastewater is pumped to the Surfside WWTF via three (3) force mains that manifold together just prior to the WWTF headworks. The force mains include the 20-inch DI force main from the Sea Street Pump Station, the 16-inch HDPE force main from the Sea Street Pump Station and the 12-inch PVC force main from the South Valley Pump Station. The Surfside Road Pump Station force main is configured so that it can discharge into either the 20-inch DI Sea Street Pump Station force main or the 16-inch HDPE Sea Street Pump Station force main. The Monomoy South Pump Station force main is manifolded into the 12-inch PVC South Valley Pump Station force main.

The town is currently conducting a Capacity, Management, Operations & Maintenance (CMOM) Program. Year 1 of the CMOM program included flow metering, partial sewer system capacity analysis and partial hydraulic model development. Flow meters were installed in eight (8) locations, seven (7) of which were located in the collection system tributary to the Sea Street Pump Station, and one (1) of which was located in a part of the collection system tributary to the Surfside Road Pump Station. Flow metering in the remainder of the Surfside Road Pump Station, South Valley Pump Station, Airport Pump Station and Monomoy South Pump Station tributary areas were not included in the CMOM Program and were not included in the CMOM hydraulic modeling. The Surfside Road Pump Station Collection System, the South Valley Pump Station Collection System, the Airport Pump Station Collection System, and the Monomoy South Pump Station Collection System are the focus of the Sewer Master Plan efforts, which include future flow development, routing alternative analysis, hydraulic modeling, and downstream collection system capacity analysis. The capacity analysis for the Sea Street Pump Station collection system will be completed as part of a future CMOM hydraulic modeling effort. That analysis will include an updated projection of future build out flows for the existing Sea Street Pump Station tributary area.

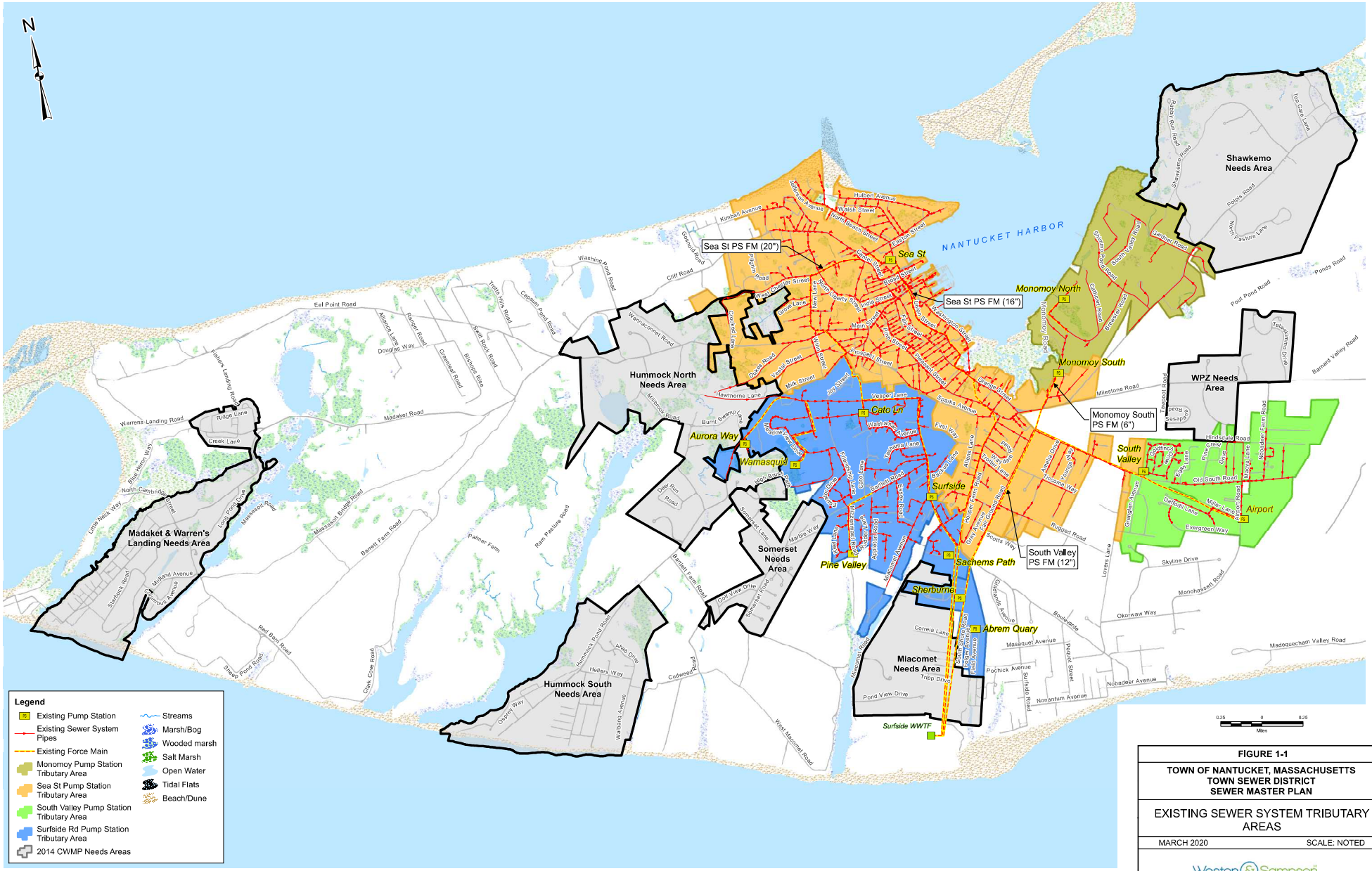


FIGURE 1-1

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

EXISTING SEWER SYSTEM TRIBUTARY AREAS

MARCH 2020 SCALE: NOTED

Weston & Sampson

2.0 DEVELOPMENT OF FUTURE WASTEWATER FLOW

The sewer master planning effort included the development of future wastewater flows tributary to the Town Sewer District wastewater collection system. These flows were used in the master planning so that the capacity of the existing collection system and all needed downstream system upgrades can be analyzed together to allow the system upgrades to be properly planned and sequenced.

2.1 Areas of Future Wastewater Flow

The first step in the assessment was to identify the areas of future wastewater flow. Weston & Sampson conducted work sessions with town representatives, including the Sewer Department, Planning and Land Use Services, Health Department, Natural Resources, Wannacomet Water, and Town Administration to review and identify these areas, which include:

- Needs Areas identified in the 2014 CWMP
- Planned development and redevelopment within the existing Town Sewer District
- Areas of interest outside of the existing Town Sewer District
- Allowance for additional building construction based on current zoning regulations

2.1.1 2014 CWMP Needs Areas

The 2014 CWMP Needs Areas include Hummock North, Hummock South, Madaket & Warren's Landing, Miacomet, Shawkemo, and Somerset. Figure 1-1 shows the location of the Needs Areas in relation to the existing Town Sewer District collection system. Maps of the individual Needs Areas are shown on Figures 2-1 through 2-6.

The 2014 CWMP identified the Town Wellhead Protection Zone (WPZ) as a needs area based on its proximity to the town's drinking water supply (well field). However, the CWMP recommended that the unsewered properties within the WPZ continue the use of on-site wastewater disposal systems with Town oversight under a septage management plan. Many of the unsewered properties within the WPZ have installed Innovative/Alternative (I/A) on-site systems. The CWMP further recommended that if it is determined that the water supply could be subject to compromise, then the remaining unsewered properties should be connected to the collection system. Based on discussions with Wannacomet Water, the town is looking to install a new drinking water well near the existing water tower between Polpis Road and Milestone Road. The unsewered properties in the WPZ Needs Area near Milestone Road would be in very close proximity to the new well. Wastewater flows for these properties have been included in the future wastewater flow projections for the Airport Pump Station to ensure that the existing collection system and any downstream system upgrades are built with sufficient capacity should the town determine the need to connect these properties in the future. A map of the WPZ Needs Area properties is shown on Figure 2-7.

2.1.2 Planned Development and Redevelopment

During the work sessions with the town, known areas of development and redevelopment within the existing Town Sewer District were identified, including recent/ongoing developments such as Hawthorne Park, Grey Lady subdivision, and the Richmond Development; pending developments such as Surfside Crossing; redevelopments such as the Nantucket Hospital apartments on Vesper Lane; and potential future development of vacant properties such as the vacant parcels along Old South Road. The additional wastewater flows for these recent and potential developments have been included in the wastewater flow projections South Road. The additional wastewater flows for these recent and potential developments have been included in the wastewater flow projections.

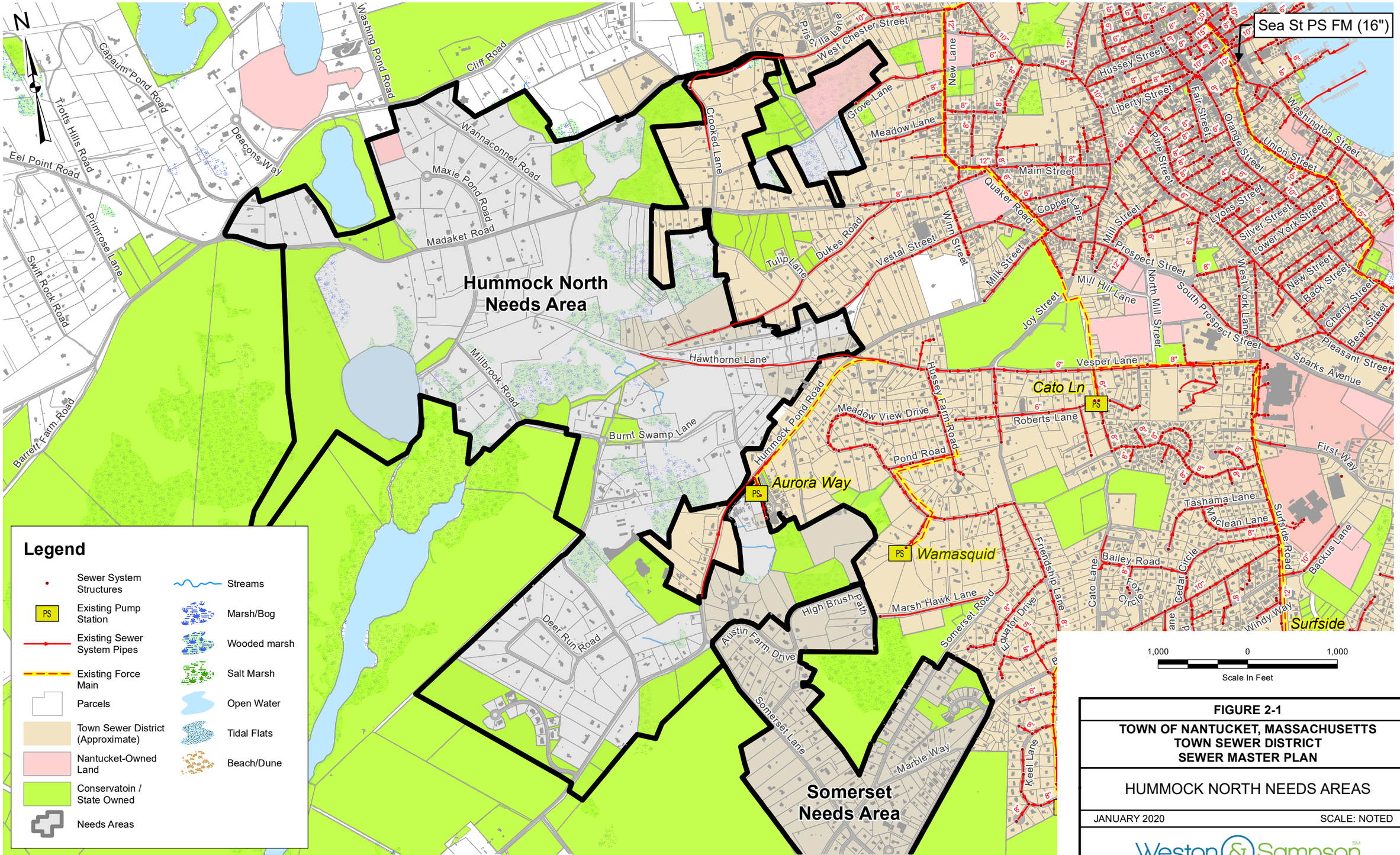


FIGURE 2-1

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

HUMMOCK NORTH NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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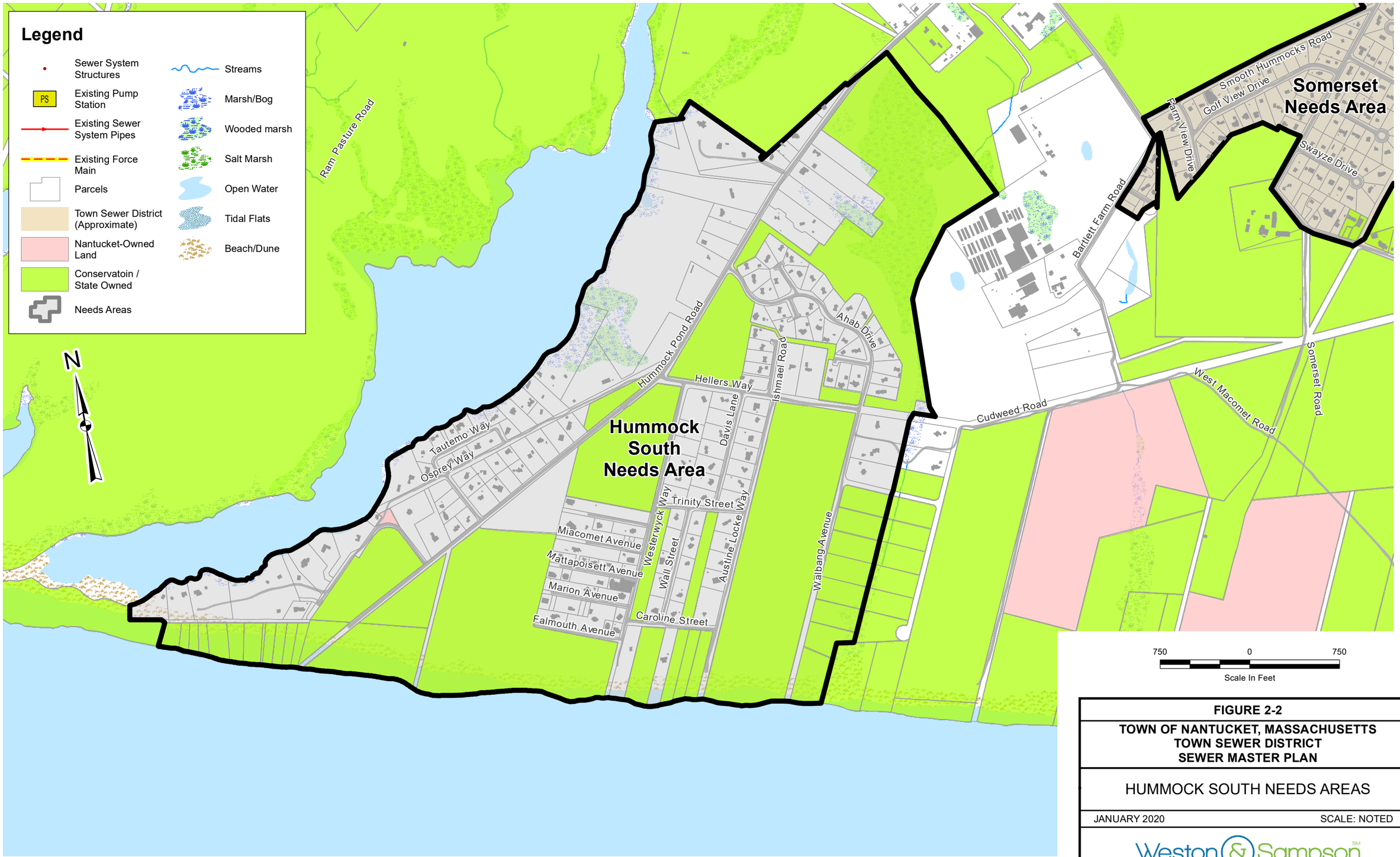

FIGURE 2-2

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

HUMMOCK SOUTH NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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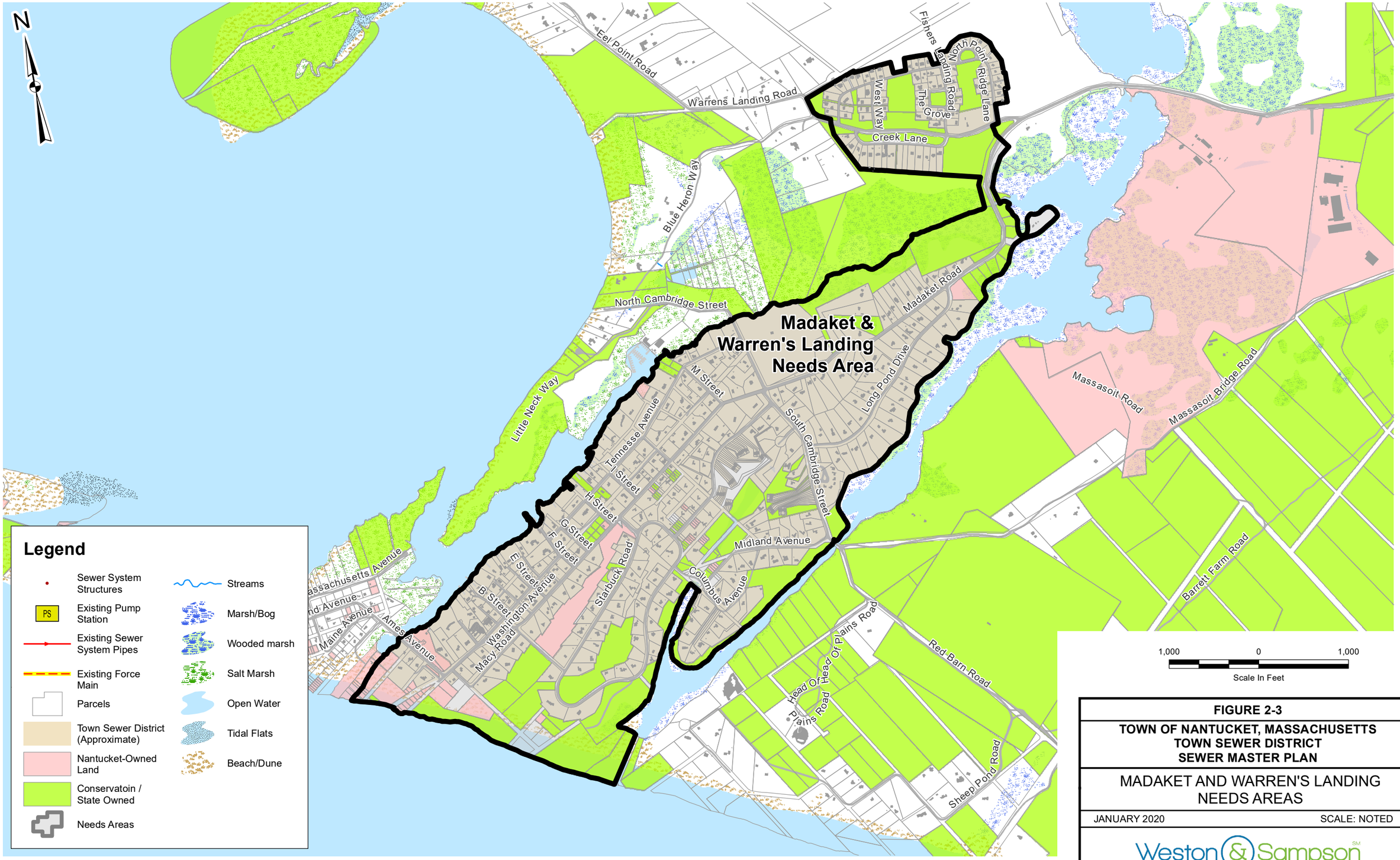

FIGURE 2-3

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

MADAKET AND WARREN'S LANDING NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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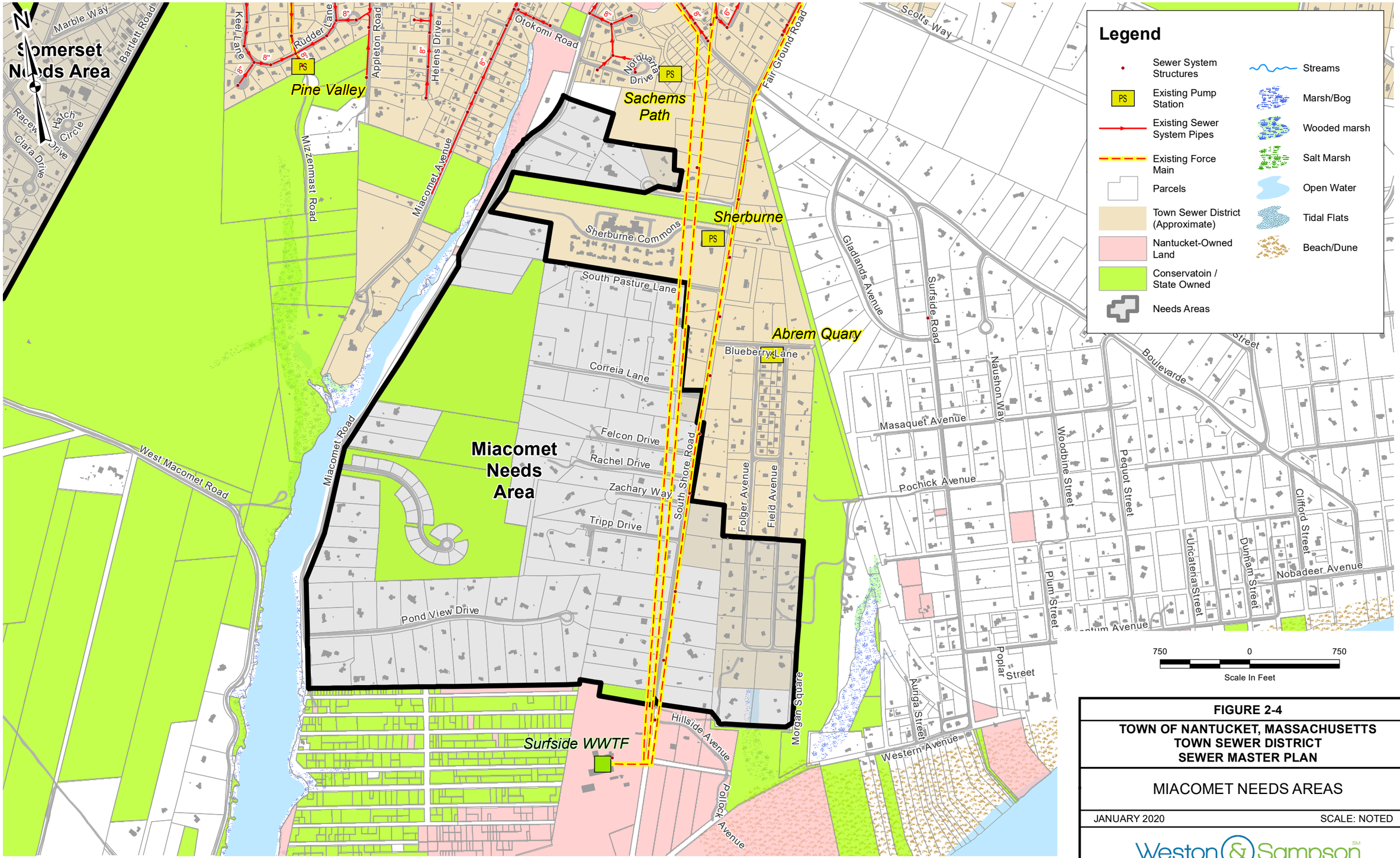

FIGURE 2-4

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

MIACOMET NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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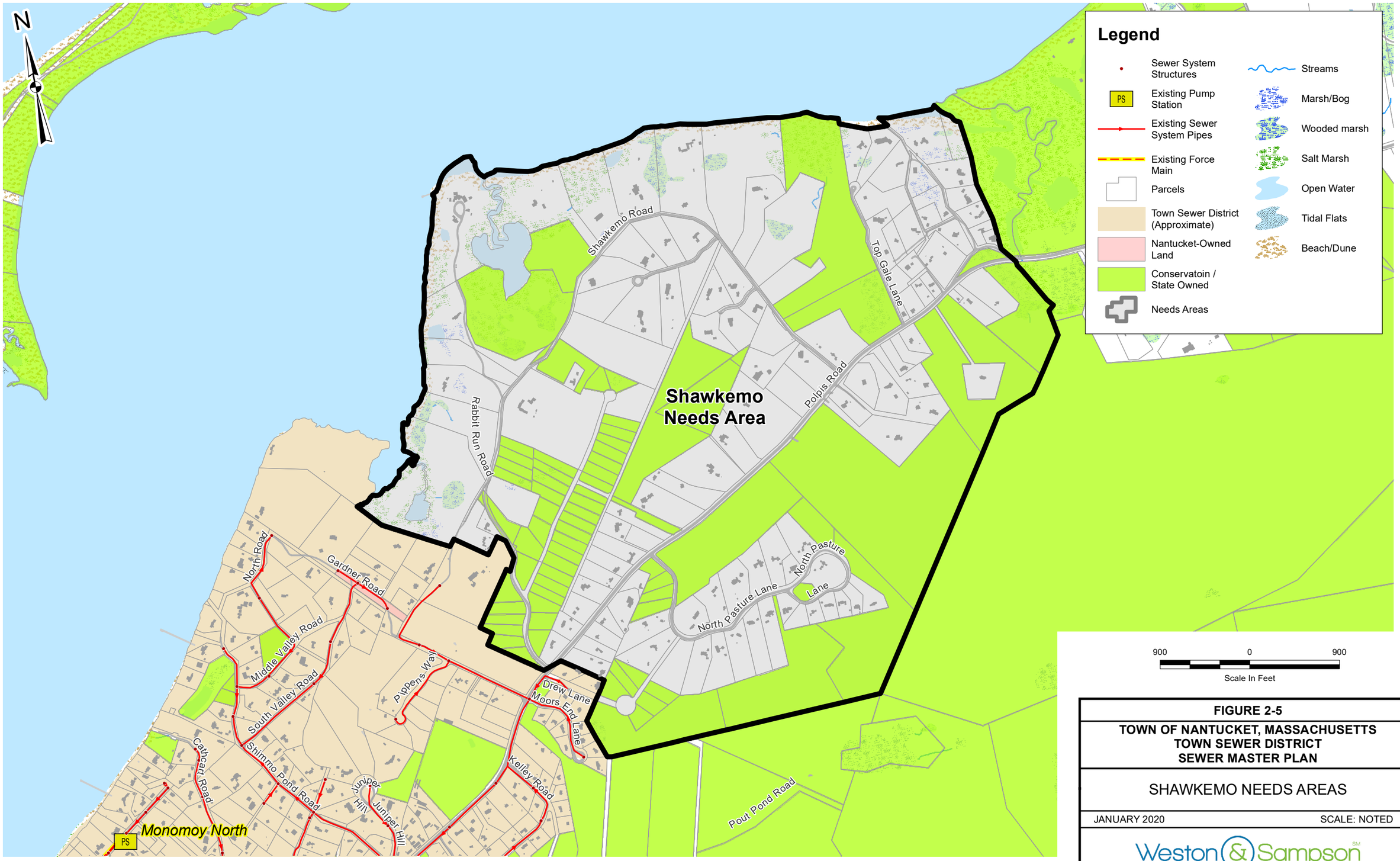

FIGURE 2-5

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SHAWKEMO NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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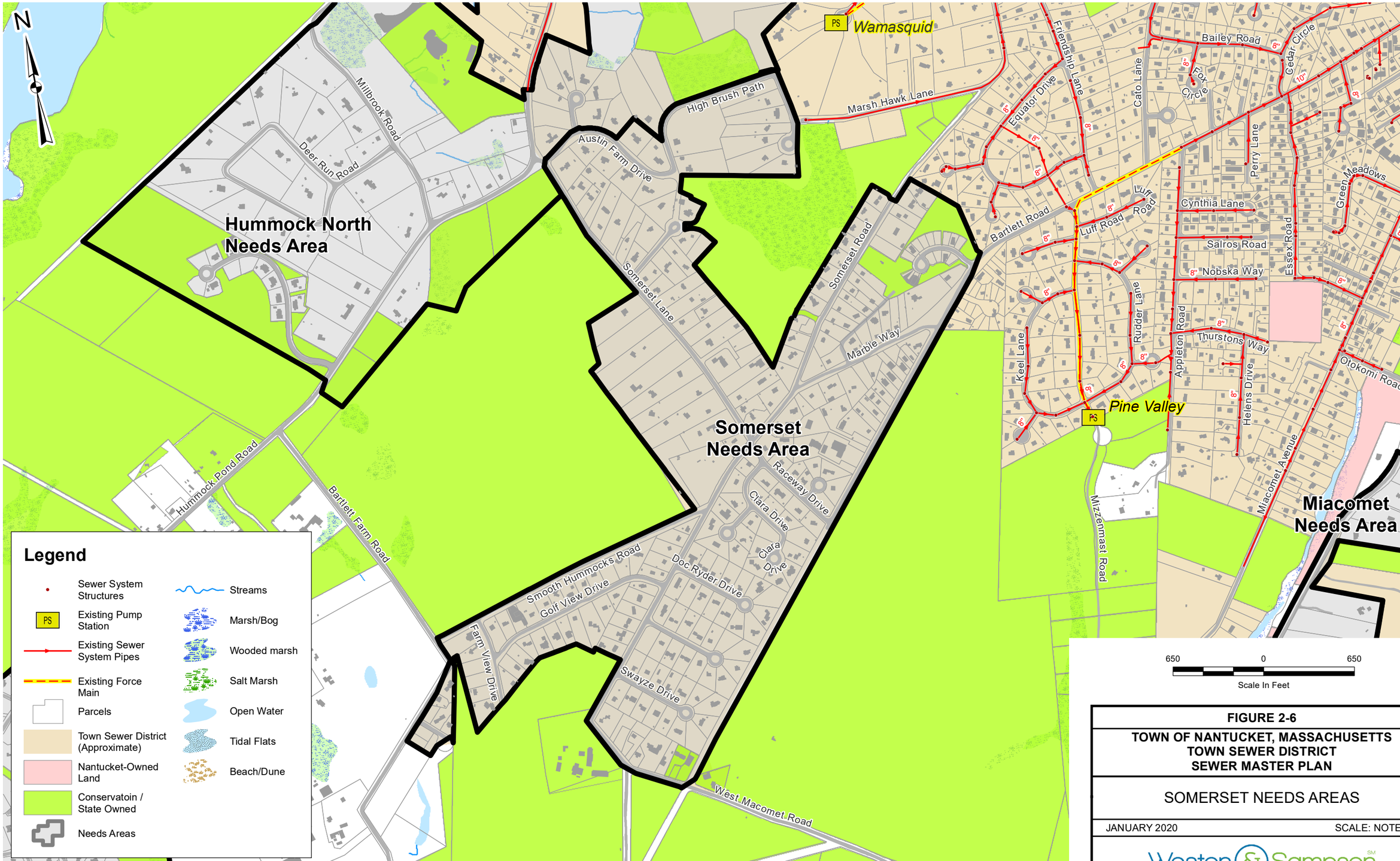

FIGURE 2-6

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SOMERSET NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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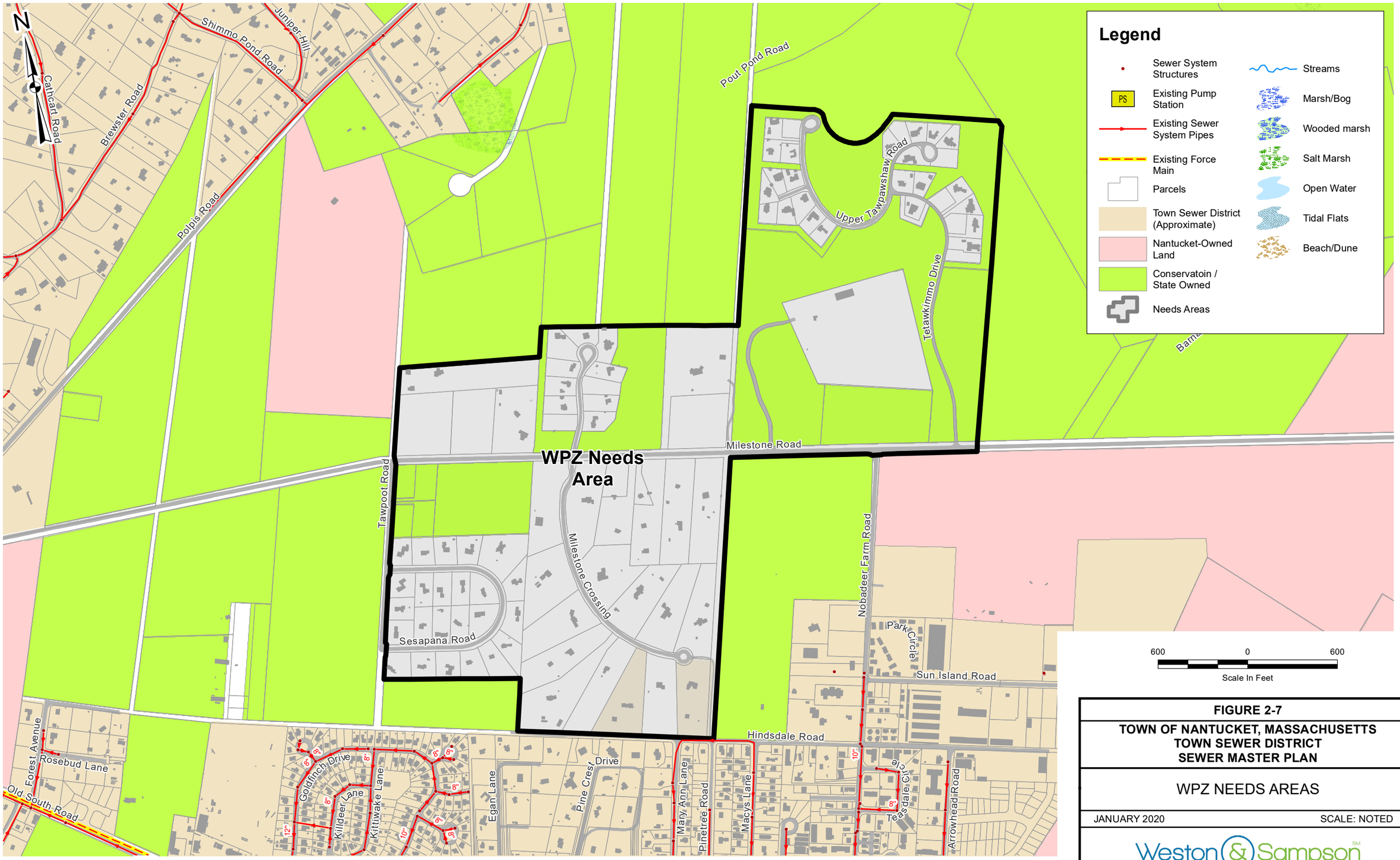

FIGURE 2-7

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

WPZ NEEDS AREAS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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2.1.3 Areas of Interest Outside of the Existing Town Sewer District

Based on discussions during the work sessions with the town, a few areas outside of the existing Town Sewer District have expressed interest in connecting to the collection system. Due to capacity limitations at the Surfside WWTF, it was determined that areas that want to connect for convenience as opposed to need will not be added to the Sewer District nor included in the future wastewater flow projections.

2.1.4 Allowance for Additional Building Construction

Based on current zoning regulations, potential additional building construction on properties within the Town Sewer District were identified. The additional buildings could be from subdividing an existing property based on lot size and minimum zoning requirements, or from the building of a secondary dwelling on an existing property. The minimum zoning requirements from the Nantucket Zoning Bylaws are shown in Table 2-1.

Table 2-1
Minimum Zoning Requirements

Zoning District	Minimum Lot Size (square feet)
ROH, SOH, R-1, SR-1, R-5, R-5L, RC, RC-2, CMI	5,000
R-10, R-10L, SR-10, CTEC, VN	10,000
R-20, SR-20, VR, VTEC	20,000
R-40, LUG1	40,000
LUG-2	80,000
LUG-3	120,000
MMD	10 acres
CDT	3,750
CN	7,500
CI	15,000

2.2 Needs Areas Future Wastewater Flow Development

Utilizing the town's GIS and Assessor's data, a spreadsheet listing the properties in each of the Needs Areas was developed. The assessor's data gathered for each property includes the address, property owner, property ID, number of existing buildings, number of existing bedrooms, existing building area, land area, and current zoning at the time of this report. This information was used to determine which properties should be included in the calculation of future wastewater flows as well as the potential build out of properties based on current zoning. It should be noted that deed restrictions on a property may restrict development that would otherwise be allowed under current zoning. Non-buildable properties, such as conservation land, wetlands, cemeteries, etc., were not included in the future wastewater flow calculation. The property list spreadsheets for each of the Needs Areas are included in Appendix A.

In addition to the potential subdivision of property based on current zoning regulations, the potential build out of properties also includes an allowance for the construction of future secondary dwellings on

a property. Existing secondary or multiple dwellings on a property are shown on separate line items on the property list spreadsheet. For each of the Needs Areas, the number of lots with multiple dwellings (existing and future) were identified and are summarized in Table 2-2.

Table 2-2
Multiple Dwelling Summary

Needs Area	No. of Lots to be Sewered	No. of Lots with Multiple Existing Dwellings (1)	No. of Lots with Multiple Future Dwellings (2)	Total No. of Lots with Multiple Dwellings (3)	Percentage of Lots with Multiple Dwellings (3)	Projected Percentage of Lots with Multiple Dwellings (4)
Hummock North	183	49	29	78	43%	60%
Hummock South	176	40	22	62	35%	50%
Madaket & Warren's Landing	509	86	12	98	19%	24%
Miacomet	143	65	18	83	58%	60%
Shawkemo	121	51	6	57	47%	50%
Somerset	283	39	69	108	38%	50%

(1) Properties with existing secondary (or more) dwellings
(2) Potential future dwellings from subdivision of land based on current zoning requirements
(3) Includes lots with existing secondary (or more) dwellings as well as future dwellings from subdivision of land based on current zoning requirements
(4) Includes allowance for projected future secondary dwellings based on discussions with the various Town Departments

Once the properties to be sewered were identified and the potential build out of properties was determined, the future wastewater flows were estimated for each of the Needs Areas. The flow components for the future wastewater flow include:

- Base sanitary flow - The portion of wastewater which includes domestic, commercial, and institutional sewage.
- Average Daily Flow - The amount of base sanitary flow per day.
- Infiltration - Water other than sanitary wastewater that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes.
- Inflow - Water other than sanitary wastewater that enters a sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, and catch basins.
- Peak Flow - A Peaking Factor based on the ratio of peak hourly sanitary flow to average daily sanitary flow.

Base Sanitary Flow/Average Daily Flow

The base sanitary flow was calculated using two methodologies, Title 5 basis and a per capita water use basis.

Flows calculated using the Title 5 methodology are based on user category design flow rates such as gallons per day (gpd) per bedroom or gpd per square foot of office space. These flows are year-round averages and do not differentiate seasonal fluctuations in population and water use. Under the Title 5 basis, the base sanitary flow component was calculated by determining the number of future sewer users within each Needs Area and then applying the Title 5 user category design flow rates as follows:

- Residential at 110 gpd per bedroom
- Office building at 75 gpd per 1000 sq. ft.
- General Commercial and Warehouse at 50 gpd per 1000 sq. ft.
- Elementary School without cafeteria, gymnasium or showers at 5 gpd per person

The Title 5 design flow rates are calculated as max day flows referring to the largest volume of flow to be received during a continuous 24-hour period. For this study, the average daily flow is calculated as two thirds (66.6%) of the Title 5 max day flow rate.

Flows calculated using the per capita water use methodology are based on the amount of water used per person and the number of people per dwelling. This methodology differentiates seasonal flows due to fluctuations in population and water use. Based on information provided by the Wannacomet Water Company, including the 2019 Wannacomet Water Sanitary Survey and current water use records, year-round and seasonal water use was determined. The per capita water use and the water use per dwelling are summarized in Table 2-3. It should be noted that the water use records include outside water use, such as irrigation, which is not discharged into the sewer. To account for this, summer-time water use was adjusted based on a 30% outside water use factor.

The sizing of the wastewater collection system is based on peak flows. As such, the calculation for average daily flow using the per capita flows are based on the summer-time water use of 60 gallons of water per person per day, with an average of 4.5 people per dwelling, which is 270 gpd per dwelling.

Table 2-3
Seasonal Water Use

	Year Round	Summer	Summer (adjusted) (1)	Winter
Capita per Dwelling	3.2	4.5	4.5	2.5
GPD per Capita	70	85	60	60
GPD per Dwelling	224	382	270	150

(1) GPD adjusted for summer-time outside water use. Based on 30% of water use not discharged to the sewer

Infiltration and Inflow (I/I)

The infiltration and inflow (I/I) for new gravity sewers was calculated using the following formula:

- 250 gpd/inch-diameter-mile x pipe diameter x mile sewer

For new low-pressure sewer systems, I/I am considered negligible.

Peak Flow

The peak flow is calculated by multiplying the average daily flow by a peaking factor. The peaking factor for each of the Needs Areas was determined based on ASCE MOP9.

The future wastewater flow calculation spreadsheets for each of the Needs Areas is attached in Appendix A.

2.2.1 Summary of Needs Area Future Flows

Table 2-4 provides a summary of the future average daily wastewater flows developed for the Needs Areas.

Table 2-4
Average Daily Flow Summary

Needs Area	Title 5 Methodology (gpd)	Per Capita Methodology (gpd)
Hummock North	76,000	92,000
Hummock South	65,000	80,000
Madaket / Warren's Landing	134,000	174,000
Miacomet	71,000	86,000
Shawkemo	48,000	55,000
Somerset	103,000	124,000

As the sizing of the wastewater collection system (gravity sewers and pump stations) is based on peak wastewater flows, the higher future flows determined from the per capita water use methodology will be used in the hydraulic computer modeling and the downstream collection system capacity analysis.

2.2.2 Comparison of Future Flows with 2014 CWMP Flows

Table 2-5 is a comparison of the future average daily flows developed as part of the Sewer Master Plan and those developed as part of the 2014 CWMP.

Table 2-5
Average Daily Flow Comparison

Needs Area	2014 CWMP		Sewer Master Plan	
	Flow (gpd)	Dwellings (1)	Flow (gpd)	Dwellings (2)
Hummock North	90,000	281	92,000	341
Hummock South	70,000	219	80,000	296
Madaket / Warren's Landing	190,000	594	174,000	644
Miacomet	70,000	219	86,000	319
Shawkemo	60,000	188	55,000	204
Somerset	100,000	312	124,000	459
Totals	580,000	1,813	611,000	2,263

(1) Estimated based on the 2014 CWMP which used the previous 2004 CWMP summer-time water use of 71.1 gallons of water per person per day, with an average of 4.5 people per dwelling. 320 gpd per dwelling.
(2) Based on current summer-time water use of 60 gallons of water per person per day, with an average of 4.5 people per dwelling. 270 gpd per dwelling.

The total combined wastewater flows for the Needs Areas developed as part of the Sewer Master Plan are approximately 5% higher than the 2014 CWMP flows. While the Sewer Master Plan used lower water

use and subsequent smaller flows per dwelling than the CWMP, the number of dwellings in the Sewer Master Plan is approximately 25% higher than the CWMP. The reasons for the increase in dwellings are the increase in multiple dwellings on a property and the potential build-out of parcels based on current zoning. The CWMP carried a 25% increase for secondary dwellings. As shown in the future wastewater flow calculation spreadsheets in Appendix A, the percentage of lots with existing secondary or multiple dwellings ranges from 19% to 58%. With the exception of Madaket, which is projected to have 24% of properties with multiple dwellings, the other Needs Area are projected to have 50% to 60% of properties with multiple or secondary dwellings.

Hummock North
The estimated wastewater flow for the Hummock North Needs Area in the Sewer Master Plan analysis is approximately 2% higher than the CWMP, while the projected number of dwellings in the Sewer Master Plan is approximately 21% higher than the CWMP. The increase in dwellings is due to the projected increase in properties with multiple dwellings and the potential build-out of parcels based on current zoning.

Hummock South
The estimated wastewater flow for the Hummock South Needs Area in the Sewer Master Plan analysis is approximately 14% higher than the CWMP, while the projected number of dwellings in the Sewer Master Plan is approximately 35% higher than the CWMP. The increase in flow and dwellings is due to the projected increase in properties with multiple dwellings and the potential build-out of parcels based on current zoning.

Madaket/Warren's Landing
The estimated wastewater flow for the Madaket/Warren's Landing Needs Area in the Sewer Master Plan analysis is approximately 8% lower than the CWMP, while the projected number of dwellings in the Sewer Master Plan is approximately only 8% higher than the CWMP.

Miacomet
The estimated wastewater flow for the Miacomet Needs Area in the Sewer Master Plan analysis is approximately 23% higher than the CWMP, while the projected number of dwellings in the Sewer Master Plan is approximately 46% higher than the CWMP. The increase in flow and dwellings is mainly due to the proposed Surfside Crossing development.

Shawkemo
The estimated wastewater flow for the Shawkemo Needs Area in the Sewer Master Plan analysis is approximately 8% lower than the CWMP, while the projected number of dwellings in the Sewer Master Plan is approximately only 8% higher than the CWMP.

Somerset
The estimated wastewater flow for the Somerset Needs Area in the Sewer Master Plan analysis is approximately 24% higher than the CWMP, while the projected number of dwellings in the Sewer Master Plan is approximately 47% higher than the CWMP. The increase in flow and dwellings is due to the projected increase in properties with multiple dwellings and the potential build-out of parcels based on current zoning.

2.3 South Valley Pump Station and Airport Pump Station Existing and Future Flow Assessment

A similar flow assessment was completed for the areas tributary to the South Valley Pump Station and the Airport Pump Station to ensure that the existing collection systems and pump stations are properly sized to handle potential future flows. A map of the South Valley Pump Station and Airport Pump Station tributary areas is shown on Figure 2-8.

Utilizing the town's GIS and Assessor's data, a spreadsheet listing the properties in each of the tributary areas was developed and included in Appendix B. This information was used to determine the number of existing properties included in the calculation of existing wastewater flows as well as the potential build out of properties to be included in the future flow calculation. It should be noted that deed restrictions on a property may restrict development that would otherwise be allowed under current zoning. Non-buildable properties were not included in the wastewater flow calculations.

In addition to the potential subdivision of property based on current zoning regulations, the potential build out of properties also includes an allowance for the construction of future secondary dwellings on a property. Existing secondary or multiple dwellings on a property are shown on separate line items on the property list spreadsheet. For each of the tributary areas, the number of lots with multiple buildings (existing and future) were identified and are summarized in Table 2-6.

Table 2-6
Multiple Dwelling Summary South Valley, Airport PS, WPZ Needs Area

Tributary Area	No. of Lots	No. of Lots with Multiple Existing Dwellings (1)	No. of Lots with Multiple Future Dwellings (2)	Total No. of Lots with Multiple Dwellings (3)	Percentage of Lots with Multiple Dwellings (3)	Projected Percentage of Lots with Multiple Dwellings (4)
South Valley Subdivision	194	5	0	5	3%	5%
Airport Pump Station Tributary Area	516	61	64	125	24%	30%
WPZ Future Needs Area	91	19	2	21	23%	35%

(1) Properties with existing secondary (or more) dwellings
(2) Potential future buildings from subdivision of land based on current zoning requirements
(3) Includes lots with existing secondary (or more) buildings as well as future buildings from subdivision of land based on current zoning requirements
(4) Includes allowance for projected future secondary dwellings based on discussions with the various Town Departments

Average Daily Flow

The existing and future wastewater flows were estimated for each of the tributary areas using both the Title 5 methodology and the per capita water use methodology.

Infiltration and Inflow (I/I)

The infiltration and inflow (I/I) for existing gravity sewers was calculated using the following formula:

- 400 gpd/inch-diameter-mile x pipe diameter x mile sewer

For new low-pressure sewer systems, I/I is considered negligible.

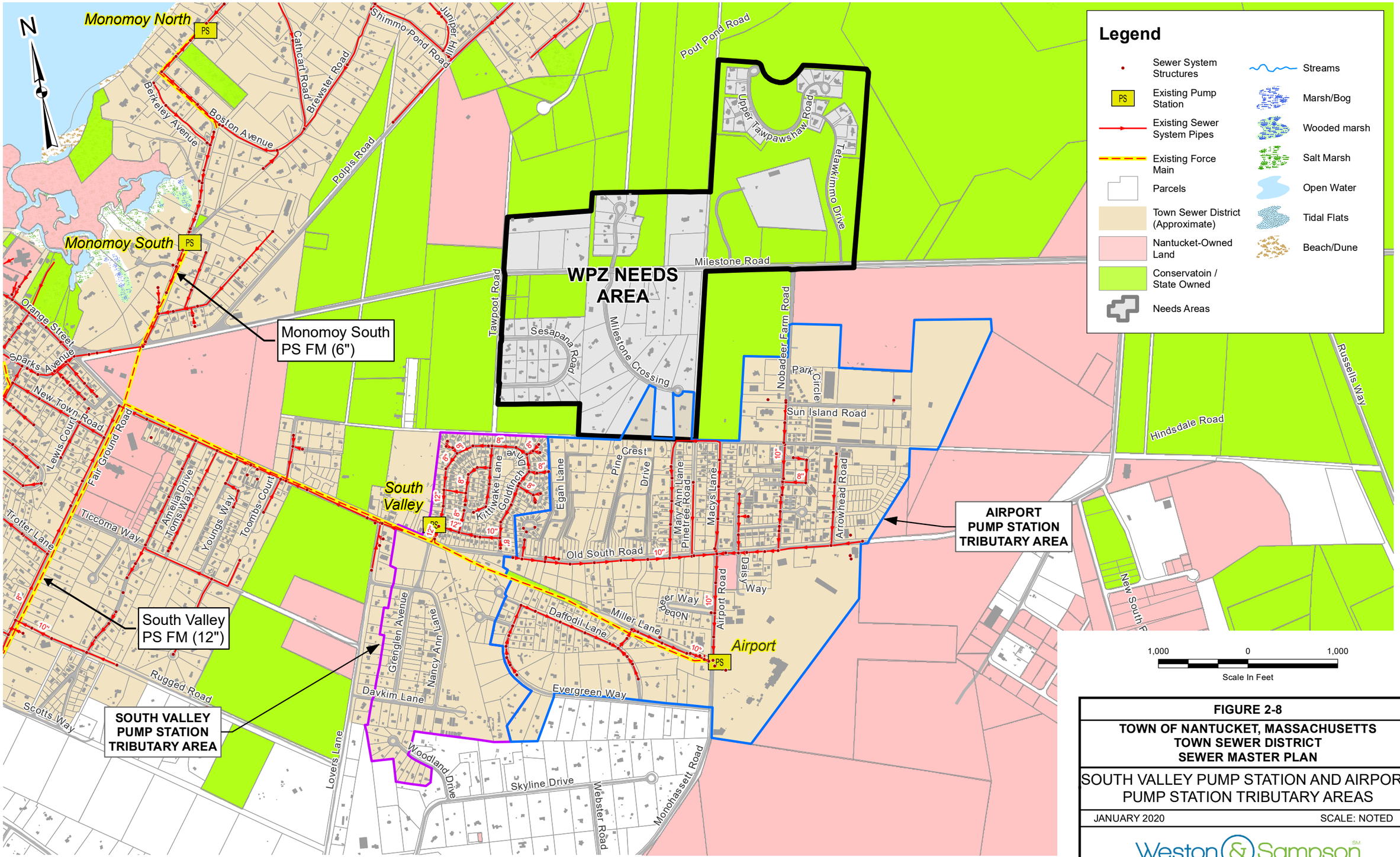

FIGURE 2-8

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SOUTH VALLEY PUMP STATION AND AIRPORT PUMP STATION TRIBUTARY AREAS

JANUARY 2020 SCALE: NOTED

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Peak Flow
The peak flow is calculated by multiplying the average daily flow by a peaking factor. The peaking factor for each of the tributary areas was determined based on ASCE MOP9.

The existing and future wastewater flow calculation spreadsheets for each of the tributary areas is attached in Appendix B.

Table 2-7 is a summary of existing and future average daily flows for the South Valley Pump Station Tributary Area, the Airport Pump Station Tributary Area, and the future WPZ Needs Area. Future flows include existing flows and future flows.

Table 2-7
Average Daily Flow Summary South Valley, Airport PS, and WPZ Needs Area

Tributary Area	Title 5 Methodology		Per Capita Methodology	
	Existing Flow (gpd)	Future Flow (gpd)	Existing Flow (gpd)	Future Flow (gpd)
South Valley Pump Station Tributary Area	126,000	127,000	127,000	128,000
Airport Pump Station Tributary Area	126,000	181,000	143,000	207,000
WPZ Future Needs Area	0	29,000	0	34,000

(1) The South Valley Subdivision flows include the Richmond Development. Flows based on the May 10, 2019 Memorandum from Hayes Engineering.

Table 2-8 is a summary of existing and future average daily flows tributary to the South Valley Pump Station and the Airport Pump Station. Future flows include existing flows and future flows. Flows tributary to the Airport Pump Station include the future WPZ Needs Area and the Airport Pump Station Tributary Area. Flows tributary to the South Valley Pump Station include the South Valley Subdivision, the Richmond Development and the Airport Pump Station.

Table 2-8
Pump Station Average Daily Flow Summary

Pump Station	Title 5 Methodology		Per Capita Methodology	
	Existing Flow (gpd)	Future Flow (gpd)	Existing Flow (gpd)	Future Flow (gpd)
Airport Pump Station	126,000	210,000	143,000	241,000
South Valley Pump Station	252,000	337,000	270,000	369,000

(1) Future Airport Pump Station flows include the future flow from the WPZ Needs Area
(2) Existing South Valley Pump Station flows include existing flows from the Airport Pump Station
(3) Future South Valley Pump Station flows include future flows from the Airport Pump Station and the WPZ.

2.4 Future Wastewater Flow Assessment Summary

The future wastewater flows for each of the Needs Areas as well as the South Valley Pump Station Tributary Area and the Airport Pump Station Tributary Area were calculated using both the Title 5 methodology and the per capita water use methodology. Flows calculated using the Title 5 methodology are year-round averages which do not differentiate seasonal fluctuations in population. The Title 5 design flow rates are calculated as max day flows referring to the largest volume of flow to be received during a continuous 24-hour period. The average daily flow is calculated as two thirds (66.6%) of the Title 5 max day flow rate. Flows calculated using the per capita water use methodology are based on the amount of water used per person and the number of people per dwelling. This methodology differentiates seasonal fluctuations in population and water use. In Nantucket, the wastewater volume peaks during the summer when the island population grows significantly.

As shown on Table 2-4 and Table 2-7, the wastewater flows calculated using the per capita water use methodology are higher than the flows calculated using the Title 5 methodology. As the sizing of the wastewater collection system (gravity sewers and pump stations) is based on peak wastewater flows, the summer-time per capita water use methodology will be used in the hydraulic computer modeling and the downstream collection system capacity analysis.

Table 2-9 provides a summary of the Needs Area future wastewater flows.

Table 2-9
Needs Area Future Wastewater Flow Summary

Needs Area	Average Daily Flow (gpd)	Peak Flow (gpd)	Infiltration (gpd)	Peak Flow with Infiltration (gpd)
Hummock North	92,000	534,000	11,000	545,000
Hummock South	80,000	464,000	13,000	477,000
Madaket / Warren's Landing	174,000	922,000	0	922,000
Miacomet	86,000	499,000	7,000	506,000
Shawkemo	55,000	319,000	0	319,000
Somerset	124,000	682,000	8,000	690,000

Table 2-10 provides a summary of the future wastewater flows for the South Valley Pump Station Tributary Area, the Airport Pump Station Tributary Area, and the future WPZ Needs Area.

Table 2-10
South Valley Area, Airport Area and WPZ Future Needs Area
Future Wastewater Flow Summary

Needs Area	Average Daily Flow (gpd)	Peak Flow (gpd)	Infiltration (gpd)	Peak Flow with Infiltration (gpd)
South Valley Pump Station Tributary Area	128,000	640,000	6000	646,000
Airport Pump Station Tributary Area	207,000	1,035,000	19,000	1,054,000
WPZ Future Needs Area	34,000	197,000	0	197,000

Table 2-11 provides a summary of the future wastewater flows tributary to the South Valley Pump Station and the Airport Pump Station. Flows tributary to the Airport Pump Station include the future WPZ Needs Area and the Airport Pump Station Tributary Area. Flows tributary to the South Valley Pump Station include the South Valley Subdivision, the Richmond Development and the Airport Pump Station.

Table 2-11
South Valley Pump Station and Airport Pump Station
Future Wastewater Flow Summary

Needs Area	Average Daily Flow (gpd)	Peak Flow (gpd)	Infiltration (gpd)	Peak Flow with Infiltration (gpd)
Airport Pump Station	241,000	1,205,000	19,000	1,224,000
South Valley Pump Station	369,000	1,845,000	25,000	1,870,000

3.0 EVALUATION OF ROUTING ALTERNATIVES

Routing alternatives for connecting each of the future wastewater needs areas to the existing wastewater collection system were evaluated. In order to identify the routing alternatives, the existing wastewater collection system was mapped and locations for connecting to the existing sewer system were identified. The 2018 aerial topography with 1 ft contours was used to develop preliminary road profiles to identify which areas could potentially be served by gravity sewers or by low pressure sewers, as well as to identify potential locations for pump stations. Preliminary design parameters for gravity sewers were established including a minimum sewer depth of 5 feet and a maximum sewer depth of 14 feet. Based on the road profiles and the design parameters, preliminary sewer system layouts for each of the needs areas were developed.

It should be noted that the sewer system layouts are preliminary and subject to change during the actual design of the sewer system, as a detailed and more accurate topographic survey will be completed. For example, a property may be on a street that is shown to be served by a gravity sewer. However, the home on the property may be set lower than the street or set too far back to allow for a gravity connection, resulting in the need for a grinder pump. The ability for the town to acquire sewer easements, as well as property for proposed pump stations will be a major factor in the type of collection system that can be designed for each of the needs areas.

3.1 Preliminary Sewer System Layouts and Recommended Routing

3.1.1 Hummock North Needs Area

The preliminary sewer system layout and recommended routing for the Hummock North Needs Area is shown on Figure 3-1. The proposed Hummock North collection system is a combination of a gravity sewer system with a pump station and a low-pressure sewer system. Due to the topography and the configuration of the area, there are multiple connection points to the existing sewer system. Nearly all of the area will connect to the Surfside Road Pump Station collection system via Vesper Lane and Bartlett Road. A few properties will be connected to the Sea Street Pump Station collection system via West Chester Street (1 property), Grove Lane (4 properties), and Vestal Street (10 properties). As shown on Figure 3-1, a pump station is proposed at the low point near #78 Millbrook Road with a force main routing to a proposed gravity sewer in the Somerset Needs Area. An easement or property purchase would be required for the pump station site on Millbrook Road.

3.1.2 Hummock South Needs Area

The preliminary sewer system layout and recommended routing for the Hummock South Needs Area is shown on Figure 3-2. The proposed Hummock South collection system is a combination of a gravity sewer system with a pump station and a low-pressure sewer system. The area will be connected to the Surfside Road Pump Station collection system via Bartlett Road. As shown on Figure 3-2, a pump station is proposed at the low point on Hummock Pond Road near Hellers Way with a force main routing to a proposed gravity sewer in the Somerset Needs Area. An easement or a potential land swap with the Nantucket Land Bank would be required for the new pump station site on Hummock Pond Road.

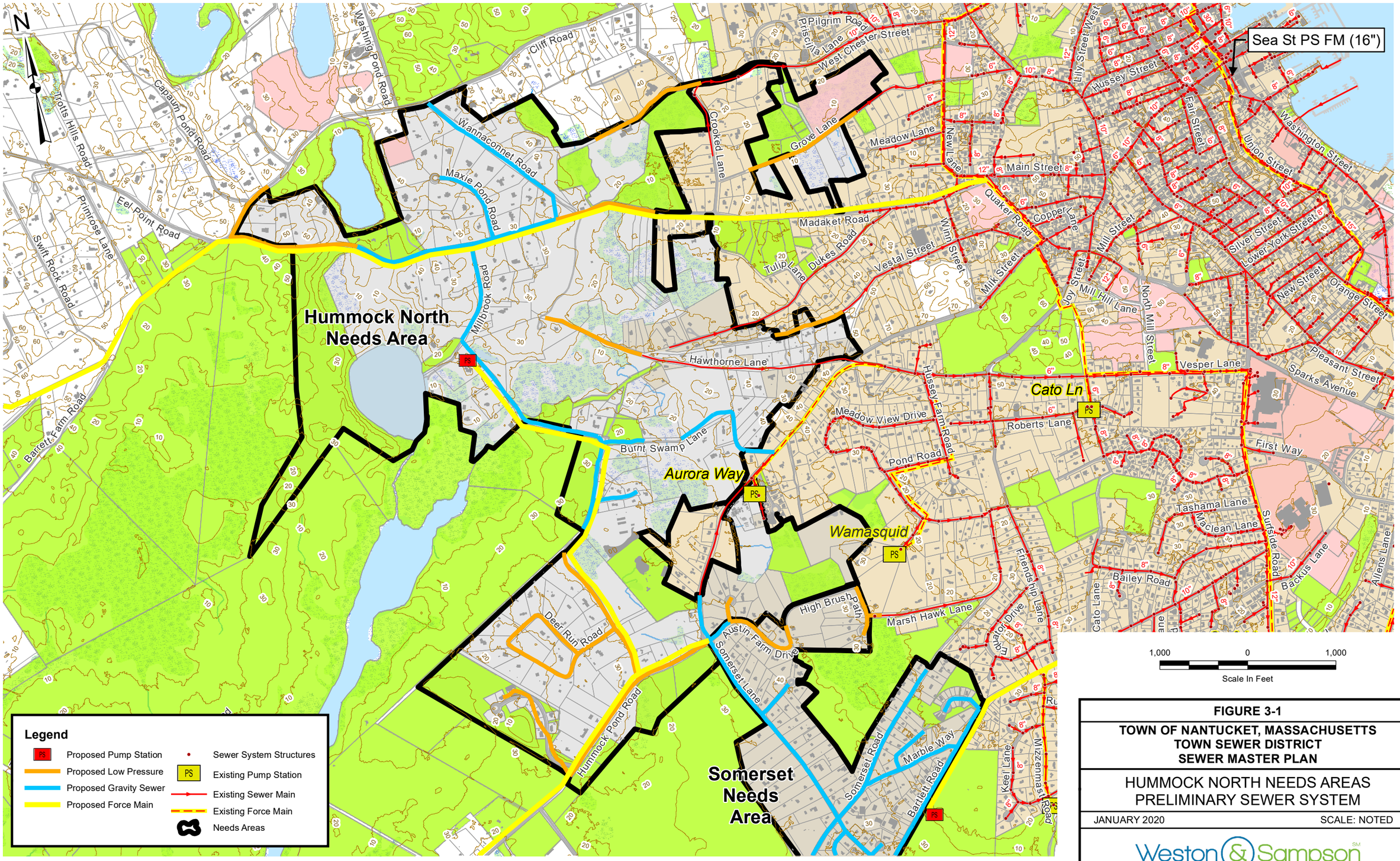

FIGURE 3-1

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

HUMMOCK NORTH NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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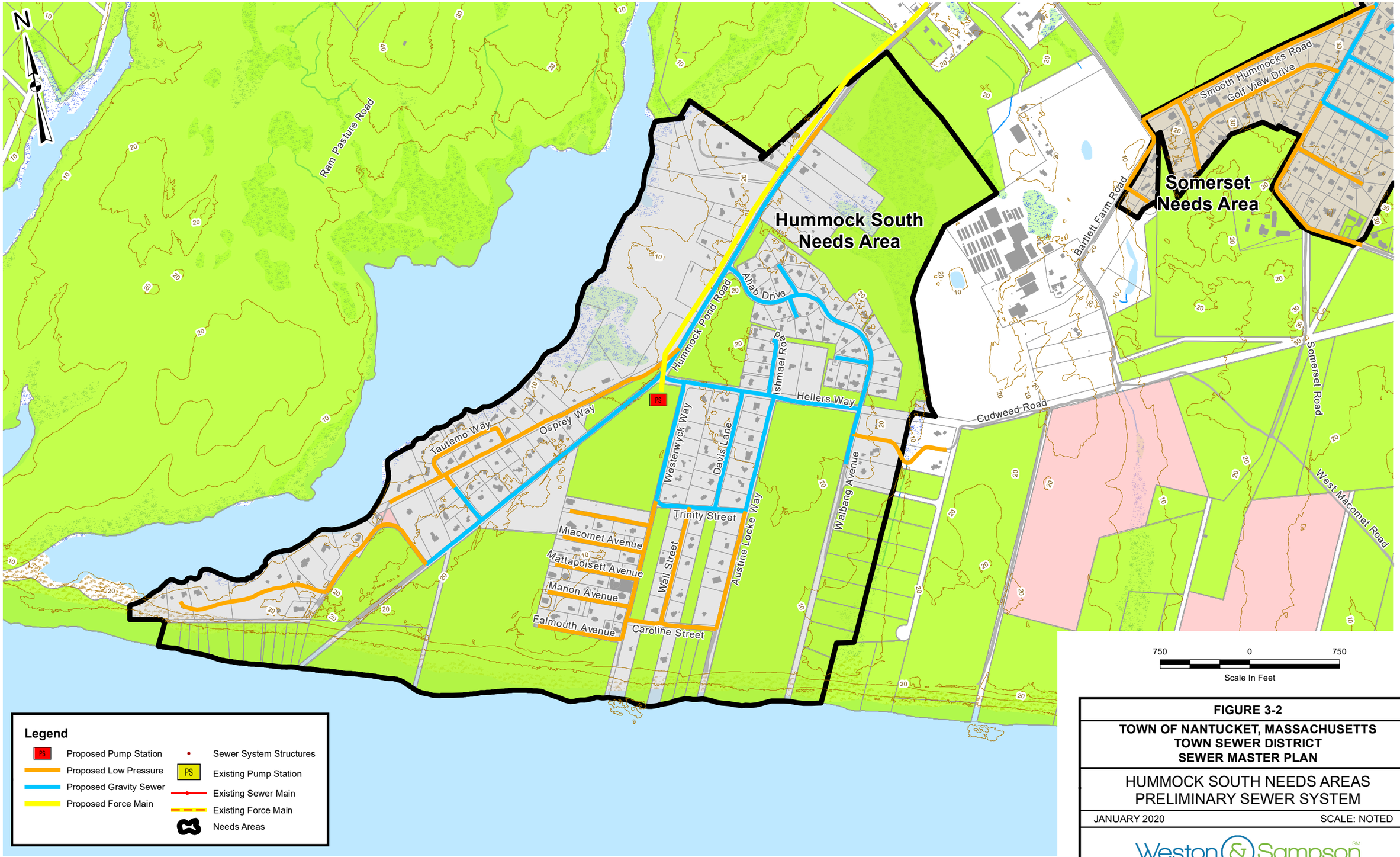

FIGURE 3-2

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

HUMMOCK SOUTH NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

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3.1.3 Madaket and Warren's Landing Needs Area

The preliminary sewer system layout and recommended routing for the Madaket and Warren's Landing Needs Area is shown on Figure 3-3. The proposed Madaket and Warren's Landing collection system is a low-pressure sewer system. The low-pressure system will discharge flow to a proposed pump station on the DPW property with a new force main configured to connect to the existing 20-inch Sea Street Pump Station force main and potentially to the new Sea Street Pump Station force main.

3.1.4 Miacomet Needs Area

The preliminary sewer system layout and recommended routing for the Miacomet Needs Area is shown on Figure 3-4. The proposed Miacomet collection system is a combination of a gravity sewer system with pump stations and a low-pressure sewer system. The recommended plan includes a new gravity sewer installed along South Shore Road from the intersection with Surfside Road and Fairgrounds Road to the Surfside WWTF, along with a new pump station located at the WWTF to pump the Miacomet Needs Area flow into the headworks. The proposed gravity sewer would allow for the elimination of the existing Sherburne Commons Pump Station, the existing Sachems Path Pump Station and the proposed Surfside Crossing Pump Station. Due to the low elevation in the existing Abrem Quary Pump Station service area, this pump station will need to remain in service. The existing Abrem Quary Pump Station force main will be connected to the new gravity sewer in South Shore Road. As shown on Figure 3-4, a pump station is also proposed at the low point on Miacomet Road, south of Pond View Drive with a force main routing to the proposed gravity sewer on South Shore Road. An easement or a potential land swap with the Land Bank would be required for the new pump station on Miacomet Road.

3.1.5 Shawkemo Needs Area

The preliminary sewer system layout and recommended routing for the Shawkemo Needs Area is shown on Figure 3-5. The proposed Shawkemo collection system is a low-pressure sewer system. A dedicated low-pressure sewer has been installed as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project to convey the future wastewater from the Shawkemo area to the Monomoy South Pump Station.

3.1.6 Somerset Needs Area

The preliminary sewer system layout and recommended routing for the Somerset Needs Area is shown on Figure 3-6. The proposed Somerset collection system is a combination of a gravity sewer system with a pump station and a low-pressure sewer system. The area will be connected to the Surfside Road Pump Station collection system via Bartlett Road. As shown on Figure 3-6, a pump station is proposed at the low point on Bartlett Road between Raceway Drive and Marble Way, with a force main routing to the gravity sewer at the intersection of Bartlett Road and Appleton Road. An easement or a potential land swap with the Land Bank would be required for the new pump station site on Bartlett Road. In addition to handling the wastewater flow from the Somerset Needs Area, the collection system and the new pump station on Bartlett Road will be sized to handle the wastewater flow from both Hummock North and Hummock South Needs Areas.

An alternate sewer system layout for the Somerset Needs Area is shown on Figure 3-7. Under this option, the proposed pump station would be moved from Bartlett Road to the end of Mizzenmast Road, with a cross country gravity sewer from Bartlett Road to Mizzenmast Road and a new force main on Mizzenmast Road to the gravity sewer on Bartlett Road. This option would require a sewer easement across two properties owned by the Land Bank, as well as a potential land swap with the Land Bank for

the new pump station site on Mizzenmast Road. The advantage for this option would be the ability to eliminate the existing Pine Valley Pump Station, which is located in the yard of #27 Keel Lane. The existing pump station is in need of an upgrade as the equipment and electrical systems have reached the end of their useful life. In lieu of the pump station upgrade, the existing gravity sewer on Mizzenmast Road would be extended further south on Mizzenmast to the new Somerset Needs Area pump station.

3.1.7 Wellhead Protection Zone (WPZ)Needs Area

The preliminary sewer system layout and recommended routing for the WPZ Needs Area is shown on Figure 3-8. The proposed WPZ Needs Area collection system is a low-pressure sewer system which will connect to the Airport Pump Station collection system via Hinsdale Road and Nobadeer Farm Road.

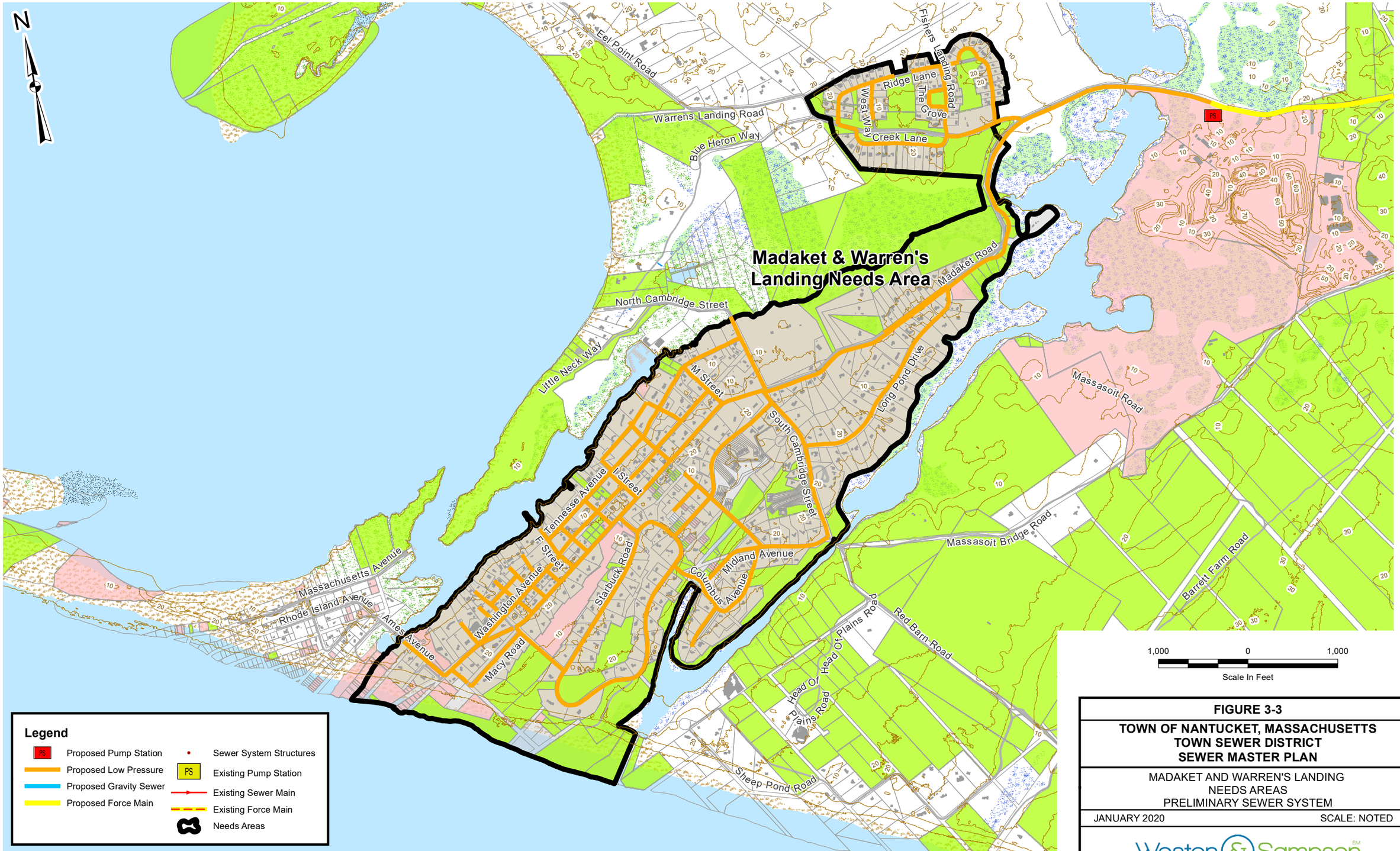

FIGURE 3-3

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

MADAKET AND WARREN'S LANDING
NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

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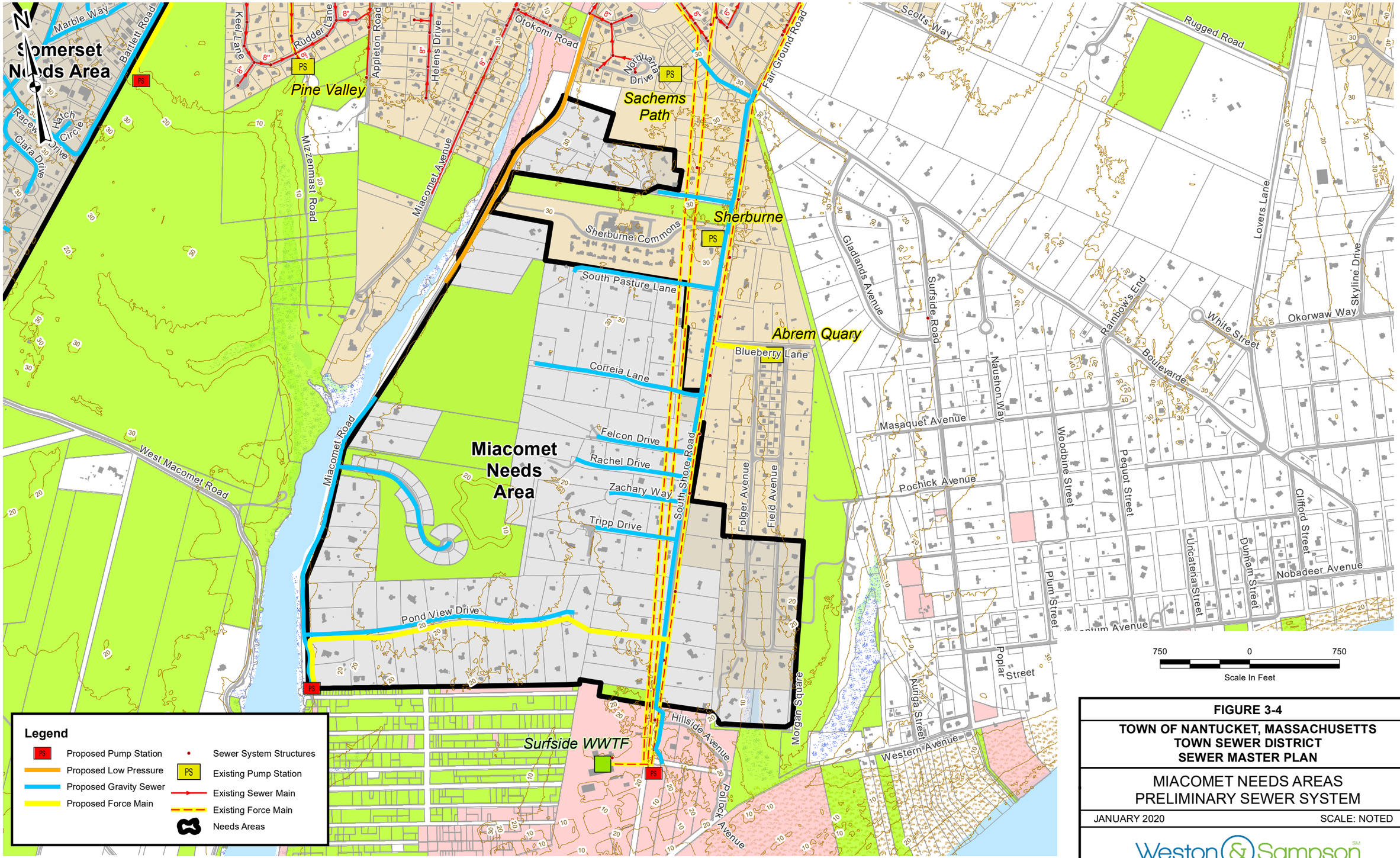

FIGURE 3-4

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

MIACOMET NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

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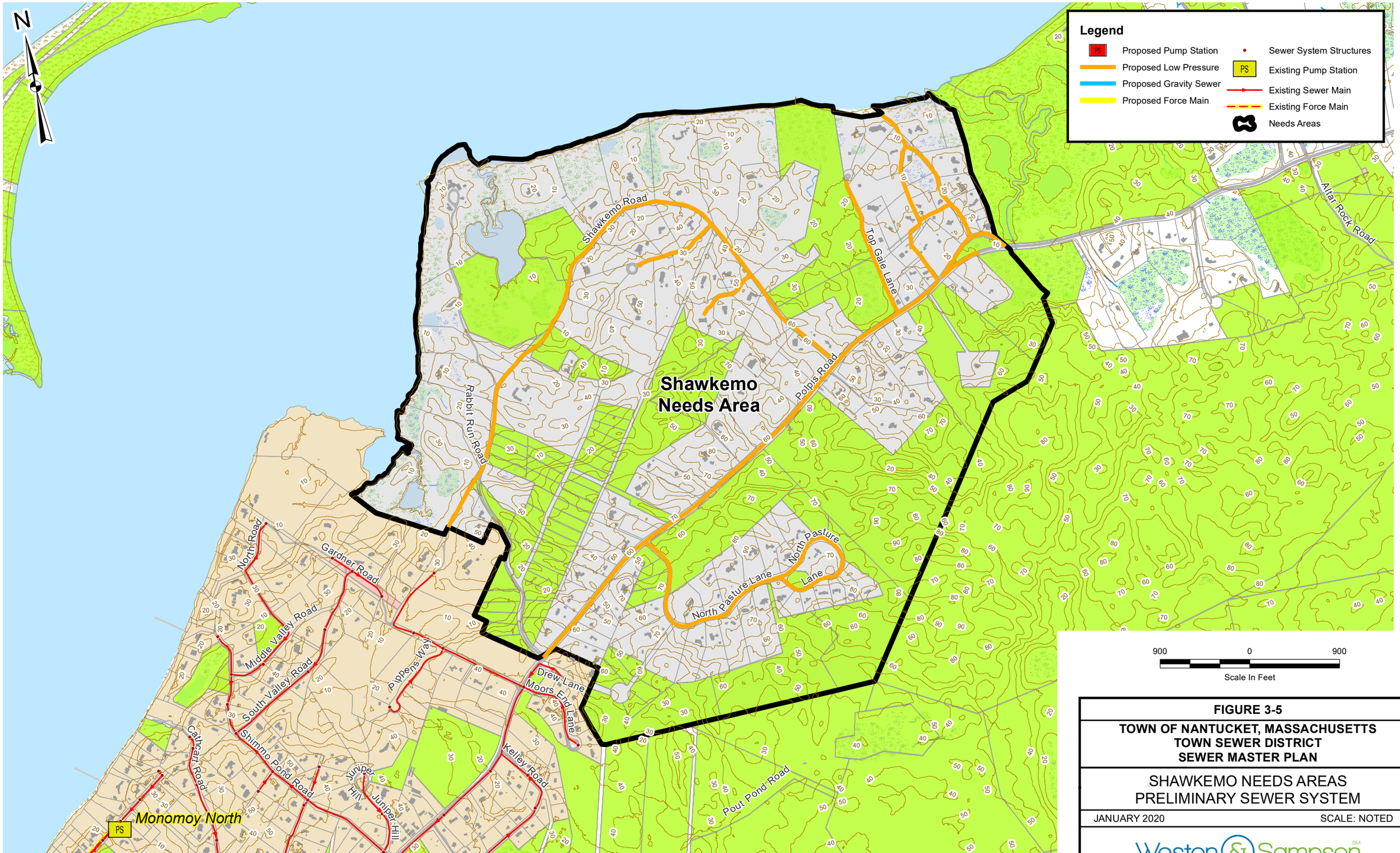

FIGURE 3-5

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SHAWKEMO NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

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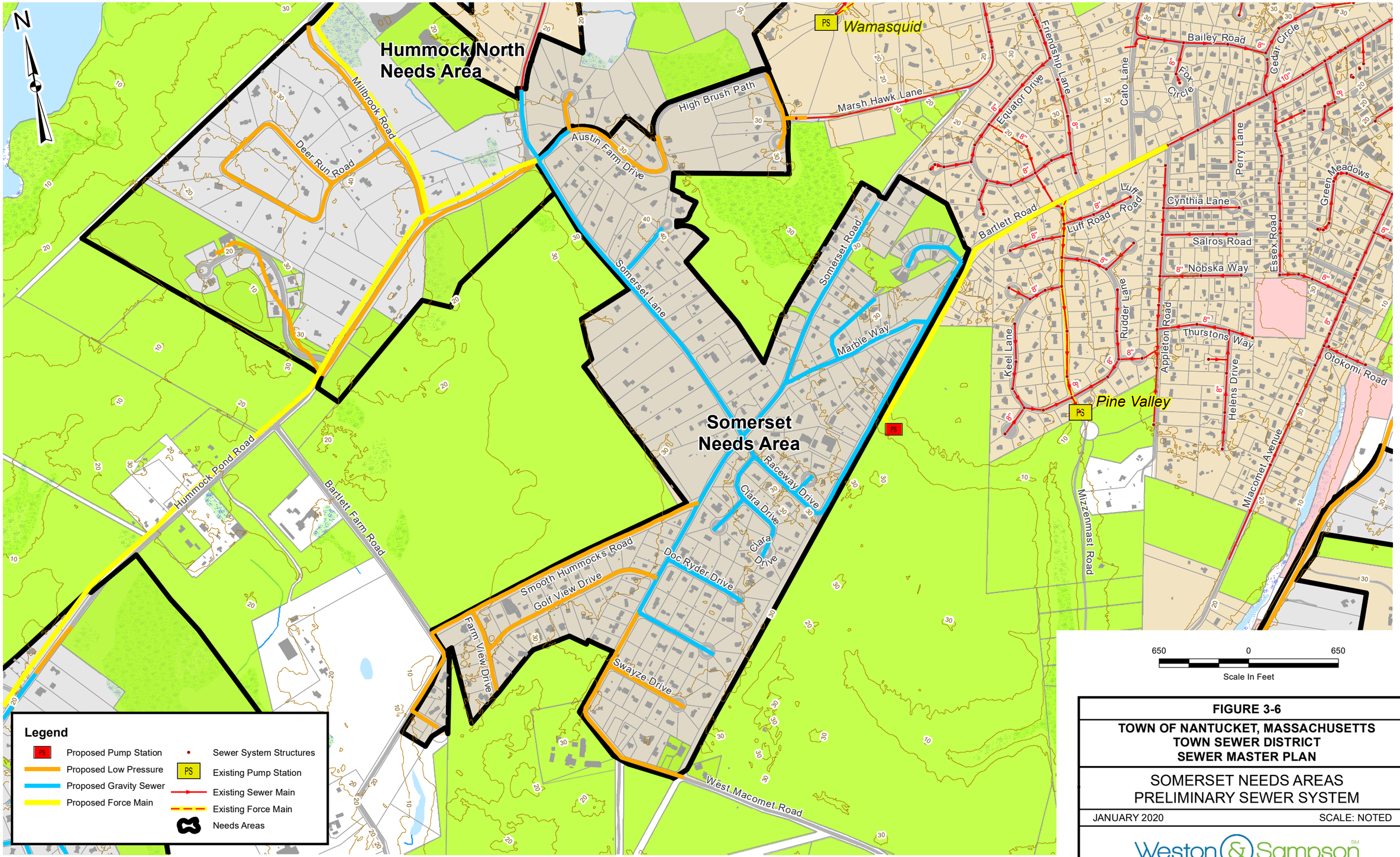

FIGURE 3-6

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SOMERSET NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

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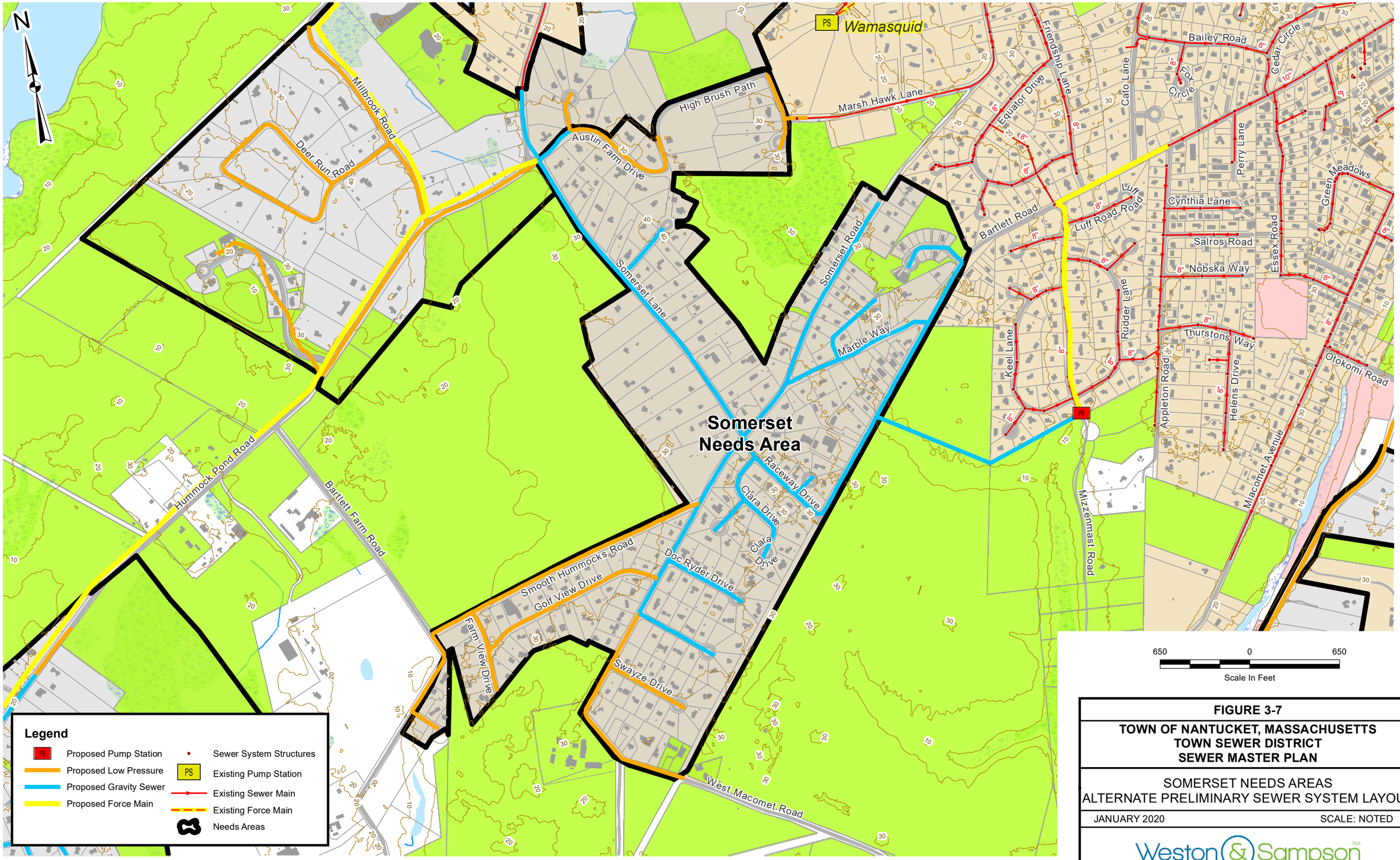

FIGURE 3-7

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SOMERSET NEEDS AREAS
ALTERNATE PRELIMINARY SEWER SYSTEM LAYOUT

JANUARY 2020 SCALE: NOTED

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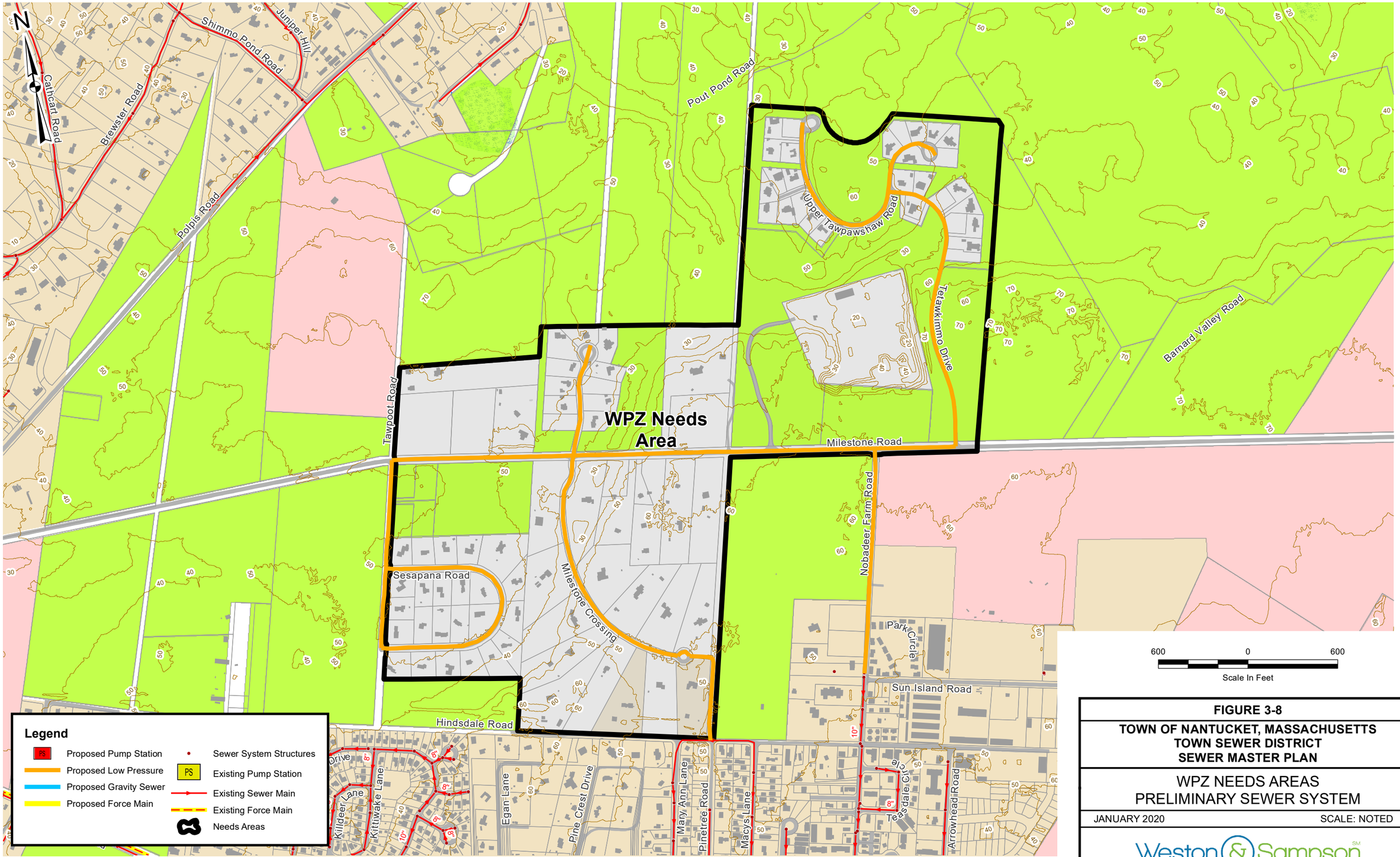

FIGURE 3-8

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

WPZ NEEDS AREAS
PRELIMINARY SEWER SYSTEM

JANUARY 2020 SCALE: NOTED

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3.2 Downstream Collection System Capacity Analysis

Based on the recommended routing alternatives, a capacity analysis of the downstream collection system was completed to identify downstream system improvements needed to convey the future wastewater flows to the Surfside WWTF. As discussed in Section 3.1, the recommended routing for the Needs Areas is as follows:

- Hummock North, Hummock South and Somerset Needs Areas will be tributary to the Surfside Road Pump Station collection system
- Madaket and Warren's Landing Needs Areas will be pumped directly to the Surfside WWTF
- Miacomet Needs Area will be pumped directly to the Surfside WWTF
- Shawkemo Needs Area will be tributary to the Monomoy South Pump Station collection system
- WPZ Needs Area will be tributary to the Airport Pump Station collection system

3.2.1 Surfside Road Pump Station Collection System

A downstream capacity analysis of the Surfside Road Pump Station collection system was completed by updating the existing collection system hydraulic model developed as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project.

3.2.1.1 Hydraulic Model Selection

SWMM (Stormwater Management Model) version 7.2 PCSWMM 2019, by CHI was selected for the hydraulic model. PCSWMM is a comprehensive software package for planning, modeling and managing drainage and sanitary sewer systems. A screenshot of the PCSWMM model for the Design Capacity Analysis Network is shown in Figure 3-9.

Sanitary Sewer computer simulation models have two components: flow data and hydraulic data.

- Flow data is an estimation of flow components to be routed through the sanitary sewer network including:
    - Infiltration - Water other than sanitary wastewater that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes.
    - Inflow - Water other than sanitary wastewater that enters a sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers and catch basins.
    - Base Sanitary Flows - The portion of wastewater which includes domestic, commercial, institutional, and industrial sewage.

- Hydraulic data includes the system data of the sewer network including:
    - Manhole Rim and Invert Elevations
    - Upstream and Downstream Pipe Invert Elevations
    - Pipe Size, Material, and Length.

Hydraulic model analysis establishes depth of flow, flow rate hydrographs, and hydraulic gradeline profiles within the sewer network for the routed flows. A screenshot of the PCSWMM model results for the Design Capacity Analysis is shown in Figure 3-10.

Figure 3-9
PCSWMM Design Capacity Analysis System Network

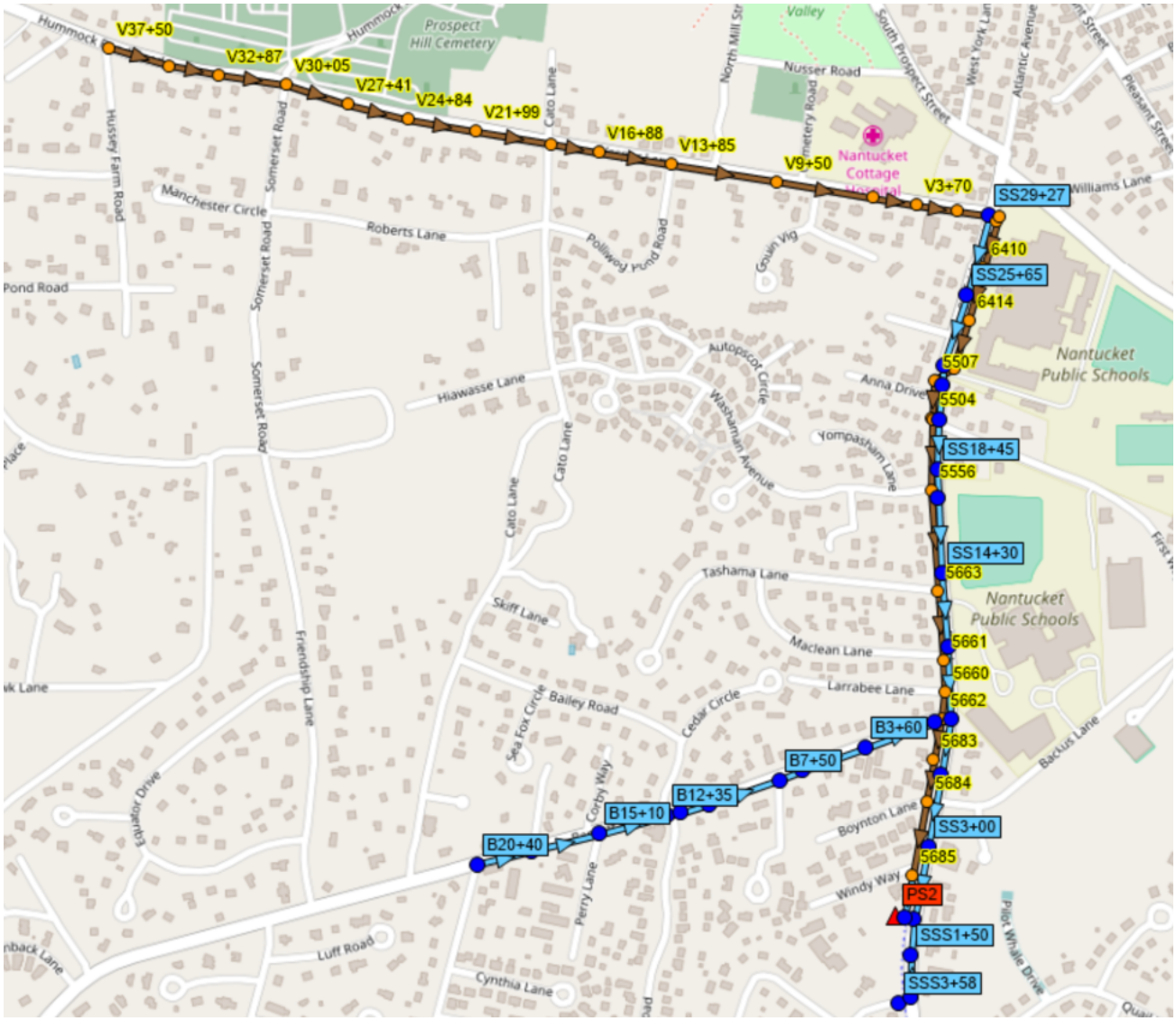
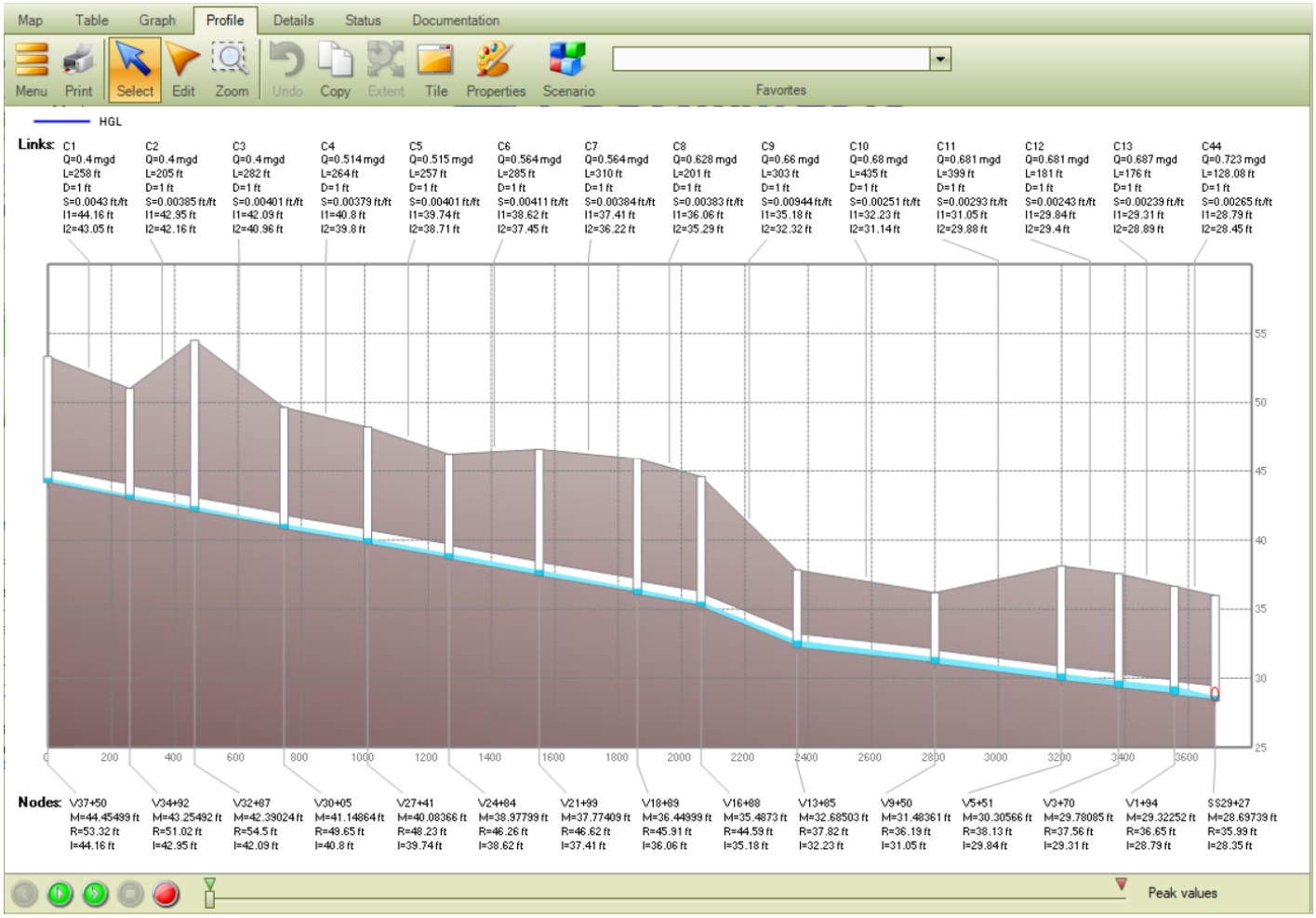


Figure 3-10
PCSWMM Design Capacity Analysis Results View



Creation of Design Capacity Model

Creating the existing capacity model system in PCSWMM included importing the manhole database, importing the sewer pipe database, and quality review (QA/QC) of model connectivity and profiles. The hydraulic components are represented in the model as a network of Nodes and Links. The Surfside Road Pump Station Area Hydraulic Model contains 57 nodes and 57 links.

Nodes represent physical manhole structures in the system or points of hydraulic transition. Hydraulic transition points are places in the model where there is a change in the hydraulic slope, manning's "n", cross section definition, or culvert/bridge crossings. Required data includes, invert elevation, rim elevation, and storage information for the node.

Links represent the conveyance component of culverts/bridges, channel cross sections, and pipes. Required data includes, link shape type, length, upstream invert, downstream invert, and manning's "n" value.

3.2.1.2 Development of Model Flows

The sewer Capacity Design Model includes tributary peak wastewater flows and peak infiltration flows for the analysis.

Model Peak Sanitary Flow

The average daily wastewater flow estimates utilized in developing the Peak Sanitary model are summarized in Table 3-1. Estimates were developed on a per capita basis estimated at a rate of 60 gal/capita and 4.5 capita/home for existing and future users.

Table 3-1
Surfside Road Pump Station Tributary Area
Average Daily Wastewater Flow

Tributary Subarea	Average Daily Flow (gpd)
Vesper Lane Sewer Area	111,000
Bartlett Road Sewer Area	85,000
Surfside Road (North) Sewer Area	162,000
Surfside Road (South) Sewer Area	145,000
Hummock North	92,000
Hummock South	80,000
Somerset	124,000
Total Average Daily Flow	**799,000**

The average daily flow for each tributary subarea in Table 3-1 was utilized to develop the peak wastewater flow for various model flow scenarios. The average daily flow calculated was peaked as determined from the TR-16 Wastewater Peaking Factor table. Peak flows were modified according to different Needs Area Flow options considered.

Model Peak Infiltration Flow

Existing condition infiltration was estimated to approximate the Meter 4 (Surfside Road) Infiltration estimates from the Nantucket, Year 1 Capacity, Management, Operations, and Maintenance (CMOM) Report, dated: December 2018

Infiltration rates for new sewers was estimated at 250 gpd/inch-diameter-mile and infiltration rates for existing sewers was estimated at 400 gpd/inch-diameter-mile.

Table 3-2 summarizes the infiltration values used in the hydraulic model.

Table 3-2 Surfside Road Pump Station Tributary Area Model Infiltration Values				
Sewer Subsystem	Length (FT)	In-Di-Mi	GPDIM	Infiltration (GPD)
New 12-inch Vesper Lane	3,700	8.4	250	2,100
New 12-inch Bartlett Road	2,100	4.8	250	1,200
Existing 8-inch and 12-inch Surfside Road	3,100	7	400	2,800
New 12-inch and 15-inch Surfside Road	3,400	8	250	2,000
Existing 8-inch Vesper Lane Tributary Area	6,600	10	400	4,000
Existing 8-inch Surfside Road Tributary Area	17,800	27	400	10,800
Existing 8-inch Bartlett Road Tributary Area	18,000	27.5	400	11,000
Hummock North Needs Area		44	250	11,000
Hummock South Needs Area		52	250	13,000
Somerset Needs Area		32	250	8,000
Total Infiltration				65,900 GPD

3.2.1.3 Model Flow Scenarios

There are five (5) flow scenarios that were analyzed to establish a recommended plan for the Surfside Road Area sewer system improvements. Scenario 1 represents the existing sanitary system with sewer area build out flows. The existing Scenario 1 results showed limiting capacity and system surcharging, therefore subsequent scenarios include proposed system upgrades. Surcharging is generally defined as when the flow in the system rises above the top of the pipe. This would occur in manholes and building connections. Scenarios 2-5 represent a proposed sanitary system with sewer area buildout and various needs area flow options.

The five (5) flow scenario descriptions analyzed with the PCSWMM capacity analysis include:

<u>Scenario 1 - Existing Tributary Collection System</u>

System Configuration:

1. Existing 12-inch Vesper Lane sewer to existing 8-inch Surfside Road sewer
2. Existing 8-inch and 12-inch Surfside Road (North) sewer to existing Surfside Road Pump Station
3. Existing 12-inch Surfside Road (South) sewer to existing Surfside Road Pump Station

Peaked System Sanitary Flow Description:

1. Existing per capita flow
2. Buildout per capita flow
3. Atlantic Ave Area flow to existing 8-inch Surfside Road sewer
4. 40,000 GPD of Infiltration

Scenario 2 – Proposed Tributary Collection System Flow Option 1

System Configuration:

1. New 12-inch and 15-inch Surfside Road (North) Sewer to new Surfside Road Pump Station
2. Existing 12-inch Vesper Lane sewer to new 12-inch Surfside Road sewer
3. New 12-inch Bartlett Road sewer to new 15-inch Surfside Road sewer
4. Existing 8-inch and 12-inch Surfside Road (North) to new Surfside Road Pump Station
5. New 12-inch Surfside Road (South) sewer to new Surfside Road Pump Station
6. New Surfside Road Pump Station with 18-inch influent sewer

Peaked System Sanitary Flow Description:

1. Existing flow
2. Buildout flow
3. Future 2/3 Hummock North Needs Area flow to Vesper Lane
4. Future 1/3 Hummock North Needs Area flow to Bartlett Road
5. Hummock South Needs Area flow to Bartlett Road
6. Somerset Needs Area flow to Bartlett Road
7. Atlantic Ave Area flow to existing 8-inch Surfside Road sewer
8. 65,900 GPD of Infiltration

Scenario 3 – Proposed Tributary Collection System Flow Option 2

System Configuration:

1. New 12-inch and 15-inch Surfside Road (North) Sewer to new Surfside Road Pump Station
2. Existing 12-inch Vesper Lane sewer to new 12-inch Surfside Road sewer
3. New 12-inch Bartlett Road sewer to new 15-inch Surfside Road sewer
4. Existing 8-inch and 12-inch Surfside Road (North) to new Surfside Road Pump Station
5. New 12-inch Surfside Road (South) sewer to new Surfside Road Pump Station
6. New Surfside Road Pump Station with 18-inch influent sewer

Peaked System Sanitary Flow Description:

1. Existing flow
2. Buildout flow
3. Future 2/3 Hummock North Needs Area flow to Vesper Lane
4. Future 1/3 Hummock North Needs Area flow to Bartlett Road
5. Hummock South Needs Area flow to Bartlett Road
6. Somerset Needs Area flow to Bartlett Road
7. Atlantic Ave Area Flow to new 12-inch Surfside Road Sewer (Modification)
8. 65,900 GPD of Infiltration

Scenario 4 – Proposed Tributary Collection System Flow Option 3

System Configuration:

1. New 12-inch and 15-inch Surfside Road (North) Sewer to new Surfside Road Pump Station
2. Existing 12-inch Vesper Lane sewer to new 12-inch Surfside Road sewer
3. New 12-inch Bartlett Road sewer to new 15-inch Surfside Road sewer
4. Existing 8-inch and 12-inch Surfside Road (North) to new Surfside Road Pump Station
5. New 12-inch Surfside Road (South) sewer to new Surfside Road Pump Station
6. New Surfside Road Pump Station with 18-inch influent sewer

Peaked System Sanitary Flow Description:

1. Existing flow
2. Buildout flow
3. Future 1/3 Hummock North Needs Area flow to Vesper Lane (Modification)
4. Future 2/3 Hummock North Needs Area flow to Bartlett Road (Modification)
5. Hummock South Needs Area flow to Bartlett Road
6. Somerset Needs Area flow to Bartlett Road
7. Atlantic Ave Area flow to existing 8-inch Surfside Road sewer
8. 65,900 GPD of Infiltration

Scenario 5 – Proposed Tributary Collection System Flow Option 4

System Configuration:

1. New 12-inch and 15-inch Surfside Road (North) Sewer to new Surfside Road Pump Station
2. Existing 12-inch Vesper Lane sewer to new 12-inch Surfside Road sewer
3. New 12-inch Bartlett Road sewer to new 15-inch Surfside Road sewer
4. Existing 8-inch and 12-inch Surfside Road (North) to new Surfside Road Pump Station
5. New 12-inch Surfside Road (South) sewer to new Surfside Road Pump Station
6. New Surfside Road Pump Station with 18-inch influent sewer

Peaked System Sanitary Flow Description:

1. Existing flow
2. Buildout flow
3. Future 1/3 Hummock North Needs Area flow to Vesper Lane
4. Future 2/3 Hummock North Needs Area flow to Bartlett Road
5. Hummock South Needs Area flow to Bartlett Road
6. Somerset Needs Area flow to Bartlett Road
7. Atlantic Ave Area flow to new 12-inch Surfside Road sewer (Modification)
8. 65,900 GPD of Infiltration

3.2.1.4 Design Capacity Model Analysis

Flows developed for each of the five (5) flow scenarios were input into the PCSWMM hydraulic model for analysis to identify existing system capacity constraints. The basis for different flow scenarios was dictated by assigning different proportions of Needs Area flow to different parts of the existing system.

The five (5) flow scenarios analyzed include:

1. Scenario 1 - Existing Tributary Collection System (Existing Flows + Tributary Area Buildout Flows)
2. Scenario 2 - Proposed Tributary Collection System Flow Option 1
3. Scenario 3 - Proposed Tributary Collection System Flow Option 2
4. Scenario 4 - Proposed Tributary Collection System Flow Option 3
5. Scenario 5 - Proposed Tributary Collection System Flow Option 4

The sewers of focus for the hydraulic capacity evaluations are located on:

1. Vesper Lane
2. Surfside Road North of the Surfside Road Pump Station
3. Bartlett Road
4. Surfside Road South of the Surfside Road Pump Station

The Design Capacity Model flows are based on routing a theoretical peak wastewater flow plus an infiltration flow. The design criteria for analyzing these flows was to ensure that the newly proposed pipes would not flow above 80% of the depth capacity, or d/D and to improve hydraulics in the existing system.

Model Results - Scenario 1 - Existing Tributary Collection System (Existing Flows +Tributary Area Buildout)
The sewer system analyzed in Scenario 1 included:

- Existing 12-inch Vesper Lane sewer to existing 8-inch Surfside Road sewer
- Existing 8-inch and 12-inch Surfside Road (North) sewer to existing Surfside Road Pump Station
- Existing 12-inch Surfside Road (South) sewer to existing Surfside Road Pump Station

The Scenario 1 model did not meet the design criteria as the system showed limiting capacity and surcharging. Surcharging on the existing sewer on Surfside Road reached 6.5 feet at its highest level. Subsequent design scenario objectives will be to remove this surcharging condition. Figure 3-11 shows the surcharging in the existing Surfside Road sewer under Scenario 1.

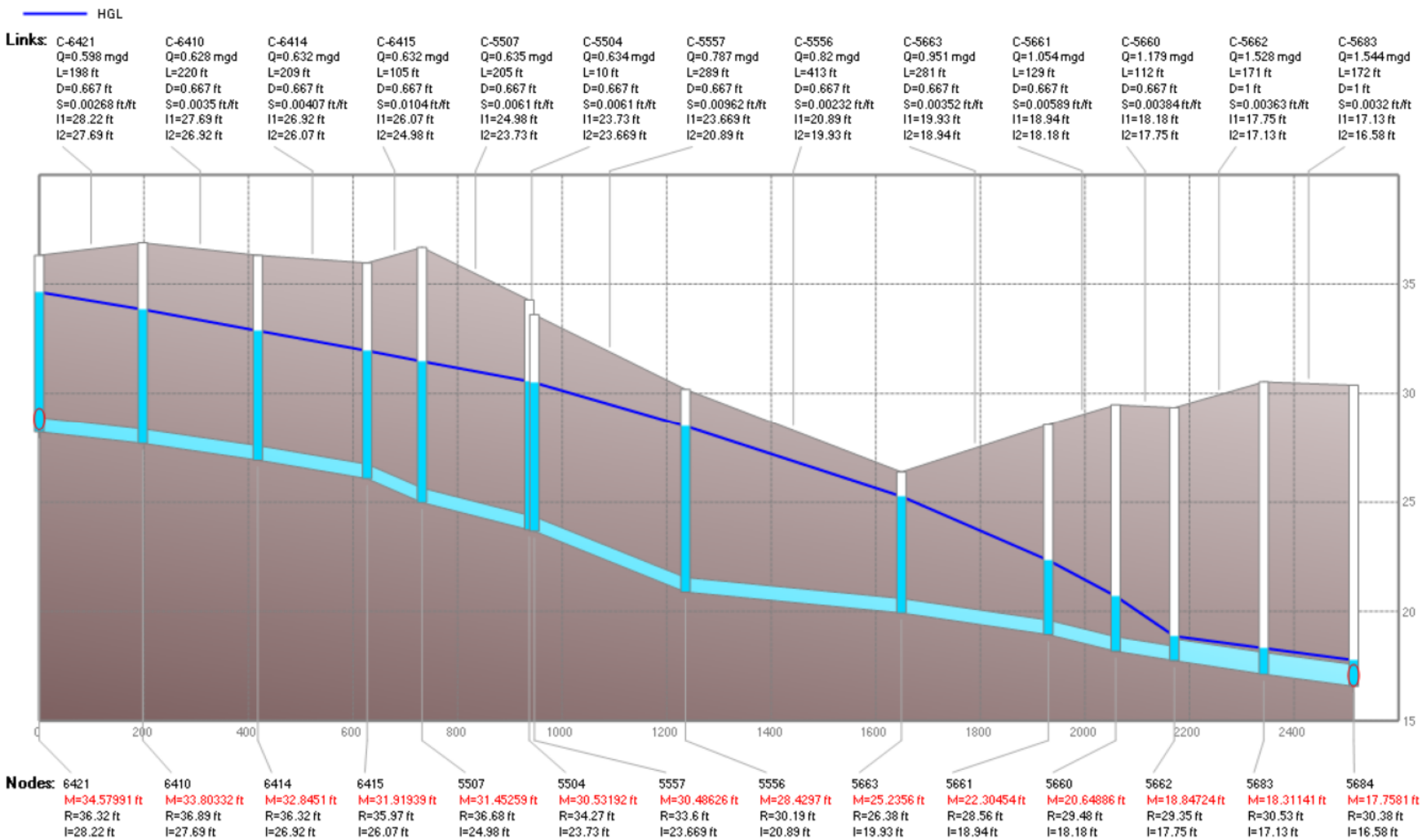
With the existing system being identified as having insufficient capacity to handle buildout flows within the Surfside Road tributary area, all subsequent model scenarios were analyzed with upgrades to the existing collection system on Surfside Road and Bartlett Road.

Scenarios 2 thru 5 have varying flow pattern options but all included the following proposed system configuration upgrades:

1. New 12-inch and 15-inch Surfside Road (North) Sewer to new Surfside Road Pump Station
2. Existing 12-inch Vesper Lane sewer to new 12-inch Surfside Road sewer
3. New 12-inch Bartlett Road sewer to new 15-inch Surfside Road sewer
4. Existing 8-inch and 12-inch Surfside Road (North) to new Surfside Road Pump Station
5. New 12-inch Surfside Road (South) sewer to new Surfside Road Pump Station
6. New Surfside Road Pump Station with 18-inch influent sewer

The major configuration change required to improve the existing system hydraulics was the removal of the Vesper Lane and Bartlett Road sewers from the existing Surfside Road sewer and connecting them to a new 12-inch and 15-inch Surfside Road sewer. The existing Surfside Road sewer will carry flow from Surfside Road building connections and tributary area lateral sewers. The new 12-inch and 15-inch Surfside Road Sewer will carry flow from the Vesper Road and Bartlett Road tributary areas plus future flow from Hummock North, Hummock South and Somerset Needs Areas.

Figure 3-11
Existing Surfside Road Surcharging Scenario 1



Model Results - Scenario 2 - Proposed Tributary Collection System Flow Option 1

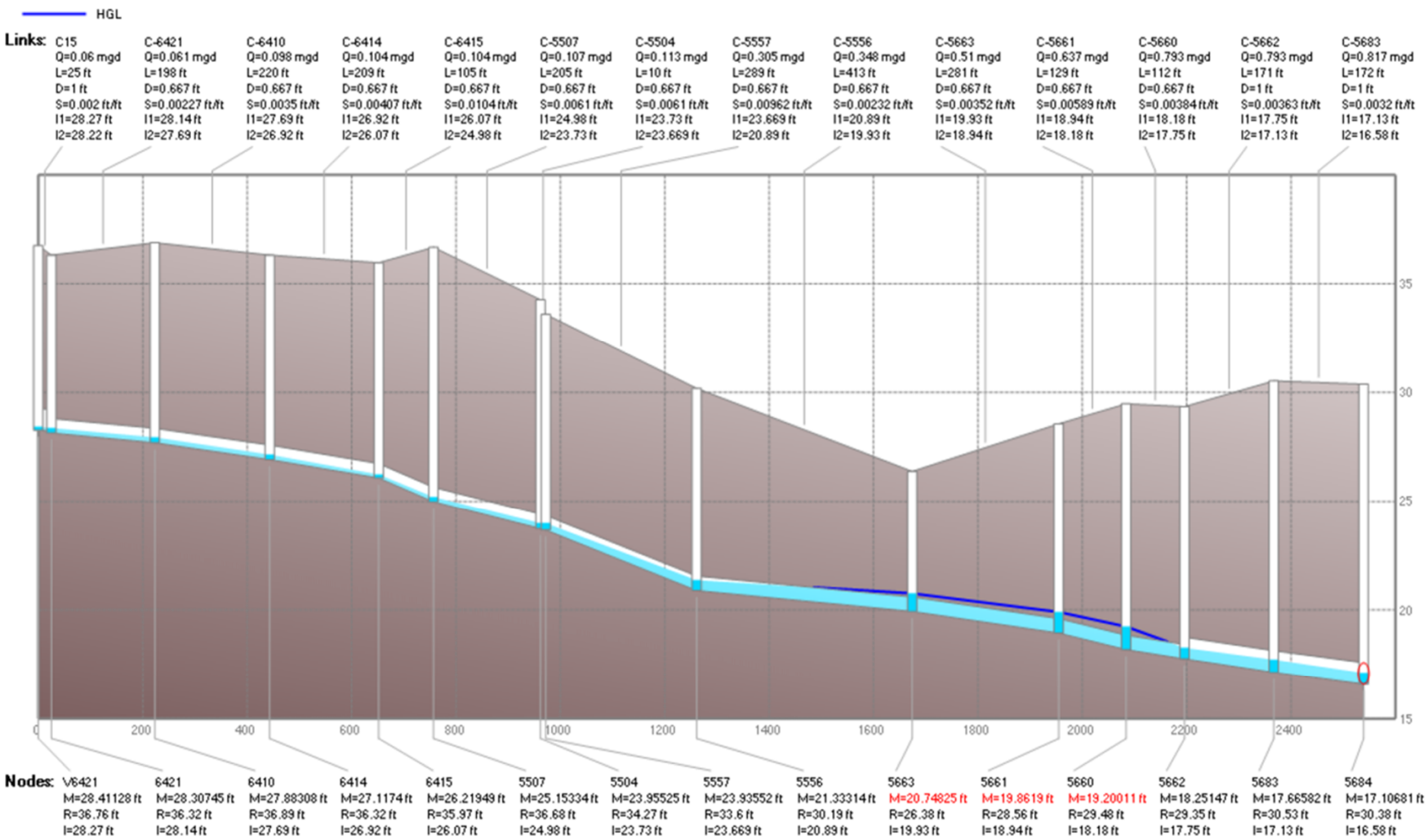
The Scenario 2 model routed flows of:

- Existing peak flow
- Peak tributary area buildout flow
- Future 2/3 Hummock North Needs Area flow to Vesper Lane
- Future 1/3 Hummock North Needs Area flow to Bartlett Road
- Hummock South Needs Area flow to Bartlett Road
- Somerset Needs Area flow to Bartlett Road
- Atlantic Ave Area flow to existing 8-inch Surfside Road sewer
- 65,900 GPD of Infiltration

Scenario 2 Model Capacity Results
Max d/D Existing 12-inch Vesper Lane sewer = 0.55
Max d/D New 12-inch Bartlett Road sewer = 0.68
Max d/D New 12-inch and 15-inch Surfside Road (North) sewer = 0.70
Max d/D New 12-inch Surfside Road (South) sewer = 0.66
Max d/D New Surfside Road Pump Station 18-inch influent sewer = 0.76
Max d/D Existing Surfside Road (North) sewer = 1.0 (surcharging sewers)

The Scenario 2 model meets the design criteria of 80% capacity threshold for the newly proposed sewers on Surfside Road and Bartlett Road, but continued to show a minor surcharging on a section of the existing 8-inch Surfside Road sewer. Surcharging on the existing Surfside Road sewer reached 0.4 feet at its highest level, down 6.1 feet from the existing system surcharge condition under Scenario 1. Figure 3-12 shows the minor surcharging in the existing Surfside Road sewer under Scenario 2.

Figure 3-12
Existing Surfside Road Surcharging Scenario 2



Model Results - Scenario 3 - Proposed Tributary Collection System Flow Option 2

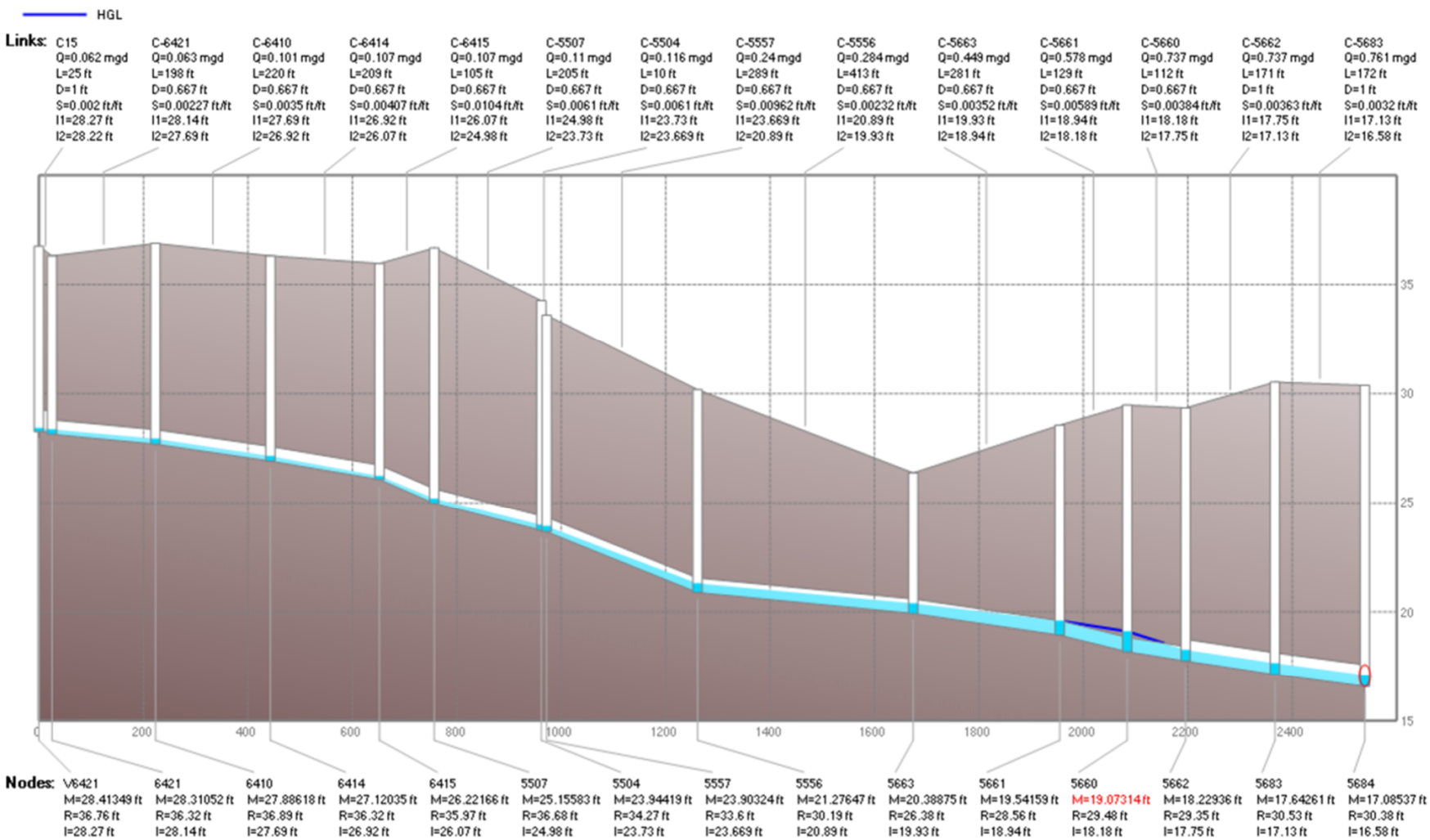
The Scenario 3 model routed flows of:

- Existing peak flow
- Peak tributary area buildout flow
- Future 2/3 Hummock North Needs Area flow to Vesper Lane
- Future 1/3 Hummock North Needs Area flow to Bartlett Road
- Hummock South Needs Area flow to Bartlett Road
- Somerset Needs Area flow to Bartlett Road
- Atlantic Ave Area Flow to new 12-inch Surfside Road Sewer (Modification from Scenario 2)
- 65,900 GPD of Infiltration

Scenario 3 Model Capacity Results
Max d/D Existing 12-inch Vesper Lane sewer = 0.54
Max d/D New 12-inch Bartlett Road sewer = 0.68
Max d/D New 12-inch and 15-inch Surfside Road (North) sewer = 0.72
Max d/D New 12-inch Surfside Road (South) sewer = 0.67
Max d/D New Surfside Road Pump Station 18-inch influent sewer = 0.77
Max d/D Existing Surfside Road (North) sewer = 1.0 (surcharging sewers)

The Scenario 3 model meets the design criteria of 80% capacity threshold for the newly proposed sewers on Surfside Road and Bartlett Road. While the modeling shows a slight surcharging on a section of the existing 8-inch Surfside Road sewer, the amount is inconsequential. It reached only 0.22 feet at its highest level, down 6.28 feet from the existing system surcharge condition from Scenario 1. Figure 3-13 shows the slight surcharging in the existing Surfside Road sewer under Scenario 3.

Figure 3-13
Existing Surfside Road Surcharging Scenario 3



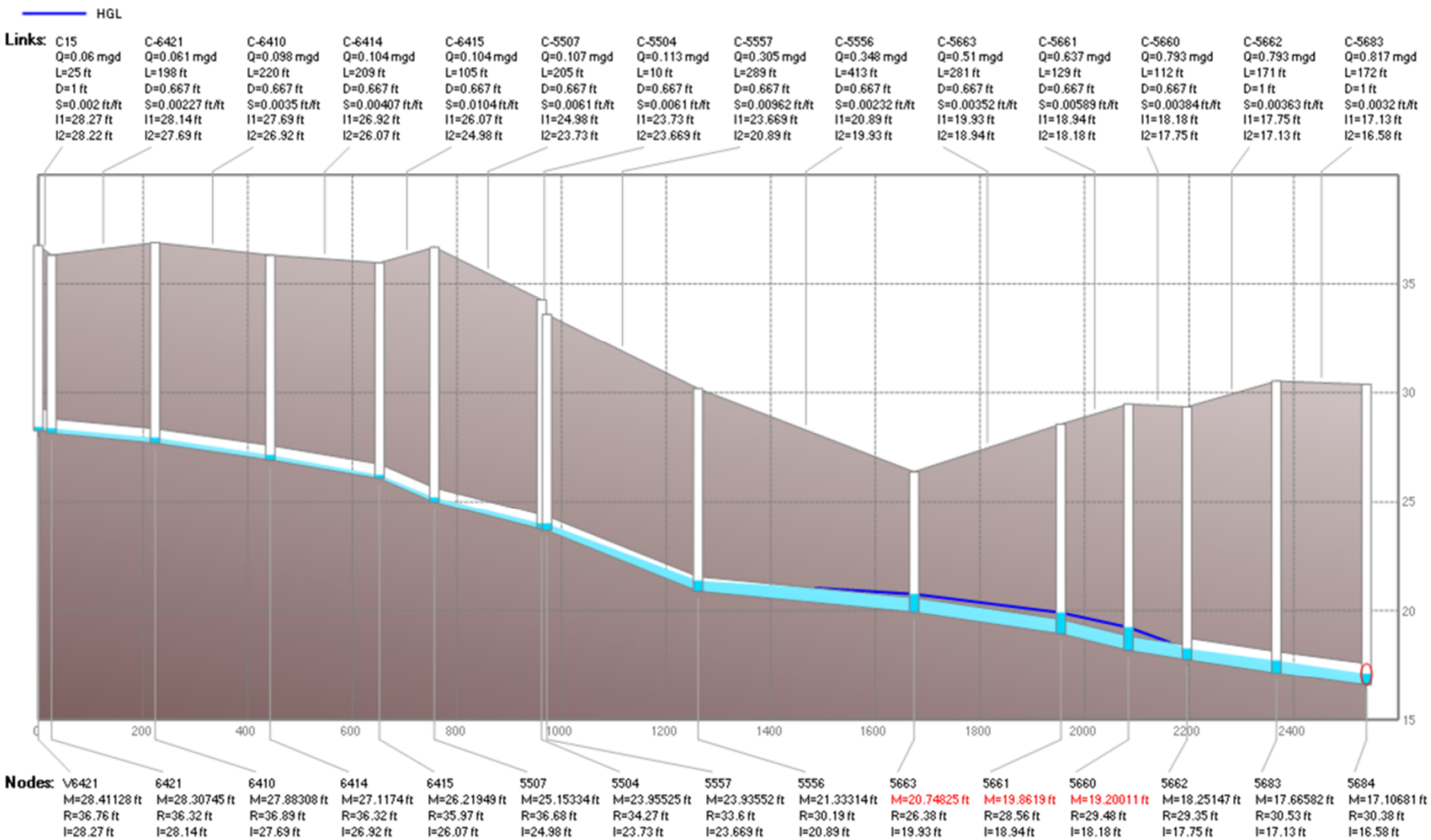
Model Results - Scenario 4 - Proposed Tributary Collection System Flow Option 3
The Scenario 4 model routed flows of:

- Existing peak flow
- Peak tributary area buildout flow
- Future 1/3 Hummock North Needs Area flow to Vesper Lane (Modification from Scenario 2)
- Future 2/3 Hummock North Needs Area flow to Bartlett Road (Modification from Scenario 2)
- Hummock South Needs Area flow to Bartlett Road
- Somerset Needs Area flow to Bartlett Road
- Atlantic Ave Area flow to existing 8-inch Surfside Road sewer
- 65,900 GPD of Infiltration

Scenario 4 Model Capacity Results
Max d/D Existing 12-inch Vesper Lane sewer = 0.49
Max d/D New 12-inch Bartlett Road sewer = 0.78
Max d/D New 12-inch and 15-inch Surfside Road (North) sewer = 0.70
Max d/D New 12-inch Surfside Road (South) sewer = 0.67
Max d/D New Surfside Road Pump Station 18-inch influent sewer = 0.77
Max d/D Existing Surfside Road (North) sewer = 1.0 (surcharging sewers)

The Scenario 4 model meets the design criteria of 80% capacity threshold for the newly proposed sewers on Surfside Road and Bartlett Road, but continued to show a minor surcharging on a section of the existing 8-inch Surfside Road sewer. Surcharging on the existing Surfside Road sewer reached 0.4 feet at its highest level, down 6.1 feet from the existing system surcharge condition under Scenario 1. Figure 3-14 shows the minor surcharging in the existing Surfside Road sewer under Scenario 4.

Figure 3-14
Existing Surfside Road Surcharging Scenario 4



Model results - Scenario 5 – Proposed Tributary Collection System Flow Option 4

The Scenario 5 model routed flows of:

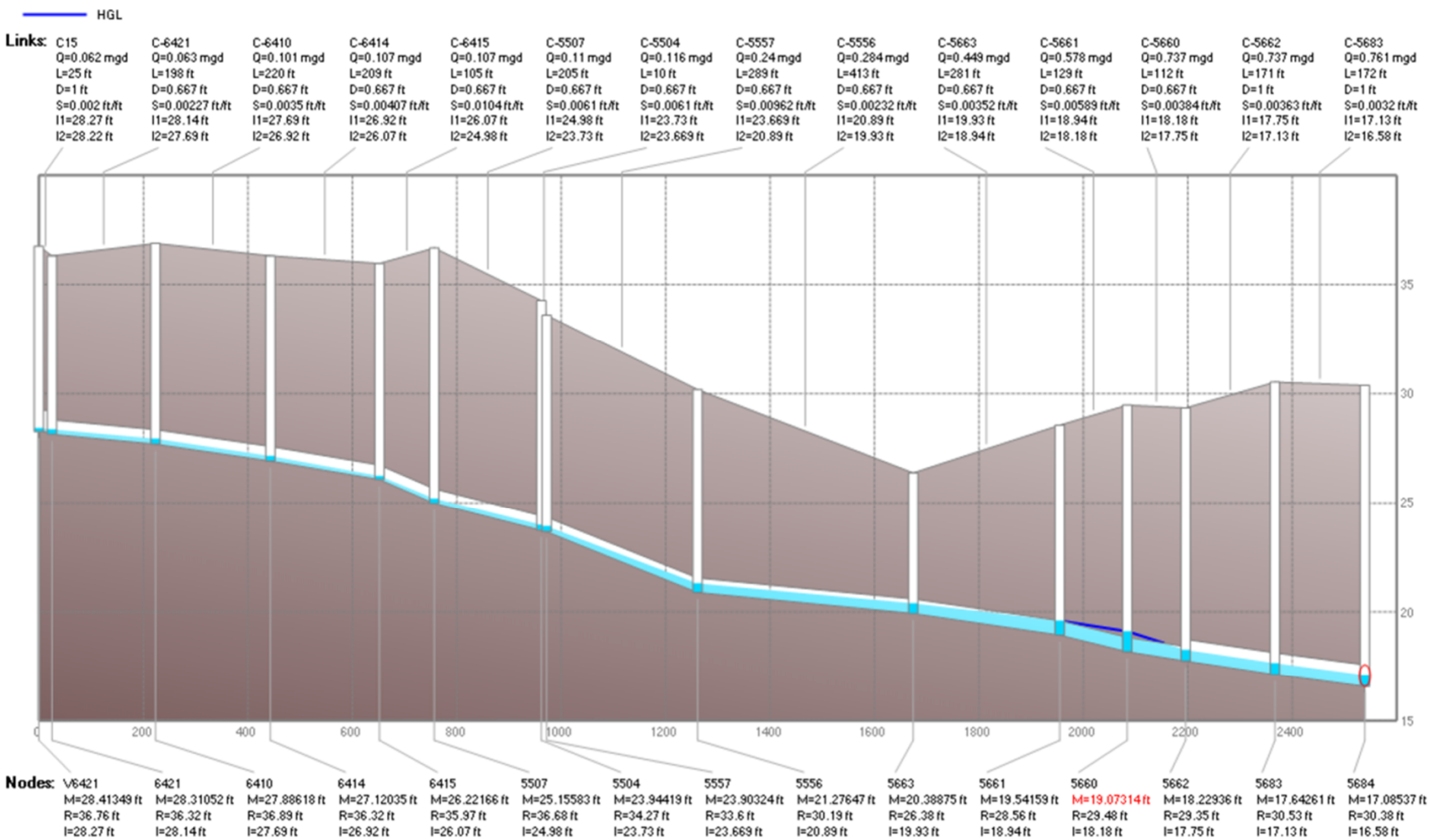
- Existing peak flow
- Peak tributary area buildout flow
- Future 1/3 Hummock North Needs Area flow to Vesper Lane
- Future 2/3 Hummock North Needs Area flow to Bartlett Road
- Hummock South Needs Area flow to Bartlett Road
- Somerset Needs Area flow to Bartlett Road
- Atlantic Ave Area flow to new 12-inch Surfside Road sewer (Modification from Scenario 4)
- 65,900 GPD of Infiltration

Scenario 5 Model Capacity Results

Max d/D Existing 12-inch Vesper Lane sewer = 0.48
Max d/D New 12-inch Bartlett Road sewer = 0.79
Max d/D New 12-inch and 15-inch Surfside Road (North) sewer = 0.72
Max d/D New 12-inch Surfside Road (South) sewer = 0.67
Max d/D New Surfside Road Pump Station 18-inch influent sewer = 0.77
Max d/D Existing Surfside Road (North) sewer = 1.0 (surcharging sewers)

The Scenario 5 model meets the design criteria of 80% capacity threshold for the newly proposed sewers on Surfside Road and Bartlett Road. While the modeling shows a slight surcharging on a section of the existing 8-inch Surfside Road sewer, the amount is inconsequential. It reached only 0.22 feet at its highest level, down 6.28 feet from the existing system surcharge condition from Scenario 1. Figure 3-15 shows the slight surcharging in the existing Surfside Road sewer under Scenario 5.

Figure 3-15
Existing Surfside Road Surcharging Scenario 5



3.2.2 Sea Street Pump Station Collection System

As shown on Figure 3-1, a few properties in the Hummock North Needs Area will be connected to the Sea Street Pump Station collection system via West Chester Street (1 property), Grove Lane (4 properties), and Vestal Street (10 properties). The future wastewater flow (approximately 4,300 gpd of average daily flow) from these properties will be included in a downstream system capacity analysis for the Sea Street Pump Station collection system as part of a future CMOM hydraulic modeling effort.

3.2.3 South Valley Pump Station and Airport Pump Station Collection System

Existing wastewater flow from the Airport Pump Station tributary area is conveyed to the Airport Pump Station via a 10-inch gravity sewer on Airport Road and a 10-inch gravity sewer on Miller Lane. A downstream capacity analysis of the Airport Pump Station collection system includes future wastewater flow from the build out of the Airport Pump Station tributary area as well as future wastewater flow from the WPZ Needs Area.

3.2.3.1 Hydraulic Model Selection

SWMM (Stormwater Management Model) version 7.2 PCSWMM 2019, by CHI was used for the hydraulic model. PCSWMM is a comprehensive software package for planning, modeling and managing drainage and sanitary sewer systems. A screenshot of the PCSWMM model for the Airport Pump Station System Design Capacity Analysis Network is shown in Figure 3-16.

3.2.3.2 Development of Model Flows

The sewer Capacity Design Model includes tributary peak wastewater flows and peak infiltration flows for the analysis.

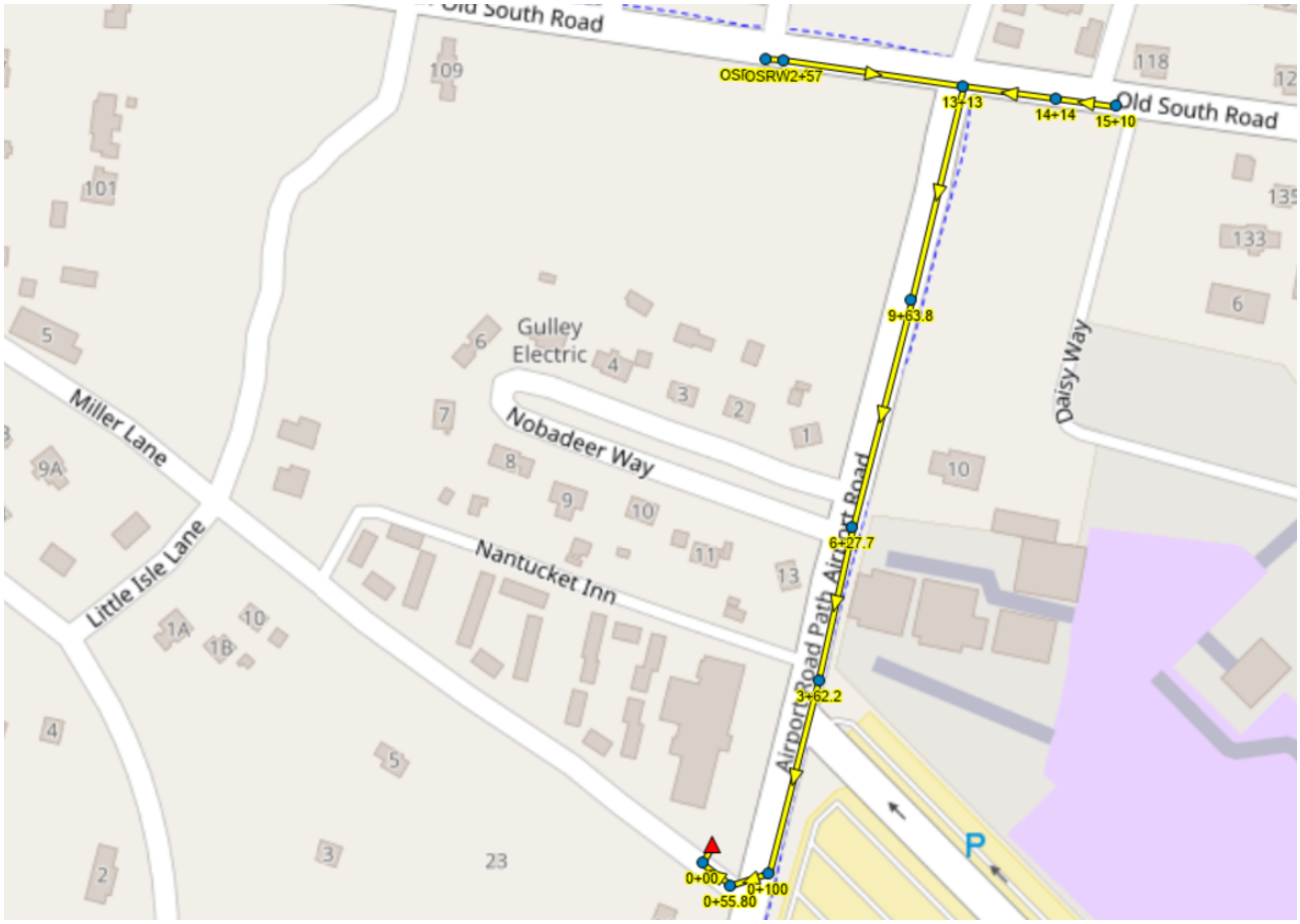
<u>Model Peak Sanitary Flow</u>

The average daily wastewater flow estimates utilized in developing the Peak Sanitary model are summarized in Table 3-3. Estimates were developed on a per capita basis estimated at a rate of 60 gal/capita and 4.5 capita/home for existing and future users.

Table 3-3
Airport Pump Station Tributary Area
Average Daily Wastewater Flow

Tributary Subarea	Existing Average Daily Flow (gpd)	Future Average Daily Flow (gpd)
Old South Road West	54,000	104,000
Old South Road East	54,000	92,000
Miller Lane	21,000	30,000
Airport Road	14,000	15,000
Total Average Daily Flow	**143,000 GPD**	**241,000 GPD**

Figure 3-16
Airport Road PCSWMM Design Capacity Analysis System Network



The average daily flow for each tributary subarea in Table 3-3 was utilized to develop the peak wastewater flow for the model flow scenarios. The average daily flow calculated was peaked as determined from the TR-16 Wastewater Peaking Factor table.

Model Peak Infiltration Flow

Infiltration rates for new sewers was estimated at 250 gpd/inch-diameter-mile and infiltration rates for existing sewers was estimated at 400 gpd/inch-diameter-mile. Table 3-4 summarizes the infiltration values used in the hydraulic model.

Table 3-4
Airport Pump Station Tributary Area
Model Infiltration Values

Sewer Subsystem	Length (FT)	In-Di-Mi	GPDIM	Infiltration (GPD)
Old South Road West	9,900	15	400	6,000
Old South Road East	13,200	20	400	8,000
Miller Lane	6,600	10	400	4,000
Airport Road	1,650	2.5	400	1,000
Total Infiltration				19,000 GPD

3.2.3.3 Model Flow Scenarios

There are three (3) flow scenarios that were analyzed to establish a recommended plan for the Airport Pump Station Area sewer system improvements. Scenario 1 represents the existing collection system. Scenario 2 represents the existing collection system with full build out of the tributary area, including the WPZ Needs Area. Scenario 3 represents the proposed collection system with full build out of the tributary area, including the WPZ Needs Area.

The three (3) flow scenario descriptions analyzed with the PCSWMM capacity analysis include:

Scenario 1 - Existing Tributary Collection System

System Configuration:

1. Existing 10-inch sewer from the pump station wetwell to Miller Lane
2. Existing 10-inch sewer from Miller Lane to Airport Road
3. Existing 10-inch sewer on Airport Road from Miller Lane to Old South Road

Peaked System Sanitary Flow Description:

1. Existing flow
2. 19,000 GPD Infiltration

Scenario 2 - Existing Tributary Collection System

System Configuration:

1. Existing 10-inch sewer from the pump station wetwell to Miller Lane
2. Existing 10-inch sewer from Miller Lane to Airport Road
3. Existing 10-inch sewer on Airport Road from Miller Lane to Old South Road

Peaked System Sanitary Flow Description:
1. Existing and Buildout flow
2. Future WPZ Needs Area
3. 19,000 GPD of infiltration

Scenario 3 – Proposed Tributary Collection System
System Configuration:
1. New 12-inch sewer from the pump station wetwell to Miller Lane
2. New 12-inch sewer from Miller Lane to Station 1+00 on Airport Road
3. Existing 10-inch sewer on Airport Road from Station 1+00 to Old South Road

Peaked System Sanitary Flow Description:
1. Existing and Buildout flow
2. Future WPZ Needs Area
3. 19,000 GPD of infiltration

3.2.3.4 Design Capacity Model Analysis
Flows developed for the three (3) flow scenarios were input into the PCSWMM hydraulic model for analysis to identify existing system capacity constraints.

The Design Capacity Model flows are based on routing a theoretical peak wastewater flow plus an infiltration flow. The design criteria for analyzing these flows was to ensure that the newly proposed pipes would not flow above 80% of the depth capacity, or d/D and to improve hydraulics in the existing system.

Model Results - Scenario 1 - Existing Tributary Collection System
The Scenario 1 model meets the design criteria of 80% capacity threshold for the existing 10-inch sewer on Miller Lane and Airport Road. Figure 3-17 shows no surcharging and all d/D values are less than 0.80 in the existing 10-inch Miller Lane and Airport Road sewers.

Max d/D Existing 10-inch Miller Lane and Airport Road sewers = 0.63

Model Results - Scenario 2 - Existing Tributary Collection System
The Scenario 2 model did not meet the design criteria as the system showed limiting capacity and d/D values above 80%. Figure 3-18 shows that d/D values are above 0.80 in the existing Miller Lane and Airport Road sewers under Scenario 2.

Max d/D Existing 10-inch Miller Lane and Airport Road sewers = 0.85

Model Results - Scenario 3 - Proposed Tributary Collection System
The Scenario 3 model meets the design criteria of 80% capacity threshold for the existing 10-inch sewer and the proposed 12-inch sewer on Miller Lane and Airport Road. Figure 3-19 shows no surcharging and all d/D values are less than 0.80 in the existing 10-inch and proposed 12-inch Miller Lane and Airport Road sewers.

Max d/D Existing 10-inch Airport Road sewers =0.76
Max d/D New 12-ich Miller Lane and Airport Road sewers =0.64

Figure 3-17
Scenario 1 Miller Lane and Airport Road Model Results

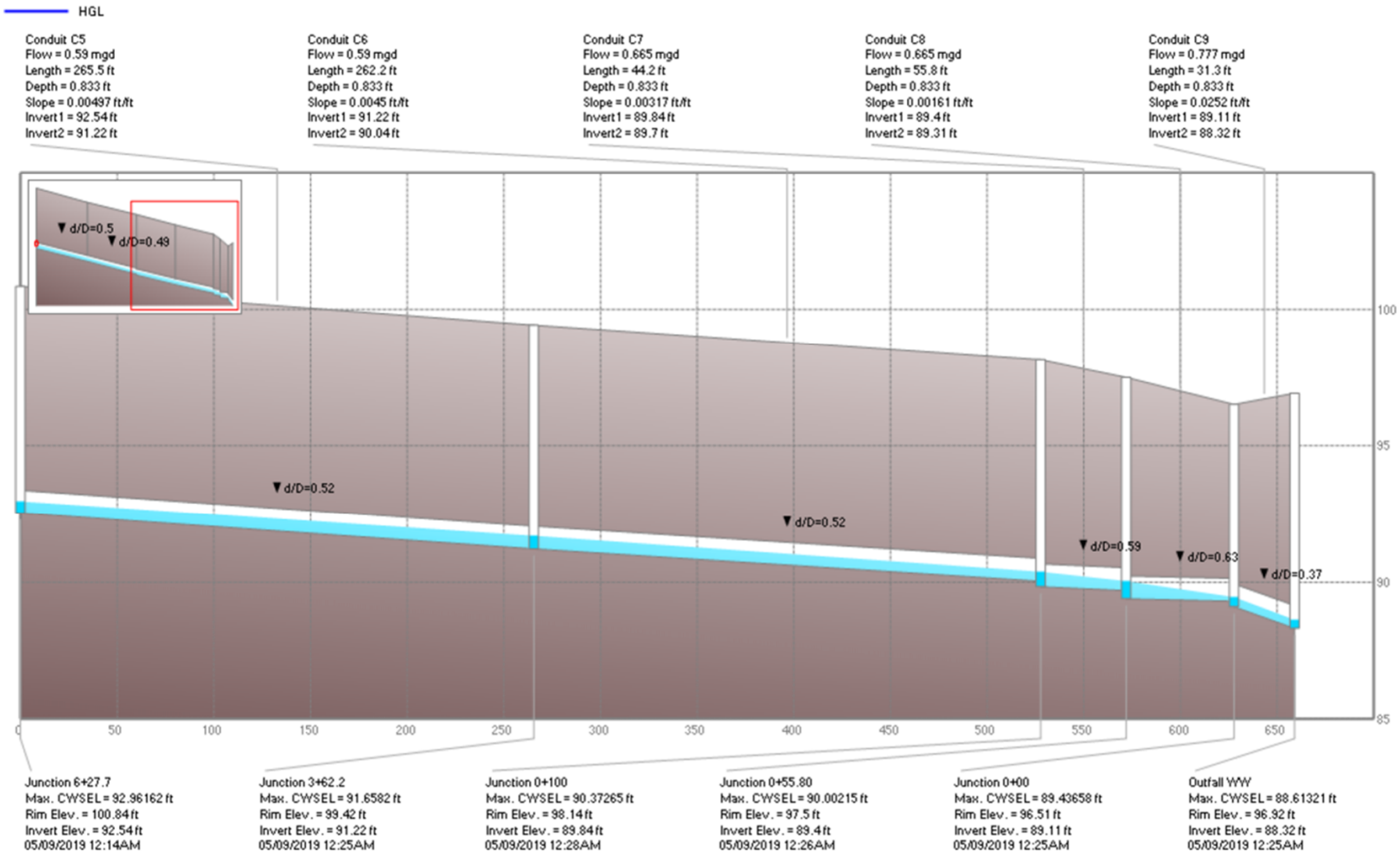


Figure 3-18
Scenario 2 Miller Lane and Airport Road Model Results

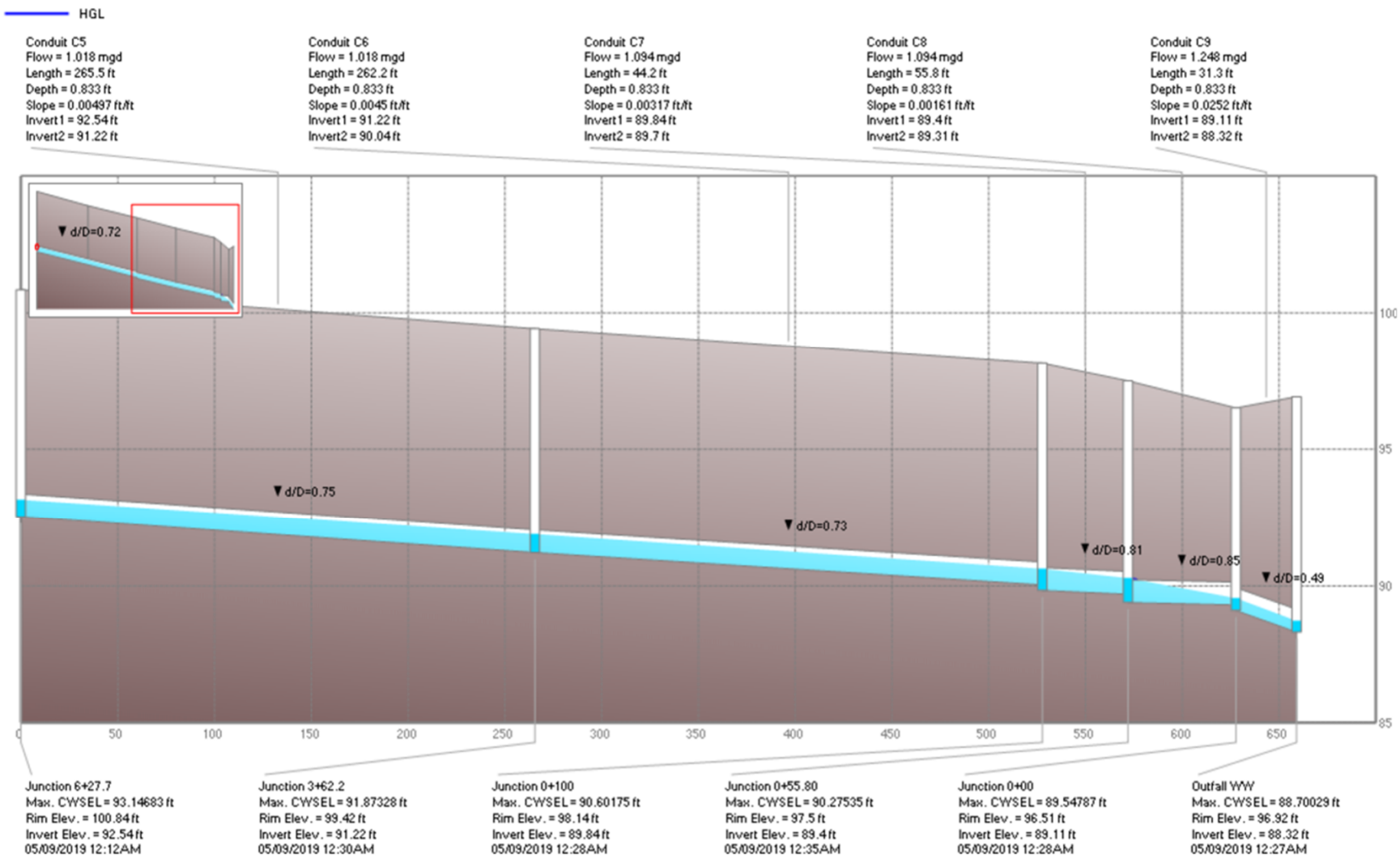
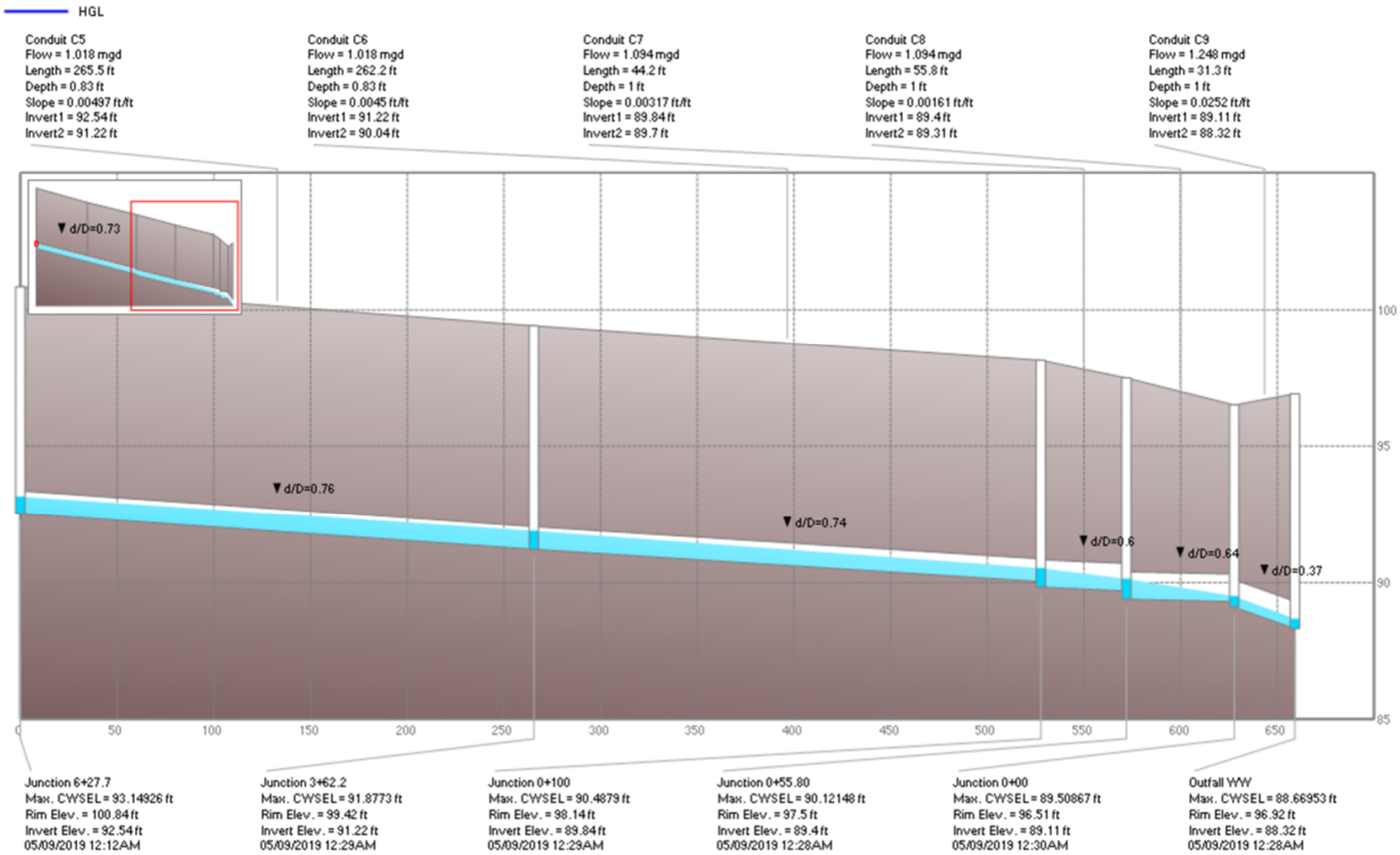


Figure 3-19
Scenario 3 Miller Lane and Airport Road Model Results



3.2.4 Monomoy South Pump Station Collection System

The future flows from the Shawkemo Needs Area will be tributary to the new Monomoy South Pump Station, which was installed as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project. The Monomoy South Pump Station was sized to handle flows from Monomoy, as well as the Shimmo and Shawkemo areas. A dedicated low-pressure sewer was installed as part of the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project to convey the future wastewater from the Shawkemo area to the Monomoy South Pump Station. No downstream collection system improvements are required for the Shawkemo Needs Area.

3.3 Pump Station Evaluations

As part of the downstream collection system capacity analysis, evaluations of the town's wastewater pump stations were conducted. The pump stations included Abrem Quary, Airport Road, Aurora Way, Cato Lane, Monomoy North, Pine Valley, Sachems Path, Sherburne Commons, South Valley and Surfside Road. Monomoy South and Wamasquid Pump Stations were not included in the evaluation, as they were recently installed as part of the Nantucket Harbor and Plus Parcels Sewer Extension Project. The locations of the pump stations are shown on Figure 1-1.

Weston & Sampson personnel performed a field visit to each of the pump stations between July 31, 2019 and August 2, 2019. The purpose of the site visits was to evaluate the condition of the existing equipment, determination of the existing pumping capacity, and review of operational issues.

A Pump Station Evaluation Memorandum was completed for each of the pump stations. Copies of the memoranda are included in Appendix C. The Pump Station Memorandum for each station included observations of existing conditions including civil/site, mechanical/process, electrical, instrumentation and controls, as well as results of drawdown testing to estimate the pump station capacities. Recommendations for improvements and upgrades was included for each of the pump stations.

3.3.1 Abrem Quary Pump Station

The Abrem Quary Pump Station, which is located in an easement on Blueberry Lane between Folger Avenue and Field Avenue, discharges flow to the Sherburne Commons Pump Station. Based on the factory pump curve, the design point for the pumps is 140 gpm at approximately 55 total dynamic head (TDH). Drawdown testing conducted during the site visit showed pump output between 46 and 68 gpm. While there are factors that can cause differing drawdown flows between pumps, the drawdown flows are a good indication of pump condition, as damaged or worn pump components (i.e. impellers) or clogging can result in lower flow outputs. The pumps are approximately 12 years old and will be nearing useful life for mechanical equipment (typically 20 years). In addition to replacement of the pumps, the evaluation memorandum in Appendix C provides a list of other recommended improvements and upgrades for the pump station.

The recommended sewer routing for the Miacomet Needs Area includes the installation of a gravity sewer on South Shore Road. Due to the low elevation of the existing Abrem Quary Pump Station service area, this pump station will need to remain in service. It is recommended that the existing Abrem Quary Pump Station force main be connected to the new gravity sewer in South Shore Road.

3.3.2 Airport Pump Station

The Airport Pump Station, which is located within an easement at the Nantucket Inn, discharges flow to the South Valley Pump Station. The force main is also configured with valves to allow flow to discharge to a gravity sewer on Old South Road near Lovers Lane. This gravity sewer is tributary to the Sea Street Pump Station. Based on the factory pump curve, the design point for the pumps is 574 gpm at 50 feet TDH. Drawdown testing conducted during the site visit showed pump output between 71 and 132 gpm. It should be noted that during the testing, the pump discharge piping was leaking which would reduce the measured pump output. In addition, Pump No. 2 was running at higher measured amps, which could be indicative of a clog. The pump station will be undergoing an upgrade design in the near future. The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station that the town should consider during the scheduled upgrade.

The recommended sewer routing for the WPZ Needs Area includes the installation of a low-pressure sewer connection to the existing Airport Pump Station tributary area collection system. Estimated future wastewater flows for the WPZ Needs Area, as well as for build out of the Airport Pump Station tributary area are included in Section 2 and Appendix B. These future wastewater flows should be considered during the design of the upgraded Airport Pump Station.

3.3.3 Aurora Way Pump Station

The Aurora Way Pump Station, which is located in an easement at #3 Aurora Way, discharges flow to a gravity sewer on Vesper Lane. The original design flow rates are not available. Drawdown testing conducted during the site visit showed pump output between 72 and 81 gpm. Based on discussions with town staff and no visual evidence of surcharging above the normal level in the wetwell, it appears that the capacity is sufficient. It is our understanding that a future design upgrade is being planned for the Aurora Way Pump Station. The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station that the town should consider during the design.

The recommended sewer routing for the Hummock North Needs Area includes approximately 15 properties on Burnt Swamp Lane and Hummock Pond Road that are tributary to the Aurora Way Pump Station. In addition, there are several properties along Hummock Pond Road which are served by grinder pumps that connect directly to the Aurora Way Pump Station force main. These connections are not recommended as grinder pump systems operate on lower pressures than a typical force main. The town should consider installing a gravity sewer or low-pressure sewer on Hummock Pond Road which would discharge to the Aurora Way Pump Station. These future wastewater flows should be considered during the design of the upgraded Aurora Way Pump Station.

3.3.4 Cato Lane Pump Station

The Cato Lane Pump Station, which is located in the town's right-of-way at the intersection of Cato Lane and Roberts Lane, discharges flow to a gravity sewer on Vesper Lane. The original design flow rates are not available. Drawdown testing conducted during the site visit showed pump output between 117 and 126 gpm. Based on discussions with town staff and no visual evidence of surcharging above the normal level in the wetwell, it appears that the capacity is sufficient. The town recently replaced one of the pumps that failed. It is our understanding that a future design upgrade is being planned for the Cato Lane Pump Station. The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station that the town should consider during the design.

3.3.5 Monomoy North Pump Station

The Monomoy North Pump Station, which is located in the town's right-of-way in front of #59A Monomoy Road, discharges flow to a gravity sewer on Monomoy Road near the intersection with Boston Avenue. As this pump station will not be receiving additional future wastewater flows, drawdown testing was not conducted during the site visit. The original design flow rates are not available. However, based on discussions with town staff and no visual evidence of surcharging above the normal level in the wetwell, it appears that the pump capacity is sufficient. The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station.

3.3.6 Pine Valley Pump Station

The Pine Valley Pump Station, which is located in an easement at #27 Keel Lane near the intersection of Keel Lane and Mizzenmast Road, discharges flow to the gravity sewer on Bartlett Road at the intersection with Appleton Road. Based on the factory pump curve, the design point for the pumps is 550 gpm at approximately 48 feet TDH. Drawdown testing conducted during the site visit showed pump output between 280 and 330 gpm. While there are factors that can cause differing drawdown flows between pumps, the drawdown flows are a good indication of pump condition, as damaged or worn pump components (i.e. impellers) or clogging can result in lower flow outputs. The pumps are approximately 12 years old and will be nearing useful life for mechanical equipment (typically 20 years). It is our understanding that a future design upgrade is being planned for the Pine Valley Pump Station. In addition to replacement of the pumps, the evaluation memorandum in Appendix C provides a list of other recommended improvements and upgrades for the pump station.

The recommended sewer routing for the Somerset Needs Area includes the installation of a new pump station on Bartlett Road with a force main discharging to the gravity sewer on Bartlett Road. An alternate sewer system layout for the Somerset Needs Area includes moving the proposed pump station from Bartlett Road to the end of Mizzenmast Road. See Figure 3-7. The advantage for this option would be the ability to eliminate the existing Pine Valley Pump Station. In lieu of the pump station upgrade, the existing gravity sewer on Mizzenmast Road would be extended further south on Mizzenmast to the new Somerset Needs Area pump station.

3.3.7 Sachems Path Pump Station

The Sachems Path Pump Station, which is located at #13 Nanina Drive, discharges flow to the gravity sewer on Surfside Road. Based on the pump curve, the design point for the pumps is 100 gpm at approximately 25 feet of TDH. Drawdown testing conducted during the site visit showed pump output between 140 and 148 gpm. The most likely reason for larger outputs is that the actual field conditions resulted in a lower TDH and subsequent higher pump rates. The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station. However, pump station improvements should not occur if the town decides to implement the recommended sewer routing for the Miacomet Needs Area. The installation of the proposed gravity sewer on South Shore Road would allow for the elimination of the Sachems Path Pump Station.

3.3.8 Sherburne Commons Pump Station

The Sherburne Commons Pump Station, which is located at the entrance to Sherburne Commons on South Shore Road, discharges flow to the gravity sewer on Surfside Road. The original design flow rates are not available. Drawdown testing conducted during the site visit showed pump output between 248 and 310 gpm. Based on discussions with town staff and no visual evidence of surcharging above

the normal level in the wetwell, it appears that the capacity is sufficient. The pumps are approximately 13 years old and will be nearing the useful life for mechanical equipment (typically 20 years). The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station. However, pump station improvements should not occur if the town decides to implement the recommended sewer routing for the Miacomet Needs Area. The installation of the proposed gravity sewer on South Shore Road would allow for the elimination of the Sherburne Commons Pump Station.

3.3.9 South Valley Pump Station

The South Valley Pump Station, which is located at #95 Goldfinch Drive, discharges flow directly to the Surfside WWTF via a 12-inch PVC force main. Based on the factory pump curve, the design point for the pumps is 1,000 gpm at 38.5 feet of TDH with two pumps running. Drawdown testing conducted during the site visit showed pump output between 470 and 531 gpm with one pump running and 647 gpm with two pumps running. While there are factors that can cause differing drawdown flows between pumps, the drawdown flows are a good indication of pump condition, as damaged or worn pump components (i.e. impellers) or clogging can result in lower flow outputs. It should be noted during the testing, that Pump No. 3 was very loud during pump operation indicating excess wear on the rotating assembly and the wear plates. It is our understanding that the pump station will be undergoing an upgrade design in the near future. The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station that the town should consider during the scheduled upgrade. As part of the design of the upcoming Airport Pump Station upgrade, the hydraulic capacity of the South Valley Pump Station should be re-evaluated based on the design flow from the new Airport Pump Station.

3.3.10 Surfside Road Pump Station

The Surfside Road Pump Station, which is located at #54 Surfside Road, discharges flow directly to the Surfside WWTF via either the 20-inch DI force main or the 16-inch HDPE force main. Based on the factory pump curve, the design point for the pumps is 750 gpm at 52 feet of TDH. Drawdown testing conducted during the site visit showed pump output between 460 and 540 gpm. While there are factors that can cause differing drawdown flows between pumps, the drawdown flows are a good indication of pump condition, as damaged or worn pump components (i.e. impellers) or clogging can result in lower flow outputs. The pumps are 33 years old and well past useful life for mechanical equipment (typically 20 years). The evaluation memorandum in Appendix C provides a list of recommended improvements and upgrades for the pump station.

However, as identified in the downstream capacity analysis completed for the Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Project and confirmed by the hydraulic modeling for the Surfside Road Pump Station collection system in Section 3.2.1, the existing Surfside Road Pump Station does not have the capacity to handle the future flows from the build out of the existing tributary area and from the 2014 CWMP Needs Areas. The recommended routing for the Hummock North, Hummock South, and Somerset Needs Areas is to connect to the Surfside Road Pump Station collection system via the gravity sewers on Vesper Lane and Bartlett Road. The recommended plan is for a new Surfside Road Pump Station to be constructed with capacity to handle the future tributary wastewater flow of approximately 4 MGD (2,800 gpm). The existing pump station should be maintained and repaired, as needed, to keep the station operational until the new Surfside Road Pump Station is completed.

3.4 Recommended Downstream Collection System Improvements

Based on the recommended routing alternatives and the capacity analysis of the downstream collection systems, recommended system improvements needed to convey the future wastewater flows to the Surfside WWTF were identified for the Surfside Road Pump Station collection system and the Airport Pump Station Collection System.

3.4.1 Surfside Road Pump Station Collection System

As discussed in Section 3.1, the recommended routing for the Hummock North, Hummock South and Somerset Needs Areas is to connect to the Surfside Road Pump Station collection system via the gravity sewers on Vesper Lane and Bartlett Road. As part of the downstream capacity analysis, five (5) flow scenarios were hydraulically modeled to establish a recommend plan for sewer system improvements for the Surfside Road Pump Station collection system. Based on the results of the hydraulic model, Scenario 5 is the recommended option, as it meets the design criteria of 80% capacity threshold for the newly proposed sewers on Surfside Road and Bartlett Road.

The recommended system improvements include the following:

1. New 4 MGD Surfside Road Pump Station at #57 Surfside Road
2. New 18-inch pump station influent sewer from the new pump station wetwell to the new 15-inch sewer and the new 12-inch sewer on Surfside Road
3. New 15-inch sewer on Surfside Road (North) from the new 18-inch pump station influent sewer to Bartlett Road
4. New 12-inch sewer on Surfside Road (North) from Bartlett Road to Vesper Lane
5. Connect the existing 12-inch Vesper Lane sewer to the new 12-inch Surfside Road (North) sewer
6. New 12-inch sewer on Bartlett Road connected to the new 15-inch Surfside Road (North) sewer
7. New 12-inch sewer on Surfside Road (South) from the new 18-inch pump station influent sewer to Miacomet Avenue
8. Connect the existing 8-inch and 12-inch sewer on Surfside Road (North) to the new 18-inch pump station influent sewer
9. Provide a connection on the new 12-inch Surfside Road (North) sewer for the Atlantic Avenue sewer relocation in the new manhole at the intersection of Surfside Road and Vesper Lane.

A plan of the recommended Surfside Road Pump Station Collection System improvements is shown on Figure 3-20.

Figure 3-21 shows the sewer profile and the model results for the proposed 12-inch Bartlett Road sewer.

Figure 3-22 shows the sewer profile and the model results for the proposed 12-inch and 15-inch Surfside Road (North) sewer.

Figure 3-23 shows the sewer profile and the model results for the proposed 18-inch pump station influent sewer and the proposed 12-inch Surfside Road (South) sewer.

The budgeted project cost for the Surfside Road Area Sewer Systems Improvements is $7,600,000. The breakdown of the project cost is as follows:

- Construction: $5,640,000
- Contingency: $ 550,000
- Engineering: $1,410,000

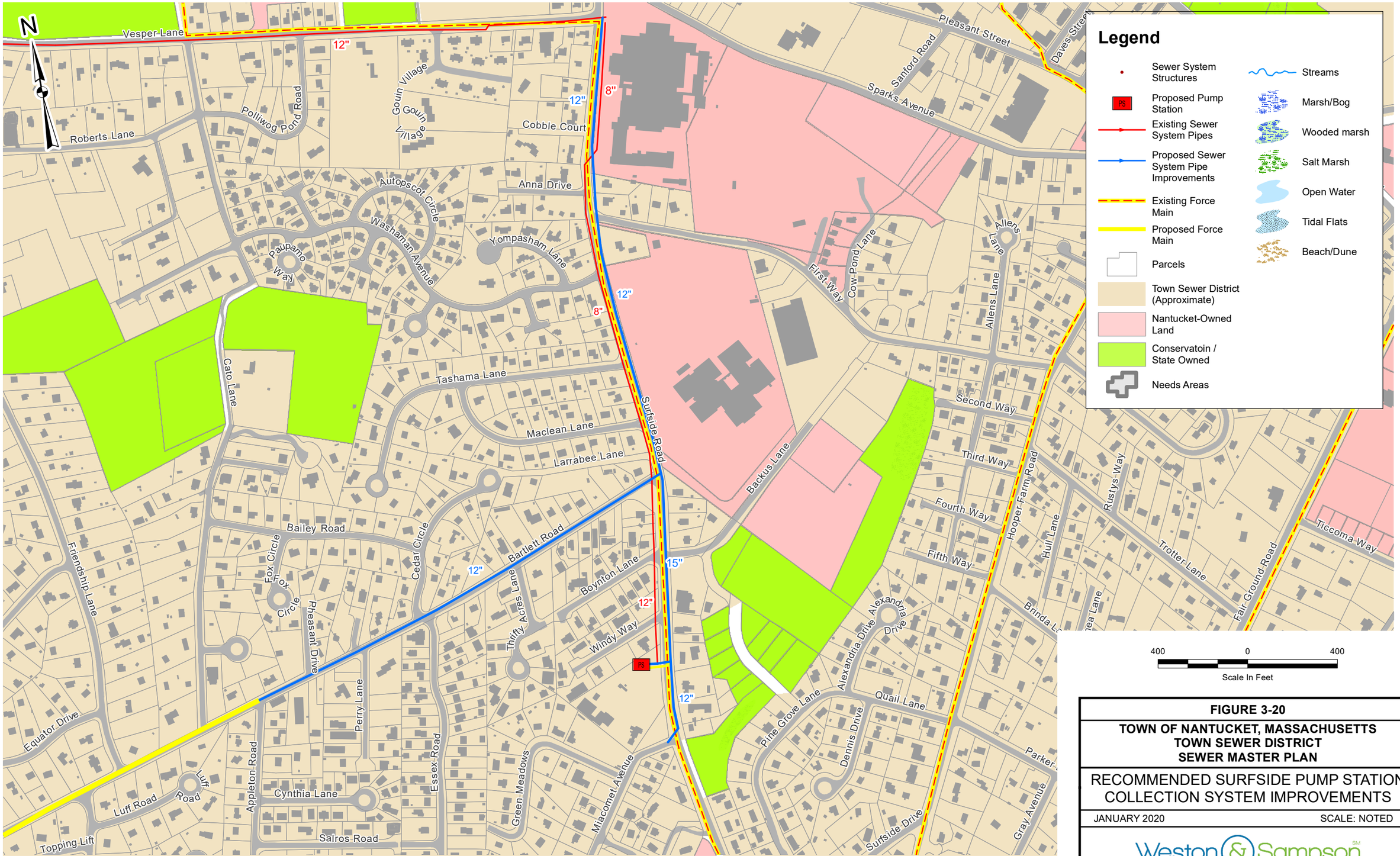


FIGURE 3-20

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

RECOMMENDED SURFSIDE PUMP STATION COLLECTION SYSTEM IMPROVEMENTS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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Figure 3-21
Proposed Bartlett Road Model Results Scenario 5

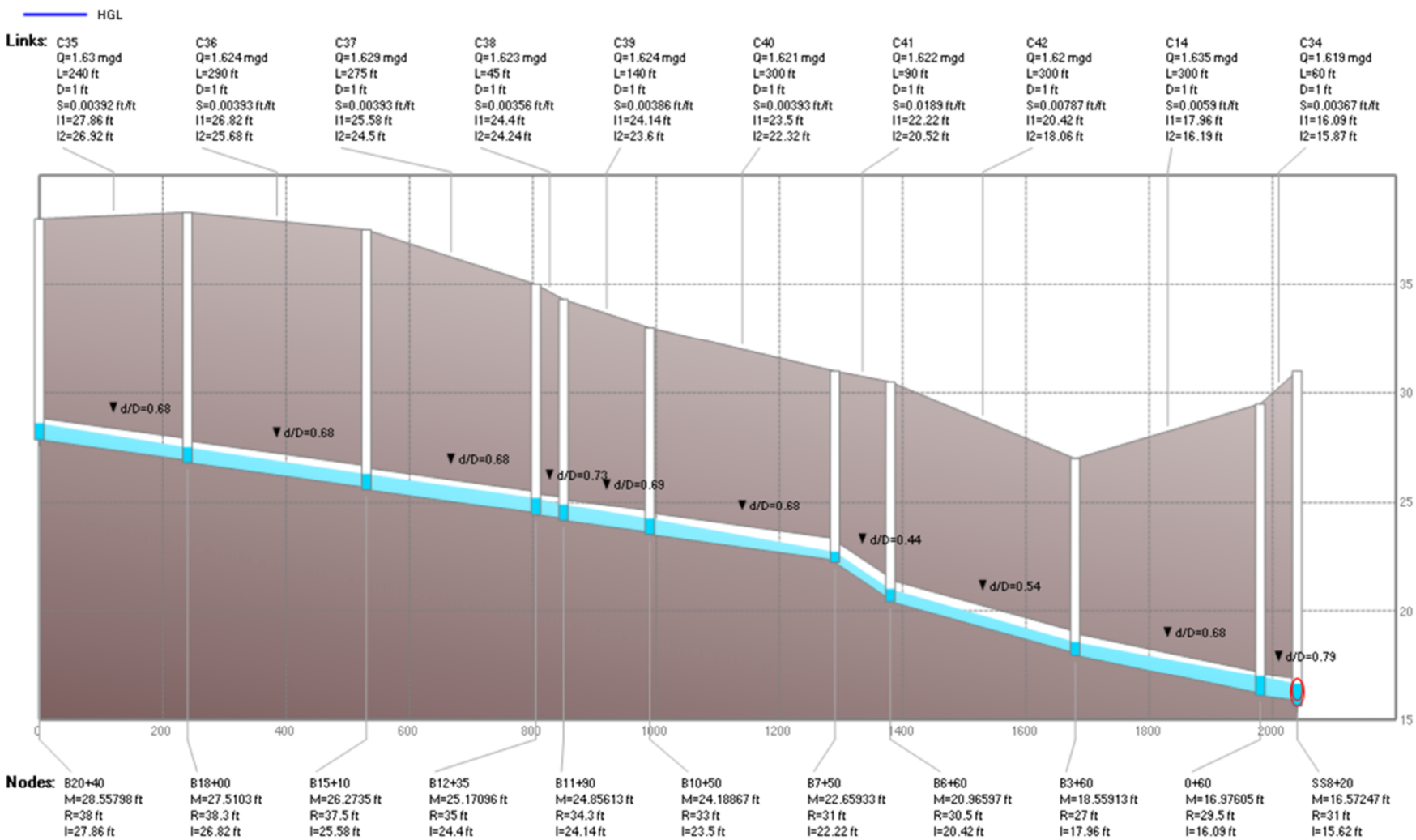


Figure 3-22
Proposed Surfside Road (NORTH) Model Results Scenario 5

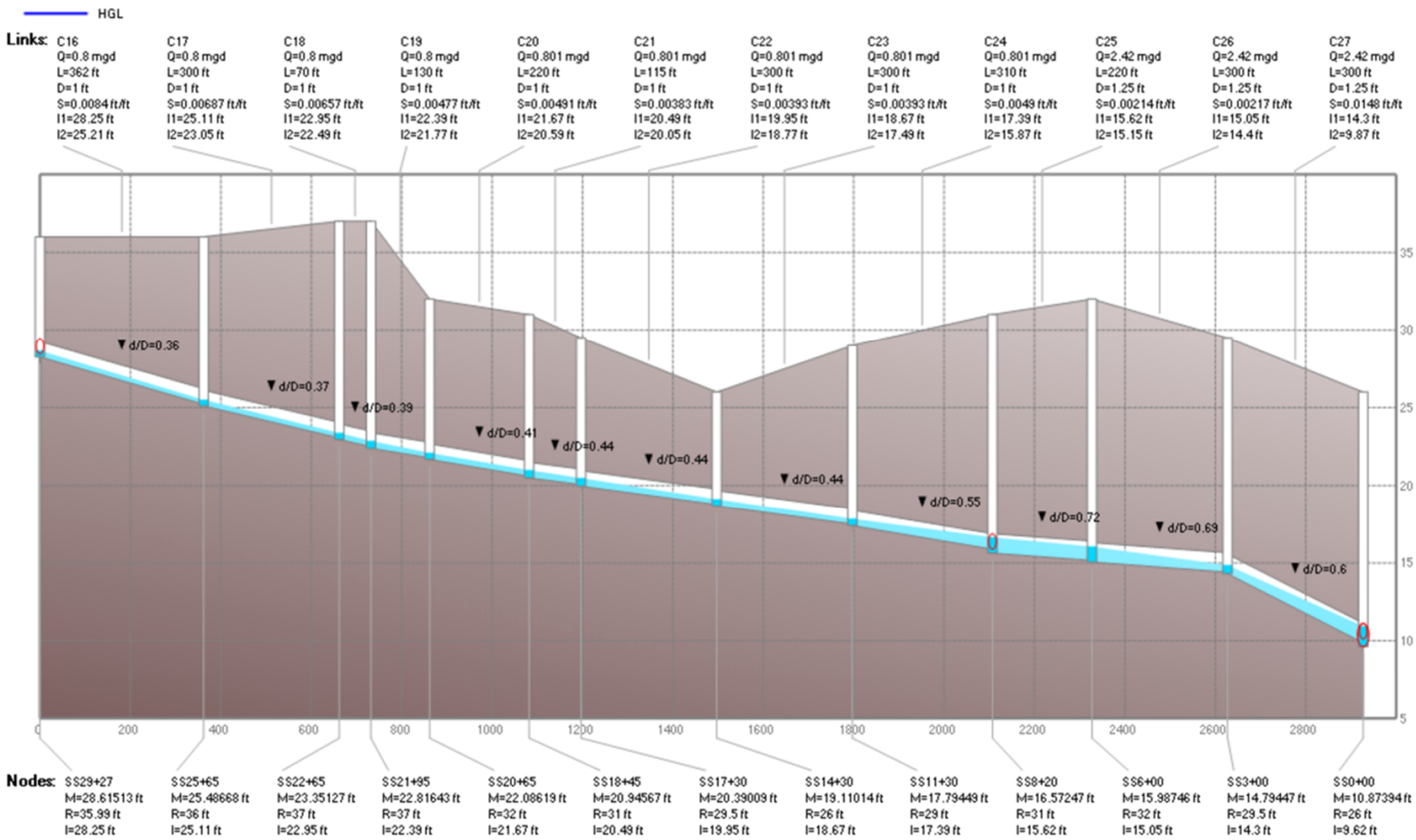
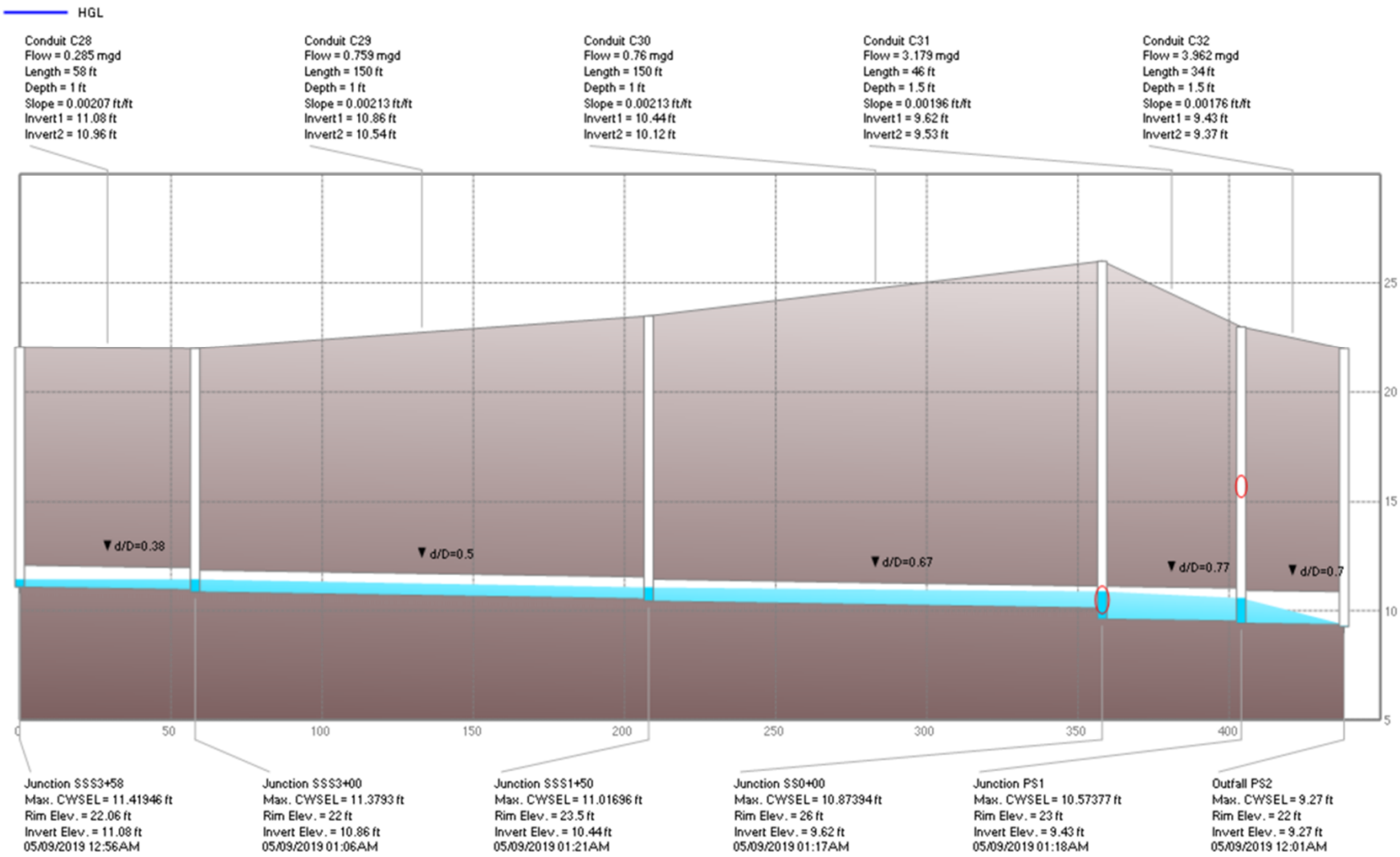


Figure 3-23
Proposed Surfside Road (SOUTH) and Pump Station Influent Sewer Model Results Scenario 5



3.4.2 Airport Pump Station Collection System

As discussed in Section 3.1, the recommended routing for the WPZ Needs Area is to connect to the Airport Pump Station collection system via the existing gravity sewers on Hinsdale Road and Nobadeer Farm Road. As part of the downstream capacity analysis, three (3) flow scenarios were hydraulically modeled to establish a recommend plan for sewer system improvements for the Airport Pump Station collection system. Based on the results of the hydraulic model, Scenario 3 is the recommended option, as it meets the design criteria of 80% capacity threshold for the newly proposed sewers on Miller Lane and Airport Road.

The recommended system improvements include the replacement of 130 feet of existing 10-inch sewer with new 12-inch sewer at the following locations:

1. 30 feet of new 12-inch sewer from the pump station wetwell to Station 0+00 on Miller Lane.
2. 100 feet of new 12-inch sewer from Station 0+00 on Miller Lane to Station 1+00 on Airport Road. This section will include the replacement of approximately 56 feet of 10-inch sewer on Miller Lane that was installed at a slope of 0.0016, which is below the recommended minimum slope of 0.0028 for a 10-inch pipe.

Figure 3-19 shows the sewer profile and the model results for the proposed 12-inch sewer from the pump station wetwell to Station 1+00 on Airport Road.

A plan of the recommended Airport Pump Station Collection System improvements is shown on Figure 3-24.

It is recommended that the sewer replacements are constructed as part of the Airport Pump Station Upgrade, as they are adjacent to the pump station. This would minimize the overall disruption near the airport and would also minimize the cost for engineering, bidding and construction of these sewer improvements.

The budgeted cost for the Airport Pump Station Collection System improvements, assuming the design and construction are included in the Airport Pump Station Upgrade project, is $90,000. The breakdown of the project cost is as follows:

- Construction: $70,000
- Contingency: $ 5,000
- Engineering: $15,000

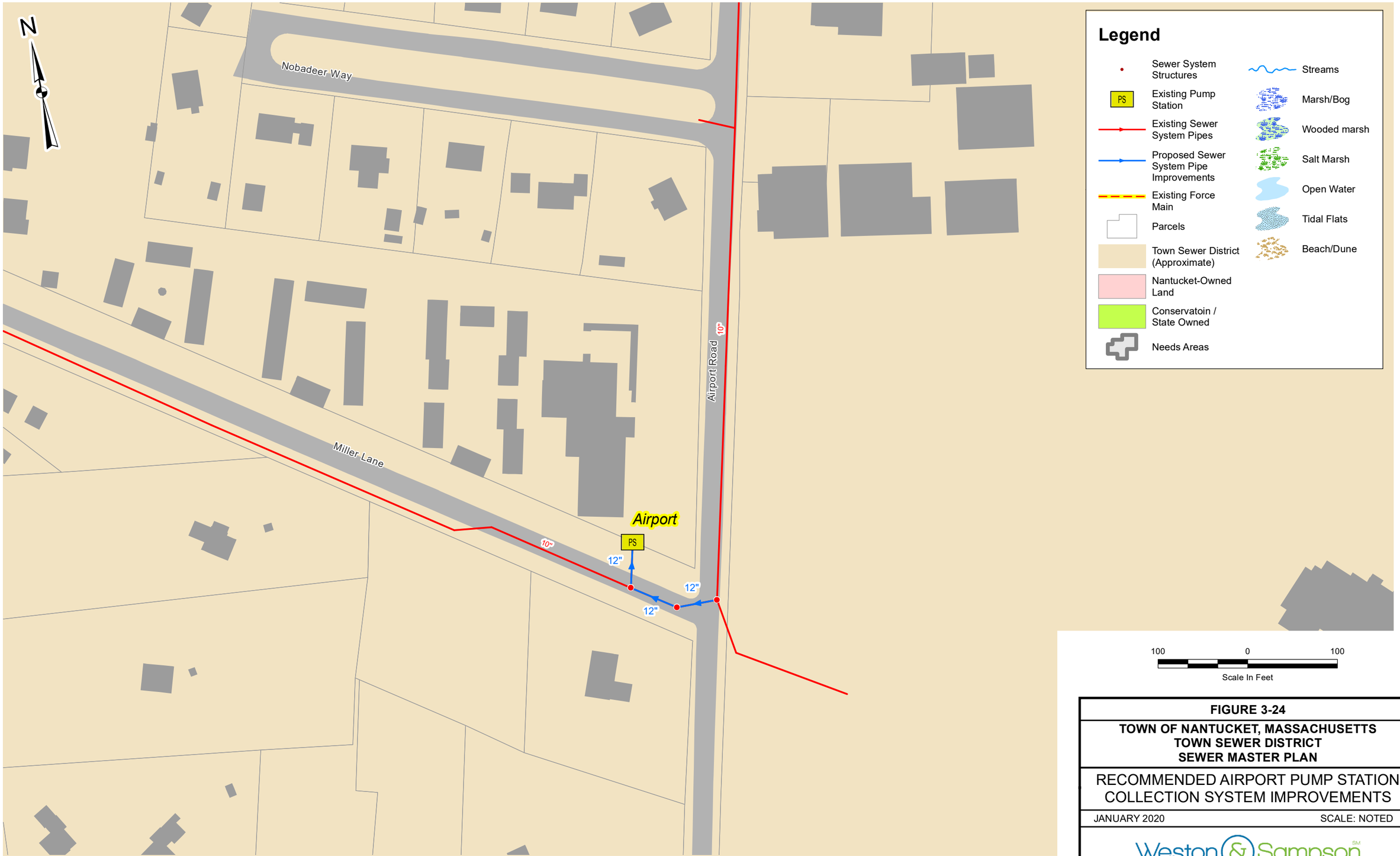


FIGURE 3-24

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

RECOMMENDED AIRPORT PUMP STATION COLLECTION SYSTEM IMPROVEMENTS

JANUARY 2020 SCALE: NOTED

Weston & Sampson

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4.0 DEVELOPMENT OF FORCE MAIN SYSTEM MODEL

The wastewater in the Town Sewer District collection system is pumped to the Surfside WWTF via three (3) force mains that manifold together into a single 20-inch DI force main just prior to the WWTF headworks. The force mains include the 20-inch DI force main from the Sea Street Pump Station, the 16-inch HDPE force main from the Sea Street Pump Station and the 12-inch PVC force main from the South Valley Pump Station. The Surfside Road Pump Station force main is configured so that it can discharge into either the 20-inch DI Sea Street Pump Station force main on Surfside Road or the 16-inch HDPE Sea Street Pump Station force main at the intersection of Surfside Road and Hooper Farm Road. The Monomoy South Pump Station force main is manifolded into the 12-inch PVC South Valley Pump Station force main at the intersection of Old South Road and Fairgrounds Road. The existing force main system tributary to the Surfside WWTF is shown on Figure 4-1.

4.1 Existing Force Main System Model

As part of the Sewer Master Plan, Weston & Sampson developed a force main system hydraulic model to identify the overall pump station and force main system hydraulics and capacity issues when any of the pump stations are operating simultaneously. This model was utilized to determine the operating characteristics of the force main system during different pumping scenarios (i.e. multiple pump stations operating at different times within multiple force mains).

For this hydraulic model, we analyzed the pump station systems using the Hazen-Williams equation. This is an empirical equation commonly used in practice to determine the discharge flow and head loss relationship for water flow in full pipes (i.e. force mains). The Hazen-Williams equation utilizes a roughness coefficient, or C-Value, as an empirical representation of roughness in the entire length of force main pipe. The C-value typically ranges from 150 for very smooth new pipe, to 60 or less for older 'internally rough' pipe. These lower C-values typically relate to a pipe with large solids deposits, grease, deterioration and/or tuberculation (mounds of corrosion/rust deposits on the inside of iron pipes) typically seen in aging infrastructure.

The pump stations were modeled using the Hazen Williams equation in Microsoft Excel. We also utilized EPANet (Version 2.0) to model the more complex pumping scenarios, when multiple pump stations were running at the same time, through the same force main. EPANet is a program developed by the US Environmental Protection Agency for computer hydraulic simulation models that, among other things, calculates the hydraulic behavior of water within a pressurized pipe network.

The reason the system was modeled with two programs was due to the complexities of the town's force main network. In a typical drinking water model, the pipe system can be assumed to be full and always under pressure due to the constant pumping that occurs. In a wastewater pump station, the pumps typically operate periodically. Depending upon the configuration of the force main, high points in the force main can potentially drain resulting in the force main not remaining fully pressurized. This causes the pumps to experience different hydraulic conditions depending on the section of pipes that are pressurized. This is case for Nantucket's existing force main system. The island's topography results in the force mains having mid-island high points that are higher than the hydraulic grade line of the discharge point at the Surfside WWTF headworks. These significant high points allow sections of the existing force mains to drain by gravity to the WWTF.

FIGURE 4-1

TOWN OF NANTUCKET, MASSACHUSETTS
TOWN SEWER DISTRICT
SEWER MASTER PLAN

SURFSIDE WWTF
EXISTING PUMP STATION AND
FORCE MAIN SYSTEM

JANUARY 2020 SCALE: NOTED

Weston & Sampson

4.1.1 Model Scenarios

The force mains for the Sea Street Pump Station, the Surfside Road Pump Station, the South Valley Pump Station, and the Monomoy South Pump Station all connect with to the overall force main system at different locations. Because of this, the flow output at each pump station will vary depending on what other pump stations are operating at the same time. In order to more fully understand the hydraulics, potential flow scenarios were developed for each pump station running alone (without any other pump stations operating) and scenarios when all other pump stations in the system are running ("All Run" Scenario). The "All Run" scenario is based on the maximum design peak flow for each pump station with the required number of pumps operating to meet the design peak flow. This "All Run" scenario is considered the 'worst-case' scenario where all pump stations are operating at peak flow and competing with all other pump stations to discharge flow into the force main system.

4.1.2 Sea Street Pump Station – 20-inch Force Main Model

The Sea Street 20-inch DI force main is approximately 21,400 feet long and runs from the Sea Street Pump Station (STA 0+00) to the Surfside WWTF Headworks (STA 213+62). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure 4-2. Currently this is the force main that both the Sea Street Pump Station and the Surfside Road Pump Station are pumping through. The 8-inch Surfside Road Pump Station force main connects to the 20-inch DI force main on Surfside Road at approximate STA 142+58.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and Yard Piping: "Renovation and Upgrade of Sea Street Pumping Station" by Hazen and Sawyer (last revised for record 2019). These drawings were on the NAVD88 vertical datum which was used for the model.
- 20-inch Force Main to Surfside WWTF Force Main Manifold: "Wastewater Conveyance System Improvements Phase 1" by Sheaffer and Roland, Inc. (1981). These drawings are on the 1934 Mean Low Water (MLW) datum which was converted to NAVD88 for the model.
- Surfside WWTF Force Main Manifold to the Surfside WWTF Headworks: "Old South Road Service Area Facilities" by Daylor Consulting Group (last revised 1988). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.
- Surfside WWTF Headworks Discharge: "Surfside Wastewater Treatment Facility Upgrades – Existing Hydraulic Profile" by Woodard & Curran (last updated June 2017). These drawings are on the NAVD29 vertical datum which was converted to NAVD88 for the model.

The 20-inch force main appears to be somewhat oversized for typical flows in the system. Thus, during normal operations, cleansing velocities (typ. 3 to 5 feet per second) are not obtained in the force main. A C-value of 100 was selected for the 20-inch DI pipe in the system due to the potential for solids accumulation along the force main length, especially at the low points. A C-value of 120 was selected for the recently installed discharge and yard piping at the Sea Street Pump Station, as this value is more typical for newer cement lined DI pipe.

The 20-inch DI force main has a high point located at approximate STA 70+47 (El. 50.68), which is approximately 25 feet higher than the discharge point at the Surfside WWTF Headworks. Hydraulically, the high point controls what head loss the pumps see until the pumps reach approximately 2,600 gpm

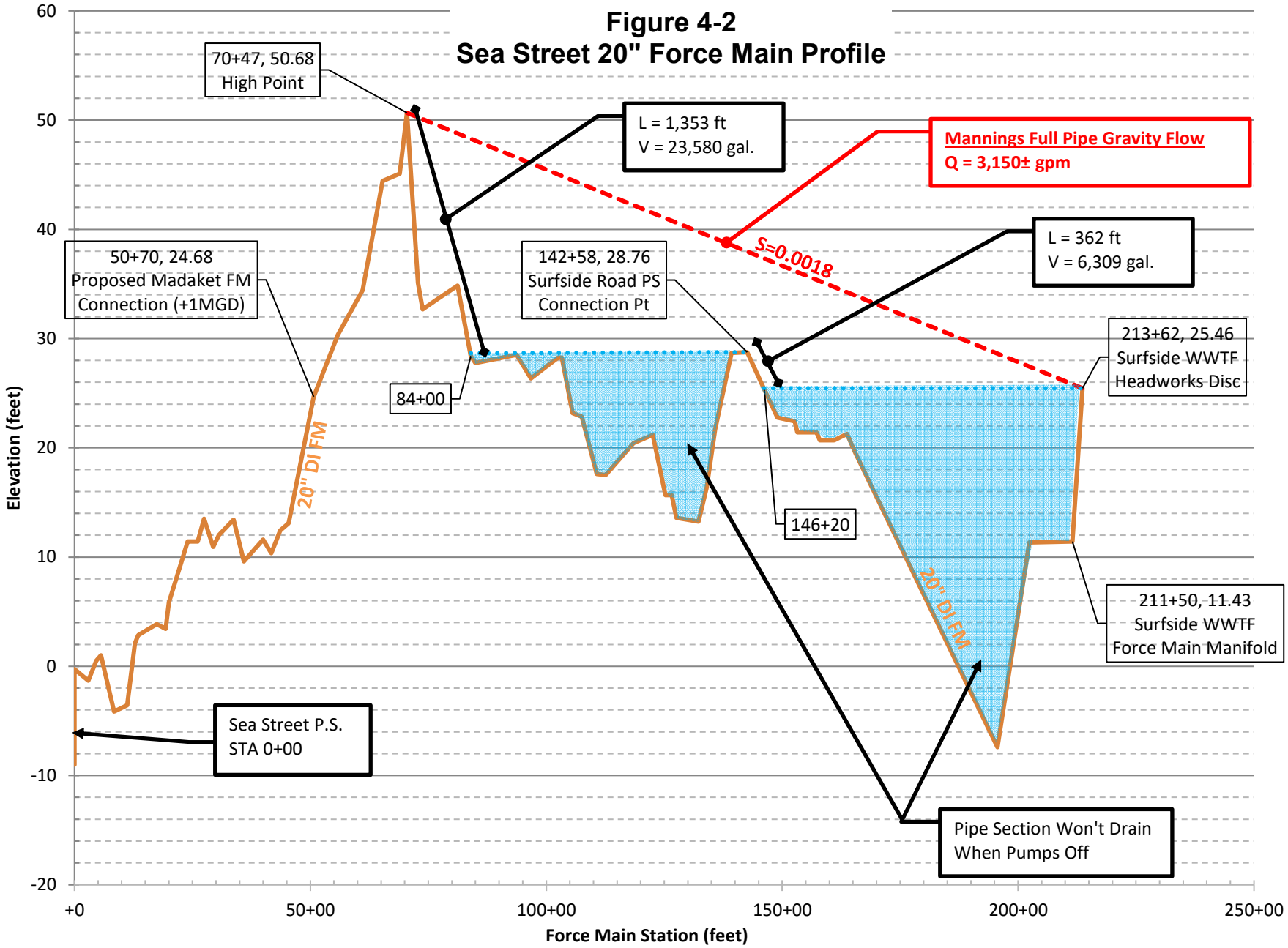


Figure 4-2
Sea Street 20" Force Main Profile
70+47, 50.68
High Point
L = 1,353 ft
V = 23,580 gal.
Mannings Full Pipe Gravity Flow
Q = 3,150± gpm
S=0.0018
L = 362 ft
V = 6,309 gal.
50+70, 24.68
Proposed Madaket FM
Connection (+1MGD)
142+58, 28.76
Surfside Road PS
Connection Pt
213+62, 25.46
Surfside WWTF
Headworks Disc
84+00
20" DI FM
146+20
20" DI FM
211+50, 11.43
Surfside WWTF
Force Main Manifold
Sea Street P.S.
STA 0+00
Pipe Section Won't Drain
When Pumps Off
Elevation (feet)
60
50
40
30
20
10
0
-10
-20
+0
50+00
100+00
150+00
200+00
250+00
Force Main Station (feet)

and the force main becomes completely full. The pump curves are shown on Figure 4-3. However, during pumping cycles, the force main beyond the high point will drain, leaving empty sections of pipe equating to approximately 30,000 gallons. In order to approximate the rate at which the 20-inch pipe will drain by gravity, a constant slope is assumed between the high point and the discharge point. Based on this, the rate at which the 20-inch pipe will drain is estimated at approximately 3,150 gpm.

In order for the Sea Street Pump Station pumps to see the head loss associated with the full length of the 20-inch force main, flows would have to enter the force main system faster than they flow out (outflow of 3,150 gpm) and the amount of excess flow above this rate would need to fill up the 30,000 gallons of empty pipeline.

The Sea Street Pump Station is designed to operate with two pumps at peak flow. With two pumps running at full speed, flows of 3,300 gpm are expected to occur based on the High Point System Curve shown on Figure 4-3. This is 150 gpm higher than the gravity draining rate of 3,150 gpm. At this peak flow rate, it would take 200 minutes of 2-pumps running at full speed for the pump station to fill the empty sections of pipe and for the pumps to see the head loss associated with the full length of the force main. At this point, the pumps would operate on the End Point System Curve shown on Figure 4-3. This would occur during very high influent flows to the station, such as large storm events which cause the pump station to receive significant I/I flow. During most pumping scenarios, the Sea Street Pump Station would hydraulically see the head loss up to the high point of the system. At the high point, the Sea Street Pump Station would not be affected by other stations running in the system. When the Surfside Road Pump Station is operating, it will hold back flow from draining out upstream of the connection point (STA 142+58). This would accelerate the filling of the empty pipe sections, which would allow the force main to completely fill more quickly.

Because the Sea Street Pump Station can potentially see a wide variety of the pumping scenarios and conditions, we have modeled the system with both the High Point controlling and the End Point (full pipe) controlling. Table 4-1 shows the estimated full speed pumping rates for the different scenarios.

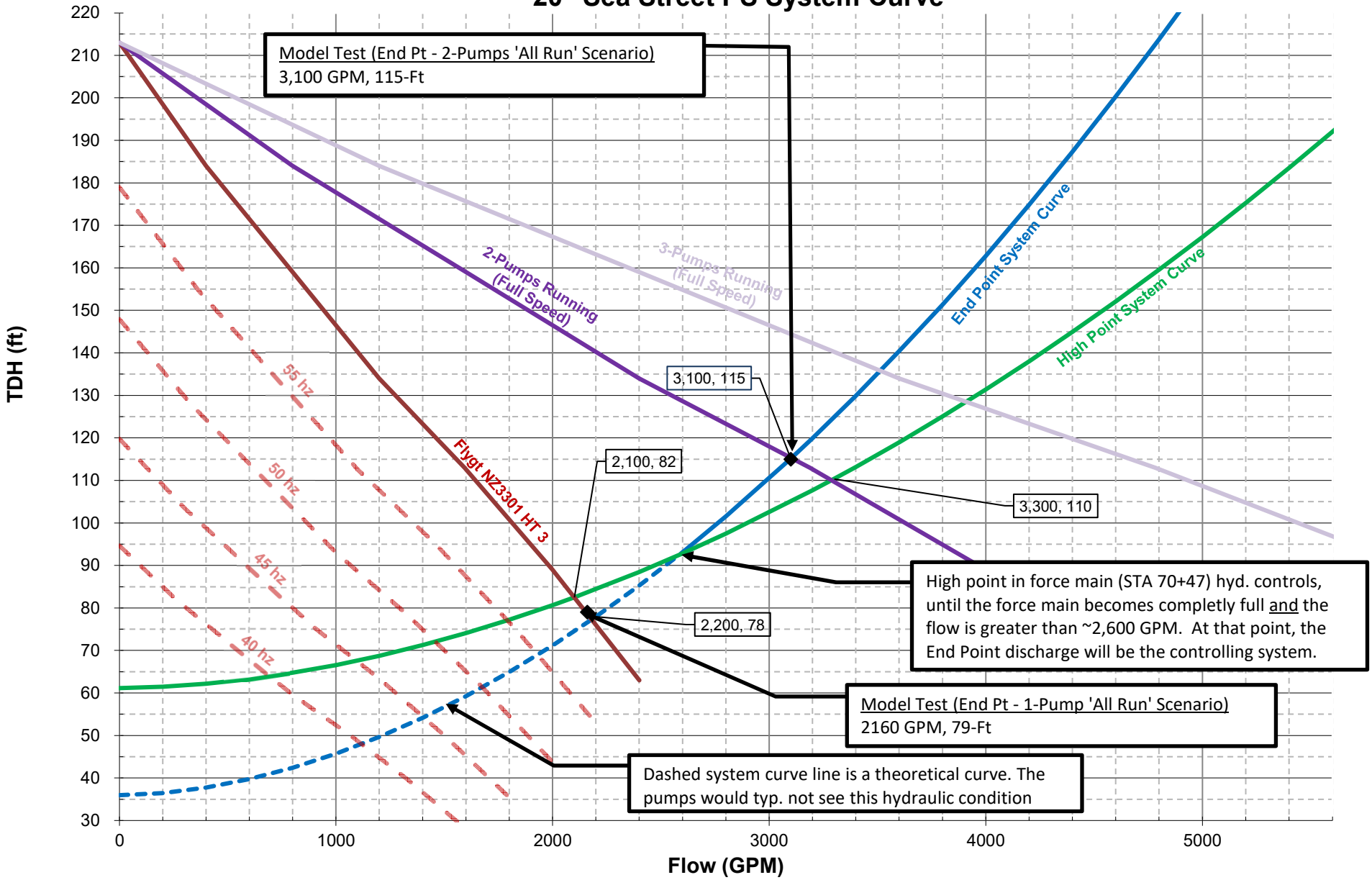
Table 4-1
Sea Street Pump Station 20-inch DI Force Main Model Scenarios

Pumping Scenario		Flow (gpm)	TDH (feet)
Sea20”-1	Sea Street PS 1-pump running alone to high point	2,100	83
Sea20”-2	Sea Street PS 1-pump running alone to full pipe end point	2,200	78
Sea20”-3	Sea Street PS 1-pump “All Run” to full pipe end point	2,160	79
Sea20”-4	Sea Street PS 2-pumps running alone to high point	3,300	110
Sea20”-5	Sea Street PS 2-pumps running alone to full pipe end point	3,100	115
Sea20”-6	Sea Street PS 2-pumps “All Run” to full pipe end point	3,100	115

Based on the January 2016 Hazen & Sawyer report titled “Sea Street Pump Station Upgrade Basis of Design Report” the average daily flow is 0.8 MGD based on the flow projection for buildout of the tributary areas to the Sea Street Pump Station. Based on the Sea Street Pump Station O&M manual, the peak wet-weather flow for the pumps is 2,900 gpm (~4.2 MGD).

Based on our existing force main system model, two pumps in operation at full speed can meet the design peak flow for the station. The Sea Street Pump Station discharge piping is configured to allow

Figure 4-3
20" Sea Street PS System Curve



the station to pump to both the 20-inch DI force main and the 16-inch HDPE force main (see Section 4.1.3) if additional capacity is needed. During the "All Run" scenario, the two pumps running at full speed should output 3,700 gpm at 98-feet with both force mains open.

4.1.3 Sea Street Pump Station – 16-inch Force Main Model

The Sea Street Pump Station 16-inch HDPE force main is approximately 17,700 feet and runs from the Sea Street Pump Station (STA 0+00) to the Surfside WWTF Headworks (STA 176+49). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure 4-4. This force main was the original 20" CI force main constructed in 1929, which was later sleeved with a 16" HDPE pipe 1982. Due to the force main break in the Winter of 2018, the HDPE force main is currently not in use, except for an emergency. Both the Sea Street Pump Station and the Surfside Road Pump Station are configured to pump through this force main as well as the 20-inch DI force main. The 8-inch Surfside Road Pump Station force main connects to the 16-HDPE force main at approximate STA 111+28, at the intersection of Surfside Road and Hooper Farm Road.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and Yard Piping: "Renovation and Upgrade of Sea Street Pumping Station" by Hazen and Sawyer (last revised for record 2019). These drawings were on the NAVD88 vertical datum which was used for the model
- 16-inch HDPE Force Main to the Surfside WWTF Force Main Manifold: "Record Plan Sewage Disposal System 20" Cast Iron Force Main" by Weston & Sampson (Nov. 1929). These drawings are on the Mean Low Water (MLW) datum at the time of the drawings, which was converted to NAVD88 for the model.
- Surfside WWTF Force Main Manifold to the Surfside WWTF Headworks: "Old South Road Service Area Facilities" by Daylor Consulting Group (last revised 1988). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.
- Surfside WWTF Headworks Discharge: "Surfside Wastewater Treatment Facility Upgrades – Existing Hydraulic Profile" by Woodard & Curran (last updated June 2017). These drawings are on the NAVD29 vertical datum which was converted to NAVD88 for the model.

A C-Value of 140 was used for the 16-inch HDPE pipe. This C-value is in the range typically used for plastic pipe, which generally has smoother walls than other pipe materials, such as concrete, DI or cast iron. A C-value of 120 was selected for the recently installed discharge and yard piping at the Sea Street Pump Station, as this value is more typical for newer cement lined DI pipe.

This 16-inch HDPE force main has a high point located at approximate STA 99+16 (El. 29.70), which is approximately 4 feet higher than the discharge point at the Surfside WWTF Headworks. Hydraulically, the high point controls what head loss the pumps see until the pumps reach approximately 700 gpm and the force main becomes completely full. The pump curves are shown on Figure 4-5. However, during pumping cycles, the force main beyond the high point will drain, leaving an empty section of pipe equating to approximately 20,000 gallons. In order to approximate the rate at which the 16-inch pipe will drain by gravity, a constant slope is assumed between the high point and the discharge point. Based on this, the rate at which the 16-inch pipe will drain is estimated at approximately 850 gpm.

In order for the Sea Street Pump Station pumps to see the head loss associated with the full length of the 16-inch force main, flows would have to enter the force main system faster than they flow out (outflow

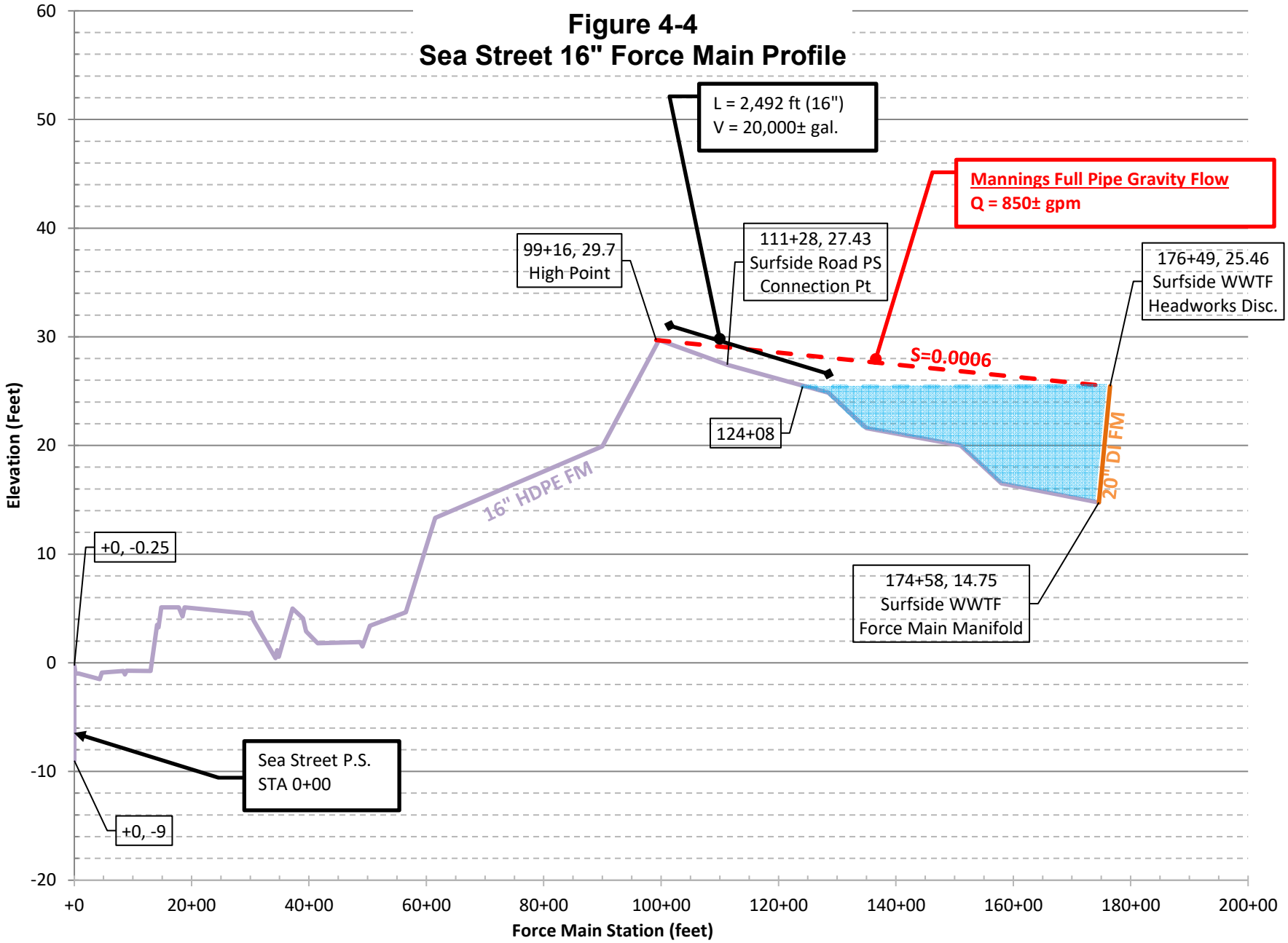
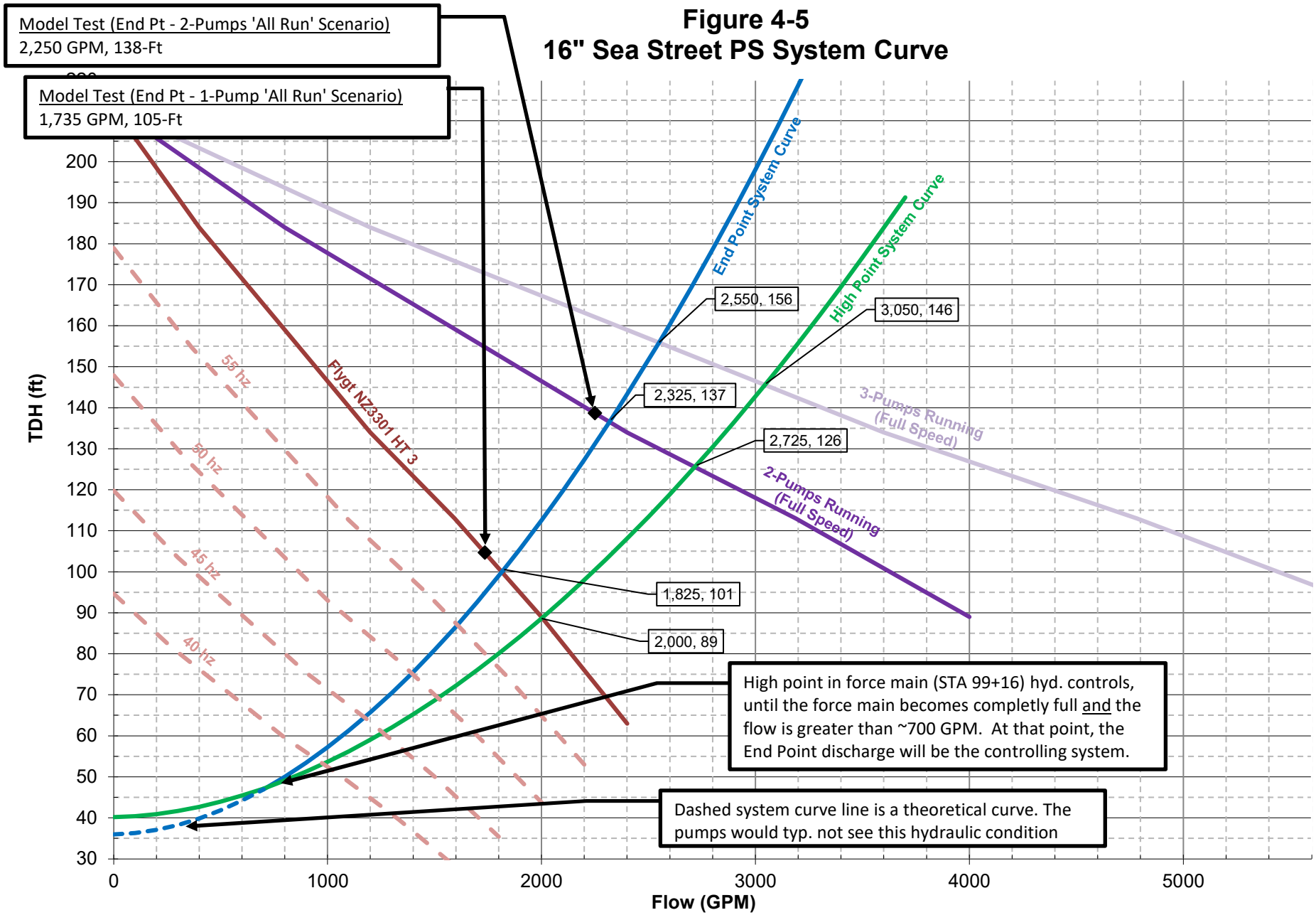


Figure 4-4
Sea Street 16" Force Main Profile
L = 2,492 ft (16")
V = 20,000± gal.
Mannings Full Pipe Gravity Flow
Q = 850± gpm
99+16, 29.7
High Point
111+28, 27.43
Surfside Road PS
Connection Pt
176+49, 25.46
Surfside WWTF
Headworks Disc.
S=0.0006
124+08
16" HDPE FM
20" DI FM
+0, -0.25
174+58, 14.75
Surfside WWTF
Force Main Manifold
Sea Street P.S.
STA 0+00
+0, -9
Elevation (Feet)
Force Main Station (feet)
60
50
40
30
20
10
0
-10
-20
+0
20+00
40+00
60+00
80+00
100+00
120+00
140+00
160+00
180+00
200+00

Figure 4-5
16" Sea Street PS System Curve



of 850 pm) and the amount of excess flow above this rate would need to fill up the 20,000 gallons of empty pipeline.

The Sea Street Pump Station is designed to operate with two pumps running at full speed during peak flow. With one pump running at full speed, flows of 2,000 gpm are expected and with two pumps running at full speed, flows of 2,725 gpm are expected to occur based on the High Point System Curve shown on Figure 4-5. This is 1,150 gpm and 1,875 gpm, respectively, higher than the gravity draining rate 850 gpm. At these flow rates, it would take 17 minutes of 1-pump running and 11 minutes of 2-pumps running at full speed for the pump station to fill the empty section of pipe and for the pumps to see the head loss associated with the full length of the force main. At this point, the pumps would operate on the End Point System Curve shown on Figure 4-5. At the high point, the Sea Street Pump Station would not be affected by other stations running in the system. When the Surfside Road Pump Station is operating, it will hold back flow from draining out upstream of the connection point (STA 111+28). This would accelerate the filling of the empty pipe sections, which would allow the force main to completely fill more quickly.

Because the Sea Street Pump Station can potentially see a wide variety of the pumping scenarios and conditions, we have modeled the system with both the High Point controlling and the End Point (full pipe) controlling. Table 4-2 shows the estimated full speed pumping rates for the different scenarios.

Table 4-2
Sea Street Pump Station 16-inch HDPE Force Main Model Scenarios

Pumping Scenario		Flow (gpm)	TDH (feet)
Sea16”-1	Sea Street PS 1-pump running alone to high point	2,000	89
Sea16”-2	Sea Street PS 1-pump running alone to full pipe end point	1,825	101
Sea16”-3	Sea Street PS 1-pump “All Run” to full pipe end point	1,735	105
Sea16”-4	Sea Street PS 2-pumps running alone to high point	2,725	126
Sea16”-5	Sea Street PS 2-pumps running alone to full pipe end point	2,325	137
Sea16”-6	Sea Street PS 2-pumps “All Run” to full pipe end point	2,250	138

Based on the January 2016 Hazen & Sawyer report titled “Sea Street Pump Station Upgrade Basis of Design Report” the average daily flow is 0.8 MGD based on the flow projection for buildout of the tributary areas to the Sea Street Pump Station. Based on the Sea Street Pump Station O&M manual, the peak wet-weather flow for the pumps is 2,900 gpm (~4.2 MGD).

Based on our existing force main system model, it appears that 2 pumps operating at full speed, using the 16-inch force main, would not meet the design peak flow. The Sea Street Pump Station discharge piping is configured to allow the station to pump to both the 16-inch HDPE force main and the 20-inch DI force main (see Section 4.1.2) if additional capacity is needed. During the “All Run” scenario, the two pumps running at full speed should output 3,700 gpm at 98-feet with both force mains open, which would be enough to handle the peak flows.

4.1.4 Surfside Road Pump Station – 8-inch to 20-inch Force Main Model

The Surfside Road Pump Station 8-inch to 20-inch force main is approximately 8,800 feet long and runs from the Surfside Road Pump Station (STA 0+00) to the Surfside WWTF Headworks (STA 89+58). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure

4-6. The Surfside Road Pump Station force main is a combination of 8-inch DI and PVC, which connects to the Sea Street Pump Station 20-inch DI force main at STA 18+19.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and 8-inch Piping: "Surfside Road Sewer Extension Project" by Weston & Sampson (last revised Oct. 1986). These drawings are on the 1934 Mean Low Water (MLW) datum which was converted to NAVD88 for the model.
- 20-inch Force Main to Surfside WWTF Force Main Manifold: "Wastewater Conveyance System Improvements Phase 1" by Sheaffer and Roland, Inc. (1981). These drawings are on the 1934 Mean Low Water (MLW) datum which was converted to NAVD88 for the model.
- Surfside WWTF Force Main Manifold to the WWTF Headworks: "Old South Road Service Area Facilities" by Daylor Consulting Group (last revised 1988). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.
- Surfside WWTF Headworks Discharge: "Surfside Wastewater Treatment Facility Upgrades – Existing Hydraulic Profile" by Woodard & Curran (last updated June 2017). These drawings are on the NAVD29 vertical datum which was converted to NAVD88 for the model.

The 20-inch pipe appears to be somewhat oversized for typical flows in the system. Thus, during normal operations, cleansing velocities (typ. 3 to 5 feet per second) are not obtained in the force main. A C-value of 100 was selected for the 20-inch DI pipe in the system due to the potential for solids accumulation along the force main length, especially at the low points. A C-value of 120 was selected for the 8-inch DI pipe and a C-value of 140 was selected for the 8-inch PVC pipe.

The force main has a high point located on the 8-inch PVC portion of the force main at approximate STA 16+10 (El. 31.43), which is approximately 6 feet higher than the discharge point at the Surfside WWTF Headworks. Hydraulically, the high point controls what head loss the pumps see until the pumps reach approximately 1,050 gpm and the force main becomes completely full. The pump curves are shown on Figure 4-7. However, during pumping cycles, the force main beyond the high point will drain, leaving an empty section of pipe equating to approximately 7,800 gallons. In order to approximate the rate at which the 8-inch and 20-inch pipe will drain by gravity, a constant slope is assumed between the high point and the discharge point. Based on this, the rate at which the 8-inch and 20-inch pipe will drain is estimated at approximately 2,800 gpm.

In order for the Surfside Road Pump Station pumps to see the head loss associated with the full length of the 8-inch and 20-inch force main, flows would have to enter the force main system faster than they flow out (outflow of 2,800 gpm) and the amount of excess flow above this rate would need to fill up the 7,800 gallons of empty pipeline.

The Surfside Road Pump Station is designed to operate with one pump at peak flow. With one pump running at full speed, flows of 800 gpm are expected to occur based on the High Point System Curve shown on Figure 4-7. This is less than the gravity draining rate of 2,800 gpm. Therefore, the existing Surfside Road Pump Station operating alone, would not see the head loss associated with the full length of the 20-inch force main. During these pumping scenarios, the Surfside Road Pump Station would hydraulically only see the head loss in the pipe up to the high point of the system. When the Sea Street Pump Station is running, it would add flow to the system, and it would hold back flow from draining out of the Surfside Road Pump Station 8-inch force main upstream of the connection point (STA 18+19).

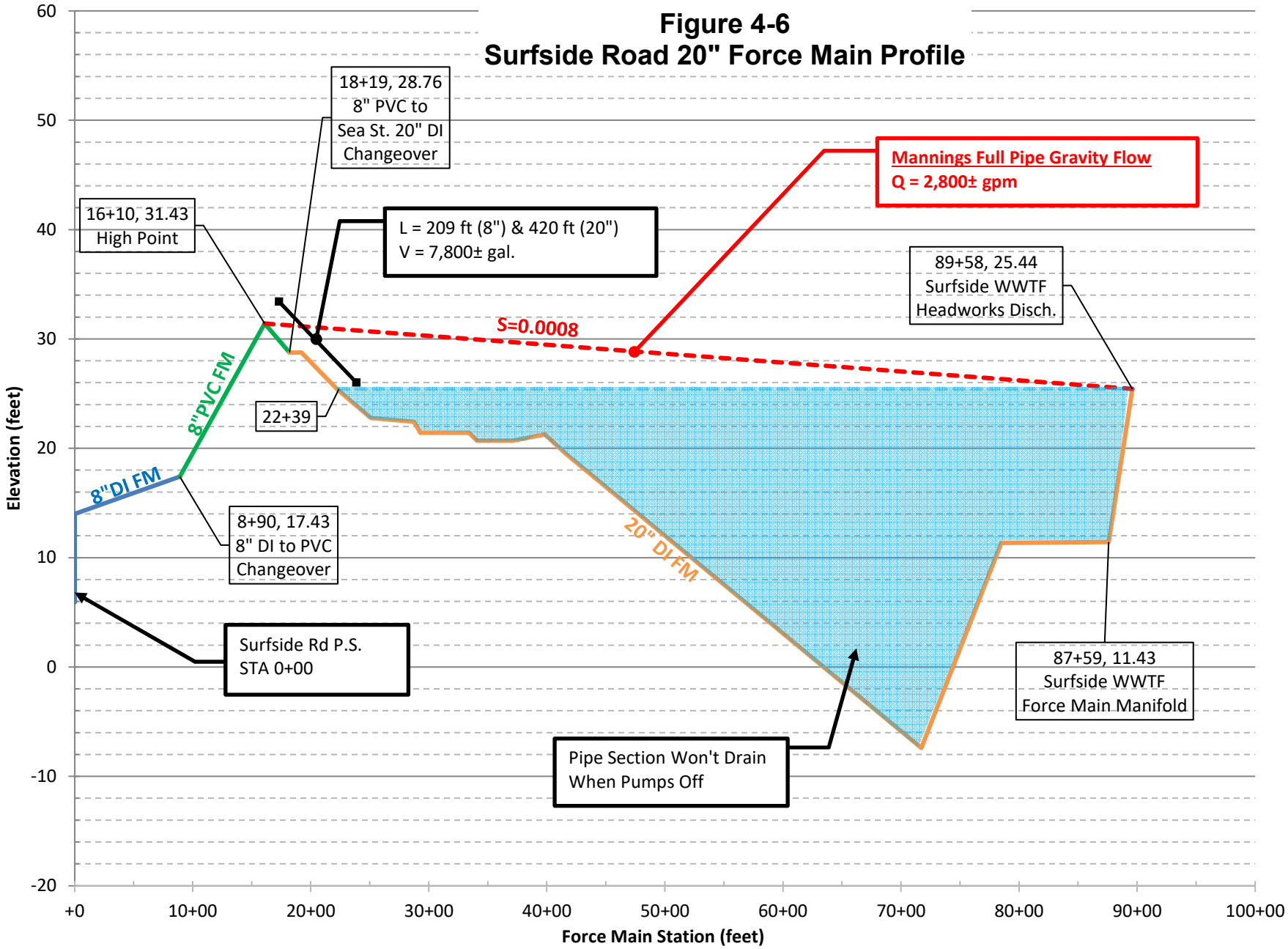
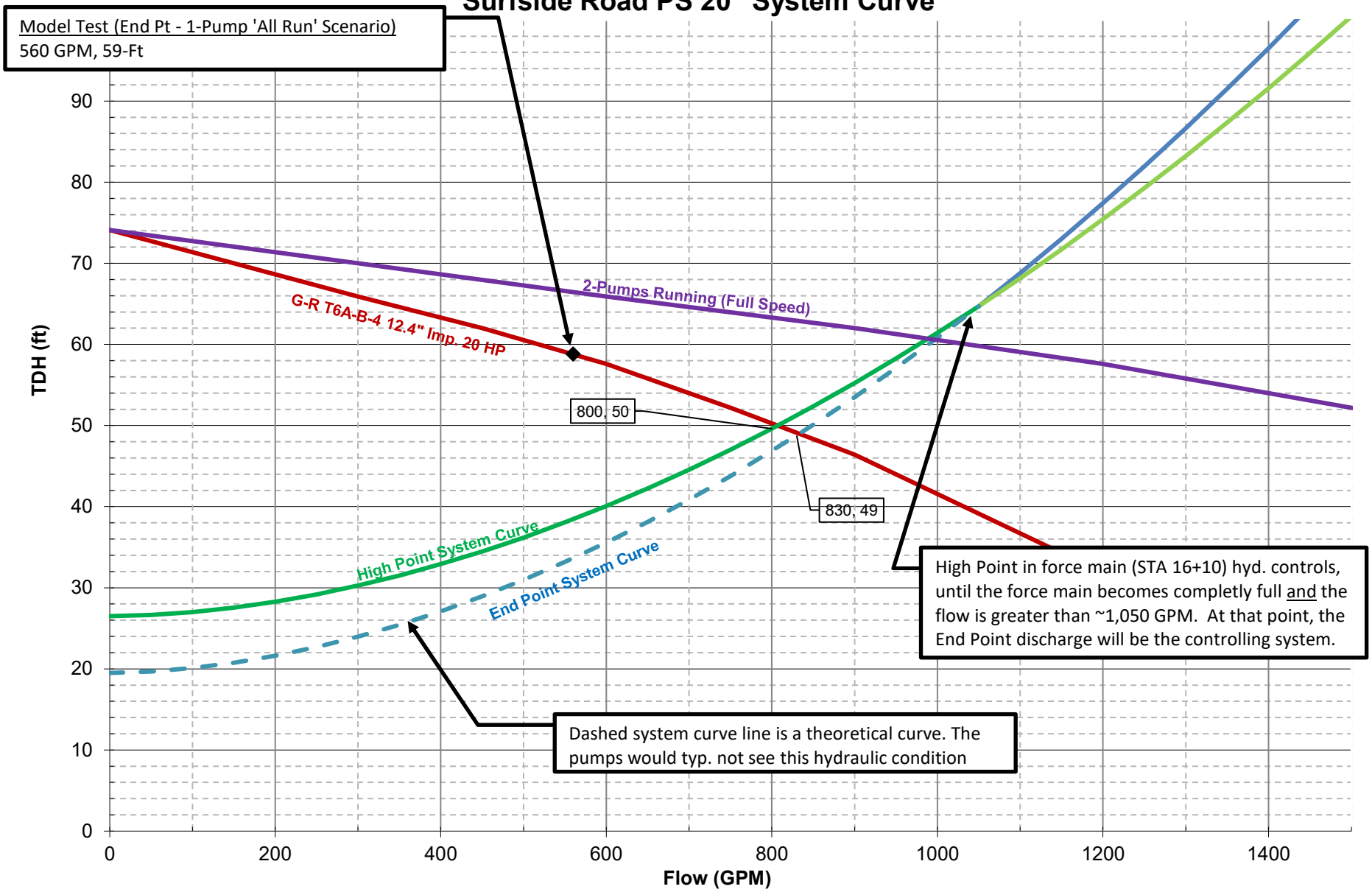


Figure 4-6
Surfside Road 20" Force Main Profile
18+19, 28.76
8" PVC to
Sea St. 20" DI
Changeover
Mannings Full Pipe Gravity Flow
Q = 2,800± gpm
16+10, 31.43
High Point
L = 209 ft (8") & 420 ft (20")
V = 7,800± gal.
89+58, 25.44
Surfside WWTF
Headworks Disch.
S=0.0008
8"PVC FM
22+39
8"DI FM
8+90, 17.43
8" DI to PVC
Changeover
20" DI FM
Surfside Rd P.S.
STA 0+00
87+59, 11.43
Surfside WWTF
Force Main Manifold
Pipe Section Won't Drain
When Pumps Off
Elevation (feet)
60
50
40
30
20
10
0
-10
-20
+0
10+00
20+00
30+00
40+00
50+00
60+00
70+00
80+00
90+00
100+00
Force Main Station (feet)

Figure 4-7
Surfside Road PS 20" System Curve



This would accelerate the filling of the empty pipe sections, which would allow the force main to completely fill more quickly. When the Surfside Road Pump Station and the Sea Street Pump Station are both operating and flowing through the 20-inch force main, the Surfside Road pumps could see the head loss associated with the full length of the 20-inch force main.

Because the Surfside Road Pump Station can potentially see a wide variety of pumping scenarios and conditions, we have modeled the system at both High Point controlling and the End Point (full pipe) controlling. Table 4-3 shows the estimated pumping rates for the different scenarios.

Table 4-3
Surfside Road Pump Station 8-inch to 20-inch Force Main Model Scenarios

Pumping Scenario		Flow (gpm)	TDH (feet)
Surf20"-1	Surfside Road PS 1-pump running alone to high point	805	50
Surf20"-2	Surfside Road PS 1-pump running alone to full pipe end point	830	49
Surf20"-3	Surfside Road PS 1-pump "All Run" to full pipe end point	560	59

While the existing Surfside Road Pump Station has the capacity to handle existing peak flow, it does not have the capacity to handle the future peak flow associated with Needs Areas sewer extensions. These sewer extensions will eventually increase peak flows to the Surfside Road Pump Station to approximately 4 MGD (2,800 gpm). As discussed in Section 3 of this report, a new Surfside Road Pump Station with the capacity to handle the future 4 MGD peak flow is recommended. The design of the new Surfside Road Pump Station needs to consider all pumping scenarios and select a pump that can meet all potential design operating points.

4.1.5 Surfside Road Pump Station – 8-inch to 16-inch Force Main Model

The Surfside Road Pump Station 8-inch to 16-inch force main is approximately 9,000 feet long and runs from the Surfside Road Pump Station (STA 0+00) to the Surfside WWTF Headworks (STA 89+91). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure 4-8. The Surfside Road Pump Station force main is a combination of 8-inch DI and PVC, which connects to the Sea Street Pump Station 16-inch HDPE force main at STA 24+70, at the intersection of Surfside Road and Hooper Farm Road.

This force main was the original 20" CI force main constructed in 1929, which was later sleeved with a 16" HDPE pipe 1982. Due to the force main break in the Winter of 2018, the HDPE force main is currently not in use, except for an emergency. Both the Sea Street Pump Station and the Surfside Road Pump Station are configured to pump through this force main as well as the 20-inch DI force main.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and 8-inch Piping: "Surfside Road Sewer Extension Project" by Weston & Sampson (last revised Oct. 1986). These drawings are on the 1934 Mean Low Water (MLW) datum which was converted to NAVD88 for the model.
- 16-inch Force Main to Surfside WWTF Force Main Manifold: "Record Plan Sewage Disposal System 20" Cast Iron Forcemain" by Weston & Sampson (Nov. 1929). These drawings are on

the Mean Low Water (MLW) datum at the time of the drawings, which was converted to NAVD88 for the model.

- Surfside WWTF Force Main Manifold to the WWTF Headworks: "Old South Road Service Area Facilities" by Daylor Consulting Group (last revised 1988). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.
- Surfside WWTF Headworks Discharge: "Surfside Wastewater Treatment Facility Upgrades – Existing Hydraulic Profile" by Woodard & Curran (last updated June 2017). These drawings are on the NAVD29 vertical datum which was converted to NAVD88 for the model.

A C-Value of 140 was selected for the 16-inch HDPE pipe. This C-value is in the range typically used for plastic pipe, which generally has smoother walls than other pipe materials, such as concrete, DI or cast iron. A C-value of 120 was selected for the 8-inch DI pipe and a C-value of 140 was selected for the 8-inch PVC pipe.

The force main has a high point located on the 8-inch PVC portion of the force main at approximate STA 16+10 (El. 31.43), which is approximately 6 feet higher than the discharge point at the Surfside WWTF Headworks. Hydraulically, the high point controls what head loss the pump see until the pumps reach approximately 450 gpm and the force main becomes completely full. The pump curves are shown on Figure 4-9. However, during pumping cycles, the force main beyond the high point will drain, leaving an empty section of pipe equating to approximately 12,700 gallons. In order to approximate the rate at which the 8-inch and 20-inch pipe will drain by gravity, a constant slope is assumed between the high point and the discharge point. Based on this, the rate at which the 8-inch and 20-inch pipe will drain is estimated at approximately 1,000 gpm.

In order for the Surfside Road Pump Station to see the head loss associated with the full length of the 8-inch and 20-inch force main, flows would have to enter the system faster than they flow out (outflow of 1,000 gpm) and the amount of excess flow above this rate would need to fill up the 12,700 gallons of empty pipeline.

The Surfside Road Pump Station is designed to operate with one pump at peak flow. With one pump running at full speed, flows of 760 gpm are expected to occur, based on the High Point System Curve shown on Figure 4-9. This is less than the gravity draining rate of 1,000 gpm. Therefore, the existing Surfside Road Pump Station operating alone would not see the head loss associated with the full length of the 16-inch force main. During these pumping scenarios, the Surfside Road Pump Station would hydraulically only see the head loss in the pipe up to the high point of the system. When the Sea Street Pump Station is running, it would add flow to the system, and it would hold back flow from draining out of the Surfside Road Pump Station 8-inch force main section upstream of the connection point (STA 24+70). This would accelerate the filling of the empty pipe sections, which would allow the force main to completely fill more quickly. When the Surfside Road Pump Station and the Sea Street Pump Station are both operating and flowing through the 16-inch force main, the Surfside Road pumps could see the head loss associated with the full length of the 16-inch force main.

Because the Surfside Road Pump Station can potentially see a wide variety of pumping scenarios and conditions, we have modeled the system at both High Point controlling and the End Point (full pipe) controlling. Table 4-4 shows the estimated pumping rates for the different scenarios.

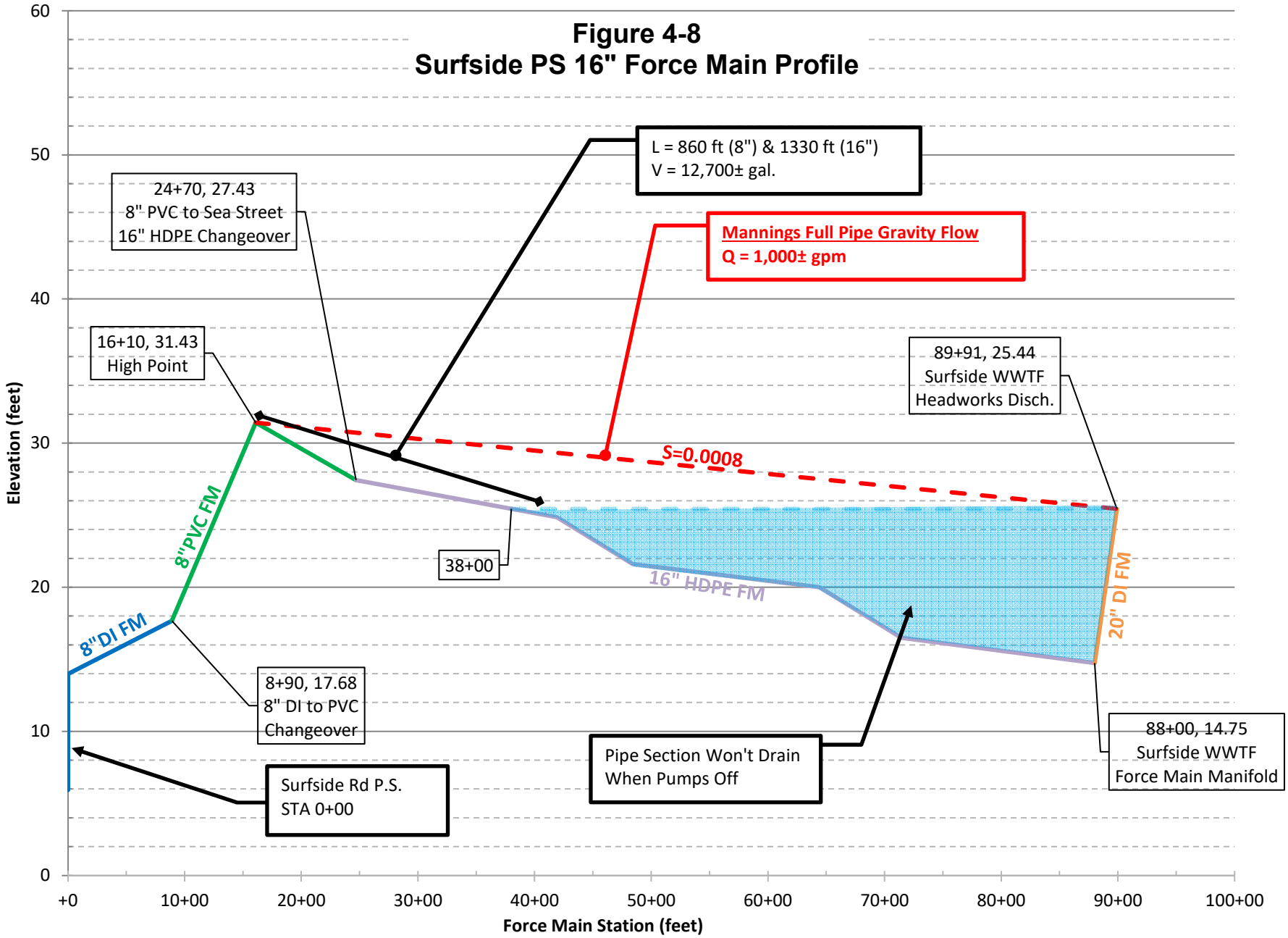


Figure 4-8
Surfside PS 16" Force Main Profile
L = 860 ft (8") & 1330 ft (16")
V = 12,700± gal.
24+70, 27.43
8" PVC to Sea Street
16" HDPE Changeover
Mannings Full Pipe Gravity Flow
Q = 1,000± gpm
16+10, 31.43
High Point
89+91, 25.44
Surfside WWTF
Headworks Disch.
S=0.0008
8"PVC FM
38+00
16" HDPE FM
20" DI FM
8" DI FM
8+90, 17.68
8" DI to PVC
Changeover
88+00, 14.75
Surfside WWTF
Force Main Manifold
Pipe Section Won't Drain
When Pumps Off
Surfside Rd P.S.
STA 0+00
Elevation (feet)
Force Main Station (feet)
0
10
20
30
40
50
60
+0
10+00
20+00
30+00
40+00
50+00
60+00
70+00
80+00
90+00
100+00

Figure 4-9
Surfside Road PS 16" System Curve

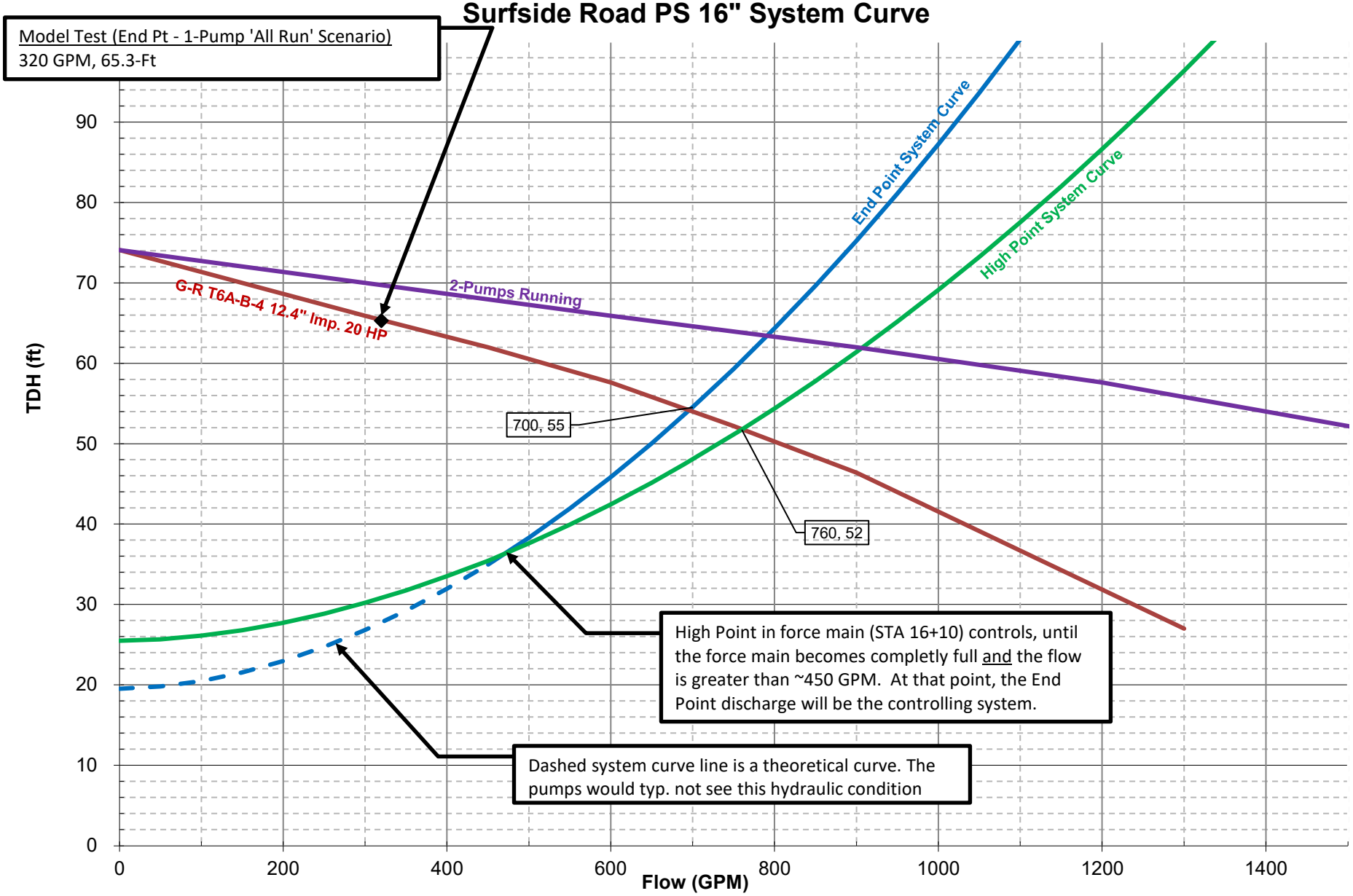


Table 4-4 Surfside Road Pump Station 8-inch to 16-inch Force Main Model Scenarios			
Pumping Scenario		Flow (gpm)	TDH (feet)
Surf16"-1	Surfside Road PS 1-pump running alone to high point	760	52
Surf16"-2	Surfside Road PS 1-pump running alone to full pipe end point	695	54
Surf16"-3	Surfside Road PS 1-pump "All Run" to full pipe end point	320	65

While the existing Surfside Road Pump Station has the capacity to handle existing peak flow, it does not have the capacity to handle the future peak flow associated with Needs Areas sewer extensions. These sewer extensions will eventually increase peak flows to the Surfside Road Pump Station to approximately 4 MGD (2,800 gpm). As discussed in Section 3 of this report, a new Surfside Road Pump Station with the capacity to handle the future 4 MGD peak flow is recommended. The design of the new Surfside Road Pump Station needs to consider all pumping scenarios and select a pump that can meet all potential design operating points.

4.1.6 South Valley Pump Station – 12-inch Force Main Model

The South Valley Pump Station 12-inch PVC force main is approximately 14,800 feet long and runs from the South Valley Pump Station (STA 0+00) to the Surfside WWTF Headworks (STA 147+41). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure 4-10. The South Valley Pump Station force main connects with the Sea Street Pump Station 20-inch DI force main and the 16-inch HDPE force main at the Surfside WWTF force main manifold at STA 145+29. At the manifold, all three force mains combine into a single 20-inch DI force main to the discharge point (STA 147+41) at the Surfside WWTF headworks.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and 12-inch Piping to Surfside WWTF Force Main Manifold to the WWTF Headworks: "Old South Road Service Area Facilities" by Daylor Consulting Group (last revised 1988). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.
- Surfside WWTF Headworks Discharge: "Surfside Wastewater Treatment Facility Upgrades – Existing Hydraulic Profile" by Woodard & Curran (last updated June 2017). These drawings are on the NAVD29 vertical datum which was converted to NAVD88 for the model.

A C-Value of 140 was selected for the 12-inch PVC pipe. This C-value is in the range typically used for plastic pipe, which generally has smoother walls than other types of pipe materials. For the 8-inch and 10-inch DI suction/discharge piping inside the pump station, a C-value of 120 was selected. This C-value is typical for cement lined DI pipe.

The 12-inch PVC force main has a high point located at approximate STA 9+66 (El. 41.43), which is approximately 16 feet higher than the discharge point at the Surfside WWTF Headworks. Hydraulically, the high point controls what head loss the pumps see until the pumps reach approximately 600 gpm and the force main becomes completely full. The pump curves are shown on Figure 4-11. However, during pumping cycles, the force main beyond this high point will drain, leaving empty sections pipe equating to approximately 6,500 gallons. In order to approximate the rate at which the 12-inch pipe will

Figure 4-10
South Valley Force Main Profile

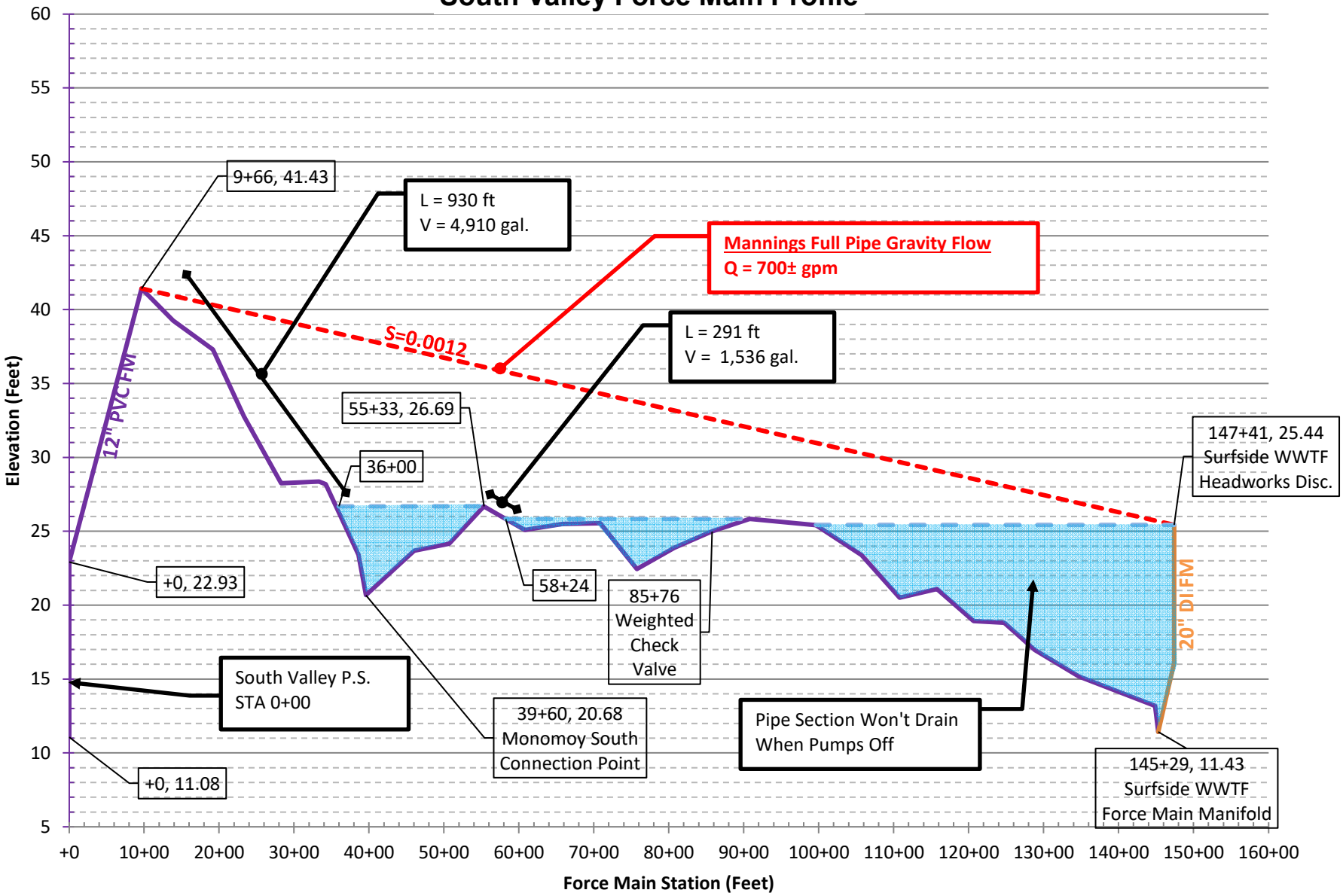
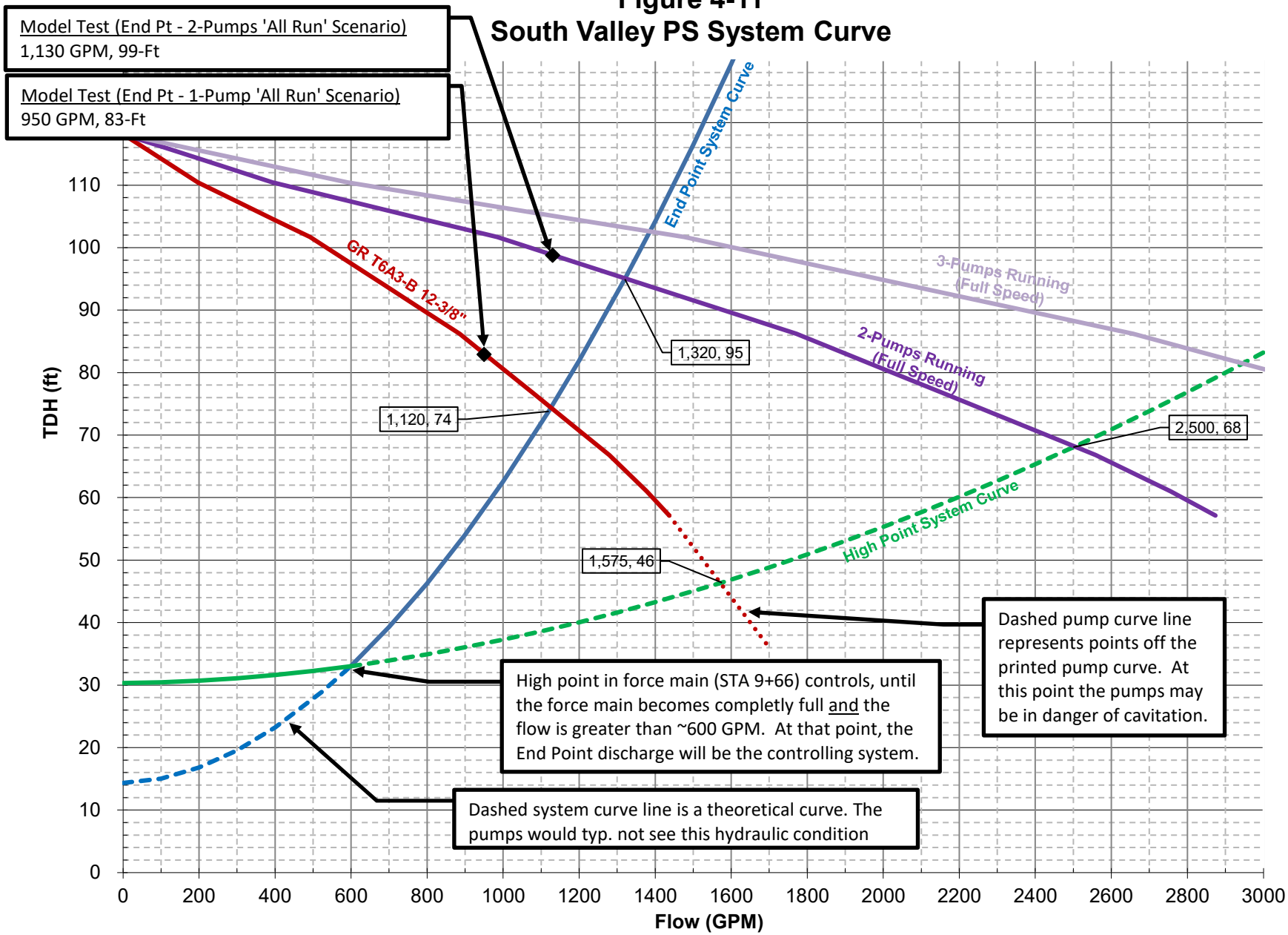


Figure 4-11
South Valley PS System Curve



drain by gravity, a constant slope is assumed between the high point and the discharge point. Based on this, the rate at which the 12-inch pipe will drain is estimated at approximately 700 gpm.

In order for the South Valley Pump Station to see the head loss associated with the full length of the 12-inch force main, flows would have to enter the system faster than they flow out (outflow of 700 gpm) and the amount of excess flow above this rate would need to fill up the 6,500 gallons of empty pipeline.

The South Valley Pump Station is designed to operate with two pumps at peak flow. With two pumps running at full speed, flows of 1,320 gpm are expected to occur based on the pump curves shown on Figure 4-11. Based on available records, two pumps rarely operate together at this pump station. With a single pump running at full speed, flows of 1,120 gpm are expected to occur (see Figure 4-11).

It should be noted that during the construction startup for the South Valley Pump Station, the pumps severely cavitated due to less head loss being seen by the pumps than what was originally designed. This was due to the 12-inch force main emptying in the locations beyond the high point, and the pumps only seeing the head loss to the high point in the force main. Due to the cavitation, a check valve, with additional weights, was installed on the 12-inch force main at STA 85+76. The purpose of the weighted check valve was to induce head to the system and to hold back flow upstream of the check valve to try to keep the upstream section of the force main from completely draining between pump cycles. This would allow the pumps to hydraulically see head loss from a larger length of the force main, which in turn would allow the pumps to operate at a point that prevented cavitation in most instances.

The check valve with additional weight (see Figure 4-12) is difficult to model, as it is not a standard fitting due to the additional weight added. In the Hazen-Williams equation, head loss through valves and fittings vary depending on the velocity and the resistance coefficient of the valve/fitting. The resistance coefficient is based on test data from valve/fitting manufacturers, with the larger the number inducing more head on the system. A typical 12-inch check value has a resistance coefficient of 0.65 to 1.3. For the purposes of our model, we selected a resistance coefficient of 3.9 for the weighted check valve to try to match field observations of the South Valley pumps operations. The modeling assumes the additional weight on the check valve prevents it from opening when the pumps are not operating, thus holding back the upstream flow from draining. During typical operation, the pumps would hydraulically see the head loss associated with the full length of the force main.

Figure 4-12
South Valley Pump Station Force Main Weighted Check Valve Photo

We have modeled the system with both the High Point controlling and the End Point (full pipe) controlling. Table 4-5 shows the estimated pumping rates for the different scenarios.

Table 4-5
South Valley Pump Station 12-inch Force Main Model Scenarios

Pumping Scenario		Flow (gpm)	TDH (feet)
SValley12"-1	South Valley PS 1-pump running alone to high point*	1,575*	46*
SValley12"-2	South Valley PS 1-pump running alone to full pipe end point	1,120	74
SValley12"-3	South Valley PS 1-pump "All Run" to full pipe end point	950	83
SValley12"-4	South Valley PS 2-pumps running alone to high point*	2,500*	68*
SValley12"-5	South Valley PS 2-pumps running alone to full pipe end point	1,320	95
Svalley12"-6	South Valley PS 2-pumps "All Run" to full pipe end point	1,130	99

* - These operating points are "theoretical" due to the weighted check valve holding back the flow from draining out of the force main when the pumps turn off. Under current conditions, the pump station would rarely, if ever, experience these conditions unless force main sections are allowed to drain.

Based on the projected future wastewater flows in the areas tributary to the South Valley Pump Station, which includes the areas tributary to the Airport Pump Station, the South Valley Pump Station would see a future peak flow of 1,870,000 gpd (1,300 gpm). As discussed in Section 2.0 of this report, this peak flow is based on full buildout of the tributary areas. The pumping scenario with the South Valley Pump Station in operation alone, with two pumps running, shows the pumps having the capacity to handle the future peak flow for the station. During the 'All Run' scenario of complete build out of properties and all pump stations running simultaneously, the South Valley pumps may not achieve the design future peak flow for the station. The future proposed force main model is discussed in Section 4.2 of this report.

4.1.7 Monomoy South Pump Station – 6-inch to 12-inch Force Main Model

The Monomoy South Pump Station 6-inch to 12-inch force main is approximately 13,000 feet long and runs from the Monomoy South Pump Station (STA 0+00) to the Surfside WWTF Headworks (STA 129+81). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure 4-13. The Monomoy South Pump Station force main is 6-inch HDPE, which connects to the South Valley Pump Station 12-inch PVC force main at the intersection of Old South Road and Fairgrounds Road (STA 22+00). The force main then connects to the Surfside WWTF Force Main Manifold at STA 127+69. At the manifold, the force main continues as a single 20-inch DI force main to the discharge point (STA 129+81) at the Surfside WWTF headworks.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and 6-inch Piping to South Valley Pump Station Force Main Connection Point: "Nantucket Harbor Shimmo and Plus Parcels Sewer Extension" by Weston & Sampson (May 2017). These drawings are on the NAVD88 datum.

- South Valley 12-inch Piping to the Surfside WWTF Force Main Manifold to the WWTF Headworks: "Old South Road Service Area Facilities" by Daylor Consulting Group (last revised 1988). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.
- Surfside WWTF Headworks Discharge: "Surfside Wastewater Treatment Facility Upgrades – Existing Hydraulic Profile" by Woodard & Curran (last updated June 2017). These drawings are on the NAVD29 vertical datum which was converted to NAVD88 for the model.

A C-Value of 140 was selected for the 6-inch HDPE and 12-inch PVC pipe. This C-value is in the range typically used for plastic pipe, which generally has smoother walls than other types of pipe materials. For the 4-inch DI suction/discharge piping inside the pump station a C-value of 120 was selected. This C-Value is typical for cement lined DI pipe.

The Monomoy South Pump Station force main has a high point located on the 6-inch HDPE portion of the force main at STA 10+45 (El. 27.33), which is approximately 2 feet higher than the discharge point at the Surfside WWTF Headworks. Hydraulically, the high point controls what head loss the pumps see until the pumps reach approximately 100 gpm and the force main becomes completely full. The pump curves are shown on Figure 4-14.

As discussed in Section 4.1.6, the South Valley Pump Station Force Main has a check valve, with additional weights, installed. The check valve is located at approximate STA 68+16 on the Monomoy South Pump Station Force Main alignment. The modeling assumes the additional weight on the check valve prevents it from opening when the pumps are not operating, thus holding back the upstream flow from draining. The Monomoy South Pump Station force main would remain full under typical conditions, and the pumps would hydraulically see the head loss associated with the full length of the force main.

The Monomoy South Pump Station is designed to operate with one pump at peak flow. With one pump running at full speed, flows of 535 gpm are expected to occur based on the End Point System Curve shown on Figure 4-14.

We have modeled the system with both the High Point controlling and the End Point (full pipe) controlling. Table 4-6 shows the estimated pumping rates for the different scenarios

Table 4-6
Monomoy South Pump Station – 6-inch to 12-inch Force Main Model Scenarios

Pumping Scenario		Flow (gpm)	TDH (feet)
Mon6"to12"-1	Monomoy South PS 1-pump running alone to high point*	685*	97*
Mon6"to12"-2	Monomoy South PS 1-pump running alone to full pipe end point	535	106
Mon6"to12"-3	Monomoy South PS 1-pump "All Run" to full pipe end point	330	118
Mon6"to12"-4	Monomoy South PS 1-pump "All Run" to full pipe end point w/ both the 6-inch and 4-inch force main open	515	107

* - These operating points are "theoretical" due to the weighted check valve holding back the flow from draining out of the force main when the pumps turn off. Under current conditions, the pump station would rarely, if ever, experience these conditions unless the force main sections are allowed to drain

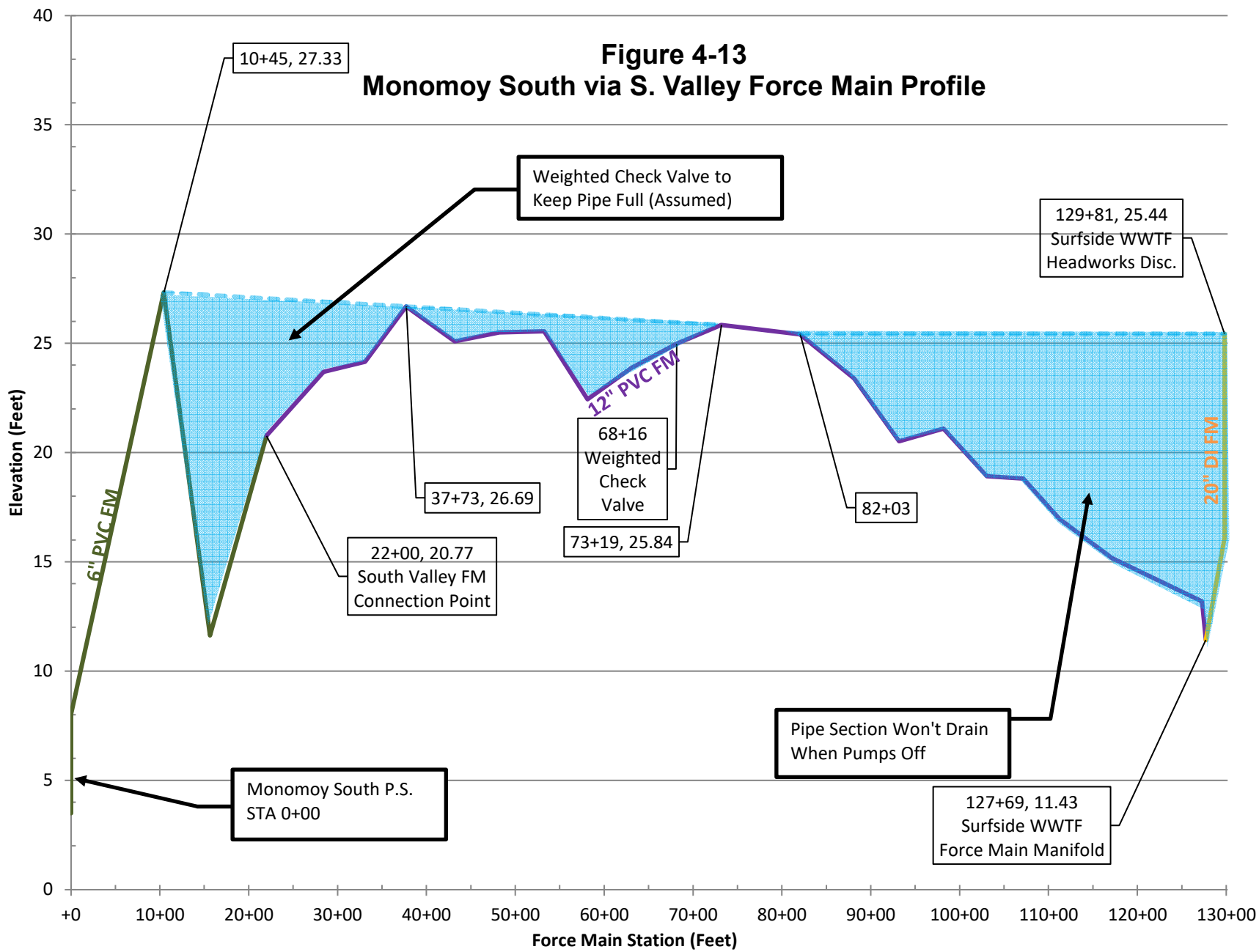
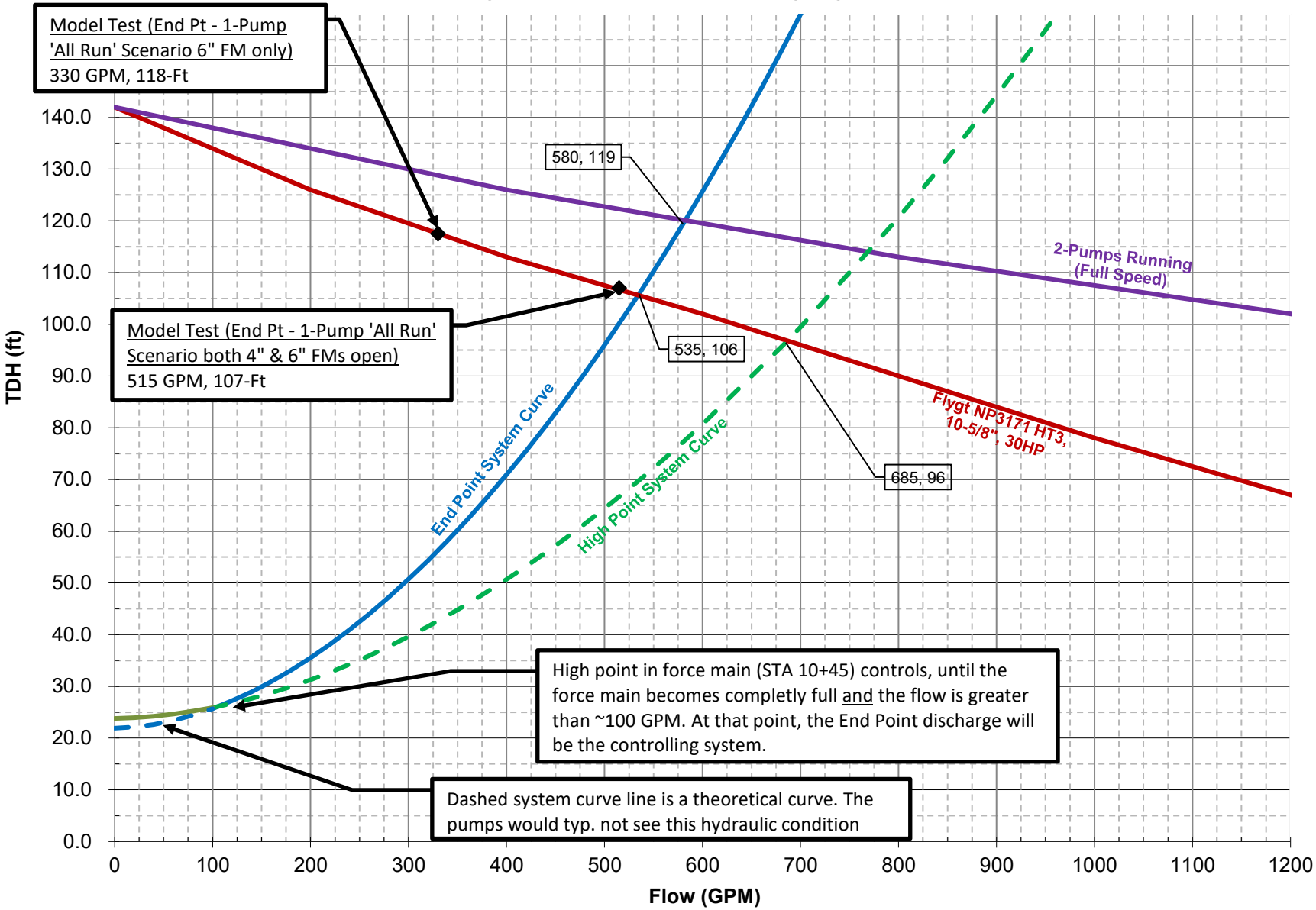


Figure 4-13
Monomoy South via S. Valley Force Main Profile
10+45, 27.33
Weighted Check Valve to Keep Pipe Full (Assumed)
129+81, 25.44 Surfside WWTF Headworks Disc.
12" PVC FM
68+16 Weighted Check Valve
37+73, 26.69
73+19, 25.84
82+03
20" DI FM
6" PVC FM
22+00, 20.77 South Valley FM Connection Point
Pipe Section Won't Drain When Pumps Off
Monomoy South P.S. STA 0+00
127+69, 11.43 Surfside WWTF Force Main Manifold
Elevation (Feet)
Force Main Station (Feet)
0
5
10
15
20
25
30
35
40
+0
10+00
20+00
30+00
40+00
50+00
60+00
70+00
80+00
90+00
100+00
110+00
120+00
130+00

Figure 4-14
Monomoy South PS via S. Valley System Curve



Based on the projected future wastewater flows in the areas tributary to the Monomoy South Pump Station, including the Shawkemo Needs Area, the Monomoy South Pump Station would see a future peak flow of 137,500 gpd (544 gpm). This is documented in the October 2017 Weston & Sampson letter report titled "Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Downstream Capacity Analysis". The pumping scenarios with the Monomoy South Pump Station in operation alone, shows the pumps having the capacity to handle the future peak flow for the station. During the 'All Run' scenario of complete build out of properties and all pump stations running simultaneously, the Monomoy South pumps will not achieve the design future peak flow for the station with one pump running.

This peak flow condition is known, which is why the Monomoy South Pump Station is configured to allow the pumps to discharge to both the 6-inch force main and the previously existing 4-inch force main that flows to the gravity sewer at intersection of Monomoy Road and Chatham Street (see Section 4.1.8). Operating both force mains would provide additional capacity to the pump station, which would allow the pumps to handle the design future peak flow under the "All Run" scenario.

4.1.8 Monomoy South Pump Station – 4-inch and 6-inch Force Main to Gravity Sewer Model

The Monomoy South Pump Station 4-inch and 6-inch force main to the gravity sewer on Monomoy Road is approximately 1,050 feet long and runs from the Monomoy South Pump Station (STA 0+00) to the gravity sewer at the intersection of Monomoy Road and Chatham Street (STA 10+48). The plan view of the force main is shown on Figure 4-1 and the profile of the force main is shown on Figure 4-15. The Monomoy South Pump Station force main is 6-inch PVC until it ties into the old Monomoy South 4-inch PVC force main at STA 0+74. The force main then discharges to a gravity sewer manhole on Monomoy Road at the intersection with Chatham Street (STA 10+48). The gravity sewer flows to the Sea Street Pump Station.

All force main components are located on different sets of record drawings and datums. The existing horizontal and vertical record information was obtained from the following locations:

- Pump Station and 6-inch Piping to the old Monomoy South FM Connection Point: "Nantucket Harbor Shimmo and Plus Parcels Sewer Extension" by Weston & Sampson (May 2017). These drawings are on the NAVD88 datum.
- Old Monomoy South 4-inch FM to the discharge manhole: "Monomoy Sewer Extension Construction Contract" by SEA Consultants (Oct. 2001). These drawings are on the Half Tide Level (HTL) datum which was converted to NAVD88 for the model.

A C-Value of 140 was selected for the 6-inch HDPE and 12-inch PVC pipe. This C-value is in the range typically used for plastic pipe, which generally has smoother walls than other types of pipe materials. For the 4-inch DI suction/discharge piping inside the pump station a C-value of 120 was selected. This C-Value is typical for cement lined DI pipe.

The Monomoy South Pump Station is designed to operate with one pump at peak flow. With one pump running at full speed, flows of 360 gpm at 116-feet are expected to occur in this system based on the System Curve shown on Figure 4-16. This discharge location is not connected to any other force mains, meaning it is not influenced by any other pump stations operating.

Based on the projected future wastewater flows in the area tributary to the Monomoy South Pump Station, including the Shawkemo Needs Area, the Monomoy South Pump Station would see a future peak flow of 137,500 gpd (544 gpm).

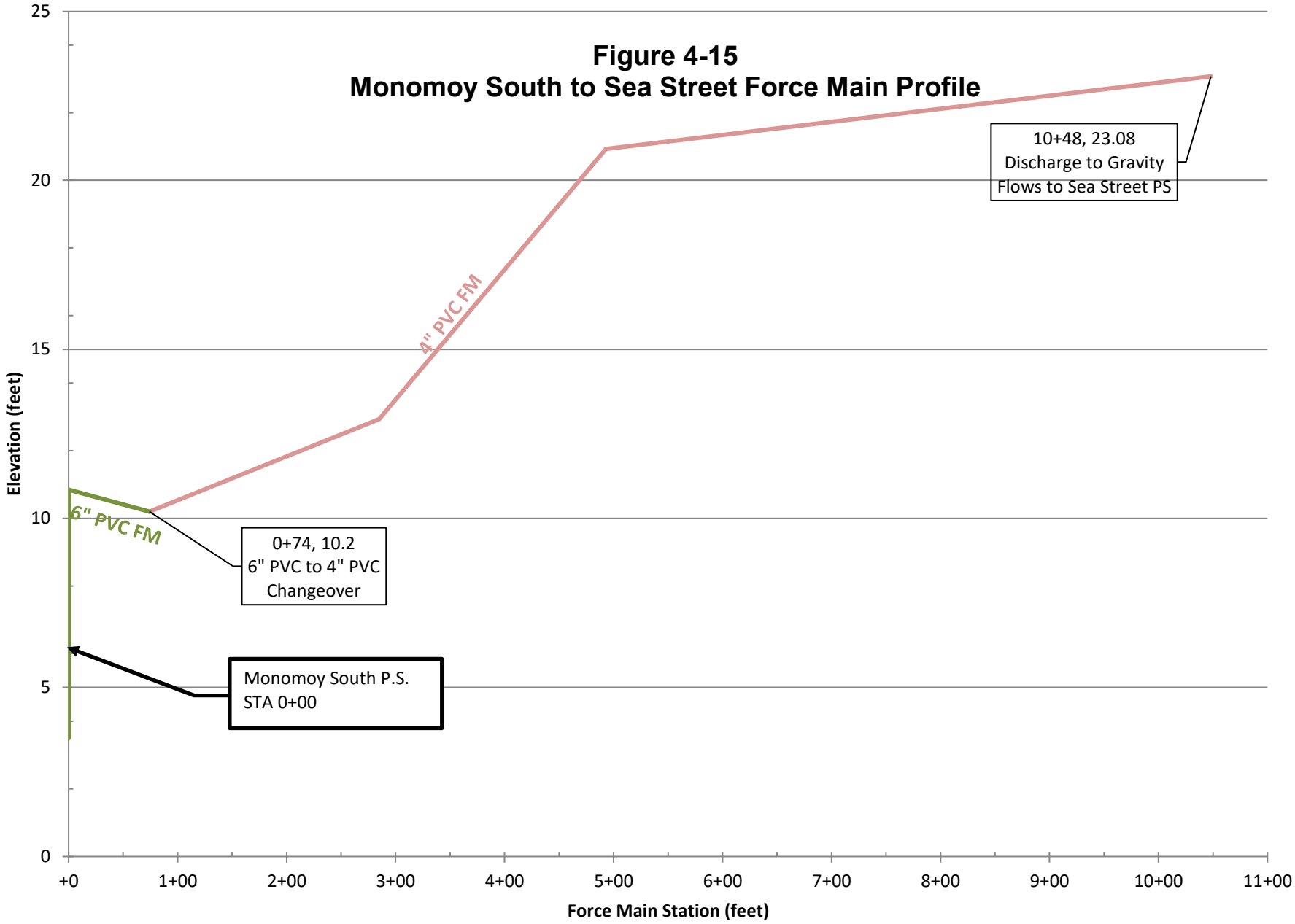
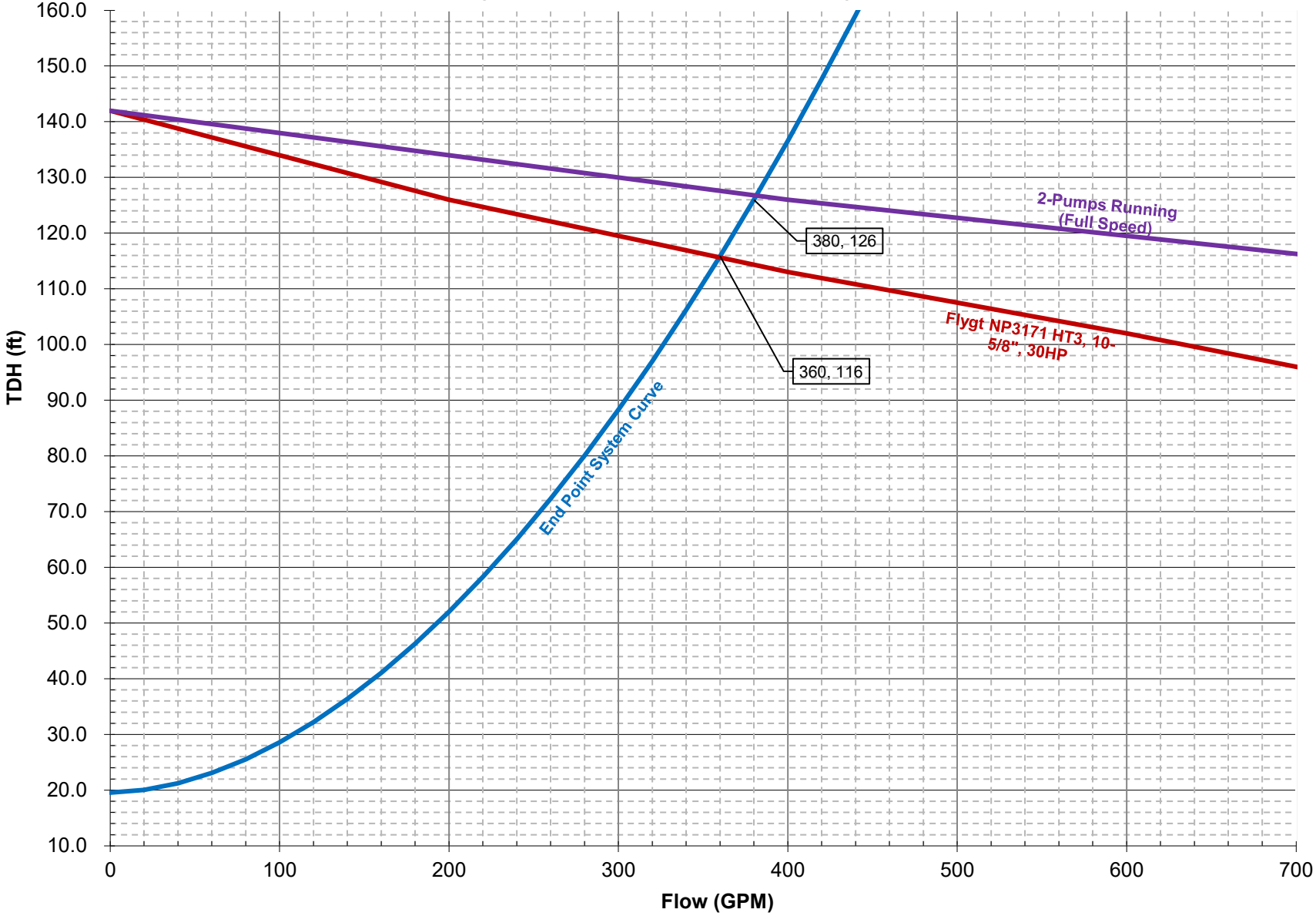


Figure 4-15
Monomoy South to Sea Street Force Main Profile
10+48, 23.08
Discharge to Gravity
Flows to Sea Street PS
4" PVC FM
6" PVC FM
0+74, 10.2
6" PVC to 4" PVC
Changeover
Monomoy South P.S.
STA 0+00
Elevation (feet)
Force Main Station (feet)
25
20
15
10
5
0
+0
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00

Figure 4-16
Monomoy South PS to Sea Street System Curve



This is documented in the October 2017 Weston & Sampson letter report titled "Nantucket Harbor Shimmo and Plus Parcels Sewer Extension Downstream Capacity Analysis". The 4-inch force main was never intended to operate alone as the main force main for new Monomoy South Pump Station. The 4-inch force main was left in place to provide additional capacity during future peak flow instances. As discussed in Section 4.1.7, the Monomoy South Pump Station is configured to allow the pumps to discharge to both the 6-inch force main and the 4-inch force main. Operating both force mains would provide additional capacity to the pump station, which would allow the pumps to handle the design future peak flow under the "All Run" scenario.

4.2 Future Proposed Force Main System Model

As discussed in Section 3 of this report, extending sewer service to the CWMP Needs Areas will require additional pump stations with connections to the existing force main system. The recommended future connections include:

- The Madaket and Warren's Landing Needs Areas will include a new pump station located at the DPW property with a new force main connecting to the Sea Street Pump Station 20-inch DI force main near the intersection of Madaket Road and Quaker Road at approx. STA 50+70, as shown on Figure 4-2. The peak flow for the new pump station will be approximately 1 MGD.
- The new Surfside Road Pump Station Pump Station required to handle the future flows for the Hummock North, Hummock South and Somerset Needs Areas will connect to the Sea Street Pump Station 20-inch DI force main at approximate STA 142+58, as shown on Figure 4-2. The peak flow for the new Surfside Road Pump Station will be approximately 4 MGD.
- The Miacomet Needs Area will include a new pump station at the Surfside WWTF with a force main connection to the Surfside WWTF Force Main Manifold at approximate STA 211+50, as shown on Figure 4-2. The peak flow for the new pump station will be approximately 0.5 MGD.

As the elevations and exact routing of the force mains is not yet known, we have only modeled the peak flow into the system and the effect on the other existing pump stations, at worst case scenario of "All Run". Table 4-7 shows the estimated pumping rates based on the future force main connections added to the system.

Table 4-7
Future Force Main Connection Model Scenarios

Pump Station	Running Alone		"All Run"	
	Flow (gpm)	TDH (feet)	Flow (gpm)	TDH (feet)
Sea Street PS 2-pumps to 20-inch full pipe end point	3,100	115	2,390	134
Sea Street PS 2-pumps to both 16-inch & 20-inch full pipe end point	3,700	98	3,230	112
Sea Street PS 2-pumps to high point	3,300	110	3,300*	110*
South Valley PS 2-pumps to full pipe end point	1,320	95	1,120	99
Monomoy South PS 1-pump to full pipe end point	535	106	330	118

* Note that when the pumps only see the high point, they are not influenced by other pump stations running in the system. It is not until the force mains become full that the pump stations see the effects of the "All Run" scenario.

4.2.1 Sea Street Pump Station

Based on the January 2016 Hazen & Sawyer report titled "Sea Street Pump Station Upgrade Basis of Design Report" the average daily flow is 0.8 MGD based on the flow projection for buildout of the tributary areas to the Sea Street Pump Station. Based on the Sea Street Pump Station O&M manual, the peak wet-weather flow for the pumps is 2,900 gpm (~4.2 MGD).

With the proposed additional force main connections and based on the "All Run" Scenario, the Sea Street Pump Station does not appear to have the capacity to meet the peak flow operating 2 pumps in just the 20-inch DI force main. Under the "All Run" scenario, the second force main would need to be activated to provide sufficient capacity. The Town is planning for a new force main from the Sea Street Pump Station to the Surfside WWTF. The design of this new force main needs to consider the future force main connections as well as the multiple pump station connection scenarios.

4.2.2 South Valley Pump Station

Based on the projected future wastewater flows in the area tributary to the South Valley Pump Station, which includes the area tributary to the Airport Pump Station, the South Valley Pump Station would see a future peak flow of 1,870,000 gpd (1,300 gpm). As discussed in Section 2.0 of this report, this peak flow is based on full buildout of the tributary areas.

With the proposed additional force main connections and based on the "All Run" Scenario, the South Valley Pump Station will pump slightly below the peak flow. The existing South Valley pumps are approximately 30 years old and well beyond the typical useful life of 20 years. When the South Valley pumps are replaced/rehabilitated, the design should consider the additional future flows and the increased pump capacity needed. If the pumps are rehabilitated, instead of replaced, increasing the impeller sizes and/or pump speed may increase the capacity to the required future peak flows. If the South Valley PS starts experiencing longer runtime hours, indicating capacity issues, these modifications should be reviewed.

4.2.3 Monomoy South Pump Station

Based on the projected future wastewater flows in the areas tributary to the Monomoy South Pump Station, including the Shawkemo Needs Area, the Monomoy South Pump Station would see a future peak flow of 137,500 gpd (544 gpm).

With the proposed additional force main connections and based on the "All Run" Scenario, the Monomoy South Pump Station does not appear to have the capacity in the 6-inch HDPE force main alone to meet the peak flow.

This peak flow condition is known, which is why the Monomoy South Pump Station was designed to allow the pumps to discharge to both the 6-inch force main and the 4-inch force main that flows to the gravity sewer at intersection of Monomoy Road and Chatham Street (see Section 4.1.8). Operating both force mains would provide additional capacity to the pump station, which would allow the pumps to handle the design future peak flow under the "All Run" scenario.

5.0 COORDINATION WITH ONGOING INFRASTRUCTURE PLANNING

As discussed in Section 3.4, downstream wastewater collection system improvements are recommended for the Surfside Road Pump Station Collection System and the Airport Pump Station Collection System. During the development of the Sewer Master Plan, ongoing infrastructure planning, such as a new Sea St Pump Station force main, water system upgrades, stormwater system upgrades, and transportation/roadway projects were coordinated with the sewer master planning analysis. This coordination benefits the planning of the various department infrastructure projects which benefits the Town as a whole.

5.1 Surfside Road Pump Station Collection System

The recommended improvements in the Surfside Road Pump Station collection system tributary area include new sewer construction on Surfside Road, from Vesper Lane to Miacomet Avenue, and on Bartlett Road, from Appleton Road to Surfside Road. Ongoing town infrastructure planning identified in this area potentially includes the new Sea Street Pump Station Force Main, the traffic roundabout at the intersection of Surfside Road and Bartlett Road, and sidewalk/bike path improvements on Surfside Road from Vesper Lane to Anna Drive.

The Surfside Road Areas Sewer System Improvements is currently under design. The design team has reviewed available documents and has met with the various town departments to coordinate the sewer design with the potential infrastructure projects. For example, the new sewer pipe and manholes will be located to minimize disruption if the town decides to install the proposed traffic circle at the intersection of Surfside Road and Bartlett Road. The design team has also met with DPW and Wannacomet Water to review the sewer design and coordinate with potential water and stormwater system upgrades planned for the area.

In order to complete the projects in a cost-effective manner and to minimize disruption (i.e. traffic) during construction, it is recommended that all utility (sewer, water and stormwater) replacement needs be installed together, instead of multiple projects. This would allow for paving the impacted roadways one time, which would be a significant cost savings for the town. In addition, with the schools and the hospital located in the project area, traffic congestion is an issue year-round, not just the summer months. Completing the pipeline work in one project, would minimize the disruption to a single season, not multiple years if the work is done as multiple projects.

5.2 Airport Pump Station Collection System

The recommended improvements in the Airport Pump Station collection system tributary area include 130 feet of new sewer construction at the intersection of Miller Lane and Airport Road. As the sewer improvements are adjacent to the Airport Pump Station site, it is recommended that the sewer replacements are constructed as part of the future Airport Pump Station Upgrade Project. The design team should meet with town departments to coordinate with potential future water and stormwater system upgrades, as well as potential future transportation/roadway improvements that get planned for the area.

5.3 Miacomet Needs Areas

The recommended sewer extension plan for the Miacomet Needs Area includes a new gravity sewer on South Shore Road, from Surfside Road to the WWTF. The design and construction of the South Shore Road gravity sewer and the new Sea Street Pump Station force main should be coordinated, if South

Shore Road is the selected route for the new force main. In order to complete the projects in a cost-effective manner and to minimize disruption (i.e. traffic) during construction, it is recommended that all utility work (sewer, water, stormwater, cable/fiber) be installed together, instead of multiple projects. This would allow for paving South Shore Road one time, which would be a significant cost savings for the town. The design team should meet with town departments to coordinate with potential future water and stormwater system upgrades, as well as potential future transportation/roadway improvements that get planned for the area.

5.4 Other Needs Areas

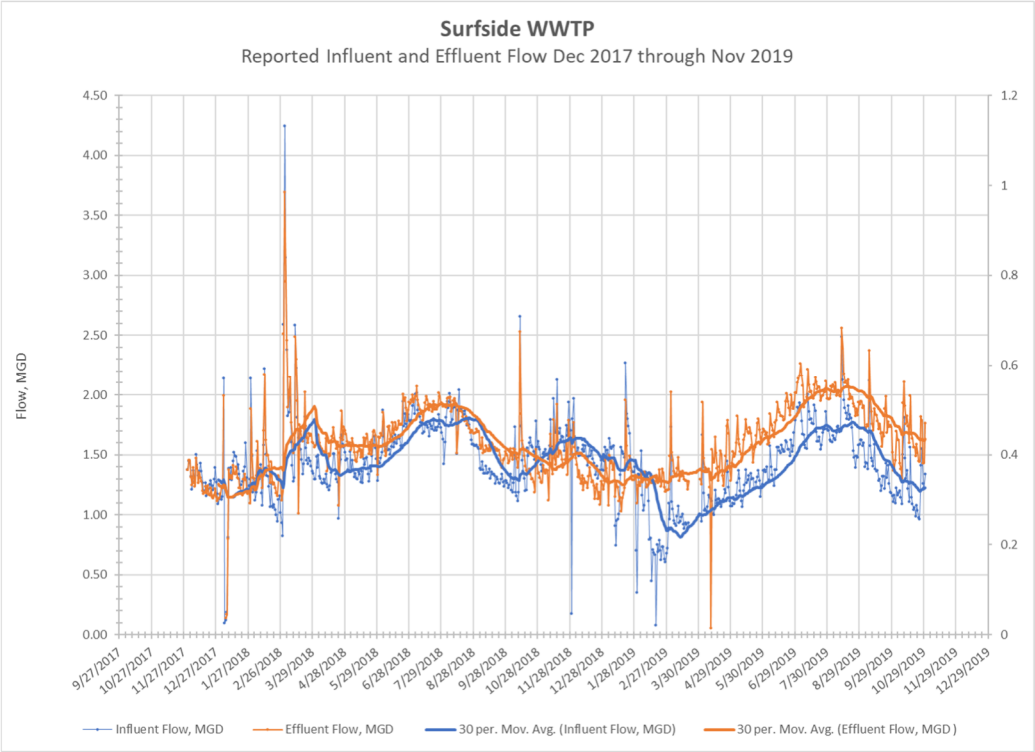
During the future design of sewer extensions in each of the Needs Areas, the design team should meet with town departments to coordinate with potential future water and stormwater system upgrades, as well as potential future transportation/roadway improvements that get planned for the areas.

6.0 REVIEW OF SURFSIDE WWTF CAPACITY

The 2014 CWMP included an update of the 2004 CWMP wastewater flow and loads to the Surfside WWTF. The flow and loads were further refined in the May 2016 Design Basis Report for the design of the recently completed Surfside WWTF Upgrades project. As part of the development of this Sewer Master Plan, potential additional future sewer flow and loads were projected. These projections were combined with the results of the analysis of more recent reported flow and load data to establish updated estimates of future flow and loads to the WWTF.

Nantucket experiences a significant seasonal population increase in the summer months due to an influx of part-time summer season residents. This seasonal variation has a significant impact on the influent wastewater flows and loads, with current average daily influent flow at the Surfside WWTF increasing from approximately 1.3 MGD during the "low season" to 1.75 MGD during the "high season". The "high season" or "summer season" consists of the months of July and August. The "low season" or "winter season" consists of the months of November through April. The months of May, June, September and October are "shoulder seasons" where the flows transition between "high season" and "low season". The WWTF capacity must be sufficient to consistently meet effluent limits during the high season conditions. To estimate the existing and projected influent design flows and loads, the WWTF data for the period of December 2017 through October 2019 was compiled and statistically analyzed. The statistical analysis included the high season data in aggregate for both 2018 and 2019 to establish current high season load peaking factors for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), and Total Nitrogen (TN). The current average daily flows at the WWTF for the period of December 2017 through November 2019 are shown graphically on Figure 6-1.

Figure 6-1 Surfside WWTF Current Average Daily Flows



The development of future wastewater flows to the Surfside WWTF are discussed in detail in Section 2 of this report and summarized in Table 6-1.

Table 6-1 Future Surfside WWTF Average Daily Flows	
Area	Average Daily Flow (gpd)
Hummock North	92,000
Hummock South	80,000
Madaket / Warren's Landing	174,000
Miacomet	86,000
Shawkemo	55,000
Somerset	124,000
WPZ	34,000
South Valley and Airport Pump Station Tributary Areas	65,000

The average per capita BOD and TSS loads for these anticipated future flows was based on a blend of the per capita waste production rates recommended in the New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works (TR-16) for residences with and without garbage grinders. This was done recognizing that the planned sewer extensions will service existing residences with septic tanks which are unlikely to have garbage grinders. The analysis assumes 50 percent of all future residences will use garbage grinders once they connect to the sewer system.

The projected total nitrogen loads are estimated based on the TR-16 recommended per capita load rate of 0.04 lbs. of nitrogen per capita per day. The resulting wastewater load basis is provided in Table 6-2.

Table 6-2 Estimated Per Capita Influent Waste Load Production Rates			
Parameter	TR-16 Recommendation without Grinders lbs/capita/d	TR-16 Recommendation with Grinders lbs/capita/d	Blended Load Factor at 50/50 with and without grinders. lbs/capita/d
TSS	0.20	0.25	0.225
BOD	0.17	0.22	0.20
TN	0.04	0.04	0.04

Max month factors to be applied to the average daily flow and load production rates to estimate the projected future flow rates and loads were determined from existing plant flow and load data. Table 6-3 summarizes the observed flow and load peak factors identified from the 2018 and 2019 high season data analysis.

Table 6-3 Maximum Month Wastewater Flow and Load Factors from Existing Data	
Parameter	Ratio
Flow	1.03
TSS	1.36
BOD	1.05
TN	1.04 (1)

(1) The maximum month peak factor for TN is assumed the same as that determined from the data for ammonia nitrogen as total nitrogen data is not available.

Peak hourly flow data was not available for the current analysis. As such, the peak hourly flow and the associated ratio to average daily flow could not be determined for current conditions. The 2016 Design Basis Report identified a peak hourly flow ratio of approximately 2.62. The maximum month flow ratio calculated for current conditions is similar to the 2016 Design Basis Report and therefore it is reasonable to expect that the current peak hour flow ratio is also similar. As such, the peak hourly flow ratio of 2.62 was used for the current analysis.

A summary of the updated design flow and load estimates for the Surfside WWTF is presented in Table 6-4. The projected future average daily influent flow for the "Town" area in Table 6-4 includes future build out of existing Sewer District properties in the Sea Street Pump Station and Surfside Road Pump Station tributary areas. The future build out of the South Valley Pump Station and Airport Pump Station tributary area is listed separately in Table 6-4. In the 2014 CWMP, the future "Town" flow was estimated at 0.59 mgd. It is understood that this included build out of the entire existing Town Sewer District. In the 2014 CWMP, the average daily influent flow at the WWTF was estimated at 1.53 mgd. The increase in the average daily influent flow from the 2014 to 2018/2019 of approximately 0.22 mgd would be from the build out of properties in the existing Town Sewer District. As such, the 0.22 mgd was deducted from the future "Town" flow estimation.

As discussed in Section 3.2.2, the capacity analysis for the Sea Street Pump Station collection system will be completed as part of a future CMOM hydraulic modeling effort. That analysis will include an updated projection of future build out flows for the existing Sea Street Pump Station tributary area.

The updated flow and loads are within typical variability of the different data sets used between 2014 and 2019. Based on the data, expansion of the existing process tankage is not necessary. The support systems, such as solids handling and aeration system equipment, warrant further consideration and evaluation as part of the design of the Surfside WWTF Phase 2 Upgrades, for which the scoping is currently underway. Due to budgetary constraints, the solids handling, and portions of the aeration upgrades were removed from the recently completed WWTF (Phase 1) upgrade project. The needed improvements to the Surfside WWTF are expected to progress over the next several years.

Table 6-4
Surfside WWTF Flow and Loading Summary

	High Season Flow (MGD)			BOD5 Load (lbs/day)		TSS Load (lbs/day)		TN Load (lbs/day) [1]	
	Average Daily	Maximum Month	Peak Hour	Average Daily	Maximum Month	Average Daily	Maximum Month	Average Daily	Maximum Month
Study / Needs Area									
Hummock Pond North	0.092			310		350		60	
Hummock Pond South	0.080			270		300		50	
Madaket and Warren's Landing	0.174			580		650		120	
Miacomet	0.086			290		320		60	
Shawkemo	0.055			180		210		40	
Somerset	0.124			410		470		80	
Shimmo and Plus Parcels[2]	0.123			410		460		80	
South Valley and Airport PS Area	0.065			220		240		40	
WPZ	0.034			110		130		20	
Town [3]	0.370			1,230		1,390		250	
Subtotal Projected	1.20	1.24	3.15	4,010		4,520		800	
Projected Infiltration/Inflow (Future)	0.06	0.06	0.06						
Total Projected	**1.26**	**1.30**	**3.21**	**4,000**	**4,200**	**4,500**	**6,100**	**800**	**830**
Existing Conditions at Surfside WWTF	**1.75**	**1.81**	**4.59**	**4,400**	**4,600**	**3,600**	**4,900**	**700**	**730**
Total Projected and Existing (Future Conditions)	**3.0**	**3.1**	**7.8**	**8,400**	**8,800**	**8,100**	**11,000**	**1,500**	**1,560**

(1) TN load based on the assumption that NH3 composes 62% of influent TN
(2) Sewer construction was recently completed. Properties are just starting to connect, so flows are still considered future and not part of Existing Conditions.
(3) Includes build out of existing Sewer District properties in the Sea St Pump Station and Surfside Rd Pump Station tributary areas.

7.0 WASTEWATER COLLECTION SYSTEM RESILIENCY

Being an island community, surrounded by the Atlantic Ocean, and being nearly 30 miles from the mainland, Nantucket has a unique set of resiliency challenges. Managing a municipal wastewater system is just one of the critical aspects of resiliency for the community. The Nantucket wastewater collection system has many components which were built over a hundred years ago, and many of the original pipes remain in service. Driven by the island's desirability as a summer vacation spot, elevated property values drive a strong local building and development industry. The combination of the historic nature of the downtown harbor area, and the strong development and redevelopment patterns on the island, results in constant changes to wastewater flows and loads, which challenge the capacity and condition of the sewer infrastructure.

From a resiliency standpoint, the Nantucket sewer system shares the challenges seen by mainland communities. These include the unpredictability of flows and loads, the effects of aging infrastructure, impacts from so called "flushable wipes", impacts from fats, oils and grease (FOG), challenges of operational staffing, reliance on utilities, and susceptibility to man-made and natural events. The added aspects of sea level rise and more general aspects of climate change have a noted effect on infrastructure in coastal communities. Many of these aspects are heightened on an island. For natural events, the most notable concerns are coastal storms, storm surge/coastal flooding, and weather-related transportation impacts which are intensified due to the island's isolation.

Nantucket has two separate municipal wastewater systems - the Town Sewer District system and the Siasconset Sewer District system. The Town Sewer District system, which is the subject of this Sewer Master Plan, serves the downtown, harbor and central developed areas of town. Major improvements to the sewer system, including the Surfside WWTF and the Sea Street Pump Station, were recently completed. The goals of these projects were to modernize the wastewater systems and improve system integrity and resiliency. Combined with long-term planning and asset management approaches, the Sewer Department has a programmatic system to improve its utility.

7.1 Sea Street Pump Station

The Sea Street Pump Station, the town's main pump station, currently conveys approximately 70% of the wastewater flow that is treated at the Surfside WWTF. The Sea Street Pump Station is located in close proximity to Nantucket Harbor in an area that is prone to coastal flooding. Due to the concern for flooding, the age of the facility and the critical nature of the pump station, the town recently upgraded the resiliency of the pump station. The resiliency improvements included elevating critical equipment and electrical components above flood level, making below grade components water resistant, and hardening the building and providing flood protection with a new "hidden" flood wall with stop log protection at the doorways.

Due to the Sea Street Pump Station's vulnerability to coastal flooding, the town has been diverting wastewater flows away from the Sea Street Pump Station whenever possible as they expand the wastewater collection system. Flow from the Airport Pump Station and the Monomoy South Pump Station were originally pumped to gravity sewers that are tributary to the Sea Street Pump Station. The Airport Pump Station flows are now conveyed to the South Valley Pump Station which pumps directly to the Surfside WWTF. As part of the recently completed Nantucket Harbor Shimmo and Plus Parcels Sewer Extension, a new Monomoy South Pump Station was built with a force main connection directly to the Surfside WWTF. Future projects, including the upcoming Surfside Road Area Sewer System

Improvements Project and the future Needs Area Sewer Extensions, will further limit the flow to the Sea Street Pump Station. As part of the Surfside Road Area Sewer System Improvements Project, the existing gravity sewer serving approximately 50 properties along Atlantic, West York, and Prospect will be re-routed to the Surfside Road Pump Station, which pumps directly to the Surfside WWTF. The future Need Area Sewer Extensions will be designed to limit the number of future connections tributary to the Sea Street Pump Station. It is currently envisioned that only approximately 15 properties from the future Needs Areas will be connected to gravity sewers tributary to the Sea Street Pump Station.

7.2 Reduce the Overall Number of Pump Stations

Reducing the number of pump stations in the collection system will improve the resiliency of the system as it would reduce the cost to both operate and maintain the pump stations. The Sewer Master Plan recommended sewer routings and preliminary sewer layouts for the Needs Areas could result in the elimination of several existing as well as proposed pump stations. The recommended sewer routing and preliminary sewer layout for the Miacomet Needs Area includes the installation of a proposed gravity sewer on South Shore Road with a new pump station located at the Surfside WWTF. This gravity sewer would allow for the elimination of the Sachems Path Pump Station and the Sherburne Commons Pump Station, as well as any proposed pump stations along South Shore Road which would otherwise be required to provide sewer service to the area. The Somerset Needs Area sewer routing and preliminary layout includes a new pump station to be located on Bartlett Road. An alternate layout includes the installation of a gravity sewer across Nantucket Land Bank property with the new pump station located at the end of Mizzenmast Road. This alternate would allow for the elimination of the existing Pine Valley Pump Station.

7.3 Upgrade Existing Aged Infrastructure

The existing Surfside Road Pump Station is over 30 years old and is in need of significant upgrade and improvement. As part of the Surfside Road Area Sewer System Improvements Project, a new Surfside Road Pump Station will be constructed with the capacity to handle the future tributary wastewater flow of approximately 4 MGD. The design of the new Surfside Road Pump Station will consider the numerous resiliency challenges faced by the town and will provide the town with a new, modern, efficient pumping facility to serve the town's wastewater pumping needs for the next 30+ years.

The Sewer Department is in the process of implementing a Capacity Management Operation and Maintenance (CMOM) program which includes cleaning and CCTV inspection of all the sewer pipes to identify capacity restrictions and structural defects in the collection system. Based on the findings of the investigations, sewer rehabilitation projects will be undertaken by the Sewer Department to upgrade the aging infrastructure.

7.4 Force Main Resiliency

The town is all too familiar with the need for and the importance of resiliency in the pump station and force main systems. In the Winter 2018 there was a catastrophic failure of the 16-inch Sea Street Pump Station force main. At the same time, the Sea Street Pump Station was undergoing construction and the station was operating on bypass pumps. Construction conditions made the secondary 20-inch force main temporarily unavailable for use. After several days of round-the-clock efforts, the use of the secondary force main was restored. The 16-inch force main was repaired, but it remains in place for emergency use only. Due to the concerns for the structural condition of the 16-inch force main, the Town will soon begin the design of a new Sea Street Pump Station force main which will restore adequate resiliency and redundancy to the Sea Street Pump Station and force main system.

The existing Surfside Road Pump Station is configured to pump to either the existing 16-inch or 20-inch Sea Street Pump Station force mains. The new Surfside Road Pump Station, which is currently under design, will also be configured to pump to either of the existing Sea Street Pump Station force mains and potentially to the new Sea Street Pump Station Force Main, depending upon the final routing of the new force main.

The Monomoy South Pump Station pumps flow directly to the Surfside WWTF via a connection to the South Valley Pump Station force main at the intersection of Old South Road and Fairgrounds Road. The Monomoy South Pump Station force main is also configured to allow flow to be pumped to the gravity sewer at the intersection of Monomoy Road and Chatham Road. This sewer flows by gravity to the Sea Street Pump Station. Should the South Valley Pump Station force main need to be taken out of service, the Monomoy South Pump Station force main connection to the gravity sewer would be activated.

The Airport Pump Station pumps flow to the South Valley Pump Station which in turn pumps flow directly to the Surfside WWTF. The Airport Pump Station force main is also configured to allow flow to be pumped to the gravity sewer on Old South Road near the intersection of Lovers Lane. This sewer flows by gravity to the Sea Street Pump Station. Should the South Valley Pump Station or the South Valley Pump Station force main need to be taken out of service, the Airport Pump Station force main connection to the gravity sewer would be activated.

The future design of the Madaket Pump Station force main is proposed to connect to the existing 20-inch Sea Street Pump Station force main at the intersection of Madaket Road and Quaker Road. Depending upon the final routing of the new Sea Street Pump Station force main, the Madaket Pump Station may be able to have a redundant force main connection to the new force main.

7.5 Future Sewer System Design Along Coastal Areas

Coastal erosion is an issue for the treatment and collection systems in various parts of the island. The loss of homes and utilities along the shoreline is an ongoing concern. The Sewer Department is planning for actions to protect the system integrity and public health, including the potential for retreat of infrastructure away from areas experiencing coastal erosion. In addition, future sewer system designs along coastal areas will consider potential for impacts from coastal erosion. Low pressure sewer systems will be designed with additional valves to allow the Sewer Department to isolate a section of the sewer should an area experience coastal erosion that damages the sewer lines.

7.6 Energy Resilience

Electrical power service is a key factor in any resiliency planning for the Sewer Department. The island growth has significantly impacted the electric power system on the island, stressing the power supply during peak demand periods, such that energy conservation and renewable energy are focal points. Recognizing that the wastewater facilities are some of the major energy consumers in the community, energy management is a focus for the Sewer Department. Ongoing activities to improve energy management include process and pumping equipment upgrades, evaluation of an anaerobic digester to generate heat and electric power at the Surfside WWTF, and the installation of a solar photovoltaic system on one of the larger building roofs. The anerobic digester system is also targeted to reduce the volume of waste solids being sent to the island's landfill, which is another limited resource. This would present a further sustainability factor for the island's waste management.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Development of Future Wastewater Flow

The total combined wastewater flows for the Needs Areas developed as part of the Sewer Master Plan are approximately 5% higher than the 2014 CWMP flows. While the Sewer Master Plan used lower water use and subsequent smaller flows per dwelling than the CWMP, the number of projected dwellings in the Sewer Master Plan is approximately 25% higher than the CWMP. The reasons for the increase in projected dwellings are the increase in construction of multiple dwellings on properties and the potential build-out of parcels based on current zoning. The CWMP carried a 25% increase for secondary dwellings. As shown in the future wastewater flow calculation spreadsheets in Appendix A, the percentage of lots with existing secondary or multiple dwellings ranges from 19% to 58%. With the exception of Madaket, which is projected to have 24% of properties with multiple dwellings, the other Needs Area are projected to have 50% to 60% of properties with multiple or secondary dwellings.

8.2 Evaluation of Routing Alternatives

The recommended sewer routing for the Needs Areas is as follows:

- Hummock North, Hummock South and Somerset Needs Areas will be tributary to the Surfside Road Pump Station collection system
- Madaket and Warren's Landing Needs Areas will be pumped directly to the Surfside WWTF
- Miacomet Needs Area will be pumped directly to the Surfside WWTF
- Shawkemo Needs Area will be tributary to the Monomoy South Pump Station collection system
- WPZ Needs Area will be tributary to the Airport Pump Station collection system

The recommended preliminary sewer system layouts are shown on Figures 3-1 through 3-8.

8.3 Downstream Collection System Improvements

Based on the recommended routing alternatives and the capacity analysis of the downstream collection systems, recommended system improvements needed to convey the future wastewater flows to the Surfside WWTF were identified for the Surfside Road Pump Station Collection System and the Airport Pump Station Collection System.

8.3.1 Surfside Road Pump Station Collection System

The recommended improvements for the Surfside Road Pump Station Collection System include the following:

1. New 4 MGD Surfside Road Pump Station at #57 Surfside Road.
2. New 18-inch pump station influent sewer from the new pump station wetwell to the new 15-inch sewer and the new 12-inch sewer on Surfside Road.
3. New 15-inch sewer on Surfside Road (North) from the new 18-inch pump station influent sewer to Bartlett Road.
4. New 12-inch sewer on Surfside Road (North) from Bartlett Road to Vesper Lane.
5. Connect the existing 12-inch Vesper Lane sewer to the new 12-inch Surfside Road (North) sewer.
6. New 12-inch sewer on Bartlett Road connected to the new 15-inch Surfside Road (North) sewer.
7. New 12-inch sewer on Surfside Road (South) from the new 18-inch pump station influent sewer to Miacomet Avenue.

8. Connect the existing 8-inch and 12-inch sewer on Surfside Road (North) to the new 18-inch pump station influent sewer.
9. Provide a connection on the new 12-inch Surfside Road (North) sewer for the Atlantic Avenue sewer relocation in the new manhole at the intersection of Surfside Road and Vesper Lane.

A plan of the recommended Surfside Road Pump Station Collection System improvements is shown on Figure 3-20.

The budgeted project cost for the Surfside Road Area Sewer Systems Improvements is $7,600,000. The breakdown of the project cost is as follows:

- Construction: $5,640,000
- Contingency: $ 550,000
- Engineering: $1,410,000

8.3.2 Airport Pump Station Collection System

The recommended improvements for the Airport Pump Station Collection System include the replacement of approximately 130 feet of existing 10-inch sewer with new 12-inch sewer at the following locations:

1. 30 feet of new 12-inch sewer from the pump station wetwell to Station 0+00 on Miller Lane.
2. 100 feet of new 12-inch sewer from Station 0+00 on Miller Lane to Station 1+00 on Airport Road. This section will include the replacement of approximately 56 feet of 10-inch sewer on Miller Lane that was installed at a slope of 0.0016, which is below the recommended minimum slope of 0.0028 for a 10-inch pipe.

A plan of the recommended Airport Pump Station Collection System improvements is shown on Figure 3-24.

It is recommended that the sewer replacements are constructed as part of the Airport Pump Station Upgrade, as they are adjacent to the pump station. This would minimize the overall disruption near the airport and would also minimize the cost for engineering, bidding and construction of these sewer improvements.

The budgeted cost for the Airport Pump Station Collection System improvements, assuming the design and construction are included in the Airport Pump Station Upgrade project, is $90,000. The breakdown of the project cost is as follows:

- Construction: $70,000
- Contingency: $ 5,000
- Engineering: $15,000

8.4 Pump Station Evaluations

As part of the downstream collection system capacity analysis, evaluations of the town's wastewater pump stations were conducted. The pump stations included Abrem Quary, Airport Road, Aurora Way, Cato Lane, Monomoy North, Pine Valley, Sachems Path, Sherburne Commons, South Valley and Surfside Road. The Sea Street Pump Station was not included in the evaluation, as it was recently upgraded in 2019. Monomoy South and Wamasquid Pump Stations were not included in the evaluation, as they were recently installed as part of the Nantucket Harbor and Plus Parcels Sewer Extension Project. The locations of the pump stations are shown on Figure 1-1. Weston & Sampson personnel performed

a field visit to each of the pump stations between July 31, 2019 and August 2, 2019. The purpose of the site visits was to evaluate the condition of the existing equipment, determine the existing pumping capacity, and review operational issues.

A Pump Station Evaluation Memorandum was completed for each of the pump stations. Copies of the memoranda are included in Appendix C. The Pump Station Memorandum for each station included observations of existing conditions including civil/site, mechanical/process, electrical, instrumentation and controls, as well as results of drawdown testing to estimate the pump station capacities. Recommendations for improvements and upgrades was included for each of the pump stations.

8.5 Existing Force Main System

A force main system hydraulic model was developed to identify the overall pump station and force main system hydraulics and capacity issues when any of the pump stations are operating simultaneously. The model was utilized to determine the operating characteristics of the force main system during different pumping scenarios (i.e. multiple pump stations operating at different times within multiple force mains). The force mains for the Sea Street Pump Station, the Surfside Road Pump Station, the South Valley Pump Station, and the Monomoy South Pump Station all connect with to the overall force main system at different locations. Because of this, the flow output at each pump station will vary depending on what other pump stations are operating at the same time. In order to more fully understand the hydraulics, potential flow scenarios were developed for each pump station running alone (without any other pump stations operating) and scenarios when all other pump stations in the system are running ("All Run" Scenario). The "All Run" scenario is based on the maximum design peak flow for each pump station with the required number of pumps operating to meet the design peak flow. This mostly theoretical "All Run" scenario is considered the 'worst-case' scenario where all pump stations are operating at peak flow and competing with all other pump stations to discharge flow into the force main system.

8.5.1 Sea Street Pump Station

Based on our existing force main system model, the Sea Street Pump Station operating on the 20-inch DI force main can meet the design peak flow for the station with two pumps in operation at full speed. However, when operating on the 16-inch HDPE force main only, the pump station with two pumps in operation at full speed would not meet the design peak flow. The Sea Street Pump Station discharge piping is configured to allow the station to pump to both the 16-inch HDPE force main and the 20-inch DI force main (see Section 4.1.2) if additional capacity is needed. During the "All Run" scenario, the two pumps running at full speed should output 3,700 gpm at 98-feet with both force mains open, which would be enough to handle the peak flows.

8.5.2 Surfside Road Pump Station

Based on our existing force main system model, the Surfside Road Pump Station operating on either the 20-inch DI force main or the 16-inch HDPE force main can meet the existing design peak flow for the station. However, the existing Surfside Road Pump Station does not have the capacity to handle the future peak flow associated with Needs Areas sewer extensions. These sewer extensions will eventually increase peak flows to the Surfside Road Pump Station to approximately 4 MGD (2,800 gpm). As discussed in Section 3 of this report, a new Surfside Road Pump Station with the capacity to handle the future 4 MGD peak flow is recommended.

8.5.3 South Valley Pump Station

Based on our existing force main system model, the South Valley Pump Station in operation alone, with two pumps running, has the capacity to handle the future peak flow for the station. However, during the 'All Run' scenario of complete build out of properties and all pump stations running simultaneously, the South Valley pumps may not achieve the design future peak flow for the station.

8.5.4 Monomoy South Pump Station

Based on our existing force main system model, the Monomoy South Pump Station in operation alone, has the capacity to handle the future peak flow for the station. However, during the 'All Run' scenario of complete build out of properties and all pump stations running simultaneously, the Monomoy South pumps will not achieve the design future peak flow for the station. This peak flow condition is known, which is why the Monomoy South Pump Station is configured to allow the pumps to discharge to both the 6-inch force main and the previously existing 4-inch force main that flows to the gravity sewer at intersection of Monomoy Road and Chatham Street. Operating both force mains would provide additional capacity to the pump station, which would allow the pumps to handle the design future peak flow under the "All Run" scenario.

8.6 Future Force Main System

Extending sewer service to the CWMP Needs Areas will require additional pump stations with new force main connections to the existing force main system. The recommended future force main connections include:

- The Madaket and Warren's Landing Needs Areas will include a new pump station located at the DPW property with a new force main connecting to the Sea Street Pump Station 20-inch DI force main near the intersection of Madaket Road and Quaker Road. Depending upon the selected routing of the new Sea Street Pump Station force main, the Madaket Pump Station could have a secondary connection to the new force main.
- The new Surfside Road Pump Station Pump Station will have connections to the Sea Street Pump Station 20-inch DI force main and the Sea Street Pump Station 16-inch HDPE force main. Depending upon the selected routing of the new Sea Street Pump Station force main, the new Surfside Road Pump Station could also connect to the new force main.
- The Miacomet Needs Area will include a new pump station at the Surfside WWTF with a force main connection to the Surfside WWTF Force Main manifold.

8.6.1 Sea Street Pump Station

With the proposed additional force main connections and based on the "All Run" Scenario, the Sea Street Pump Station does not appear to have the capacity to meet the peak flow operating 2 pumps in just the 20-inch DI force main. Under the "All Run" scenario, the second force main would need to be activated to provide sufficient capacity. The Town is planning for a new force main from the Sea Street Pump Station to the Surfside WWTF. The design of this new force main needs to consider the future force main connections as well as the multiple pump station operation scenarios.

8.6.2 New Surfside Road Pump Station

The design of the new Surfside Road Pump Station and force main needs to consider the future force main connections as well as the multiple pump station operation scenarios. Once the new Surfside Road Pump Station reaches future design flows, the new Surfside Road Pump Station and Sea Street Pump Station will need to operate on different force mains during peak flow seasons.

8.6.3 South Valley Pump Station

With the proposed additional force main connections and based on the "All Run" Scenario, the South Valley Pump Station will pump slightly below the peak flow. The existing South Valley pumps are approximately 30 years old and well beyond the typical useful life of 20 years. When the South Valley pumps are replaced/rehabilitated, the design should consider the additional future flows and the increased pump capacity needed. If the pumps are rehabilitated, instead of replaced, increasing the impeller sizes and/or pump speed may increase the capacity to the required future peak flows. If the South Valley pumps start experiencing longer runtime hours, indicating capacity issues, these modifications should be reviewed.

8.6.4 Monomoy South Pump Station

With the proposed additional force main connections and based on the "All Run" Scenario, the Monomoy South Pump Station does not have the capacity in the 6-inch HDPE force main alone to meet the peak flow. This peak flow condition is known, which is why the Monomoy South Pump Station was designed to allow the pumps to discharge to both the 6-inch force main and the 4-inch force main that flows to the gravity sewer at intersection of Monomoy Road and Chatham Street. Operating both force mains would provide additional capacity to the pump station, which would allow the pumps to handle the design future peak flow under the "All Run" scenario.

8.7 Coordination with Ongoing Infrastructure Projects

In order to complete the various sewer projects in a cost-effective manner and to minimize disruption (i.e. traffic) during construction, it is recommended that all utility (sewer, water and stormwater) replacement needs be installed together, instead of multiple projects. This would allow for paving the impacted roadways one time, which would be a significant cost savings for the town. In addition, with the schools and the hospital located in the project area, traffic congestion is an issue year-round, not just the summer months. Completing the pipeline work in one project, would minimize the disruption to a single season, not multiple years if the work is done as multiple projects.

8.8 Review of Surfside WWTF Capacity

The 2014 CWMP included an update of the 2004 CWMP wastewater flow and loads to the Surfside WWTF. The flow and loads were further refined in the May 2016 Design Basis Report for the design of the recently completed Surfside WWTF Upgrades project. As part of the development of the Sewer Master Plan, potential additional future sewer flow and loads were projected. These projections were combined with the results of the analysis of more recent reported flow and load data to establish updated estimates of future flow and loads to the WWTF.

The updated flow and loads are within typical variability of the different data sets used between 2014 and 2019. Based on the data, expansion of the existing process tankage (large underground concrete tanks) is not necessary. The support systems, such as solids handling and aeration system equipment, warrant further consideration and evaluation as part of the design of the Surfside WWTF Phase 2 Upgrades, for which the scoping is currently underway. Due to budgetary constraints, the solids handling, and portions of the aeration upgrades were removed from the recently completed WWTF (Phase 1) upgrade project. The needed improvements to the Surfside WWTF are expected to progress over the next several years.

APPENDIX A

Needs Area Flow Calculations

NANTUCKET SEWER MASTER PLAN - HUMMOCK NORTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
2	AUSTIN FARM DR	F_1034714_2561965	R20	20,000	1	2	1	3272	0.96	4	440	330	270	270	
8	AUSTIN FARM DR	F_1035225_2562027	R20	20,000	1	2	1	2798	0.92	3	330	330	270	270	
3	BURNT SWAMP LN	F_1035618_2563970	R20	20,000	2	2	-	1257	1.01	1	110	-	270	-	
3	BURNT SWAMP LN	F_1035618_2563970	R20	N/A	N/A	N/A	N/A	620	N/A	1	110	-	270	-	
5	BURNT SWAMP LN	F_1035661_2564137	R20	20,000	1	3	2	1824	1.57	3	330	660	270	540	
7	BURNT SWAMP LN	F_1035607_2564206	R20	20,000	1	2	1	2223	1.15	3	330	330	270	270	
8	BURNT SWAMP LN	F_1035253_2564110	R2	20,000	1	3	2	2988	1.42	3	330	660	270	540	
9	BURNT SWAMP LN	-	R20	20,000	0	2	1	Vacant	1.04	Vacant	330	330	210	270	
11	BURNT SWAMP LN	F_1035483_2564388	R20	20,000	2	1	-	1765	0.81	3	330	-	270	-	
11	BURNT SWAMP LN	F_1035483_2564388	R2	N/A	N/A	N/A	N/A	664	N/A	1	110	-	270	-	Colonial w/ one bathroom (assume one bedroom)
14	BURNT SWAMP LN	F_1034675_2563858	LUG2	80,000	1	5	2	1323	9.66	2	220	660	270	540	1/2 Wetland
15	BURNT SWAMP LN	-	LUG3	120,000	0	4	3	Vacant	11.2	Vacant	330	990	270	540	
19	BURNT SWAMP LN	F_1034541_2564294	LUG2	80,000	1	1	-	2963	2.40	4	440	-	270	-	1/2 Wetland
20	BURNT SWAMP LN	F_1034289_2564073	R20	20,000	1	1	-	919	0.32	2	220	-	270	-	
188	CLIFF RD	F_1742420_104717	LUG1	40,000	1	1	-	2412	1.58	4	440	-	270	-	
190	CLIFF RD	F_1742271_104878	LUG1	40,000	2	1	-	852	1.18	1	110	-	270	-	
190	CLIFF RD	F_1742271_104878	LUG1	N/A	N/A	N/A	N/A	6797	N/A	5	550	-	270	-	
196	CLIFF RD	F_1741811_104684	LUG2	80,000	3	1	-	620	1.84	1	110	-	270	-	Guest Quarters (assume one bedroom)
196	CLIFF RD	F_1741811_104684	LUG2	N/A	N/A	N/A	N/A	3020	N/A	4	440	-	270	-	
196	CLIFF RD	F_1741811_104684	LUG2	N/A	N/A	N/A	N/A	768	N/A	2	220	-	270	-	
216	CLIFF RD		LUG2	80,000	1	1	-	2600	0.34	4	440	-	270	-	
218	CLIFF RD		LUG2	80,000	1	1	-	1812	1.84	2	220	-	270	-	
220	CLIFF RD		LUG2	80,000	1	1	-	5402	1.84	5	550		270	-	
3	DEER RUN RD	F_1033186_2562165	LUG2	80,000	1	1	-	2520	1.84	4	440	-	270	-	
4	DEER RUN RD	-	LUG2	80,000	0	1	-	Vacant	1.84	Vacant	330	-	270	-	
5	DEER RUN RD	F_1033105_2562397	LUG2	80,000	2	1	-	1996	1.84	3	330	-	270	-	
5	DEER RUN RD	F_1033105_2562397	LUG2	N/A	N/A	N/A	N/A	2115	N/A	3	330	-	270	-	
6	DEER RUN RD	F_1032849_2561570	LUG2	80,000	2	1	-	1033	1.84	2	220	-	270	-	
6	DEER RUN RD	F_1032849_2561570	LUG2	N/A	N/A	N/A	N/A	1502	N/A	3	330	-	270	-	
7	DEER RUN RD	F_1032972_2562572	LUG2	80,000	1	1	-	1432	1.84	2	220	-	270	-	
8	DEER RUN RD	F_1032644_2561734	LUG2	80,000	2	1	-	1271	1.84	1	110	-	270	-	Garage/Office (assume one bedroom)
8	DEER RUN RD	F_1032644_2561734	LUG2	N/A	N/A	N/A	N/A	2782	N/A	2	220	-	270	-	
9	DEER RUN RD	F_1032800_2562670	LUG2	80,000	1	1	-	5157	1.84	5	550	-	270	-	
10	DEER RUN RD	F_1032424_2561897	LUG2	80,000	1	1	-	2420	1.84	4	440	-	270	-	
11	DEER RUN RD	F_1032570_2562550	LUG2	80,000	1	1	-	2494	1.84	5	550	-	270	-	
13	DEER RUN RD	F_1032328_2562395	LUG2	80,000	1	1	-	2961	1.84	3	330	-	270	-	
14	DEER RUN RD	F_1032214_2562074	LUG2	80,000	1	1	-	3608	1.84	5	550	-	270	-	
15	DEER RUN RD	F_1032135_2562240	LUG2	80,000	1	1	-	3751	1.84	4	440	-	270	-	
16	DEER RUN RD	F_1032934_2561914	LUG2	80,000	1	1	-	2840	1.90	4	440	-	270	-	
17	DEER RUN RD	F_1032638_2562114	LUG2	80,000	2	1	-	4316	1.84	5	550	-	270	-	
17	DEER RUN RD	F_1032638_2562114	LUG2	N/A	N/A	N/A	N/A	664	N/A	2	220	-	270	-	
18	DEER RUN RD	F_1032795_2562232	LUG2	80,000	1	1	-	3329	1.85	3	330	-	270	-	
1	DEER RUN RD #1	F_1742750_98696	LUG1	40,000	1	1	-	555	0	2	220	-	270	-	6 Millbrook Rd #2
61	DUKES RD	-	LUG1	40,000	0	0	-	Vacant	0.76	Vacant	330	-	270	-	1/2 Wetland-Sewered
36	GROVE LN	-	R40	40,000	0	1	-	Vacant	1.83	Vacant	330	-	270	-	
38	GROVE LN	-	R40	40,000	0	1	-	Vacant	1.16	Vacant	330	-	270	-	Wetland
40	GROVE LN	-	R40	40,000	0	1	-	Vacant	1.8	Vacant	330	-	270	-	
54	GROVE LN	-	R40	40,000	0	2	-	Vacant	2.01	Vacant	330	-	270	-	
27	HAWTHORNE LN	-	LUG 1	40,000	0	0	-	Vacant	0.46	Vacant	330	-	270	-	1/2 Wetland-Sewered
25	HAWTHORNE LN	F_1034421_2565377	LUG1	40,000	1	0	-	1572	0.62	3	330	-	270	-	Wetland-Sewered
23	HAWTHORNE LN	-	LUG1	40,000	0	0	-	Vacant	0.47	Vacant	330	-	270	-	1/2 Wetland - Sewered
35	HAWTHORNE LN	-	LUG2	80,000	0	0	-	Vacant	1.8	Vacant	330	-	270	-	Wetland-Sewered
40	HAWTHORNE LN	F_1033120_2565510	LUG2	80,000	2	5	3	2421	9.36	2	220	-	270	0	Sewered
40	HAWTHORNE LN	F_1033120_2565510	LUG2	N/A	N/A	N/A	N/A	1071	N/A	2	220	-	270	-	Sewered
8	HICKORY MEADOW LN	-	LUG2	80,000	0	1	-	Vacant	1.84	Vacant	330	-	270	-	
10	HICKORY MEADOW LN	-	LUG2	80,000	0	1	-	Vacant	2.22	Vacant	330	-	270	-	
11	HICKORY MEADOW LN	-	LUG2	80,000	0	2	1	Vacant	4.87	Vacant	330	330	270	270	
8	HIGH BRUSH PA	F_1035412_2562134	R20	20,000	2	4	2	3360	2.24	4	440	660	270	540	
8	HIGH BRUSH PA	F_1035412_2562134	R20	N/A	N/A	N/A	N/A	503	N/A	1	110	-	270	-	
12	HIGH BRUSH PA	-	R40	40,000	0	1	-	Vacant	1.67	Vacant	330	-	540	-	1/3 Wetland
20	HIGH BRUSH PA	-	R40	40,000	0	2	1	Vacant	2.21	Vacant	330	330	540	270	1/2 Wetland
69	HUMMOCK POND RD	F_1035297_2563710	LUG2	80,000	1	1	-	1072	2.25	3	330	-	270	-	
71	HUMMOCK POND RD	F_1034972_2563558	LUG2	80,000	1	2	1	3678	5.7	3	330	330	270	270	1/3 Wetland
76	HUMMOCK POND RD	F_1035453_2563045	R20	20,000	1	1	-	1788	0.79	4	440	-	270	-	
78	HUMMOCK POND RD	F_1035427_2563376	R20	20,000	1	1	-	2144	0.48	4	440	-	270	-	
80	HUMMOCK POND RD	-	R2	20,000	0	1	-	Vacant	0.6	Vacant	330	-	270	-	Boat Yard
82	HUMMOCK POND RD	F_1035289_2563168	R20	20,000	1	3	2	544	1.39	1	110	660	270	540	Boat Yard

NANTUCKET SEWER MASTER PLAN - HUMMOCK NORTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
84	HUMMOCK POND RD	-	R20	20,000	0	12	11	Vacant	5.7	Vacant	330	3630	270	2970	Boat Yard
99	HUMMOCK POND RD	F_1034426_2562475	R20	20,000	1	2	1	2451	0.92	3	330	330	270	270	
103	HUMMOCK POND RD	F_1034522_2562102	R20	20,000	1	1	-	960	0.23	3	330	-	270	-	
111	HUMMOCK POND RD	F_1034318_2561818	R20	20,000	1	1	-	1176	0.58	2	220	-	270	-	
113	HUMMOCK POND RD	F_1034199_2561783	R20	20,000	1	1	-	1413	0.75	3	330	-	270	-	
115	HUMMOCK POND RD	F_1034066_2561756	R20	20,000	2	1	-	727	0.88	2	220	-	270	-	
115	HUMMOCK POND RD	F_1034066_2561756	R20	N/A	N/A	N/A	N/A	480	N/A	2	220	-	270	-	
119	HUMMOCK POND RD	F_1033891_2561686	R20	20,000	2	2	-	1799	1.06	3	330	-	270	-	
119	HUMMOCK POND RD	F_1033891_2561686	R2	N/A	N/A	N/A	N/A	263	N/A	1	110	-	270	-	
123	HUMMOCK POND RD	F_1033573_2561624	LUG2	80,000	1	1	-	868	2.63	3	330	-	270	-	
128	HUMMOCK POND RD	F_1033525_2561097	LUG2	80,000	1	1	-	2064	2.53	3	330	-	270	-	
135	HUMMOCK POND RD	-	LUG2	80,000	0	1	-	Vacant	1.84	Vacant	330	-	270	-	
137	HUMMOCK POND RD	F_1033178_2561363	LUG2	80,000	1	1	-	2286	1.84	5	550	-	270	-	
139	HUMMOCK POND RD	F_1033076_2561251	LUG2	80,000	1	1	-	1602	1.84	3	330	-	270	-	
141	HUMMOCK POND RD	F_1032978_2561104	LUG2	80,000	1	1	-	3903	2.3	4	440	-	270	-	
143	HUMMOCK POND RD	F_1032856_2560916	LUG2	80,000	1	1	-	1830	1.84	3	330	-	270	-	
35	MADAKET RD		R40	40,000	2	4	-	1707	3.79	2	220		270		1/2 Wetland
35	MADAKET RD		R40	N/A	N/A	N/A	N/A	568	N/A	1	110		270		1/2 Wetland
60	MADAKET RD	F_1035296_2566134	LUG1	40,000	2	6	2	2448	5.84	3	330	660	270	540	1/2 Wetland
60	MADAKET RD	F_1035296_2566134	LUG1	N/A	N/A	N/A	N/A	432	N/A	1	110	-	270	-	
74	MADAKET RD	-	LUG2	80,000	0	1	-	Vacant	2.35	Vacant	330	-	270	-	1/2 Wetland
76	MADAKET RD	-	LUG2	80,000	0	1	-	Vacant	2.59	Vacant	330	-	270	-	1/2 Wetland
79	MADAKET RD	F_1743518_103460	LUG2	80,000	1	1	-	2625	0.46	3	330	-	270	-	
80	MADAKET RD		LUG2	80,000	0	16	11	Vacant	30.85	Vacant	330	3630	270	1890	1/4 Wetland
86	MADAKET RD	F_1033473_2566560	LUG2	80,000	3	1	-	596	2.08	2	220	-	270	-	
86	MADAKET RD	F_1033473_2566560	LUG2	N/A	N/A	N/A	N/A	1368	N/A	2	220	-	270	-	
86	MADAKET RD	F_1033473_2566560	LUG2	N/A	N/A	N/A	N/A	360	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
88	MADAKET RD	F_1033274_2566536	LUG2	80,000	1	1	-	3798	1.84	5	550	-	270	-	
96	MADAKET RD		LUG2	80,000	0	1	-	Vacant	3.01	Vacant	330	-	270	-	
100	MADAKET RD	F_1032246_2566324	LUG2	80,000	2	1	-	960	3.01	2	220	-	270	-	
100	MADAKET RD	F_1032246_2566324	LUG2	N/A	N/A	N/A	N/A	1632	N/A	3	330	-	270	-	
107	MADAKET RD	F_1741930_103511	LUG2	80,000	2	1	-	1224	2.49	1	110	-	270	-	Guest Quarters (assume one bedroom)
107	MADAKET RD	F_1741930_103511	LUG2	N/A	N/A	N/A	N/A	5442	N/A	4	440	-	270	-	
109	MADAKET RD	F_1741665_103592	LUG2	80,000	2	1	-	5427	2.85	5	550	-	270	-	Small wetland area
109	MADAKET RD	F_1741665_103592	LUG2	N/A	N/A	N/A	N/A	496	N/A	1	110	-	270	-	
112	MADAKET RD	F_1031643_2566291	LUG3	120,000	2	8	4	756	23.06	1	110	1320	270	1080	1/3 wetland area
112	MADAKET RD	F_1031643_2566291	LUG3	N/A	N/A	N/A	N/A	4429	N/A	6	660	-	270	-	
117	MADAKET RD		LUG2	80,000	2	2	-	6615	4.35	5	550	-	270	-	
117	MADAKET RD		LUG2	N/A	N/A	N/A	N/A	2082	N/A	3	330	-	270	-	
121	MADAKET RD		LUG2	80,000	2	1	-	1457	3.4	2	220	-	270	-	
121	MADAKET RD		LUG2	N/A	N/A	N/A	N/A	342	N/A	1	110	-	270	-	
123	MADAKET RD		LUG2	80,000	1	1	-	3648	2	4	440	-	270	-	
74A	MADAKET RD	-	LUG2	80,000	2	1	-	5076	2.44	5	550	-	270	-	1/2 Wetland
74A	MADAKET RD	-	LUG2	N/A	N/A	N/A	N/A	708	N/A	1	110	-	270		
76A	MADAKET RD	-	LUG2	80,000	1	1	-	4688	2.58	5	550	-	270	-	1/2 Wetland
1	MAXEY POND RD	F_1033247_2566900	LUG2	80,000	1	1	-	4558	1.94	4	440	-	270	-	
2	MAXEY POND RD	F_1032857_2566894	LUG2	80,000	2	1	-	2999	1.99	4	440	-	270	-	
2	MAXEY POND RD	F_1032857_2566894	LUG2	N/A	N/A	N/A	N/A	348	N/A	1	110		270	-	
3	MAXEY POND RD	F_1742681_103698	LUG2	80,000	2	1	-	975	2.00	2	220	-	270	-	
3	MAXEY POND RD	F_1742681_103698	LUG2	N/A	N/A	N/A	N/A	2578	N/A	4	440	-	270	-	
4	MAXEY POND RD	F_1742226_103712	LUG2	80,000	2	1	-	3666	1.98	3	330	-	270	-	
4	MAXEY POND RD	F_1742226_103712	LUG2	N/A	N/A	N/A	N/A	1048	N/A	1	110	-	270	-	
5	MAXEY POND RD	F_1742677_103909	LUG2	80,000	2	1	-	726	2.46	1	110	-	270	-	Guest Quarters (assume one bedroom)
5	MAXEY POND RD	F_1742677_103909	LUG2	N/A	N/A	N/A	N/A	4257	N/A	3	330	-	270	-	
6	MAXEY POND RD	F_1741994_103884	LUG2	80,000	2	1	-	4554	2.13	4	440	-	270	-	
6	MAXEY POND RD	F_1741994_103884	LUG2	N/A	N/A	N/A	N/A	972	N/A	2	220	-	270	-	
7	MAXEY POND RD	F_1742509_104082	LUG2	80,000	2	1	-	1315	2.37	2	220	-	270	-	
7	MAXEY POND RD	F_1742509_104082	LUG2	N/A	N/A	N/A	N/A	3743	N/A	4	440	-	270	-	
8	MAXEY POND RD	F_1741645_103938	LUG2	80,000	2	1	-	959	2.82	2	220	-	270	-	
8	MAXEY POND RD	F_1741645_103938	LUG2	N/A	N/A	N/A	N/A	7153	N/A	5	550	-	270	-	
10	MAXEY POND RD		LUG2	80,000	0	1	-	Vacant	3.07	Vacant	330	-	270	-	
11	MAXEY POND RD	F_1742181_104385	LUG2	80,000	2	1	-	3982	2.49	5	550	-	270	-	
11	MAXEY POND RD	F_1742181_104385	LUG2	N/A	N/A	N/A	N/A	1459	N/A	2	220	-	270	-	
13	MAXEY POND RD	F_1741936_104358	LUG2	80,000	2	1	-	642	2.49	1	110	-	270	-	
13	MAXEY POND RD	F_1741936_104358	LUG2	N/A	N/A	N/A	N/A	6227	N/A	6	660	-	270	-	
3	MILLBROOK RD	F_1033867_2561826	R2	20,000	2	1	-	832	0.40	2	220	-	270	-	

NANTUCKET SEWER MASTER PLAN - HUMMOCK NORTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
3	MILLBROOK RD	F_1033867_2561826	R20	N/A	N/A	N/A	N/A	1858	N/A	3	330	-	270	-	
4	MILLBROOK RD	F_1033469_2561895	LUG2	80,000	1	1	-	4096	2.62	4	440	-	270	-	
5	MILLBROOK RD	-	R20	20,000	0	8	3	Vacant	4.03	Vacant	330	990	270	810	1/2 Wetland
7	MILLBROOK RD	-	LUG2	80,000	0	1	-	Vacant	0.47	Vacant	330	-	270	-	
8	MILLBROOK RD	F_1033416_2562328	LUG2	80,000	1	1	-	1904	1.00	4	440	-	270	-	
9	MILLBROOK RD	F_1033583_2562695	LUG2	80,000	1	3	2	2096	8.14	3	330	660	270	540	1/3 Wetland
10	MILLBROOK RD	F_1033340_2562518	LUG2	80,000	1	1	-	5576	1.05	6	660	-	270	-	
14	MILLBROOK RD	F_1033140_2562810	LUG2	80,000	1	1	-	1350	2.82	1	110	-	270	-	
25	MILLBROOK RD	F_1034001_2563258	R20	20,000	1	13	12	283	9.46	-	21	3960	270	3240	Garden Center/Commercial- 1/3 wetland
29	MILLBROOK RD	F_1033709_2563514	R20	20,000	1	1	-	1458	0.46	3	330	-	270	-	
31	MILLBROOK RD	F_1033884_2563516	R20	20,000	1	1	-	1788	0.46	3	330	-	270	-	
33	MILLBROOK RD	F_1034076_2563516	R20	20,000	1	1	-	1440	0.46	3	330	-	270	-	
35	MILLBROOK RD	F_1034235_2563546	R20	20,000	1	1	-	2830	0.50	3	330	-	270	-	
37	MILLBROOK RD	F_1034146_2563750	R20	20,000	3	2	-	1008	1.36	1	110	-	270	-	
37	MILLBROOK RD	F_1034146_2563750	R20	N/A	N/A	N/A	N/A	1028	N/A	1	110	-	270	-	
37	MILLBROOK RD	F_1034146_2563750	R20	N/A	N/A	N/A	N/A	1120	N/A	2	220	-	270	-	
39	MILLBROOK RD	F_1033905_2563676	R20	20,000	2	1	-	823	0.65	1	110	-	270	-	
39	MILLBROOK RD	F_1033905_2563676	R20	N/A	N/A	N/A	N/A	2008	N/A	2	220	-	270	-	
41	MILLBROOK RD	F_1033738_2563709	R20	20,000	2	1	-	928	0.48	2	220	-	270	-	
41	MILLBROOK RD	F_1033738_2563709	R20	N/A	N/A	N/A	N/A	3737	N/A	3	330	-	270	-	
43	MILLBROOK RD	F_1033812_2563846	R20	20,000	1	1	-	3111	0.48	3	330	-	270	-	
45	MILLBROOK RD	F_1034039_2563942	R20	20,000	1	1	-	1973	2.03	2	220	-	270	-	Mostly wetland
47	MILLBROOK RD	F_1034051_2564103	R20	20,000	1	3	2	3197	1.44	3	330	660	270	540	
49	MILLBROOK RD	F_1034318_2564748	LUG1	40,000	1	1	-	496	1.29	1	110	-	270	-	
49	MILLBROOK RD	F_1034318_2564748	LUG1	N/A	N/A	N/A	N/A	1535	N/A	3	330	-	270	-	
51	MILLBROOK RD	F_1034394_2564550	LUG2	80,000	2	1	-	2176	2.27	5	550	-	270	-	
51	MILLBROOK RD	F_1034394_2564550	LUG2	N/A	N/A	N/A	N/A	336	N/A	1	110	-	270	-	
51	MILLBROOK RD	-	LUG2	80,000	0	1	-	Vacant	0.21	Vacant	330	-	270	-	
53	MILLBROOK RD	F_1033987_2564588	LUG1	40,000	1	1	-	768	0.65	2	220	-	270	-	
55	MILLBROOK RD	F_1033813_2564518	LUG1	40,000	2	2	-	5912	2.03	4	440	-	270	-	
55	MILLBROOK RD	F_1033813_2564518	LUG1	N/A	N/A	N/A	N/A	1349	N/A	2	220	-	270	-	
61	MILLBROOK RD	-	LUG1	40,000	0	1	-	Vacant	1.03	Vacant	330	-	270	-	
68	MILLBROOK RD	F_1032689_2564597	LUG2	80,000	2	2	-	3457	3.69	4	440	-	270	-	
68	MILLBROOK RD	F_1032689_2564597	LUG2	N/A	N/A	N/A	N/A	592	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
72	MILLBROOK RD	F_1032700_2564939	LUG2	80,000	2	1	-	3379	2.14	4	440	-	270	-	
72	MILLBROOK RD	F_1032700_2564939	LUG2	N/A	N/A	N/A	N/A	460	N/A	1	110	-	270	-	
74	MILLBROOK RD	F_1032475_2564839	LUG2	80,000	2	1	-	2648	2.15	3	330	-	270	-	
74	MILLBROOK RD	F_1032475_2564839	LUG2	N/A	N/A	N/A	N/A	1323	N/A	1	110	-	270	-	
75	MILLBROOK RD	-	LUG2	80,000	0	1	-	Vacant	0.46	Vacant	330	-	270	-	
76	MILLBROOK RD	F_1032382_2565071	LUG2	80,000	1	1	-	2979	3.15	3	330	-	270	-	
77	MILLBROOK RD	-	LUG2	80,000	0	1	-	Vacant	0.46	Vacant	330	-	270	-	
78	MILLBROOK RD	F_1032420_2565356	LUG2	80,000	1	1	-	4822	3.08	4	440	-	270	-	1/2 Wetland
80	MILLBROOK RD	F_1032233_2565748	LUG2	80,000	3	1	-	6445	3.34	5	550	-	270	-	Mostly wetland
80	MILLBROOK RD	F_1032233_2565748	LUG2	N/A	N/A	N/A	N/A	714	N/A	1	110	-	270	-	
80	MILLBROOK RD	F_1032233_2565748	LUG2	N/A	N/A	N/A	N/A	6445	N/A	5	550	-	270	-	
81	MILLBROOK RD	F_1033022_2565835	LUG2	80,000	1	1	-	4289	3.06	4	440	-	270	-	
82	MILLBROOK RD	F_1032526_2566022	LUG2	80,000	2	1	-	5287	3.40	5	550	-	270	-	
82	MILLBROOK RD	F_1032526_2566022	LUG2	N/A	N/A	N/A	N/A	1391	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
83	MILLBROOK RD	-	LUG2	80,000	0	1	-	Vacant	0.46	Vacant	330	-	270	-	
84	MILLBROOK RD	F_1032472_2566327	LUG2	80,000	1	1	-	2471	1.66	4	440	-	270	-	
85	MILLBROOK RD	F_1033015_2566191	LUG2	80,000	2	1	-	708	2.26	2	220	-	270	-	
85	MILLBROOK RD	F_1033015_2566191	LUG2	N/A	N/A	N/A	N/A	7407	N/A	4	440	-	270	-	
87	MILLBROOK RD	F_1033007_2566522	LUG2	80,000	1	1	-	2601	1.95	3	330	-	270	-	
53R	MILLBROOK RD	-	LUG1	40,000	0	1	-	Vacant	0.46	Vacant	330	-	270	-	
84R	MILLBROOK RD	F_1032417_2566613	LUG2	80,000	1	1	-	1425	1.00	3	330	-	270	-	
6	MILLBROOK RD #2	-	LUG2	80,000	1	1		1792	0	3	330	-	270	-	#1 Deerbrook #1
8	NANAHUMACKE LN	F_1032567_2561121	LUG2	80,000	1	1	-	3813	0.29	5	550	-	270	-	
9	NANAHUMACKE LN	F_1032720_2561157	LUG2	80,000	1	1	-	220	0.29	1	110	-	270	-	
9	NANAHUMACKE LN	F_1032720_2561157	LUG2	80,000	1	1	-	2190	0.29	4	440	-	270	-	
10	NANAHUMACKE LN	F_1032579_2561237	LUG2	80,000	1	1	-	4926	0.29	4	440	-	270	-	
11	NANAHUMACKE LN	F_1032737_2561295	LUG2	80,000	1	1	-	4286	0.29	4	440	-	270	-	
12	NANAHUMACKE LN	F_1032566_2561352	LUG2	80,000	1	1	-	3002	0.29	4	440	-	270	-	
14	NANAHUMACKE LN	F_1032521_2561453	LUG2	80,000	1	1	-	3069	0.29	4	440	-	270	-	
16	NANAHUMACKE LN		LUG2	80,000	0	1	-	Vacant	0.29	Vacant	330	-	270	-	
17	NANAHUMACKE LN	F_1032332_2561654	LUG2	80,000	2	1	-	518	0.29	1	110	-	270	-	
17	NANAHUMACKE LN	F_1032332_2561654	LUG2	N/A	N/A	N/A	N/A	4094	N/A	4	440	-	270	-	

NANTUCKET SEWER MASTER PLAN - HUMMOCK NORTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
18	NANAHUMACKE LN	F_1032308_2561487	LUG2	80,000	1	1	-	5996	0.29	4	440	-	270	-	
19	NANAHUMACKE LN	F_1032195_2561616	LUG2	80,000	1	1	-	2918	0.29	4	440	-	270	-	
20	NANAHUMACKE LN	F_1032145_2561386	LUG2	80,000	1	1	-	3971	0.29	4	440	-	270	-	
21	NANAHUMACKE LN	F_1032088_2561602	LUG2	80,000	1	1	-	4965	0.29	4	440	-	270	-	
22	NANAHUMACKE LN	F_1032039_2561423	LUG2	80,000	1	1	-	4237	0.29	4	440	-	270	-	
3	NANCYS LN	-	LUG2	80,000	0	1	-	Vacant	0.94	Vacant	330	-	270	-	
1	NEW HUMMOCK CI	F_1035054_2562080	R20	20,000	1	2	1	3254	0.92	3	330	330	270	270	
2	NEW HUMMOCK CI	-	R20	20,000	0	2	1	Vacant	0.98	Vacant	330	330	270	270	
3	NEW HUMMOCK CI	F_1035175_2562252	R20	20,000	1	2	1	4982	0.93	5	550	330	270	270	
4	NEW HUMMOCK CI	-	R2	20,000	0	2	1	Vacant	0.92	Vacant	330	330	270	270	
5	NEW HUMMOCK CI	F_1035047_2562402	R20	20,000	1	2	-	3166	0.92	4	440	-	270	-	1/2 wetland
6	NEW HUMMOCK CI	F_1034828_2562423	R20	20,000	1	2	-	1996	0.98	3	330	-	270	-	1/2 wetland
8	NEW HUMMOCK CI	F_1034918_2562491	R20	20,000	1	2	-	3135	0.92	5	550	-	270	-	1/2 wetland
14	OAK HOLLOW LN	-	R40	40,000	1	7	2	1770	6.88	3	330	660	270	540	1/3 wetland
88	VESTAL STREET	-	R20	20,000	1	2	-	2288	1.04	3	330		270		
84	VESTAL STREET	-	R20	20,000	1	1	-	864	0.6	2	220		270		
80	VESTAL STREET	-	R20	20,000	1	1	-	2216	0.66	3	330		270		
78	VESTAL STREET	-	R20	20,000	1	1	-	Vacant	0.7	Vacant	330		270		
74	VESTAL STREET	-	R20	20,000	1	2	-	2512	1.27	4	440		270		
91	VESTAL STREET	-	R20	20,000	2	1	-	784	0.47	2	220		270		
91	VESTAL STREET	-	R20	N/A	N/A	N/A	N/A	2408	N/A	3	330		270		
92	VESTAL STREET	-	R20	20,000	1	2	-	1362	0.93	3	330		270		
81	VESTAL STREET	-	R20	20,000	0	1	-	Vacant	0.32	3	330		270		
83	VESTAL STREET	-	R20	20,000	0	1	-	Vacant	0.31	3	330		270		
1	W CHESTER EXT	-	LUG2	80,000	1	5	2	11385	9.9	6	660	660	270	270	1/3 Wetland
2	WANNACOMET RD	-	LUG1	80,000	1	1	-	3562	1.97	5	550	-	270	-	
3	WANNACOMET RD	-	LUG3	120,000	0	1	-	Vacant	0.89	Vacant	330	-	270	-	
4	WANNACOMET RD	-	LUG2	80,000	2	1	-	3125	2	4	440	-	270	-	
4	WANNACOMET RD	-	LUG2	N/A	N/A	N/A	N/A	318	N/A	1	110	-	270	-	
5	WANNACOMET RD	F_1743176_103939	LUG2	80,000	2	1	-	969	3.40	2	220	-	270	-	
5	WANNACOMET RD	F_1743176_103939	LUG2	N/A	N/A	N/A	N/A	2044	N/A	4	440	-	270	-	
9	WANNACOMET RD	F_1743005_104282	LUG2	80,000	1	1	-	2336	3.30	2	220	-	270	-	
12	WANNACOMET RD	F_1742346_104270	LUG2	80,000	2	1	-	376	2.31	1	110	-	270	-	Guest Quarters (assume one bedroom)
12	WANNACOMET RD	F_1742346_104270	LUG2	N/A	N/A	N/A	N/A	5570	N/A	5	550	-	270	-	
15	WANNACOMET RD	F_1742814_104509	LUG2	80,000	1	1	-	2370	2.70	4	440	-	270	-	
16	WANNACOMET RD	F_1742037_104713	LUG2	80,000	2	1	-	3083	1.84	4	440	-	270	-	
16	WANNACOMET RD	F_1742037_104713	LUG2	N/A	N/A	N/A	N/A	1205	N/A	2	220	-	270	-	
17	WANNACOMET RD	F_1742573_104549	LUG1	40,000	1	1	-	4049	0.92	5	550	-	270	-	
								SUBTOTAL		**591**	**77571**	**25080**	**64470**	**18900**	

Total Number of Lots	183
Total Number of Vacant Lots	38
Total Number of Lots with one (1) Dwelling	95
Total Number of Lots with Multiple Existing Dwellings	49
Total Number of Lots with Multiple Future Dwellings	29
Number of Existing Bedrooms	591
Number of Future Bedrooms	342
Total Number of Bedrooms	933
Average Number of Bedrooms per Lot	3.6

Percentage of Lots with Multiple Dwellings (Existing and Future)	43%
Projected Percentage of Lots with Multiple Dwellings (Future)	60%
Additional Percentage of Lots with Multiple Dwellings (Future)	17%
Number of Additional Future Secondary Dwellings	31

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**68,800**	**83,400**
ADF for Additional Future Secondary Dwellings (gpd)	**6,900**	**8,400**
Total Average Daily Flow	**76,000**	**92,000**
Peaking Factor (determined from ASCE MOP9)	**5.8**	**5.8**
Peak Flow (gpd)	**440,800**	**533,600**
Infiltration and Inflow (I/I) Allowance (3)	**11,700**	**11,700**
Total Peak Flow including I/I allowance (gpd)	**452,500**	**545,300**

Notes:

(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)

(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.

(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers

(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

NANTUCKET SEWER MASTER PLAN - HUMMOCK SOUTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
2	AHAB DR	F_1029767_2558032	LUG2	80,000	2	1	-	780	0.63	1	110	-	270	-	Guest Quarters (assume one bedroom)
2	AHAB DR	F_1029767_2558032	LUG2	N/A	N/A	N/A	N/A	1440	N/A	3	330	-	270	-	
4	AHAB DR	F_1029798_2557922	LUG2	80,000	1	1	-	2312	0.52	4	440	-	270	-	
6	AHAB DR	F_1029856_2557800	LUG2	80,000	1	1	-	1440	0.62	3	330	-	270	-	
7	AHAB DR	F_1029774_2557606	LUG2	80,000	2	1	-	720	0.78	1	110	-	270	-	
7	AHAB DR	F_1029774_2557606	LUG2	N/A	N/A	N/A	N/A	2397	N/A	5	550	-	270	-	
8	AHAB DR	F_1029979_2557849	LUG2	80,000	1	1	-	1440	0.64	3	330	-	270	-	
9	AHAB DR	F_1029922_2557619	LUG2	80,000	2	1	-	1440	0.52	3	330	-	270	-	
9	AHAB DR	F_1029922_2557619	LUG2	N/A	N/A	N/A	N/A	608	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
11	AHAB DR	F_1030148_2557623	LUG2	80,000	2	1	-	390	0.64	1	110	-	270	-	Guest Quarters (assume one bedroom)
11	AHAB DR	F_1030148_2557623	LUG2	N/A	N/A	N/A	N/A	1440	N/A	3	330	-	270	-	
12	AHAB DR	F_1030131_2557896	LUG2	80,000	2	1	-	1824	0.58	3	330	-	270	-	
12	AHAB DR	F_1030131_2557896	LUG2	N/A	N/A	N/A	N/A	552	N/A	1	110	-	270	-	
14	AHAB DR	F_1030246_2557842	LUG2	80,000	1	1	-	1440	0.54	3	330	-	270	-	
16	AHAB DR	F_1030320_2557740	LUG2	80,000	1	1	-	1440	0.49	3	330	-	270	-	
17	AHAB DR	F_1030214_2557446	LUG2	80,000	1	1	-	1648	0.66	4	440	-	270	-	
18	AHAB DR	F_1030388_2557596	LUG2	80,000	1	1	-	1584	0.52	3	330	-	270	-	
19	AHAB DR	F_1030325_2557362	LUG2	80,000	1	1	-	1548	0.64	3	330	-	270	-	
20	AHAB DR	F_1030514_2557526	LUG2	80,000	1	1	-	1440	0.58	3	330	-	270	-	
21	AHAB DR	F_1030429_2557283	LUG2	80,000	1	1	-	1764	0.46	4	440	-	270	-	
22	AHAB DR	F_1030607_2557462	LUG2	80,000	1	1	-	1692	0.69	4	440	-	270	-	
24	AHAB DR	F_1030662_2557334	LUG2	80,000	1	1	-	2661	0.57	3	330	-	270	-	
26	AHAB DR	F_1030699_2557218	LUG2	80,000	2	1	-	726	0.47	1	110	-	270	-	Guest Quarters (assume one bedroom)
26	AHAB DR	F_1030699_2557218	LUG2	N/A	N/A	N/A	N/A	1644	N/A	3	330	-	270	-	
28	AHAB DR	F_1030726_2557095	LUG2	80,000	1	1	-	1440	0.56	3	330	-	270	-	
30	AHAB DR	F_1030730_2556978	LUG2	80,000	2	1	-	1584	0.58	3	330	-	270	-	
30	AHAB DR	F_1030730_2556978	LUG2	N/A	N/A	N/A	N/A	941	N/A	1	110	-	270	-	
32	AHAB DR	F_1030683_2556883	LUG2	80,000	1	1	-	1520	0.57	3	330	-	270	-	
34	AHAB DR	F_1030645_2556794	LUG2	80,000	1	1	-	2440	0.57	4	440	-	270	-	
1	AUSTINE LOCKE WY	F_1029526_2556757	LUG2	80,000	1	1	-	2440	0.68	4	440	-	270	-	
3	AUSTINE LOCKE WY	F_1029468_2556634	LUG2	80,000	1	1	-	2984	0.70	4	440	-	270	-	
5	AUSTINE LOCKE WY	F_1029411_2556512	LUG2	80,000	1	1	-	4656	0.67	4	440	-	270	-	
9	AUSTINE LOCKE WY	F_1029296_2556270	LUG2	80,000	1	1	-	2728	0.65	3	330	-	270	-	
13	AUSTINE LOCKE WY	F_1029166_2555965	LUG2	80,000	1	1	-	3141	0.78	5	550	-	270	-	
15	AUSTINE LOCKE WY	F_1029092_2555813	LUG2	80,000	1	1	-	1888	0.72	3	330	-	270	-	
17	AUSTINE LOCKE WY	F_1029024_2555668	LUG2	80,000	1	1	-	1712	0.72	3	330	-	270	-	
19	AUSTINE LOCKE WY	F_1028958_2555523	LUG2	80,000	1	1	-	3410	0.72	5	550	-	270	-	
1	CAROLINE WY	F_1028858_2555312	LUG2	80,000	1	1	-	1870	1.50	4	440	-	270	-	
3	CAROLINE WY	F_1028576_2555323	LUG2	80,000	1	1	-	4104	1.17	4	440	-	270	-	
5	CAROLINE WY	F_1028415_2555383	LUG2	80,000	1	1	-	4113	1.39	4	440	-	270	-	
8	CAROLINE WY	F_1028387_2554892	LUG3	120,000	1	1	-	1837	0.55	3	330	-	270	-	
12	CAROLINE WY	F_1028091_2554989	LUG3	120,000	1	1	-	1837	0.71	3	330	-	270	-	
3	CUDWEED	F_1030961_2556346	MMD	435,600	2	1	-	768	1.84	1	110	-	270	-	
3	CUDWEED	F_1030961_2556346	MMD	N/A	N/A	N/A	N/A	2944	N/A	3	330	-	270	-	
5	CUDWEED	F_1030874_2556158	MMD	435,600	1	1	-	3491	1.84	5	550	-	270	-	
1	DAVIS LN	F_1029270_2556841	LUG2	80,000	1	1	-	2604	0.71	4	440	-	270	-	
3	DAVIS LN	F_1029213_2556721	LUG2	80,000	1	1	-	2220	0.71	3	330	-	270	-	
5	DAVIS LN	F_1029157_2556598	LUG2	80,000	1	1	-	1777	0.71	4	440	-	270	-	
6	DAVIS LN	F_1029352_2556390	LUG2	80,000	1	1	-	2304	0.67	4	440	-	270	-	
7	DAVIS LN	F_1029099_2556475	LUG2	80,000	1	1	-	3797	0.71	6	660	-	270	-	
9	DAVIS LN	F_1029042_2556351	LUG2	80,000	1	1	-	2976	0.71	4	440	-	270	-	
11	DAVIS LN	F_1028976_2556227	LUG2	80,000	1	1	-	3124	0.75	4	440	-	270	-	
1	FALMOUTH AV	F_1028073_2555275	LUG2	80,000	1	1	-	3544	0.24	4	440	-	270	-	
3	FALMOUTH AV	F_1028004_2555303	LUG2	80,000	1	1	-	2501	0.23	3	330	-	270	-	
9	FALMOUTH AV	F_1027559_2555477	LUG2	80,000	1	1	-	3575	0.70	4	440	-	270	-	
3	HELLER WY	F_1029094_2556979	LUG2	80,000	1	1	-	2520	1.30	4	440	-	270	-	
5	HELLER WY	F_1029331_2556966	LUG2	80,000	2	1	-	525	0.77	1	110	-	270	-	
5	HELLER WY	F_1029331_2556966	LUG2	N/A	N/A	N/A	N/A	3796	N/A	4	440	-	270	-	
7	HELLER WY	F_1029587_2556878	LUG2	80,000	1	1	-	2520	0.71	3	330	-	270	-	
14	HELLER WY	F_1030093_2557069	LUG2	80,000	1	1	-	3576	2.00	5	550	-	270	-	
187	HUMMOCK POND RD	F_1030684_2559249	R20	20,000	1	1	-	1862	0.49	3	330	-	270	-	
189	HUMMOCK POND RD	-	R20	20,000	1	2	1	2228	1.06	4	440	330	270	270	
190	HUMMOCK POND RD	-	LUG2	80,000	0	1	-	Vacant	2	Vacant	330	-	270	-	

NANTUCKET SEWER MASTER PLAN - HUMMOCK SOUTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
191	HUMMOCK POND RD		R20	20,000	1	1	-	Vacant	0.46	Vacant	330	-	270	-	
192	HUMMOCK POND RD	F_1030656_2558602	LUG2	80,000	1	1	-	3656	3	3	330	-	270	-	
193	HUMMOCK POND RD	F_1030156_2558867	R2	20,000	1	1	-	1605	0.51	3	330	-	270	-	
194	HUMMOCK POND RD	F_1030575_2558452	LUG2	80,000	1	1	-	3560	3	4	440	-	270	-	
196	HUMMOCK POND RD	-	LUG2	80,000	0	1	-	Vacant	2.03	Vacant	330	-	270	-	
197	HUMMOCK POND RD	-	R20	20,000	1	2	1	896	1.06	2	220	330	270	270	
198	HUMMOCK POND RD	F_1030266_2558349	LUG2	80,000	2	1	-	1736	2	3	330	-	270	-	
198	HUMMOCK POND RD	F_1030266_2558349	LUG2	N/A	N/A	N/A	N/A	384	N/A	1	110	-	270	-	
199	HUMMOCK POND RD	F_1029884_2558811	R20	20,000	1	3	2	928	1.54	2	220	660	270	540	
200	HUMMOCK POND RD	F_1030139_2558275	LUG2	80,000	2	1	-	3787	1.84	4	440	-	270	-	
200	HUMMOCK POND RD	F_1030139_2558275	LUG2	N/A	N/A	N/A	N/A	1440	N/A	2	220	-	270	-	
201	HUMMOCK POND RD	F_1029565_2558734	R20	20,000	1	10	9	2245	4.7	3	330	2970	270	2430	
205	HUMMOCK POND RD	F_1029701_2558479	R20	20,000	1	2	1	3056	1.02	3	330	330	270	270	
205R	HUMMOCK POND RD	-	LUG2	80,000	3	1	-	1793	1.44	1	110	-	270	-	
205R	HUMMOCK POND RD	-	LUG2	N/A	N/A	N/A	N/A	520	N/A	2	220	-	270	-	
205R	HUMMOCK POND RD	-	LUG2	N/A	N/A	N/A	N/A	680	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
207	HUMMOCK POND RD	-	R2	20,000	0	2	1	Vacant	1.02	Vacant	330	330	270	270	
209	HUMMOCK POND RD	F_1029527_2558264	R20	20,000	1	2	1	2298	1.02	4	440	330	270	270	
211	HUMMOCK POND RD	F_1028920_2558145	LUG2	80,000	1	9	8	768	22.15	2	220	2640	270	2160	1/4 Wetland
215	HUMMOCK POND RD		LUG2	80,000	0	1	-	Vacant	1.88	Vacant	330	-	270	-	
219	HUMMOCK POND RD	F_1028289_2557422	LUG2	80,000	1	3	2	648	5.55	1	110	660	270	540	
233	HUMMOCK POND RD	F_1028043_2557010	R20	20,000	2	1	-	3348	0.78	4	440	-	270	-	
233	HUMMOCK POND RD	F_1028043_2557010	R20	N/A	N/A	N/A	N/A	400	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
235	HUMMOCK POND RD	F_1027905_2556955	R20	20,000	1	2	1	2236	0.92	3	330	330	270	270	
239	HUMMOCK POND RD	F_1027636_2556847	R20	20,000	2	2	-	360	1	1	110	-	270	-	Guest Quarters (assume one bedroom)
239	HUMMOCK POND RD	F_1027636_2556847	R20	N/A	N/A	N/A	N/A	1666	N/A	3	330	-	270	-	
240	HUMMOCK POND RD	-	LUG3	120,000	0	2	1	Vacant	5.6	Vacant	330	330	270	270	
241	HUMMOCK POND RD	F_1027548_2556730	R20	20,000	1	1	-	1892	0.49	3	330	-	270	-	
243	HUMMOCK POND RD	F_1027438_2556677	R20	20,000	2	1	-	3460	0.53	4	440	-	270	-	
243	HUMMOCK POND RD	F_1027438_2556677	R20	N/A	N/A	N/A	N/A	144	N/A	1	110	-	270	-	
245	HUMMOCK POND RD		R20	20,000	2	1	-	2689	0.57	4	440	-	270	-	
245	HUMMOCK POND RD		R20	N/A	N/A	N/A	N/A	312	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
249	HUMMOCK POND RD	F_1027025_2556432	R20	20,000	1	1	-	1412	0.46	4	440	-	270	-	
251	HUMMOCK POND RD	F_1026907_2556365	R20	20,000	1	1	-	2244	0.48	3	330	-	270	-	
253	HUMMOCK POND RD	F_1026732_2556389	R20	20,000	1	4	3	3256	1.93	4	440	990	270	810	
257	HUMMOCK POND RD	F_1026592_2556513	R20	20,000	1	4	3	2852	1.93	4	440	990	270	810	
273	HUMMOCK POND RD	F_1025488_2555953	VR	20,000	1	1	-	5282	0.51	3	330	-	270	-	1 Mothball Way Ext- blg limit due to erosion
281	HUMMOCK POND RD	F_1025245_2556154	VR	20,000	3	11	4	484	5.13	1	110	1320	270	1080	3 Mothball Way Ext- blg limit due to erosion
281	HUMMOCK POND RD	F_1025245_2556154	VR	N/A	N/A	N/A	N/A	806	N/A	1	110	-	270	-	3 Mothball Way Ext- blg limit due to erosion
281	HUMMOCK POND RD	F_1025245_2556154	VR	N/A	N/A	N/A	N/A	1044	N/A	3	330	-	270	-	3 Mothball Way Ext- blg limit due to erosion
283	HUMMOCK POND RD	F_1024798_2556209	VR	20,000	1	6	-	2070	3	2	220	-	270	-	
287	HUMMOCK POND RD	F_1024532_2556222	VR	20,000	1	3	-	1584	1.41	3	330	-	270	-	
289	HUMMOCK POND RD	F_1024298_2556217	VR	20,000	1	3	-	1638	1.4	2	220	-	270	-	Dune
195B	HUMMOCK POND RD	F_1029695_2559103	R20	20,000	3	1	-	2224	-	3	330	-	270	-	
195C	HUMMOCK POND RD	F_1738993_95697	R20	20,000	1	1	-	4284	-	5	550	-	270	-	
199A	HUMMOCK POND RD	-	R20	20,000	1	2	1	-	1.95	3	330	330	270	270	
2	ISHMAEL RD	F_1029608_2557076	LUG2	80,000	2	1	-	632	0.63	1	110	-	270	-	Guest Quarters (assume one bedroom)
2	ISHMAEL RD	F_1029608_2557076	LUG2	N/A	N/A	N/A	N/A	1584	N/A	3	330	-	270	-	
4	ISHMAEL RD	F_1029652_2557186	LUG2	80,000	2	1	-	715	0.57	1	110	-	270	-	Guest Quarters (assume one bedroom)
4	ISHMAEL RD	F_1029652_2557186	LUG2	N/A	N/A	N/A	N/A	1440	N/A	3	330	-	270	-	
5	ISHMAEL RD	F_1029906_2557138	LUG2	80,000	2	1	-	528	2	1	110	-	270	-	
5	ISHMAEL RD	F_1029906_2557138	LUG2	N/A	N/A	N/A	N/A	2624	N/A	5	550	-	270	-	
6	ISHMAEL RD	F_1029689_2557280	LUG2	80,000	1	1	-	1440	0.56	3	330	-	270	-	
8	ISHMAEL RD	F_1029716_2557372	LUG2	80,000	1	1	-	3372	0.53	4	440	-	270	-	
10	ISHMAEL RD	F_1029755_2557461	LUG2	80,000	1	1	-	2525	0.56	3	330	-	270	-	
2	MARION AV	F_1027891_2555403	LUG2	80,000	2	1	-	2320	1.62	3	330	-	270	-	
2	MARION AV	F_1027891_2555403	LUG2	N/A	N/A	N/A	N/A	1062	N/A	2	220	-	270	-	
3	MARION AV	F_1027786_2555681	LUG2	80,000	2	1	-	2080	0.92	3	330	-	270	-	
3	MARION AV	F_1027786_2555681	LUG2	N/A	N/A	N/A	N/A	51	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
6	MARION AV	F_1027709_2555552	LUG2	80,000	1	1	-	3420	0.58	4	440	-	270	-	
10	MARION AV	F_1027536_2555620	LUG2	80,000	1	1	-	3856	0.23	4	440	-	270	-	
1	MATTAPOISETT AV	F_1028270_2555739	LUG2	80,000	1	1	-	2438	0.28	3	330	-	270	-	
3	MATTAPOISETT AV	F_1028118_2555799	LUG2	80,000	1	1	-	2456	0.49	5	550	-	270	-	

NANTUCKET SEWER MASTER PLAN - HUMMOCK SOUTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
4	MATTAPOISETT AV	F_1027934_2555732	LUG2	80,000	1	1	-	1740	0.72	4	440	-	270	-	
5	MATTAPOISETT AV	F_1027988_2555851	LUG2	80,000	1	1	-	3048	0.18	4	440	-	270	-	
7	MATTAPOISETT AV	F_1027914_2555880	LUG2	80,000	1	1	-	3048	0.18	4	440	-	270	-	
8	MATTAPOISETT AV	F_1027750_2555806	LUG2	80,000	1	1	-	3600	0.18	4	440	-	270	-	
10	MATTAPOISETT AV	F_1027657_2555842	LUG2	80,000	1	1	-	4226	0.28	4	440	-	270	-	
11	MATTAPOISETT AV	F_1027752_2555944	LUG2	80,000	1	1	-	2554	0.46	4	440	-	270	-	
1	MELVILLE CT	F_1030478_2557179	LUG2	80,000	2	1	-	2181	0.73	3	330	-	270	-	
1	MELVILLE CT	F_1030478_2557179	LUG2	N/A	N/A	N/A	N/A	556	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
2	MELVILLE CT	F_1030456_2556946	LUG2	80,000	2	1	-	552	0.69	2	220	-	270	-	
2	MELVILLE CT	F_1030456_2556946	LUG2	N/A	N/A	N/A	N/A	3047	N/A	3	330	-	270	-	
4	MELVILLE CT	F_1030350_2556985	LUG2	80,000	2	1	-	1728	0.53	3	330	-	270	-	
4	MELVILLE CT	F_1030350_2556985	LUG2	N/A	N/A	N/A	N/A	480	N/A	1	110	-	270	-	
6	MELVILLE CT	F_1030252_2557018	LUG2	80,000	2	1	-	2416	0.51	4	440	-	270	-	
6	MELVILLE CT	F_1030252_2557018	LUG2	N/A	N/A	N/A	N/A	384	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
3	MOBY WY	F_1030138_2558022	LUG2	80,000	2	1	-	1440	0.56	3	330	-	270	-	
3	MOBY WY	F_1030138_2558022	LUG2	N/A	N/A	N/A	N/A	614	N/A	1	110	-	270	-	
4	MOBY WY	F_1029914_2558091	LUG2	80,000	1	1	-	1800	0.5	3	330	-	270	-	
5	MOBY WY	F_1030011_2558146	LUG2	80,000	1	1	-	1580	0.58	3	330	-	270	-	
1	MOTHBALL WY	F_1026031_2556432	VR	20,000	1	3	2	2625	1.5	3	330	660	270	540	
3	MOTHBALL WY	F_1025818_2556402	VR	20,000	1	3	2	3015	1.4	3	330	660	270	540	
5	MOTHBALL WY	F_1025665_2556299	VR	20,000	2	3	1	3774	1.64	4	440	330	270	270	
5	MOTHBALL WY	F_1025665_2556299	VR	N/A	N/A	N/A	N/A	888	N/A	1	110	-	270	-	
7	MOTHBALL WY	-	VR	20,000	0	2	1	Vacant	0.93	Vacant	330	330	270	270	
1	OSPREY WY	F_1028147_2557631	LUG2	80,000	3	2	-	1904	4.60	3	330	-	270	-	2/3 Wetland
1	OSPREY WY	F_1028147_2557631	LUG2	N/A	N/A	N/A	N/A	600	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
1	OSPREY WY	F_1028147_2557631	LUG2	N/A	N/A	N/A	N/A	1151	N/A	1	110	-	270	-	
2	OSPREY WY	-	LUG2	80,000	0	1	-	Vacant	0.3	Vacant	330	-	270	-	
3	OSPREY WY	F_1027860_2557308	R2	20,000	2	2	-	1728	1.20	3	330	-	270	-	
3	OSPREY WY	F_1027860_2557308	R20	N/A	N/A	N/A	N/A	378	N/A	2	220	-	270	-	
5	OSPREY WY	F_1027793_2557167	R20	20,000	1	1	-	1694	0.47	4	440	-	270	-	
7	OSPREY WY	F_1027683_2557312	LUG2	80,000	1	1	-	2129	0.60	3	330	-	270	-	
8	OSPREY WY	F_1027768_2556901	R20	20,000	1	2	1	1936	0.93	4	440	330	270	270	
11	OSPREY WY	F_1027595_2557201	LUG2	80,000	1	1	-	2009	1.00	4	440	-	270	-	
12	OSPREY WY	F_1027472_2556878	R20	20,000	1	1	-	1890	0.46	3	330	-	270	-	
13	OSPREY WY	F_1027520_2557093	R20	20,000	1	1	-	2928	0.44	3	330	-	270	-	
14	OSPREY WY	F_1027357_2556834	R20	20,000	1	1	-	1024	0.49	4	440	-	270	-	
16	OSPREY WY	F_1027243_2556792	R20	20,000	1	1	-	1500	0.52	4	440	-	270	-	
17	OSPREY WY	F_1027294_2557015	R20	20,000	2	1	-	2061	0.84	3	330	-	270	-	
17	OSPREY WY	F_1027294_2557015	R20	N/A	N/A	N/A	N/A	318	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
19	OSPREY WY	F_1027097_2556955	R20	20,000	1	1	-	3360	0.42	3	330	-	270	-	
21	OSPREY WY	F_1026783_2556882	R20	20,000	1	1	-	2624	0.40	3	330	-	270	-	
23	OSPREY WY	F_1026564_2556885	R2	20,000	2	5	3	2046	2.40	3	330	990	270	810	
23	OSPREY WY	F_1026564_2556885	R20	N/A	N/A	N/A	N/A	1506	N/A	3	330	-	270	-	
27	OSPREY WY	F_1026266_2556582	LUG2	80,000	1	1	-	1040	0.25	4	440	-	270	-	
3	QUEQUEG DR	F_1029954_2557475	LUG2	80,000	1	1	-	1440	0.58	3	330	-	270	-	
5	QUEQUEG DR	F_1030096_2557437	LUG2	80,000	2	1	-	1952	0.6	3	330	-	270	-	
5	QUEQUEG DR	F_1030096_2557437	LUG2	N/A	N/A	N/A	N/A	516	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
6	S MIACOMET AV	F_1027951_2555969	LUG2	80,000	1	1	-	3328	1.38	3	330	-	270	-	
1	SACCACHA AV	F_1028191_2556273	LUG2	80,000	2	1	-	3520	1.66	4	440	-	270	-	
1	SACCACHA AV	F_1028191_2556273	LUG2	N/A	N/A	N/A	N/A	1284	N/A	2	220	-	270	-	
2	SACCACHA AV	F_1028339_2556070	LUG2	80,000	1	1	-	2574	1	4	440	-	270	-	
4	SACCACHA AV	F_1028133_2556152	LUG2	80,000	1	1	-	2178	0.37	4	440	-	270	-	
1	TAUTEMO WY	F_1027195_2556551	R20	20,000	1	2	1	2056	0.92	3	330	330	270	270	
2	TAUTEMO WY	F_1026925_2556518	R20	20,000	1	1	-	2147	0.54	4	440	-	270	-	
3	TAUTEMO WY	F_1027125_2556688	R20	20,000	1	1	-	1764	0.46	3	330	-	270	-	
4	TAUTEMO WY	F_1026891_2556609	R20	20,000	2	1	-	2046	0.48	4	440	-	270	-	
4	TAUTEMO WY	F_1026891_2556609	R20	N/A	N/A	N/A	N/A	1389	N/A	1	110	-	270	-	
5	TAUTEMO WY	F_1027072_2556780	R20	20,000	1	1	-	2160	0.47	3	330	-	270	-	
6	TAUTEMO WY	-	R2	20,000	0	1	-	Vacant	0.47	Vacant	330	-	270	-	
7	TAUTEMO WY	F_1026959_2556916	R20	20,000	1	1	-	2187	0.44	3	330	-	270	-	
10	TAUTEMO WY	F_1026786_2557057	R20	20,000	2	1	-	768	0.62	2	220	-	270	-	
10	TAUTEMO WY	F_1026786_2557057	R20	N/A	N/A	N/A	N/A	612	N/A	1	110	-	270	-	
12	TAUTEMO WY	F_1026919_2557111	R20	20,000	1	1	-	1788	0.43	3	330	-	270	-	

NANTUCKET SEWER MASTER PLAN - HUMMOCK SOUTH NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
14	TAUTEMO WY	F_1027048_2557138	R20	20,000	1	1	-	1056	0.44	2	220	-	270	-	
16	TAUTEMO WY	F_1027157_2557184	R20	20,000	1	1	-	3267	0.52	3	330	-	270	-	
18	TAUTEMO WY	F_1027284_2557213	LUG2	80,000	1	1	-	1404	0.46	2	220	-	270	-	
20	TAUTEMO WY	F_1027416_2557235	LUG2	80,000	1	1	-	2578	0.42	5	550	-	270	-	
6	TRINITY AV	F_1029235_2556152	LUG2	80,000	1	1	-	1960	0.67	4	440	-	270	-	
4	WALBANG AV	F_1030585_2556488	MMD	435,600	1	1	-	4561	1.84	4	440	-	270	-	
6	WALBANG AV	F_1030503_2556311	MMD	435,600	2	1	-	3264	1.84	5	550	-	270	-	
6	WALBANG AV	F_1030503_2556311	MMD	N/A	N/A	N/A	N/A	386	N/A	1	110	-	270	-	
8	WALBANG AV	F_1030422_2556137	MMD	435,600	2	1	-	336	1.84	1	110	-	270	-	Guest Quarters (assume one bedroom)
8	WALBANG AV	F_1030422_2556137	MMD	N/A	N/A	N/A	N/A	1958	N/A	4	440	-	270	-	
1	WALL ST	F_1028746_2556086	LUG2	80,000	1	1	-	1974	0.53	3	330	-	270	-	
2	WALL ST	F_1028908_2556019	LUG2	80,000	1	1	-	3321	0.61	4	440	-	270	-	
3	WALL ST	-	LUG2	80,000	0	1	-	Vacant	0.56	Vacant	330	-	270	-	
4	WALL ST	F_1028822_2555839	LUG2	80,000	2	1	-	2216	0.56	3	330	-	270	-	
4	WALL ST	F_1028822_2555839	LUG2	N/A	N/A	N/A	N/A	294	N/A	1	110	-	270	-	
5	WALL ST	F_1028584_2555741	LUG2	80,000	1	1	-	2560	0.56	4	440	-	270	-	
6	WALL ST	F_1028739_2555666	LUG2	80,000	1	1	-	1394	0.56	3	330	-	270	-	
7	WALL ST	F_1028503_2555568	LUG2	80,000	1	1	-	1770	0.56	3	330	-	270	-	
8	WALL ST	F_1028658_2555493	LUG2	80,000	1	1	-	1855	0.56	3	330	-	270	-	
4	WESTERWYCK WY	F_1029003_2556789	LUG2	80,000	1	1	-	2984	0.71	3	330	-	270	-	
6	WESTERWYCK WY	-	LUG2	80,000	0	1	-	Vacant	0.71	Vacant	330	-	270	-	
8	WESTERWYCK WY	F_1028883_2556536	LUG2	80,000	1	1	-	1855	0.71	4	440	-	270	-	
10	WESTERWYCK WY	F_1028823_2556411	LUG2	80,000	1	1	-	2132	0.71	4	440	-	270	-	
11	WESTERWYCK WY	F_1028355_2555943	LUG2	80,000	1	1	-	3008	0.19	4	440	-	270	-	
12	WESTERWYCK WY	F_1028761_2556286	LUG2	80,000	1	1	-	2009	0.74	4	440	-	270	-	
17	WESTERWYCK WY	F_1028293_2555840	LUG2	80,000	1	1	-	2152	0.39	4	440	-	270	-	
17	WESTERWYCK WY	F_1028293_2555840	LUG2	N/A	N/A	N/A	N/A	306	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
23	WESTERWYCK WY	F_1028178_2555635	LUG2	80,000	1	1	-	3702	0.47	4	440	-	270	-	
25	WESTERWYCK WY	F_1028102_2555556	LUG2	80,000	1	1	-	3312	0.65	4	440	-	270	-	
27	WESTERWYCK WY	F_1028127_2555389	LUG2	80,000	1	1	-	2492	0.24	5	550	-	270	-	
								SUBTOTAL		**623**	**72160**	**16500**	**59130**	**13500**	

Total Number of Lots	176
Total Number of Vacant Lots	11
Total Number of Lots with one (1) Dwelling	126
Total Number of Lots with Multiple Existing Dwellings	40
Total Number of Lots with Multiple Future Dwellings	22
Number of Existing Bedrooms	623
Number of Future Bedrooms	183
Total Number of Bedrooms	806
Average Number of Bedrooms per Lot	3.6

Percentage of Lots with Multiple Dwellings (Existing and Future)	35%
Projected Percentage of Lots with Multiple Dwellings (Future)	50%
Additional Percentage of Lots with Multiple Dwellings (Future)	15%
Number of Additional Future Secondary Dwellings	26

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**59,400**	**72,600**
ADF for Additional Future Secondary Dwellings (gpd)	**5,700**	**7,000**
Total Average Daily Flow	**65,000**	**80,000**
Peaking Factor (determined from ASCE MOP9)	**5.8**	**5.8**
Peak Flow (gpd)	**377,000**	**464,000**
Infiltration and Inflow (I/I) Allowance (3)	**13,000**	**13,000**
Total Peak Flow including I/I allowance (gpd)	**390,000**	**477,000**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
1	A ST	F_1013636_2562560	VR	20,000	1	1	-	1424	0.22	3	330	-	270	-	
3	A ST	F_1013565_2562656	VR	20,000	1	1	-	817	0.22	2	220	-	270	-	
4	A ST	F_1013448_2562643	VR	20,000	3	1	-	861	0.44	1	110	-	270	-	
4	A ST	F_1013448_2562643	VR	N/A	N/A	N/A	N/A	336	N/A	1	110	-	270	-	
4	A ST	F_1013448_2562643	VR	N/A	N/A	N/A	N/A	230	N/A	1	110	-	270	-	
4	AMES AV	F_1012670_2562203	VR	20,000	1	1	-	1056	0.34	2	220	-	270	-	
6	AMES AV	F_1012609_2562281	VR	20,000	1	1	-	1656	0.34	3	330	-	270	-	
8	AMES AV	F_1012516_2562400	VR	20,000	1	1	-	1054	0.36	1	110	-	270	-	
1	ARKANSAS AV	F_1016794_2564148	VR	20,000	1	1	-	1015	0.84	3	330	-	270	-	
5	ARKANSAS AV	F_1016255_2563905	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
6	ARKANSAS AV	F_1016945_2564053	VR	20,000	1	1	-	3292	0.48	3	330	-	270	-	
7	ARKANSAS AV	F_1016316_2563837	VR	20,000	1	1	-	1015	0.48	3	330	-	270	-	
8	ARKANSAS AV	F_1016711_2563748	VR	20,000	1	2	1	2607	1.08	3	330	330	270	270	
9	ARKANSAS AV	F_1016220_2563743	VR	20,000	1	1	-	1015	0.52	3	330	-	270	-	
10	ARKANSAS AV	F_1016808_2563874	VR	20,000	1	1	-	1440	0.15	3	330	-	270	-	
11	ARKANSAS AV	F_1016144_2563762	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
12	ARKANSAS AV	F_1016781_2563882	VR	20,000	1	1	-	960	0.10	2	220	-	270	-	
13	ARKANSAS AV	F_1016209_2563576	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
14	ARKANSAS AV	F_1016803_2563844	VR	20,000	1	1	-	1296	0.14	3	330	-	270	-	
15	ARKANSAS AV	F_1016115_2563643	VR	20,000	1	1	-	1015	0.58	3	330	-	270	-	
16	ARKANSAS AV	F_1016712_2563881	VR	20,000	1	1	-	1440	0.11	3	330	-	270	-	
17	ARKANSAS AV	F_1015999_2563573	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
18	ARKANSAS AV	F_1016689_2563884	VR	20,000	1	1	-	948	0.07	3	330	-	270	-	
19	ARKANSAS AV	F_1016119_2563410	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
20	ARKANSAS AV	F_1016681_2563865	VR	20,000	1	1	-	1440	0.10	3	330	-	270	-	
21	ARKANSAS AV	F_1016030_2563351	VR	20,000	1	1	-	1015	0.32	3	330	-	270	-	
22	ARKANSAS AV	F_1016656_2563866	VR	20,000	1	1	-	1440	0.08	3	330	-	270	-	
23	ARKANSAS AV	F_1015780_2563395	VR	20,000	1	1	-	1015	0.55	3	330	-	270	-	
24	ARKANSAS AV	F_1016627_2563882	VR	20,000	1	1	-	1280	0.08	2	220	-	270	-	
26	ARKANSAS AV	F_1016646_2563847	VR	20,000	1	1	-	1280	0.08	3	330	-	270	-	
27	ARKANSAS AV	F_1015916_2563261	VR	20,000	1	1	-	1015	0.37	3	330	-	270	-	
28	ARKANSAS AV	F_1016593_2563866	VR	20,000	1	1	-	1440	0.10	3	330	-	270	-	
30	ARKANSAS AV	F_1016575_2563862	VR	20,000	1	1	-	960	0.06	2	220	-	270	-	
34	ARKANSAS AV	F_1016598_2563764	VR	20,000	1	1	-	960	0.10	2	220	-	270	-	
36	ARKANSAS AV	F_1016588_2563752	VR	20,000	1	1	-	1264	0.16	3	330	-	270	-	
38	ARKANSAS AV	F_1016695_2563697	VR	20,000	1	1	-	1280	0.18	3	330	-	270	-	
40	ARKANSAS AV	F_1016535_2563765	VR	20,000	1	1	-	960	0.10	2	220	-	270	-	
42	ARKANSAS AV	F_1016533_2563743	VR	20,000	1	1	-	1280	0.11	3	330	-	270	-	
44	ARKANSAS AV	F_1016528_2563719	VR	20,000	1	1	-	1440	0.14	3	330	-	270	-	
46	ARKANSAS AV	F_1016501_2563719	VR	20,000	1	1	-	1280	0.11	3	330	-	270	-	
48	ARKANSAS AV	F_1016491_2563705	VR	20,000	1	1	-	960	0.09	2	220	-	270	-	
50	ARKANSAS AV	F_1016477_2563634	VR	20,000	1	1	-	960	0.11	2	220	-	270	-	
52	ARKANSAS AV	F_1016473_2563613	VR	20,000	1	1	-	1280	0.13	3	330	-	270	-	
54	ARKANSAS AV	F_1016462_2563601	VR	20,000	1	1	-	1264	0.12	3	330	-	270	-	
56	ARKANSAS AV	F_1016450_2563590	VR	20,000	1	1	-	1280	0.12	3	330	-	270	-	
58	ARKANSAS AV	F_1016436_2563576	VR	20,000	1	1	-	1440	0.14	4	440	-	270	-	
60	ARKANSAS AV	F_1016441_2563249	VR	20,000	1	1	-	1440	0.07	3	330	-	270	-	
62	ARKANSAS AV	F_1016425_2563258	VR	20,000	1	1	-	1264	0.05	3	330	-	270	-	
64	ARKANSAS AV	F_1016411_2563271	VR	20,000	1	1	-	1264	0.04	3	330	-	270	-	
66	ARKANSAS AV	F_1016398_2563280	VR	20,000	1	1	-	960	0.03	2	220	-	270	-	
68	ARKANSAS AV	F_1016397_2563361	VR	20,000	1	1	-	960	0.06	2	220	-	270	-	
70	ARKANSAS AV	F_1016385_2563370	VR	20,000	1	1	-	1280	0.07	3	330	-	270	-	
72	ARKANSAS AV	F_1016373_2563382	VR	20,000	1	1	-	1280	0.07	3	330	-	270	-	
74	ARKANSAS AV	F_1016361_2563393	VR	20,000	1	1	-	1264	0.07	3	330	-	270	-	
76	ARKANSAS AV	F_1016350_2563411	VR	20,000	1	1	-	1440	0.09	3	330	-	270	-	
78	ARKANSAS AV	F_1016328_2563413	VR	20,000	1	1	-	948	0.05	3	330	-	270	-	
80	ARKANSAS AV	F_1016239_2563248	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
82	ARKANSAS AV	F_1016138_2563173	VR	20,000	1	1	-	1015	0.46	3	330	-	270	-	
84	ARKANSAS AV	F_1015989_2563058	VR	20,000	1	1	-	1015	0.60	3	330	-	270	-	
5	BALTIMORE ST	F_1014010_2562338	VR	20,000	2	1	-	1522	0.80	3	330	-	270	-	
5	BALTIMORE ST	F_1014010_2562338	VR	N/A	N/A	N/A	N/A	1522	N/A	3	330	-	270	-	
6	BALTIMORE ST	F_1013867_2562194	VR	20,000	1	1	-	1424	0.52	4	440	-	270	-	
12	BALTIMORE ST	F_1013480_2562747	VR	20,000	2	1	-	929	0.27	3	330	-	270	-	
12	BALTIMORE ST	F_1013480_2562747	VR	N/A	N/A	N/A	N/A	480	N/A	1	110	-	270	-	
14	BALTIMORE ST	F_1013360_2562844	VR	20,000	2	1	-	1880	0.35	2	220	-	270	-	
14	BALTIMORE ST	F_1013360_2562844	VR	N/A	N/A	N/A	N/A	308	N/A	1	110	-	270	-	
16	BALTIMORE ST	F_1013408_2562894	VR	20,000	1	1	-	1248	0.11	3	330	-	270	-	
19	BALTIMORE ST	F_1013505_2562895	VR	20,000	1	1	-	811	0.43	3	330	-	270	-	
5	C ST	F_1013901_2562776	VR	20,000	1	1	-	496	0.37	1	110	-	270	-	
6	C ST	F_1013775_2562734	VR	20,000	2	1	-	528	0.18	1	110	-	270	-	Cottage (Assume one bedroom)
6	C ST	F_1013775_2562734	VR	N/A	N/A	N/A	N/A	1161	N/A	1	110	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
10	C ST	F_1013690_2562853	VR	20,000	1	1	-	2133	0.30	4	440	-	270	-	
12	C ST	F_1013585_2562993	VR	20,000	1	1	-	1902	0.83	3	330	-	270	-	
13	C ST	F_1013716_2563069	VR	20,000	1	1	-	4397	0.76	3	330	-	270	-	
5	CHICAGO ST	-	LUG3	120,000	0	1	-	Vacant	1	Vacant	330	-	270	-	
6	CHICAGO ST	F_1013392_2561824	VR	20,000	1	1	-	2022	0.89	4	440	-	270	-	
3	COLUMBUS AV	F_1015965_2562218	VR	20,000	1	1	-	2569	0.55	4	440	-	270	-	
5	COLUMBUS AV	F_1015880_2562142	VR	20,000	1	1	-	2043	0.62	4	440	-	270	-	
7	COLUMBUS AV	F_1015788_2562070	VR	20,000	1	1	-	1880	0.65	4	440	-	270	-	
9	COLUMBUS AV	F_1015709_2561902	VR	20,000	1	1	-	1820	0.67	4	440	-	270	-	
10	COLUMBUS AV	F_1016091_2562334	VR	20,000	1	1	-	2442	0.57	3	330	-	270	-	
11	COLUMBUS AV	F_1015690_2561789	VR	20,000	1	1	-	2221	0.74	4	440	-	270	-	
12	COLUMBUS AV	F_1016203_2562273	VR	20,000	1	1	-	2208	0.86	3	330	-	270	-	
13	COLUMBUS AV	F_1015730_2561726	VR	20,000	1	1	-	1592	0.65	4	440	-	270	-	
14	COLUMBUS AV	-	VR	20,000	0	1	-	Vacant	0.59	Vacant	330	-	270	-	
15	COLUMBUS AV	F_1015835_2561764	VR	20,000	1	1	-	3175	0.61	4	440	-	270	-	
17	COLUMBUS AV	F_1015942_2561851	VR	20,000	1	2	1	2706	0.92	5	550	330	270	270	
19	COLUMBUS AV	F_1016054_2561926	VR	20,000	1	1	-	2611	0.49	4	440	-	270	-	
21	COLUMBUS AV	F_1016125_2562005	VR	20,000	1	1	-	2005	0.48	3	330	-	270	-	
2	CREEK LN	F_1019484_2566564	LUG2	80,000	1	1	-	2023	0.48	3	330	-	270	-	
4	CREEK LN	F_1019410_2566572	LUG2	80,000	1	1	-	2524	0.50	3	330	-	270	-	
6	CREEK LN	F_1019341_2566600	LUG2	80,000	1	1	-	1332	0.51	3	330	-	270	-	
8	CREEK LN	F_1019262_2566622	LUG2	80,000	1	1	-	2451	0.52	3	330	-	270	-	
10	CREEK LN	F_1019177_2566644	LUG2	80,000	1	1	-	1764	0.52	3	330	-	270	-	
12	CREEK LN	-	LUG2	80,000	0	1	-	Vacant	0.53	Vacant	330	-	270	-	
14	CREEK LN	-	LUG2	80,000	0	1	-	Vacant	0.53	Vacant	330	-	270	-	
16	CREEK LN	F_1018963_2566702	LUG2	80,000	2	1	-	405	0.52	1	110	-	270	-	Guest Quarters (assume one bedroom)
16	CREEK LN	F_1018963_2566702	LUG2	N/A	N/A	N/A	N/A	1735	N/A	3	330	-	270	-	
18	CREEK LN	F_1018887_2566714	LUG2	80,000	1	1	-	4227	0.52	3	330	-	270	-	
20	CREEK LN	F_1018817_2566732	LUG2	80,000	1	1	-	1902	0.51	4	440	-	270	-	
22	CREEK LN	F_1018740_2566752	LUG2	80,000	2	1	-	2745	0.50	3	330	-	270	-	
22	CREEK LN	F_1018740_2566752	LUG2	N/A	N/A	N/A	N/A	518	N/A	1	110	-	270	-	
24	CREEK LN	F_1018658_2566753	LUG2	80,000	1	1	-	2873	0.59	4	440	-	270	-	
26	CREEK LN	F_1018598_2566822	LUG2	80,000	1	1	-	2561	0.42	3	330	-	270	-	
28	CREEK LN	F_1727938_103628	LUG2	80,000	1	1	-	3454	0.38	4	440	-	270	-	
30	CREEK LN	F_1727888_103731	LUG2	80,000	1	1	-	2664	0.51	3	330	-	270	-	
6	D ST	F_1013881_2562961	VR	20,000	1	1	-	1834	0.49	2	220	-	270	-	
7	D ST	F_1014063_2562953	VR	20,000	1	1	-	1456	0.26	3	330	-	270	-	
9	D ST	F_1014027_2563002	VR	20,000	1	1	-	940	0.16	2	220	-	270	-	
11	D ST	-	VR	20,000	0	1	-	Vacant	0.37	Vacant	330	-	270	-	
14	D ST	F_1013801_2563094	VR	20,000	2	1	-	360	0.38	1	110	-	270	-	
14	D ST	F_1013801_2563094	VR	N/A	N/A	N/A	N/A	1128	N/A	2	220	-	270	-	
16	D ST	F_1013829_2563154	VR	20,000	1	1	-	600	0.23	2	220	-	270	-	
9	E ST	F_1014067_2563238	VR	20,000	2	1	-	1556	0.26	2	220	-	270	-	
9	E ST	F_1014067_2563238	VR	N/A	N/A	N/A	N/A	552	N/A	1	110	-	270	-	
11	E ST	F_1013942_2563207	VR	20,000	2	2	-	1405	0.95	3	330	-	270	-	
11	E ST	F_1013942_2563207	VR	N/A	N/A	N/A	N/A	2483	N/A	3	330	-	270	-	
8	F ST	F_1014259_2563141	VR	20,000	2	2	-	2736	1.02	5	550	-	270	-	
8	F ST	F_1014259_2563141	VR	N/A	N/A	N/A	N/A	579	N/A	2	220	-	270	-	
10	F ST	F_1014204_2563324	VR	20,000	2	2	-	672	1.20	2	220	-	270	-	
10	F ST	F_1014204_2563324	VR	N/A	N/A	N/A	N/A	2496	N/A	3	330	-	270	-	
1	FISHERS LANDING RD	F_1729094_103680	LUG2	80,000	1	1	-	1066	0.24	2	220	-	270	-	
2	FISHERS LANDING RD	F_1728921_103685	LUG2	80,000	1	1	-	3416	0.29	3	330	-	270	-	
3	FISHERS LANDING RD	F_1729114_103750	LUG2	80,000	2	1	-	1940	0.24	2	220	-	270	-	
3	FISHERS LANDING RD	F_1729114_103750	LUG2	N/A	N/A	N/A	N/A	452	N/A	1	110	-	270	-	
4	FISHERS LANDING RD	F_1728994_103776	LUG2	80,000	2	1	-	2304	0.25	4	440	-	270	-	
4	FISHERS LANDING RD	F_1728994_103776	LUG2	N/A	N/A	N/A	N/A	523	N/A	1	110	-	270	-	
5	FISHERS LANDING RD	F_1729138_103822	LUG2	80,000	2	1	-	1613	0.24	3	330	-	270	-	
5	FISHERS LANDING RD	F_1729138_103822	LUG2	N/A	N/A	N/A	N/A	790	N/A	1	110	-	270	-	
7	FISHERS LANDING RD	F_1729177_103892	LUG2	80,000	1	1	-	1436	0.26	2	220	-	270	-	
9	FISHERS LANDING RD	F_1729193_103975	LUG2	80,000	2	1	-	1488	0.28	3	330	-	270	-	
9	FISHERS LANDING RD	F_1729193_103975	LUG2	N/A	N/A	N/A	N/A	162	N/A	1	110	-	270	-	
11	FISHERS LANDING RD	F_1729178_104050	LUG2	80,000	1	1	-	1224	0.24	3	330	-	270	-	
13	FISHERS LANDING RD	F_1729174_104127	LUG2	80,000	1	1	-	1732	0.24	3	330	-	270	-	
1	GOOSE COVE AV	F_1016725_2562940	VR	20,000	1	1	-	2336	0.60	3	330	-	270	-	
3	GOOSE COVE AV	F_1016710_2563033	VR	20,000	1	1	-	1895	0.64	3	330	-	270	-	
5	GOOSE COVE AV	F_1016692_2563116	VR	20,000	1	1	-	2323	0.52	4	440	-	270	-	
1	GOOSE COVE WY	F_1017067_2563937	VR	20,000	1	1	-	2012	0.69	3	330	-	270	-	
4	GOOSE COVE WY	F_1017048_2563595	VR	20,000	1	2	1	1790	0.93	4	440	330	270	270	
5	GOOSE COVE WY		VR	20,000	0	2	-	Vacant	0.92	Vacant	330	-	270	-	
6	GOOSE COVE WY	F_1016952_2563609	VR	20,000	2	2	-	216	0.92	1	110	-	270	-	Guest Quarters (assume one bedroom)
6	GOOSE COVE WY	F_1016952_2563609	VR	N/A	N/A	N/A	N/A	3990	N/A	4	440	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
1	H ST	F_1015119_2563370	VR	20,000	1	1	-	1533	0.14	2	220	-	270	-	
5	H ST	F_1014999_2563576	VR	20,000	1	1	-	2630	0.41	4	440	-	270	-	More than one bldg?
11	H ST	F_1014810_2563788	VR	20,000	1	1	-	873	0.48	1	110	-	270	-	
4	I ST	F_1015309_2563558	VR	20,000	1	1	-	1936	0.55	4	440	-	270	-	
7	I ST	F_1015298_2563812	VR	20,000	2	1	-	1140	0.28	2	220	-	270	-	
7	I ST	F_1015298_2563812	VR	N/A	N/A	N/A	N/A	242	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
2	L STREET	F_1016185_2564645	VR	20,000	1	1	-	736	0.46	2	220	-	270	-	
1	LONG POND DR	F_1019211_2565045	VR	20,000	1	1	-	2792	0.46	4	440	-	270	-	
3	LONG POND DR	F_1019116_2564972	VR	20,000	1	1	-	2693	0.46	4	440	-	270	-	
4	LONG POND DR	F_1019447_2564921	LUG1	40,000	2	1	-	849	1.00	1	110	-	270	-	
4	LONG POND DR	F_1019447_2564921	LUG1	N/A	N/A	N/A	N/A	1472	N/A	3	330	-	270	-	
5	LONG POND DR	F_1019022_2564924	VR	20,000	1	1	-	3229	0.46	4	440	-	270	-	
6	LONG POND DR	F_1019358_2564780	LUG1	40,000	1	1	-	2335	1.05	4	440	-	270	-	
7	LONG POND DR	F_1018933_2564875	VR	20,000	1	1	-	3658	0.46	3	330	-	270	-	
8	LONG POND DR	F_1019194_2564723	LUG1	40,000	1	1	-	1898	1.06	4	440	-	270	-	
9	LONG POND DR	F_1018850_2564829	VR	20,000	1	1	-	1548	0.46	3	330	-	270	-	
10	LONG POND DR	F_1019058_2564597	LUG1	40,000	1	1	-	2205	1.33	5	550	-	270	-	
11	LONG POND DR	F_1018780_2564777	VR	20,000	1	1	-	3710	0.50	5	550	-	270	-	
12	LONG POND DR	F_1018968_2564496	LUG1	40,000	1	1	-	2956	0.98	3	330	-	270	-	
13	LONG POND DR	F_1018707_2564730	VR	20,000	1	1	-	2580	0.54	4	440	-	270	-	
14	LONG POND DR	F_1018893_2564412	LUG1	40,000	1	1	-	2592	0.91	4	440	-	270	-	
15	LONG POND DR	F_1018590_2564695	LUG1	40,000	1	1	-	3470	0.93	4	440	-	270	-	
16	LONG POND DR	F_1018797_2564344	LUG1	40,000	1	1	-	2482	0.94	3	330	-	270	-	
17	LONG POND DR	F_1018535_2564583	LUG1	40,000	1	1	-	2675	1.04	3	330	-	270	-	
18	LONG POND DR	F_1018702_2564258	LUG1	40,000	2	1	-	1804	0.71	4	440	-	270	-	
18	LONG POND DR	F_1018702_2564258	LUG1	N/A	N/A	N/A	N/A	810	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
19	LONG POND DR	F_1018328_2564585	LUG1	40,000	1	1	-	2178	1.05	3	330	-	270	-	
20	LONG POND DR	F_1018622_2564142	LUG1	40,000	2	1	-	741	0.87	1	110	-	270	-	Guest Quarters (assume one bedroom)
20	LONG POND DR	F_1018622_2564142	LUG1	N/A	N/A	N/A	N/A	2349	N/A	4	440	-	270	-	
21	LONG POND DR	F_1018458_2564423	LUG1	40,000	2	1	-	2000	0.96	3	330	-	270	-	
21	LONG POND DR	F_1018458_2564423	LUG1	N/A	N/A	N/A	N/A	671	N/A	1	110	-	270	-	
22	LONG POND DR	F_1018540_2564047	LUG1	40,000	1	1	-	2543	0.96	4	440	-	270	-	
23	LONG POND DR	F_1018295_2564348	LUG1	40,000	1	1	-	2240	0.97	4	440	-	270	-	
24	LONG POND DR	F_1018458_2563943	LUG1	40,000	2	1	-	455	1.00	1	110	-	270	-	
24	LONG POND DR	F_1018458_2563943	LUG1	N/A	N/A	N/A	N/A	3485	N/A	4	440	-	270	-	
25	LONG POND DR	F_1018251_2564227	LUG1	40,000	2	1	-	216	1.05	1	110	-	270	-	Guest Quarters (assume one bedroom)
25	LONG POND DR	F_1018251_2564227	LUG1	N/A	N/A	N/A	N/A	1702	N/A	3	330	-	270	-	
26	LONG POND DR	F_1018400_2563816	LUG1	40,000	1	1	-	2912	1.17	4	440	-	270	-	
27	LONG POND DR	F_1018159_2564152	LUG1	40,000	1	1	-	3064	0.67	4	440	-	270	-	
28	LONG POND DR	F_1018318_2563705	LUG1	40,000	2	1	-	920	1.32	1	110	-	270	-	
28	LONG POND DR	F_1018318_2563705	LUG1	N/A	N/A	N/A	N/A	2016	N/A	4	440	-	270	-	
29	LONG POND DR	F_1018075_2564086	LUG1	40,000	1	1	-	2532	0.79	5	550	-	270	-	
30	LONG POND DR	F_1018190_2563606	LUG1	40,000	1	1	-	2051	1.17	5	550	-	270	-	
31	LONG POND DR	F_1018013_2563989	LUG1	40,000	1	1	-	2336	0.75	3	330	-	270	-	
32	LONG POND DR	F_1018062_2563542	LUG1	40,000	1	1	-	1561	1.13	4	440	-	270	-	
33	LONG POND DR	F_1017915_2563946	LUG1	40,000	1	1	-	2010	0.95	4	440	-	270	-	
34	LONG POND DR	F_1017949_2563512	LUG1	40,000	2	1	-	1001	1.04	1	110	-	270	-	
34	LONG POND DR	F_1017949_2563512	LUG1	N/A	N/A	N/A	N/A	2252	N/A	3	330	-	270	-	
35	LONG POND DR	F_1017809_2563895	LUG1	40,000	1	1	-	2076	1.05	4	440	-	270	-	
36	LONG POND DR	F_1017839_2563504	LUG1	40,000	1	1	-	1684	0.88	3	330	-	270	-	
37	LONG POND DR	F_1017683_2563884	LUG1	40,000	1	1	-	3246	1.01	4	440	-	270	-	
38	LONG POND DR	F_1017736_2563472	LUG1	40,000	2	1	-	708	1.09	1	110	-	270	-	
38	LONG POND DR	F_1017736_2563472	LUG1	N/A	N/A	N/A	N/A	2446	N/A	4	440	-	270	-	
39	LONG POND DR	F_1017572_2563867	VR	20,000	2	1	-	2157	0.75	3	330	-	270	-	
39	LONG POND DR	F_1017572_2563867	VR	N/A	N/A	N/A	N/A	396	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
40	LONG POND DR	F_1017587_2563589	VR	20,000	1	1	-	1960	0.47	3	330	-	270	-	
41	LONG POND DR	F_1017457_2563870	VR	20,000	1	1	-	1918	0.71	4	440	-	270	-	
42	LONG POND DR	F_1017475_2563615	VR	20,000	1	1	-	2469	0.46	3	330	-	270	-	
6	M ST	F_1016336_2564604	VR	20,000	1	1	-	1714	0.46	3	330	-	270	-	
8	M ST	F_1016271_2564503	VR	20,000	1	1	-	1232	0.54	3	330	-	270	-	
4	MACY RD	F_1013753_2562117	VR	20,000	1	1	-	1621	0.52	4	440	-	270	-	
6	MACY RD	F_1013657_2562020	VR	20,000	1	1	-	2646	0.56	4	440	-	270	-	
8	MACY RD	F_1013531_2561937	VR	20,000	1	1	-	2067	0.52	5	550	-	270	-	
198	MADAKET RD	F_1020394_2565656	LUG3	120,000	2	1	-	556	2.04	1	110	-	270	-	
198	MADAKET RD	F_1020394_2565656	LUG3	N/A	N/A	N/A	N/A	370	N/A	2	220	-	270	-	
199	MADAKET RD	F_1019399_2565337	VR	20,000	1	1	-	2750	0.47	2	220	-	270	-	
201	MADAKET RD	F_1019291_2565301	VR	20,000	1	1	-	2509	0.46	5	550	-	270	-	
203	MADAKET RD	F_1019196_2565284	VR	20,000	1	1	-	2065	0.47	4	440	-	270	-	
205	MADAKET RD	F_1019125_2565243	VR	20,000	1	1	-	1752	0.49	3	330	-	270	-	
207	MADAKET RD	F_1019023_2565309	VR	20,000	1	1	-	2398	0.52	3	330	-	270	-	
209	MADAKET RD	F_1018975_2565254	VR	20,000	1	1	-	2909	0.51	3	330	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
211	MADAKET RD	-	VR	20,000	0	1	-	Vacant	0.59	Vacant	330	-	270	-	
213	MADAKET RD	F_1018838_2565207	VR	20,000	1	1	-	2098	0.61	3	330	-	270	-	
215	MADAKET RD	F_1018771_2565173	VR	20,000	1	1	-	1728	0.64	3	330	-	270	-	
217	MADAKET RD	F_1018705_2565146	VR	20,000	1	1	-	2668	0.69	4	440	-	270	-	
219	MADAKET RD	F_1018636_2565113	VR	20,000	2	1	-	2155	0.68	3	330	-	270	-	
221	MADAKET RD	F_1018569_2565082	VR	N/A	N/A	N/A	N/A	720	N/A	1	110	-	270	-	
221	MADAKET RD	F_1018569_2565082	VR	20,000	1	1	-	2122	0.65	3	330	-	270	-	
223	MADAKET RD	F_1018525_2564989	VR	20,000	1	1	-	1544	0.56	3	330	-	270	-	
227	MADAKET RD	F_1018161_2564879	LUG1	40,000	2	1	-	2271	1.38	3	330	-	270	-	1/2 Wetland
229	MADAKET RD	F_1018329_2565106	LUG3	N/A	N/A	N/A	N/A	1344	N/A	2	220	-	270	-	1/2 Wetland
229	MADAKET RD	F_1018329_2565106	LUG3	120,000	1	1	-	317	2.3	1	110	-	270	-	
230	MADAKET RD	F_1018152_2564509	LUG1	40,000	1	1	-	1004	0.67	2	220	-	270	-	
231	MADAKET RD	F_1018300_2565265	LUG1	40,000	2	2	-	2112	2.6	4	440	-	270	-	1/3 Wetland
231	MADAKET RD	F_1018300_2565265	LUG1	N/A	N/A	N/A	N/A	592	N/A	1	110	-	270	-	
232	MADAKET RD	F_1018055_2564561	LUG1	40,000	1	1	-	1776	0.57	3	330	-	270	-	
234	MADAKET RD	F_1017932_2564435	LUG1	40,000	1	1	-	2287	1.75	3	330	-	270	-	
235	MADAKET RD	F_1017788_2564752	LUG1	40,000	2	1	-	926	0.57	1	110	-	270	-	
235	MADAKET RD	F_1017788_2564752	LUG1	N/A	N/A	N/A	N/A	1885	N/A	3	330	-	270	-	
238	MADAKET RD	F_1017788_2564361	LUG1	40,000	1	1	-	2957	1.05	4	440	-	270	-	1/3 Wetland
240	MADAKET RD	F_1017723_2564264	LUG1	40,000	1	1	-	1271	1.05	3	330	-	270	-	1/2 Wetland
241	MADAKET RD	F_1017359_2564944	LUG1	40,000	2	14	12	2184	13.2	3	330	3960	270	3240	
241	MADAKET RD	F_1017359_2564944	LUG1	N/A	N/A	N/A	N/A	1792	N/A	3	330	-	270	-	
242	MADAKET RD	F_1017608_2564241	LUG1	40,000	1	1	-	3012	1.05	4	440	-	270	-	1/2 Wetland
244	MADAKET RD	F_1017498_2564286	VR	20,000	1	1	-	2352	0.75	4	440	-	270	-	1/3 Wetland
246	MADAKET RD	F_1017408_2564409	VR	20,000	1	1	-	1620	0.42	5	550	-	270	-	
248	MADAKET RD	F_1017291_2564349	VR	20,000	1	1	-	1338	0.46	3	330	-	270	-	
249	MADAKET RD	F_1017537_2564552	VR	20,000	1	1	-	2222	0.53	2	220	-	270	-	
250	MADAKET RD	F_1016456_2564118	VR	20,000	2	2	-	1008	1.20	-	75.6	-	270	-	Service Shop
250	MADAKET RD	F_1016456_2564118	VR	N/A	N/A	N/A	N/A	1092	N/A	3	330	-	270	-	
252	MADAKET RD	F_1016879_2564301	VR	20,000	2	2	-	3538	1.1	5	550	-	270	-	
252	MADAKET RD	F_1016879_2564301	VR	N/A	N/A	N/A	N/A	470	N/A	1	110	-	270	-	Apartment
253	MADAKET RD	F_1016739_2564523	VR	20,000	1	1	-	1512	0.65	3	330	-	270	-	1/2 Wetland
254	MADAKET RD	F_1016654_2564224	VR	20,000	1	3	2	1547	1.5	3	330	660	270	540	
255	MADAKET RD	F_1016609_2564503	VR	20,000	2	1	-	1344	0.66	3	330	-	270	-	
255	MADAKET RD	F_1016609_2564503	VR	N/A	N/A	N/A	N/A	1176	N/A	1	110	-	270	-	
259	MADAKET RD	F_1016344_2564341	VR	20,000	2	1	-	1280	0.5	2	220	-	270	-	
259	MADAKET RD	F_1016344_2564341	VR	N/A	N/A	N/A	N/A	432	N/A	1	110	-	270	-	
260	MADAKET RD	F_1016361_2563997	VR	20,000	1	1	-	1015	0.5	3	330	-	270	-	
261	MADAKET RD	F_1016233_2564241	VR	20,000	1	1	-	1790	0.58	3	330	-	270	-	
262	MADAKET RD	F_1016213_2564028	VR	20,000	1	1	-	1208	0.29	3	330	-	270	-	
264	MADAKET RD	-	VR	20,000	0	1	-	Vacant	0.15	Vacant	330	-	270	-	
265	MADAKET RD	F_1016052_2564113	VR	20,000	3	1	-	536	0.59	1	110	-	270	-	
265	MADAKET RD	F_1016052_2564113	VR	N/A	N/A	N/A	N/A	750	N/A	1	110	-	270	-	
265	MADAKET RD	F_1016052_2564113	VR	N/A	N/A	N/A	N/A	3024	N/A	2	220	-	270	-	
266	MADAKET RD	F_1016011_2563877	VR	20,000	1	1	-	980	0.33	2	220	-	270	-	
270	MADAKET RD	F_1015888_2563785	VR	20,000	1	1	-	1296	0.09	4	440	-	270	-	
271	MADAKET RD	F_1015815_2563882	VR	20,000	1	1	-	1982	0.09	3	330	-	270	-	
273	MADAKET RD	F_1015739_2563885	VR	20,000	2	1	-	1900	0.46	3	330	-	270	-	
273	MADAKET RD	F_1015739_2563885	VR	N/A	N/A	N/A	N/A	588	N/A	2	220	-	270	-	
274	MADAKET RD	F_1015747_2563680	VR	20,000	1	1	-	1587	0.18	3	330	-	270	-	
275	MADAKET RD	F_1015652_2563810	VR	20,000	1	1	-	1434	0.37	4	440	-	270	-	
277	MADAKET RD	F_1015615_2563731	VR	20,000	1	1	-	1624	0.11	2	220	-	270	-	
280	MADAKET RD	-	VR	20,000	0	1	-	Vacant	0.05	Vacant	330	-	270	-	Combined with 278& 2 lots on Mississippi
281	MADAKET RD	-	VR	20,000	0	1	-	Vacant	0.39	Vacant	330	-	270	-	
282	MADAKET RD	F_1015536_2563486	VR	20,000	1	1	-	1015	0.66	3	330	-	270	-	
284	MADAKET RD	F_1015361_2563348	VR	20,000	1	1	-	1059	0.59	3	330	-	270	-	
291	MADAKET RD	F_1015187_2563470	VR	20,000	1	1	-	2524	0.55	5	550	-	270	-	
300	MADAKET RD	F_1014862_2562989	VR	20,000	1	1	-	2180	0.64	3	330	-	270	-	
301	MADAKET RD	F_1014769_2563163	VR	20,000	1	1	-	1924	0.28	3	330	-	270	-	
303	MADAKET RD	F_1014700_2563061	VR	20,000	1	1	-	3585	0.18	3	330	-	270	-	
304	MADAKET RD	F_1014746_2562884	VR	20,000	1	1	-	2003	0.6	3	330	-	270	-	
305	MADAKET RD	F_1014619_2563002	VR	20,000	2	1	-	1427	0.18	2	220	-	270	-	
306	MADAKET RD	F_1014635_2562800	VR	N/A	N/A	N/A	N/A	656	N/A	1	110	-	270	-	
306	MADAKET RD	F_1014635_2562800	VR	20,000	1	1	-	2172	0.56	3	330	-	270	-	
307	MADAKET RD	F_1014491_2562956	VR	20,000	1	1	-	660	0.37	2	220	-	270	-	
308	MADAKET RD	F_1014534_2562695	VR	20,000	1	1	-	1536	0.62	3	330	-	270	-	
310	MADAKET RD	F_1014404_2562646	VR	20,000	1	1	-	2116	0.56	3	330	-	270	-	
312	MADAKET RD	F_1014305_2562550	VR	20,000	1	1	-	1308	0.48	3	330	-	270	-	
313	MADAKET RD	F_1014290_2562756	VR	20,000	2	1	-	728	0.37	2	220	-	270	-	
313	MADAKET RD	F_1014290_2562756	VR	N/A	N/A	N/A	N/A	792	N/A	2	220	-	270	-	
316	MADAKET RD	F_1014210_2562500	VR	20,000	2	1	-	665	0.4	1	110	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
316	MADAKET RD	F_1014210_2562500	VR	N/A	N/A	N/A	N/A	1296	N/A	3	330	-	270	-	
317	MADAKET RD	F_1014106_2562622	VR	20,000	1	1	-	2329	0.37	4	440	-	270	-	
318	MADAKET RD	F_1014137_2562396	VR	20,000	1	1	-	1302	0.6	3	330	-	270	-	
321	MADAKET RD	F_1013935_2562545	VR	20,000	2	1	-	450	0.38	1	110	-	270	-	
321	MADAKET RD	F_1013935_2562545	VR	N/A	N/A	N/A	N/A	1211	N/A	2	220	-	270	-	
324	MADAKET RD	-	VR	20,000	0	1	-	Vacant	0.17	Vacant	330	-	270	-	
326	MADAKET RD	F_1013549_2562230	VR	20,000	3	1	-	4072	0.4	-	249	-	270	-	Restaurant-peak water use records
326	MADAKET RD	F_1013549_2562230	VR	N/A	N/A	N/A	N/A	540	N/A	-	40.5	-	270	-	Warehouse
328	MADAKET RD	F_1013421_2562166	VR	N/A	N/A	N/A	N/A	1134	N/A	2	220	-	270	-	
328	MADAKET RD	F_1013421_2562166	VR	20,000	1	1	-	1275	0.36	2	220	-	270	-	
330	MADAKET RD	F_1013254_2562060	VR	20,000	1	1	-	2058	0.41	5	550	-	270	-	
332	MADAKET RD	F_1013172_2562006	VR	20,000	1	1	-	1212	0.45	2	220	-	270	-	
333	MADAKET RD	F_1013252_2562362	VR	20,000	1	1	-	3570	0.74	3	330	-	270	-	
334	MADAKET RD	F_1013023_2561962	VR	20,000	1	1	-	2016	0.24	3	330	-	270	-	
337	MADAKET RD	F_1013147_2562301	VR	20,000	1	1	-	1950	0.62	3	330	-	270	-	
339	MADAKET RD	F_1013034_2562363	VR	20,000	1	1	-	791	0.79	2	220	-	270	-	
341	MADAKET RD	F_1013085_2562593	VR	20,000	1	3	-	2864	1.41	3	330	-	270	-	1/2 Wetland
343	MADAKET RD	F_1012966_2562330	VR	20,000	2	2	-	764	0.97	2	220	-	270	-	
343	MADAKET RD	F_1012966_2562330	VR	N/A	N/A	N/A	N/A	2702	N/A	4	440	-	270	-	
347	MADAKET RD	F_1012710_2562034	VR	20,000	1	1	-	2225	0.6	3	330	-	270	-	
353	MADAKET RD	F_1012483_2562117	LUG3	120,000	1	1	-	1352	1.26	3	330	-	270	-	
197A	MADAKET RD	F_1019538_2565385	VR	20,000	1	1	-	2152	0.47	4	440	-	270	-	
1	MIDLAND AV	F_1017319_2562736	VR	20,000	1	1	-	1028	0.72	3	330	-	270	-	
3	MIDLAND AV	F_1017152_2562847	VR	20,000	2	2	1	1015	0.93	3	330	330	270	270	
4	MIDLAND AV	F_1017081_2562561	VR	20,000	1	1	-	1821	0.56	4	440	-	270	-	
5	MIDLAND AV	F_1017046_2562853	VR	20,000	1	1	-	1015	0.74	3	330	-	270	-	
6	MIDLAND AV	F_1016949_2562580	VR	20,000	1	1	-	2424	0.55	3	330	-	270	-	
7	MIDLAND AV	F_1016942_2562857	VR	20,000	1	1	-	1015	0.81	3	330	-	270	-	
8	MIDLAND AV	F_1016821_2562579	VR	20,000	2	1	-	774	0.62	1	110	-	270	-	
8	MIDLAND AV	F_1016821_2562579	VR	N/A	N/A	N/A	N/A	3525	N/A	4	440	-	270	-	
9	MIDLAND AV	F_1016864_2562813	VR	20,000	1	1	-	2002	0.47	4	440	-	270	-	
10	MIDLAND AV	F_1016681_2562585	VR	20,000	1	1	-	3198	0.69	3	330	-	270	-	
11	MIDLAND AV	F_1016743_2562826	VR	20,000	2	1	-	506	0.46	1	110	-	270	-	
11	MIDLAND AV	F_1016743_2562826	VR	N/A	N/A	N/A	N/A	2442	N/A	3	330	-	270	-	
12	MIDLAND AV	F_1016490_2562185	VR	20,000	2	2	-	909	1.00	1	110	-	270	-	Guest Quarters (assume one bedroom)
12	MIDLAND AV	F_1016490_2562185	VR	N/A	N/A	N/A	N/A	3576	N/A	4	440	-	270	-	
13	MIDLAND AV	F_1016560_2562789	VR	20,000	1	1	-	2672	0.48	4	440	-	270	-	
14	MIDLAND AV	F_1016354_2562152	VR	20,000	1	1	-	1677	0.75	3	330	-	270	-	
16	MIDLAND AV	F_1016551_2562632	VR	20,000	1	1	-	2406	0.62	3	330	-	270	-	
18	MIDLAND AV	F_1016434_2562591	VR	20,000	2	1	-	1984	0.53	3	330	-	270	-	
18	MIDLAND AV	F_1016434_2562591	VR	N/A	N/A	N/A	N/A	440	N/A	1	110	-	270	-	
20	MIDLAND AV	F_1016305_2562591	VR	20,000	1	1	-	1541	0.48	4	440	-	270	-	
22	MIDLAND AV	F_1016298_2562435	VR	20,000	2	2	1	3251	1.20	4	440	330	270	270	
10	MISSISSIPPI AV		VR	20,000	1	1	-	2165	0.18	3	330	-	270		
10	MISSISSIPPI AV		VR	20,000	0	1	-	Vacant	0.09	Vacant	330	-	270	-	
11	MISSISSIPPI AV	F_1015887_2563484	VR	20,000	1	1	-	1662	0.43	3	330	-	270	-	
2	N CAMBRIDGE ST	F_1016949_2564527	VR	20,000	2	1	-	1804	0.75	2	220	-	270	-	
2	N CAMBRIDGE ST	F_1016949_2564527	VR	N/A	N/A	N/A	N/A	516	N/A	1	110	-	270	-	
8	N CAMBRIDGE ST	F_1016910_2564763	VR	20,000	2	1	-	380	0.45	1	110	-	270	-	
8	N CAMBRIDGE ST	F_1016910_2564763	VR	N/A	N/A	N/A	N/A	1584	N/A	3	330	-	270	-	
10	N CAMBRIDGE ST	F_1016833_2564648	VR	20,000	1	1	-	1450	0.86	4	440	-	270	-	
12	N CAMBRIDGE ST	F_1016733_2564866	VR	20,000	1	1	-	700	0.39	2	220	-	270	-	
14	N CAMBRIDGE ST	F_1016792_2564917	VR	20,000	1	1	-	672	0.19	2	220	-	270	-	
1	NORTH PT	F_1729607_104343	LUG2	80,000	1	1	-	2159	0.35	3	330	-	270	-	
3	NORTH PT	F_1729596_104422	LUG2	80,000	2	1	-	783	0.28	2	220	-	270	-	
3	NORTH PT	F_1729596_104422	LUG2	N/A	N/A	N/A	N/A	1893	N/A	3	330	-	270	-	
5	NORTH PT	F_1729543_104484	LUG2	80,000	1	1	-	1657	0.25	2	220	-	270	-	
7	NORTH PT	F_1729463_104521	LUG2	80,000	1	1	-	2716	0.25	2	220	-	270	-	
9	NORTH PT	F_1729367_104511	LUG2	80,000	1	1	-	2696	0.30	3	330	-	270	-	
11	NORTH PT	F_1729285_104456	LUG2	80,000	1	1	-	2512	0.29	5	550	-	270	-	
3	OAKLAND ST	F_1015901_2564001	VR	20,000	1	1	-	975	0.55	2	220	-	270	-	
7	OAKLAND ST	F_1015770_2564152	VR	20,000	2	2	1	2972	0.93	4	440	330	270	270	
12	OAKLAND ST	F_1015411_2564395	VR	20,000	1	3	-	3179	1.38	5	550	-	270	-	1/2 Wetland
14	OAKLAND ST	F_1015581_2564558	VR	20,000	1	3	-	1280	1.41	1	110	-	270	-	1/2 Wetland
	OKLAHOMA AV		VR	20,000	0	1	-	Vacant	0.5	Vacant	330	-	270	-	
3	POPS LN	F_1013289_2562634	VR	20,000	2	2	-	1554	1.28	3	330	-	270	-	
3	POPS LN	F_1013289_2562634	VR	N/A	N/A	N/A	N/A	317	N/A	1	110	-	270	-	
1	RIDGE LN	F_1729675_103797	LUG2	80,000	1	1	-	1702	0.24	3	330	-	270	-	
2	RIDGE LN	F_1729519_103801	LUG2	80,000	1	1	-	2266	0.24	3	330	-	270	-	
3	RIDGE LN	F_1729680_103873	LUG2	80,000	1	1	-	440	0.24	1	110	-	270	-	Cottage (assume one bedroom)
3	RIDGE LN	F_1729680_103873	LUG2	80,000	1	1	-	1677	0.24	2	220	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
4	RIDGE LN	F_1729525_103868	LUG2	80,000	1	1	-	1944	0.24	3	330	-	270	-	
5	RIDGE LN	F_1729701_103951	LUG2	80,000	1	1	-	1195	0.26	2	220	-	270	-	
5	RIDGE LN	F_1729701_103951	LUG2	80,000	1	1	-	2184	0.26	3	330	-	270	-	
6	RIDGE LN	F_1729518_103942	LUG2	80,000	1	1	-	2595	0.29	3	330	-	270	-	
6	RIDGE LN	F_1729518_103942	LUG2	80,000	1	1	-	594	0.29	1	110	-	270	-	
7	RIDGE LN	F_1729707_104040	LUG2	80,000	1	1	-	1296	0.26	3	330	-	270	-	
8	RIDGE LN	F_1729522_104041	LUG2	80,000	1	1	-	2085	0.29	3	330	-	270	-	
9	RIDGE LN	F_1729700_104117	LUG2	80,000	1	1	-	1055	0.24	2	220	-	270	-	
10	RIDGE LN	F_1729537_104116	LUG2	80,000	1	1	-	1384	0.24	3	330	-	270	-	
11	RIDGE LN	F_1729699_104191	LUG2	80,000	1	1	-	960	0.26	3	330	-	270	-	
12	RIDGE LN	F_1729546_104190	LUG2	80,000	1	1	-	1600	0.23	3	330	-	270	-	
13	RIDGE LN	F_1729689_104270	LUG2	80,000	1	1	-	1202	0.29	3	330	-	270	-	
16	RIDGE LN	F_1729223_104227	LUG2	80,000	1	1	-	1206	0.23	2	220	-	270	-	
17	RIDGE LN	F_1729249_104370	LUG2	80,000	1	1	-	1378	0.31	4	440	-	270	-	
18	RIDGE LN	F_1729143_104225	LUG2	80,000	1	1	-	2240	0.23	4	440	-	270	-	
19	RIDGE LN	F_1729163_104384	LUG2	80,000	1	1	-	1584	0.26	3	330	-	270	-	
20	RIDGE LN	F_1729019_104251	LUG2	80,000	1	1	-	786	0.30	1	110	-	270	-	
20	RIDGE LN	F_1729019_104251	LUG2	80,000	1	1	-	1933	0.30	3	330	-	270	-	
21	RIDGE LN	F_1729004_104380	LUG2	80,000	1	1	-	1638	0.25	3	330	-	270	-	
22	RIDGE LN	F_1728917_104224	LUG2	80,000	1	1	-	1123	0.24	3	330	-	270	-	
23	RIDGE LN	F_1728930_104390	LUG2	80,000	1	1	-	1656	0.24	4	440	-	270	-	
24	RIDGE LN	F_1728845_104228	LUG2	80,000	1	1	-	2622	0.24	4	440	-	270	-	
25	RIDGE LN	F_1728853_104393	LUG2	80,000	1	1	-	1504	0.24	3	330	-	270	-	
25	RIDGE LN	F_1728853_104393	LUG2	80,000	1	1	-	396	0.24	1	110	-	270	-	
27	RIDGE LN	F_1728773_104395	LUG2	80,000	1	1	-	1623	0.24	5	550	-	270	-	
29	RIDGE LN	-	LUG2	80,000	0	1	-	Vacant	0.24	Vacant	330	-	270	-	
30	RIDGE LN	F_1728401_104226	LUG2	80,000	1	1	-	1296	0.30	2	220	-	270	-	
30	RIDGE LN	F_1728401_104226	LUG2	80,000	1	1	-	528	0.30	1	110	-	270	-	
31	RIDGE LN	F_1728440_104377	LUG2	80,000	1	1	-	2396	0.24	4	440	-	270	-	
31	RIDGE LN	F_1728440_104377	LUG2	80,000	1	1	-	1331	0.24	3	330	-	270	-	
33	RIDGE LN	F_1728362_104371	LUG2	80,000	1	1	-	2473	0.25	4	440	-	270	-	
33	RIDGE LN	F_1728362_104371	LUG2	80,000	1	1	-	564	0.25	1	110	-	270	-	
34	RIDGE LN	F_1728247_104192	LUG2	80,000	1	1	-	3007	0.26	4	440	-	270	-	
35	RIDGE LN	F_1728282_104366	LUG2	80,000	1	1	-	789	0.25	2	220	-	270	-	
35	RIDGE LN	F_1728282_104366	LUG2	80,000	1	1	-	1528	0.25	3	330	-	270	-	
36	RIDGE LN	-	LUG2	80,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	
37	RIDGE LN	F_1728203_104359	LUG2	80,000	1	1	-	2692	0.25	4	440	-	270	-	
39	RIDGE LN	F_1728133_104360	LUG2	80,000	1	1	-	2621	0.25	3	330	-	270	-	
41	RIDGE LN	F_1728049_104339	LUG2	80,000	1	1	-	1875	0.26	3	330	-	270	-	
42	RIDGE LN	F_1728002_104163	LUG2	80,000	1	1	-	2565	0.32	4	440	-	270	-	
43	RIDGE LN	F_1727968_104327	LUG2	80,000	1	1	-	2880	0.27	4	440	-	270	-	
45	RIDGE LN	-	LUG2	80,000	0	1	-	Vacant	0.37	Vacant	330	-	270	-	
47	RIDGE LN	F_1727831_104230	LUG2	80,000	1	1	-	1764	0.32	5	550	-	270	-	
48	RIDGE LN	F_1727970_104057	LUG2	80,000	1	1	-	1701	0.26	3	330	-	270	-	
49	RIDGE LN	F_1727803_104143	LUG2	80,000	1	1	-	1796	0.30	2	220	-	270	-	
49	RIDGE LN	F_1727803_104143	LUG2	80,000	1	1	-	3218	0.30	3	330	-	270	-	
50	RIDGE LN	F_1727946_103988	LUG2	80,000	1	1	-	1750	0.24	3	330	-	270	-	
51	RIDGE LN	F_1727796_104064	LUG2	80,000	1	1	-	1762	0.25	3	330	-	270	-	
1	S CAMBRIDGE ST	F_1017069_2564125	VR	20,000	1	1	-	1088	0.64	3	330	-	270	-	
2	S CAMBRIDGE ST	F_1017185_2564337	VR	20,000	2	1	-	2152	0.46	2	220	-	270	-	
2	S CAMBRIDGE ST	F_1017185_2564337	VR	N/A	N/A	N/A	N/A	336	N/A	1	110	-	270	-	
3	S CAMBRIDGE ST	F_1017140_2564015	VR	20,000	1	1	-	1834	0.56	4	440	-	270	-	
4	S CAMBRIDGE ST	F_1017341_2564216	VR	20,000	1	1	-	2271	0.45	3	330	-	270	-	
6	S CAMBRIDGE ST	F_1017399_2564076	VR	20,000	1	2	1	1667	1.00	3	330	330	270	270	
7	S CAMBRIDGE ST	F_1017264_2563782	VR	20,000	1	1	-	2157	0.75	4	440	-	270	-	
11	S CAMBRIDGE ST	F_1017235_2563617	VR	20,000	1	1	-	4488	0.61	4	440	-	270	-	
13	S CAMBRIDGE ST	F_1017261_2563491	VR	20,000	1	1	-	1268	0.49	2	220	-	270	-	
15	S CAMBRIDGE ST	F_1017162_2563361	LUG3	120,000	1	1	-	1015	0.46	3	330	-	270	-	
17	S CAMBRIDGE ST	F_1017117_2563274	LUG3	120,000	1	1	-	1264	0.16	3	330	-	270	-	
19	S CAMBRIDGE ST	F_1017115_2563261	VR	20,000	1	1	-	1280	0.16	3	330	-	270	-	
21	S CAMBRIDGE ST	F_1016986_2563236	VR	20,000	1	1	-	1440	0.20	3	330	-	270	-	
23	S CAMBRIDGE ST	F_1017111_2563235	VR	20,000	1	1	-	1264	0.16	3	330	-	270	-	
25	S CAMBRIDGE ST	F_1017110_2563224	VR	20,000	1	1	-	960	0.14	2	220	-	270	-	
27	S CAMBRIDGE ST	F_1017088_2563200	VR	20,000	1	1	-	1264	0.16	3	330	-	270	-	
29	S CAMBRIDGE ST	F_1017110_2563191	VR	20,000	1	1	-	1280	0.16	3	330	-	270	-	
31	S CAMBRIDGE ST	F_1017098_2563173	VR	20,000	1	1	-	1368	0.20	3	330	-	270	-	
32	S CAMBRIDGE ST	F_1726909_99992	LUG1	40,000	1	1	-	1364		3	330	-	270	-	
33	S CAMBRIDGE ST	F_1017124_2563170	VR	20,000	1	1	-	1280	0.16	3	330	-	270	-	
34	S CAMBRIDGE ST	F_1726909_99992	LUG1	40,000	1	1	-	1030		3	330	-	270	-	
35	S CAMBRIDGE ST	F_1017253_2563179	VR	20,000	1	1	-	960	0.14	2	220	-	270	-	
36	S CAMBRIDGE ST	F_1726909_99992	LUG1	40,000	1	1	-	860		4	440	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
37	S CAMBRIDGE ST	F_1017275_2563167	VR	20,000	1	1	-	1280	0.13	3	330	-	270	-	
38	S CAMBRIDGE ST	F_1726909_99992	LUG1	40,000	1	1	-	640		2	220	-	270	-	
39	S CAMBRIDGE ST	F_1017179_2563151	VR	20,000	1	1	-	1264	0.13	3	330	-	270	-	
40	S CAMBRIDGE ST	F_1726909_99992	LUG1	40,000	1	1	-	860		3	330	-	270	-	
41	S CAMBRIDGE ST	F_1017187_2563141	VR	20,000	1	1	-	1440	0.16	3	330	-	270	-	
42	S CAMBRIDGE ST	F_1017566_2563258	LUG1	40,000	1	1	-	860		2	220	-	270	-	
43	S CAMBRIDGE ST	F_1017202_2563130	LUG3	120,000	1	1	-	1280	0.13	3	330	-	270	-	
44	S CAMBRIDGE ST	F_1726909_99992	LUG1	40,000	1	1	-	1027		3	330	-	270	-	
45	S CAMBRIDGE ST	F_1017210_2563117	LUG3	120,000	1	1	-	948	0.12	2	220	-	270	-	
47	S CAMBRIDGE ST	F_1017304_2562975	VR	20,000	1	1	-	1044	0.47	3	330	-	270	-	
49	S CAMBRIDGE ST	F_1017304_2562870	VR	20,000	1	1	-	1184	0.55	3	330	-	270	-	
1	STARBUCK RD	F_1015235_2563102	VR	20,000	2	1	-	288	0.47	1	110	-	270	-	Guest Quarters (assume one bedroom)
1	STARBUCK RD	F_1015235_2563102	VR	N/A	N/A	N/A	N/A	1583	N/A	4	440	-	270	-	
2	STARBUCK RD	F_1015392_2562717	VR	20,000	4	4	3	2127	2.13	3	330	990	270	810	
3	STARBUCK RD	F_1015199_2562992	VR	20,000	1	1	-	1450	0.45	4	440	-	270	-	
4	STARBUCK RD	F_1015359_2562906	VR	20,000	1	1	-	2250	0.48	3	330	-	270	-	
5	STARBUCK RD	F_1015121_2562903	VR	20,000	1	1	-	2932	0.49	5	550	-	270	-	
6	STARBUCK RD	F_1015313_2562779	VR	20,000	1	1	-	2198	0.51	4	440	-	270	-	
7	STARBUCK RD	F_1015037_2562756	VR	20,000	1	1	-	2382	0.47	4	440	-	270	-	
8	STARBUCK RD	F_1015256_2562666	VR	20,000	1	1	-	1992	0.57	4	440	-	270	-	
10	STARBUCK RD	F_1015178_2562588	VR	20,000	1	1	-	1506	0.51	4	440	-	270	-	
11	STARBUCK RD	F_1014918_2562630	VR	20,000	1	1	-	1600	0.39	4	440	-	270	-	
12	STARBUCK RD	F_1015059_2562521	VR	20,000	1	1	-	1818	0.55	4	440	-	270	-	
13	STARBUCK RD	F_1014818_2562551	VR	20,000	1	1	-	2064	0.52	3	330	-	270	-	
14	STARBUCK RD	F_1014980_2562388	VR	20,000	1	1	-	2620	0.61	4	440	-	270	-	
15	STARBUCK RD	F_1014750_2562438	VR	20,000	1	1	-	2216	0.44	3	330	-	270	-	
16	STARBUCK RD	F_1014906_2562276	VR	20,000	2	1	-	624	0.74	1	110	-	270	-	Guest Quarters (assume one bedroom)
16	STARBUCK RD	F_1014906_2562276	VR	N/A	N/A	N/A	N/A	2409	N/A	4	440	-	270	-	
17	STARBUCK RD	F_1014634_2562336	VR	20,000	1	1	-	2220	0.51	3	330	-	270	-	
18	STARBUCK RD	F_1014790_2562204	VR	20,000	1	1	-	2206	0.41	4	440	-	270	-	
19	STARBUCK RD	F_1014546_2562219	VR	20,000	1	1	-	4635	0.69	5	550	-	270	-	
20	STARBUCK RD	F_1014697_2562117	VR	20,000	1	1	-	3857	0.50	4	440	-	270	-	
21	STARBUCK RD	-	VR	20,000	0	1	-	Vacant	0.49	Vacant	330	-	270	-	
22	STARBUCK RD	F_1014638_2562012	VR	20,000	1	1	-	2406	0.54	2	220	-	270	-	
23	STARBUCK RD	F_1014310_2561981	VR	20,000	1	1	-	1732	0.85	4	440	-	270	-	
24	STARBUCK RD	F_1014532_2561913	VR	20,000	1	1	-	2826	0.77	4	440	-	270	-	
25	STARBUCK RD	F_1014112_2561797	VR	20,000	2	1	-	902	0.80	1	110	-	270	-	
25	STARBUCK RD	F_1014112_2561797	VR	N/A	N/A	N/A	N/A	4168	N/A	4	440	-	270	-	
26	STARBUCK RD	F_1014438_2561794	VR	20,000	1	1	-	2419	0.82	3	330	-	270	-	
40	STARBUCK RD	F_1014754_2561673	VR	20,000	1	1	-	1166	0.40	4	440	-	270	-	
41	STARBUCK RD	F_1015253_2561743	VR	20,000	1	1	-	1780	0.59	3	330	-	270	-	
42	STARBUCK RD	F_1014909_2561674	VR	20,000	1	1	-	1922	0.61	4	440	-	270	-	
43	STARBUCK RD		VR	20,000	0	1	-	Vacant	0.41	Vacant	330	-	270		
44	STARBUCK RD	F_1015046_2561704	VR	20,000	1	1	-	2021	0.55	3	330	-	270	-	
45	STARBUCK RD	F_1015349_2561974	VR	20,000	1	1	-	3583	0.48	4	440	-	270	-	
46	STARBUCK RD	-	VR	20,000	0	1	-	Vacant	0.48	Vacant	330	-	270	-	
47	STARBUCK RD	F_1015336_2562105	VR	20,000	1	1	-	2388	0.40	3	330	-	270	-	
48	STARBUCK RD	F_1015149_2561949	VR	20,000	1	1	-	3342	0.55	4	440	-	270	-	
49	STARBUCK RD	F_1015392_2562249	VR	20,000	1	1	-	1216	0.57	3	330	-	270	-	
50	STARBUCK RD	F_1015167_2562120	VR	20,000	1	1	-	2164	0.52	3	330	-	270	-	
51	STARBUCK RD	F_1015476_2562370	VR	20,000	1	1	-	1613	0.41	3	330	-	270	-	
52	STARBUCK RD	F_1015226_2562295	VR	20,000	1	1	-	2215	0.49	3	330	-	270	-	
54	STARBUCK RD	F_1015297_2562432	VR	20,000	1	1	-	1972	0.43	4	440	-	270	-	
56	STARBUCK RD	F_1015463_2562618	VR	20,000	1	1	-	2297	0.41	4	440	-	270	-	
58	STARBUCK RD	F_1015544_2562693	VR	20,000	1	1	-	1578	0.34	4	440	-	270	-	
59	STARBUCK RD	F_1015586_2562427	VR	20,000	1	1	-	2761	0.61	4	440	-	270	-	
60	STARBUCK RD	F_1015696_2562850	VR	20,000	1	1	-	2450	0.79	3	330	-	270	-	
61	STARBUCK RD	F_1015658_2562540	VR	20,000	1	1	-	1617	0.62	2	220	-	270	-	
62	STARBUCK RD	F_1015622_2562961	VR	20,000	1	1	-	1640	0.61	3	330	-	270	-	
63	STARBUCK RD	F_1015956_2562799	VR	20,000	1	1	-	2373	0.70	3	330	-	270	-	
64	STARBUCK RD	F_1015607_2563060	VR	20,000	1	1	-	2596	0.41	5	550	-	270	-	
66	STARBUCK RD	F_1015526_2563140	VR	20,000	1	1	-	1499	0.57	4	440	-	270	-	
67	STARBUCK RD	F_1015692_2563276	VR	20,000	1	1	-	1388	0.56	2	220	-	270	-	
69	STARBUCK RD	F_1015573_2563340	VR	20,000	1	1	-	1015	0.54	3	330	-	270	-	
71	STARBUCK RD	F_1015436_2563302	VR	20,000	1	1	-	1512	0.40	4	440	-	270	-	
54R	STARBUCK RD	-	VR	20,000	0	1	-	Vacant	0.29	Vacant	330	-	270	-	
1	TENNESSEE AV	F_1013700_2562680	VR	20,000	2	1	-	220	0.16	1	110	-	270	-	
1	TENNESSEE AV	F_1013700_2562680	VR	N/A	N/A	N/A	N/A	952	N/A	2	220	-	270	-	
2	TENNESSEE AV	F_1013613_2562786	VR	20,000	1	1	-	1235	0.26	1	110	-	270	-	
6	TENNESSEE AV	F_1013774_2562905	VR	20,000	2	1	-	1638	0.14	5	550	-	270	-	
6	TENNESSEE AV	F_1013774_2562905	VR	N/A	N/A	N/A	N/A	289	N/A	1	110	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
9	TENNESSEE AV	F_1014515_2563233	VR	20,000	1	1	-	1977	0.60	3	330	-	270	-	
10	TENNESSEE AV	F_1014393_2563373	VR	20,000	1	1	-	902	0.23	2	220	-	270	-	
12	TENNESSEE AV	F_1014440_2563435	VR	20,000	2	1	-	1350	0.29	2	220	-	270	-	
12	TENNESSEE AV	F_1014440_2563435	VR	N/A	N/A	N/A	N/A	191	N/A	1	110	-	270	-	Cottage (assume one bedroom)
14	TENNESSEE AV	F_1014481_2563562	VR	20,000	2	2	-	2792	1.16	3	330	-	270	-	
14	TENNESSEE AV	F_1014481_2563562	VR	N/A	N/A	N/A	N/A	432	N/A	1	110	-	270	-	
15	TENNESSEE AV	F_1014675_2563354	VR	20,000	1	1	-	1992	0.55	-	150	-	270	-	Clubs/Lodges
18	TENNESSEE AV	F_1014645_2563713	VR	20,000	2	2	-	690	1.21	2	220	-	270	-	
18	TENNESSEE AV	F_1014645_2563713	VR	N/A	N/A	N/A	N/A	435	N/A	3	330	-	270	-	
19	TENNESSEE AV	F_1014825_2563465	VR	20,000	1	1	-	3349	0.69	3	330	-	270	-	
24	TENNESSEE AV	F_1014937_2563866	VR	20,000	1	1	-	3131	0.47	3	330	-	270	-	
25	TENNESSEE AV	F_1015183_2563726	VR	20,000	1	1	-	2020	0.55	2	220	-	270	-	
26	TENNESSEE AV	F_1015008_2563897	VR	20,000	1	1	-	1772	0.41	2	220	-	270	-	
28	TENNESSEE AV	F_1015092_2563910	VR	20,000	1	1	-	1488	0.28	1	110	-	270	-	
32	TENNESSEE AV	-	VR	20,000	0	1	-	Vacant	0.18	Vacant	330	-	270	-	
33	TENNESSEE AV	F_1015358_2563857	VR	20,000	2	1	-	1700	0.28	3	330	-	270	-	
33	TENNESSEE AV	F_1015358_2563857	VR	N/A	N/A	N/A	N/A	389	N/A	1	110	-	270	-	
34	TENNESSEE AV		VR	20,000	0	1	-	Vacant	0.36	Vacant	330	-	270	-	
35	TENNESSEE AV	F_1015466_2563943	VR	20,000	1	1	-	2384	0.72	5	550	-	270	-	
36	TENNESSEE AV	F_1015288_2564284	VR	20,000	1	1	-	1704	0.91	3	330	-	270	-	1/2 Wetland
38	TENNESSEE AV		VR	20,000	0	1	-	Vacant	0.45	Vacant	330	-	270	-	
39	TENNESSEE AV	F_1015890_2564287	VR	20,000	2	1	-	576	0.66	1	110	-	270	-	Guest Quarters (assume one bedroom)
39	TENNESSEE AV	F_1015890_2564287	VR	N/A	N/A	N/A	N/A	3707	N/A	6	660	-	270	-	
40	TENNESSEE AV	F_1015708_2564393	VR	20,000	1	2	1	1651	1.36	2	220	330	270	270	
41	TENNESSEE AV	F_1015984_2564483	VR	20,000	1	1	-	1008	0.28	3	330	-	270	-	
43	TENNESSEE AV	F_1016105_2564481	VR	20,000	1	1	-	2837	0.88	4	440	-	270	-	
44	TENNESSEE AV	F_1015854_2564605	VR	20,000	2	1	-	504	0.68	1	110	-	270	-	1/4 Wetland
44	TENNESSEE AV	F_1015854_2564605	VR	N/A	N/A	N/A	N/A	3474	N/A	3	330	-	270	-	
46	TENNESSEE AV	F_1015958_2564765	VR	20,000	1	2	-	2212	1.27	3	330	-	270	-	3/4 Wetland
51	TENNESSEE AV	F_1016404_2564736	VR	20,000	2	1	-	1104	0.78	3	330	-	270	-	
51	TENNESSEE AV	F_1016404_2564736	VR	N/A	N/A	N/A	N/A	84	N/A	1	110	-	270	-	
52	TENNESSEE AV	F_1016239_2564950	VR	20,000	2	1	-	419	0.34	1	110	-	270	-	
52	TENNESSEE AV	F_1016239_2564950	VR	N/A	N/A	N/A	N/A	1506	N/A	3	330	-	270	-	
53	TENNESSEE AV	-	VR	20,000	0	1	-	Vacant	0.49	Vacant	330	-	270	-	
54	TENNESSEE AV	F_1016381_2564971	VR	20,000	1	1	-	1620	0.15	3	330	-	270	-	
54	TENNESSEE AV	-	VR	20,000	0	1	-	Vacant	0.15	Vacant	330	-	270	-	
55	TENNESSEE AV	F_1016604_2564885	VR	20,000	2	1	-	2369	0.57	3	330	-	270	-	
55	TENNESSEE AV	F_1016604_2564885	VR	N/A	N/A	N/A	N/A	611	N/A	1	110	-	270	-	
58	TENNESSEE AV	-	VR	20,000	0	1	-	Vacant	0.74	Vacant	330	-	270	-	Wetland (Mostly)
60	TENNESSEE AV	F_1016814_2565155	VR	20,000	1	1	-	566	0.65	1	110	-	270	-	
61	TENNESSEE AV	F_1016837_2564939	VR	20,000	2	1	-	700	0.17	2	220	-	270	-	
61	TENNESSEE AV	F_1016837_2564939	VR	N/A	N/A	N/A	N/A	924	N/A	1	110	-	270	-	
63	TENNESSEE AV	F_1016890_2564970	VR	20,000	1	1	-	1016	0.21	3	330	-	270	-	
2	THE GROVE	F_1728915_103798	LUG2	80,000	2	1	-	1866	0.26	1	110	-	270	-	
2	THE GROVE	F_1728915_103798	LUG2	N/A	N/A	N/A	N/A	546	N/A	2	220	-	270	-	
4	THE GROVE	F_1728791_103809	LUG2	80,000	2	1	-	484	0.25	1	110	-	270	-	
4	THE GROVE	F_1728791_103809	LUG2	N/A	N/A	N/A	N/A	27839	N/A	3	330	-	270	-	
6	THE GROVE	F_1728803_103885	LUG2	80,000	1	1	-	1648	0.25	3	330	-	270	-	
8	THE GROVE	F_1728817_103955	LUG2	80,000	1	1	-	1992	0.27	3	330	-	270	-	
10	THE GROVE	F_1728834_104043	LUG2	80,000	1	1	-	962	0.26	2	220	-	270	-	
12	THE GROVE	F_1728855_104119	LUG2	80,000	1	1	-	2371	0.29	3	330	-	270	-	
14	THE GROVE	F_1728983_104139	LUG2	80,000	2	1	-	1691	0.25	3	330	-	270	-	
14	THE GROVE	F_1728983_104139	LUG2	N/A	N/A	N/A	N/A	924	N/A	2	220	-	270	-	
16	THE GROVE	F_1729054_104133	LUG2	80,000	1	1	-	1628	0.25	3	330	-	270	-	
7	WARRENS LANDING RD	F_1729313_103643	LUG3	120,000	1	1	-	1182	2.3	3	330	-	270	-	
1	WASHINGTON AV	F_1013668_2562405	VR	20,000	1	1	-	1738	0.42	4	440	-	270	-	
3	WASHINGTON AV	F_1013854_2562490	VR	20,000	1	1	-	2950	0.34	2	220	-	270	-	
4	WASHINGTON AV	F_1013382_2562559	VR	20,000	2	2	1	3574	0.99	3	330	330	270	270	
6	WASHINGTON AV	F_1013583_2562483	VR	20,000	1	1	-	1176	0.06	3	330	-	270	-	
7	WASHINGTON AV	F_1014018_2562656	VR	20,000	1	1	-	940	0.18	3	330	-	270	-	
9	WASHINGTON AV	F_1014098_2562715	VR	20,000	2	1	-	392	0.18	1	110	-	270	-	
9	WASHINGTON AV	F_1014098_2562715	VR	N/A	N/A	N/A	N/A	985	N/A	3	330	-	270	-	
10	WASHINGTON AV	F_1013749_2562615	VR	20,000	1	1	-	928	0.16	3	330	-	270	-	
11	WASHINGTON AV	F_1014183_2562777	VR	20,000	2	1	-	850	0.09	2	220	-	270	-	
11	WASHINGTON AV	F_1014183_2562777	VR	N/A	N/A	N/A	N/A	394	N/A	1	110	-	270	-	
12	WASHINGTON AV	F_1013823_2562670	VR	20,000	1	1	-	2873	0.18	2	220	-	270	-	
15	WASHINGTON AV	F_1014243_2562821	VR	20,000	1	1	-	1968	0.18	3	330	-	270	-	
17	WASHINGTON AV	F_1014303_2562865	VR	20,000	1	1	-	1698	0.09	3	330	-	270	-	
18	WASHINGTON AV	F_1014110_2562888	VR	20,000	1	1	-	1400	0.26	3	330	-	270	-	
19	WASHINGTON AV	F_1014410_2562897	VR	20,000	1	1	-	1256	0.37	2	220	-	270	-	
20	WASHINGTON AV	F_1014234_2562992	VR	20,000	1	1	-	1073	0.34	2	220	-	270	-	

NANTUCKET SEWER MASTER PLAN - MADAKET AND WARREN'S LANDING NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FURUTRE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
22	WASHINGTON AV	-	VR	20,000	0	1	-	Vacant	0.18	Vacant	330	-	270	-	
24	WASHINGTON AV	F_1014398_2563089	VR	20,000	1	1	-	408	0.12	1	110	-	270	-	
25	WASHINGTON AV	-	VR	20,000	0	1	-	Vacant	0.18	Vacant	330	-	270	-	
27	WASHINGTON AV	-	VR	20,000	0	1	-	Vacant	0.18	Vacant	330	-	270	-	
41	WASHINGTON AV	F_1015071_2563435	VR	20,000	1	1	-	1254	0.14	2	220	-	270	-	
51	WASHINGTON AV	F_1015457_2563720	VR	20,000	2	1	-	772	0.40	1	110	-	270	-	
51	WASHINGTON AV	F_1015457_2563720	VR	N/A	N/A	N/A	N/A	2708	N/A	3	330	-	270	-	
53	WASHINGTON AV	F_1015567_2563799	VR	20,000	1	1	-	1180	0.09	3	330	-	270	-	
54	WASHINGTON AV	-	VR	N/A	N/A	N/A	N/A	Vacant	N/A	Vacant	330	-	270	-	Not Buildable
56	WASHINGTON AV	F_1015628_2564055	VR	20,000	2	1	-	1782	0.73	1	110	-	270	-	
56	WASHINGTON AV	F_1015628_2564055	VR	N/A	N/A	N/A	N/A	2294	N/A	2	220	-	270	-	
62	WASHINGTON AV	F_1016100_2564363	VR	20,000	1	1	-	1124	0.23	3	330	-	270	-	
68	WASHINGTON AV	F_1016606_2564736	VR	20,000	1	1	-	3758	0.46	3	330	-	270	-	
69	WASHINGTON AV	F_1016458_2564413	VR	20,000	2	1	-	3309	0.50	3	330	-	270	-	
69	WASHINGTON AV	F_1016458_2564413	VR	N/A	N/A	N/A	N/A	664	N/A	1	110	-	270	-	
6A	WASHINGTON AV	F_1013529_2562489	VR	20,000	1	1	-	616	0.24	2	220	-	270	-	
1	WEST WY	F_1728317_103907	LUG2	80,000	2	1	-	2415	0.23	3	330	-	270	-	
1	WEST WY	F_1728317_103907	LUG2	N/A	N/A	N/A	N/A	958	N/A	2	220	-	270	-	
2	WEST WY	F_1728160_103927	LUG2	80,000	1	1	-	1558	0.24	3	330	-	270	-	
3	WEST WY	F_1728342_103977	LUG2	80,000	1	1	-	1960	0.30	4	440	-	270	-	
4	WEST WY	F_1728164_104005	LUG2	80,000	2	1	-	961	0.26	2	220	-	270	-	
4	WEST WY	F_1728164_104005	LUG2	N/A	N/A	N/A	N/A	1914	N/A	2	220	-	270	-	
5	WEST WY	F_1728360_104065	LUG2	80,000	1	1	-	1936	0.30	3	330	-	270	-	
6	WEST WY	F_1728184_104090	LUG2	80,000	2	1	-	2240	0.27	4	440	-	270	-	
6	WEST WY	F_1728184_104090	LUG2	N/A	N/A	N/A	N/A	808	N/A	2	220	-	270	-	
7	WEST WY	-	LUG2	80,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	
								SUBTOTAL		1572	183665	8580	160380	7020	

Total Number of Lots	509
Total Number of Vacant Lots	31
Total Number of Lots with one (1) Dwelling	393
Total Number of Lots with Multiple Existing Dwellings	86
Total Number of Lots with Multiple Future Dwellings	12
Number of Existing Bedrooms	1572
Number of Future Bedrooms	171
Total Number of Bedrooms	1743
Average Number of Bedrooms per Lot	3.3

Percentage of Lots with Multiple Dwellings (Existing and Future)	19%
Projected Percentage of Lots with Multiple Dwellings (Future)	24%
Additional Percentage of Lots with Multiple Dwellings (Future)	5%
Number of Additional Future Secondary Dwellings	25

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**128,800**	**167,400**
ADF for Additional Future Secondary Dwellings (gpd)	**5,500**	**6,800**
Total Average Daily Flow	**134,000**	**174,000**
Peaking Factor (determined from ASCE MOP9)	**5.3**	**5.3**
Peak Flow (gpd)	**710,200**	**922,200**
Infiltration and Inflow (I/I) Allowance (3)	**0**	**0**
Total Peak Flow including I/I allowance (gpd)	**710,200**	**922,200**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

NANTUCKET SEWER MASTER PLAN - MIACOMET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
3	CORREIA LN	F_1040601_2556126	LUG1	40,000	1	1	-	1923	1.15	3	330	-	270	-	
4	CORREIA LN	F_1040503_2555904	LUG1	40,000	1	1	-	2160	1.41	4	440	-	270	-	
8	CORREIA LN	F_1040235_2556021	LUG1	40,000	1	1	-	960	1.4	3	330	-	270	-	
9	CORREIA LN	F_1040415_2556390	LUG1	40,000	2	2	1	1232	2.3	3	330	330	270	270	
11	CORREIA LN	F_1040242_2556461	LUG1	40,000	2	1	-	1456	1.83	2	220	-	270	-	
11	CORREIA LN	F_1040242_2556461	LUG1	N/A	N/A	N/A	N/A	2570	N/A	4	440	-	270	-	
12	CORREIA LN	-	LUG1	40,000	0	2	1	Vacant	2	Vacant	330	330	270	270	
13	CORREIA LN	F_1040075_2556519	LUG1	40,000	2	2	1	1867	2.16	3	330	330	270	270	
15	CORREIA LN	F_1039837_2556650	LUG1	40,000	3	3	2	2050	3.31	5	550	660	270	540	
16	CORREIA LN	F_1039627_2556254	LUG1	40,000	2	2	1	1264	2	3	330	330	270	270	
17	CORREIA LN	F_1039654_2556536	LUG1	40,000	1	1	-	2207	1.15	5	550	-	270	-	
2	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	
4	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	
6	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.25	Vacant	330	-	270	-	
8	ELLENS WY	-	LUG 2	80,000	0	1	-	Vacant	0.25	Vacant	330	-	270	-	
10	ELLENS WY	F_1038360_2555693	LUG2	80,000	1	1	-	4031	0.25	5	550	-	270	-	
11	ELLENS WY	-	LUG 2	80,000	0	1	-	Vacant	0.24	Vacant	330	-	270	-	
12	ELLENS WY	F_1038418_2555586	LUG2	80,000	1	1	-	5373	0.25	4	440	-	270	-	
13	ELLENS WY	F_1038309_2555480	LUG2	80,000	1	1	-	2771	0.24	4	440	-	270	-	
14	ELLENS WY	F_1038447_2555468	LUG2	80,000	1	1	-	3247	0.25	4	440	-	270	-	
15	ELLENS WY	F_1038312_2555376	LUG2	80,000	1	1	-	4106	0.24	4	440	-	270	-	
16	ELLENS WY	F_1038444_2555346	LUG2	80,000	1	1	-	3648	0.25	4	440	-	270	-	
17	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.31	Vacant	330	-	270	-	
19	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.31	Vacant	330	-	270	-	
20	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.31	Vacant	330	-	270	-	
21	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.31	Vacant	330	-	270	-	
22	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.26	Vacant	330	-	270	-	
23	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.31	Vacant	330	-	270	-	
25	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.26	Vacant	330	-	270	-	
27	ELLENS WY	-	LUG2	80,000	0	1	-	Vacant	0.26	Vacant	330	-	270	-	
1	FELCON DR	F_1040587_2555634	LUG1	40,000	2	2	1	2240	2.18	4	440	330	270	270	
5	FELCON DR	-	LUG1	40,000	0	2	1	Vacant	2.18	Vacant	330	330	270	270	
9	FELCON DR	-	LUG1	40,000	0	2	1	Vacant	2.13	Vacant	330	330	270	270	
11	FELCON DR	-	LUG1	40,000	0	2	1	Vacant	2.17	Vacant	330	330	270	270	
15A	FIELD AV	-	LUG1	40,000	2	1		1092	1	1	110	-	270	-	
15A	FIELD AV	-	LUG1	N/A	N/A	N/A	N/A	756	N/A	2	220	-	270	-	
17	FIELD AV	F_1041070_2554298	LUG1	40,000	1	1	-	1111	0.99	1	110	-	270	-	
18	FIELD AV	F_1041355_2554459	LUG1	40,000	1	1	-	2326	1	3	330	-	270	-	
19	FIELD AV	-	LUG1	40,000	0	1	-	Vacant	0.99	Vacant	330	-	270	-	
20	FIELD AV	F_1041301_2554245	LUG1	40,000	2	1	-	2340	1.01	4	440	-	270	-	
20	FIELD AV	F_1041301_2554245	LUG1	N/A	N/A	N/A	N/A	1520	N/A	2	220	-	270	-	
21	FIELD AV	F_1040961_2553865	LUG1	40,000	1	1	-	1660	0.99	3	330	-	270	-	
22	FIELD AV	F_1041245_2554029	LUG1	40,000	2	1	-	3231	1	5	550	-	270	-	
22	FIELD AV	F_1041245_2554029	LUG1	N/A	N/A	N/A	N/A	1294	N/A	1	110	-	270	-	
24	FIELD AV	F_1041190_2553810	LUG1	40,000	1	1	-	3155	1	5	550	-	270	-	
13	FOLGER AV	F_1040948_2554800	LUG1	40,000	2	1	-	866	1	1	110	-	270	-	
13	FOLGER AV	F_1040948_2554800	LUG1	N/A	N/A	N/A	N/A	2604	N/A	3	330	-	270	-	
15	FOLGER AV	F_1040894_2554582	LUG1	40,000	2	1	-	1637	1	1	110	-	270	-	
15	FOLGER AV	F_1040894_2554582	LUG1	N/A	N/A	N/A	N/A	1866	N/A	3	330	-	270	-	
17	FOLGER AV	F_1040838_2554365	LUG1	40,000	2	1	-	980	1	2	220	-	270	-	
17	FOLGER AV	F_1040838_2554365	LUG1	N/A	N/A	N/A	N/A	2979	N/A	4	440	-	270	-	
19	FOLGER AV	F_1040784_2554150	LUG1	40,000	3	1	-	1471	1	1	110	-	270	-	
19	FOLGER AV	F_1040784_2554150	LUG1	N/A	N/A	N/A	N/A	2008	N/A	4	440	-	270	-	
19	FOLGER AV	F_1040784_2554150	LUG1	N/A	N/A	N/A	N/A	366	N/A	1	110	-	270	-	
21	FOLGER AV	F_1040727_2553932	LUG1	40,000	2	1	-	3108	1	6	660	-	270	-	
21	FOLGER AV	F_1040727_2553932	LUG1	N/A	N/A	N/A	N/A	378	N/A	1	110	-	270	-	
3	MARYLIN LN	F_1040674_2556378	LUG1	40,000	2	2	-	1344	2.14	3	330	-	270	-	
3	MARYLIN LN	F_1040674_2556378	LUG1	N/A	N/A	N/A	N/A	3508	N/A	6	660	-	270	-	
20	MIACOMET RD		LUG2	80,000	1	1	-	3582	2	5	550	-	270	-	
17	MIACOMET RD		LUG2	80,000	1	1	-	2150	1.43	4	440	-	270	-	
22	MIACOMET RD	F_1040284_2559686	LUG2	80,000	2	1	-	2365	2	3	330	-	270	-	
22	MIACOMET RD	F_1040284_2559686	LUG2	N/A	N/A	N/A	N/A	600	N/A	1	110	-	270	-	
24	MIACOMET RD	F_1040178_2559557	LUG2	80,000	3	1	-	3498	1.86	4	440	-	270	-	
24	MIACOMET RD	F_1040178_2559557	LUG2	N/A	N/A	N/A	N/A	1331	N/A	2	220	-	270	-	
24	MIACOMET RD	F_1040178_2559557	LUG2	N/A	N/A	N/A	N/A	1032	N/A	2	220	-	270	-	
28	MIACOMET RD	F_1040002_2558004	LUG2	80,000	1	1	-	2014	1.84	3	330	-	270	-	
44	MIACOMET RD	F_1039643_2557580	LUG2	80,000	2	1	-	2476	2.22	3	330	-	270	-	
44	MIACOMET RD	F_1039643_2557580	LUG2	N/A	N/A	N/A	N/A	676	N/A	1	110	-	270	-	
90	MIACOMET RD	F_1038416_2556239	LUG2	80,000	1	1	-	2602	1.8	3	330	-	270	-	
92	MIACOMET RD	F_1038324_2556126	LUG2	80,000	1	1	-	2140	1.8	4	440	-	270	-	
94	MIACOMET RD	F_1038225_2556016	LUG2	80,000	2	1	-	1304	1.84	2	220	-	270	-	
94	MIACOMET RD	F_1038225_2556016	LUG2	N/A	N/A	N/A	N/A	5659	N/A	3	330	-	270	-	
130	MIACOMET RD	F_1037900_2555679	LUG2	80,000	2	1	-	936	1.84	2	220	-	270	-	
130	MIACOMET RD	F_1037900_2555679	LUG2	N/A	N/A	N/A	N/A	2672	N/A	3	330	-	270	-	
132	MIACOMET RD	F_1037836_2555480	LUG2	80,000	2	1	-	3618	1.84	4	440	-	270	-	
132	MIACOMET RD	F_1037836_2555480	LUG2	N/A	N/A	N/A	N/A	1176	N/A	2	220	-	270	-	
134	MIACOMET RD	F_1037772_2555304	LUG2	80,000	2	1	-	3430	1.84	6	660	-	270	-	

NANTUCKET SEWER MASTER PLAN - MIACOMET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
134	MIACOMET RD	F_1037772_2555304	LUG2	N/A	N/A	N/A	N/A	468	N/A	1	110	-	270	-	
136	MIACOMET RD	F_1037699_2555149	LUG2	80,000	2	1	-	3661	1.84	4	440	-	270	-	
136	MIACOMET RD	F_1037699_2555149	LUG2	N/A	N/A	N/A	N/A	1504	N/A	3	330	-	270	-	
138	MIACOMET RD	F_1037627_2555018	LUG2	80,000	2	1	-	416	1.84	1	110	-	270	-	Guest Quarters (assume one bedroom)
138	MIACOMET RD	F_1037627_2555018	LUG2	N/A	N/A	N/A	N/A	3330	N/A	3	330	-	270	-	
140	MIACOMET RD	F_1037507_2554868	LUG2	80,000	1	1	-	1872	1.8	4	440	-	270	-	
142	MIACOMET RD	F_1037471_2554664	LUG2	80,000	1	1	-	3245	1.7	4	440	-	270	-	
144	MIACOMET RD	F_1037422_2554416	LUG2	80,000	2	1	-	4416	1.8	5	550	-	270	-	
144	MIACOMET RD	F_1037422_2554416	LUG2	N/A	N/A	N/A	N/A	822	N/A	3	330	-	270	-	
146	MIACOMET RD	F_1037383_2554209	LUG2	80,000	1	1	-	3120	1.85	4	440	-	270	-	
26a	MIACOMET RD		LUG2	80,000	1	1	-	2472	1.26	3	330	-	270	-	
26b	MIACOMET RD		LUG2	80,000	1	1	-	832	0.57	2	220	-	270	-	
1	MORGAN SQ	F_1040936_2553225	LUG2	80,000	2	1	-	1350	2.06	2	220	-	270	-	
1	MORGAN SQ	F_1040936_2553225	LUG2	N/A	N/A	N/A	N/A	496	N/A	1	110	-	270	-	
2	MORGAN SQ	F_1041021_2553524	LUG1	40,000	2	2	-	432	2.06	1	110	-	270	-	
2	MORGAN SQ	F_1041021_2553524	LUG1	N/A	N/A	N/A	N/A	2294	N/A	4	440	-	270	-	
3	MORGAN SQ	F_1040657_2553297	LUG2	80,000	2	1	-	3312	2.06	4	440	-	270	-	
3	MORGAN SQ	F_1040657_2553297	LUG2	N/A	N/A	N/A	N/A	1436	N/A	1	110	-	270	-	
4	MORGAN SQ	F_1040741_2553594	LUG1	40,000	3	2	-	1291	2.06	2	220	-	270	-	
4	MORGAN SQ	F_1040741_2553594	LUG1	N/A	N/A	N/A	N/A	3711	N/A	4	440	-	270	-	
4	MORGAN SQ	F_1040741_2553594	LUG1	N/A	N/A	N/A	N/A	502	N/A	1	110	-	270	-	
3	POND VIEW DR	F_1037672_2554250	LUG2	80,000	1	1	-	5833	1.79	5	550	-	270	-	
4	POND VIEW DR	F_1037780_2554726	LUG2	80,000	1	1	-	3702	1.80	5	550	-	270	-	
5	POND VIEW DR	F_1037853_2554240	LUG2	80,000	2	1	-	5138	1.80	6	660	-	270	-	
5	POND VIEW DR	F_1037853_2554240	LUG2	N/A	N/A	N/A	N/A	616	N/A	1	110	-	270	-	
6	POND VIEW DR	F_1037976_2554699	LUG2	80,000	2	1	-	432	1.80	1	110	-	270	-	
6	POND VIEW DR	F_1037976_2554699	LUG2	N/A	N/A	N/A	N/A	2400	N/A	4	440	-	270	-	
7	POND VIEW DR	F_1038026_2554221	LUG2	80,000	1	1	-	1820	1.80	4	440	-	270	-	
8	POND VIEW DR	F_1038182_2554676	LUG2	80,000	1	1	-	5442	1.84	5	550	-	270	-	
9	POND VIEW DR	F_1038190_2554209	LUG2	80,000	1	1	-	2826	1.80	4	440	-	270	-	
10	POND VIEW DR	F_1038420_2554669	LUG2	80,000	3	1	-	72	1.84	1	110	-	270	-	Guest Quarters (assume one bedroom)
10	POND VIEW DR	F_1038420_2554669	LUG2	N/A	N/A	N/A	N/A	1684	N/A	2	220	-	270	-	
10	POND VIEW DR	F_1038420_2554669	LUG2	N/A	N/A	N/A	N/A	1446	N/A	2	220	-	270	-	
11	POND VIEW DR	F_1038344_2554196	LUG2	80,000	2	1	-	2876	1.80	5	550	-	270	-	
11	POND VIEW DR	F_1038344_2554196	LUG2	N/A	N/A	N/A	N/A	1304	N/A	2	220	-	270	-	
12	POND VIEW DR	F_1038678_2554627	LUG2	80,000	3	1	-	2659	1.80	5	550	-	270	-	
12	POND VIEW DR	F_1038678_2554627	LUG2	N/A	N/A	N/A	N/A	780	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
12	POND VIEW DR	F_1038678_2554627	LUG2	N/A	N/A	N/A	N/A	1464	N/A	2	220	-	270	-	
13	POND VIEW DR	F_1038490_2554182	LUG2	80,000	1	1	-	3263	1.80	3	330	-	270	-	
14	POND VIEW DR	F_1038916_2554569	LUG2	80,000	1	1	-	3253	1.80	4	440	-	270	-	
15	POND VIEW DR	F_1038631_2554151	LUG2	80,000	1	1	-	2080	1.80	3	330	-	270	-	
16	POND VIEW DR	F_1039139_2554527	LUG2	80,000	1	1	-	3288	1.80	4	440	-	270	-	
17	POND VIEW DR	F_1038777_2554109	LUG2	80,000	1	1	-	2243	1.80	3	330	-	270	-	
18	POND VIEW DR	F_1039375_2554502	LUG2	80,000	1	1	-	2408	1.80	4	440	-	270	-	
19	POND VIEW DR	F_1038930_2554074	LUG2	80,000	1	1	-	2594	1.80	3	330	-	270	-	
20	POND VIEW DR	F_1039587_2554417	LUG2	80,000	2	1	-	3233	1.84	4	440	-	270	-	
20	POND VIEW DR	F_1039587_2554417	LUG2	N/A	N/A	N/A	N/A	997	N/A	2	220	-	270	-	
21	POND VIEW DR	F_1039086_2554046	LUG2	80,000	2	1	-	672	1.90	2	220	-	270	-	
21	POND VIEW DR	F_1039086_2554046	LUG2	N/A	N/A	N/A	N/A	1792	N/A	2	220	-	270	-	
23	POND VIEW DR	F_1039251_2554027	LUG2	80,000	1	1	-	2448	2.10	3	330	-	270	-	
25	POND VIEW DR	F_1039424_2554014	LUG2	80,000	2	1	-	1458	1.80	2	220	-	270	-	
25	POND VIEW DR	F_1039424_2554014	LUG2	N/A	N/A	N/A	N/A	2606	N/A	4	440	-	270	-	
1	RACHEL DR	F_1040120_2555539	LUG2	80,000	1	1	-	764	0.92	2	220	-	270	-	
2	RACHEL DR	F_1039903_2555379	LUG1	40,000	2	2	-	148	1.85	1	110	-	270	-	
2	RACHEL DR	F_1039903_2555379	LUG1	N/A	N/A	N/A	N/A	1383	N/A	2	220	-	270	-	
3	RACHEL DR	F_1039899_2555612	LUG1	40,000	1	1	-	1697	0.92	3	330	-	270	-	
4	RACHEL DR	F_1039387_2555449	LUG1	40,000	2	2	-	1976	2.25	3	330	-	270	-	
4	RACHEL DR	F_1039387_2555449	LUG1	N/A	N/A	N/A	N/A	3009	N/A	4	440	-	270	-	
5	RACHEL DR	F_1039537_2555745	LUG1	40,000	1	2	1	1316	2.29	3	330	330	270	270	
2	S PASTURE LN	F_1041031_2556679	LUG1	40,000	2	1		840	1.05	1	110	-	270	-	
2	S PASTURE LN	F_1041031_2556679	LUG1	N/A	N/A	N/A	N/A	960	N/A	1	110	-	270	-	
4	S PASTURE LN	F_1040776_2556691	LUG1	40,000	2	2	1	3720	1.84	6	660	330	270	270	
6	S PASTURE LN	F_1040600_2556817	LUG1	40,000	1	1		3956	0.92	5	550	-	270	-	
8	S PASTURE LN	F_1040325_2556860	LUG1	40,000	2	2		1480	1.84	3	330	-	270	-	
8	S PASTURE LN	F_1040325_2556860	LUG1	N/A	N/A	N/A	N/A	1152	N/A	2	220	-	270	-	
10	S PASTURE LN	F_1040096_2556941	LUG1	40,000	3	2		1528	1.84	3	330	-	270	-	
10	S PASTURE LN	F_1040096_2556941	LUG1	N/A	N/A	N/A	N/A	1376	N/A	1	110	-	270	-	(Assume one bedroom)
10	S PASTURE LN	F_1040096_2556941	LUG1	N/A	N/A	N/A	N/A	1596	N/A	1	110	-	270	-	
12	S PASTURE LN	F_1039853_2556955	LUG1	40,000	1	1	-	1421	1.09	2	220	-	270	-	
14	S PASTURE LN	F_1039868_2557133	LUG1	40,000	2	1	-	489	1.10	1	110	-	270	-	
14	S PASTURE LN	F_1039868_2557133	LUG1	N/A	N/A	N/A	N/A	1777	N/A	3	330	-	270	-	
6-	S PASTURE LN	F_1040498_2556745	LUG1	40,000	1	1	-	1840	0.92	4	440	-	270	-	
25	S SHORE RD	F_1040994_2556519	LUG1	40,000	1	1	-	2772	0.92	4	440	-	270	-	
33	S SHORE RD	F_1040851_2556075	LUG1	40,000	1	1	-	480	1.15	1	110	-	270	-	
35	S SHORE RD	F_1040760_2555808	LUG1	40,000	1	1	-	2077	0.75	3	330	-	270	-	
36	S SHORE RD	F_1040959_2555639	LUG1	40,000	1	1	-	1692	1.07	2	220	-	270	-	
38	S SHORE RD	F_1040888_2555415	LUG2	80,000	1	1	-	590	1.14	1	110	-	270	-	

NANTUCKET SEWER MASTER PLAN - MIACOMET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
42	S SHORE RD	F_1040805_2555155	LUG1	40,000	2	1	-	1876	1.6	4	440	-	270	-	
42	S SHORE RD	F_1040805_2555155	LUG1	N/A	N/A	N/A	N/A	1181	N/A	1	110	-	270	-	
43	S SHORE RD	F_1040460_2555418	LUG1	40,000	2	2	1	3224	1.84	3	330	330	270	270	
47	S SHORE RD	F_1040381_2555215	LUG1	40,000	2	2	-	3881	1.84	4	440	-	270	-	
47	S SHORE RD	F_1040381_2555215	LUG1	N/A	N/A	N/A	N/A	1102	N/A	3	330	-	270	-	
52	S SHORE RD	F_1040715_2554868	LUG1	40,000	2	2	1	2474	1.84	3	330	330	270	270	
53	S SHORE RD	F_1040374_2554932	LUG1	40,000	3	2	-	399	1.84	2	220		270		Cant access property card
53	S SHORE RD	F_1040374_2554932	LUG1	N/A	N/A	N/A	N/A	787	N/A	2	220		270		Cant access property card
53	S SHORE RD	F_1040374_2554932	LUG1	N/A	N/A	N/A	N/A	2164	N/A	3	330		270		Cant access property card
56	S SHORE RD	F_1040632_2554610	LUG2	80,000	1	1	-	1224	1.84	3	330	-	270	-	
59	S SHORE RD	-	LUG2	80,000	0	1	-	Vacant	1.84	Vacant	330	-	270	-	
60	S SHORE RD	F_1040558_2554377	LUG2	80,000	1	1	-	2573	1.84	4	440	-	270	-	
61	S SHORE RD	F_1039960_2554286	LUG2	80,000	1	1	-	3963	2.1	6	660	-	270	-	
62	S SHORE RD	F_1040491_2554163	LUG2	80,000	2	1	-	560	1.84	1	110	-	270	-	
62	S SHORE RD	F_1040491_2554163	LUG2	N/A	N/A	N/A	N/A	4192	N/A	4	440	-	270	-	
63	S SHORE RD	F_1039908_2554146	LUG2	80,000	2	1	-	2008	2.13	5	550	-	270	-	
63	S SHORE RD	F_1039908_2554146	LUG2	N/A	N/A	N/A	N/A	1350	N/A	2	220	-	270	-	
64	S SHORE RD	F_1040426_2553962	LUG2	80,000	1	1	-	2965	1.84	1	110	-	270	-	
65	S SHORE RD	F_1039854_2554009	LUG2	80,000	2	1	-	2410	2.14	4	440	-	270	-	
65	S SHORE RD	F_1039854_2554009	LUG2	N/A	N/A	N/A	N/A	963	N/A	1	110	-	270	-	
66	S SHORE RD	F_1040362_2553769	LUG2	80,000	2	1	-	594	1.84	1	110	-	270	-	
66	S SHORE RD	F_1040362_2553769	LUG2	N/A	N/A	N/A	N/A	3964	N/A	4	440	-	270	-	
67	S SHORE RD	F_1039801_2553871	LUG2	80,000	2	1	-	2588	2.16	5	550	-	270	-	
67	S SHORE RD	F_1039801_2553871	LUG2	N/A	N/A	N/A	N/A	2597	N/A	4	440	-	270	-	
68	S SHORE RD	F_1040308_2553598	LUG2	80,000	2	1	-	446	1.84	1	110	-	270	-	
68	S SHORE RD	F_1040308_2553598	LUG2	N/A	N/A	N/A	N/A	1262	N/A	2	220	-	270	-	
69	S SHORE RD	F_1039749_2553729	LUG2	80,000	1	1	-	3360	2.18	4	440	-	270	-	
70	S SHORE RD		LUG2	80,000	1	1	-	1862	1.84	4	440	-	270	-	
3	S SHORE RD		LUG2	80,000	0	4	-	Vacant	7.36	Vacant	16500	-	13500	-	Surfside Commons -Assumed 50 units/ 3 bedrooms
5	S SHORE RD		LUG2	80,000	0	1	-	Vacant	1.84	Vacant	8250	-	6750	-	Surfside Commons -Assumed 25 units/ 3 bedrooms
7	S SHORE RD		LUG2	80,000	0	1	-	Vacant	1.84	Vacant	8250	-	6750	-	Surfside Commons -Assumed 25 units/ 3 bedrooms
9	S SHORE RD		LUG2	80,000	0	1	-	Vacant	1.84	Vacant	-	-	-	-	Surfside Commons-Included in 7 S Shore
2	TRIPP DR	F_1040323_2554619	LUG1	40,000	2	2	1	2688	1.84	3	330	330	270	270	
4	TRIPP DR	F_1040121_2554688	LUG1	40,000	2	2	1	1456	1.84	3	330	330	270	270	
8	TRIPP DR	F_1039861_2554779	LUG1	40,000	2	2	-	3160	2.06	3	330	-	270	-	
8	TRIPP DR	F_1039861_2554779	LUG1	N/A	N/A	N/A	N/A	1005	N/A	2	220	-	270	-	
14	TRIPP DR		LUG1	40,000	2	2	1	3871	2.04	7	770	330	270	270	
12	TRIPP DR	F_1039569_2554872	LUG1	40,000	2	2	-	2122	1.84	3	330	-	270	-	
12	TRIPP DR	F_1039569_2554872	LUG1	N/A	N/A	N/A	N/A	1008	N/A	2	220	-	270	-	
1	WHEROWHERO LN	F_1040931_2557838	R40	40,000	2	2	-	2052	1.88	1	110	-	270	-	
1	WHEROWHERO LN	F_1040931_2557838	R40	N/A	N/A	N/A	N/A	1635	N/A	1	110	-	270	-	
3	WHEROWHERO LN	F_1040662_2557968	LUG2	80,000	2	1	-	372	2.00	1	110	-	270	-	
3	WHEROWHERO LN	F_1040662_2557968	LUG2	N/A	N/A	N/A	N/A	3236	N/A	4	440	-	270	-	
5	WHEROWHERO LN	F_1040507_2557851	LUG2	80,000	1	1	-	6272	1.90	15	1650	-	270	-	
1	ZACHARY WY	F_1040112_2555026	LUG1	40,000	2	2	1	3647	1.84	2	220	330	270	270	
2	ZACHARY WY	F_1039742_2555110	LUG1	40,000	2	2	-	4431	2.06	4	440	-	270	-	
2	ZACHARY WY	F_1039742_2555110	LUG1	N/A	N/A	N/A	N/A	1216	N/A	3	330	-	270	-	
3	ZACHARY WY	F_1039587_2555293	LUG1	40,000	2	2	1	1816	2.60	3	330	330	270	270	
								SUBTOTAL		**539**	**98560**	**6270**	**80460**	**5130**	

Total Number of Lots	143
Total Number of Vacant Lots	23
Total Number of Lots with one (1) Dwelling	55
Total Number of Lots with Multiple Existing Dwellings	65
Total Number of Lots with Multiple Future Dwellings	18
Number of Existing Bedrooms	539
Number of Future Bedrooms	126
Total Number of Bedrooms	665
Average Number of Bedrooms per Lot	4.1

Percentage of Lots with Multiple Dwellings (Existing and Future)	58%
Projected Percentage of Lots with Multiple Dwellings (Future)	60%
Additional Percentage of Lots with Multiple Dwellings (Future)	2%
Number of Additional Future Secondary Dwellings	3

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**70,200**	**85,600**
ADF for Additional Future Secondary Dwellings (gpd)	**700**	**800**
Total Average Daily Flow	**71,000**	**86,000**
Peaking Factor (determined from ASCE MOP9)	**5.8**	**5.8**
Peak Flow (gpd)	**411,800**	**498,800**
Infiltration and Inflow (I/I) Allowance (3)	**7,100**	**7,100**
Total Peak Flow including I/I allowance (gpd)	**418,900**	**505,900**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

NANTUCKET SEWER MASTER PLAN -SHAWKEMO NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

												TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENT
1	CHADWICK CT	F_1055239_2570038	LUG3	120,000	2	1	-	2170	1.16	5	550	-	270	-	
1	CHADWICK CT	F_1055239_2570038	LUG3	120,000	N/A	N/A	N/A	360	N/A	1	110	-	270	-	
2	CHADWICK CT	-	LUG3	120,000	0	1	-	Vacant	1.15	Vacant	330	-	270	-	
37	CONSERVATION AV	-	LUG3	120,000	0	1	-	Vacant	2.75	Vacant	330	-	270	-	
3	FULLING MILL RD	F_1055989_2570231	LUG3	120,000	1	1	-	2106	1.10	3	330	-	270	-	
4	FULLING MILL RD	F_1055718_2570241	LUG3	120,000	1	1	-	3800	1.70	4	440	-	270	-	
5	FULLING MILL RD	F_1055958_2570414	LUG3	120,000	2	1	-	1691	1.30	2	220	-	270	-	
5	FULLING MILL RD	F_1055958_2570414	LUG3	120,000	N/A	N/A	N/A	2565	N/A	3	330	-	270	-	
8	FULLING MILL RD	F_1055509_2570484	LUG3	120,000	1	1	-	1507	1.00	3	330	-	270	-	
9	FULLING MILL RD	F_1055877_2570609	LUG3	120,000	2	1	-	958	1.41	1	110	-	270	-	
9	FULLING MILL RD	F_1055877_2570609	LUG3	120,000	N/A	N/A	N/A	9017	N/A	7	770	-	270	-	
10	FULLING MILL RD	F_1055282_2570397	LUG3	120,000	1	1	-	1665	2.10	3	330	-	270	-	
11	FULLING MILL RD	F_1055839_2570861	LUG3	120,000	3	1	-	1092	2.34	2	220	-	270	-	
11	FULLING MILL RD	F_1055839_2570861	LUG3	120,000	N/A	N/A	N/A	7069	N/A	5	550	-	270	-	
11	FULLING MILL RD	F_1055839_2570861	LUG3	120,000	N/A	N/A	N/A	594	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
12	FULLING MILL RD	F_1055112_2570298	LUG3	120,000	1	1	-	1792	1.30	2	220	-	270	-	
13	FULLING MILL RD	-	LUG3	120,000	0	1	-	Vacant	4.60	Vacant	330	-	270	-	Wetland (mostly)
14	FULLING MILL RD	F_1054983_2570338	LUG3	120,000	2	1	-	1204	2.35	1	110	-	270	-	
14	FULLING MILL RD	F_1054983_2570338	LUG3	120,000	N/A	N/A	N/A	4486	N/A	5	550	-	270	-	
15	FULLING MILL RD	F_1055603_2571298	LUG3	120,000	3	1	-	6170	4.60	4	440	-	270	-	
15	FULLING MILL RD	F_1055603_2571298	LUG3	120,000	N/A	N/A	N/A	324	N/A	1	110	-	270	-	
15	FULLING MILL RD	F_1055603_2571298	LUG3	120,000	N/A	N/A	N/A	3822	N/A	5	550	-	270	-	
16	FULLING MILL RD	F_1055572_2570619	LUG3	120,000	1	1	-	3035	1.51	5	550	-	270	-	
20	FULLING MILL RD	F_1055480_2570872	LUG3	120,000	1	1	-	2437	1.51	4	440	-	270	-	1/3 Wetland
22	FULLING MILL RD	F_1055229_2571013	LUG3	120,000	1	1	-	1240	2.92	2	220	-	270	-	
24	FULLING MILL RD	F_1055064_2570730	LUG3	120,000	1	1	-	1418	3.01	1	110	-	270	-	
24	FULLING MILL RD	F_1055064_2570730	LUG3	120,000	N/A	N/A	N/A	1792	N/A	4	440	-	270	-	
5	N PASTURE LN	F_1051891_2566970	LUG3	120,000	2	1	-	1008	2.78	2	220	-	270	-	
5	N PASTURE LN	F_1051891_2566970	LUG3	120,000	N/A	N/A	N/A	2897	N/A	4	440	-	270	-	
7	N PASTURE LN	F_1051894_2566750	LUG3	120,000	3	1	-	264	2.82	1	110	-	270	-	
7	N PASTURE LN	F_1051894_2566750	LUG3	120,000	N/A	N/A	N/A	704	N/A	1	110	-	270	-	
7	N PASTURE LN	F_1051894_2566750	LUG3	120,000	N/A	N/A	N/A	4069	N/A	3	330	-	270	-	
8	N PASTURE LN	F_1052380_2567005	LUG3	120,000	3	1	-	1254	0.41	2	220	-	270	-	
8	N PASTURE LN	F_1052380_2567005	LUG3	120,000	N/A	N/A	N/A	4559	N/A	5	550	-	270	-	
8	N PASTURE LN	F_1052380_2567005	LUG3	120,000	N/A	N/A	N/A	331	N/A	1	110	-	270	-	
9	N PASTURE LN	-	LUG3	120,000	0	1	-	Vacant	2.86	Vacant	330	-	270	-	
11	N PASTURE LN	F_1052348_2566507	LUG3	120,000	1	1	-	4591	2.83	5	550	-	270	-	
12	N PASTURE LN	F_1762017_103423	LUG3	120,000	2	1	-	1050	2.75	3	330	-	270	-	
12	N PASTURE LN	F_1762017_103423	LUG3	120,000	N/A	N/A	N/A	2667	N/A	2	220	-	270	-	
13	N PASTURE LN	F_1052556_2566481	LUG3	120,000	2	1	-	720	2.8	2	220	-	270	-	
13	N PASTURE LN	F_1052556_2566481	LUG3	120,000	N/A	N/A	N/A	3205	N/A	4	440	-	270	-	
14	N PASTURE LN	F_1762253_103528	LUG3	120,000	2	1	-	1557	2.75	2	220	-	270	-	
14	N PASTURE LN	F_1762253_103528	LUG3	120,000	N/A	N/A	N/A	4974	N/A	5	550	-	270	-	
15	N PASTURE LN	F_1052788_2566561	LUG3	120,000	3	1	-	2219	2.81	3	330	-	270	-	
15	N PASTURE LN	F_1052788_2566561	LUG3	120,000	N/A	N/A	N/A	484	N/A	1	110	-	270	-	
15	N PASTURE LN	F_1052788_2566561	LUG3	120,000	N/A	N/A	N/A	2219	N/A	3	330	-	270	-	
17	N PASTURE LN	F_1052983_2566642	LUG3	120,000	2	1	-	3720	2.76	4	440	-	270	-	
17	N PASTURE LN	F_1052983_2566642	LUG3	120,000	N/A	N/A	N/A	86	N/A	1	110	-	270	-	
18	N PASTURE LN	F_1762495_103655	LUG3	120,000	1	1	-	3614	2.75	5	550	-	270	-	
19	N PASTURE LN	F_1053148_2566690	LUG3	120,000	2	1	-	1103	2.87	2	220	-	270	-	Cottage (assume one bedroom)
19	N PASTURE LN	F_1053148_2566690	LUG3	120,000	N/A	N/A	N/A	7737	N/A	4	440	-	270	-	
20	N PASTURE LN	F_1762707_103768	LUG3	120,000	1	1	-	3344	2.75	4	440	-	270	-	
21	N PASTURE LN	F_1053339_2566931	LUG3	120,000	1	1	-	4297	0.91	4	440	-	270	-	
22	N PASTURE LN	F_1762845_103593	LUG3	120,000	1	1	-	5406	2.77	6	660	-	270	-	
24	N PASTURE LN	F_1762961_103870	LUG3	120,000	1	1	-	3501	2.77	4	440	-	270	-	
25	N PASTURE LN	-	LUG3	120,000	0	1	-	Vacant	2.86	Vacant	330	-	270	-	
27	N PASTURE LN	F_1053605_2566807	LUG3	120,000	1	1	-	2150	0.8	4	440	-	270	-	
29	N PASTURE LN	F_1053757_2566842	LUG3	120,000	2	1	-	3256	1.04	5	550	-	270	-	
29	N PASTURE LN	F_1053757_2566842	LUG3	120,000	N/A	N/A	N/A	136	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
31	N PASTURE LN	F_1053898_2566835	LUG3	120,000	1	1	-	2950	0.83	4	440	-	270	-	
33	N PASTURE LN	F_1054020_2566866	LUG3	120,000	1	1	-	2920	0.88	4	440	-	270	-	
35	N PASTURE LN	F_1054169_2566873	LUG3	120,000	1	1	-	3206	1.55	3	330	-	270	-	
37	N PASTURE LN	F_1053794_2567176	LUG3	120,000	1	1	-	3662	2.48	5	550	-	270	-	
76	POLPIS RD	F_1050963_2566981	LUG3	120,000	1	1	-	1592	1.47	2	220	-	270	-	
77	POLPIS RD	F_1051270_2566756	LUG3	120,000	3	1	-	1624	1.97	1	110	-	270	-	
77	POLPIS RD	F_1051270_2566756	LUG3	120,000	N/A	N/A	N/A	819	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
77	POLPIS RD	F_1051270_2566756	LUG3	120,000	N/A	N/A	N/A	4034	N/A	5	550	-	270	-	
78	POLPIS RD	F_1051134_2567163	LUG3	120,000	3	1	-	4265	1.21	7	770	-	270	-	
78	POLPIS RD	F_1051134_2567163	LUG3	120,000	N/A	N/A	N/A	1044	N/A	1	110	-	270	-	
78	POLPIS RD	F_1051134_2567163	LUG3	120,000	N/A	N/A	N/A	304	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
79	POLPIS RD	F_1051374_2566881	LUG3	120,000	1	1	-	1662	1.37	2	220	-	270	-	
81	POLPIS RD	F_1051478_2566992	LUG3	120,000	1	1	-	1525	1.18	3	330	-	270	-	
82	POLPIS RD	F_1760712_103674	LUG3	120,000	2	1	-	1715	1.22	3	330	-	270	-	

NANTUCKET SEWER MASTER PLAN -SHAWKEMO NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

												TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENT
82	POLPIS RD	F_1760712_103674	LUG3	120,000	N/A	N/A	N/A	1088	N/A	1	110	-	270	-	
83	POLPIS RD	F_1051566_2567111	LUG3	120,000	1	1	-	2542	0.93	3	330	-	270	-	
84	POLPIS RD	F_1760833_103806	LUG3	120,000	1	1	-	2694	1.42	3	330	-	270	-	
86	POLPIS RD	F_1760946_103937	LUG3	120,000	1	1	-	2312	1.59	6	660	-	270	-	
87	POLPIS RD	F_1761123_103565	LUG3	120,000	3	1	-	480	2.02	1	110	-	270	-	
87	POLPIS RD	F_1761123_103565	LUG3	120,000	N/A	N/A	N/A	320	N/A	1	110	-	270	-	
87	POLPIS RD	F_1761123_103565	LUG3	120,000	N/A	N/A	N/A	7780	N/A	5	550	-	270	-	
88	POLPIS RD	F_1761061_104049	LUG3	120,000	1	1	-	3262	1.57	4	440	-	270	-	
89	POLPIS RD	F_1761298_103788	LUG3	120,000	1	1	-	2316	0.92	3	330	-	270	-	
90	POLPIS RD	F_1761184_104156	LUG3	120,000	1	1	-	5832	1.8	2	220	-	270	-	
92	POLPIS RD	F_1761204_104354	LUG3	120,000	2	1	-	1092	1.38	1	110	-	270	-	
92	POLPIS RD	F_1761204_104354	LUG3	120,000	N/A	N/A	N/A	6427	N/A	4	440	-	270	-	
94	POLPIS RD	-	LUG3	120,000	0	1	-	Vacant	1.18	Vacant	330	-	270	-	
96	POLPIS RD	F_1761290_104503	LUG3	120,000	1	1	-	1926	1.65	3	330	-	270	-	
102	POLPIS RD	F_1761740_104482	LUG3	120,000	2	1	-	839	4.22	1	110	-	270	-	
102	POLPIS RD	F_1761740_104482	LUG3	120,000	N/A	N/A	N/A	5637	N/A	6	660	-	270	-	
104	POLPIS RD	F_1761966_104573	LUG3	120,000	2	1	-	1628	2.83	3	330	-	270	-	
104	POLPIS RD	F_1761966_104573	LUG3	120,000	N/A	N/A	N/A	2739	N/A	4	440	-	270	-	
110	POLPIS RD	F_1762207_104770	LUG3	120,000	2	2	-	528	6.08	1	110	-	270	-	
110	POLPIS RD	F_1762207_104770	LUG3	120,000	N/A	N/A	N/A	5675	N/A	5	550	-	270	-	
114	POLPIS RD	F_1762542_104944	LUG3	120,000	1	1	-	3707	3.15	5	550	-	270	-	
116	POLPIS RD	F_1762844_105168	LUG3	120,000	1	3	2	2459	8.34	4	440	660	270	540	
118	POLPIS RD	-	LUG3	120,000	0	1	-	Vacant	3.31	Vacant	330	-	270	-	
125	POLPIS RD	F_1764068_104729	LUG3	120,000	2	2	-	3951	5.78	5	550	-	270	-	
125	POLPIS RD	F_1764068_104729	LUG3	120,000	N/A	N/A	N/A	552	N/A	1	110	-	270	-	
127	POLPIS RD	F_1763763_105070	LUG3	120,000	1	1	-	4283	1.59	5	550	-	270	-	
129	POLPIS RD	F_1764472_104877	LUG3	120,000	2	1	-	5894	3.07	6	660	-	270	-	
129	POLPIS RD	F_1764472_104877	LUG3	120,000	N/A	N/A	N/A	1513	N/A	3	330	-	270	-	
131	POLPIS RD	F_1763937_105264	LUG3	120,000	1	1	-	2661	2.46	4	440	-	270	-	
133	POLPIS RD	F_1764156_105161	LUG3	120,000	2	1	-	3922	3.06	4	440	-	270	-	
133	POLPIS RD	F_1764156_105161	LUG3	120,000	N/A	N/A	N/A	1456	N/A	1	110	-	270	-	
135	POLPIS RD	F_1764508_105177	LUG3	120,000	2	1	-	4663	3.04	4	440	-	270	-	
135	POLPIS RD	F_1764508_105177	LUG3	120,000	N/A	N/A	N/A	1467	N/A	2	220	-	270	-	
137	POLPIS RD	F_1764305_105443	LUG3	120,000	1	1	-	3627	1.18	5	550	-	270	-	
139	POLPIS RD	-	LUG3	120,000	0	1	-	Vacant	1.22	Vacant	330	-	270	-	
140	POLPIS RD	F_1764464_105918	LUG3	120,000	1	1	-	1904	0.39	3	330	-	270	-	
141	POLPIS RD	F_1764526_105584	LUG3	120,000	1	1	-	2682	0.97	4	440	-	270	-	
144	POLPIS RD	F_1764574_105969	LUG3	120,000	1	1	-	1472	1.12	3	330	-	270	-	
146	POLPIS RD	F_1764707_106035	LUG3	120,000	2	1	-	292	0.73	1	110	-	270	-	
146	POLPIS RD	F_1764707_106035	LUG3	120,000	N/A	N/A	N/A	2683	N/A	4	440	-	270	-	
147	POLPIS RD	F_1765078_105048	LUG3	120,000	2	1	-	2252	3.34	3	330	-	270	-	
147	POLPIS RD	F_1765078_105048	LUG3	120,000	N/A	N/A	N/A	1821	N/A	2	220	-	270	-	
148	POLPIS RD	F_1055386_2569807	LUG3	120,000	2	1	-	2482	0.75	4	440	-	270	-	
148	POLPIS RD	F_1055386_2569807	LUG3	120,000	N/A	N/A	N/A	510	N/A	1	110	-	270	-	
150	POLPIS RD	F_1055546_2570043	LUG3	120,000	2	1	-	1533	3.41	3	330	-	270	-	
150	POLPIS RD	F_1055546_2570043	LUG3	120,000	N/A	N/A	N/A	762	N/A	2	220	-	270	-	
151	POLPIS RD	F_1765020_105933	LUG3	120,000	1	1	-	1252	0.25	2	220	-	270	-	
153	POLPIS RD	F_1765207_105779	LUG3	120,000	1	1	-	2368	1.75	4	440	-	270	-	
155	POLPIS RD	F_1765367_105897	LUG3	120,000	2	1	-	5095	3.18	5	550	-	270	-	
155	POLPIS RD	F_1765367_105897	LUG3	120,000	N/A	N/A	N/A	1949	N/A	3	330	-	270	-	
155	POLPIS RD	F_1765367_105897	LUG3	120,000	N/A	N/A	N/A	303	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
158	POLPIS RD	-	LUG3	120,000	1	1	-	5120	0.37	1	110	-	270	-	Museum (one Bathroom)
16	RABBIT RUN RD	F_1759698_104615	LUG3	120,000	1	1	-	2257	2.66	3	330	-	270	-	
18	RABBIT RUN RD	F_1759961_104649	LUG3	120,000	1	1	-	4787	0.88	5	550	-	270	-	
22	RABBIT RUN RD	F_1760011_106069	LUG3	120,000	2	2	-	3596	5.55	5	550	-	270	-	
22	RABBIT RUN RD	F_1760011_106069	LUG3	120,000	N/A	N/A	N/A	740	N/A	2	220	-	270	-	
24	RABBIT RUN RD	-	LUG3	120,000	0	1	-	Vacant	5.11	Vacant	330	-	270	-	
26	RABBIT RUN RD	F_1050692_2570315	LUG3	120,000	1	2	-	3362	6.8	3	330	-	270	-	Wetland
30	RABBIT RUN RD	F_1050848_2571316	LUG3	120,000	5	5	-	1080	13.9	1	110	-	270	-	
30	RABBIT RUN RD	F_1050848_2571316	LUG3	120,000	N/A	N/A	N/A	640	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
30	RABBIT RUN RD	F_1050848_2571316	LUG3	120,000	N/A	N/A	N/A	1369	N/A	1	110	-	270	-	Cottage (assume one bedroom)
30	RABBIT RUN RD	F_1050848_2571316	LUG3	120,000	N/A	N/A	N/A	3775	N/A	4	440	-	270	-	
30	RABBIT RUN RD	F_1050848_2571316	LUG3	120,000	N/A	N/A	N/A	13312	N/A	5	550	-	270	-	
1	SHAWKEMO HILLS LN	F_1053608_2569935	LUG3	120,000	1	1	-	8139	1.27	5	550	-	270	-	
2	SHAWKEMO HILLS LN	F_1053447_2570278	LUG3	120,000	2	1	-	1384	2.54	3	330	-	270	-	
2	SHAWKEMO HILLS LN	F_1053447_2570278	LUG3	120,000	N/A	N/A	N/A	6057	N/A	8	880	-	270	-	
3	SHAWKEMO HILLS LN	F_1053401_2569760	LUG3	120,000	1	1	-	5188	2.43	5	550	-	270	-	
4	SHAWKEMO HILLS LN	F_1053217_2570126	LUG3	120,000	2	1	-	4562	2.39	5	550	-	270	-	
4	SHAWKEMO HILLS LN	F_1053217_2570126	LUG3	120,000	N/A	N/A	N/A	1503	N/A	3	330	-	270	-	
5	SHAWKEMO HILLS LN	F_1053128_2569770	LUG3	120,000	2	1	-	6942	2.38	6	660	-	270	-	
5	SHAWKEMO HILLS LN	F_1053128_2569770	LUG3	120,000	N/A	N/A	N/A	886	N/A	1	110	-	270	-	
14	SHAWKEMO RD	-	LUG3	120,000	0	7	2	Vacant	19.73	Vacant	330	660	270	540	1/2 Wetland
20	SHAWKEMO RD	-	LUG3	120,000	0	2	1	Vacant	7.3	Vacant	330	330	270	270	

NANTUCKET SEWER MASTER PLAN -SHAWKEMO NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

												TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENT
21	SHAWKEMO RD	-	LUG3	120,000	0	1	-	Vacant	3.84	Vacant	330	-	270	-	
30	SHAWKEMO RD	F_1051669_2571392	LUG3	120,000	2	1	-	4425	1.27	5	550	-	270	-	
30	SHAWKEMO RD	F_1051669_2571392	LUG3	120,000	N/A	N/A	N/A	1728	N/A	4	440	-	270	-	
34	SHAWKEMO RD	F_1052234_2571357	LUG3	120,000	1	2	-	4460	7.66	4	440	-	270	-	1/2 Wetland
35	SHAWKEMO RD	F_1760617_105703	LUG3	120,000	2	5	3	8924	15.28	4	440	990	270	810	
35	SHAWKEMO RD	F_1760617_105703	LUG3	120,000	N/A	N/A	N/A	1481	N/A	4	440	-	270	-	
36	SHAWKEMO RD	F_1052687_2571467	LUG3	120,000	3	2	-	231	7.8	1	110	-	270	-	Cottage (assume one bedroom)
36	SHAWKEMO RD	F_1052687_2571467	LUG3	120,000	N/A	N/A	N/A	1109	N/A	1	110	-	270	-	
36	SHAWKEMO RD	F_1052687_2571467	LUG3	120,000	N/A	N/A	N/A	7688	N/A	3	330	-	270	-	
40	SHAWKEMO RD	F_1053163_2571403	LUG3	120,000	3	3	-	5690	9	5	550	-	270	-	
40	SHAWKEMO RD	F_1053163_2571403	LUG3	120,000	N/A	N/A	N/A	512	N/A	1	110	-	270	-	
40	SHAWKEMO RD	F_1053163_2571403	LUG3	120,000	N/A	N/A	N/A	2688	N/A	3	330	-	270	-	
41	SHAWKEMO RD	F_1761095_105914	LUG3	120,000	2	1		1120	0.92	1	110	-	270	-	
41	SHAWKEMO RD	F_1761095_105914	LUG3	120,000	N/A	N/A	N/A	3612	N/A	4	440	-	270	-	
45	SHAWKEMO RD	-	LUG3	120,000	0	1	-	Vacant	5.01	Vacant	330	-	270	-	
57	SHAWKEMO RD	-	LUG3	120,000	0	1	-	Vacant	2.76	Vacant	330	-	270	-	
58	SHAWKEMO RD	-	LUG3	120,000	0	3	2	Vacant	10.78	Vacant	330	660	270	540	
59	SHAWKEMO RD	F_1763009_105658	LUG3	120,000	3	1	-	7649	2.93	6	660	-	270	-	
59	SHAWKEMO RD	F_1763009_105658	LUG3	120,000	N/A	N/A	N/A	1176	N/A	2	220	-	270	-	
59	SHAWKEMO RD	F_1763009_105658	LUG3	120,000	N/A	N/A	N/A	448	N/A	1	110	-	270	-	Cottage (assume one bedroom)
60	SHAWKEMO RD	F_1053812_2570853	LUG3	120,000	2	1	-	5204	4.62	5	550	-	270	-	
60	SHAWKEMO RD	F_1053812_2570853	LUG3	120,000	N/A	N/A	N/A	1273	N/A	2	220	-	270	-	
61	SHAWKEMO RD	F_1763452_105511	LUG3	120,000	1	1	-	5604	3.02	5	550	-	270	-	
62	SHAWKEMO RD	-	LUG3	120,000	0	3	2	Vacant	10.79	Vacant	330	660	270	540	
64	SHAWKEMO RD	-	LUG3	120,000	0	1	-	Vacant	3.48	Vacant	330	-	270	-	
68	SHAWKEMO RD	F_1763731_105762	LUG3	120,000	2	1	-	270	4.99	1	110	-	270	-	
68	SHAWKEMO RD	F_1763731_105762	LUG3	120,000	N/A	N/A	N/A	2272	N/A	3	330	-	270	-	
15	TOP GALE LN	F_1055117_2571220	LUG3	120,000	1	1	-	13077	2.75	7	770	-	270	-	
17	TOP GALE LN	F_1054904_2571289	LUG3	120,000	2	1	-	1360	2.84	4	440	-	270	-	
17	TOP GALE LN	F_1054904_2571289	LUG3	120,000	N/A	N/A	N/A	4790	N/A	5	550	-	270	-	
1	WINGSPREAD LN	F_1053096_2570767	LUG3	120,000	1	1	-	4716	2.77	4	440	-	270	-	
2	WINGSPREAD LN		LUG3	120,000	0	1	-	Vacant	2.84	Vacant	330	-	270	-	
3	WINGSPREAD LN	F_1052808_2570778	LUG3	120,000	1	1	-	3311	3.04	4	440	-	270	-	
4	WINGSPREAD LN	F_1052789_2570098	LUG3	120,000	2	1	-	8386	3.63	5	550	-	270	-	
4	WINGSPREAD LN	F_1052789_2570098	LUG3	120,000	N/A	N/A	N/A	736	N/A	1	110	-	270	-	
5	WINGSPREAD LN	F_1052541_2570724	LUG3	120,000	2	1	-	886	3.53	1	110	-	270	-	
5	WINGSPREAD LN	F_1052541_2570724	LUG3	120,000	N/A	N/A	N/A	5263	N/A	4	440	-	270	-	
6	WINGSPREAD LN	F_1052477_2570113	LUG3	120,000	2	1	-	7479	5.01	5	550	-	270	-	
6	WINGSPREAD LN	F_1052477_2570113	LUG3	120,000	N/A	N/A	N/A	1500	N/A	3	330	-	270	-	
7	WINGSPREAD LN	F_1052244_2570552	LUG3	120,000	1	1	-	8776	3.07	5	550	-	270	-	
8	WINGSPREAD LN	F_1052127_2570302	LUG3	120,000	2	1	-	6384	3.48	3	330	-	270	-	
8	WINGSPREAD LN	F_1052127_2570302	LUG3	120,000	N/A	N/A	N/A	970	N/A	1	110	-	270	-	
								SUBTOTAL		544	65780	3960	50760	3240	

Total Number of Lots	121
Total Number of Vacant Lots	18
Total Number of Lots with one (1) Dwelling	52
Total Number of Lots with Multiple Existing Dwellings	51
Total Number of Lots with Multiple Future Dwellings	6
Number of Existing Bedrooms	544
Number of Future Bedrooms	90
Total Number of Bedrooms	634
Average Number of Bedrooms per Lot	4.8

Percentage of Lots with Multiple Dwellings (Existing and Future)	47%
Projected Percentage of Lots with Multiple Dwellings (Future)	50%
Additional Percentage of Lots with Multiple Dwellings (Future)	3%
Number of Additional Future Secondary Dwellings	4

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**46,700**	**54,000**
ADF for Additional Future Secondary Dwellings (gpd)	**900**	**1,100**
Total Average Daily Flow	**48,000**	**55,000**
Peaking Factor (determined from ASCE MOP9)	**5.8**	**5.8**
Peak Flow (gpd)	**278,400**	**319,000**
Infiltration and Inflow (I/I) Allowance (3)	**0**	**0**
Total Peak Flow including I/I allowance (gpd)	**278,400**	**319,000**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

NANTUCKET SEWER MASTER PLAN -SOMERSET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
1	AUSTIN FARM DR	F_1034807_2561736	R20	20,000	1	2	1	2218	0.92	3	330	330	270	270	
3	AUSTIN FARM DR	F_1034979_2561849	R20	20,000	1	2	1	3478	0.93	4	440	330	270	270	
5	AUSTIN FARM DR	F_1035105_2561726	R20	20,000	1	2	1	2932	0.92	4	440	330	270	270	
7	AUSTIN FARM DR		R20	20,000	1	2	1	4646	0.94	4	440	330	270	270	
9	AUSTIN FARM DR	F_1035378_2561462	R20	20,000	1	2	1	2784	0.93	3	330	330	270	270	
10	AUSTIN FARM DR	F_1035324_2561856	R20	20,000	1	2	1	4979	0.93	6	660	330	270	270	
12	AUSTIN FARM DR	F_1035436_2561695	R20	20,000	1	2	1	4400	0.93	4	440	330	270	270	
20	BARTLETT FARM RD	F_1040082_2561214	RC2	5,000	1	1	-	1735	0.48	2	220	-	270	-	Not in CWMP added to sewer dist.
22	BARTLETT FARM RD		RC2	5,000	1	1	-	672	0.2	1	110	-	270	-	Not in CWMP added to sewer dist.
24	BARTLETT FARM RD	F_1039730_2561051	RC2	5,000	1	1	-	3528	0.22	4	440	-	270	-	Not in CWMP added to sewer dist.
26	BARTLETT FARM RD	-	RC2	5,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	Not in CWMP added to sewer dist.
28	BARTLETT FARM RD	-	RC2	5,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	Not in CWMP added to sewer dist.
55	BARTLETT RD	F_1037369_2560444	R20	20,000	1	1	-	1646	0.46	3	330	-	270	-	
61	BARTLETT RD	F_1037130_2560321	R20	20,000	1	3	2	1596	1.47	3	330	660	270	540	
63	BARTLETT RD	F_1036955_2560250	R20	20,000	1	1	-	2648	0.46	3	330	-	270	-	
65	BARTLETT RD	F_1036912_2559919	CTEC	10,000	1	1	-	2566	0.14	-	192	-	270	-	Service Shop
67	BARTLETT RD	F_1036884_2559872	CTEC	10,000	1	1	-	2880	0.13	-	216	-	270	-	Warehouse
69	BARTLETT RD	-	CTEC	10,000	0	1	-	Vacant	0.12	Vacant	330	-	270	-	
71	BARTLETT RD	F_1036786_2559822	CTEC	10,000	1	1	-	2560	0.28	-	192	-	270	-	Warehouse
73	BARTLETT RD	F_1036748_2559764	CTEC	10,000	1	1	-	3824	0.26	-	287	-	270	-	Service Shop
77	BARTLETT RD	F_1036657_2559662	CTEC	10,000	2	1	-	1005	0.28	1	110	-	270	-	
77	BARTLETT RD	F_1036657_2559662	CTEC	N/A	N/A	N/A	N/A	1782	N/A	3	330	-	270	-	
79	BARTLETT RD	F_1036608_2559618	CTEC	10,000	1	1	-	864	0.31	-	65	-	270	-	Warehouse
81	BARTLETT RD	F_1036560_2559572	CTEC	10,000	1	1	-	777	0.32	-	58	-	270	-	Warehouse
83	BARTLETT RD	F_1036470_2559521	CTEC	10,000	2	4	2	2132	0.92	-	160	660	270	540	Warehouse
83	BARTLETT RD	F_1036470_2559521	CTEC	N/A	N/A	N/A	N/A	828	N/A	2	220	-	270	-	
85	BARTLETT RD	F_1036375_2559598	CTEC	N/A	N/A	N/A	N/A	2390	N/A	-	179	-	270	-	Warehouse
85	BARTLETT RD	F_1036375_2559598	CTEC	10,000	2	5	3	1776	1.19	3	330	990	270	810	
87	BARTLETT RD	F_1036215_2559551	CTEC	10,000	1	4	3	2560	0.92	-	192	990	270	810	
91	BARTLETT RD	F_1036146_2559404	CTEC	10,000	1	4	3	4027	0.97	-	302	990	270	810	Warehouse
75A	BARTLETT RD	F_1036704_2559711	CTEC	10,000	1	1	-	2079	0	3	330	-	270	-	
75B	BARTLETT RD	F_1746030_96235	CTEC	10,000	1	1	-	2079	0	3	330	-	270	-	
89A-B	BARTLETT RD	F_1036326_2559367	CTEC	10,000	3	8	5	4302	2.02	6	660	1650	270	1350	
89A-B	BARTLETT RD	F_1036326_2559367	CTEC	N/A	N/A	N/A	N/A	1800	N/A	-	135	-	270	-	Warehouse
89A-B	BARTLETT RD	F_1036326_2559367	CTEC	N/A	N/A	N/A	N/A	10840	N/A	-	813	-	270	-	Warehouse w/ bathroom
2	CATHERINE LN	F_1035148_2561010	R20	20,000	2	1	-	1999	0.56	4	440	-	270	-	
2	CATHERINE LN	F_1035148_2561010	R20	N/A	N/A	N/A	N/A	209	N/A	1	110	-	270	-	Guest Quarters (Assume one bedroom)
3	CATHERINE LN	F_1035376_2560896	R20	20,000	1	1	-	1920	0.65	4	440	-	270	-	
4	CATHERINE LN	F_1035282_2561156	R2	20,000	1	1	-	1723	0.81	3	330	-	270	-	
5	CATHERINE LN	F_1035467_2560945	R20	20,000	2	1	-	1117	0.71	2	220	-	270	-	
5	CATHERINE LN	F_1035467_2560945	R20	N/A	N/A	N/A	N/A	1556	N/A	2	220	-	270	-	
7	CATHERINE LN	F_1035544_2561065	R20	20,000	1	1	-	1872	0.46	4	440	-	270	-	
10	CATHERINE LN	F_1035608_2561263	R20	20,000	2	1	-	2973	0.64	3	330	-	270	-	
10	CATHERINE LN	F_1035608_2561263	R2	N/A	N/A	N/A	N/A	648	N/A	2	220	-	270	-	
1	CLARA DR		RC2	5,000	0	1	-	Vacant	0.17	Vacant	330	-	270	-	
3	CLARA DR	F_1035537_2559288	CTEC	10,000	1	1	-	976	0.43	3	330	-	270	-	
4	CLARA DR	F_1035683_2559186	CTEC	10,000	1	1	-	1514	0.45	3	330	-	270	-	
6	CLARA DR	F_1035768_2559061	R10	10,000	1	1	-	1538	0.41	3	330	-	270	-	
8	CLARA DR	F_1035861_2558943	R10	10,000	1	1	-	1176	0.44	2	220	-	270	-	
9	CLARA DR		CTEC	10,000	0	1	-	Vacant	0.45	Vacant	330	-	270	-	
10	CLARA DR	F_1035931_2558805	R10	10,000	1	2	1	1105	0.56	3	330	330	270	270	
11	CLARA DR	F_1035634_2558796	R10	10,000	1	1	-	2079	0.43	4	440	-	270	-	
12	CLARA DR	F_1035862_2558709	R10	10,000	2	1	-	1414	0.44	3	330	-	270	-	
12	CLARA DR	F_1035862_2558709	R10	N/A	N/A	N/A	N/A	350	N/A	1	110	-	270	-	Garage apartment (Assume one bedroom)
13	CLARA DR	F_1035578_2558670	R10	10,000	1	2	1	2708	0.46	3	330	330	270	270	
14	CLARA DR	F_1035806_2558589	R10	10,000	1	2	1	3288	0.46	4	440	330	270	270	
15	CLARA DR	F_1035702_2558554	R10	10,000	2	1	-	4109	0.45	4	440	-	270	-	
15	CLARA DR	F_1035702_2558554	R10	N/A	N/A	N/A	N/A	576	N/A	1	110	-	270	-	Guest Quarters (Assume one bedroom)
1A	CLARA DR	-	RC2	5,000	1	1	-	2005	0.22	4	440	-	270	-	
1	DOC RYDER DR	F_1035065_2558577	R10	10,000	1	1	-	1368	0.45	2	220	-	270	-	
2	DOC RYDER DR	F_1035223_2558760	R10	10,000	1	1	-	3208	0.45	4	440	-	270	-	
3	DOC RYDER DR	F_1035140_2558512	R10	10,000	1	1	-	2008	0.45	3	330	-	270	-	
4	DOC RYDER DR	F_1035295_2558698	R10	10,000	1	1	-	1248	0.45	3	330	-	270	-	
5	DOC RYDER DR	F_1035217_2558448	R10	10,000	1	1	-	1632	0.45	3	330	-	270	-	
6	DOC RYDER DR	F_1035373_2558636	R10	10,000	1	1	-	1265	0.45	3	330	-	270	-	
7	DOC RYDER DR	F_1035291_2558382	R10	10,000	1	1	-	1700	0.45	3	330	-	270	-	
8	DOC RYDER DR	F_1035452_2558571	R10	10,000	1	1	-	1582	0.45	3	330	-	270	-	
9	DOC RYDER DR	F_1035357_2558293	R10	10,000	1	1	-	1794	0.4	3	330	-	270	-	
10	DOC RYDER DR	F_1035548_2558520	R10	10,000	1	1	-	3341	0.4	5	550	-	270	-	
11	DOC RYDER DR	F_1035463_2558231	R10	10,000	1	2	1	2135	0.61	4	440	330	270	270	

NANTUCKET SEWER MASTER PLAN -SOMERSET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
12	DOC RYDER DR	F_1035633_2558431	R10	10,000	1	2	1	3894	0.61	3	330	330	270	270	
13	DOC RYDER DR	F_1035562_2558319	R10	10,000	1	1	-	2354	0.44	3	330	-	270	-	
1	FARMVIEW RD	F_1033388_2558546	R10	10,000	1	3	2	3525	0.85	3	330	660	270	540	
2	FARMVIEW RD	F_1033645_2558565	R10	10,000	1	2	1	1518	0.49	4	440	330	270	270	
3	FARMVIEW RD	F_1033460_2558457	R10	10,000	1	1	-	1936	0.45	3	330	-	270	-	
5	FARMVIEW RD	-	R10	10,000	0	1	-	Vacant	0.45	Vacant	330	-	270	-	
7	FARMVIEW RD	-	R10	10,000	0	1	-	Vacant	0.45	Vacant	330	-	270	-	
9	FARMVIEW RD	F_1033472_2558164	R10	10,000	1	2	1	1800	0.46	3	330	330	270	270	
10	FARMVIEW RD	F_1033663_2558208	R10	10,000	2	1	-	1496	0.39	3	330	-	270	-	
10	FARMVIEW RD	F_1033663_2558208	R10	N/A	N/A	#VALUE!	N/A	280	N/A	1	110	-	270	-	Cottage (Assume one bedroom)
11	FARMVIEW RD	F_1033461_2558037	R10	10,000	1	1	-	2978	0.45	4	440	-	270	-	
1	FINBACK LN	F_1037458_2560660	R20	20,000	1	1	-	3484	0.12	4	440	-	270	-	
2	FINBACK LN	F_1037376_2560557	R20	20,000	1	1	-	3149	0.11	4	440	-	270	-	
3	FINBACK LN	F_1037416_2560691	R20	20,000	1	1	-	2303	0.11	4	440	-	270	-	
4	FINBACK LN	F_1037334_2560588	R20	20,000	1	1	-	2659	0.15	4	440	-	270	-	
5	FINBACK LN	F_1037369_2560713	R20	20,000	1	1	-	3823	0.13	5	550	-	270	-	
6	FINBACK LN	F_1037283_2560601	R2	20,000	1	1	-	3553	0.14	4	440	-	270	-	
7	FINBACK LN	F_1037307_2560729	R20	20,000	1	1	-	3552	0.13	4	440	-	270	-	
8	FINBACK LN	F_1037231_2560590	R20	20,000	1	1	-	3079	0.12	4	440	-	270	-	
9	FINBACK LN	F_1037255_2560730	R20	20,000	1	1	-	3835	0.12	4	440	-	270	-	
11	FINBACK LN	-	R20	20,000	0	1	-	Vacant	0.11	Vacant	330	-	270	-	
13	FINBACK LN	F_1037155_2560703	R20	20,000	1	1	-	3586	0.11	5	550	-	270	-	
15	FINBACK LN	F_1037110_2560676	R20	20,000	1	1	-	2323	0.11	4	440	-	270	-	
17	FINBACK LN	F_1037072_2560641	R20	20,000	1	1	-	4052	0.11	5	550	-	270	-	
21	FINBACK LN	F_1037048_2560508	R20	20,000	1	1	-	3482	0.12	5	550	-	270	-	
23	FINBACK LN	F_1037088_2560468	R20	20,000	1	1	-	2985	0.13	5	550	-	270	-	
1	GOLFVIEW DR	F_1034838_2558771	R10	10,000	2	1	-	576	0.38	1	110	-	270	-	Cottage (Assume one bedroom)
1	GOLFVIEW DR	F_1034838_2558771	R10	N/A	N/A	N/A	N/A	1296	N/A	3	330	-	270	-	
2	GOLFVIEW DR	F_1034760_2558676	R10	10,000	1	1	-	1785	0.34	3	330	-	270	-	
3	GOLFVIEW DR	F_1034766_2558914	R10	10,000	1	2	1	2250	0.61	3	330	330	270	270	
4	GOLFVIEW DR	F_1034559_2558664	R10	10,000	2	1	-	1924	0.36	3	330	-	270	-	
4	GOLFVIEW DR	F_1034559_2558664	R10	N/A	N/A	N/A	N/A	480	N/A	1	110	-	270	-	Cottage (Assume one bedroom)
5	GOLFVIEW DR	F_1034631_2558877	R10	10,000	1	1	-	1608	0.45	3	330	-	270	-	
7	GOLFVIEW DR	-	R10	10,000	0	1	-	Vacant	0.43	Vacant	330	-	270	-	
8	GOLFVIEW DR	F_1034445_2558584	R10	10,000	1	1	-	1510	0.45	3	330	-	270	-	
9	GOLFVIEW DR	F_1034419_2558814	R10	10,000	1	1	-	1392	0.44	4	440	-	270	-	
10	GOLFVIEW DR	F_1034339_2558497	R10	10,000	1	3	2	2220	0.7	4	440	660	270	540	
11	GOLFVIEW DR	F_1034323_2558790	R10	10,000	1	2	1	2034	0.46	3	330	330	270	270	
12	GOLFVIEW DR	F_1034239_2558472	R10	10,000	1	2	1	1572	0.6	3	330	330	270	270	
13	GOLFVIEW DR	F_1034224_2558764	R10	10,000	1	2	1	1774	0.46	3	330	330	270	270	
14	GOLFVIEW DR	F_1034146_2558485	R10	10,000	1	1	-	2928	0.45	3	330	-	270	-	
15	GOLFVIEW DR	F_1034123_2558732	R10	10,000	1	2	1	2474	0.46	3	330	330	270	270	
16	GOLFVIEW DR	F_1034061_2558458	R10	10,000	1	1	-	2276	0.45	3	330	-	270	-	
17	GOLFVIEW DR	F_1034024_2558703	R10	10,000	1	2	1	1404	0.46	3	330	330	270	270	
18	GOLFVIEW DR	F_1033959_2558433	R10	10,000	1	2	1	3860	0.46	4	440	330	270	270	
19	GOLFVIEW DR	F_1033912_2558669	R10	10,000	1	2	1	1368	0.46	4	440	330	270	270	
20	GOLFVIEW DR	F_1033859_2558424	R10	10,000	1	1	-	3124	0.41	3	330	-	270	-	
21	GOLFVIEW DR	-	R10	10,000	0	1	-	Vacant	0.43	Vacant	330	-	270	-	
22	GOLFVIEW DR	F_1033792_2558364	R10	10,000	1	1	-	2906	0.44	3	330	-	270	-	
23	GOLFVIEW DR	F_1033731_2558613	R10	10,000	1	1	-	1536	0.42	3	330	-	270	-	
24	GOLFVIEW DR	F_1033721_2558301	R10	10,000	1	1	-	1960	0.44	2	220	-	270	-	
1	HATCH CI	-	R10	10,000	0	2	1	Vacant	0.49	Vacant	330	330	270	270	
3	HATCH CI	F_1036245_2559106	R10	10,000	1	1	-	1344	0.42	2	220	-	270	-	
4	HATCH CI	F_1036120_2559292	R10	10,000	1	1	-	1354	0.28	3	330	-	270	-	
5	HATCH CI	F_1036237_2559234	R10	10,000	1	2	1	1886	0.48	2	220	330	270	270	
1	HENDERSONS DR	F_1034783_2558240	R10	10,000	1	1	-	1383	0.45	3	330	-	270	-	
2	HENDERSONS DR	F_1034936_2558426	R10	10,000	1	1	-	2308	0.45	4	440	-	270	-	
3	HENDERSONS DR	F_1034860_2558176	R10	10,000	1	1	-	3336	0.45	5	550	-	270	-	
4	HENDERSONS DR	F_1035014_2558362	R10	10,000	1	1	-	2320	0.45	3	330	-	270	-	
5	HENDERSONS DR	F_1034936_2558113	R10	10,000	1	1	-	1667	0.45	3	330	-	270	-	
6	HENDERSONS DR	F_1035090_2558297	R10	10,000	1	1	-	2775	0.45	5	550	-	270	-	
7	HENDERSONS DR	F_1035012_2558046	R10	10,000	1	1	-	1890	0.45	3	330	-	270	-	
8	HENDERSONS DR	F_1035168_2558234	R10	10,000	1	1	-	1664	0.45	3	330	-	270	-	
9	HENDERSONS DR	F_1035081_2557954	R10	10,000	1	1	-	1636	0.4	3	330	-	270	-	
10	HENDERSONS DR	-	R10	10,000	0	1	-	Vacant	0.4	Vacant	330	-	270	-	
11	HENDERSONS DR	F_1035187_2557895	R10	10,000	1	2	1	2300	0.61	3	330	330	270	270	
12	HENDERSONS DR	F_1035347_2558093	R10	10,000	1	2	1	2362	0.61	3	330	330	270	270	
13	HENDERSONS DR	F_1035284_2557983	R10	10,000	1	1	-	1917	0.44	3	330	-	270	-	
2	HIGH BRUSH PA	F_1035401_2561314	R20	20,000	1	2	1	2048	0.93	3	330	330	270	270	
5	HIGH BRUSH PA	F_1035759_2561573	R20	20,000	2	3	1	2486	1.44	4	440	330	270	270	

NANTUCKET SEWER MASTER PLAN -SOMERSET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
5	HIGH BRUSH PA	F_1035759_2561573	R20	N/A	N/A	N/A	N/A	405	N/A	1	110	-	270	-	Guest Quarters (Assume one bedroom)
9	HIGH BRUSH PA	F_1035764_2561833	R20	20,000	1	2	1	2620	2.85	3	330	330	270	270	2/3 Wetland
15	HIGH BRUSH PA	F_1036166_2562010	R20	20,000	1	2	1	2195	0.93	3	330	330	270	270	
17	HIGH BRUSH PA	F_1036212_2561921	R20	20,000	1	2	1	2058	0.93	3	330	330	270	270	
19	HIGH BRUSH PA	F_1036233_2561822	R20	20,000	1	2	1	3090	0.95	5	550	330	270	270	
21	HIGH BRUSH PA	F_1036184_2561740	R20	20,000	1	2	1	2032	0.96	4	440	330	270	270	
23	HIGH BRUSH PA	F_1036099_2561652	R20	20,000	1	2	1	2894	1.25	4	440	330	270	270	
25	HIGH BRUSH PA	F_1036115_2561529	R20	20,000	1	2	1	1908	1.21	3	330	330	270	270	
27	HIGH BRUSH PA	F_1036293_2561444	R20	20,000	1	2	1	3290	0.95	4	440	330	270	270	
2	MARBLE WY	F_1037010_2560026	CTEC	10,000	1	1	-	1448	0.37	3	330	-	270	-	
6	MARBLE WY	-	CTEC	10,000	0	1	-	Vacant	0.34	Vacant	330	-	270	-	
8	MARBLE WY	-	CTEC	10,000	0	1	-	Vacant	0.34	Vacant	330	-	270	-	
10	MARBLE WY	F_1036503_2559806	CTEC	10,000	1	3	2	1428	0.77	3	330	660	270	540	
12	MARBLE WY	F_1036355_2559817	CTEC	10,000	2	2	-	960	0.52	1	110	-	270	-	
12	MARBLE WY	F_1036355_2559817	CTEC	N/A	N/A	N/A	N/A	1280	N/A	2	220	-	270	-	
13	MARBLE WY	-	R20	20,000	0	1	-	Vacant	0.46	Vacant	330	-	270	-	
14	MARBLE WY	F_1036217_2559784	CTEC	10,000	1	1	-	792	0.4	2	220	-	270	-	
16	MARBLE WY	F_1036131_2559738	CTEC	10,000	1	1	-	2304	0.23	-	173	-	270	-	
2-	MARBLE WY	F_1036947_2559956	CTEC	10,000	1	1	-	672	0.15	1	110	-	270	-	
4B	MARBLE WY	-	CTEC	10,000	0	1	-	Vacant	0.21	Vacant	330	-	270	-	
1	MARBLE WY #2	F_1746195_96753	R20	20,000	1	1	-	1792	0	3	330		270	-	#9 Sleepy Hollow Rd #1
3	MARBLE WY #2	F_1746134_96722	R20	20,000	1	1	-	1560	0	3	330		270	-	#7 Sleepy Hollow Rd #1
5	MARBLE WY #2	F_1746059_96695	RC2	5,000	1	1	-	1440	0	3	330		270	-	#5 Sleepy Hollow Rd #1
7	MARBLE WY #2	F_1745967_96657	RC2	5,000	1	1	-	1668	0	3	330		270	-	#3 Sleepy Hollow Rd
9	MARBLE WY #2	F_1745860_96602	RC2	5,000	1	1	-	1716	0	3	330		270	-	#1 Sleepy Hollow Rd #2
11	MARBLE WY #2	F_1745718_96542	R20	20,000	1	1	-	1792	0	3	330		270	-	#2 Sleepy Hollow Rd #2
2	MIKES DR	F_1035787_2560282	R20	20,000	1	1	-	3598	0.46	3	330	-	270	-	
4	MIKES DR	F_1035815_2560173	R20	20,000	1	1	-	3066	0.46	4	440	-	270	-	
3	MIOXES WY	-	RC2	5,000	0	1	-	Vacant	0.22	Vacant	330	-	270	-	Not in CWMP added to sewer dist.
4	MIOXES WY	F_1033160_2558057	RC2	5,000	1	1	-	1733	0.41	4	440	-	270	-	Not in CWMP added to sewer dist.
6	MIOXES WY	F_1033187_2557971	RC2	5,000	1	1	-	1667	0.27	3	330	-	270	-	Not in CWMP added to sewer dist.
3	RACEWAY DR	F_1035760_2559265	RC2	5,000	1	3	2	1596	0.38	2	220	660	270	540	
4	RACEWAY DR	F_1035885_2559364	RC2	5,000	1	4	3	1344	0.46	3	330	990	270	810	
5	RACEWAY DR	F_1035849_2559143	R10	10,000	1	1	-	2786	0.38	3	330	-	270	-	
6	RACEWAY DR	F_1035975_2559279	RC2	5,000	1	3	2	1613	0.36	3	330	660	270	540	
7	RACEWAY DR	F_1035939_2559020	R10	10,000	1	1	-	2832	0.38	4	440	-	270	-	
8	RACEWAY DR	F_1036026_2559190	R10	10,000	2	1	-	274	0.38	2	220	-	270	-	
8	RACEWAY DR	F_1036026_2559190	R10	N/A	N/A	N/A	N/A	1320	N/A	3	330	-	270	-	
9	RACEWAY DR	F_1036032_2558890	R10	10,000	1	1	-	1624	0.38	3	330	-	270	-	
3	SLEEPY HOLLOW RD	-	RC2	5,000	0	4	3	Vacant	0.46	Vacant	330	990	270	810	#7 Marble Wy
4	SLEEPY HOLLOW RD	-	R20	20,000	0	1	-	Vacant	0.29	Vacant	330	-	270	-	#82 Somerset Rd #2
10	SLEEPY HOLLOW RD	F_1745884_96846	R20	20,000	1	1	-	2142	0.77	4	440	-	270	-	#76 Somerset Rd
1	SLEEPY HOLLOW RD #1	F_1745860_96602	RC2	5,000	1	1	-	1380	0	3	330	-	270	-	#9 Marble Wy
2	SLEEPY HOLLOW RD #1		RC2	5,000	0	1	-	Vacant	0	Vacant	330	-	270	-	#11 Marble Wy #2
5	SLEEPY HOLLOW RD #1	F_1746059_96695	RC2	5,000	1	1	-	2800	0	4	440		270	-	#5 Marble Wy #1
6	SLEEPY HOLLOW RD #1		R20	20,000	0	1	-	Vacant	0	Vacant	330	-	270	-	#80 Somerset Rd #2
7	SLEEPY HOLLOW RD #1	F_1746134_96722	R20	20,000	1	1	-	1848	0	4	440	-	270	-	#3 Marble Wy #2
8	SLEEPY HOLLOW RD #1	F_1745819_96791	R20	20,000	1	1	-	1936	0.38	4	440	-	270	-	#78 Somerset Rd #2
9	SLEEPY HOLLOW RD #1	-	R20	20,000	0	1	-	Vacant	0.23	Vacant	330	-	270	-	#1 Marble Wy #2
12	SLEEPY HOLLOW RD #1	F_1745942_96890	R20	20,000	1	1	-	1956	0.38	4	440	-	270	-	#74 Somerset Rd #2
14	SLEEPY HOLLOW RD #1		`	20,000	1	1	-	1820	0.28	3	330	-	270	-	
16	SLEEPY HOLLOW RD #1	F_1746024_96975	R20	20,000	1	1	-	1904	0.23	3	330	-	270	-	
18	SLEEPY HOLLOW RD #1	F_1746083_97013	R20	20,000	1	1	-	3036	0.77	4	440	-	270	-	
10	SOMERSET LN	F_1034901_2561475	R2	20,000	1	1	-	1734	0.54	2	220	-	270	-	#68 Somerset Rd #2
12	SOMERSET LN	F_1035027_2561573	R20	20,000	2	1	-	2016	0.73	3	330	-	270	-	
12	SOMERSET LN	F_1035027_2561573	R20	N/A	N/A	N/A	N/A	1280	N/A	2	220	-	270	-	
14	SOMERSET LN	F_1035009_2561376	R2	20,000	2	6	3	864	3.19	1	110	990	270	810	
14	SOMERSET LN	F_1035009_2561376	R2	N/A	N/A	N/A	N/A	1530	N/A	3	330	-	270	-	
16	SOMERSET LN	F_1035078_2561276	R20	20,000	1	1	-	1985	0.46	3	330	-	270	-	
18	SOMERSET LN	-	R20	20,000	0	1	-	Vacant	0.46	Vacant	330	-	270	-	
20	SOMERSET LN	F_1035118_2561114	R20	20,000	1	1	-	1440	0.46	3	330	-	270	-	
22	SOMERSET LN	F_1035220_2560864	R20	20,000	2	1	-	1632	0.53	3	330	-	270	-	
22	SOMERSET LN	F_1035220_2560864	R20	N/A	N/A	N/A	N/A	280	N/A	1	110	-	270	-	
24	SOMERSET LN	F_1035279_2560769	R20	20,000	1	1	-	1960	0.53	3	330	-	270	-	
26	SOMERSET LN	F_1035418_2560714	R20	20,000	2	2	-	1128	0.92	2	220	-	270	-	
26	SOMERSET LN	F_1035418_2560714	R20	N/A	N/A	N/A	N/A	1680	N/A	3	330	-	270	-	
27	SOMERSET LN	F_1034937_2560605	R40	40,000	1	2	1	2176	1.84	3	330	330	270	270	
28	SOMERSET LN	F_1035471_2560620	R2	20,000	2	2	-	216	1.04	1	110	-	270	-	
28	SOMERSET LN	F_1035471_2560620	R2	N/A	N/A	N/A	N/A	1376	N/A	3	330	-	270	-	
29	SOMERSET LN	F_1034976_2560450	R40	40,000	1	2	1	1980	1.84	3	330	330	270	270	

NANTUCKET SEWER MASTER PLAN -SOMERSET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
30	SOMERSET LN	F_1035442_2560496	R20	20,000	1	1	-	1896	0.49	2	220	-	270	-	
30B	SOMERSET LN	-	R20	20,000	1	1	-	1680	0.49	4	440	-	270	-	
31	SOMERSET LN	F_1035011_2560303	R40	40,000	2	2	-	3588	2.13	4	440	-	270	-	
31	SOMERSET LN	F_1035011_2560303	R40	N/A	N/A	N/A	N/A	2097	N/A	2	220	-	270	-	
32	SOMERSET LN	F_1035573_2560432	R20	20,000	2	2	1	3835	0.97	6	660	330	270	270	
33	SOMERSET LN	F_1035090_2560171	R40	40,000	2	2	1	3120	2.18	4	440	330	270	270	
34	SOMERSET LN	F_1035631_2560338	R20	20,000	2	2	-	546	0.97	1	110	-	270	-	
34	SOMERSET LN	F_1035631_2560338	R20	N/A	N/A	N/A	N/A	2924	N/A	3	330	-	270	-	
35	SOMERSET LN	F_1035164_2560050	R40	40,000	2	2	-	1976	1.87	3	330	-	270	-	
35	SOMERSET LN	F_1035164_2560050	R40	N/A	N/A	N/A	N/A	1790	N/A	3	330	-	270	-	
37	SOMERSET LN	F_1035201_2559927	R40	40,000	2	2	-	1132	1.87	2	220	-	270	-	
37	SOMERSET LN	F_1035201_2559927	R40	N/A	N/A	N/A	N/A	1932	N/A	3	330	-	270	-	
39	SOMERSET LN	F_1035271_2559802	R40	40,000	3	2	1	736	1.87	1	110	330	270	270	
39	SOMERSET LN	F_1035271_2559802	R40	N/A	N/A	N/A	N/A	938	N/A	2	220	-	270	-	
39	SOMERSET LN	F_1035271_2559802	R40	N/A	N/A	N/A	N/A	3095	N/A	3	330	-	270	-	
40	SOMERSET LN	F_1035616_2560131	R20	20,000	1	1	-	3471	0.89	5	550	-	270	-	
41	SOMERSET LN	F_1035444_2559683	R40	40,000	2	1	-	648	1.63	1	110	-	270	-	Guest Quarters (assume one bedroom)
41	SOMERSET LN	F_1035444_2559683	R40	N/A	N/A	N/A	N/A	3082	N/A	3	330	-	270	-	
42	SOMERSET LN	F_1035761_2560033	R20	20,000	2	2	-	4904	1.02	5	550	-	270	-	
42	SOMERSET LN	F_1035761_2560033	R20	N/A	N/A	N/A	N/A	1056	N/A	1	110	-	270	-	Guest Quarters (assume one bedroom)
44	SOMERSET LN	F_1035805_2559932	R20	20,000	2	2	-	1568	1.01	2	220	-	270	-	
44	SOMERSET LN	F_1035805_2559932	R20	N/A	N/A	N/A	N/A	2458	N/A	4	440	-	270	-	
46	SOMERSET LN	F_1035756_2559800	R20	20,000	1	1	-	2466	0.46	4	440	-	270	-	
8	SOMERSET LN #1		R20	20,000	1	1	-	1734	0.85	2	220	-	270	-	
43	SOMERSET LN #1		R40	40,000	1	1	-	960	0	2	220	-	270	-	#89 Somerset Rd #2
82	SOMERSET LN #2	F_1745670_96651	R20	20,000	1	1	-	1656	0	3	330	-	270	-	#43 Somerset Rd #1
52	SOMERSET RD	F_1037256_2561053	R20	20,000	1	1	-	2853	0.48	5	550	-	270	-	
54	SOMERSET RD	F_1037165_2561004	R20	20,000	1	1	-	1588	0.46	2	220	-	270	-	
55	SOMERSET RD	F_1036936_2561085	R2	20,000	1	1	-	2598	0.47	4	440	-	270	-	
56	SOMERSET RD	F_1037111_2560925	R20	20,000	2	1	-	1456	0.47	4	440	-	270	-	
56	SOMERSET RD	F_1037111_2560925	R20	N/A	N/A	N/A	N/A	1564	N/A	1	110	-	270	-	
57	SOMERSET RD	F_1036848_2560993	R20	20,000	2	1	-	2195	0.46	3	330	-	270	-	
57	SOMERSET RD	F_1036848_2560993	R20	N/A	N/A	N/A	N/A	447	N/A	1	110	-	270	-	
58	SOMERSET RD	F_1037018_2560828	R20	20,000	1	2	1	1232	0.93	3	330	330	270	270	
59	SOMERSET RD	F_1036764_2560898	R20	20,000	1	1	-	1728	0.46	3	330	-	270	-	
61	SOMERSET RD	F_1036679_2560804	R20	20,000	1	1	-	2311	0.46	3	330	-	270	-	
62	SOMERSET RD	F_1036925_2560729	R20	20,000	1	1	-	1040	0.47	1	110	-	270	-	
63	SOMERSET RD	F_1036594_2560712	R2	20,000	2	1	-	882	0.47	1	110	-	270	-	
63	SOMERSET RD	F_1036594_2560712	R2	N/A	N/A	N/A	N/A	2118	N/A	3	330	-	270	-	
65	SOMERSET RD	F_1036510_2560618	R20	20,000	1	1	-	1629	0.46	4	440	-	270	-	
67	SOMERSET RD	F_1036426_2560526	R20	20,000	1	1	-	2592	0.46	4	440	-	270	-	
69	SOMERSET RD	F_1036336_2560432	R20	20,000	1	1	-	2998	0.47	3	330	-	270	-	
72	SOMERSET RD	F_1745985_96933	R20	20,000	1	2	1	1548	0.95	3	330	330	270	270	
75	SOMERSET RD	F_1036273_2560280	R20	20,000	1	1	-	2194	0.18	3	330	-	270	-	
76	SOMERSET RD	F_1745884_96846	R20	20,000	1	2	1	1332	0.95	3	330	330	270	270	
77	SOMERSET RD	F_1036210_2560318	R20	20,000	1	1	-	752	0.28	3	330	-	270	-	
79	SOMERSET RD	F_1036170_2560204	R20	20,000	1	1	-	1632	0.47	3	330	-	270	-	
81	SOMERSET RD	F_1036105_2560100	R20	20,000	1	1	-	3165	0.47	3	330	-	270	-	
83	SOMERSET RD	F_1036050_2559985	R20	20,000	1	1	-	512	0.47	1	110	-	270	-	
85	SOMERSET RD	F_1035934_2559847	R20	20,000	2	1	-	2040	0.71	2	220	-	270	-	
85	SOMERSET RD	F_1035934_2559847	R20	N/A	N/A	N/A	N/A	1470	N/A	1	110	-	270	-	
86	SOMERSET RD	F_1036005_2559658	RC2	5,000	2	9	7	5400	1.04	-	405	2310	270	1890	Pre-Eng Warehouse/Gar
86	SOMERSET RD	F_1036005_2559658	RC2	N/A	N/A	N/A	N/A	1856	N/A	3	330	-	270	-	
87	SOMERSET RD	F_1035775_2559699	R20	20,000	1	1	-	3110	0.5	5	550	-	270	-	
88	SOMERSET RD	F_1035875_2559487	RC2	5,000	2	8	6	2996	0.95	-	224.7	1980	270	1620	Current Commercial use
88	SOMERSET RD	F_1035875_2559487	RC2	N/A	N/A	N/A	N/A	1729	N/A	3	330	-	270	-	
91	SOMERSET RD	F_1035334_2559425	R40	40,000	2	2	1	192	2.45	-	14.4	330	270	270	Current Commercial use
91	SOMERSET RD	F_1035334_2559425	R40	N/A	N/A	N/A	N/A	168	N/A		12.6	-	270	-	Current Commercial use
95	SOMERSET RD	F_1035136_2559462	R40	40,000	1	2	1	3728	1.87	4	440	330	270	270	
97	SOMERSET RD	F_1035144_2559048	R10	10,000	1	1	-	1576	0.27	3	330	-	270	-	
98	SOMERSET RD	F_1035147_2558827	R10	10,000	1	1	-	2404	0.45	3	330	-	270	-	
99	SOMERSET RD	F_1035036_2558989	R10	10,000	1	1	-	1364	0.4	3	330	-	270	-	
101	SOMERSET RD	F_1034964_2558920	R10	10,000	1	1	-	1344	0.45	4	440	-	270	-	
103	SOMERSET RD	F_1034898_2558841	R10	10,000	1	1	-	1600	0.45	3	330	-	270	-	
104	SOMERSET RD	F_1034987_2558641	R10	10,000	1	1	-	2548	0.45	4	440	-	270	-	
108	SOMERSET RD	F_1034861_2558493	R10	10,000	1	1	-	2689	0.45	5	550	-	270	-	
109	SOMERSET RD	F_1034699_2558614	R10	10,000	1	1	-	2277	0.45	4	440	-	270	-	
111	SOMERSET RD	F_1034635_2558538	R10	10,000	1	1	-	1726	0.45	3	330	-	270	-	
112	SOMERSET RD	F_1034705_2558305	R10	10,000	1	1	-	3336	0.45	4	440	-	270	-	
113	SOMERSET RD	F_1034572_2558463	R10	10,000	1	1	-	2328	0.45	4	440	-	270	-	

NANTUCKET SEWER MASTER PLAN -SOMERSET NEEDS AREA
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
115	SOMERSET RD	F_1034508_2558386	R10	10,000	1	1	-	2322	0.45	3	330	-	270	-	
117	SOMERSET RD	F_1034443_2558304	R10	10,000	2	1	-	838	0.45	1	110	-	270	-	
117	SOMERSET RD	F_1034443_2558304	R10	N/A	N/A	N/A	N/A	2004	N/A	4	440	-	270	-	
118	SOMERSET RD	F_1034578_2558153	R10	10,000	1	1	-	2335	0.27	3	330	-	270	-	
126	SOMERSET RD	F_1034321_2557805	R10	10,000	2	1	-	432	0.27	1	110	-	270	-	
126	SOMERSET RD	F_1034321_2557805	R10	N/A	N/A	N/A	N/A	1500	N/A	4	440	-	270	-	
128	SOMERSET RD	-	R10	10,000	0	1	-	Vacant	0.31	Vacant	330	-	270	-	
130	SOMERSET RD	-	R10	10,000	0	1	-	Vacant	0.37	Vacant	330	-	270	-	
132	SOMERSET RD	F_1034468_2557493	R10	10,000	1	1	-	2761	0.22	4	440	-	270	-	
128-	SOMERSET RD	F_1034386_2557652	R10	10,000	1	1	-	2493	0.26	4	440	-	270	-	
130-	SOMERSET RD	F_1034466_2557592	R10	10,000	1	1	-	1768	0.28	3	330	-	270	-	
86-	SOMERSET RD	F_1745291_96170	RC2	5,000	1	1	-	1512	0.11	-	113.4	-	270	-	Current Commercial use
68	SOMERSET RD #2	F_1746083_97013	R20	20,000	1	1	-	1680	0	3	330	-	270	-	
70	SOMERSET RD #2	F_1746024_96975	R20	20,000	1	1	-	1440	0	3	330	-	270	-	
74	SOMERSET RD #2	F_1745942_96890	R20	20,000	1	1	-	1792	0	3	330	-	270	-	
78	SOMERSET RD #2	F_1745819_96791	R20	20,000	1	1	-	1440	0	3	330	-	270	-	
80	SOMERSET RD #2	F_1745755_96729	R20	20,000	1	1	-	1680	0	3	330	-	270	-	
89	SOMERSET RD #2	F_1744896_96082	R40	40,000	1	1	-	1128	0	2	220	-	270	-	
1	SWAYZES DR	F_1034422_2557969	R10	10,000	1	1	-	1404	0.44	3	330	-	270	-	
2	SWAYZES DR	F_1034656_2558086	R10	10,000	1	1	-	1404	0.45	3	330	-	270	-	
3	SWAYZES DR	F_1034499_2557903	R10	10,000	1	1	-	2910	0.45	4	440	-	270	-	
4	SWAYZES DR	F_1034731_2558022	R10	10,000	1	1	-	1760	0.45	3	330	-	270	-	
5	SWAYZES DR	F_1034573_2557840	R10	10,000	1	1	-	2128	0.45	3	330	-	270	-	
6	SWAYZES DR	F_1034804_2557958	R10	10,000	1	1	-	2262	0.45	4	440	-	270	-	
7	SWAYZES DR	F_1034650_2557775	R10	10,000	1	1	-	2777	0.45	4	440	-	270	-	
8	SWAYZES DR	F_1034884_2557894	R10	10,000	1	1	-	1544	0.45	3	330	-	270	-	
9	SWAYZES DR	F_1034725_2557711	R10	10,000	1	1	-	1680	0.45	4	440	-	270	-	
10	SWAYZES DR	F_1034988_2557846	R10	10,000	1	1	-	1320	0.40	3	330	-	270	-	
11	SWAYZES DR	F_1034792_2557617	R10	10,000	1	1	-	2149	0.40	3	330	-	270	-	
12	SWAYZES DR	F_1035064_2557753	R10	10,000	1	2	1	3024	0.61	5	550	330	270	270	
13	SWAYZES DR	F_1034899_2557551	R10	10,000	1	2	1	3746	0.60	5	550	330	270	270	
14	SWAYZES DR	F_1034995_2557640	R10	10,000	1	1	-	1842	0.43	3	330	-	270	-	
1	TODD CI	F_1035515_2559158	CTEC	10,000	1	1	-	2688	0.44	3	330	-	270	-	
2	TODD CI	F_1035609_2558988	CTEC	10,000	1	1	-	1870	0.38	5	550	-	270	-	
3	TODD CI	F_1035426_2559101	CTEC	10,000	1	2	1	3372	0.50	4	440	330	270	270	
4	TODD CI	F_1035533_2558897	CTEC	10,000	1	1	-	1845	0.38	3	330	-	270	-	
5	TODD CI	F_1035302_2559013	CTEC	10,000	1	2	1	2646	0.50	5	550	330	270	270	
6	TODD CI	F_1035459_2558787	CTEC	10,000	1	1	-	1367	0.44	3	330	-	270	-	
7	TODD CI	F_1035317_2558872	CTEC	10,000	1	2	1	2325	0.47	3	330	330	270	270	
2	W MIACOMET RD	-	R10	10,000	1	4	3	5721	1.00	6	660	990	270	810	
4	W MIACOMET RD	-	R10	10,000	1	1	-	4725	0.37	6	660	-	270	-	
6	W MIACOMET RD	-	CN	7,500	1	2	1	3176	0.40	5	550	330	270	270	Land Bank w/ Home
								SUBTOTAL		878	108564	34320	86670	28080	

Total Number of Lots	283
Total Number of Vacant Lots	25
Total Number of Lots with one (1) Dwelling	219
Total Number of Lots with Multiple Existing Dwellings	39
Total Number of Lots with Multiple Future Dwellings	69
Number of Existing Bedrooms	878
Number of Future Bedrooms	387
Total Number of Bedrooms	1265
Average Number of Bedrooms per Lot	3.3

Percentage of Lots with Multiple Dwellings (Existing and Future)	38%
Projected Percentage of Lots with Multiple Dwellings (Future)	50%
Additional Percentage of Lots with Multiple Dwellings (Future)	12%
Number of Additional Future Secondary Dwellings	34

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**95,700**	**114,800**
ADF for Additional Future Secondary Dwellings (gpd)	**7,500**	**9,200**
Total Average Daily Flow	**103,000**	**124,000**
Peaking Factor (determined from ASCE MOP9)	**5.5**	**5.5**
Peak Flow (gpd)	**566,500**	**682,000**
Infiltration and Inflow (I/I) Allowance (3)	**8,300**	**8,300**
Total Peak Flow including I/I allowance (gpd)	**574,800**	**690,300**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

APPENDIX B

South Valley, Airport Pump Station, WPZ Flow Calculations

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
1	AIRPORT RD		R20	20,000	0	1	-	Vacant	0.79	Vacant		330		270	
7	AIRPORT RD		R20	20,000	0	1	-	Vacant	0.76	Vacant		330		270	
10	AIRPORT RD		CI	15,000	2	2	-	4679	0.92	-	1750	-	1750	-	50 Cars at 75 gal/day
10	AIRPORT RD		N/A	N/A	N/A	N/A	N/A	1920	N/A	-	144	-	270	-	Office Bldg
14	2 AIRPORT RD		CI	-	22	-		-	0		1200		1200		Based on Avg flow from water use records
21	AIRPORT RD		R40	40,000	1	1	-	1900	0.82	-	95	-	135	-	Service Shop
23	AIRPORT RD		R40	40,000	0	1	-	Vacant	0.86	Vacant		330		270	
3	ARROWHEAD DR		CI	15,000	1	1	-	2821	0.11	2	220	-	270	-	
4	ARROWHEAD DR		RC2	5,000	1	3		2880	0.44	-	144		135		Service Shop
6	ARROWHEAD DR		RC2	5,000	1	1	-	3090	0.14	-	232	-	135	-	Office/ Warehouse
8	ARROWHEAD DR		RC2	5,000	1	3		3976	0.40	-	199		135		Warehouse
10	ARROWHEAD DR		RC2	5,000	0	3		Vacant	0.40	Vacant		330		270	
12	ARROWHEAD DR	F_1052160_2559563	RC2	20,000	1	1	-	4039	0.40	8	880	-	720	-	Four - 2 bedroom units
13	ARROWHEAD DR		RC2	5,000	2	8		8635	0.96	-	432		135		Garage/Office
13	ARROWHEAD DR		N/A	N/A	N/A	N/A	N/A	1731	N/A	-	87	-	135	-	Service Shop
18	ARROWHEAD DR	F_1052212_2559760	RC2	5,000	2	10		21716	1.20	-	1086		135		Warehouse
18	ARROWHEAD DR	F_1052212_2559760	N/A	N/A	N/A	N/A	N/A	2593	N/A	8	880	-	540	-	two - 4 bedroom units
19	ARROWHEAD DR		RC2	5,000	3	21		9928	2.52	-	496		135		Garage/Office
19	ARROWHEAD DR		N/A	N/A	N/A	N/A	N/A	2048	N/A	-	102	-	135	-	Warehouse
19	ARROWHEAD DR		N/A	N/A	N/A	N/A	N/A	2480	N/A	4	440	-	270	-	
20	ARROWHEAD DR		RC2	5,000	1	3		3269	0.42	-	245		135		Office Bldg
6B	ARROWHEAD DR		RC2	5,000	2	2	-	2240	0.25	-	112	-	135	-	Office/ Warehouse
6B	ARROWHEAD DR		N/A	N/A	N/A	N/A	N/A	1120	N/A	3	330	-	270	-	
	ARROWHEAD DR		RC2	5,000	0	2		Vacant	0.25	Vacant		330		270	69 10.4
1	DAFFODIL LN	F_1049848_2557728	LUG2	80,000	2	1	-	2439	1.84	4	440	-	270	-	
1	DAFFODIL LN	F_1049848_2557728	N/A	N/A	N/A	N/A	N/A	1874	N/A	4	440	-	270	-	
2	DAFFODIL LN	F_1049570_2557867	R40	40,000	1	2	1	2787	1.84	4	440	330	270	270	
3	DAFFODIL LN	F_1049930_2557950	LUG2	80,000	2	1	-	1904	1.84	3	330	-	270	-	
3	DAFFODIL LN	F_1049930_2557950	N/A	N/A	N/A	N/A	N/A	1672	N/A	4	440	-	270	-	
4	DAFFODIL LN	F_1049341_2558185	R40	40,000	2	2	-	2387	1.84	3	330	-	270	-	
4	DAFFODIL LN	F_1049341_2558185	N/A	N/A	N/A	N/A	N/A	312	N/A	1	110	-	135	-	
5	DAFFODIL LN	F_1049899_2558115	R40	40,000	1	2	1	2289	1.84	2	220	330	270	270	
7	DAFFODIL LN	F_1049584_2558385	R20	20,000	2	1	-	2240	0.60	3	330	-	270	-	
7	DAFFODIL LN	F_1049584_2558385	N/A	N/A	N/A	N/A	N/A	2016	N/A	4	440	-	270	-	
18	DAFFODIL LN	F_1048827_2558543	R20	20,000	1	1	-	1911	0.57	4	440	-	270	-	
29	DAFFODIL LN	F_1048671_2559025	R20	20,000	2	1	-	2835	0.46	6	660	-	270	-	
29	DAFFODIL LN	F_1048671_2559025	N/A	N/A	N/A	N/A	N/A	1640	N/A	2	220	-	270	-	
31	DAFFODIL LN	F_1048592_2559078	R20	20,000	1	1	-	2271	0.46	5	550	-	270	-	
33	DAFFODIL LN		R20	20,000	0	1	-	Vacant	0.46	Vacant		330		270	
35	DAFFODIL LN	F_1048427_2559248	R5	5,000	1	4	-	364	0.46	1	110	-	135	-	
10A	DAFFODIL LN	F_1049120_2558424	R20	20,000	1	1	-	1632	0.44	3	330	-	270	-	
10B	DAFFODIL LN	F_1049072_2558328	R20	20,000	1	1	-	475	0.08	1	110	-	135	-	
11A	DAFFODIL LN	F_1049375_2558468	R20	20,000	1	1	-	1807	0.12	1	110	-	135	-	
11B	DAFFODIL LN	F_1049414_2558544	R20	20,000	1	1	-	2641	0.34	3	330	-	270	-	
12A	DAFFODIL LN	F_1049043_2558486	R20	20,000	1	1	-	2587	0.27	2	220	-	270	-	
12B	DAFFODIL LN	F_1049002_2558349	R20	20,000	1	1	-	1401	0.14	3	330	-	270	-	
13A	DAFFODIL LN	F_1049298_2558544	R20	20,000	1	1	-	2128	0.28	4	440	-	270	-	
13B	DAFFODIL LN	F_1049354_2558627	R20	20,000	1	1	-	1274	0.18	3	330	-	270	-	
14A	DAFFODIL LN	F_1048978_2558545	R20	20,000	1	1	-	2403	0.29	4	440	-	270	-	
14B	DAFFODIL LN	F_1048933_2558392	R20	20,000	1	1	-	986	0.21	1	110	-	135	-	
16A	DAFFODIL LN	F_1048938_2558619	R20	20,000	1	1	-	1911	0.09	3	330	-	270	-	
16B	DAFFODIL LN	F_1048881_2558486	R20	20,000	1	1	-	3504	0.43	4	440	-	270	-	
17A	DAFFODIL LN	F_1049136_2558663	R20	20,000	1	1	-	4781	0.29	6	660	-	270	-	
17B	DAFFODIL LN	F_1049191_2558744	R20	20,000	1	1	-	693	0.17	2	220	-	270	-	
19A	DAFFODIL LN	F_1049051_2558711	R20	20,000	1	1	-	3256	0.27	4	440	-	270	-	
19B	DAFFODIL LN	F_1049107_2558790	R20	20,000	1	1	-	1656	0.19	5	550	-	270	-	
20A	DAFFODIL LN	F_1048797_2558709	R20	20,000	1	1	-	1326	0.13	3	330	-	270	-	
20B	DAFFODIL LN	F_1048751_2558536	R20	20,000	1	1	-	2173	0.48	3	330	-	270	-	
21A	DAFFODIL LN		R20	20,000	1	N/A	-	3488	0	4	440	-	270	-	Condo
21B	DAFFODIL LN		R20	20,000	1	N/A	-	1320	0	2	220	-	270	-	Condo
22A	DAFFODIL LN	F_1048741_2558739	R20	20,000	1	1	-	1365	0.21	3	330	-	270	-	
22B	DAFFODIL LN	F_1048676_2558547	R20	20,000	1	1	-	2982	0.44	6	660	-	270	-	
23A	DAFFODIL LN		R20	20,000	0	1	-	Vacant	0.18	Vacant		330		270	
23B	DAFFODIL LN		R20	20,000	1	1	-	2160	0.28	4	440	-	270	-	
24B	DAFFODIL LN		R20	20,000	1	N/A	-	2024	0	4	440	-	270	-	Condominium
25B	DAFFODIL LN		R20	20,000	1	N/A	-	1488	0	3	330	-	270	-	Condominium
26B	DAFFODIL LN		R20	20,000	1	N/A	-	2704	0	4	440	-	270	-	Condo
27A	DAFFODIL LN	F_1048730_2558971	R20	20,000	1	1	-	2240	0.36	3	330	-	270	-	
27B	DAFFODIL LN		R20	20,000	0	1	-	Vacant	0.10	Vacant		330		270	
8A	DAFFODIL LN	F_1049223_2558409	R20	20,000	1	1	-	3024	0.29	4	440	-	270	-	
8B	DAFFODIL LN		R20	20,000	1	1	-	1999	0.18	4	440	-	270	-	
9A	DAFFODIL LN	F_1049519_2558479	R20	20,000	1	1	-	3352	0.36	4	440	-	270	-	

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
9B	DAFFODIL LN		R20	20,000	1	1	-	1962	0.12	3	330	-	270	-	
15A	DAFFODIL LN #1		R20	20,000	1	N/A	-	1508	0	2	220	-	270	-	Condo
15B	DAFFODIL LN #B		R20	20,000	1	N/A	-	1456	0	2	220	-	270	-	Condo
26A	DAFFODIL LN		R20	20,000	1	N/A	-	1560	0	3	330	-	270	-	Condo
5	DAISY WY		CI	15,000	0	1	-	Vacant	0.24	Vacant		330		270	
6	DAISY WY		CI	15,000	1	1	-	3200	0.46	-	160	-	135	-	Warehouse
7	DAISY WY		CI	15,000	0	1	-	Vacant	0.24	Vacant		330		270	
9	DAISY WY		CI	15,000	0	1	-	Vacant	0.24	Vacant		330		270	
11	DAISY WY		CI	15,000	0	1	-	Vacant	0.24	Vacant		330		270	
10A	DAISY WY		RC2	5,000	1	N/A	-	957	0	-	48	-	135	-	Indust Condo
10B	DAISY WY		RC2	5,000	1	N/A	-	1914	0	3	330	-	270	-	Condo
8A	DAISY WY		RC2	5,000	1	N/A	-	1960	0	-	98	-	135	-	Indust Condo
8B	DAISY WY		RC2	5,000	1	N/A	-	980	0	1	110	-	135	-	Condo
1	EVERGREEN WY	F_1050316_2557605	R40	40,000	1	2	1	560	1.84	2	220	330	270	270	
3	EVERGREEN WY	F_1050156_2557687	R40	40,000	1	1	-	678	0.92	2	220	-	270	-	
5	EVERGREEN WY	F_1050042_2557684	R40	40,000	1	1	-	2419	0.92	3	330	-	270	-	
9	EVERGREEN WY	F_1049379_2557916	R40	40,000	1	2	1	2722	1.84	3	330	330	270	270	
11	EVERGREEN WY		R40	40,000	0	2	2	Vacant	1.84	Vacant		660		540	
13	EVERGREEN WY	F_1048981_2558074	R40	40,000	1	2	1	2560	1.84	4	440	330	270	270	
17	EVERGREEN WY	F_1048603_2558176	R40	40,000	2	2	-	3000	1.85	6	660	-	270	-	
17	EVERGREEN WY	F_1048603_2558176	N/A	N/A	N/A	N/A	N/A	1236	N/A	3	330	-	270	-	
19	EVERGREEN WY	F_1048506_2558357	R40	40,000	1	2	1	2732	1.85	4	440	330	270	270	
20	EVERGREEN WY	F_1048516_2557655	R40	40,000	3	2	-	2483	1.88	2	220	-	270	-	
20	EVERGREEN WY	F_1048516_2557655	N/A	N/A	N/A	N/A	N/A	468	N/A	1	110	-	135	-	
20	EVERGREEN WY	F_1048516_2557655	N/A	N/A	N/A	N/A	N/A	2714	N/A	2	220	-	270	-	
22	EVERGREEN WY	F_1048346_2557694	R40	40,000	3	2	-	2128	2.51	4	440	-	270	-	
22	EVERGREEN WY	F_1048346_2557694	N/A	N/A	N/A	N/A	N/A	1536	N/A	3	330	-	270	-	
22	EVERGREEN WY	F_1048346_2557694	N/A	N/A	N/A	N/A	N/A	312	N/A	1	110	-	135	-	
27	EVERGREEN WY		R20	20,000	1	1	-	3089	0.22	8	880	-	270	-	
32	EVERGREEN WY		R20	20,000	0	1	-	Vacant	0.46	Vacant		330		270	
15A	EVERGREEN WY		R40	40,000	1	-	-	708	N/A	2	220	-	270	-	Affordable Hsg
15B	EVERGREEN WY		R40	40,000	1	-	-	3312	N/A	4	440	-	270	-	Condo
21A	EVERGREEN WY	F_1048408_2558524	R20	20,000	1	1	-	1260	0.20	2	220	-	270	-	
21B	EVERGREEN WY	F_1048540_2558482	R20	20,000	1	1	-	3024	0.26	6	660	-	270	-	
23A	EVERGREEN WY		R20	20,000	1	1	-	1274	0.20	3	330	-	270	-	
23B	EVERGREEN WY		R20	20,000	1	1	-	2080	0.26	4	440	-	270	-	
25A	EVERGREEN WY	F_1048492_2558660	R20	20,000	1	1	-	1760	0.23	3	330	-	270	-	
25B	EVERGREEN WY	F_1048607_2558631	R20	20,000	1	1	-	2841	0.24	3	330	-	270	-	
27B	EVERGREEN WY		R20	20,000	2	1	-	2860	0.24	3	330	-	270	-	
27B	EVERGREEN WY		N/A	N/A	N/A	N/A	N/A	546	N/A	1	110	-	135	-	
36A	EVERGREEN WY	F_1048424_2558830	R20	20,000	1	1	-	1344	0.19	2	220	-	270	-	
2	HANABEA LN		CMI	5,000	1	1	-	6362	0.22	-	318	-	135	-	Store
3	HANABEA LN		CMI	5,000	1	1	-	4090	0.17	4	645	-	540	-	ApptovrRet/Off
4	HANABEA LN		CMI	5,000	0	1	-	Vacant	0.16	Vacant		330		270	
5	HANABEA LN		CMI	5,000	1	1	-	3830	0.18	4	632	-	540	-	ApptovrRet/Off
6	HANABEA LN		CMI	5,000	0	1	-	Vacant	0.12	Vacant		330		270	
7	HANABEA LN		CMI	5,000	1	1	-	3750	0.17	4	628	-	540	-	ApptovrRet/Off
8	HANABEA LN		CMI	5,000	0	1	-	Vacant	0.11	Vacant		330		270	
10	HANABEA LN		CMI	5,000	0	1	-	Vacant	0.11	Vacant		330		270	
12	HANABEA LN		CMI	5,000	0	1	-	Vacant	0.14	Vacant		330		270	
29	HINSDALE RD	F_1049443_2560584	RC2	5,000	1	7	1	1702	0.81	3	330	330	270	270	not enough frontage to subdivide into 7 lots
45	HINSDALE RD	F_1049901_2560463	CTEC	10,000	1	2	1	1640	0.66	3	330	330	270	270	
47	HINSDALE RD		CTEC	5,000	0	1	-	Vacant	0.11	Vacant		330		270	
63	HINSDALE RD		R5	5,000	0	1	-	Vacant	0.11	Vacant		330		270	
73	HINSDALE RD	F_1050979_2560250	R5	5,000	1	1	-	3680	0.11	6	660	-	270	-	
79	HINSDALE RD	F_1051241_2560209	R5	5,000	1	1	-	1344	0.11	1	110	-	135	-	
81	HINSDALE RD		RC2	5,000	1	5		5020	0.68	0	251		270		Warehouse
83	HINSDALE RD	F_1051379_2560141	RC2	5,000	1	1	-	1404	0.14	2	220	-	270	-	
85	HINSDALE RD	F_1051427_2560022	RC2	5,000	1	6	1	3778	0.69	5	550	330	270	270	frontage limit
89	HINSDALE RD	F_1051548_2560059	RC2	5,000	2	7	1	1171	0.91	2	220	330	270	270	frontage limit
89	HINSDALE RD	F_1051548_2560059	N/A	N/A	N/A	N/A	N/A	648	N/A	3	330	-	270	-	
93	HINSDALE RD		R5	5,000	1	1	-	2493	0.12	4	440	-	270	-	
95	HINSDALE RD	F_1051739_2560097	R5	5,000	1	1	-	2493	0.11	4	440	-	270	-	
109	HINSDALE RD		CI	15,000	1	2		2376	0.71	0	119		135		garage with office
110	HINSDALE RD		RC2	5,000	2	3		2048	0.44	-	102		135		Warehouse
110	HINSDALE RD		N/A	N/A	N/A	N/A	N/A	960	N/A	-	48	-	135	-	Warehouse
112	HINSDALE RD		RC2	5,000	1	4		5200	0.47	-	260		135		Warehouse
114	HINSDALE RD		RC2	5,000	1	4		5980	0.47	-	299		135		Warehouse
71A	HINSDALE RD		RC2	5,000	1	-	-	1528	0	3	330	-	270	-	Condo
71B	HINSDALE RD		RC2	5,000	1	-	-	1576	0	3	330	-	270	-	Condo
98A	HINSDALE RD		R5	5,000	1	-	-	1344	0	2	220	-	270	-	Condo
98B	HINSDALE RD		R5	5,000	1	-	-	1472	0	2	220	-	270	-	Condo

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
98C	HINSDALE RD		R5	5,000	1	-	-	1472	0	2	220	-	270	-	Condo
98D	HINSDALE RD		R5	5,000	1	-	-	1344	0	4	440	-	270	-	Condo
87B	HINSDALE RD #2		RC2	5,000	1	-	-	1120	0	2	220	-	270	-	Condo
1A	LITTLE ISLE LN		R20	20,000	1	1	-	2591	0.26	5	550	-	270	-	
1B	LITTLE ISLE LN		R20	20,000	1	1	-	1764	0.15	4	440	-	270	-	
8	MACYS LN		R5	5,000	0	3	3	Vacant	0.42	Vacant		990		810	
9	MACYS LN	F_1051014_2559388	CN	7,500	1	1	-	2620	0.21	4	440	-	270	-	
11	MACYS LN	F_1050971_2559430	CN	7,500	2	1	-	2392	0.13	4	440	-	270	-	
11	MACYS LN	F_1050971_2559430	N/A	N/A	N/A	N/A	N/A	432	N/A	1	110	-	135	-	
13	MACYS LN		CN	7,500	1	1	-	1547	0.23	-	77	-	135	-	Store
14	MACYS LN		R5	5,000	0	3	3	Vacant	0.41	Vacant		990		810	
15	MACYS LN	F_1051036_2559570	CN	7,500	1	2	1	1920	0.49	4	440	330	270	270	
20	MACYS LN	F_1050861_2559596	R5	5,000	2	1	-	705	0.14	2	220	-	270	-	
20	MACYS LN	F_1050861_2559596	N/A	N/A	N/A	N/A	N/A	1872	N/A	4	440	-	270	-	
21	MACYS LN	F_1051056_2559650	R5	5,000	1	1	-	3348	0.15	4	440	-	270	-	
22	MACYS LN	F_1050872_2559645	R5	5,000	1	1	-	1482	0.14	3	330	-	270	-	
23	MACYS LN	F_1051067_2559693	R5	5,000	1	1	-	1558	0.18	4	440	-	270	-	
24	MACYS LN	F_1050884_2559693	R5	5,000	1	1	-	3778	0.13	3	330	-	270	-	
25	MACYS LN	F_1051076_2559734	R5	5,000	1	1	-	1357	0.13	3	330	-	270	-	
26	MACYS LN	F_1050894_2559737	R5	5,000	1	1	-	1455	0.12	3	330	-	270	-	
27	MACYS LN	F_1051077_2559790	R5	5,000	1	2	1	1494	0.25	2	220	330	270	270	
28	MACYS LN	F_1050902_2559776	R5	5,000	1	1	-	1716	0.12	2	220	-	270	-	
29	MACYS LN	F_1051116_2559838	R5	5,000	1	2	1	1326	0.25	3	330	330	270	270	
30	MACYS LN	F_1050916_2559829	R5	5,000	1	1	-	1390	0.18	3	330	-	270	-	
33	MACYS LN	F_1051117_2559895	R5	5,000	2	1	-	2181	0.15	3	330	-	270	-	
33	MACYS LN	F_1051117_2559895	N/A	N/A	N/A	N/A	N/A	1680	N/A	4	440	-	270	-	
34	MACYS LN	F_1050928_2559884	R5	5,000	1	1	-	2668	0.12	4	440	-	270	-	
35	MACYS LN	F_1051127_2559933	R5	5,000	2	1	-	1120	0.18	4	440	-	270	-	
35	MACYS LN	F_1051127_2559933	N/A	N/A	N/A	N/A	N/A	2668	N/A	2	220	-	270	-	
36	MACYS LN	F_1050941_2559939	R5	5,000	1	1	-	2791	0.18	4	440	-	270	-	
37	MACYS LN	F_1051137_2559974	R5	5,000	1	1	-	2791	0.18	4	440	-	270	-	
38	MACYS LN	F_1050954_2559992	R5	5,000	1	1	-	2746	0.12	8	880	-	270	-	
39	MACYS LN	F_1051148_2560015	R5	5,000	1	1	-	2668	0.16	6	660	-	270	-	
40	MACYS LN	F_1050972_2560042	R5	5,000	1	1	-	3622	0.17	5	550	-	270	-	
41	MACYS LN	F_1051158_2560056	R5	5,000	1	1	-	1248	0.17	3	330	-	270	-	
42	MACYS LN	F_1050967_2560094	R5	5,000	1	1	-	1190	0.13	4	440	-	270	-	
43	MACYS LN	F_1051196_2560092	R5	5,000	1	1	-	2100	0.11	3	330	-	270	-	
44	MACYS LN	F_1050985_2560135	R5	5,000	1	1	-	2668	0.11	6	660	-	270	-	
45	MACYS LN	F_1051179_2560159	R5	5,000	1	2	1	1851	0.29	2	220	330	270	270	
47	MACYS LN		R5	5,000	0	1	-	Vacant	0.11	Vacant		330		270	
43A	MACYS LN	F_1051114_2560112	R5	5,000	1	1	-	680	0.06	2	220	-	270	-	
46A	MACYS LN #1		RC2	5,000	1	-	-	1440	0	3	330	-	270	-	Condo
48A	MACYS LN #1		R5	5,000	1	-	-	1450	0	4	440	-	270	-	Condo
46B	MACYS LN #2		RC2	5,000	1	-	-	1440	0	2	220	-	270	-	Condo
5	MACY'S LN #A1		CN	7,500	1	-	-	4584	0	4	440	-	270	-	
3A	MACY'S LN #C1		CN	7,500	1	-	-	471	0	1	110	-	135	-	
3B	MACY'S LN #C2		CN	7,500	1	-	-	744	0	2	220	-	270	-	
3C	MACY'S LN #C3		CN	7,500	1	-	-	1272	0	3	330	-	270	-	
7A	MACY'S LN #D1		CN	7,500	1	-	-	514	0	4	440	-	270	-	4 bathrooms - Assume 4BR
7B	MACYS LN #D2		CN	7,500	1	-	-	753	0	4	440	-	270	-	5 bathrooms - Assume 4BR
1A	MACY'S LN #E1		CN	7,500	1	-	-	418	0	1	110	-	135	-	1.5 Bath - Assume 1 BR
1B	MACY'S LN #E2		CN	7,500	1	-	-	406	0	1	110	-	135	-	1.5 Bath - Assume 1 BR
1C	MACY'S LN #E3		CN	7,500	1	-	-	668	0	2	220	-	270	-	
1	MARY ANN DR	F_1050418_2559292	CN	7,500	2	1	-	732	0.14	3	330	-	270	-	
1	MARY ANN DR	F_1050418_2559292	N/A	N/A	N/A	N/A	N/A	2021	N/A	4	440	-	270	-	
2	MARY ANN DR		CN	7,500	1	1	-	1314	0.12	1	110	-	135	-	
3	MARY ANN DR		CTEC	10,000	0	1	-	Vacant	0.11	Vacant		330		270	
6	MARY ANN DR	F_1050272_2559341	CTEC	10,000	1	1	-	2218	0.15	5	550	-	270	-	
7	MARY ANN DR	F_1050480_2559587	R5	5,000	1	1	-	2492	0.13	4	440	-	270	-	
9	MARY ANN DR	F_1050510_2559731	R5	5,000	1	1	-	1930	0.16	3	330	-	270	-	
11	MARY ANN DR	F_1050555_2559922	R5	5,000	1	1	-	1746	0.17	5	550	-	270	-	
12	MARY ANN DR		CTEC	10,000	1	1	-	2528	0.28	-	126	-	135	-	Service Shop
14	MARY ANN DR	F_1050313_2559525	R5	5,000	2	1	-	2324	0.15	3	330	-	270	-	
14	MARY ANN DR	F_1050313_2559525	N/A	N/A	N/A	N/A	N/A	1306	N/A	2	220	-	270	-	
15	MARY ANN DR	F_1050603_2560147	R5	5,000	1	1	-	1750	0.18	3	330	-	270	-	
16	MARY ANN DR	F_1050268_2559586	R5	5,000	1	2	1	1750	0.28	3	330	330	270	270	
17	MARY ANN DR	F_1050653_2560331	R5	5,000	1	1	-	1288	0.18	3	330	-	270	-	
18	MARY ANN DR	F_1050335_2559622	R5	5,000	1	1	-	1590	0.15	4	440	-	270	-	
20	MARY ANN DR	F_1050289_2559680	R5	5,000	2	2	-	1128	0.28	2	220	-	270	-	
20	MARY ANN DR	F_1050289_2559680	N/A	N/A	N/A	N/A	N/A	1784	N/A	2	220	-	270	-	
22	MARY ANN DR	F_1050358_2559715	R5	5,000	1	1	-	2128	0.15	4	440	-	270	-	
26	MARY ANN DR	F_1050372_2559807	R5	5,000	2	1	-	1404	0.16	3	330	-	270	-	

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
26	MARY ANN DR	F_1050372_2559807	N/A	N/A	N/A	N/A	N/A	936	N/A	3	330	-	270	-	
40	MARY ANN DR		R5	5,000	0	1	-	Vacant	0.13	Vacant		330		270	
42	MARY ANN DR	F_1050530_2560355	R5	5,000	1	1	-	3363	0.13	4	440	-	270	-	
1-	MARY ANN DR		CN	7,500	1	1	-	2783	0.12	6	660	-	270	-	
10A	MARY ANN DR		CTEC	10,000	1	-	-	2312	0	3	330	-	270	-	Condo
10B	MARY ANN DR		CTEC	10,000	1	-	-	1254	0	2	220	-	270	-	Condo
11A	MARY ANN DR	F_1050540_2559860	R5	5,000	1	1	-	6656	0.12	6	660	-	270	-	
13A	MARY ANN DR		R5	5,000	1	-	-	1248	0	2	220	-	270	-	Condo
13B	MARY ANN DR		R5	5,000	1	-	-	1248	0	2	220	-	270	-	Condo
13C	MARY ANN DR	F_1050581_2560031	R5	5,000	1	1	-	2599	0.11	5	550	-	270	-	
13D	MARY ANN DR	F_1050590_2560078	R5	5,000	1	1	-	2570	0.11	5	550	-	270	-	
15-	MARY ANN DR	F_1050628_2560209	R5	5,000	1	1	-	2686	0.13	4	440	-	270	-	
17A	MARY ANN DR	F_1050635_2560264	R5	5,000	1	1	-	3942	0.13	7	770	-	270	-	
24A	MARY ANN DR		R5	5,000	1	-	-	1348	0	2	220	-	270	-	Condo
24B	MARY ANN DR		R5	5,000	1	-	-	1923	0	3	330	-	270	-	Condo
3-	MARY ANN DR		CTEC	10,000	1	1	-	1521	0.11	-	76	-	135	-	Service Shop
4A	MARY ANN DR		CTEC	10,000	1	-	-	1426	0	4	440	-	270	-	Condo
4B	MARY ANN DR		CTEC	10,000	1	-	-	1356	0	3	330	-	270	-	Condo
5-	MARY ANN DR	F_1050467_2559535	R5	5,000	1	1	-	1928	0.11	6	660	-	270	-	
5-	MARY ANN DR	F_1050467_2559535	R5	5,000	1	1	-	1477	0.11	2	220	-	270	-	
5A	MARY ANN DR		R5	5,000	1	-	-	1248	0	3	330	-	270	-	Condo
5B	MARY ANN DR		R5	5,000	1	-	-	1248	0	3	330	-	270	-	Condo
7A	MARY ANN DR	F_1050496_2559655	R5	5,000	1	1	-	1484	0.18	3	330	-	270	-	
8A	MARY ANN DR		CTEC	10,000	1	-	-	1872	0	5	550	-	270	-	Condo
8B	MARY ANN DR		CTEC	10,000	1	-	-	1248	0	5	550	-	270	-	Condo
9-	MARY ANN DR	F_1050526_2559799	R5	5,000	1	1	-	912	0.16	2	220	-	270	-	
1	MAYFLOWER CI	F_1048349_2558873	R20	20,000	1	1	-	3378	0.30	5	550	-	270	-	
2	MAYFLOWER CI	F_1048293_2558721	R2	20,000	3	1	-	274	0.46	1	110	-	135	-	
2	MAYFLOWER CI	F_1048293_2558721	N/A	N/A	N/A	N/A	N/A	1865	N/A	5	550	-	270	-	
2	MAYFLOWER CI	F_1048293_2558721	N/A	N/A	N/A	N/A	N/A	396	N/A	1	110	-	135	-	
5	MILLER LN		R2	20,000	2	1	-	3920	0.53	1	110	-	135	-	
5	MILLER LN		N/A	N/A	N/A	N/A	N/A	1320	N/A	2	220	-	270	-	
7	MILLER LN		R20	20,000	2	1	-	1462	0.48	3	330	-	270	-	
7	MILLER LN		N/A	N/A	N/A	N/A	N/A	858	N/A	2	220	-	270	-	
10	MILLER LN		R20	20,000	1	1	-	748	0.60	2	220	-	270	-	
17	MILLER LN		R2	20,000	0	1	-	Vacant	0.68	Vacant		330		270	
19	MILLER LN		R20	20,000	0	1	-	Vacant	0.57	Vacant		330		270	
100	NANTUCKET INN		CN	7,500	1	-	-	298	0	100	6200		6200		Based on Average from Water Use Records
9	NOBADEER FARM RD		R40	40,000	1	2		4326	2.00	-	350		270		assume 70 students - 5 gpd/student (No showers or cafeteria
11	NOBADEER FARM RD		R40	40,000	0	1	-	Vacant	0.99	Vacant		330		270	
12	NOBADEER FARM RD		RC2	5,000	1	1	-	2958	0.12	3	330	-	270	-	
13	NOBADEER FARM RD		R40	40,000	0	1		Vacant	0.99	Vacant		330		270	
14	NOBADEER FARM RD		RC2	5,000	1	1	-	2012	0.17	2	220	-	270	-	
15	NOBADEER FARM RD	F_1051638_2560775	R40	40,000	2	1		10368	0.99	-	700		540	-	140 Student MAX - 5 gpd/student (No showers or cafeteria
15	NOBADEER FARM RD	F_1051638_2560775	N/A	N/A	N/A	N/A	N/A	3704	N/A	4	440	-	270	-	
17	NOBADEER FARM RD		R40	40,000	0	1	-	Vacant	0.99	Vacant		330		270	
18	NOBADEER FARM RD	F_1051969_2560262	R5	5,000	1	4	3	1152	0.51	3	330	990	270	810	
19	NOBADEER FARM RD	F_1051511_2560579	R40	40,000	1	1	-	1680	0.99	1	110	-	135	-	
20	NOBADEER FARM RD	F_1051889_2560180	R5	5,000	4	2	-	1609	0.26	2	220	-	270	-	
20	NOBADEER FARM RD	F_1051889_2560180	N/A	N/A	N/A	N/A	N/A	1553	N/A	2	220	-	270	-	
20	NOBADEER FARM RD	F_1051889_2560180	N/A	N/A	N/A	N/A	N/A	1569	N/A	2	220	-	270	-	
20	NOBADEER FARM RD	F_1051889_2560180	N/A	N/A	N/A	N/A	N/A	1463	N/A	2	220	-	270	-	
21	NOBADEER FARM RD		R40	40,000	1	1	-	7225	0.99	-	399	-	399	-	School - Avg. flow from water use records
23	NOBADEER FARM RD	F_1051574_2560332	R40	40,000	4	3	-	3768	3.00	-	283	-	270	-	Clubs/Lodges
23	NOBADEER FARM RD	F_1051574_2560332	N/A	N/A	N/A	N/A	N/A	2204	N/A	2	220	-	270	-	Clubs/Lodges
23	NOBADEER FARM RD	F_1051574_2560332	N/A	N/A	N/A	N/A	N/A	416	N/A	-	21	-	135	-	Warehouse
23	NOBADEER FARM RD	F_1051574_2560332	N/A	N/A	N/A	N/A	N/A	1680	N/A	2	220	-	270	-	
27	NOBADEER FARM RD	F_1051685_2560030	RC2	5,000	1	2	1	4176	0.23	6	660	330	270	270	
29	NOBADEER FARM RD		RC2	5,000	1	2	1	3698	0.23	4	440	330	270	270	
40	NOBADEER FARM RD #A		R5	5,000	1	-	-	1368	0	2	220	-	270	-	
40	NOBADEER FARM RD #B		R5	5,000	1	-	-	1391	0	2	220	-	270	-	
41	NOBADEER FARM RD		RC2	5,000	2	7		6764	0.87	-	338		135		Warehouse
41	NOBADEER FARM RD		N/A	N/A	N/A	N/A	N/A	4800	N/A	-	240	-	135	-	Service Shop
43	NOBADEER FARM RD		RC2	5,000	5	4	-	6873	0.57	-	344	-	135	-	Warehouse
43	NOBADEER FARM RD		N/A	N/A	N/A	N/A	N/A	3920	N/A	-	196	-	135	-	Warehouse
43	NOBADEER FARM RD		N/A	N/A	N/A	N/A	N/A	978	N/A	-	73	-	135	-	Office Bldg
43	NOBADEER FARM RD	F_1051455_2559450	N/A	N/A	N/A	N/A	N/A	626	N/A	2	220	-	270	-	
43	NOBADEER FARM RD		N/A	N/A	N/A	N/A	N/A	286	N/A	-	21	-	135	-	Service Shop
44	NOBADEER FARM RD		RC2	5,000	1	2		3600	0.27	-	180		135		Warehouse
46	NOBADEER FARM RD		RC2	5,000	1	-	-	598	0	1	110	-	135	-	Office Condo - Assume 1 BR

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
48	NOBADEER FARM RD		RC2	5,000	1	2		2400	0.28	-	120		135		Service Shop
49	NOBADEER FARM RD	F_1051462_2559169	CMI	5,000	1	1	-	2016	0.17	6	660	-	270	-	
51	NOBADEER FARM RD		CMI	5,000	1	1	-	504	0.11	-	38	-	135	-	Office Bldg
16A	NOBADEER FARM RD		R5	5,000	1	-	-	1440	0	2	220	-	270	-	Condo
16B	NOBADEER FARM RD		R5	5,000	1	-	-	1440	0	2	220	-	270	-	Condo
16C	NOBADEER FARM RD		R5	5,000	1	-	-	1440	0	2	220	-	270	-	Condo
41-	NOBADEER FARM RD	F_1051592_2559531	RC2	5,000	1	1	-	1750	0.12	3	330	-	270	-	
47A	NOBADEER FARM RD #A		CMI	5,000	1	-	-	1008	0	3	330	-	270	-	Condo
47B	NOBADEER FARM RD #B		CMI	5,000	1	-	-	1008	0	3	330	-	270	-	
47C	NOBADEER FARM RD #C		CMI	5,000	1	-	-	600	0	1	110	-	135	-	Condo
42	NOBADEER FARM RD #A		R5	5,000	8	-	-	1386	0	2	220	-	270	-	Condo
42	NOBADEER FARM RD #B		N/A	N/A	N/A	N/A	N/A	1391	N/A	2	220	-	270	-	Condo
42	NOBADEER FARM RD #C		N/A	N/A	N/A	N/A	N/A	1400	N/A	2	220	-	270	-	Condo
42	NOBADEER FARM RD #D		N/A	N/A	N/A	N/A	N/A	1488	N/A	2	220	-	270	-	Condo
42	NOBADEER FARM RD #E		N/A	N/A	N/A	N/A	N/A	1428	N/A	2	220	-	270	-	Condo
42	NOBADEER FARM RD #F		N/A	N/A	N/A	N/A	N/A	1404	N/A	2	220	-	270	-	Condo
42	NOBADEER FARM RD #G		N/A	N/A	N/A	N/A	N/A	1392	N/A	2	220	-	270	-	Condo
42	NOBADEER FARM RD #H		N/A	N/A	N/A	N/A	N/A	1248	N/A	2	220	-	270	-	Condo
1	NOBADEER WY	F_1050626_2558599	R20	20,000	1	1	-	1120	0.37	2	220	-	270	-	
2	NOBADEER WY	F_1050531_2558633	R20	20,000	2	1	-	1120	0.34	3	330	-	270	-	
2	NOBADEER WY	F_1050531_2558633	N/A	N/A	N/A	-	N/A	768	N/A	1	110	-	135	-	
3	NOBADEER WY	F_1050437_2558665	R20	20,000	2	1	-	720	0.34	2	220	-	270	-	
3	NOBADEER WY	F_1050437_2558665	N/A	N/A	N/A	-	N/A	1120	N/A	3	330	-	270	-	
4	NOBADEER WY	F_1050342_2558699	R20	20,000	2	1	-	1492	0.34	2	220	-	270	-	
4	NOBADEER WY	F_1050342_2558699	N/A	N/A	N/A	-	N/A	672	N/A	2	220	-	270	-	
5	NOBADEER WY	F_1050248_2558729	R20	20,000	1	1	-	1456	0.34	3	330	-	270	-	
6	NOBADEER WY	F_1050150_2558743	R20	20,000	1	1	-	2072	0.44	5	550	-	270	-	
7	NOBADEER WY	F_1050081_2558543	R20	20,000	1	1	-	1470	0.44	3	330	-	270	-	
8	NOBADEER WY	F_1050166_2558487	R20	20,000	2	1	-	2048	0.34	3	330	-	270	-	
8	NOBADEER WY	F_1050166_2558487	N/A	N/A	N/A	N/A	N/A	456	N/A	1	110	-	135	-	
9	NOBADEER WY	F_1050264_2558453	R20	20,000	1	1	-	1580	0.34	3	330	-	270	-	
10	NOBADEER WY	F_1050358_2558423	R20	20,000	1	1	-	1120	0.34	3	330	-	270	-	
11	NOBADEER WY	F_1050448_2558390	R20	20,000	1	1	-	1456	0.34	3	330	-	270	-	
12	NOBADEER WY	F_1050556_2558352	R20	20,000	1	1	-	1120	0.45	3	330	-	270	-	
74	OLD SOUTH RD		RC2	5,000	0	8		Vacant	1.02	Vacant		330		270	frontage limited
76	OLD SOUTH RD	F_1049205_2560102	RC2	5,000	1	8	7	1683	0.92	2	220	2310	270	1890	
77	OLD SOUTH RD	F_1048380_2559488	R20	20,000	1	1	-	1819	0.46	3	330	-	270	-	
78	OLD SOUTH RD	F_1049069_2559656	RC2	5,000	2	8		2592	0.93	-	91		135		Warehouse
78	OLD SOUTH RD		N/A	N/A	N/A	N/A	N/A	2464	N/A	5	550	-	270	-	
79	OLD SOUTH RD	F_1048603_2559383	R20	20,000	1	2	1	1712	0.98	3	330	330	270	270	
80	OLD SOUTH RD	F_1049545_2560498	RC2	5,000	2	9		2315	1.09	4	440		270		frontage limited
80	OLD SOUTH RD	F_1049545_2560498	N/A	N/A	N/A	N/A	N/A	1368	N/A	3	330	-	270	-	
82	OLD SOUTH RD	F_1049651_2560326	RC2	5,000	3	12		2372	1.43	4	440		270		frontage limited
82	OLD SOUTH RD	F_1049651_2560326	N/A	N/A	N/A	N/A	N/A	1488	N/A	1	110	-	135	-	
82	OLD SOUTH RD	F_1049651_2560326	N/A	N/A	N/A	N/A	N/A	2937	N/A	5	550	-	270	-	
83	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.50	Vacant		330	270	270	
84	OLD SOUTH RD	F_1049467_2560161	RC2	5,000	1	10		1176	1.25	2	220	330	270	270	frontage limited
86	OLD SOUTH RD		RC2	5,000	0	11		Vacant	1.35	Vacant		330		270	frontage limited
87	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.58	Vacant		330		270	
88	OLD SOUTH RD		RC2	5,000	0	5		Vacant	0.66	Vacant		330		270	frontage limited
91	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.68	Vacant		330		270	
92	OLD SOUTH RD	F_1049580_2559360	RC2	5,000	1	1	-	2168	0.16	4	440	-	270	-	
95	OLD SOUTH RD		R20	20,000	1	1	-	1862	0.46	2	360	-	270	-	AptovrRet/Off
97	OLD SOUTH RD	F_1049457_2559104	R20	20,000	1	1	-	2821	0.47	3	330	-	270	-	
98	OLD SOUTH RD		CTEC	10,000	1	5		4276	1.22	-	321		270		Office - frontage limited
100	OLD SOUTH RD	F_1050025_2559314	RC2	5,000	1	1	-	1547	0.16	1	110	-	135	-	
101	OLD SOUTH RD	F_1049541_2558880	R2	20,000	2	1	-	2946	0.52	2	220	-	270	-	
101	OLD SOUTH RD	F_1049541_2558880	N/A	N/A	N/A	N/A	N/A	600	N/A	2	220	-	270	-	
102	OLD SOUTH RD	F_1050136_2559254	CN	7,500	1	1	-	2512	0.11	6	660	-	270	-	
103	OLD SOUTH RD	F_1049571_2559090	R20	20,000	2	2	-	2853	0.93	4	440	-	270	-	
103	OLD SOUTH RD	F_1049571_2559090	N/A	N/A	N/A	N/A	N/A	1357	N/A	2	220	-	270	-	
104	OLD SOUTH RD	F_1050167_2559299	CN	7,500	2	1	-	3755	0.17	7	770	-	270	-	
104	OLD SOUTH RD	F_1050167_2559299	N/A	N/A	N/A	N/A	N/A	756	N/A	1	110	-	135	-	
105	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.75	Vacant		330		270	
106	OLD SOUTH RD	F_1050214_2559253	CN	7,500	1	1	-	3478	0.12	8	880	-	270	-	
107	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.72	Vacant		330		270	
108	OLD SOUTH RD		CN	7,500	0	1	-	Vacant	0.12	Vacant		330		270	
109	OLD SOUTH RD	F_1050127_2559080	R20	20,000	1	1	-	1640	0.66	3	330	-	270	-	
110	OLD SOUTH RD	F_1050486_2559239	CN	7,500	1	1		840	0.15	2	220	-	270	-	
111	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.67	Vacant		330		270	
112	OLD SOUTH RD	F_1050523_2559221	CN	7,500	1	1	-	1248	0.12	3	330	-	270	-	
113	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.70	Vacant		330		270	

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
114	OLD SOUTH RD		CN	7,500	0	2	2	Vacant	0.46	Vacant		660		540	
115	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.72	Vacant		330		270	
116	OLD SOUTH RD	F_1050769_2559207	CN	7,500	1	2	1	2466	0.43	5	550	330	270	270	
117	OLD SOUTH RD		R2	20,000	0	1	-	Vacant	0.73	Vacant		330		270	
118	OLD SOUTH RD		CMI	5,000	1	1	-	2620	0.19	6	660	-	270	-	
124	OLD SOUTH RD		CMI	5,000	0	1	-	Vacant	0.18	Vacant		330		270	
126	OLD SOUTH RD		CMI	5,000	1	1	-	3347	0.17	4	440	-	270	-	
127	OLD SOUTH RD		CMI	5,000	0	1	-	Vacant	0.20	Vacant		330		270	
128	OLD SOUTH RD		CMI	5,000	1	1	-	3066	0.17	4	440	-	270	-	
129	OLD SOUTH RD		CMI	5,000	0	1	-	Vacant	0.20	Vacant		330		270	
130	OLD SOUTH RD		CMI	5,000	1	1	-	2176	0.18	3	330	-	270	-	
132	OLD SOUTH RD		RC2	5,000	1	3		8400	0.37	-	420		135		Garage/ Office
134	OLD SOUTH RD		RC2	5,000	0	2	2	Vacant	0.32	Vacant		660		540	
136	OLD SOUTH RD		RC2	5,000	1	2		2160	0.31	8	880		270		
136	OLD SOUTH RD		RC2	5,000	1	2	1	1728	0.31	-	86	330	135	270	Self Storage
137	OLD SOUTH RD		CMI	5,000	1	2		6286	0.33	-	314		135		shop with office
138	OLD SOUTH RD		RC2	5,000	2	6		1632	0.71	2	220		270		
138	OLD SOUTH RD	F_1051912_2559064	N/A	N/A	N/A	N/A	N/A	1862	N/A	6	660	-	270	-	
138	OLD SOUTH RD		N/A	N/A	N/A	N/A	N/A	1862	N/A	6	660	-	270	-	
140	OLD SOUTH RD		RC2	5,000	1	2	1	1667	0.29	-	83	330	135	270	Barn
142	OLD SOUTH RD		RC2	5,000	1	2	1	5507	0.30	3	330	330	270	270	
143	OLD SOUTH RD		CMI	5,000	1	7		5928	0.88	-	296		135		Post Office
144	OLD SOUTH RD		RC2	5,000	1	6		5440	0.78	-	272		135		Warehouse
152	OLD SOUTH RD		RC2	5,000	0	6	6	Vacant	0.73	Vacant		300		135	assume future warehouse or similar
108-	OLD SOUTH RD		CN	7,500	0	1	-	Vacant	0.12	Vacant		330		270	
133A	OLD SOUTH RD		CMI	5,000	1	-	-	267	0	1	110	-	135	-	Condo
133B	OLD SOUTH RD		CMI	5,000	1	-	-	285	0	1	110	-	135	-	Condo
133C	OLD SOUTH RD		CMI	5,000	1	-	-	374	0	1	110	-	135	-	Condo
133D	OLD SOUTH RD		CMI	5,000	1	-	-	438	0	1	110	-	135	-	Condo
133E	OLD SOUTH RD		CMI	5,000	1	-	-	442	0	1	110	-	135	-	Condo
133F	OLD SOUTH RD		CMI	5,000	1	-	-	392	0	1	110	-	135	-	Condo
133G	OLD SOUTH RD		CMI	5,000	1	-	-	370	0	1	110	-	135	-	Condo
133H	OLD SOUTH RD		CMI	5,000	1	-	-	1044	0	2	220	-	270	-	
135A	OLD SOUTH RD		CMI	5,000	1	1	-	2474	0.11	3	330	-	270	-	
135B	OLD SOUTH RD		CMI	5,000	1	1	-	2464	0.11	3	330	-	270	-	Condo
72A	OLD SOUTH RD	F_1049238_2560631	R5	5,000	1	9	8	2304	1.09	-	115	330	135	270	warehouse - frontage limitations
72A	OLD SOUTH RD		N/A	N/A	N/A	N/A	N/A	1632	N/A	4	440		270		
74A	OLD SOUTH RD		RC2	5,000	1	-	-	1833	0	4	440	-	270	-	Condo
74B	OLD SOUTH RD		RC2	5,000	1	-	-	1926	0	4	440	-	270	-	Condo
75B	OLD SOUTH RD		R5	5,000	3	5		2716	0.66	-	204		135		Office Building
75B	OLD SOUTH RD	F_1048327_2559431	N/A	N/A	N/A	N/A	N/A	1308	N/A	1	110	-	135	-	
75B	OLD SOUTH RD	F_1048327_2559431	N/A	N/A	N/A	N/A	N/A	844	N/A	3	330	-	270	-	
76A	OLD SOUTH RD	F_1049137_2559803	RC2	5,000	3	8		2400	0.97	-	120		135		warehouse - frontage limitations
76A	OLD SOUTH RD		N/A	N/A	N/A	N/A	N/A	1512	N/A	3	330	-	270	-	
76A	OLD SOUTH RD		N/A	N/A	N/A	N/A	N/A	951	N/A	-	71	-	135	-	office
78A	OLD SOUTH RD		RC2	5,000	0	4		Vacant	0.46	Vacant		660		540	frontage limited
80A	OLD SOUTH RD	F_1049697_2560447	RC2	5,000	1	10	9	1444	1.25	3	330	2970	270	2430	
81A	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.46	Vacant		330		270	
81B	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.46	Vacant		330		270	
82A	OLD SOUTH RD		RC2	5,000	3	10		2799	1.24	3	330		270		frontage limited
82A	OLD SOUTH RD	F_1049489_2560359	N/A	N/A	N/A	N/A	N/A	2421	N/A	4	440	-	270	-	
82A	OLD SOUTH RD	F_1049489_2560359	N/A	N/A	N/A	N/A	N/A	1619	N/A	-	81	-	135	-	Warehouse
84A	OLD SOUTH RD		RC2	5,000	0	11	11	Vacant	1.27	Vacant		660		540	frontage limited
86A	OLD SOUTH RD	F_1049398_2559658	RC2	5,000	1	20	12	1388	2.33	2	220	3960	270	3240	assume subdivision similar to Witherspoon
96A	OLD SOUTH RD	F_1049826_2559546	CTEC	10,000	2	4		2669	0.96	3	330		270		frontage limited
96A	OLD SOUTH RD	F_1049826_2559546	N/A	N/A	N/A	N/A	N/A	884	N/A	1	110	-	135	-	
98A	OLD SOUTH RD		RC2	5,000	0	1	-	Vacant	0.15	Vacant		330		270	
	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.77	Vacant		330		270	68-124
	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.47	Vacant		330		270	68-123
	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.74	Vacant		330		270	68-208
	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.67	Vacant		330		270	68-174
	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.66	Vacant		330		270	68-120
	OLD SOUTH RD		R20	20,000	0	2	1	Vacant	0.92	Vacant		660		540	68-210
	OLD SOUTH RD		R20	20,000	0	1	-	Vacant	0.72	Vacant		330		270	68-209
1A	PARK CI		R5	5,000	24	-	-	-	0	144	15840	-	12960	-	48 Condo Units/ 3BR each
5	PINE CREST DR	F_1049878_2559717	CTEC	10,000	2	5	2	1644	1.21	3	330	660	270	540	frontage limited
5	PINE CREST DR	F_1049878_2559717	N/A	N/A	N/A	N/A	N/A	424	N/A	1	110	-	135	-	
7	PINE CREST DR	F_1050036_2559683	R5	5,000	1	11	2	2096	1.29	3	330	660	270	540	frontage limited
8	PINE CREST DR	F_1049730_2559747	CTEC	10,000	1	4	2	3329	0.99	4	440	660	270	540	
11	PINE CREST DR	F_1050380_2559946	R5	5,000	2	10	2	588	1.25	2	220	660	270	540	frontage limited
11	PINE CREST DR	F_1050380_2559946	N/A	N/A	N/A	N/A	N/A	1883	N/A	3	330	-	270	-	
13	PINE CREST DR	F_1050383_2560084	R5	5,000	1	5	1	1278	0.57	2	220	330	270	270	frontage limited

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
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14	PINE CREST DR	F_1050059_2559404	CTEC	10,000	1	4	3	2379	1.10	3	330	990	270	810	
15	PINE CREST DR	F_1050417_2560179	R5	5,000	1	5	1	1304	0.57	3	330	330	270	270	frontage limited
18	PINE CREST DR	F_1050116_2559545	R10	10,000	2	4	2	2128	1.05	3	330	660	270	540	
18	PINE CREST DR	F_1050116_2559545	N/A	N/A	N/A	N/A	N/A	1769	N/A	3	330	-	270	-	
19	PINE CREST DR	F_1050404_2560344	R5	5,000	1	6	1	4025	0.69	5	550	330	270	270	frontage limited
22	PINE CREST DR	F_1050048_2560226	R10	10,000	1	4	2	2170	1.07	5	550	660	270	540	frontage limited
23	PINE CREST DR	F_1050183_2559790	R10	10,000	1	4	1	2415	0.92	4	440	330	270	270	frontage limited
26	PINE CREST DR	F_1050004_2560034	R10	10,000	1	4	2	2094	1.12	5	550	660	270	540	frontage limited
27	PINE CREST DR	F_1050077_2560390	R10	10,000	1	4	1	4708	1.09	4	440	330	270	270	frontage limited
31	PINE CREST DR	F_1049951_2560151	R10	10,000	1	3	1	2558	0.73	4	440	330	270	270	frontage limited
35	PINE CREST DR	F_1049896_2560055	R10	10,000	2	5	1	1029	1.22	3	330	330	270	270	frontage limited
35	PINE CREST DR	F_1049896_2560055	N/A	N/A	N/A	N/A	N/A	4273	N/A	4	440	-	270	-	
39	PINE CREST DR	F_1049815_2559906	R10	10,000	2	5	1	896	1.24	1	110	330	135	270	frontage limited
39	PINE CREST DR	F_1049815_2559906	N/A	N/A	N/A	N/A	N/A	1520	N/A	3	330	-	270	-	
4A	PINE CREST DR	F_1049587_2559587	CTEC	10,000	1	4	1	1267	0.98	2	220	330	270	270	frontage limited
2	PINE TREE RD	F_1050523_2559318	CN	7,500	1	1	-	1513	0.11	3	330	-	270	-	
3	PINE TREE RD	F_1050694_2559379	R5	5,000	2	3	1	570	0.41	2	220	330	270	270	
3	PINE TREE RD	F_1050694_2559379	N/A	N/A	N/A	N/A	N/A	1280	N/A	3	330	-	270	-	
4	PINE TREE RD	F_1050555_2559487	R5	5,000	1	2	1	370	0.23	1	110	330	135	270	
5	PINE TREE RD	F_1050717_2559477	R5	5,000	1	1	-	576	0.14	2	220	-	270	-	
6	PINE TREE RD	F_1050575_2559578	R5	5,000	1	1	-	1225	0.19	2	220	-	270	-	
7	PINE TREE RD	F_1050761_2559672	R5	5,000	1	3	2	1388	0.42	4	440	660	270	540	
8	PINE TREE RD	F_1050609_2559720	R5	5,000	1	1	-	1574	0.20	4	440	-	270	-	
9	PINE TREE RD	F_1050795_2559819	R5	5,000	1	3	2	4553	0.42	5	550	660	270	540	
10	PINE TREE RD	F_1050641_2559874	R5	5,000	1	2	1	240	0.32	1	110	330	135	270	
11	PINE TREE RD	F_1050819_2559921	R5	5,000	1	1	-	1004	0.17	3	330	-	270	-	
12	PINE TREE RD	F_1050663_2559972	R5	5,000	1	1	-	1780	0.14	4	440	-	270	-	
13	PINE TREE RD	F_1050851_2560059	R5	5,000	1	1	-	1088	0.12	3	330	-	270	-	
14	PINE TREE RD		R5	5,000	0	1	-	Vacant	0.14	Vacant		330		270	
16	PINE TREE RD		R5	5,000	1	1	-	1365	0.20	3	330	-	270	-	
17	PINE TREE RD	F_1050874_2560274	R5	5,000	1	1	-	3734	0.16	4	440	-	270	-	
18	PINE TREE RD		R5	5,000	1	1	-	1983	0.20	3	330	-	270	-	
11A	PINE TREE RD		R5	5,000	1	1	-	728	0.14	2	220	-	270	-	
11A	PINE TREE RD		R5	5,000	1	1	-	1254	0.14	1	110	-	135	-	
11B	PINE TREE RD		R5	5,000	1	1	-	2233	0.11	5	550	-	270	-	
12-	PINE TREE RD	F_1050677_2560032	R5	5,000	1	1	-	1514	0.11	4	440	-	270	-	
13A	PINE TREE RD		R5	5,000	1	1	-	1779	0.18	2	220	-	270	-	
13B	PINE TREE RD		R5	5,000	1	1	-	3046	0.13	5	550	-	270	-	
15A	PINE TREE RD		R5	5,000	1	-	-	2016	0	3	330	-	270	-	Condo
15B	PINE TREE RD		R5	5,000	1	-	-	1418	0	3	330	-	270	-	Condo
2-	PINE TREE RD		CN	7,500	0	1	-	Vacant	0.11	Vacant		330		270	
5A	PINE TREE RD		R5	5,000	2	1		1188	0.12	2	220		270		
5A	PINE TREE RD		N/A	N/A	N/A	N/A	N/A	2246	N/A	3	330	-	270	-	
5B	PINE TREE RD		R5	5,000	1	-	-	798	0	2	220	-	270	-	Condo
5C	PINE TREE RD		R5	5,000	1	-	-	1152	0	3	330	-	270	-	Condo
6-	PINE TREE RD	F_1050592_2559647	R5	5,000	1	1	-	1751	0.13	4	440	-	270	-	
8-	PINE TREE RD	F_1050614_2559785	R5	5,000	1	1	-	882	0.12	2	220	-	270	-	
1	ROSEMARY WY	F_1051664_2559849	RC2	5,000	1	1	-	2414	0.12	3	330	-	270	-	
3	ROSEMARY WY		RC2	5,000	0	1	-	Vacant	0.12	Vacant		330		270	
5	ROSEMARY WY		RC2	5,000	1	1	-	2448	0.12	-	122	-	135	-	Warehouse
7	ROSEMARY WY	F_1051378_2559913	RC2	5,000	1	1	-	2142	0.20	2	220	-	270	-	
10	ROSEMARY WY		RC2	5,000	1	2	1	6773	0.28	6	660		270		
3	SQUARE RIGGER RD		RC2	5,000	1	1	-	4384	0.21	-	219	-	135	-	Warehouse
4	SQUARE RIGGER RD	F_1051821_2559461	RC2	5,000	1	1	-	1287	0.18	3	330	-	270	-	
5	SQUARE RIGGER RD	F_1051829_2559217	RC2	5,000	1	1	-	2524	0.17	5	550	-	270	-	
6	SQUARE RIGGER RD		RC2	5,000	0	1	-	Vacant	0.15	Vacant		330		270	
7	SQUARE RIGGER RD		RC2	5,000	1	1	-	4384	0.21	-	219	-	135	-	Warehouse
8	SQUARE RIGGER RD		RC2	5,000	1	4	3	4296	0.47	-	215		135		Service Shop
9	SQUARE RIGGER RD	F_1051948_2559236	RC2	5,000	1	2		1944	0.27	5	550		270		
9	SQUARE RIGGER RD		N/A	N/A	N/A	N/A	N/A	1896	N/A	5	550		270		
1	SUN ISLAND RD		RC2	5,000	0	1	-	Vacant	0.12	Vacant		300		135	assume warehouse or similar
3	SUN ISLAND RD		RC2	5,000	0	2	2	Vacant	0.28	Vacant		600		270	
5	SUN ISLAND RD		CI	15,000	14	15		2000	5.35	-	-	-	-	-	Self Storage Buildings
5	SUN ISLAND RD		N/A	N/A	N/A	N/A	N/A	11600	N/A	-	580	-	135	-	Pre-Eng Whse/Gar
5	SUN ISLAND RD		N/A	N/A	N/A	N/A	N/A	8000	N/A	-	400	-	135	-	Pre-Eng Whse/Gar
5	SUN ISLAND RD		N/A	N/A	N/A	N/A	N/A	6000	N/A	-	300	-	135	-	Pre-Eng Whse/Gar
7	SUN ISLAND RD		CI	15,000	0	2		Vacant	0.93	Vacant		300		135	assume warehouse or similar
9	SUN ISLAND RD		CI	15,000	0	3		Vacant	1.30	Vacant		300		135	assume warehouse or similar
10	SUN ISLAND RD		CN	7,500	1	-	-	-	0	60		6600		5400	future employee housing - 60 bdrms - 20 units
11	SUN ISLAND RD		RC2	5,000	0	3		Vacant	0.45	Vacant		300		135	assume warehouse or similar
13	SUN ISLAND RD		RC2	5,000	0	4		Vacant	0.46	Vacant		300		135	assume warehouse or similar
14	SUN ISLAND RD		CI	15,000	1	5		4000	1.78	-	200		135		Pre-Eng Whse/Gar

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15	SUN ISLAND RD		RC2	5,000	2	4		4264	0.46	-	213		135		Service Shop
15	SUN ISLAND RD		N/A	N/A	N/A	N/A	N/A	2652	N/A	-	133	-	135	-	Service Shop
1A	SUN ISLAND RD		RC2	5,000	0	1	-	Vacant	0.12	Vacant		300		135	assume warehouse or similar
3A	SUN ISLAND RD		R5	5,000	1	-	-	528	-	1	110	-	135	-	Condo
3B	SUN ISLAND RD		R5	5,000	1	-	-	1092	-	2	220	-	270	-	Condo
3C	SUN ISLAND RD		R5	5,000	1	-	-	1040	-	2	220	-	270	-	Condo
3D	SUN ISLAND RD		R5	5,000	1	-	-	672	-	2	220	-	270	-	Condo
1	TEASDALE CI		CTEC	10,000	1	1	-	2496	0.28	5	550	-	270	-	
2	TEASDALE CI		CTEC	10,000	1	1	-	6052	0.31	-	303	-	135	-	Warehouse
3	TEASDALE CI	F_1051841_2559587	RC2	5,000	1	2	1	4113	0.28	5	550	330	270	270	
5	TEASDALE CI		CTEC	10,000	1	1	-	3960	0.33	-	198	-	135	-	Warehouse
6	TEASDALE CI		CTEC	10,000	1	1	-	6114	0.31	4	306	-	135	-	Warehouse
7	TEASDALE CI		CTEC	10,000	1	1	-	3864	0.30	-	193	-	135	-	Warehouse
13	TEASDALE CI		CTEC	10,000	2	1	-	2496	0.31	3	330	-	270	-	
13	TEASDALE CI	F_1052114_2559929	N/A	N/A	N/A	N/A	N/A	2120	N/A	4	440	-	270	-	
15	TEASDALE CI	F_1052066_2560002	CTEC	10,000	3	1	-	1200	0.35	3	330	-	270	-	
15	TEASDALE CI		N/A	N/A	N/A	ok	N/A	3632	N/A	-	182	-	135	-	Warehouse
15	TEASDALE CI		N/A	N/A	N/A	N/A	N/A	1500	N/A	-	75	-	135	-	Warehouse
16	TEASDALE CI	F_1051928_2559860	CTEC	10,000	1	1	-	4113	0.32	5	550	-	270	-	
17	TEASDALE CI		CTEC	10,000	1	1	-	6210	0.29	-	311	-	135	-	Warehouse
19	TEASDALE CI		CTEC	10,000	1	1	-	5964	0.27	4	440	-	270	-	
20	TEASDALE CI		CTEC	10,000	1	1	-	2211	0.31	2	386	-	270	-	Office with 2 bedroom apartment
11A	TEASDALE CI		CTEC	10,000	1	-	-	1536	0	3	330	-	270	-	Condo
11B	TEASDALE CI		CTEC	10,000	1	-	-	2298	0	2	220	-	270	-	Condo
11C	TEASDALE CI		CTEC	10,000	1	-	-	1854	0	2	220	-	270	-	Condo
11D	TEASDALE CI		CTEC	10,000	1	-	-	1878	0	2	220	-	270	-	Condo
9A	TEASDALE CI		CTEC	10,000	1	-	-	1084	0	2	220	-	270	-	Condo
9B	TEASDALE CI		CTEC	10,000	1	-	-	1084	0	2	220	-	270	-	Condo
9C	TEASDALE CI		CTEC	10,000	1	-	-	1456	0	2	220	-	270	-	Condo
9D	TEASDALE CI		CTEC	10,000	1	-	-	2288	0	-	172	-	135	-	Office
45	TOMAHAWK RD		CI	15,000	1	1	-	6480	0.52		324	-	135	-	45,43,41,39 Tomahawk
37	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
35	TOMAHAWK RD		CI	15,000	1	1	2	1800	0.33		90	300	135	135	35,33,31 Tomahawk assume warehouse
29	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
27	TOMAHAWK RD		CI	15,000	1	1	-	2090	0.11		105	-	135	-	
25	TOMAHAWK RD		CI	15,000	1	1	-	2400	0.30		120	-	135	-	25,23 Tomahawk
21	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.36	Vacant		300		135	19,21 Tomahawk assume warehouse
17	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.33	Vacant		300		135	17,15,13 Tomahawk assume warehouse
16	TOMAKHAWK RD		CI	15,000	0	1	-	Vacant	0.22	Vacant		300		135	assume warehouse or similar
11	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
1	TOMAHAWK RD		CI	15,000	1	1	-	1831	0.11	1	110	-	135	-	
20	TOMAHAWK RD		CI	15,000	1	1	-	2040	0.11	-	102	-	135	-	Garage/Office
5	ARROWHEAD DR		CI	15,000	1	1	-	1764	0.22	-	88	-	135	-	Service Shop - 5 Arrowhead, 2 Tomahawk
7	ARROWHEAD DR		CI	15,000	0	1	-	Vacant	0.22	Vacant		300		135	7 Arrowhead; 1,3 Spearhead - assume warhs
11	ARROWHEAD DR		CI	15,000	0	1	-	2040	0.11	-	102	-	135	-	warehouse
4	FLINT RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
6	FLINT RD		CI	15,000	1	1	-	3000	0.11	-	150	-	135	-	
8	FLINT RD		CI	15,000	0	1	-	Vacant	0.13	Vacant		300		135	assume warehouse or similar
5	SPEARHEAD RD		CI	15,000	1	1	-	6400	0.23	-	320	-	135	-	5,7 Spearhead Rd - warehouse
9	SPEARHEAD RD		CI	15,000	1	1	-	7000	0.23		350	-	135	-	warehouse
13	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
15	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.12	Vacant		300		135	assume warehouse or similar
17	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.24	Vacant		300		135	17, 19 Spearhead - assume warehouse
14	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
12	SPEARHEAD RD		CI	15,000	1	1	-	2064	0.11	-	103	-	135	-	warehouse
10	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.12	Vacant		300		135	assume warehouse or similar
8	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.33	Vacant		300		135	assume warehouse or similar
2	SPEARHEAD RD		CI	15,000	0	1	-	Vacant	0.22	Vacant		300		135	2 Spearhead,9 Arrowhead - assume warehse
6	SUN ISLAND RD		CI	15,000	1	4	-	97645	1.70	3	330		270		self storage with 3 bedroom apartment
10	SUN ISLAND RD		CN	7,500	0	-	-	-	105.07	-		600		270	future warehouse or similar
14	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
12	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.12	Vacant		300		135	assume warehouse or similar
10	TOMAHAWK RD		CI	15,000	1	1	-	0	0.17	-	300	-	135	-	warehouse
7	TOMAHAWK RD		CI	15,000	1	1	-	2775	0.33	-	139		135		5,7,9 Tomahawk Rd
6	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.17	Vacant		300		135	assume warehouse or similar
4	TOMAHAWK RD		CI	15,000	1	1	-	720	0.11	-	36	-	135	-	garage/office
18	TOMAHAWK RD		CI	15,000	0	1	-	Vacant	0.11	Vacant		300		135	assume warehouse or similar
34	TOMAHAWK RD		CI	15,000	1	2	-	37532	0.95		300	-	135	-	Self storage 1,3,5,7 Flint; 28,30,32 Tomahwk
3A	WITHERSPOON DR		R5	5,000	1	1	-	1120	0	4	440		270		
3B	WITHERSPOON DR		R5	5,000	1	1	-	1120	0	2	220		270		
4A	WITHERSPOON DR		R5	5,000	1	1	-	1658	0	3	330		270		
4B	WITHERSPOON DR		R5	5,000	1	1	-	1658	0	3	330		270		

NANTUCKET SEWER MASTER PLAN -AIRPORT PS
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
6A	WITHERSPOON DR		R5	5,000	1	1	-	1431	0	3	330		270		
6B	WITHERSPOON DR		R5	5,000	1	1	-	1680	0	3	330		270		
8A	WITHERSPOON DR		R5	5,000	1	1	-	1020	0	2	220		270		
8B	WITHERSPOON DR		R5	5,000	1	1	-	1166	0	2	220		270		
11A	WITHERSPOON DR		R5	5,000	1	1	-	2490	0	3	330		270		
11B	WITHERSPOON DR		R5	5,000	1	1	-	1140	0	2	220		270		
13A	WITHERSPOON DR		R5	5,000	1	1	-	1406	0	3	330		270		
13B	WITHERSPOON DR		R5	5,000	1	1	-	1451	0	3	330		270		
10	WITHERSPOON DR	F_1048722_2559773	R5	5,000	1	1	-	2372	0.13	4	440	-	270	-	
12	WITHERSPOON DR	F_1048721_2559840	R5	5,000	1	1	-	2088	0.13	4	440	-	270	-	
14	WITHERSPOON DR	F_1048752_2559889	R5	5,000	1	1	-	2789	0.14	4	440	-	270	-	
15	WITHERSPOON DR	F_1048833_2559890	R5	5,000	1	1	-	2331	0.12	4	440	-	270	-	
5	WITHERSPOON DR	F_1048872_2559693	R5	5,000	1	1	-	2520	0.13	6	660	-	270	-	
7	WITHERSPOON DR	F_1048927_2559720	R5	5,000	1	1	-	1904	0.12	4	440	-	270	-	
9	WITHERSPOON DR	F_1048969_2559782	R5	5,000	1	1	-	2192	0.13	3	330	-	270	-	
15	WAMAPANOAG WY		CMI	5,000	1	1	-	3086	0.17	11	1210	-	660	-	Dormitory
1	WAMPANOAG WY		CMI	5,000	1	1	-	4100	0.18	6	865	-	810	-	AptovereRet/Off
5	WAMPANOAG WY		CMI	5,000	0	2	2	Vacant	0.24	Vacant		660		540	
9	WAMPANOAG WY		CMI	5,000	1	1	-	1150	0.22	1	168	-	135	-	AptovereRet/Off - assume 1 BR
11	WAMPANOAG WY		CMI	5,000	0	1	-	Vacant	0.22	Vacant		300		135	assume commerical
13	WAMPANOAG WY		CMI	5,000	0	2	2	Vacant	0.28	Vacant		300		135	assume commerical
19	WAMPANOAG WY		CMI	5,000	0	1	-	Vacant	0.17	Vacant		300		135	assume commerical
21	WAMPANOAG WY		CMI	5,000	0	1	-	Vacant	0.17	Vacant		300		135	assume commerical
23	WAMPANOAG WY	F_1051225_2559806	CMI	5,000	1	2	-	3908	0.23	7	770	-	270	-	
1	YAWKEY WY	F_1051611_2559756	RC2	5,000	1	1	-	2990	0.15	4	440	-	270	-	
2	YAWKEY WY	F_1051591_2559666	RC2	5,000	1	1	-	2798	0.14	4	440	-	270	-	
3	YAWKEY WY	F_1051511_2559779	RC2	5,000	1	1	-	2208	0.12	4	440	-	270	-	
4	YAWKEY WY	F_1051491_2559687	RC2	5,000	1	1	-	3540	0.12	4	440	-	270	-	
5	YAWKEY WY		RC2	5,000	0	1	-	Vacant	0.09	Vacant	-	330		270	
6	YAWKEY WY		RC2	5,000	0	1	-	Vacant	0.09	Vacant	-	330		270	
								SUBTOTAL		**1608**	**187244**	**73170**	**142824**	55890	

Total Number of Lots	516
Total Number of Vacant Lots	101
Total Number of Lots with one (1) Dwelling	354
Total Number of Lots with Multiple Existing Dwellings	61
Total Number of Lots with Multiple Future Dwellings	64
Number of Existing Bedrooms	1608
Number of Future Bedrooms	968
Total Number of Bedrooms	2576
Average Number of Bedrooms per Lot	3.9

Percentage of Lots with Multiple Dwellings (Existing and Future)	24%
Projected Percentage of Lots with Multiple Dwellings (Future)	30%
Additional Percentage of Lots with Multiple Dwellings (Future)	6%
Number of Additional Future Secondary Dwellings	31

	Title 5 (1)	Per Capita (2)
Existing Average Daily Flow (gpd) Subtotal	**125,500**	**142,800**
Future Average Daily Flow (gpd) Subtotal	**49,000**	**55,900**
ADF for Additional Future Secondary Dwellings (gpd)	**6,900**	**8,400**
Total Future Average Daily Flow	**181,000**	**207,000**
Peaking Factor (determined from ASCE MOP9)	**5.00**	**5.00**
Peak Flow (gpd)	**905,000**	**1,035,000**
Infiltration and Inflow (I/I) Allowance (3)	**19,000**	**19,000**
Total Peak Flow including I/I allowance (gpd)	**924,000**	**1,054,000**

Notes:

(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)

(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day for residential properties.

(3) I/I values calculated using the following formula (400 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers

(4) Future residential buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

NANTUCKET SEWER MASTER PLAN -SOUTH VALLEY
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
1	BLUEBIRD LN	F_1048371_2559836	R5	5,000	1	1	-	3518	0.15	4	440	-	270	-	
10	BLUEBIRD LN	F_1048223_2559711	R5	5,000	1	1	-	3013	0.15	4	440	-	270	-	
11	BLUEBIRD LN	F_1048131_2559910	R5	5,000	1	1	-	2452	0.13	4	440	-	270	-	
12	BLUEBIRD LN	F_1048173_2559729	R5	5,000	1	1	-	2816	0.15	4	440	-	270	-	
14	BLUEBIRD LN	F_1048119_2559747	R5	5,000	1	1	-	2813	0.16	3	330	-	270	-	
16	BLUEBIRD LN	F_1048066_2559765	R5	5,000	1	1	-	1102	0.15	4	440	-	270	-	
18	BLUEBIRD LN	F_1048020_2559787	R5	5,000	1	1	-	1800	0.15	4	440	-	270	-	
2	BLUEBIRD LN	F_1048428_2559649	R5	5,000	2	1	-	2453	0.16	5	550	-	270	-	
2	BLUEBIRD LN	F_1048428_2559649	R5	N/A	N/A	N/A	N/A	366	N/A	1	110	-	270	-	
20	BLUEBIRD LN	F_1047971_2559803	R5	5,000	1	1	-	1800	0.16	3	330	-	270	-	
22	BLUEBIRD LN	F_1047925_2559825	R5	5,000	1	1	-	2250	0.17	5	550	-	270	-	
24	BLUEBIRD LN	F_1047881_2559847	R5	5,000	1	1	-	2124	0.17	3	330	-	270	-	
26	BLUEBIRD LN		R5	5,000	1	-	-	1664	0	3	330	-	270	-	
3	BLUEBIRD LN	F_1048325_2559854	R5	5,000	1	1	-	2462	0.15	4	440	-	270	-	
4	BLUEBIRD LN	F_1048377_2559664	R5	5,000	1	1	-	1352	0.16	3	330	-	270	-	
5	BLUEBIRD LN	F_1048274_2559860	R5	5,000	1	1	-	3500	0.14	5	550	-	270	-	
6	BLUEBIRD LN	F_1048325_2559678	R5	5,000	1	1	-	2008	0.15	3	330	-	270	-	
7	BLUEBIRD LN	F_1048225_2559874	R5	5,000	1	1	-	3615	0.13	6	660	-	270	-	
8	BLUEBIRD LN	F_1048273_2559695	R5	5,000	1	1	-	2894	0.14	6	660	-	270	-	
9	BLUEBIRD LN	F_1048178_2559892	R5	5,000	1	1	-	2278	0.13	4	440	-	270	-	
1	CURLEW CT	F_1048801_2560158	R5	5,000	1	1	-	2359	0.11	3	330	-	270	-	
10	CURLEW CT	F_1049088_2560172	R5	5,000	2	1	-	2460	0.15	5	550	-	270	-	
10	CURLEW CT	F_1049088_2560172	R5	N/A	N/A	N/A	N/A	378	N/A	1	110	-	270	-	
11	CURLEW CT	F_1048999_2559959	R5	5,000	1	1	-	2384	0.13	4	440	-	270	-	
12	CURLEW CT	F_1049092_2560114	R5	5,000	1	1	-	1800	0.12	3	330	-	270	-	
13	CURLEW CT	F_1049059_2559974	R5	5,000	1	1	-	2316	0.18	4	440	-	270	-	
14	CURLEW CT	F_1049081_2560044	R5	5,000	1	1	-	2234	0.13	3	330	-	270	-	
2	CURLEW CT	F_1048879_2560258	R5	5,000	1	1	-	2024	0.12	3	330	-	270	-	
3	CURLEW CT	F_1048845_2560117	R5	5,000	1	1	-	2004	0.11	3	330	-	270	-	
4	CURLEW CT	F_1048921_2560221	R5	5,000	1	1	-	2086	0.12	3	330	-	270	-	
5	CURLEW CT	F_1048883_2560076	R5	5,000	1	1	-	1682	0.12	3	330	-	270	-	
6	CURLEW CT	F_1048968_2560198	R5	5,000	1	1	-	1640	0.12	3	330	-	270	-	
7	CURLEW CT	F_1048875_2559979	R5	5,000	1	1	-	2704	0.18	5	550	-	270	-	
8	CURLEW CT	F_1049038_2560197	R5	5,000	1	1	-	2064	0.11	3	330	-	270	-	
9	CURLEW CT	F_1048934_2559961	R5	5,000	1	1	-	2251	0.13	3	330	-	270	-	
1	DOVEKIE CT	F_1048253_2560898	R5	5,000	1	1	-	2864	0.16	5	550	-	270	-	
2	DOVEKIE CT	F_1048045_2560784	R5	5,000	1	1	-	1596	0.15	3	330	-	270	-	
3	DOVEKIE CT	F_1048199_2560930	R5	5,000	1	1	-	2392	0.12	4	440	-	270	-	
4	DOVEKIE CT	F_1048048_2560850	R5	5,000	1	1	-	1404	0.12	3	330	-	270	-	
5	DOVEKIE CT	F_1048129_2560946	R5	5,000	1	1	-	2340	0.12	4	440	-	270	-	
6	DOVEKIE CT	F_1048074_2560927	R5	5,000	1	1	-	3768	0.13	5	550	-	270	-	
1	FALCON CT	F_1049022_2560519	R5	5,000	1	1	-	2646	0.12	4	440	-	270	-	
2	FALCON CT	F_1049020_2560699	R5	5,000	1	1	-	2208	0.19	3	330	-	270	-	
3	FALCON CT	F_1049088_2560512	R5	5,000	1	1	-	2036	0.12	3	330	-	270	-	
4	FALCON CT	F_1049087_2560711	R5	5,000	1	1	-	1901	0.12	3	330	-	270	-	
5	FALCON CT	F_1049149_2560514	R5	5,000	1	1	-	2222	0.15	4	440	-	270	-	
6	FALCON CT	F_1049154_2560697	R5	5,000	1	1	-	2376	0.12	4	440	-	270	-	
7	FALCON CT	F_1049177_2560574	R5	5,000	1	1	-	2568	0.12	3	330	-	270	-	
8	FALCON CT	F_1049186_2560653	R5	5,000	1	1	-	2351	0.14	3	330	-	270	-	
1	GOLDFINCH DR	F_1048554_2559577	R5	5,000	2	1	-	0	0.25	1	110	-	270	-	
1	GOLDFINCH DR	F_1048554_2559577	R5	N/A	N/A	N/A	N/A	2419	N/A	3	330	-	270	-	
10	GOLDFINCH DR	F_1048516_2559982	R5	5,000	1	1	-	2120	0.12	3	330	-	270	-	
11	GOLDFINCH DR	F_1048594_2559825	R5	5,000	1	1	-	1800	0.12	3	330	-	270	-	
12	GOLDFINCH DR	F_1048552_2560018	R5	5,000	1	1	-	1816	0.12	3	330	-	270	-	
13	GOLDFINCH DR	F_1048607_2559872	R5	5,000	1	1	-	1976	0.12	5	550	-	270	-	
14	GOLDFINCH DR	F_1048586_2560057	R5	5,000	1	1	-	2112	0.12	3	330	-	270	-	
15	GOLDFINCH DR	F_1048631_2559923	R5	5,000	1	1	-	2004	0.11	3	330	-	270	-	
16	GOLDFINCH DR	F_1048614_2560097	R5	5,000	1	1	-	4024	0.13	5	550	-	270	-	
17	GOLDFINCH DR	F_1048697_2559962	R5	5,000	1	1	-	2316	0.13	4	440	-	270	-	
18	GOLDFINCH DR	F_1048639_2560137	R5	5,000	1	1	-	2913	0.14	4	440	-	270	-	
19	GOLDFINCH DR	F_1048744_2559989	R5	5,000	1	1	-	1881	0.16	2	220	-	270	-	
2	GOLDFINCH DR	F_1048429_2559783	R5	5,000	1	1	-	1396	0.12	2	220	-	270	-	
21	GOLDFINCH DR	F_1048773_2560027	R5	5,000	1	1	-	1260	0.16	3	330	-	270	-	
22	GOLDFINCH DR	F_1048684_2560223	R5	5,000	1	1	-	2172	0.14	4	440	-	270	-	
23	GOLDFINCH DR	F_1048800_2560064	R5	5,000	1	1	-	2064	0.16	5	550	-	270	-	
24	GOLDFINCH DR	F_1048706_2560265	R5	5,000	1	1	-	2185	0.14	3	330	-	270	-	
25	GOLDFINCH DR	F_1048955_2560310	R5	5,000	1	1	-	2412	0.15	3	330	-	270	-	
26	GOLDFINCH DR	F_1048734_2560305	R5	5,000	1	1	-	1580	0.15	4	440	-	270	-	
27	GOLDFINCH DR	F_1049029_2560399	R5	5,000	1	1	-	2028	0.12	4	440	-	270	-	
28	GOLDFINCH DR		R5	5,000	0	1	-	Vacant	0.16	-	330	-	270	-	
29	GOLDFINCH DR	F_1049036_2560451	R5	5,000	1	1	-	2586	0.12	4	440	-	270	-	
3	GOLDFINCH DR	F_1048564_2559634	R5	5,000	1	1	-	2674	0.16	4	440	-	270	-	
30	GOLDFINCH DR	F_1048815_2560372	R5	5,000	1	1	-	2041	0.17	3	330	-	270	-	
31	GOLDFINCH DR	F_1048971_2560643	R5	5,000	1	1	-	2304	0.12	4	440	-	270	-	
32	GOLDFINCH DR	F_1048852_2560407	R5	5,000	1	1	-	2702	0.16	5	550	-	270	-	
33	GOLDFINCH DR	F_1048947_2560716	R5	5,000	1	1	-	2250	0.16	4	440	-	270	-	
34	GOLDFINCH DR	F_1048878_2560449	R5	5,000	1	1	-	1848	0.15	3	330	-	270	-	

NANTUCKET SEWER MASTER PLAN -SOUTH VALLEY
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
35	GOLDFINCH DR	F_1048896_2560739	R5	5,000	1	1	-	2204	0.14	3	330	-	270	-	
36	GOLDFINCH DR	F_1048889_2560495	R5	5,000	1	1	-	3328	0.14	5	550	-	270	-	
37	GOLDFINCH DR	F_1048839_2560756	R5	5,000	1	1	-	1768	0.14	4	440	-	270	-	
38	GOLDFINCH DR	F_1048878_2560540	R5	5,000	1	1	-	3470	0.15	4	440	-	270	-	
39	GOLDFINCH DR	F_1048787_2560766	R5	5,000	1	1	-	2004	0.12	3	330	-	270	-	
4A	GOLDFINCH DR		R5	5,000	1	-	-	742	0	1	110	-	270	-	
40	GOLDFINCH DR	F_1048858_2560586	R5	5,000	1	1	-	2493	0.12	4	440	-	270	-	
41	GOLDFINCH DR	F_1048738_2560778	R5	5,000	1	1	-	2224	0.12	3	330	-	270	-	
42	GOLDFINCH DR	F_1048812_2560603	R5	5,000	1	1	-	3834	0.12	5	550	-	270	-	
43	GOLDFINCH DR	F_1048689_2560790	R5	5,000	1	1	-	2008	0.12	4	440	-	270	-	
44	GOLDFINCH DR	F_1048768_2560618	R5	5,000	1	1	-	2800	0.12	4	440	-	270	-	
45	GOLDFINCH DR	F_1048640_2560802	R5	5,000	1	1	-	1814	0.12	3	330	-	270	-	
46	GOLDFINCH DR	F_1048722_2560629	R5	5,000	1	1	-	2202	0.12	3	330	-	270	-	
47	GOLDFINCH DR	F_1048592_2560814	R5	5,000	1	1	-	2208	0.12	3	330	-	270	-	
49	GOLDFINCH DR	F_1048543_2560825	R5	5,000	1	1	-	2002	0.12	4	440	-	270	-	
5	GOLDFINCH DR	F_1048570_2559680	R5	5,000	1	1	-	2078	0.15	4	440	-	270	-	
50	GOLDFINCH DR	F_1048627_2560654	R5	5,000	2	1	-	2520	0.12	4	440	-	270	-	
51	GOLDFINCH DR	F_1048494_2560837	R5	5,000	1	1	-	2045	0.12	3	330	-	270	-	
52	GOLDFINCH DR	F_1048542_2560680	R5	5,000	1	1	-	2072	0.11	3	330	-	270	-	
53	GOLDFINCH DR	F_1048443_2560849	R5	5,000	1	1	-	3965	0.13	6	660	-	270	-	
54	GOLDFINCH DR	F_1048491_2560692	R5	5,000	1	1	-	2638	0.11	4	440	-	270	-	
55	GOLDFINCH DR		R5	5,000	0	1	-	Vacant	0.13	-	330	-	270	-	
56	GOLDFINCH DR	F_1048443_2560701	R5	5,000	1	1	-	2495	0.11	3	330	-	270	-	
57	GOLDFINCH DR	F_1048344_2560860	R5	5,000	1	1	-	2229	0.14	4	440	-	270	-	
58	GOLDFINCH DR	F_1048398_2560703	R5	5,000	1	1	-	4670	0.11	5	550	-	270	-	
59	GOLDFINCH DR	F_1048295_2560845	R5	5,000	1	1	-	2025	0.13	3	330	-	270	-	
6	GOLDFINCH DR	F_1048444_2559900	R5	5,000	1	1	-	1495	0.17	3	330	-	270	-	
60	GOLDFINCH DR	F_1048356_2560701	R5	5,000	1	1	-	2520	0.11	4	440	-	270	-	
61	GOLDFINCH DR	F_1048236_2560813	R5	5,000	1	1	-	2286	0.13	4	440	-	270	-	
62	GOLDFINCH DR	F_1048314_2560694	R5	5,000	1	1	-	2676	0.12	5	550	-	270	-	
63	GOLDFINCH DR	F_1048122_2560746	R5	5,000	1	1	-	2527	0.13	3	330	-	270	-	
64	GOLDFINCH DR	F_1048273_2560681	R5	5,000	1	1	-	3340	0.12	4	440	-	270	-	
65	GOLDFINCH DR	F_1048059_2560713	R5	5,000	1	1	-	1533	0.13	3	330	-	270	-	
66	GOLDFINCH DR	F_1048236_2560659	R5	5,000	1	1	-	3744	0.12	3	330	-	270	-	
67	GOLDFINCH DR	F_1048020_2560678	R5	5,000	1	1	-	1231	0.15	2	220	-	270	-	
68	GOLDFINCH DR	F_1048201_2560633	R5	5,000	1	1	-	3564	0.13	6	660	-	270	-	
69	GOLDFINCH DR	F_1047997_2560627	R5	5,000	1	1	-	1456	0.13	3	330	-	270	-	
7	GOLDFINCH DR	F_1048576_2559731	R5	5,000	1	1	-	1208	0.15	3	330	-	270	-	
70	GOLDFINCH DR	F_1048168_2560608	R5	5,000	1	1	-	2749	0.12	5	550	-	270	-	
71	GOLDFINCH DR	F_1047974_2560572	R5	5,000	1	1	-	3988	0.13	6	660	-	270	-	
72	GOLDFINCH DR	F_1048139_2560578	R5	5,000	1	1	-	2278	0.12	4	440	-	270	-	
73	GOLDFINCH DR	F_1047956_2560514	R5	5,000	1	1	-	1910	0.13	2	220	-	270	-	
74	GOLDFINCH DR	F_1048116_2560541	R5	5,000	1	1	-	3545	0.11	4	440	-	270	-	
75	GOLDFINCH DR	F_1047941_2560458	R5	5,000	1	1	-	2387	0.12	5	550	-	270	-	
76	GOLDFINCH DR	F_1048097_2560502	R5	5,000	1	1	-	2960	0.11	3	330	-	270	-	
77	GOLDFINCH DR	F_1047926_2560408	R5	5,000	1	1	-	1800	0.12	3	330	-	270	-	
78	GOLDFINCH DR	F_1048082_2560457	R5	5,000	1	1	-	2968	0.12	4	440	-	270	-	
79	GOLDFINCH DR	F_1047911_2560360	R5	5,000	1	1	-	2827	0.12	4	440	-	270	-	
8	GOLDFINCH DR	F_1048483_2559941	R5	5,000	1	1	-	1936	0.13	3	330	-	270	-	
80	GOLDFINCH DR	F_1048070_2560409	R5	5,000	1	1	-	2654	0.12	4	440	-	270	-	
81	GOLDFINCH DR	F_1047899_2560312	R5	5,000	1	1	-	3216	0.12	2	220	-	270	-	
82	GOLDFINCH DR	F_1048058_2560362	R5	5,000	1	1	-	3501	0.12	5	550	-	270	-	
83	GOLDFINCH DR	F_1047885_2560264	R5	5,000	1	1	-	2743	0.13	4	440	-	270	-	
84	GOLDFINCH DR	F_1048046_2560315	R5	5,000	1	1	-	2821	0.11	4	440	-	270	-	
85	GOLDFINCH DR	F_1047874_2560218	R5	5,000	1	1	-	2821	0.12	4	440	-	270	-	
86	GOLDFINCH DR		R5	5,000	0	1	-	Vacant	0.11	-	330	-	270	-	
87	GOLDFINCH DR	F_1047859_2560173	R5	5,000	1	1	-	2592	0.12	3	330	-	270	-	
88	GOLDFINCH DR	F_1048022_2560219	R5	5,000	1	1	-	4626	0.11	4	440	-	270	-	
89	GOLDFINCH DR	F_1047843_2560130	R5	5,000	1	1	-	2278	0.12	4	440	-	270	-	
9	GOLDFINCH DR	F_1048583_2559780	R5	5,000	1	1	-	1650	0.13	3	330	-	270	-	
90	GOLDFINCH DR	F_1048008_2560169	R5	5,000	1	1	-	2184	0.11	4	440	-	270	-	
91	GOLDFINCH DR	F_1047824_2560087	R5	5,000	1	1	-	2250	0.12	4	440	-	270	-	
92	GOLDFINCH DR	F_1047992_2560121	R5	5,000	1	1	-	2630	0.11	5	550	-	270	-	
93	GOLDFINCH DR	F_1047801_2560046	R5	5,000	1	1	-	930	0.12	3	330	-	270	-	
94	GOLDFINCH DR	F_1047973_2560074	R5	5,000	1	1	-	1552	0.11	3	330	-	270	-	
96	GOLDFINCH DR	F_1047951_2560028	R5	5,000	1	1	-	1536	0.11	3	330	-	270	-	
98	GOLDFINCH DR	F_1047928_2559979	R5	5,000	1	1	-	1768	0.11	3	330	-	270	-	
99	GOLDFINCH DR		R5	5,000	1	1	-	2742	0.23	1	110	-	270	-	Office building
0	KILLDEER LN		R5	5000	1	1	-	2228	0.15	3	330	-	270	-	
1	KILLDEER LN	F_1048271_2560209	R5	5,000	1	1	-	2814	0.11	3	330	-	270	-	
10	KILLDEER LN	F_1048102_2560132	R5	5,000	1	1	-	3326	0.12	3	330	-	270	-	
11	KILLDEER LN	F_1048353_2560458	R5	5,000	1	1	-	3084	0.13	6	660	-	270	-	
12	KILLDEER LN	F_1048120_2560180	R5	5,000	1	1	-	2320	0.12	4	440	-	270	-	
14	KILLDEER LN	F_1048134_2560230	R5	5,000	1	1	-	2255	0.12	4	440	-	270	-	
16	KILLDEER LN	F_1048147_2560276	R5	5,000	1	1	-	1848	0.12	4	440	-	270	-	
18	KILLDEER LN	F_1048161_2560323	R5	5,000	1	1	-	2272	0.12	3	330	-	270	-	
2	KILLDEER LN	F_1048014_2559933	R5	5,000	1	1	-	1485	0.12	3	330	-	270	-	

NANTUCKET SEWER MASTER PLAN -SOUTH VALLEY
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISTING DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	EXISTING FLOW (GPD)	FUTURE FLOW (GPD)	COMMENTS
20	KILLDEER LN	F_1048174_2560370	R5	5,000	1	1	-	1930	0.12	4	440	-	270	-	
22	KILLDEER LN	F_1048187_2560417	R5	5,000	1	1	-	1988	0.12	4	440	-	270	-	
24	KILLDEER LN	F_1048205_2560471	R5	5,000	1	1	-	1596	0.15	4	440	-	270	-	
26	KILLDEER LN	F_1048246_2560520	R5	5,000	1	1	-	2078	0.13	3	330	-	270	-	
28B	KILLDEER LN		R5	5,000	1	-	-	1568	?	3	330	-	270	-	
3	KILLDEER LN		R5	5,000	0	1	-	Vacant	0.11	-	330	-	270	-	
30	KILLDEER LN	F_1048353_2560587	R5	5,000	1	1	-	2566	0.13	4	440	-	270	-	
32	KILLDEER LN	F_1048413_2560593	R5	5,000	1	1	-	2759	0.12	5	550	-	270	-	
4	KILLDEER LN	F_1048040_2559983	R5	5,000	1	1	-	2616	0.12	4	440	-	270	-	
5	KILLDEER LN	F_1048300_2560305	R5	5,000	1	1	-	1822	0.11	3	330	-	270	-	
6	KILLDEER LN	F_1048063_2560032	R5	5,000	1	1	-	2146	0.12	4	440	-	270	-	
7	KILLDEER LN	F_1048314_2560352	R5	5,000	1	1	-	2646	0.11	3	330	-	270	-	
8	KILLDEER LN	F_1048085_2560083	R5	5,000	1	1	-	1326	0.12	4	440	-	270	-	
9	KILLDEER LN	F_1048329_2560401	R5	5,000	1	1	-	2794	0.12	4	440	-	270	-	
1	KITTIWAKE LN	F_1048497_2560612	R5	5,000	1	1	-	1914	0.11	3	330	-	270	-	
10	KITTIWAKE LN	F_1048542_2560233	R5	5,000	1	1	-	2634	0.14	3	330	-	270	-	
11	KITTIWAKE LN	F_1048411_2560316	R5	5,000	1	1	-	2002	0.11	4	440	-	270	-	
12	KITTIWAKE LN	F_1048521_2560185	R5	5,000	1	1	-	2040	0.13	3	330	-	270	-	
13	KITTIWAKE LN	F_1048396_2560267	R5	5,000	1	1	-	2752	0.11	4	440	-	270	-	
14	KITTIWAKE LN	F_1048504_2560133	R5	5,000	1	1	-	2124	0.15	3	330	-	270	-	
15	KITTIWAKE LN	F_1048381_2560218	R5	5,000	1	1	-	2362	0.12	4	440	-	270	-	
16	KITTIWAKE LN	F_1048472_2560079	R5	5,000	1	1	-	2428	0.14	4	440	-	270	-	
17	KITTIWAKE LN	F_1048366_2560169	R5	5,000	1	1	-	2124	0.11	3	330	-	270	-	
18	KITTIWAKE LN	F_1048426_2560031	R5	5,000	1	1	-	2765	0.15	3	330	-	270	-	
19	KITTIWAKE LN	F_1048335_2560123	R5	5,000	2	1	-	2971	0.12	4	440	-	270	-	
19	KITTIWAKE LN	F_1048335_2560123	R5	N/A	N/A	N/A	N/A	216	N/A	1	110	-	270	-	
2	KITTIWAKE LN		R5	5000	1	1	-	900	0.96	0	67.5	-	270	-	Club/Lodge
20	KITTIWAKE LN	F_1048372_2559992	R5	5,000	1	1	-	2002	0.17	3	330	-	270	-	
21	KITTIWAKE LN	F_1048276_2560125	R5	5,000	1	1	-	1605	0.11	3	330	-	270	-	
22	KITTIWAKE LN	F_1048307_2559977	R5	5,000	1	1	-	2252	0.18	4	440	-	270	-	
23	KITTIWAKE LN	F_1048227_2560145	R5	5,000	1	1	-	2318	0.11	3	330	-	270	-	
24	KITTIWAKE LN	F_1048240_2559985	R5	5,000	1	1	-	2979	0.17	4	440	-	270	-	
3	KITTIWAKE LN	F_1048485_2560561	R5	5,000	1	1	-	3110	0.11	4	440	-	270	-	
4	KITTIWAKE LN	F_1048597_2560374	R5	5,000	1	1	-	2542	0.17	4	440	-	270	-	
5	KITTIWAKE LN	F_1048444_2560474	R5	5,000	1	1	-	3859	0.14	5	550	-	270	-	
6	KITTIWAKE LN	F_1048578_2560326	R5	5,000	1	1	-	2030	0.16	3	330	-	270	-	
7	KITTIWAKE LN	F_1048447_2560416	R5	5,000	1	1	-	2840	0.12	3	330	-	270	-	
8	KITTIWAKE LN	F_1048560_2560279	R5	5,000	1	1	-	2368	0.15	4	440	-	270	-	
9	KITTIWAKE LN	F_1048426_2560365	R5	5,000	1	1	-	3769	0.11	5	550	-	270	-	
1	SPARROW DR	F_1049019_2560285	R5	5,000	1	1	-	2004	0.12	3	330	-	270	-	
2	SPARROW DR	F_1049106_2560412	R5	5,000	1	1	-	2867	0.12	5	550	-	270	-	
3	SPARROW DR	F_1049076_2560275	R5	5,000	1	1	-	1800	0.12	4	440	-	270	-	
4	SPARROW DR	F_1049157_2560409	R5	5,000	1	1	-	2918	0.12	4	440	-	270	-	
5	SPARROW DR	F_1049131_2560271	R5	5,000	1	1	-	1946	0.13	3	330	-	270	-	
								SUBTOTAL		**698**	**78168**	**0**	**53460**	**0**	
	RICHMOND DEVELOPMENT										110,000		73700		

Total Number of Lots	194
Total Number of Vacant Lots	4
Total Number of Lots with one (1) Dwelling	185
Total Number of Lots with Multiple Existing Dwellings	5
Total Number of Lots with Multiple Future Dwellings	0
Number of Existing Bedrooms	698
Number of Future Bedrooms	12
Total Number of Bedrooms	710
Average Number of Bedrooms per Lot	3.7

Percentage of Lots with Multiple Dwellings (Existing and Future)	3%
Projected Percentage of Lots with Multiple Dwellings (Future)	5%
Additional Percentage of Lots with Multiple Dwellings (Future)	2%
Number of Additional Future Secondary Dwellings	4

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**126,100**	**127,200**
ADF for Additional Future Secondary Dwellings (gpd)	**900**	**1,000**
Total Average Daily Flow	**127,000**	**128,000**
Peaking Factor (determined from ASCE MOP9)	**5**	**5**
Peak Flow (gpd)	**635,000**	**640,000**
Infiltration and Inflow (I/I) Allowance (3)	**6,000**	**6,000**
Total Peak Flow including I/I allowance (gpd)	**641,000**	**646,000**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (400 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home
(5) Flows for the Richmond Development based on the May 10, 2019 Memorandum from Hayes Engineering.

NANTUCKET SEWER MASTER PLAN -WELL HEAD PROTECTION ZONE (WPZ)
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
8	TAWPOOT RD	F_1049033_2561999	LUG3	120,000	1	1	-	4391	0.69	3	330	-	270	-	
12	TAWPOOT RD	F_1048956_2561625	LUG3	120,000	1	1	-	3333	0.69	4	440	-	270	-	
1	SESAPANA RD	F_1048993_2561777	LUG3	120,000	1	1	-	1684	0.69	3	330	-	270	-	
3	SESAPANA RD	F_1049134_2561720	LUG3	120,000	1	1	-	3019	0.69	5	550	-	270	-	
5	SESAPANA RD	F_1049255_2561700	LUG3	120,000	1	1	-	2198	0.69	3	330	-	270	-	
7	SESAPANA RD	F_1049377_2561679	LUG3	120,000	1	1	-	3043	0.69	3	330	-	270	-	
11	SESAPANA RD	F_1049516_2561637	LUG3	120,000	1	1	-	1974	0.88	4	440	-	270	-	
17	SESAPANA RD	F_1049474_2561451	LUG3	120,000	1	1	-	2954	0.83	4	440	-	270	-	
23	SESAPANA RD	F_1049324_2561448	LUG3	120,000	1	1	-	2856	0.69	4	440	-	270	-	
25	SESAPANA RD	F_1049203_2561468	LUG3	120,000	1	1	-	3520	0.69	4	440	-	270	-	
27	SESAPANA RD	F_1049082_2561487	LUG3	120,000	1	1	-	1888	0.69	4	440	-	270	-	
29	SESAPANA RD	F_1048919_2561472	LUG3	120,000	1	1	-	2550	0.69	4	440	-	270	-	
4	SESAPANA RD	F_1049178_2561975	LUG3	120,000	1	1	-	2560	0.69	4	440	-	270	-	
6	SESAPANA RD	F_1049326_2561951	LUG3	120,000	1	1	-	4088	0.69	4	440	-	270	-	
8	SESAPANA RD	F_1049480_2561928	LUG3	120,000	1	1	-	3531	0.70	4	440	-	270	-	
12	SESAPANA RD	F_1049700_2561857	LUG3	120,000	1	1	-	5221	1.78	4	440	-	270	-	
14	SESAPANA RD	F_1049747_2561644	LUG3	120,000	1	1	-	3784	0.78	3	330	-	270	-	
16	SESAPANA RD	F_1049685_2561400	LUG3	120,000	1	1	-	2624	0.80	3	330	-	270	-	
18	SESAPANA RD	F_1049615_2561212	LUG3	120,000	1	1	-	2972	0.76	4	440	-	270	-	
20	SESAPANA RD	F_1049513_2561149	LUG3	120,000	1	1	-	1728	0.87	3	330	-	270	-	
22	SESAPANA RD	F_1049356_2561160	LUG3	120,000	1	1	-	2080	0.74	3	330	-	270	-	
24	SESAPANA RD	F_1049193_2561194	LUG3	120,000	1	1	-	3396	0.71	4	440	-	270	-	
26	SESAPANA RD	F_1049031_2561224	LUG3	120,000	1	1	-	2000	0.70	4	440	-	270	-	
28	SESAPANA RD	F_1048863_2561253	LUG3	120,000	1	1	-	2256	0.75	4	440	-	270	-	
44	MILESTONE	F_1049708_2563062	LUG3	120,000	2	1	-	3661	4.00	5	550	-	270	-	
44	MILESTONE	F_1049708_2563062	LUG3	N/A	N/A	N/A	N/A	1056	N/A	1	110	-	270	-	Assume 1 BR
46	MILESTONE		LUG3	120,000	0	1	-	Vacant	3.50	-	330	-	270	-	
50	MILESTONE		LUG3	120,000	0	1	-	Vacant	2.75	-	330	-	270	-	
54	MILESTONE	F_1049952_2562715	LUG3	120,000	2	1	-	2336	2.78	3	330	-	270	-	
54	MILESTONE	F_1049952_2562715	LUG3	N/A	N/A	N/A	N/A	1749	N/A	2	220	-	270	-	
71	MILESTONE	F_1051087_2561870	LUG3	120,000	1	1	-	3036	3.00	3	330	-	270	-	
70	MILESTONE	F_1051208_2562841	LUG3	120,000	2	1	-	3478	4.99	4	440	-	270	-	
70	MILESTONE	F_1051208_2562841	LUG3	N/A	N/A	N/A	N/A	2100	N/A	1	110	-	270	-	
68	MILESTONE	F_1051155_2562466	LUG3	120,000	1	1	-	2282	2.77	1	110	-	270	-	
69	MILESTONE	F_1050898_2561904	LUG3	120,000	3	1	-	510	3.00	1	110	-	270	-	
69	MILESTONE	F_1050898_2561904	LUG3	N/A	N/A	N/A	N/A	2301	N/A	5	550	-	270	-	
69	MILESTONE	F_1050898_2561904	LUG3	N/A	N/A	N/A	N/A	2476	N/A	3	330	-	270	-	
67	MILESTONE	F_1050705_2561906	LUG3	120,000	3	1	-	532	2.53	2	220	-	270	-	
67	MILESTONE	F_1050705_2561906	LUG3	N/A	N/A	N/A	N/A	2387	N/A	4	440	-	270	-	
67	MILESTONE	F_1050705_2561906	LUG3	N/A	N/A	N/A	N/A	1838	N/A	1	110	-	270	-	
67a	MILESTONE	F_1050691_2562105	LUG3	120,000	1	1	-	1694	0.47	3	330	-	270	-	
65	MILESTONE	F_1050499_2561957	LUG3	120,000	1	1	-	999	1.95	1	110	-	270	-	
65a	MILESTONE	F_1050540_2562197	LIG3	120,000	1	1	-	1760	1.95	2	220	-	270	-	No Property Card, info collected from Residential.xlsx
2	MILESTONE CROSSING	F_1050296_2562058	LUG3	120,000	1	1	-	3870	2.76	4	440	-	270	-	
1	MILESTONE CROSSING	F_1050046_2562116	LUG3	120,000	1	1	-	4446	2.87	3	330	-	270	-	
4	MILESTONE CROSSING	F_1050362_2561584	LUG3	120,000	1	1	-	4656	2.76	4	440	-	270	-	
6	MILESTONE CROSSING	F_1050544_2561376	LUG3	120,000	2	1	-	956	2.76	1	110	-	270	-	
6	MILESTONE CROSSING	F_1050544_2561376	LUG3	N/A	N/A	N/A	N/A	4648	N/A	6	660	-	270	-	
8	MILESTONE CROSSING	F_1050722_2561260	LUG3	120,000	1	1	-	3685	2.77	4	440	-	270	-	
10	MILESTONE CROSSING	F_1050909_2561191	LUG3	120,000	2	1	-	3332	2.79	4	440	-	270	-	
10	MILESTONE CROSSING	F_1050909_2561191	LUG3	N/A	N/A	N/A	N/A	432	N/A	1	110	-	270	-	
17	MILESTONE CROSSING	F_1050757_2560655	LUG3	120,000	2	1	-	2243	2.75	5	550	-	270	-	
17	MILESTONE CROSSING	F_1050757_2560655	LUG3	N/A	N/A	N/A	N/A	5067	N/A	5	550	-	270	-	
15	MILESTONE CROSSING	F_1050542_2560701	LUG3	120,000	1	1	-	2937	2.75	4	440	-	270	-	
13	MILESTONE CROSSING	F_1050312_2560723	LUG3	120,000	2	1	-	4502	2.75	5	550	-	270	-	
13	MILESTONE CROSSING	F_1050312_2560723	LUG3	N/A	N/A	N/A	N/A	576	N/A	2	220	-	270	-	
11	MILESTONE CROSSING	F_1050160_2560844	LUG3	120,000	1	1	-	1930	2.75	2	220	-	270	-	
9	MILESTONE CROSSING	F_1049882_2560849	LUG3	120,000	1	1	-	3260	3.61	5	550	-	270	-	
7	MILESTONE CROSSING	F_1049943_2561089	LUG3	120,000	1	1	-	3730	2.75	4	440	-	270	-	
5	MILESTONE CROSSING	F_1049967_2561305	LUG3	120,000	1	1	-	5005	2.75	4	440	-	270	-	
3	MILESTONE CROSSING	F_1049948_2561603	LUG3	120,000	1	1	-	4288	2.76	4	440	-	270	-	
2	SHEEP COMMONS LN		LUG3	120,000	0	1	-	Vacant	0.62	-	330	-	270	-	
4	SHEEP COMMONS LN	F_1050268_2562753	LUG3	120,000	1	1	-	3395	0.62	4	440	-	270	-	
6	SHEEP COMMONS LN	F_1050292_2562875	LUG3	120,000	2	1	-	2938	0.62	3	330	-	270	-	
6	SHEEP COMMONS LN	F_1050292_2562875	LUG3	N/A	N/A	N/A	N/A	637	N/A	1	110	-	270	-	
8	SHEEP COMMONS LN	F_1050331_2562992	LUG3	120,000	1	1	-	2153	0.63	4	440	-	270	-	
10	SHEEP COMMONS LN	F_1050349_2563141	LUG3	120,000	1	1	-	2601	0.81	3	330	-	270	-	
11	SHEEP COMMONS LN	F_1050504_2563186	LUG3	120,000	1	1	-	1990	0.54	3	330	-	270	-	
9	SHEEP COMMONS LN	F_1050656_2563094	LUG3	120,000	2	1	-	4784	0.65	4	440	-	270	-	
9	SHEEP COMMONS LN	F_1050656_2563094	LUG3	N/A	N/A	N/A	N/A	440	N/A	1	110	-	270	-	
7	SHEEP COMMONS LN	F_1050616_2562911	LUG3	120,000	1	1	-	3154	0.62	4	440	-	270	-	
5	SHEEP COMMONS LN		LUG3	120,000	0	1	-	Vacant	0.62		330	-	270	-	

NANTUCKET SEWER MASTER PLAN -WELL HEAD PROTECTION ZONE (WPZ)
FUTURE WASTEWATER FLOW CALCULATION

											TITLE 5		PER CAPITA		
NUMBER	STREET NAME	ID	ZONE	MIN. LOT SIZE (SF)	# EXISITNG DWELLINGS	# TOTAL POTENTIAL LOTS (Based on zoning)	# POTENTIAL ADDITIONAL LOTS	LIVING AREA	LAND AREA (AC)	# OF BEDROOM	FUTURE FLOW GPD	ADDITIONAL FLOW GPD	FLOW GPD	FUTURE FLOW GPD	COMMENTS
3	SHEEP COMMONS LN	F_1050535_2562715	LUG3	120,000	1	1	-	1040	0.62	3	330	-	270	-	
1	SHEEP COMMONS LN	F_1050495_2562602	LUG3	120,000	1	1	-	1976	0.62	3	330	-	270	-	
1	BARNARD VALLEY RD		LUG3	120,000	2	3	2	512	10.41	0	110	660	270	540	Office Building
1	BARNARD VALLEY RD		LUG3	N/A	N/A	N/A	N/A	6750	N/A	0	0	-	270	-	Garage/Warehouse
10	UPPER TAWPAWSHAW	F_1052040_2564280	LUG3	120,000	2	1	-	3315	0.46	4	440	-	270	-	
10	UPPER TAWPAWSHAW	F_1052040_2564280	LUG3	N/A	N/A	N/A	N/A	1157	N/A	1	110	-	270	-	
12	UPPER TAWPAWSHAW		LUG3	120,000	0	1	1	Vacant	0.34	0	330	-	270	-	
8	UPPER TAWPAWSHAW	F_1052006_2564151	LUG3	120,000	1	1	-	2414	0.47	2	220	-	270	-	
6	UPPER TAWPAWSHAW	F_1052105_2564103	LUG3	120,000	1	1	-	1306	0.35	3	330	-	270	-	
1	MIDDLE TAWPAWSHAW	F_1052090_2563934	LUG3	120,000	2	1	-	2493	0.37	5	550	-	270	-	
1	MIDDLE TAWPAWSHAW	F_1052090_2563934	LUG3	N/A	N/A	N/A	N/A	223	N/A	1	110	-	270	-	Assume 1 BR
3	MIDDLE TAWPAWSHAW	F_1051979_2563950	LUG3	120,000	2	1	-	4098	0.40	4	440	-	270	-	
3	MIDDLE TAWPAWSHAW	F_1051979_2563950	LUG3	N/A	N/A	N/A	N/A	140	N/A	1	110	-	270	-	
5	MIDDLE TAWPAWSHAW	F_1051906_2563888	LUG3	120,000	2	1	-	3517	0.39	4	440	-	270	-	
5	MIDDLE TAWPAWSHAW	F_1051906_2563888	LUG3	N/A	N/A	N/A	N/A	700	N/A	1	110	-	270	-	
6	MIDDLE TAWPAWSHAW	F_1051884_2563741	LUG3	120,000	1	1	-	2250	0.40	3	330	-	270	-	
4	MIDDLE TAWPAWSHAW	F_1052000_2563721	LUG3	120,000	1	1	-	5642	0.40	5	550	-	270	-	
2	MIDDLE TAWPAWSHAW	F_1052116_2563746	LUG3	120,000	1	1	-	2877	0.40	4	440	-	270	-	
4	UPPER TAWPAWSHAW	F_1052164_2563634	LUG3	120,000	1	1	-	3959	0.35	4	440	-	270	-	
2	UPPER TAWPAWSHAW	F_1052219_2563547	LUG3	120,000	1	1	-	2247	0.35	3	330	-	270	-	
13	UPPER TAWPAWSHAW	F_1052773_2564026	LUG3	120,000	1	1	-	3096	0.38	2	220	-	270	-	
11	UPPER TAWPAWSHAW		LUG3	120,000	0	1	-	Vacant	0.37	-	330	-	270	-	
9	UPPER TAWPAWSHAW	F_1052969_2564085	LUG3	120,000	1	1	-	3203	0.36	4	440	-	270	-	
7	UPPER TAWPAWSHAW	F_1053096_2564055	LUG3	120,000	1	1	-	2593	0.38	4	440	-	270	-	
5	UPPER TAWPAWSHAW	F_1053175_2563992	LUG3	120,000	1	1	-	4861	0.39	4	440	-	270	-	
3	UPPER TAWPAWSHAW		LUG3	120,000	0	1	-	Vacant	0.42	-	330	-	270	-	
1	UPPER TAWPAWSHAW	F_1052903_2563920	LUG3	120,000	1	1	-	3650	0.40	4	440	-	270	-	
19	TETAWKIMMO DR	F_1052811_2563776	LUG3	120,000	2	1	-	3213	0.43	4	440	-	270	-	
19	TETAWKIMMO DR	F_1052811_2563776	LUG3	N/A	N/A	N/A	N/A	552	N/A	1	110	-	270	-	Assume 1 BR
17	TETAWKIMMO DR	F_1052935_2563740	LUG3	120,000	2	1	-	3260	0.39	3	330	-	270	-	
17	TETAWKIMMO DR	F_1052935_2563740	LUG3	N/A	N/A	N/A	N/A	576	N/A	1	110	-	270	-	
16	TETAWKIMMO DR	F_1052847_2563590	LUG3	120,000	2	1	-	3304	0.36	3	330	-	270	-	
16	TETAWKIMMO DR	F_1052847_2563590	LUG3	N/A	N/A	N/A	N/A	672	N/A	1	110	-	270	-	
15	TETAWKIMMO DR		LUG3	120,000	0	1	-	Vacant	0.48	-	330	-	270	-	
13	TETAWKIMMO DR	F_1053157_2563629	LUG3	120,000	1	1	-	3263	0.48	4	440	-	270	-	
11	TETAWKIMMO DR	F_1053193_2563520	LUG3	120,000	1	1	-	4667	0.44	5	550	-	270	-	
9	TETAWKIMMO DR		LUG3	120,000	0	1	-	Vacant	0.39	-	330	-	270	-	
7	TETAWKIMMO DR	F_1053202_2563380	LUG3	120,000	1	1	-	3627	0.46	4	440	-	270	-	
5	TETAWKIMMO DR	F_1053135_2563278	LUG3	120,000	1	1	-	3968	0.46	3	330	-	270	-	
3	TETAWKIMMO DR		LUG3	120,000	0	1	-	Vacant	0.37	-	330	-	270	-	
								SUBTOTAL		**323**	**38940**	**660**	**30240**	**540**	

Total Number of Lots	91
Total Number of Vacant Lots	10
Total Number of Lots with one (1) Dwelling	62
Total Number of Lots with Multiple Existing Dwellings	19
Total Number of Lots with Multiple Future Dwellings	2
Number of Existing Bedrooms	323
Number of Future Bedrooms	36
Total Number of Bedrooms	359
Average Number of Bedrooms per Lot	3.8

Percentage of Lots with Multiple Dwellings (Existing and Future)	23%
Projected Percentage of Lots with Multiple Dwellings (Future)	35%
Additional Percentage of Lots with Multiple Dwellings (Future)	12%
Number of Additional Future Secondary Dwellings	11

	Title 5 (1)	Per Capita (2)
Average Daily Flow (gpd) Subtotal	**26,500**	**30,800**
ADF for Additional Future Secondary Dwellings (gpd)	**2,400**	**3,000**
Total Average Daily Flow	**29,000**	**34,000**
Peaking Factor (determined from ASCE MOP9)	**5.8**	**5.8**
Peak Flow (gpd)	**168,200**	**197,200**
Infiltration and Inflow (I/I) Allowance (3)	**0**	**0**
Total Peak Flow including I/I allowance (gpd)	**168,200**	**197,200**

Notes:
(1) Title 5 Average Daily Flow calculated by the following equation/criteria: # of bedrooms x 73.7 gpd/bedroom (66.6% of Title 5 Criteria - 110 gpd/bedroom)
(2) Per Capita Average Daily Flow calculated by the following equation/criteria: 4.5 capita/home x 60 gal/capita day.
(3) I/I values calculated using the following formula (250 gpd/inch-diameter-mile x pipe diameter x mile sewer); N/A for low-pressure sewers
(4) Future buildings (vacant lots and future secondary dwellings) assumed to have 3 bedrooms per home

APPENDIX C

Pump Station Memorandums

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

M E M O R A N D U M

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

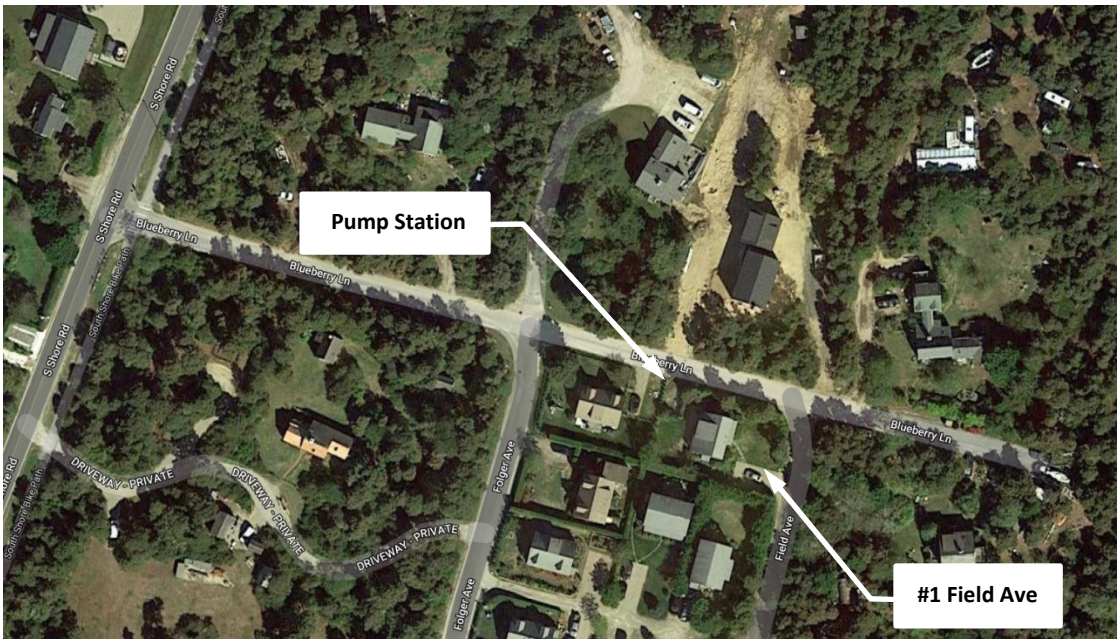
SUBJECT: Abrem Quary Pump Station Evaluation

CC:

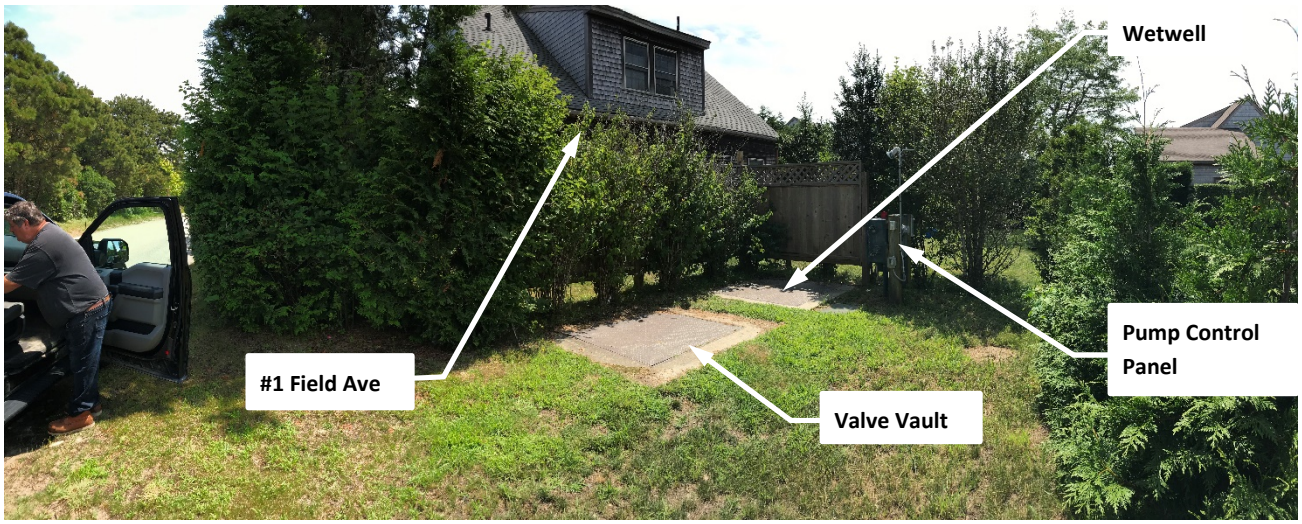
Weston & Sampson performed a field visit to the Abrem Quary Pump Station on 08/01/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Abrem Quary Pump Station is located on Blueberry Lane between Folger Avenue and Field Avenue. Based on the available sewer as-built plan, it is assumed the station was built in ~2007± (12 years old). It is located in a grassed area, within an easement adjacent to 1 Field Avenue. The pump station is a submersible type, with a rectangular wetwell (~10'x5') and a rectangular below grade valve vault (~10'x10'). The wetwell has a smaller upper section (~5'x5'), but the lower section that includes the pumps is the larger assumed ~10'x5' dimensions based on the available on the Town's information sheet.



Abrem Quary PS Aerial Photo



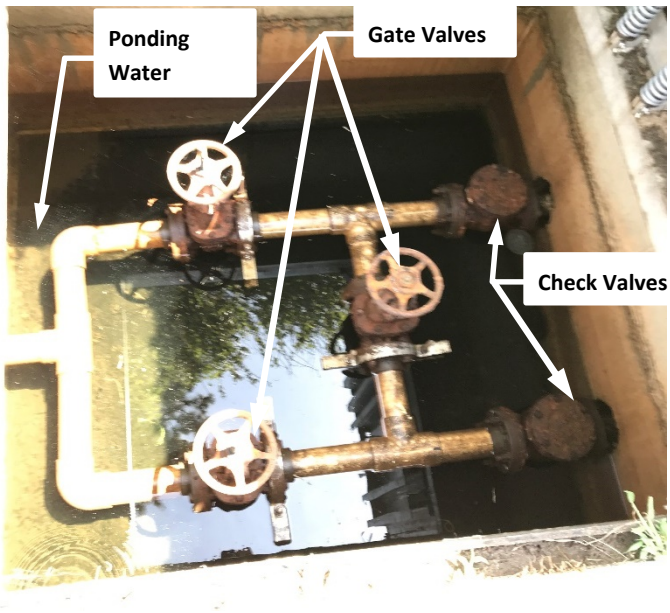
Abrem Quary Site Photo

Civil/Site Observations

- Site is located in a grassed easement area off of Blueberry Lane, adjacent to #1 Field Avenue.
- No fencing at the site.
- Precast wetwell is rectangular (~10'x5'). The wetwell has a smaller upper section (~5'x5') but opens up to the lower section that includes the pumps. The larger section dimensions have been assumed (~10'x5') based on the information available on the Town's station log sheet at the station.
    - Precast concrete appears in good condition, with only minor concrete spalling/pitting in the wetwell which is typical for concrete in wastewater applications.
    - Wetwell access is via an aluminum access hatch (~48"x48") with safety netting.

Wetwell

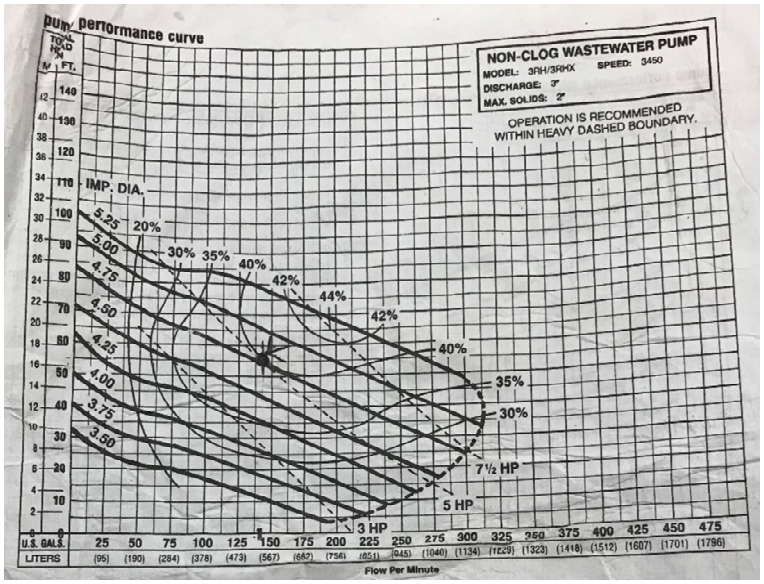
- Valve vault is large (~10'x10') for the station size.
    - Access is via an aluminum access hatch (~36"x60").
    - Drain in vault is set higher than the bottom of the structure, causing water to pond inside structure.



Valve Vault

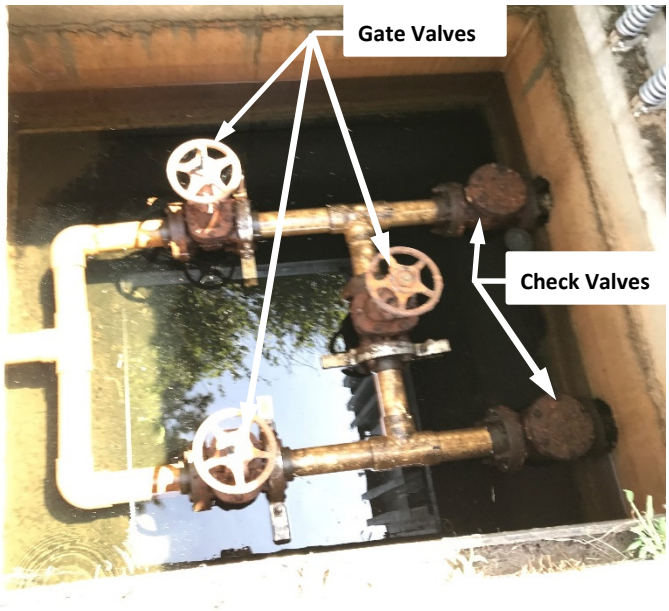
Mechanical/Process Observations

- Ventilation
  - There was no wetwell vent observed at the station.
- Wastewater Pump Equipment
  - Pumps are submersible manufactured by Myers. At the time of the evaluation, there was no available record information on the pumping equipment.
  - Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation. The pumps do appear to be original to the station, which would make them ~12 years old.
  - Pump motors are 5 horsepower, single phase with capacitor starters.



Existing Pump Curve

- Piping, Gates and Valves
    - The forcemain piping in the wetwell and valve vault appears to be Schedule 40 PVC, which is not recommended for higher pressure applications. It appears the entire forcemain is this material, as it can be seen exiting the wetwell.



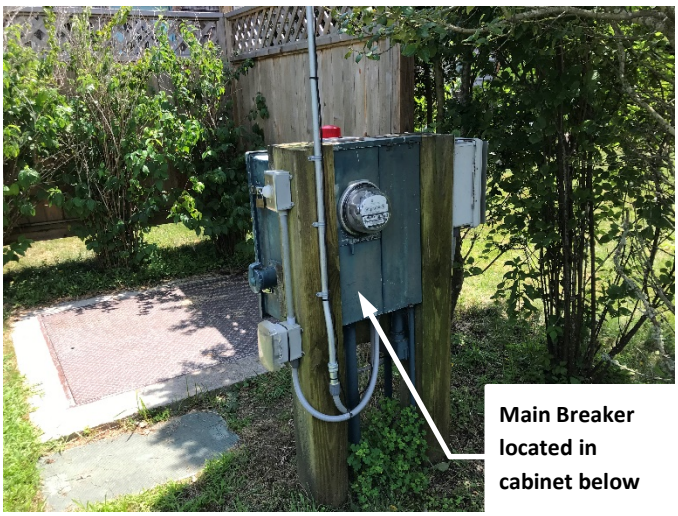
Valve Vault

- Piping configuration is non-typical. There is a connecting pipe/valve between the check and gate valves.
- Pump gate and check valves has surface corrosion but appeared operational. They appear to be original.
- There is no bypass connection in the valve vault or on the site. With no bypass connection, any flow handling from pump issues/failures will require pumper truck(s). Bypass pumps cannot be utilized in the current piping setup.
- Valve vault drain to wetwell is set higher than the floor elevation. This leads to constant ponding water in the vault. This damp condition causes additional corrosion on the valves and supports.

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
    - Electrical service is 240-volt, single phase.
    - Main breaker located in access cabinet on electric meter.

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by an licensed electrician in accordance will all applicable industry standards and codes.



Electric Meter

- Pump Control Panel
    - There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
    - Panel was built by Myers Pump.
    - Control panel is mounted on pressure treated wooden posts.
    - Dirt and debris inside control panel indicates that the door seal may be deteriorated.
    - Panel has an aluminum front and is located in a fiberglass enclosure with faded paint.
    - Control panel has a three-way manual transfer switch on panel (off-main power-portable generator power).
    - Manual transfer to portable generator plug.
    - 60-amp main breaker located inside panel.
    - Single phase capacitor motor starters. These show signs of age, and the Town has had issues with similar capacitor motor starters at other stations.
    - Panel components are aged (~12 years old), but in satisfactory condition.
    - Control panel has the following switches/indicating lights
        - Three Way Switch for Control Panel for Main Power, Portable Generator Power or Off.
        - Pump 1/2 Hand-Off-Auto (H-O-A) 3-way switches.
        - Pump 1/2 Run Incandescent Indicating Lights.
        - Pump 1/2 Seal Fail Incandescent Indicating Lights.
            - Incandescent indicating lights are becoming less frequent due to power consumption and bulb lifespan. The more common standard is LED type indicating lights with push-to-test feature to ensure bulb function.
        - Pump 1/2 Runtime Meters
        - Alarm Horn Test-Silence switch.

Control Panel Enclosure

Pump Control Panel

- Level Controls
  - The existing pump/level controls are from 4 floats (off, lead on, lag on, high level/flood).

Wetwell

- Alarm Telemetry
  - Station alarm(s) are transmitted through a cellular autodialer (Mission).

Cellular Autodialer Alarm Panel

- Other
    - Site lighting is from a single LED bulb floodlight mounted on a mast off the control panel wooden post supports.
    - Outdoor electrical receptable located on the wooden control panel supports.

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 68 gpm.
    - Pump 2 – 46 gpm

While there are outside factors that can cause differing drawdown flows between pumps (i.e. variations in influent flows during testing), the drawdown flows are a good indication of pump condition, as any damaged/worn pump components and/or clogging can result in lower flow outputs.

Recommendations

- Review the need for fencing around the site for security/safety. Due to the location in a residential area, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.

- Consider adding a static wetwell gooseneck style vent to prevent concrete corrosion from the buildup of hydrogen sulfide inside the wetwell. A replaceable carbon filter can be added to the vent if odors are a concern.
- The pumps are 12-years old and are nearing useful life for mechanical equipment (typ. 20 years). It is recommended to replace the pumps/motors with new submersible pumps with three phase motors and new variable frequency drives (VFDs) if any station upgrade/replacement takes place. While single phase power is sufficient for 5 horsepower motors and lower, three phase motors allows for smaller, typically less expensive motor wiring, draw less current than a similar sized single-phase motor and are generally more electrically efficient.
    - Note that it may be possible to rewire the existing motor for three phase, however, because of the age and other recommended upgrades at the station, replacement with brand new equipment is more practical and will increase the lifespan of the pumps.
    - New VFDs will convert the current single-phase electrical service to three phase, while also allowing the ability to vary the pump output to account for varying residential type influent flows.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- Piping and valves (gates and checks) in valve vault should be replaced as the current are corroded and are aging. The existing piping also appears to be non-pressure rated. New piping should be pressure rated PVC (with flange adaptors) or flanged ductile iron. Valves shall be ductile iron. When ductile iron is utilized (pipe or valves), it should be epoxy painted to prevent corrosion.
- When piping/valves are replaced, concrete should be added to the wetwell floor and pitched to the drain invert to avoid ponding inside the structure.
- Existing control panel is dated and requires replacement. Install a new pump control panel in a new outdoor enclosure.
- Existing pressure treated control panel supports are not permanent (will eventually rot and need replacement). The new control panel/enclosure shall be more permanently mounted on either stainless steel Unistrut or mounted on a concrete pad (depending on proposed enclosure size).
- Add a separate manual transfer switch with outdoor generator receptacle, similar to existing (to match Town's generator plug), on the electrical enclosure.
- New submersible transducer with backup floats should be installed for wetwell level/pump control.
    - Submersible transducer should be installed in a PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and/or rags.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

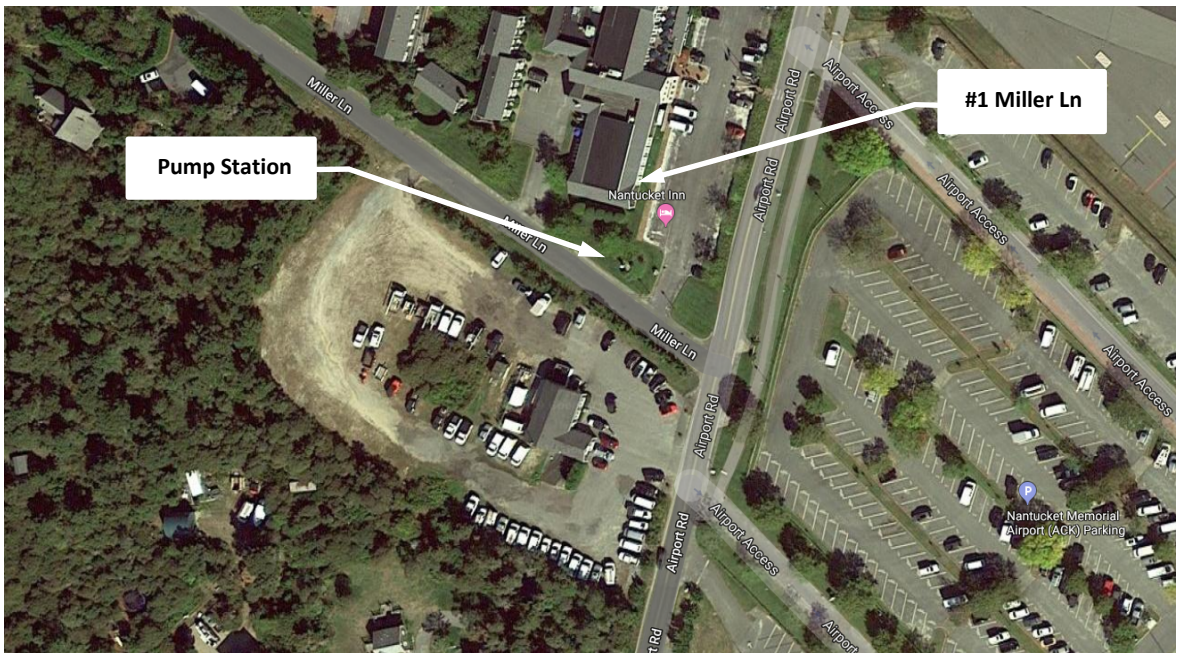
SUBJECT: Airport Pump Station Evaluation

CC:

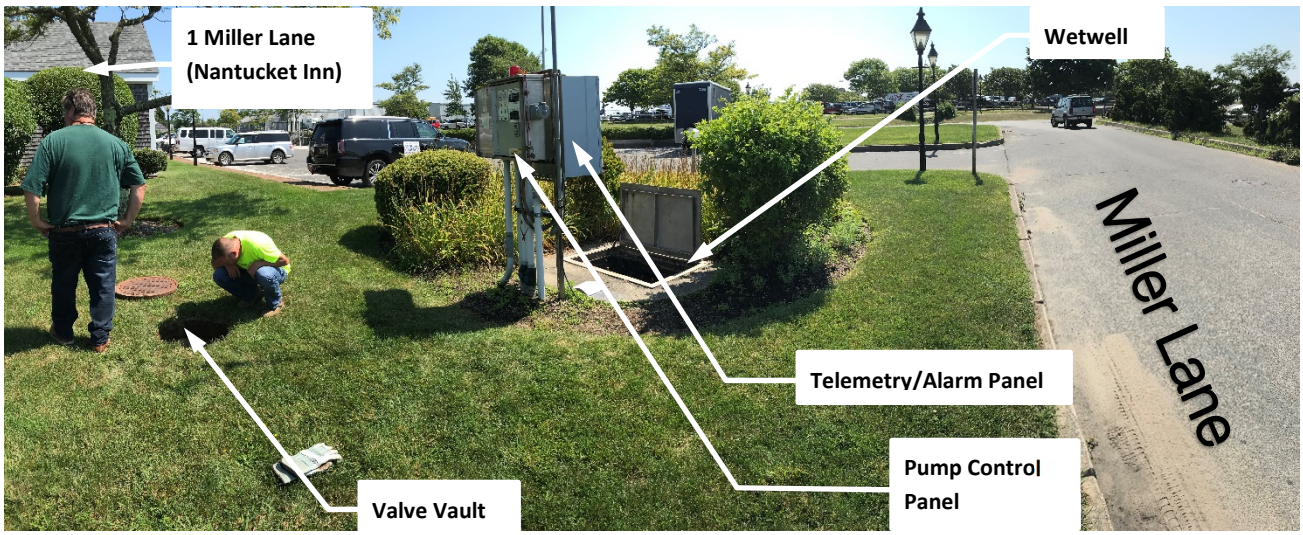
Weston & Sampson performed a field visit to the Airport Pump Station on 07/31/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Airport Pump Station is located at the intersection of Miller Lane and Airport Road. It is located in a grassed area, within an easement on #1 Miller Lane (Nantucket Inn). Based on the dates on the control panel, it is assumed the station was built in ~2002± (17 years old), however the pumps have been replaced since that time. The pump station is a submersible type, with a circular wetwell (6' diameter) and a rectangular below grade valve vault (~5'x6'). The station has a pump control panel and alarm telemetry panel mounted on Unistrut, adjacent to the wetwell. The station is also surrounded on three sides by a planting bed with various ornamental plantings.



Airport Pump Station Aerial Photo



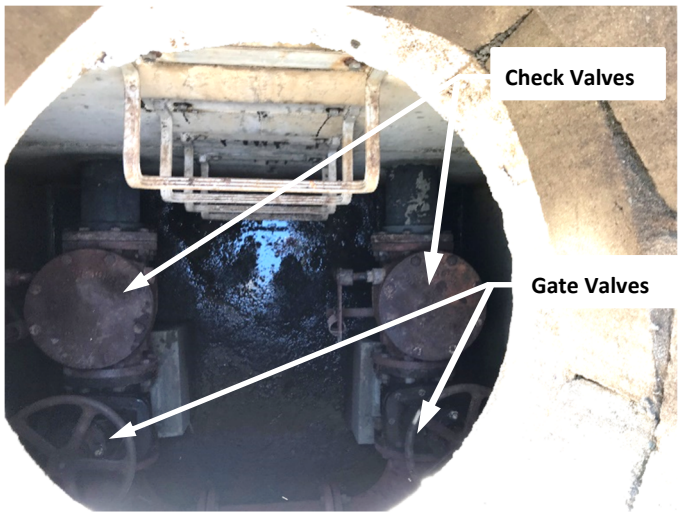
Airport Pump Station Site Photo

Civil/Site Observations

- Site is located in a grassed easement area adjacent to #1 Miller Lane (Nantucket Inn).
- No fencing at the site.
- Precast wetwell is 6-foot diameter.
    - Wetwell concrete appears in good condition, with only minor concrete spalling/pitting observed, which is typical for concrete in wastewater applications.
    - Wetwell access is via an aluminum access hatch (~24”x48”). Access hatch has safety netting for fall protection.

Wetwell

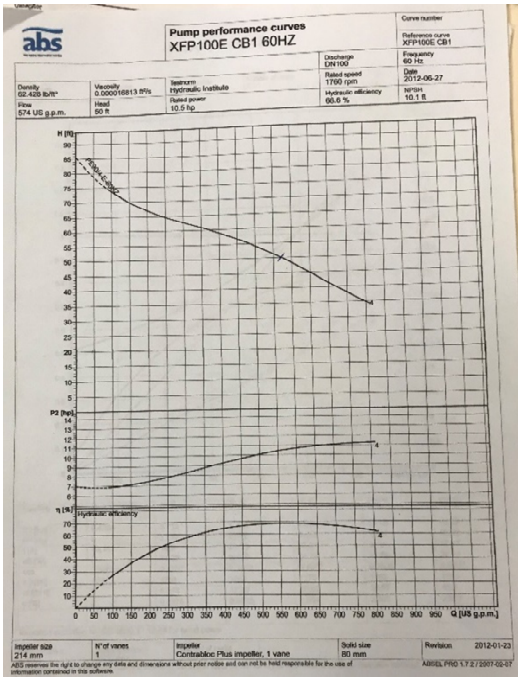
- Valve vault is on the smaller side. Access is provided through a standard manhole frame/cover. There also does not appear to be a drain/sump in the vault, allowing water to build up in structure.

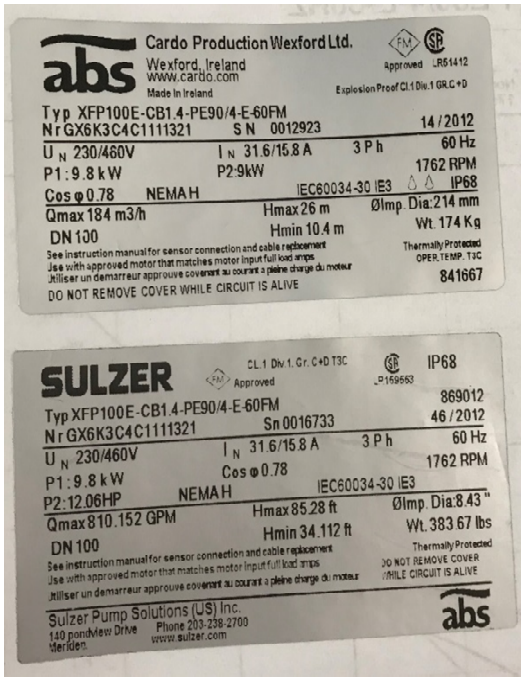


Valve Vault

Mechanical/Process Observations

- Ventilation
  - There was no wetwell vent observed at the station.
- Wastewater Pump Equipment
  - Pumps are submersible manufactured by ABS.
    - Records from the Town indicate the pumps were replaced in approximately 2012 (~7 years old).
    - Pumps are 4" discharge with 8.43" diameter impeller.
    - Listed design point is 574 gpm at 50-feet total dynamic head (TDH).





Pump Records from Town

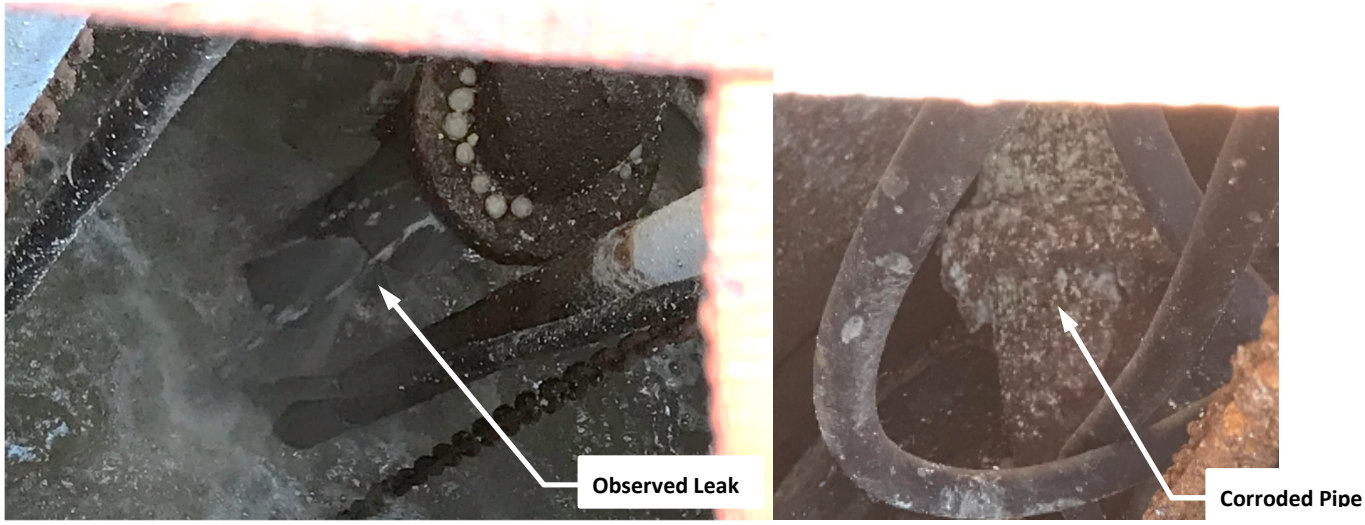
- Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.

- Pump rails and lifting chain are pitted and heavily corroded. These are not stainless steel, as would be expected in a wetwell environment.

Pump Rail/Lifting Chain

- Pump motors are 12 horsepower, three phase with full voltage starters (contractor plus overload relay).
    - It appears that when the pumps were upgraded in 2012, the starters were not and are now undersized (see additional details in 'Electrical Observations' below)

- Piping, Gates and Valves
    - Pump discharge piping in the wetwell is 4". It appears there is a 6"x4" reducing 90° bend at the top of the wetwell piping, then 6" ductile iron into the valve vault.
        - Pump #1 piping in wetwell has a significant leak when the pumps turn on (i.e. under pressure). It was difficult to determine from above grade, but it the leak does not appear to be at a flanged connection, and maybe from a crack in the existing discharge piping.
            - Note that per the Town, the piping in the wetwell has been replaced since our site visit/observations.
        - Pipe and fittings in wetwell appear heavily corroded.



Wetwell Piping

- All pipe, fittings, check valves and gate valves are 6" inside the valve vault.
    - Slight surface corrosion on piping and valves but does not appears to be a significant issue currently.

Valve Vault Piping

- There is no valve vault drain/sump pump to wetwell. This leads to constant ponding water in the vault. This damp condition causes additional corrosion on the pipe, valves and supports.
- There is no bypass connection in the valve vault or on the site. With no bypass connection, any flow handling from pump issues/failures will require pumper truck(s). Bypass pumps cannot be utilized in the current piping setup.

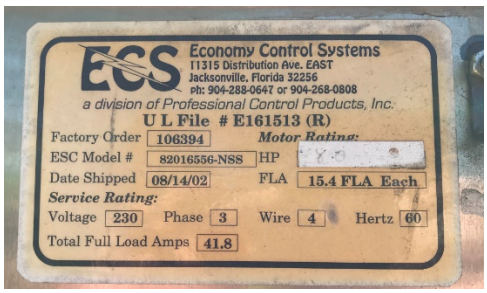
Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
    - Electrical service is 230-volt, three-phase.
    - We could not locate the main breaker or the electric meter on-site. The service may be coming in from the adjacent property.
        - The main breaker may be located with the meter, however, there is only a breaker inside the control panel. This would not completely de-energize the panel (i.e. incoming side of the breaker will always be live/high voltage) causing additional safety requirements, licenses/certifications and specialized personal protective equipment (PPE) anytime the panel needs to be opened.

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by an certified electrical engineer and installed by an licensed electrician in accordance will all applicable industry standards and codes.

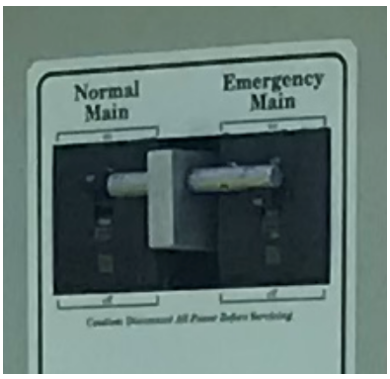
Pump Control Panel Exterior

- Pump Control Panel
  - There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
  - Control panel was built by Economy Control Systems (Jacksonville, FL)



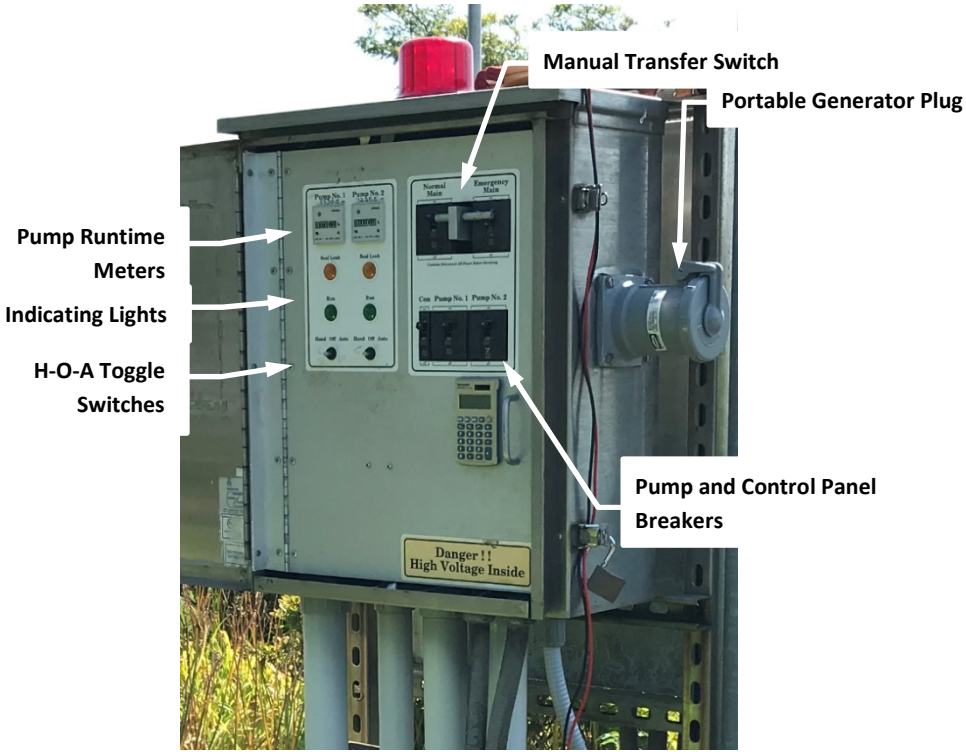
Control Panel Manufacturer Tag

  - Control panel is mounted on stainless steel Unistrut.
  - Control panel is dated (17 years old), and some of the components may now be obsolete.
  - Control panel has a dual breaker type manual transfer switch with a bus bar to lock one breaker in place (to avoid dual power going to the panel).



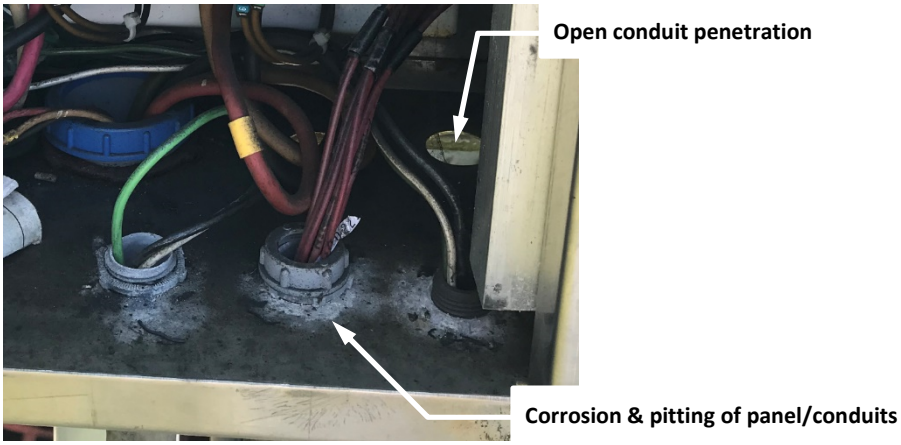
Transfer Switch

- Backup power is provided through a portable generator plug on the side of the panel.
- Control panel has the following switches/indicating lights
    - Manual Transfer Switch/Breakers.
    - Pump 1/2 and Control Panel breakers.
    - Pump 1/2 Hand-Off-Auto (H-O-A) toggle switches.
        - Toggle switches are not the standard anymore. Industry standard are three-way type switches.
    - Pump 1/2 Run Incandescent Indicating Lights.
    - Pump 1/2 Seal Fail Incandescent Indicating Lights.
        - Incandescent indicating lights are becoming less frequent due to power consumption and bulb lifespan. The more common standard is LED type indicating lights with push-to-test feature to ensure bulb function.
    - Pump 1/2 Runtime Meters.
    - Alarm silence/reset (located on the side of panel)



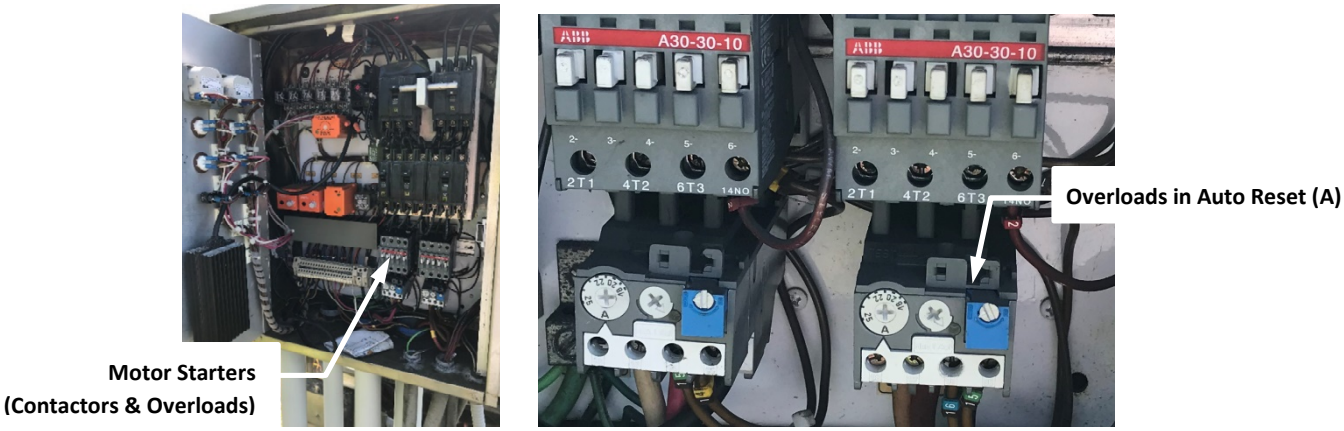
Pump Control Panel

- Interior control panel contacts/conduit showing signs of corrosion and pitting. There are also conduit penetrations that are open to the outside.
    - It appears that the conduits into the wetwell may not have been sealed correctly. This most likely occurred during the ~2012 pump replacements. With the conduits not being sealed (and no wetwell vent), moisture and hydrogen sulfide gas can enter the control panel. This will increase corrosion potential and is a hazard as it has the potential for combustible gases (i.e. hydrogen sulfide) to enter the energized panel.



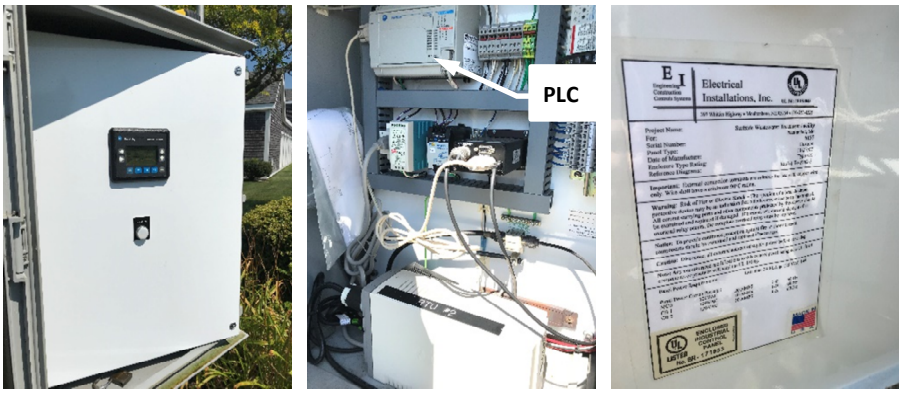
Pitted/Corroded Conduits in Control Panel

- 60-amp main breaker located inside panel (part of the transfer switch).
- Three phase full voltage motor starters (contactor plus overload relay).
    - The starters consist of 30-amp contactors with 25-amp overloads. The overloads were set for automatic reset which basically overrides the overload protection (they will automatically reset and not trip the pumps). The 12 HP motors were reading 31 amp (max.) when in operation which would normally trigger an overload if not set in automatic reset.
        - It appears that when the pumps were upgraded (~2012), they went from ~8 HP to 12 HP, however none of the electrical was upgraded with this motor size increase. Assuming the overloads continued to trip, the only way to allow the pumps to operate for any duration was to set the overloads to automatically reset.



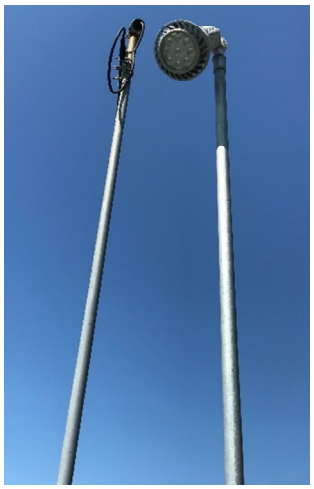
Control Panel Interior

- Level Controls
    - The existing pump/level controls are from 4 floats (off, lead on, lag on, high level/flood).
- Alarm Telemetry
    - Station alarm(s) are transmitted through a custom radio alarm telemetry system. The panel was built by Electrical Installations, Inc. (EEI). Radio antenna mast is mounted on the Unistrut support.
        - The panel includes an Allen-Bradley Micro Logix 1500 Programmable Logic Controller (PLC), with custom programming to transmit the alarm signals relayed from the pump control panel.



Radio Telemetry Panel

- Other
    - Site lighting is from a single LED bulb floodlight mounted on a mast off the telemetry panel.



Site Lighting & Radio Antenna Masts

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 132 gpm.
    - Pump 2 – 71 gpm

While there are outside factors that can cause differing drawdown flows between pumps (i.e. larger variations in influent flows during testing), the drawdown flows are a good indication of pump condition,

as any damaged/worn pump components and/or clogging can result in lower flow outputs. Pump #2 was running at higher measured amps, which could be indicative of a clog. At the time of testing, Pump #1 discharge piping also has a leak, which should result in lower pump outputs. According to the Town, the piping in the wetwell has since been replaced, eliminating this leak.

Both of these flow rates are significantly less than the design rates (per Town's records) of 500 gpm. Based on discussions with operators, it appears this station's capacity is sufficient (i.e. no significant high-level alarms occurring; no flooding observed). This correlates to either 1) the station was oversized to accommodate future flows, or 2) the original design is incorrect for the existing conditions/hydraulics.

<u>Recommendations</u>

- Review the need for fencing around the site for security/safety. Due to the location, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.
- Consider adding a static wetwell gooseneck style vent to prevent concrete corrosion from the buildup of hydrogen sulfide inside the wetwell. A replaceable carbon filter can be added to the vent if odors are a concern.
- Replace corroding/leaking piping, fittings, pump rails and lifting chain in wetwell.
    - New pipe and fittings shall be flanged ductile iron.
        - Note that per the Town, this piping has been replaced since our site visit/observations.
    - Pump rails and lifting chain shall be stainless steel.
- While the pumps are not yet approaching the end of useful life for mechanical equipment (typ. 20 years) the station hydraulics and existing/future flows should be reviewed to determine if the pumps are sufficiently sized. If sized correctly, rebuild pumps to ensure they are not worn/clogged and diagnose the low capacity/outputs observed during the drawdowns (noted above).
    - New submersible pumps with three phase motors and new variable frequency drives (VFDs) if any station upgrade/replacement takes place.
    - New VFDs will convert the current single-phase electrical service to three phase, while also allowing the ability to vary the pump output to account for varying residential type influent flows.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- Either an external or internal (inside valve vault) bypass connection should be added.
    - Review the need for a larger valve vault to accommodate the bypass internally and for better access.
- A sump pump or drain should be added (with P-trap) into the wetwell from the valve vault. Add needed concrete to pitch the floor to the drain to avoid ponding inside the structure.
- Existing control panel is dated and requires replacement. There is also some internal corrosion occurring and all the electrical equipment appears undersized for the existing pumps. The motor starter overloads are also in automatic reset mode, prohibiting them from tripping on high amps.

    - It is recommended to install a new pump control panel with new properly sized variable frequency drives (VFDs) in a new outdoor electrical enclosure. Depending on the size of the VFDs required, it may be recommended to mount them separately, outside the control panel.
- Add a separate manual transfer switch with outdoor generator receptacle (to match Town's generator plug) in the electrical enclosure.
- New submersible transducer with backup floats should be installed for wetwell level/pump control.
    - Submersible transducer should be installed in a 6-inch (min) PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.
- The new control panel/enclosure should be permanently mounted on either stainless steel Unistrut or mounted on a concrete pad (depending on proposed enclosure size).
- The electric meter/main shutoff was not mounted locally and could not be located during the site visit.
    - A new main shutoff should be mounted locally in a more visible location to prevent any electrical loads being live when working on the panel.
    - Electric meter should also be relocated locally.
- Town would like to switch over all the stations to a Mission cellular alarm autodialer. Existing radio telemetry panel should be removed, and the alarm wiring be re-routed to the Mission unit.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

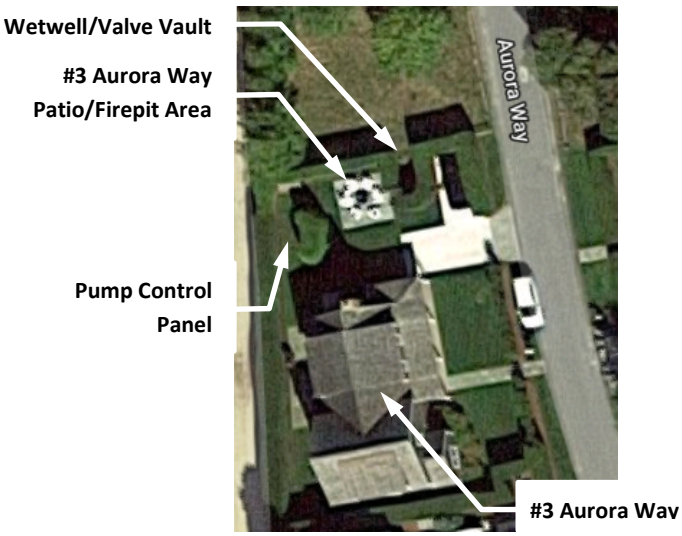
SUBJECT: Aurora Way Pump Station Evaluation

CC:

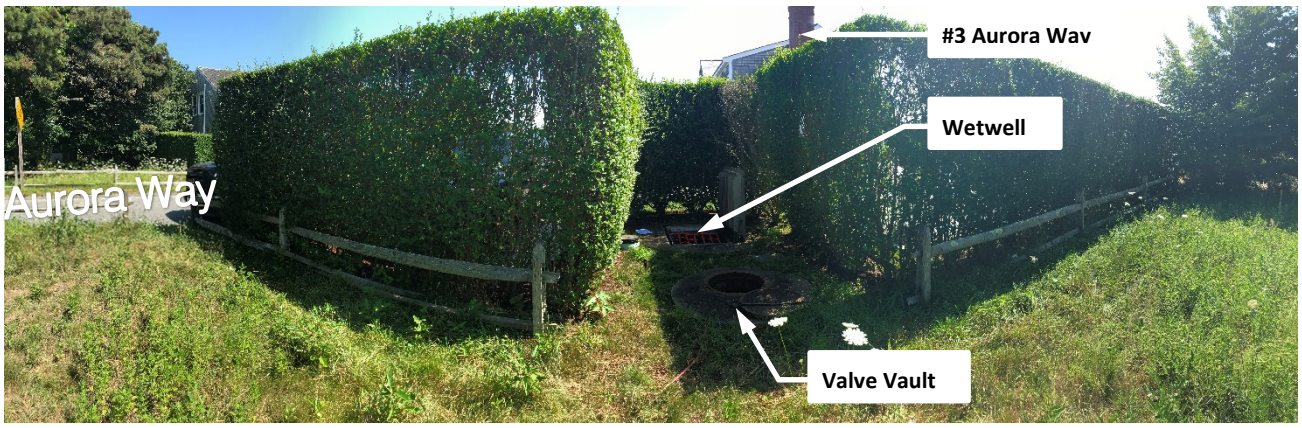
Weston & Sampson performed a field visit to the Aurora Way Pump Station on 07/31/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

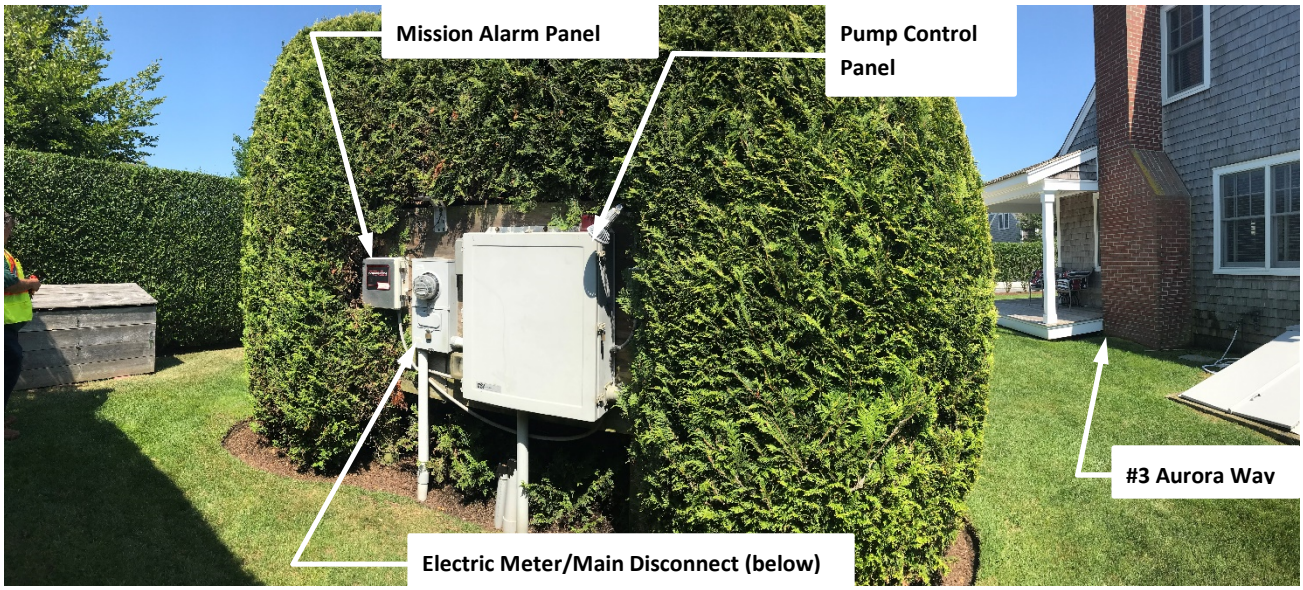
The Aurora Way Pump Station is located on Aurora Way. It is located in the side yard of #3 Aurora Way within an easement. The pump station is a submersible type, with a circular wetwell (6' diameter) and a circular below grade valve vault manhole (4' diameter), built in ~2003± (16 years old). The wetwell and valve vault is surrounded by ~8-10' tall hedges. The station has a pump control panel and alarm telemetry panel located at the back of the property, behind a different set of hedges. The panels/electric meter is mounted on plywood/wood posts. Between the control panel and wetwell/valve vault is the patio/firepit area for #3 Aurora Way.



Aurora Way Aerial Photo



Aurora Way Wetwell/Valve Vault Site Photo



Aurora Way Control Panel Site Photo

Civil/Site Observations

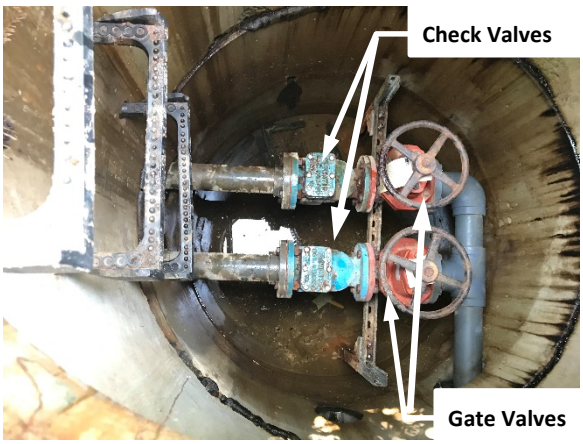
- Site is located in a grassed easement area in the side yard of #3 Aurora Way.
- No fencing at the site. Wetwell and valve vault are surrounded by ~8-10' hedges. There is a side access from the driveway of #3 Aurora Way through the hedges (cut out archway). The other access is from the empty lot adjacent to the property.

Side Access from Driveway

- Precast wetwell is 6-foot diameter.
    - Wetwell concrete appears in good condition, with only minor concrete spalling/pitting observed, which is typical for concrete in wastewater applications.
    - Wetwell access is via an aluminum access hatch (~36”x48”). Access hatch has safety netting for fall protection.
    - Hatch is extremely close to the hedges on one side. This side of the hatch has the hinge lock/release, making it difficult to access the release without pushing into the hedges.

Wetwell

- Valve vault is on the smaller side (4’ diameter manhole) and roughly 7’-8’ deep. Access is provided through a standard manhole frame/cover. There is not a drain/sump pump in the vault, allowing water to pond in structure.



Valve Vault

Mechanical/Process Observations

- Ventilation
  - There appears to be a PVC wetwell vent adjacent to the wetwell. It is low to the ground and could be blocked if any significant snowfall occurred.

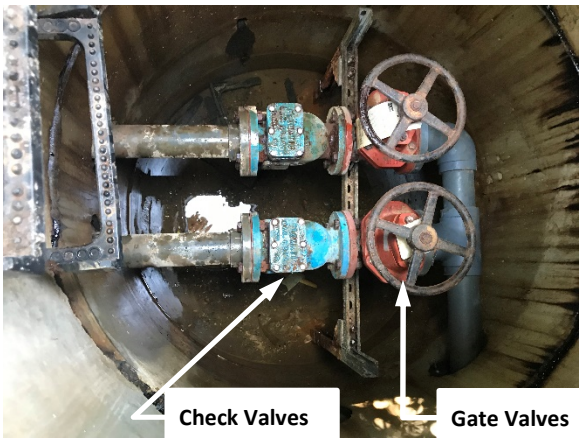
Wetwell Vent

- Wastewater Pump Equipment
  - Pumps are submersible grinder style manufactured by Barnes.
    - Records from the Town indicate the pumps are model SGV[3] 3 HP, 230-volt, single phase centrifugal grinder pumps installed ~2003 (~16 years old).
    - Pumps are 2" discharge.
    - Design point is unknown/not found in Town records.
  - Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.
  - Pump motors are 3 horsepower (3450 RPM), 230-volt, single phase with run/start capacitor starters.
- Piping, Gates and Valves
  - Pump discharge is 2-inch. Piping in the wetwell is 3" PVC with glued fittings (it appeared that there was a partially submerged 2"x3" PVC reducer fitting at the pump connection).

- Wetwell piping appears to be schedule 80.

Wetwell Piping

- All pipe, fittings, check valves and gate valves are 3" inside the valve vault.
    - Pipe is 3-inch PVC.
    - Swing check and gate valves are flanged cast/ductile iron. Slight surface corrosion on valves but does not appears to be a significant issue currently.



Valve Vault Piping

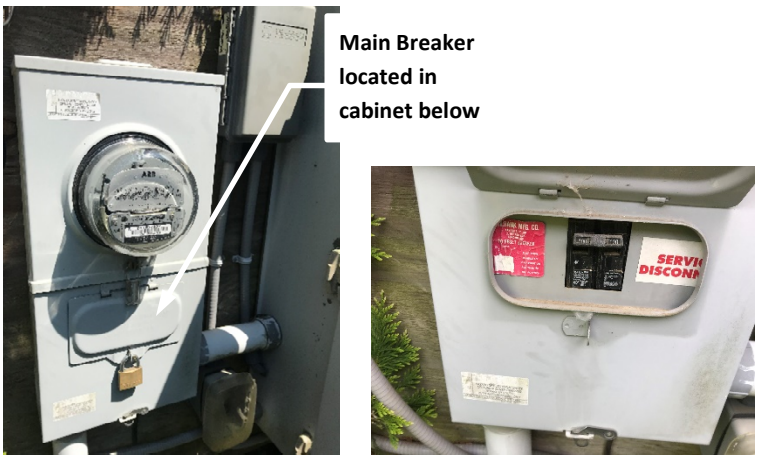
- There is no valve vault drain/sump pump to wetwell. This leads to constant water in the vault. This could lead to additional corrosion on the valves and supports.
- There is no bypass connection in the valve vault or on the site. With no bypass connection, any flow handling from pump issues/failures will require pumper truck(s). Bypass pumps cannot be utilized in the current piping setup.

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
    - Electrical service is 230-volt, single phase.

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by an certified electrical engineer and installed by an licensed electrician in accordance will all applicable industry standards and codes.

- Main breaker located on below the electric meter in a locked cabinet. All operators should have the key to the lock to avoid the risk of not being able to shut power off to the entire station.
- Because of the distance and location of the hedges, there is no direct sight from the pump disconnects to the wetwell (where the pumps are located). This is a safety concern when working on the pumps and having no means of immediately de-energizing.



Electric Meter and Main Shutoff Breaker

- Pump Control Panel
  - There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
  - Control panel was built by CSI Controls (Ashland OH).
  - Location of control panel is close to hedges and mulched areas. There may be a fire hazard with the electric meter and control panel in close proximity to these combustible materials.

Pump Control Panel Exterior Enclosure

Pump Control Panel Interior

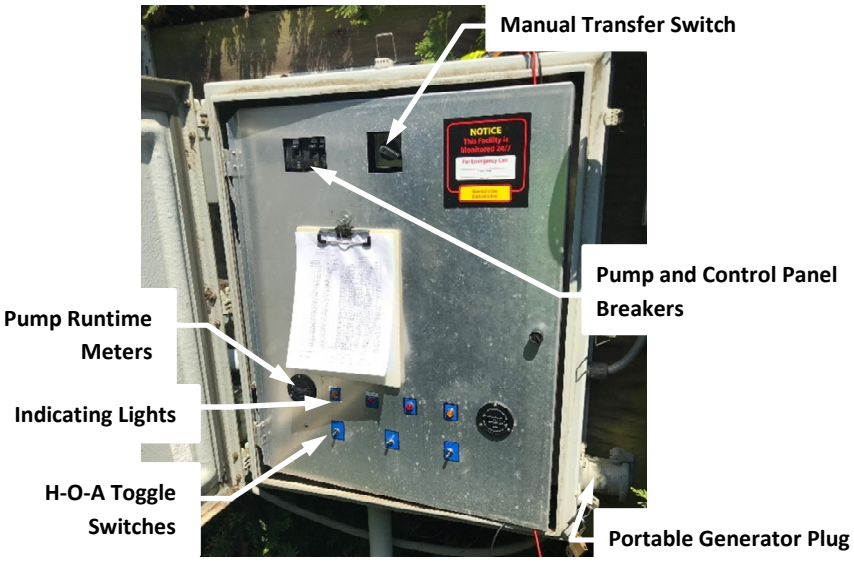
- Control panel is mounted on pressure treated wooden posts and plywood.
- Panel has an aluminum front and is located in a fiberglass enclosure.
- Control panel has a three-way manual transfer switch.

Transfer Switch

- Backup power is provided through a portable generator plug on the side of the panel.
- Control panel has the following switches/indicating lights
    - Manual Transfer Switch/Breakers.
    - Pump 1/2 and Control Panel breakers.
    - Pump 1/2 Hand-Off-Auto (H-O-A) toggle switches.
        - Toggle switches are not the standard anymore. Industry standard are three-way type switches.
    - Pump 1/2 Run Incandescent Indicating Lights.
    - High Level and Low Level (from floats) Incandescent Indicating Lights.

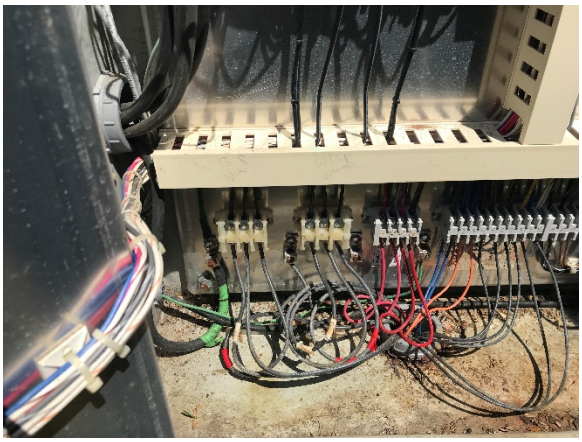
- Incandescent indicating lights are becoming less frequent due to power consumption and bulb lifespan. The more common standard is LED type indicating lights with push-to-test feature to ensure bulb function.

- Pump 1/2 Runtime Meters.
- Alarm silence/reset (located on the side of panel)



Pump Control Panel Exterior

- Interior control panel contacts/conduit showing signs of corrosion and pitting. There is also dirt and debris inside control panel that would indicate that the door seal may not be tight.



Interior Debris at Bottom of Control Panel

- Single phase capacitor motor starters. These show signs of age, and the Town has had issues with similar capacitor motor starters at other stations.

Pump Capacitor Starters

- Level Controls
    - The existing pump/level controls are from 4 floats (off, lead on, lag on, high level/flood).

- Alarm Telemetry
    - Station alarm(s) are transmitted through a cellular autodialer (Mission) mounted to the plywood rack.

Mission Cellular Autodialer

- Other
    - Site lighting is from a single LED bulb floodlight mounted on the Pump Control Panel.
    - There is no lighting adjacent to the wetwell/valve vault area.

Site Lighting

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 72 gpm.
    - Pump 2 – 81 gpm

Based on the reviewed information, the original design flow rates are not known. Because of this it is difficult to determine if there may be issues with the pump's operation. Overflows were not mentioned during discussions with the operators, nor was there evidence of flood levels at the wetwell. This can be indicative of the pumps output being adequate for the current influent flows to the station, however, further investigation/review is recommended to verify pump capacity is adequate.

Recommendations

- Review the potential to relocate the control panel/electric meter/Mission unit adjacent to the wetwell. This would remove the controls/electrical from the 'side yard' of the adjacent property and allow access to the equipment without crossing through the yard area. It would also allow pump disconnects to be installed in line of sight from the pumps.
    - If the electrical and pump control panel location cannot be relocated, it is recommended to add separate pump disconnects near the wetwell to allow de-energizing in direct line of sight of the equipment.
- The hedges around the site make access and opening/closing of the wetwell hatch difficult. Review trimming and/or relocating hedges to allow for better access.
    - Review the need for fencing around the site for security/safety. Due to the location in a residential area, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.
- Consider extending the static wetwell gooseneck style vent to prevent it from being covered during larger snow accumulations. A replaceable carbon filter can be added to the vent if odors are a concern.

- Existing control panel is dated and should be replaced when relocating the other electrical equipment.
    - It is recommended to install a new pump control panel with new properly sized variable frequency drives (VFDs) in a new outdoor electrical enclosure. Depending on the size of the VFDs required, it may be recommended to mount them separately, outside the control panel.
- The pumps are ~16 years old and are nearing useful life for mechanical equipment (typ. 20 years). It is recommended to replace the pumps/motors with new submersible pumps with three phase motors and new variable frequency drives (VFDs) during the upgrade of the station. While single phase power is sufficient for 5 horsepower motors and lower, three phase motors allows for smaller, typically less expensive motor wiring, draw less current than a similar sized single-phase motor and are generally more electrically efficient.
    - New VFDs will convert the current single-phase electrical service to three phase, while also allowing the ability to vary the pump output to account for varying residential type influent flows.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- Either an external or internal (inside valve vault) bypass connection should be added.
    - Review the need for a larger valve vault to accommodate the bypass internally and for better access.
- A drain should be added (with P-trap) into the wetwell from the valve vault. Add needed concrete to pitch the floor to the drain to avoid ponding inside the structure.
- New submersible transducer with backup floats should be installed for wetwell level/pump control.
    - Submersible transducer should be installed in a 6-inch (min) PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.
- The new control panel/enclosure should be permanently mounted on either stainless steel Unistrut or mounted on a concrete pad (depending on proposed enclosure size).

Weston & Sampson

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

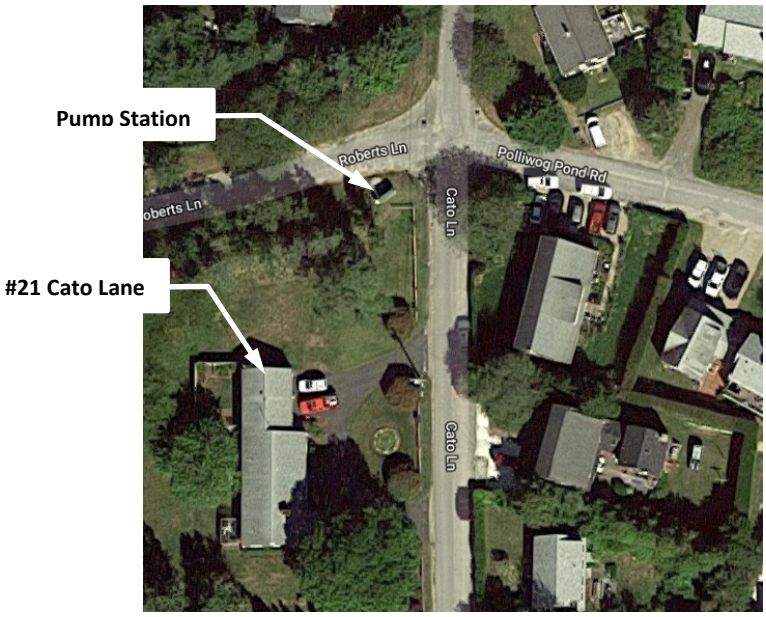
SUBJECT: Cato Lane Pump Station Evaluation

CC:

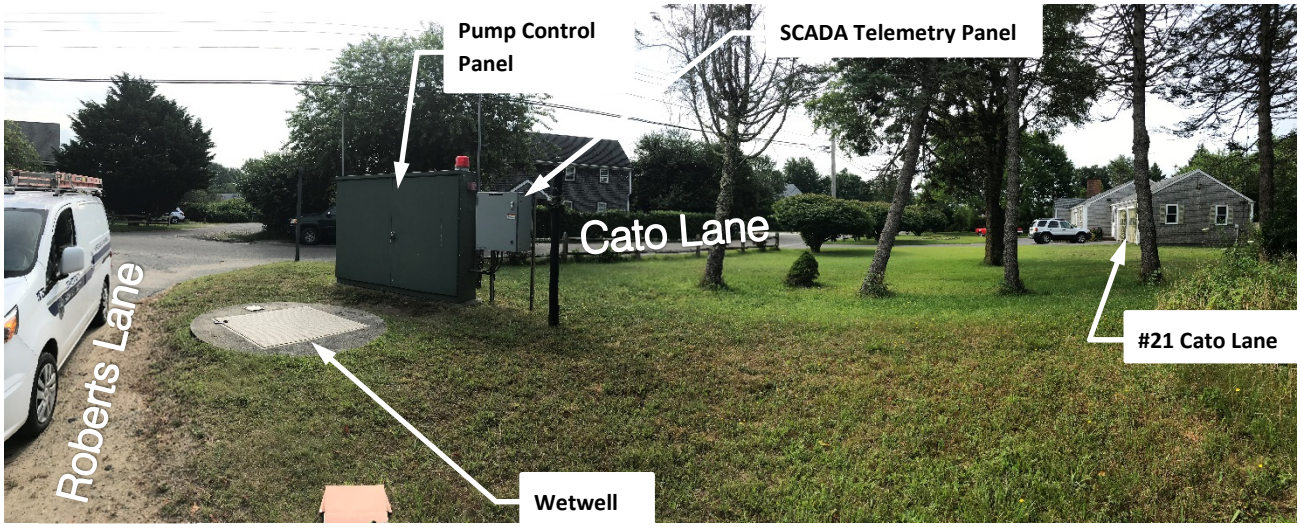
Weston & Sampson performed a field visit to the Cato Lane Pump Station on 08/01/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

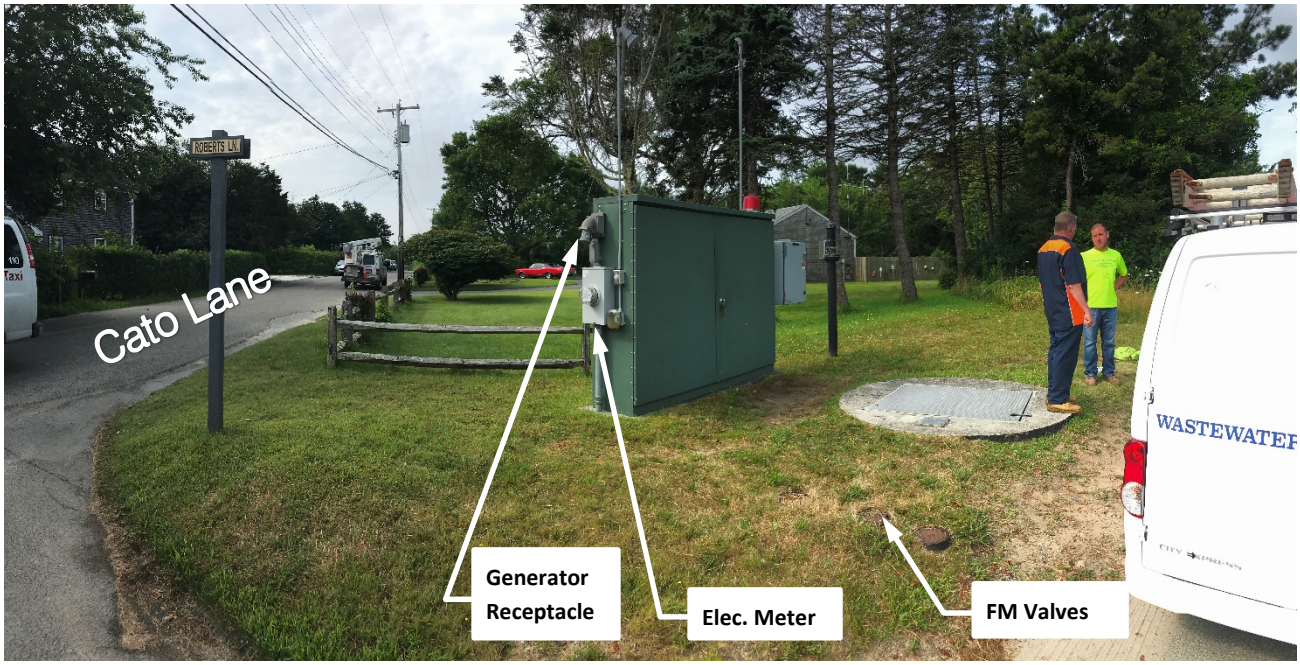
The Cato Lane Pump Station is located at the intersection of Cato Lane and Roberts Lane. The station was built in ~2003± (16 years old). It is located in the Town's Right-of-Way, adjacent to #21 Cato Lane. The pump station is a submersible type, with a circular wetwell (6' diameter) and buried forcemain valves. The pump control panel, manual transfer switch and electrical disconnects are located in an exterior painted steel outdoor enclosure mounted on a concrete pad. The electric meter and portable generator receptacle are mounted on the exterior of the outdoor electrical enclosure. The SCADA telemetry panel is mounted adjacent to the exterior electrical enclosure on stainless steel Unistrut.



Cato Lane PS Aerial Photo



Cato Lane Site Photo



Cato Lane Site Photo

Civil/Site Observations

- Site is located in the grassed Right-of-Way area at the intersection of Cato Lane and Roberts Lane.
- External painted steel electrical cabinet housing pump control panel disconnects and manual transfer switch.
- No fencing and or traffic protection (i.e. bollards) at the site.
- Access/parking to the site is along the paved surface of Roberts Lane.
- Precast wetwell is 6-foot diameter.

- Wetwell concrete appears in fair condition. There is some concrete spalling/pitting observed around the water level. While this is somewhat typical for concrete in wastewater applications it should be patched/parged to prevent further degradation.
- Wetwell access is via an aluminum access hatch (~36"x48"). Access hatch has safety netting for fall protection and appears in satisfactory condition.

Wetwell

- No external valve vault. Vertical check valves in the wetwell and three buried gate valves for pump isolation (one for each pump and a third to drain the forcemain back to the wetwell).

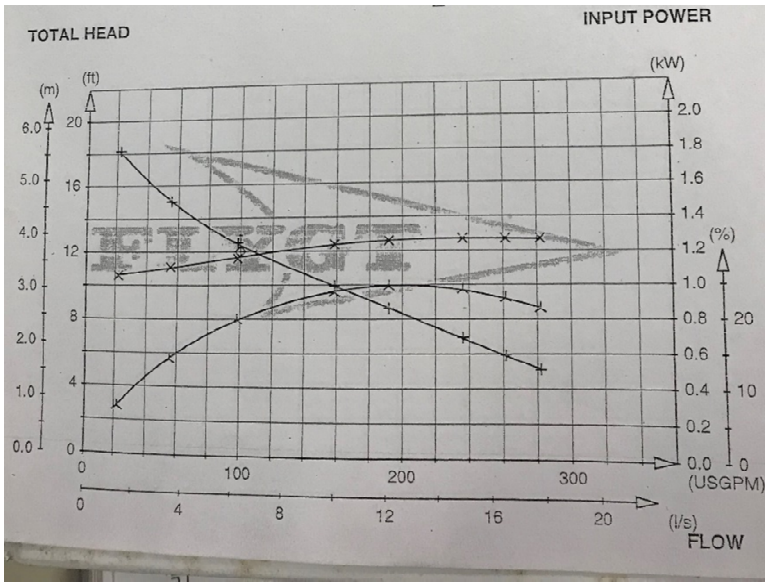
Buried Forcemain Gate Valves

Mechanical/Process Observations

- Ventilation
  - There is a painted DI and PVC wetwell vent adjacent to the wetwell (next to the SCADA telemetry panel.

Wetwell Vent

- Wastewater Pump Equipment
    - Pumps are submersible solids handling. There is one original pump (manufactured by Flygt) and one new pump (manufactured by ABS).
        - Records from the Town indicate the new ABS pump is model XFP-PE1-80C-CB1.2-PE20. This pump is 2.7 HP, 230-volt, single phase installed 2019.
        - The original pump is a Flygt CP3085.092. This pump is 2.4 HP, 230V, single phase installed ~2003.
        - Pumps are 3" discharge.
        - The original Flygt factory pump test curves are available, however, the apparent design point for the station is not known.
    - Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.
    - Pump removal is through a portable hand winch, which is stored inside the cabinet. Hand winch appeared in satisfactory condition.



Existing Flygt Pump Curve

- Piping, Gates and Valves

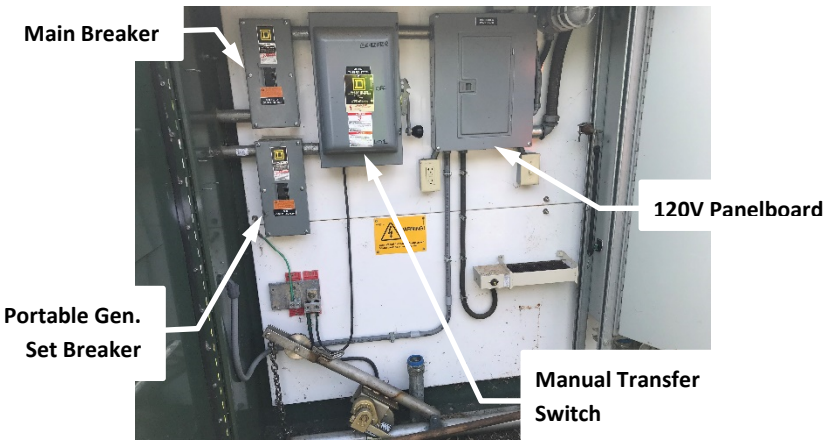
- Discharge piping is 4-inch. Piping in the wetwell is flanged ductile iron (DI).
- It could not be confirmed, but it is assumed that there is a partially submerged 3"x4" DI reducer fitting at the 3-inch pump discharge connection.
- There is a vertical ductile iron flanged ball check valve before the 90° bend at the piping exit of the wetwell.
- All the piping, valves and fittings inside the wetwell are heavily corroded.
- Buried gate valves are operational according to the station operator personnel.
- There is no bypass connection for the station. With no bypass connection, any flow handling from pump issues/failures will require pumper truck(s). Bypass pumps cannot be utilized in the current piping setup.

Wetwell Piping

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
  - Electrical service is 230-volt, single phase.
  - Backup power is provided through a portable generator plug on the side of the panel.
  - Minor corrosion on exterior electrical enclosure. Minor pitting/corrosion on ground wire terminals. Neither considered major issue.
- Inside the right side of the electrical enclosure is the main breaker, manual transfer switch, additional breaker for a portable generator, station ground and the 120-volt panelboard.

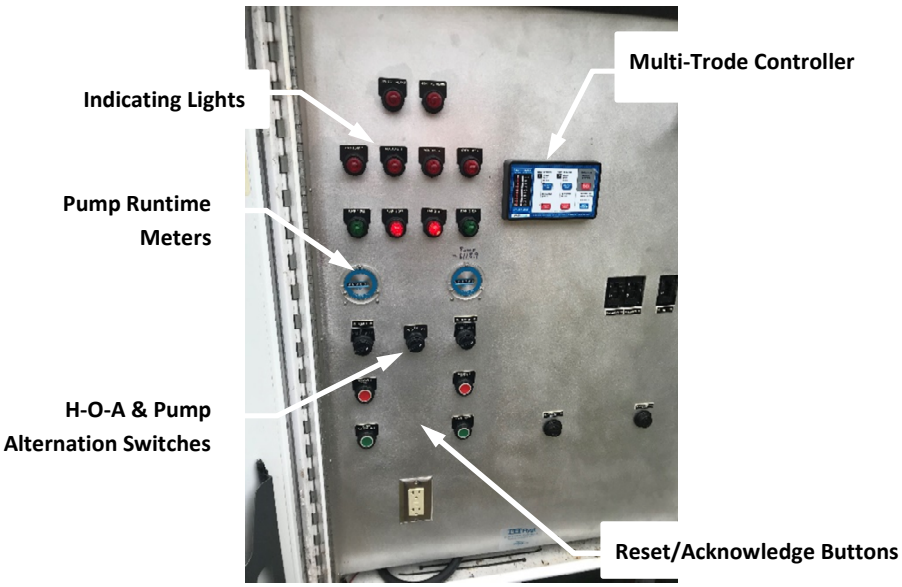
[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by a licensed electrician in accordance will all applicable industry standards and codes.



Right Side Cabinet of Electrical Enclosure

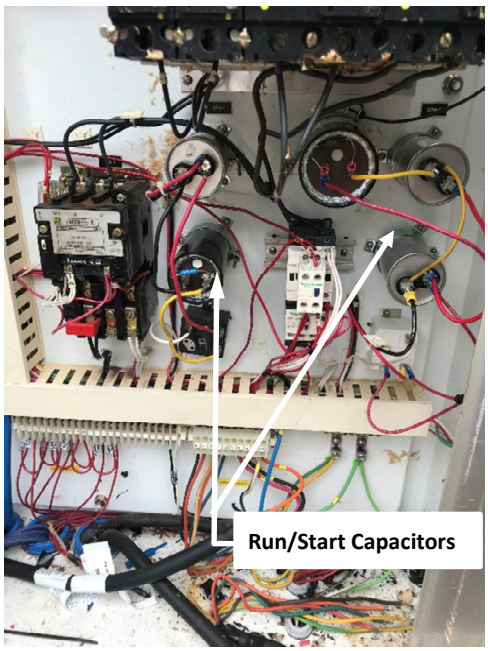
- Pump Control Panel is located on the left side cabinet of the electrical enclosure. It is housed inside a separate exterior enclosure.
    - There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
    - Control panel was built by Flygt (Trumbull, CT).

Pump Control Panel Exterior Enclosure



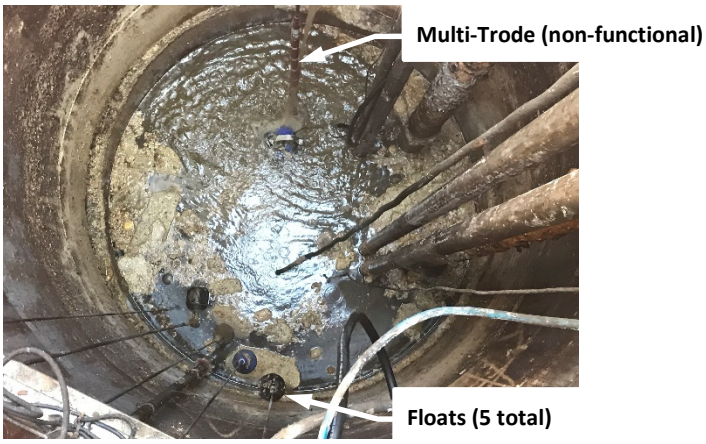
Pump Control Panel

- Control panel has the following switches/indicating lights
    - Main Control Panel breakers.
    - Pump 1/2 Hand-Off-Auto (H-O-A) three-way switches.
    - Alternation/Lead/Lag three-way switch (Auto, 1-2, 2-1)
    - Pump 1/2 Run Incandescent Indicating Lights.
    - Pump 1/2 Off Incandescent Indicating Lights.
    - Pump 1/2 Moisture Probe Incandescent Indicating Lights.
    - Pump 1/2 Overtemp Incandescent Indicating Lights.
    - High Level and Low Level (from floats) Alarm Incandescent Indicating Lights.
        - Incandescent indicating lights are becoming less frequent due to power consumption and bulb lifespan. The more common standard is LED type indicating lights with push-to-test feature to ensure bulb function.
    - Pump 1/2 Runtime Meters.
    - Alarm acknowledge and reset buttons.
    - Pump 1/2 Overload Reset buttons.
    - Pump 1/2 Mini-CAS Reset Buttons (Mini-CAS units are Flygt standard equipment for pump moisture/seal failure).
    - Multi-Trode controller.
        - Multi-Trode level transmitter is in wetwell. Level is transmitted to the controller, which signals pump on/off.
        - Town is having issues with the transmitter and controller at this station. It appears one or both of the units are faulty.
- Single phase capacitor (run and start) motor starters. Recently one capacitor failed and exploded, causing a fire in the control panel. Evidence of the explosion can be seen on the interior of the panel.



Pump Capacitor Starters

- Level Controls
  - The existing pump/level controls are from a Multi-Trode digital level controller and 5 backup floats (low level, off, lead on, lag on, high level/flood).
    - The Multi-Trode unit is a stick type probe suspended in the wetwell. The unit has sensors spaced at intervals which detect the water level as it raises/lowers past the sensor intervals. There is a control unit inside the pump control panel with pump run/stop and alarm setpoints for the sensor intervals. Typically these sensors are spaced at 6" to 12" intervals depending on the model.
    - The existing Multi-Trode unit is non-functional. The operators also do not like this style of level control.
    - The floats appear to be set up to run independently of the Multi-Trode, so the station is currently running off of the float controls.



Wetwell Level Controls

- Alarm Telemetry

- Station alarm(s) are transmitted through a custom radio SCADA alarm telemetry system. The panel was built by Electrical Installations, Inc. (EEI). Panel is mounted on the Unistrut support with the radio antennal mast mounted on the electrical enclosure.
- The panel includes an Allen-Bradley Micro Logix 1500 Programmable Logic Controller (PLC), with custom programming to transmit the alarm signals relayed from the pump control panel.

Alarm Telemetry Panel

- Other
  - Site lighting is from a single LED bulb floodlight mounted on the Pump Control Panel.

Site Lighting

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
  - Pump 1 – 126 gpm.
  - Pump 2 – 117 gpm

Based on the reviewed information, the original design flow rates are not known. Because of this it is difficult to determine if there may be issues with the pump's operation. Overflows were not mentioned during discussions with the operators, nor was there evidence of flood levels at the wetwell. This can be indicative of the pumps output being adequate for the current influent flows to the station, however, further investigation/review is recommended to verify pump capacity is adequate.

Recommendations

- Review the need for fencing around the site for security/safety. Due to the location in a residential area, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.
- The one Flygt pump is ~16 years old for mechanical equipment (typ. 20 years). Recommended to replace the Flygt pump. It is recommended to replace the pumps/motors with new submersible pumps with three phase motors and new variable frequency drives (VFDs)
    - The ABS pump (new) does not need replacement but is single phase. It may be beneficial to retrofit/replace the pump motor for 3-phase to utilize the VFDs.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- It is recommended to replace the existing pump control panel with a new PLC based control panel. The new panel would include new properly sized variable frequency drives (VFDs) or soft starters, eliminating the start/run capacitors.
- Replace all wetwell piping. When ductile iron is utilized (pipe or valves), it should be epoxy painted to prevent corrosion.
- Replace both vertical check valves in wetwell.
- An external bypass connection should be installed.
    - Review the potential for a separate valve vault which would house the check valves, gate valves and bypass connection.
- Install bollards around the electrical enclosure for traffic protection.
- Town is looking to standardize around Mission alarm telemetry panels. Replace existing radio telemetry panel with a new Mission panel.
- New submersible transducer with backup floats should be installed for wetwell level/pump control.
    - Submersible transducer should be installed in a 6-inch (min) PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

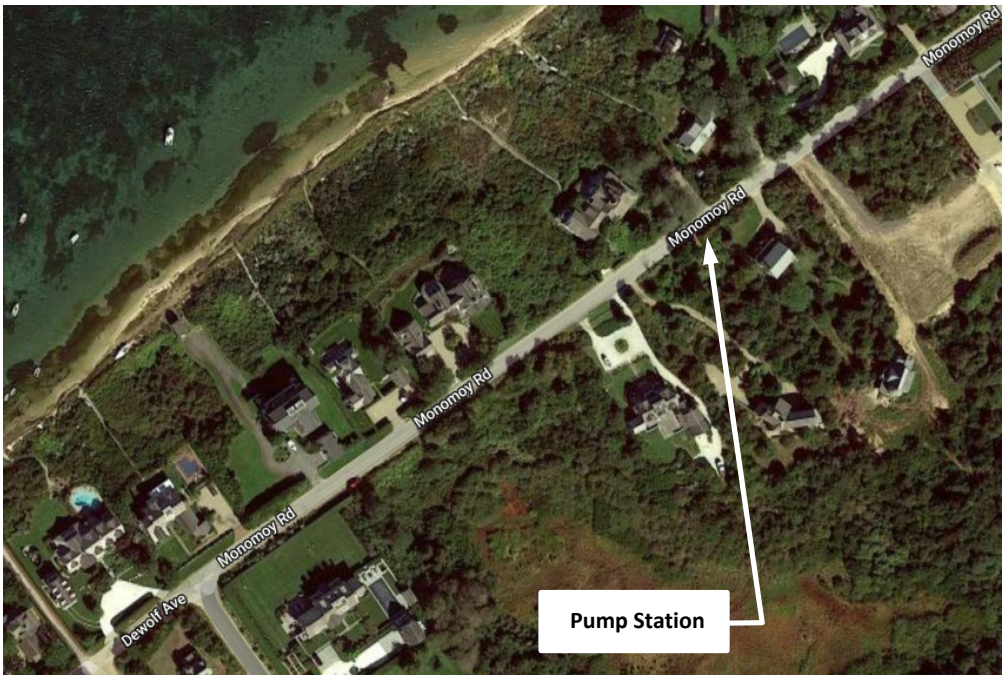
SUBJECT: Monomoy North Pump Station Evaluation

CC:

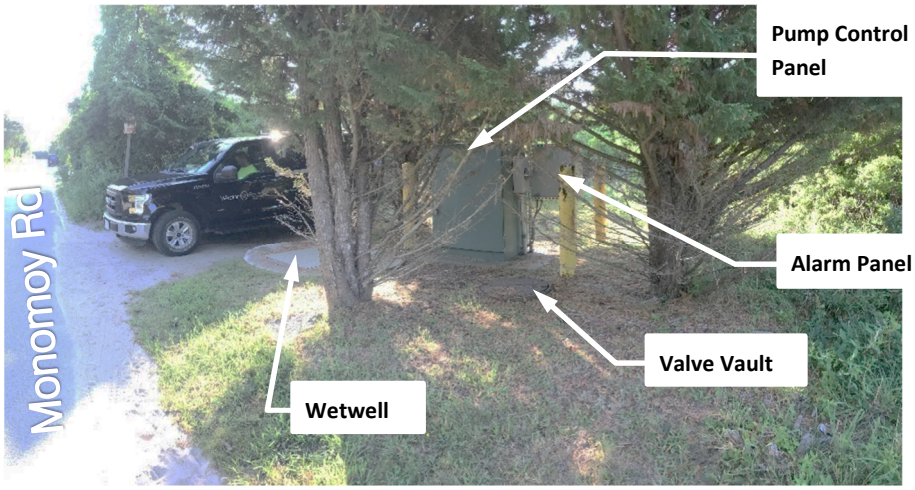
Weston & Sampson performed a field visit to the Monomoy North Pump Station on 08/02/19.

The purpose of this visit was to evaluate the condition of the existing equipment and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Monomoy North Pump Station is located in the right-of-way in front of #59A Monomoy Road. The pump station is a submersible type, with a circular wetwell (5' diameter) and a circular below grade valve vault manhole (4' diameter). The pump station was built in ~2002± (17 years old) per the available information available at the station. The wetwell and valve vault is surrounded by large evergreen trees. The station has a pump control panel and alarm telemetry panel adjacent to the wetwell.



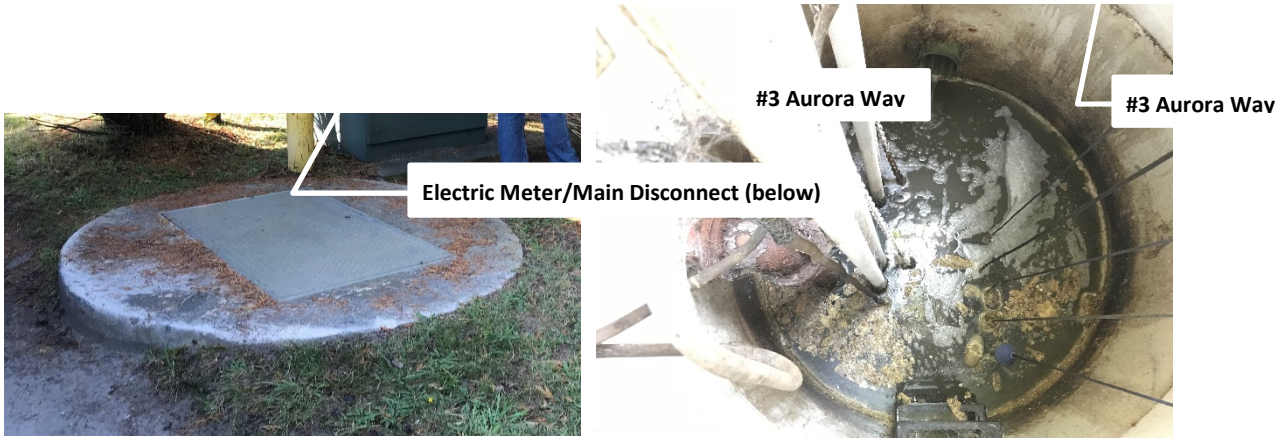
Monomoy North PS Aerial Photo



Monomoy North Site Photo

Civil/Site Observations

- Site is located in a grassed right-of-way area.
- No fencing at the site. Wetwell and valve vault are surrounded by large evergreen trees. There is access from an unpaved driveway off of Monomoy Road.
- Precast wetwell is 5-foot diameter.
    - Wetwell concrete appears in good condition, with only minor concrete spalling/pitting observed, which is typical for concrete in wastewater applications.
    - Wetwell access is via an aluminum access hatch (~24"x48"). Access hatch has safety netting for fall protection.



Wetwell

- Valve vault is on the smaller side (4' diameter manhole) and roughly 7'-8' deep. Access is provided through a standard manhole frame/cover. There also does not appear to be a drain/sump in the vault, allowing water to pond in structure.

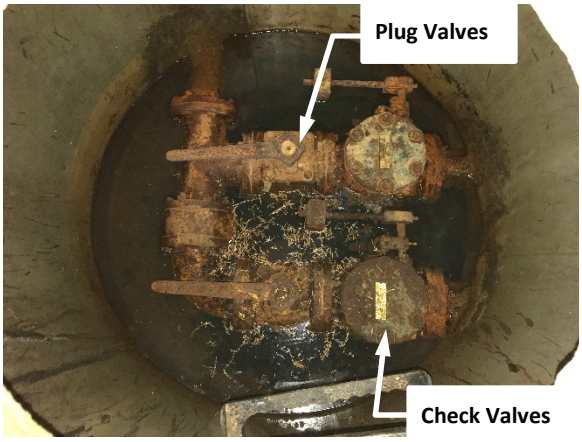
Valve Vault

Mechanical/Process Observations

- Ventilation
  - There is no wetwell vent.
- Wastewater Pump Equipment
  - Pumps are submersible type manufactured by Flygt.
    - Records reviewed at the station indicate the pumps were installed ~2002 (~17 years old).
    - Design point is unknown/not found in Town records.
  - Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.
  - Pump motors are 5 HP, 230-volt, three phase connected to VFDs.
- Piping, Gates and Valves
  - Discharge pipe is 4-inch ductile iron pipe.
    - Significant surface corrosion on the visible discharge piping/fittings.

Wetwell Piping

- All pipe, fittings, check valves and plug valves are 4" ductile iron inside the valve vault.
    - Surface corrosion on valves but does not appears to be a significant issue currently, but the piping is partially submerged, which is most likely increasing corrosion.



Valve Vault Piping

- There is no valve vault drain/sump pump to wetwell. This causes constant ponding water in the vault leading to additional corrosion on the valves and supports.
- There is no bypass connection in the valve vault or on the site. With no bypass connection, any flow handling from pump issues/failures will require pumper truck(s). Bypass pumps cannot be utilized in the current piping setup.

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical service is 230-volt, single phase.
- Backup power is provided through a portable generator plug on the side of the outdoor enclosure.

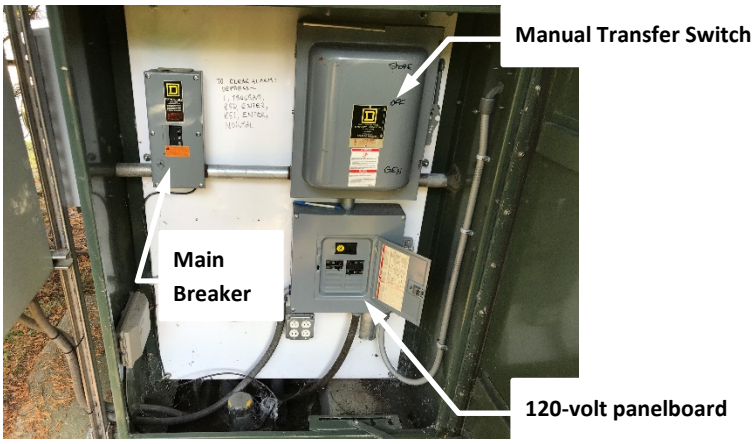
Generator Receptabl

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by a licensed electrician in accordance will all applicable industry standards and codes.

Main
Breaker

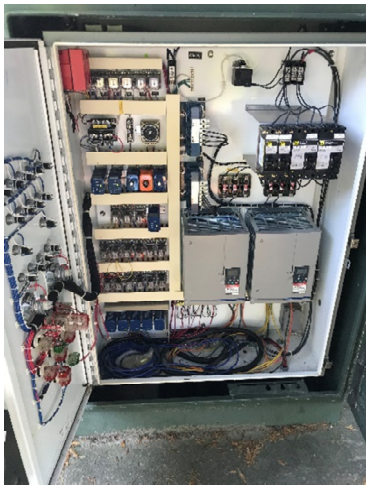
120-volt panelboard

- Main breaker, manual transfer switch and 120-volt panel board are located on one side of the double sided outdoor electrical enclosure. This breaker is the only way to fully de-energize the station, so all operators should have the key to the enclosure lock to avoid the risk of not being able to shut power off to the entire station.



Main Breaker

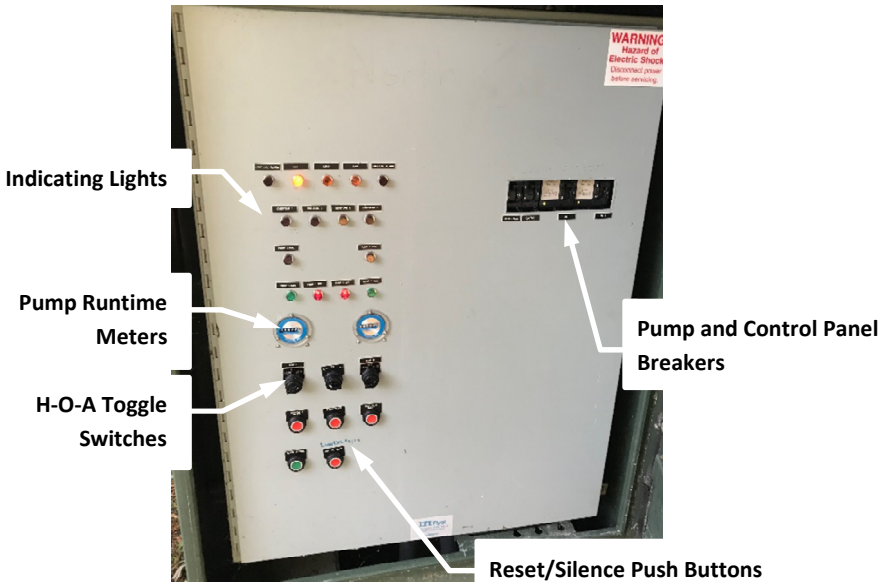
- Pump Control Panel
  - There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
  - Control panel was built by Flygt (Trumbull, CT).
  - Location of control panel is on the opposite side of the double-sided outdoor enclosure from the main breaker/transfer switch.



Pump Control Panel Interior

  - Control panel is mounted on a concrete equipment pad.
  - Panel is a painted steel cabinet.
  - Control panel has the following switches/indicating lights
    - Pump 1/2 and Control Panel and Electrical Receptacle (located on panel interior) breakers.
    - Pump 1/2 Hand-Off-Auto (H-O-A) 3-way switches.
    - Pump Alternation 3-way switch.
    - Pump 1/2 Run and Off Incandescent Indicating Lights.

- Lead and Lag Pump Indicating Light.
- High Level and Low Level (from floats) Incandescent Indicating Lights.
- Pump 1/2 Failure, Moisture and Overtemp Incandescent Indicating Lights
    - Incandescent indicating lights are becoming less frequent due to power consumption and bulb lifespan. The more common standard is LED type indicating lights with push-to-test feature to ensure bulb function.
- Pump 1/2 Runtime Meters.
- Alarm silence/reset, Mini-CAS (Flygt Pump Standard) reset, and High-Level Reset.

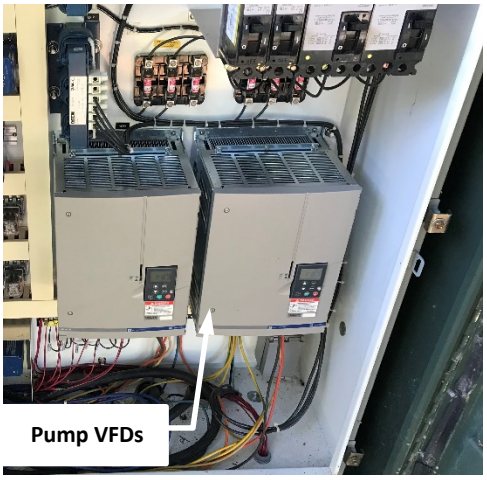


Pump Control Panel Exterior

- The pump alternator is a time-based alternation, not based on pump starts which is more typical in this application. There is a 24-hour timer with push button selectors that will alternate the pumps based on time of day.

Pump Alternator Timer Clock

- Variable frequency drive (VFD) are located in the pump control cabinet. Condition is satisfactory.



Pump VFDs

- Level Controls
  - The existing pump/level controls are from 5 floats (low level, off, lead on, lag on, high level/flood).

Level Controls

- Alarm Telemetry
  - Station alarm(s) are transmitted through a cellular autodialer (Mission). The Mission unit has been retrofitted inside the old custom radio alarm system. There are still some remaining items from the old (non-functional) system.
  - The cabinet is showing signs of corrosion at the bottom. Potential that the door seal or conduit seals have failed.
  - There is also an alarm beacon light mounted to the outdoor cabinet.

Mission Cellular Autodialer

- Other
    - Site lighting is from a single LED bulb floodlight mounted on the outdoor electrical cabinet.

Site Lighting

<u>Recommendations</u>

- The large tress on the site make access to the valve vault difficult. Review trimming some of the lower branches for better access.
- Review the need for fencing around the site for security/safety. Due to the location in a residential area, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.
- Consider adding a static wetwell gooseneck style vent to prevent concrete corrosion from the buildup of hydrogen sulfide inside the wetwell.

- The pumps are ~17 years old and nearing the end of useful life of rotating mechanical equipment. A plan should be made to replace the pumps.
- Either an external or internal (inside valve vault) bypass connection should be added.
    - Review the need for a larger valve vault to accommodate the bypass internally and for better access.
- A sump pump or drain (with P-trap) should be added into the wetwell from the valve vault. Add needed concrete to pitch the floor to the sump/drain to avoid ponding inside the structure.
- New submersible transducer with backup floats should be installed for wetwell level/pump control.
    - Submersible transducer should be installed in a 6-inch (min) PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.
- The time-based alternator should be replaced with a pump-based cycle alternator which would alternate the pumps during each cycle.
- Plug and check valves are corroded, and a plan should be made for replacement.
- Non-functional alarm telemetry equipment should be removed to avoid operator confusion.
- Review the door gasket and conduit seals on the alarm telemetry panel and replace as necessary.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

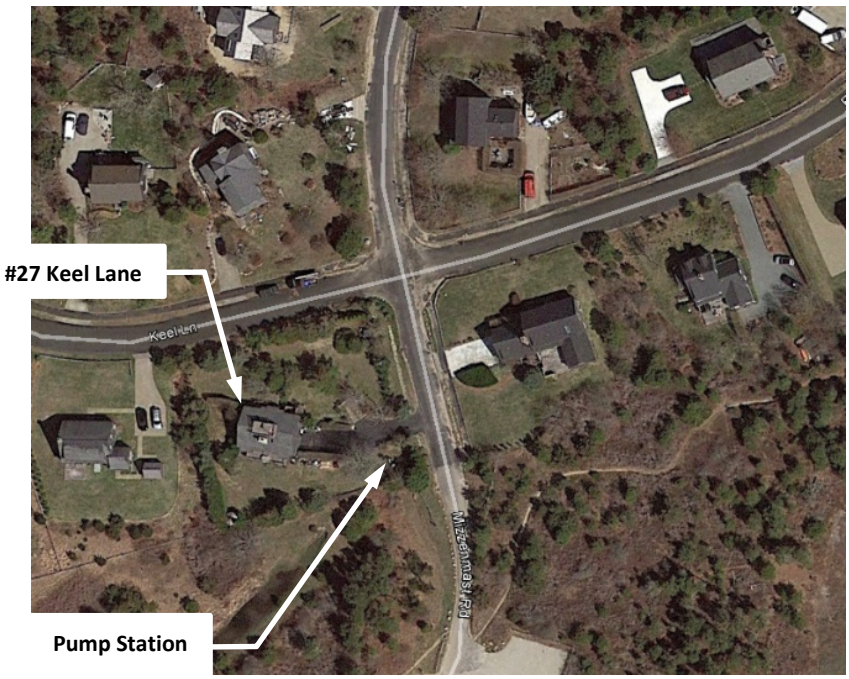
SUBJECT: Pine Valley Pump Station Evaluation

CC:

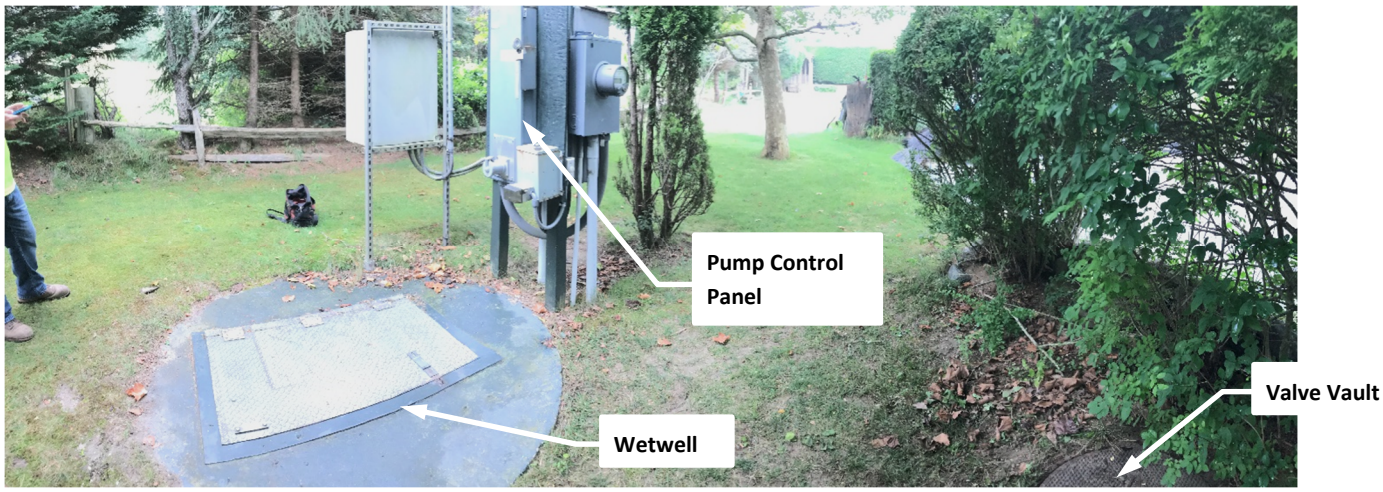
Weston & Sampson performed a field visit to the Pine Valley Pump Station on 08/01/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Pine Valley Pump Station is located on Mizzenmast Road near the intersection with Keel Lane. It is located in the yard of #27 Keel Lane. Based on available information, the pump station was constructed in 1988 (31 years old). The pump station is a submersible type, with a ~6-foot diameter precast wetwell and a concrete block below grade valve vault (~4'x4').



Pine Valley Pump Station Aerial Photo

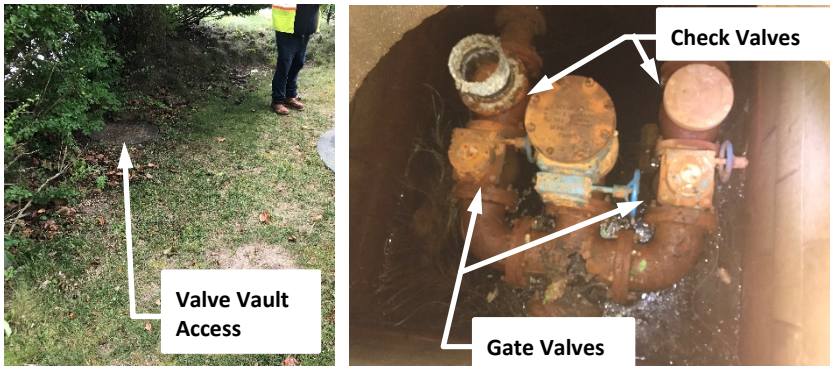


Civil/Site Observations

- Site is located in a grassed easement area, located in the yard of #27 Keel Lane.
- No fencing at the site.
- Precast wetwell is 6' diameter precast concrete.
    - Precast concrete appears in good condition, with only minor concrete spalling/pitting in the wetwell which is typical for concrete in wastewater applications.
    - Wetwell access is via an aluminum access hatch (24"x48").

Wetwell

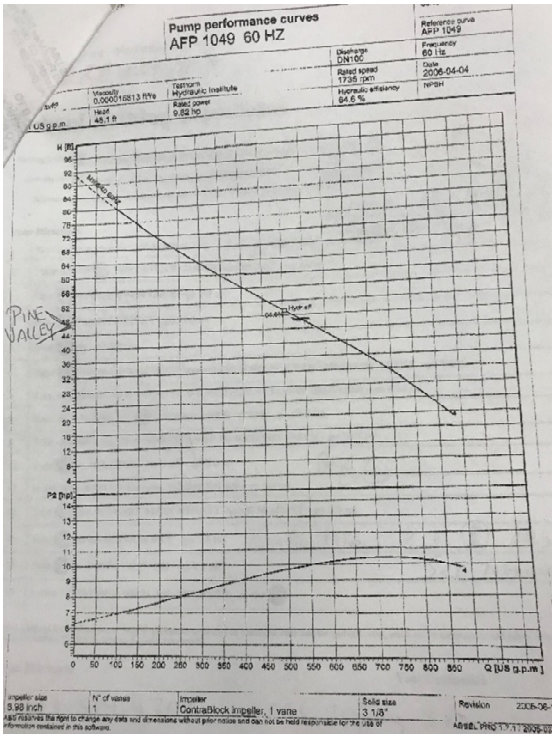
- Valve vault is 4'x4' rectangular concrete block.
    - Access is via a manhole frame and cover.
    - The access is somewhat difficult due to proximity of existing trees/shrubs.
    - No drain or sump pump in vault, so water is ponding at the bottom of the structure.



Valve Vault

Mechanical/Process Observations

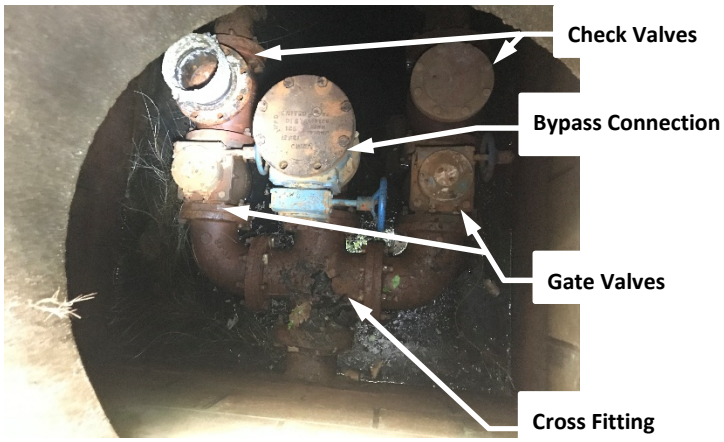
- Ventilation
  - There was no wetwell vent observed at the station.
- Wastewater Pump Equipment
  - Pumps are submersible manufactured by ABS Model AFP 1049, per available records. These pumps do not appear to be original to the station and were replaced in ~2007 (12 years old) based on available records.
  - Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.
  - Pump motors are 15 horsepower, three phase with full voltage motor starters.
  - Pump rails appear pitted and starting to corrode.



Existing Pump Curve

- Piping, Gates and Valves
  - The forcemain piping in the wetwell and valve vault is 4-inch flanged ductile iron.

Wetwell



Valve Vault

- Wetwell piping has surface corrosion.
- Valve vault piping has slight surface corrosion, except for the 4" cross fitting, which has more significant corrosion. This also may be more of a specialty type fitting, which could lead to longer lead times to replace.
- Gate and check valves have corrosion around the operators which could limit ability to operate.
- There is a vertical bypass connection in the valve vault
- No valve vault drain or sump pump leading to ponding inside valve vault.

Electrical & Instrumentation & Controls (I&C) Observations[1]

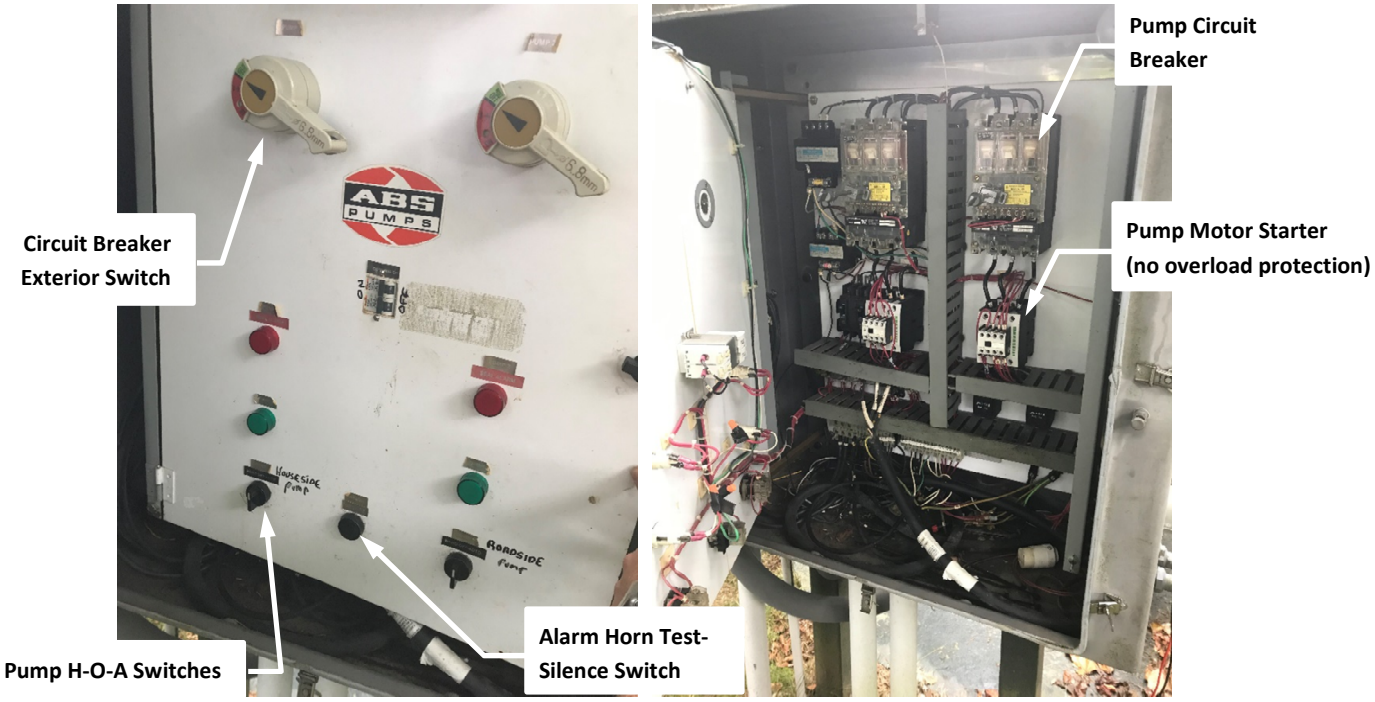
- Electrical Service
  - Electrical service is 240-volt, three phase per available records. Main Electrical service comes into the manual transfer switch (located on the opposite side of the pump control panel), which has a portable generator plug for backup power. The transfer switch is a knife gate with 3 replaceable fuses for each power phase.
    - Replaceable fuses in this application are older technology (compared to solid state circuit breakers) and could lead to issues if replacement fuses are not available at the site.
  - No main breaker. Only way to kill power to station is to throw the manual transfer switch. If station were to be on generator power, and the electric service came back on, there would be no immediate way to remove power to the station, as both the feeds inside the transfer switch would be live.

Manual Transfer Switch

- Pump Control Panel

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by an licensed electrician in accordance will all applicable industry standards and codes.

- There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
- Panel was built by ABS Pump.
- Control panel is mounted on plywood mounted to pressure treated wooden 4x4 posts.
- Control panel is dated and appears original to the station (~31 years old). The panel components may now be obsolete.
- Panel has a steel front and is located in a fiberglass enclosure.
- Circuit breakers for each pump, with external hand switches to operate when the panel is closed.
- Three phase full voltage motor starters with no visible overload protection. Pumps are wired directly into the starters. With no overload available to protect the pumps, damage could occur to the pump motors if abnormal current comes from the incoming power source.
- Control panel has the following switches/indicating lights
    - Dual circuit breaker for Control Panel Power.
    - Pump 1/2 Hand-Off-Auto (H-O-A) 3-way switches.
    - Pump 1/2 Run Incandescent Indicating Lights.
    - Pump 1/2 Seal Fail Incandescent Indicating Lights.
        - Incandescent indicating lights are becoming less frequent due to power consumption and bulb lifespan. The more common standard is LED type indicating lights with push-to-test feature to ensure bulb function.
    - Alarm Horn Silence switch.
- There are no runtime meters located on the pump control panel. Runtimes are logged on the alarm telemetry panel display. This could lead to non-trackable pump run hours at the station if the alarm panel is replaced or down.



Pump Control Panel

- Level Controls
  - The existing pump/level controls are from 4 floats (off, lead on, lag on, high level/flood).

Wetwell

- Alarm Telemetry
  - Station alarm(s) are transmitted through a custom radio alarm telemetry system. The panel was built by Electrical Installations, Inc. (EEI). Radio antenna mast is mounted on the Unistrut alarm panel support.
    - The alarm panel includes an Allen-Bradley Micro Logix 1500 Programmable Logic Controller (PLC), with custom programming to transmit the alarm signals relayed from the pump control panel.

Alarm Telemetry Panel

- Other
  - Site lighting is from a single LED bulb floodlight mounted on a mast off the control panel wooden post supports.
  - Outdoor electrical receptacle located on the wooden control panel supports next to the manual transfer switch.

Site Lighting

Outdoor Elec. Receptacle

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 300 to 330 gpm.
    - Pump 2 – 240 to 280 gpm
    - Pump 1 & 2 together – 380 gpm

While there are outside factors that can cause differing drawdown flows between pumps (i.e. larger variations in influent flows during testing), the drawdown flows are a good indication of pump condition, as any damaged/worn pump components and/or clogging can result in lower flow outputs.

Recommendations

- Review relocating the site. The site is currently in the yard of 27 Keel Lane, and the only main access is through the driveway to the property.
- Review the need for fencing around the site for security/safety. Due to the location in a residential area, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.
- Consider adding a static wetwell gooseneck style vent to prevent concrete corrosion from the buildup of hydrogen sulfide inside the wetwell. A replaceable carbon filter can be added to the vent if odors are a concern.
- Existing control panel is dated and should be replaced. Install a new pump control panel with new variable frequency drives (VFDs) in a new outdoor electrical enclosure.
- Existing pressure treated control panel supports are not permanent (will eventually rot and need replacement). The new control panel/enclosure shall be more permanently mounted on either stainless steel Unistrut or a concrete pad (depending on proposed enclosure size).
- Add a separate manual transfer switch, with solid state circuit breakers with outdoor generator receptacle (to match Town's generator plug) in the electrical enclosure.

- Add a separate main breaker to fully isolate the pump control panel from electricity and to allow de-energizing of the entire station at any time.
- New submersible transducer with backup floats should be installed for wetwell level/pump control.
    - Submersible transducer should be installed in a PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.
- The pumps are 12-years old and are nearing useful life for mechanical equipment (typ. 20 years). It is recommended to replace the pumps/motors with new submersible pumps with three phase motors and new variable frequency drives (VFDs) if any station upgrade/replacement takes place.
    - New VFDs will convert the current single-phase electrical service to three phase, while also allowing the ability to vary the pump output to account for varying residential type influent flows.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- Piping and valves (gates and checks) in valve vault should be replaced during any upgrade/replacement project as the current are corroded and are aging.
- When piping/valves are replaced, review adding a sump with a sump pump or drain directed to the wetwell to avoid ponding inside the structure.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

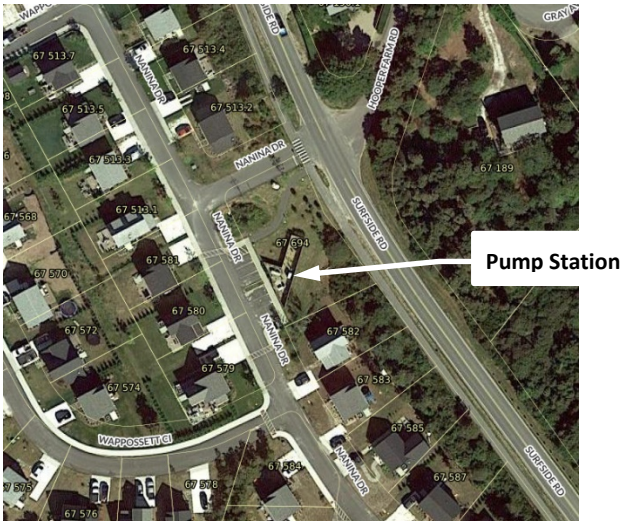
M E M O R A N D U M

TO:	David Gray, Sewer Director
FROM:	Weston & Sampson
DATE:	September 17, 2019
SUBJECT:	Sachems Path Pump Station Evaluation
CC:	

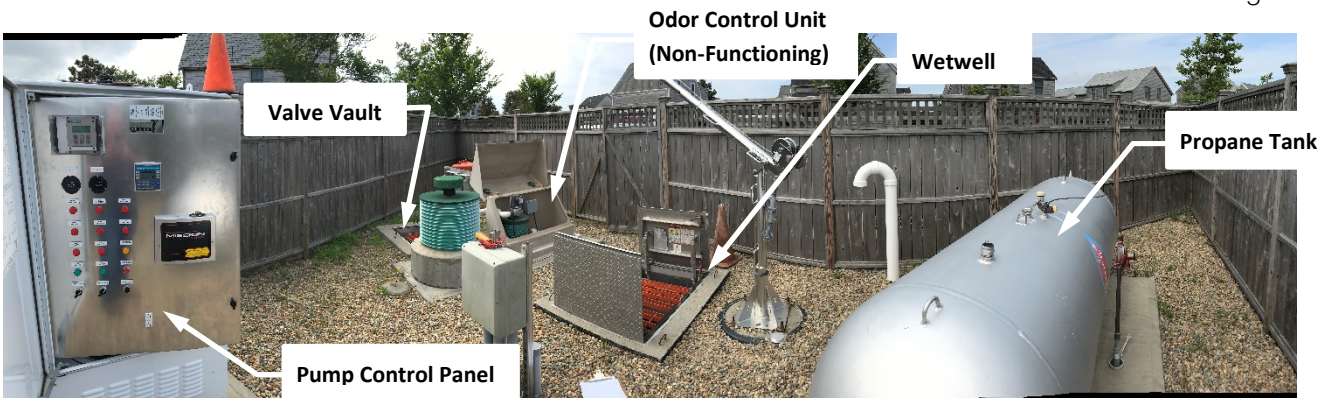
Weston & Sampson performed a field visit to the Sachems Path Pump Station on 08/1/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Sachems Path Pump Station is located at #13 Nanina Drive. The entire site has crushed stone on the ground surface. The pump station is a submersible type, with a circular wetwell (8' diameter), a rectangular below grade valve vault (~8'x8') and a circular below grade flow meter vault (~6' diameter). The station has a motor control center (MCC), pump control panel and alarm telemetry panel mounted on concrete pad, adjacent to the wetwell. There is a propane generator towards the back of the site, with a above ground propane tank adjacent to the wetwell. A non-functional odor control unit is also located adjacent to the wetwell. The station is also surrounded by a ~6' high wooden fence, with gates on the front and back of the site.



Sachems Path Pump Station Aerial Photo



Sachems Path Site Photos

Civil/Site Observations

- Site is located in a ~6-foot high fenced site with crushed stone base.
- Precast wetwell is 8-foot diameter.
    - Wetwell concrete appears in good condition, with only minor concrete spalling/pitting observed, which is typical for concrete in wastewater applications.
    - Wetwell access is via an aluminum access hatch (36"x48"). Access hatch has a hinged safety grate for fall protection.
    - There is a portable stainless-steel pump retrieval crane and manual winch mounted adjacent to the wetwell. Crane, winch and cable are in good condition.
    - 4-inch PVC static wetwell vent (candy cane style) is located adjacent to the wetwell and propane tank.

Wetwell

- There is an offline ~5,000-gallon buried emergency storage tank on Nanina Drive. The wetwell has an overflow pipe to this tank.
- Valve vault is ~8'x8'. Access is provided through a 24"x24" aluminum hatch with a hinged safety grate for fall protection.

Valve Vault

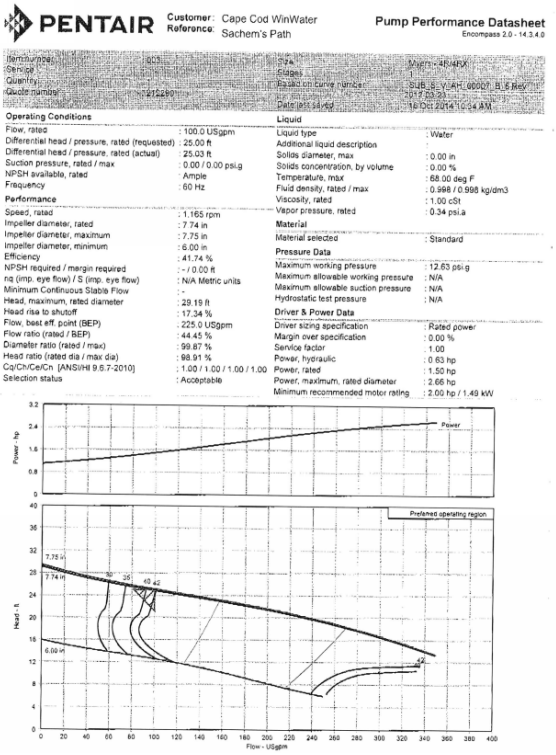
Mechanical/Process Observations

- Ventilation
  - There is a ~4" PVC static wetwell vent.
  - The carbon type odor control ventilation system is non-functional and does not appear to even be wired electrically.
    - It is not clear how this system would have been activated, as it's not wired to the MCC or control panel, nor does it appear there is any programming/logic on when the odor control system would run.
    - It could not be determined during the field visit if the vent actually connected into the wetwell, as the location is blocked from viewing by the top slab.
    - The concrete base to the unit was also cracking and spalling significantly.
    - The amount and/or condition of the carbon media could not be determined.

Non-Functional Odor Control Unit

- Wastewater Pump Equipment
  - Pumps are submersible manufactured by Myers.
    - Pumps are model 4RX, 4" discharge with 7.74" impeller.

- Records from the Town indicate the pumps were installed in approximately 2015 (~4 years old).
- Listed design point is 100 gpm at 25-feet total dynamic head (TDH).



PENTAIR Customer: Cape Cod WinWater Reference: Sachem's Path

Pump Performance Datasheet

Encompass 2.0 - 14.3.4.0

Item number	001	Size	Model - 4RJ4RX
Service		Stages	1
Quantity		Based on curve number	SUB_S_V-SH_00007_B_6.dwg
Quote number	1412280	Last modified	2017-09-33
		Date last saved	18 Oct 2014 10:44 AM

Operating Conditions		Liquid	
Flow, rated	: 100.0 USgpm	Liquid type	: Water
Differential head / pressure, rated (requested)	: 25.00 ft	Additional liquid description	:
Differential head / pressure, rated (actual)	: 25.03 ft	Solids diameter, max	: 0.00 in
Suction pressure, rated / max	: 0.00 / 0.00 psi.g	Solids concentration, by volume	: 0.00 %
NPSH available, rated	: Ample	Temperature, max	: 68.00 deg F
Frequency	: 60 Hz	Fluid density, rated / max	: 0.998 / 0.998 kg/dm3
Performance		Viscosity, rated	: 1.00 cSt
Speed, rated	: 1,165 rpm	Vapor pressure, rated	: 0.34 psi.a
Impeller diameter, rated	: 7.74 in	**Material**	
Impeller diameter, maximum	: 7.75 in	Material selected	: Standard
Impeller diameter, minimum	: 6.00 in	**Pressure Data**	
Efficiency	: 41.74 %	Maximum working pressure	: 12.63 psi.g
NPSH required / margin required	: - / 0.00 ft	Maximum allowable working pressure	: N/A
nq (imp. eye flow) / S (imp. eye flow)	: N/A Metric units	Maximum allowable suction pressure	: N/A
Minimum Continuous Stable Flow	: -	Hydrostatic test pressure	: N/A
Head, maximum, rated diameter	: 29.19 ft	**Driver & Power Data**	
Head rise to shutoff	: 17.34 %	Driver sizing specification	: Rated power
Flow, best eff. point (BEP)	: 225.0 USgpm	Margin over specification	: 0.00 %
Flow ratio (rated / BEP)	: 44.45 %	Service factor	: 1.00
Diameter ratio (rated / max)	: 99.87 %	Power, hydraulic	: 0.63 hp
Head ratio (rated dia / max dia)	: 98.91 %	Power, rated	: 1.50 hp
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00	Power, maximum, rated diameter	: 2.66 hp
Selection status	: Acceptable	Minimum recommended motor rating	: 2.00 hp / 1.49 kW

Pump Records from Town

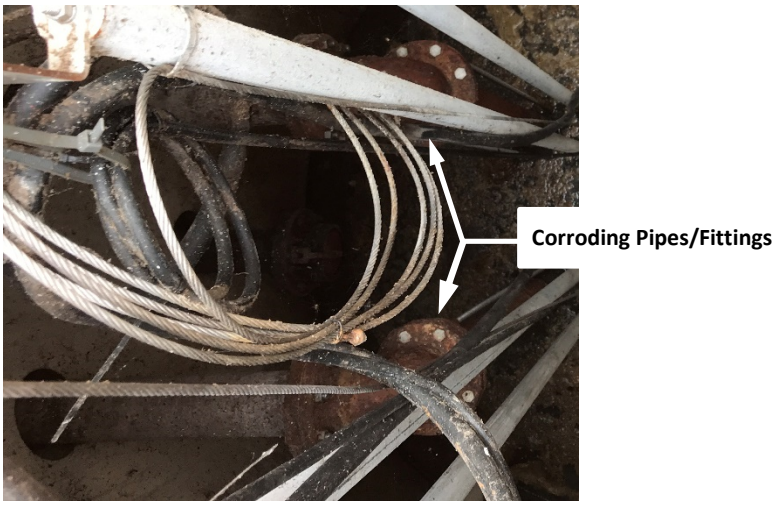
- Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.
- Pump rails/bracket are pitted and showing some corrosion. It does not appear that these are stainless steel which should be standard in a wastewater application.

Pump Rails

- Pump motors are 5 horsepower, per electrical MCC drawing at the station. Motors are single phase with run/start capacitor starters.

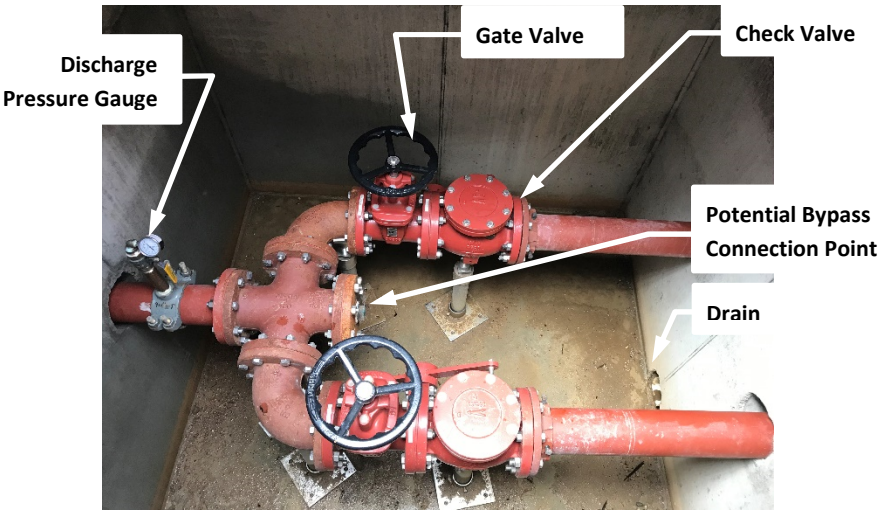
- Piping, Gates and Valves
  - Pump discharge piping in the wetwell is 4".

- Pipe and fittings in wetwell are starting to pit/corrode. Does not appears to be a significant issue currently



Wetwell Piping

- All pipe, fittings, check valves and gate valves are 4" inside the valve vault.
    - Slight surface corrosion on piping but does not appears to be a significant issue currently. Valves are in good condition.
    - Pipe/fittings appear to only have a primer coat of paint, while the valves have a final epoxy coating.



Valve Vault Piping

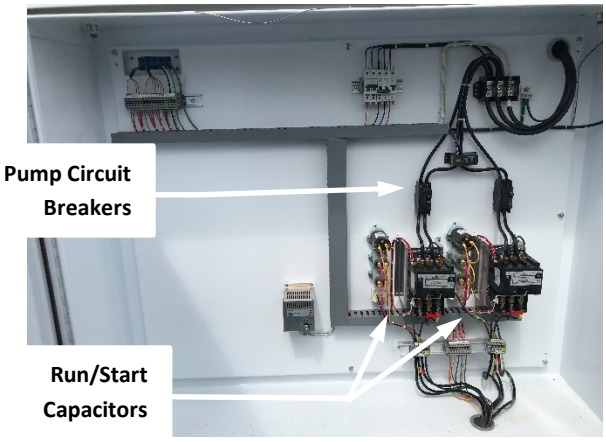
- There is a drain in the bottom of the structure that is directed to the wetwell. The presence of a trap, to prevent wetwell gasses from entering the valve vault, could not be determined from the field visit.
- Discharge pressure gauge on the forcemain before exiting the valve vault.
- Bypass could be achieved through the cross fitting, as one side has a blind flange that can be removed for a bypass connection.
    - It does not appear that a bypass connection fitting is available at the site.

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
  - Electrical service is 230-volt, single phase.
  - Electric meter is on a standalone pedestal, mounted on the electrical enclosure concrete pad.
  - The electrical enclosure is two sided. One side houses the motor control center (MCC), while the opposite side houses the pump control panel and main circuit breaker/automatic transfer switch (ATS) in separate bays.
    - Enclosure has an external LED indicator to show if power is present to the panel without opening the enclosure (for safety).

Electrical Enclosure Exterior

- Motor Control Center (MCC)
  - The MCC was built by Primex (Ashland OH)
  - The MCC houses the pump circuit breakers (70 amp), and single-phase capacitor (run and start) motor starters.
  - These are located separately from the pump control panel, separating higher voltage (230v) items with lower voltage (120v, 24v) items.

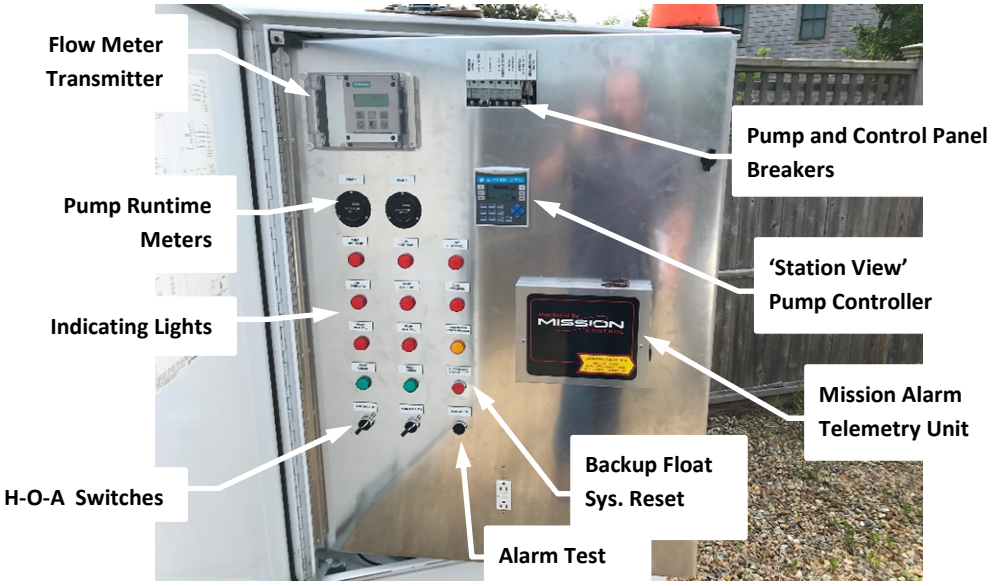


MCC Interior

- Pump Control Panel

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by a licensed electrician in accordance will all applicable industry standards and codes.

- Control panel was built by Primex (Ashland OH) in 2015.
- Control panel is mounted inside the electrical control cabinet, on a concrete pad.
- Control panel has the following switches/indicating lights
    - Pump 1/2 Hand-Off-Auto (H-O-A) three-way type switches.
    - Pump 1/2 Run LED Indicating Lights.
    - Pump 1/2 Seal Fail LED Indicating Lights.
    - Pump 1/2 Overload LED Indicating Lights.
    - Pump 1/2 High Temperature LED Indicating Lights.
    - Float High Level and low-level LED Indicating Lights.
    - Float Backup System LED Indicating Light.
    - Float Backup System Reset.
    - Pump 1/2 Analog Runtime Meters.
    - Alarm Test.
    - Alarm Beacon (on top of enclosure).



Pump Control Panel

- The control panel has a 'Station View' pump controller, which signals the pumps to run based on the wetwell levels. The controller also has logic to calculate an estimated pump flow rate based on the rising and falling of the wetwell level during operation.

- Level Controls
    - The primary pump/level controls are from a submersible transducer (in a stilling well)
    - The station also has secondary (backup) float controls, consisting of 5 floats (low level, off, lead on, lag on, high level/flood).
        - The station will run independently off the secondary float controls, should the transducer fail. It appears that this occurs if the lag float is activated.
- Flow Meter
    - The station has a Siemens 4" magnetic flow meter, located in the flow meter vault.
        - There is a PVC ball valve located directly downstream of the flow meter. Typically, the general rule of thumb for magnetic flow meters is for straight piping five-

diameter length upstream and three diameters downstream from the meter. When these lengths are not met, the accuracy of the meter can be affected.

- The flow meter transmitter/display is located on the pump control panel.
    - Flowmeter needs programming to change the settings. It is currently displaying in metric units.

Flow Meter Vault Interior

- Alarm Telemetry
    - Station alarm(s) are transmitted through a cellular autodialer (Mission) mounted on the front of the pump control panel.
- Standby Generator
    - The station's standby power comes from a Generac 20kW propane 'Guardian Series' generator. The automatic transfer switch is located in the cabinet next to the pump control panel in the electrical enclosure.
        - The 'Guardian Series' is a residential home type model, not typically used for municipal/industrial operations.
    - The generator is pad mounted and located at the rear of the site. The propane tank is located adjacent to the wetwell.

Standby Generator and ATS

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – ~140 to 145 gpm.
    - Pump 2 – ~143 to 148 gpm.

While there are outside factors that can cause differing drawdown flows (i.e. larger variations in influent flows during testing), the drawdown flows are a good indication of pump condition, as any damaged/worn pump components and/or clogging can result in lower flow outputs.

Both of these flow rates are above the listed design rates (per Town's records) of 100 gpm. Based on discussions with operators, it appears this station's capacity is sufficient (i.e. no significant high-level alarms occurring; no flooding observed). The most likely reason for larger outputs is that the original design was conservative when calculating the station hydraulics. Actual field conditions resulted in a lower TDH, resulting in higher pump flows.

Recommendations

- Review the need to keep a bypass connection fitting on-site. This would be to avoid delays if bypass is ever needed.
- Currently, the existing plans show a flap valve, which may not seal fully if debris becomes logged in the valve seat. It is recommended to install a tide flex style check valve to ensure wetwell gasses or wastewater are not able to enter the valve vault.
- Calibrate flow meter and determine if the location adjacent to the ball valve is providing accurate readings. In addition, flow meter settings should be re-programmed to display the correct flow units (gallons).
- If odor control is warranted, the existing unit should be replaced or retrofitted. The new odor control unit should have programming and/or logic to automatically operate only when required.
    - Another option to consider is adding a replaceable carbon filter to the existing wetwell vent.
- Replacement of the generator and ATS with a model made for industrial/municipal operations is recommended.
- The ductile iron wetwell and vault piping should be epoxy painted to prevent further external corrosion.
- Replace the pump rails with stainless steel.
- The pumps and capacitor starters are in satisfactory condition, however, if an upgrade to this station is performed, it is recommended to replace the pumps/motors with new submersible pumps with three phase motors and new variable frequency drives (VFDs). While single phase power is sufficient for 5 horsepower motors and lower, three phase motors allows for smaller, typically less expensive motor wiring, draw less current than a similar sized single-phase motor and are generally more electrically efficient. The Town has also had past issues with the single-phase capacitor starters at other stations (Cato Lane).
    - New VFDs will convert the current single-phase electrical service to three phase, while also allowing the ability to vary the pump output to account for varying residential type influent flows.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

SUBJECT: Sherburne Commons Pump Station Evaluation

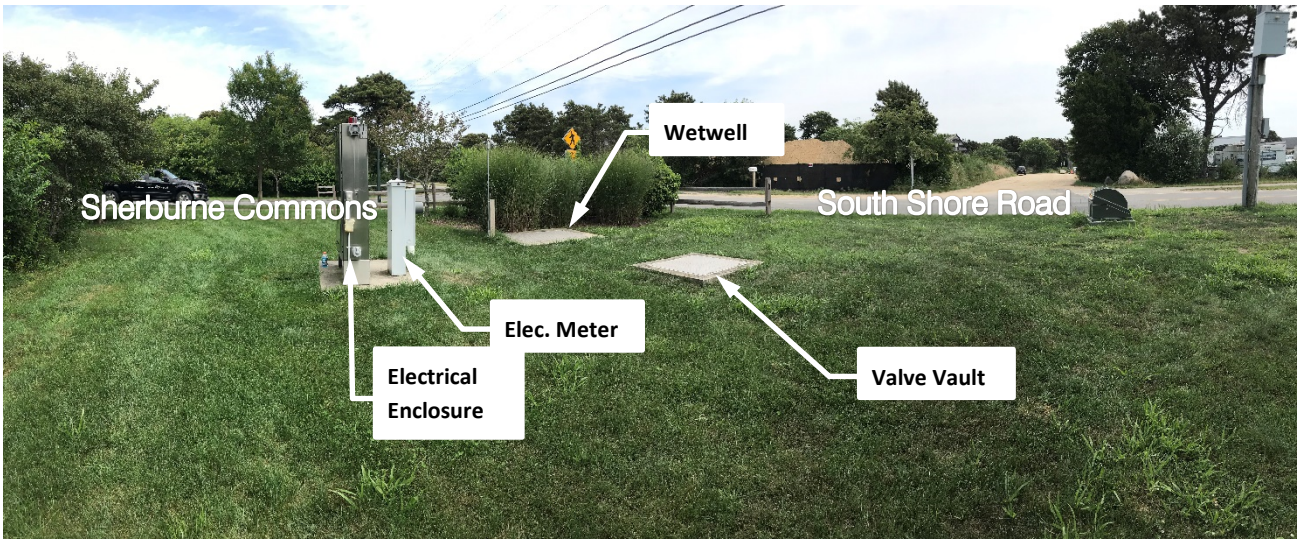
CC:

Weston & Sampson performed a field visit to the Sherburne Commons Pump Station on 08/01/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Sherburne Commons Pump Station is located at the Sherburne Commons driveway entrance on South Shore Road. The station was built in 2006± (~13 years old). The pump station is a submersible type, with a circular wetwell (8' diameter) and a rectangular below grade valve vault (~5'x5'). There is a stainless-steel electrical enclosure housing the pump control panel, transfer switch, alarm telemetry unit, etc. The outdoor enclosure is mounted on a concrete pad. The electric meter is on a separate pedestal mounted on the same concrete pad.

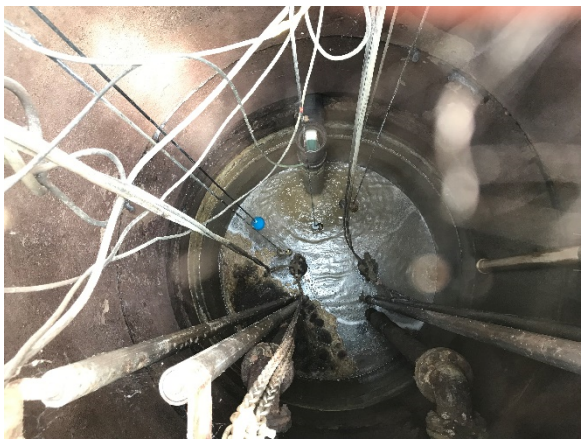
Sherburne Commons PS Aerial Photo



Sherburne Commons Pump Station Site Photo

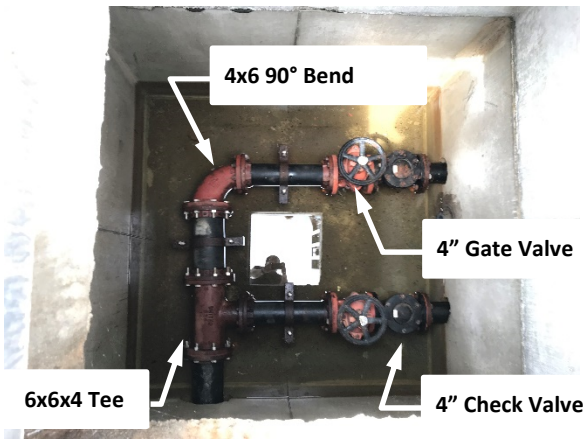
Civil/Site Observations

- Site is located in the grassed area at the intersection of Sherburne Commons and South Shore Road.
- No fencing and or traffic protection (i.e. bollards) at the site.
- Access/parking to the site is along Sherburne Commons or South Shore Road.
- Precast wetwell is 8-foot diameter.
    - Wetwell concrete appears in fair condition. There is some concrete spalling/pitting observed around the water level. While this is somewhat typical for concrete in wastewater applications it should be patched/parged to prevent further degradation.
    - Wetwell access is via an aluminum access hatch (~36”x36”). Access hatch has safety netting for fall protection and appears in satisfactory condition.



Wetwell

- Valve vault is ~5’x5’ precast concrete. Access is provided through a 30”x30” aluminum hatch.



Valve Vault

Mechanical/Process Observations

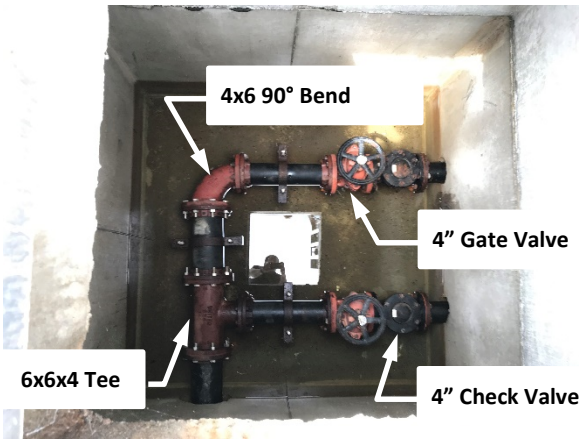
- Ventilation
  - There is a PVC static wetwell vent adjacent to the electrical enclosure. There appears to be a replaceable carbon filter on the wetwell vent.

Wetwell Vent

- Wastewater Pump Equipment
  - Pumps are submersible solids handling Myers pumps. The town has no available records on the pumps.
    - Pumps appear to be 4" discharge.
  - Because the pumps were submerged, no visual observations of the pump condition could be made during the evaluation.
  - The pump rails are showing signs of pitting/corrosion, and do not appear to be stainless steel which is typical for wetwell applications.
- Piping, Gates and Valves
  - Discharge piping and valves are 4-inch. The piping eventually changes over to 6-inch in the valve vault before existing. Piping in the wetwell is flanged ductile iron (DI).
  - The wetwell piping is showing signs of corrosion, however, it appears to be only surface. The condition of the pipe and valves in the wetwell is satisfactory. The piping only has a primer coating with no epoxy top coat.

- There is no bypass connection for the station. With no bypass connection, any flow handling from pump issues/failures will require pumper truck(s). Bypass pumps cannot be utilized in the current piping setup.
- The drain in the valve vault is not set flush with the floor. This leads to constant water in the vault. This could lead to additional corrosion on the valves and supports.

Wetwell Piping



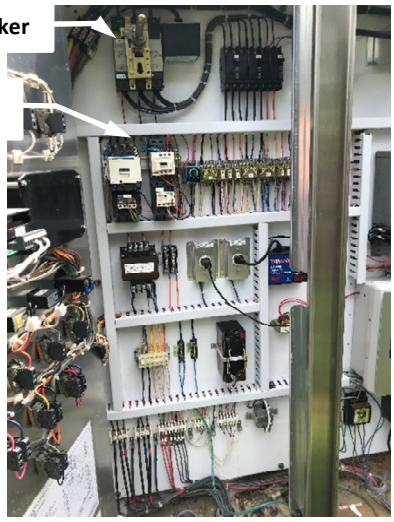
Valve Vault Piping/Valves

Electrical & Instrumentation & Controls (I&C) Observations[1]

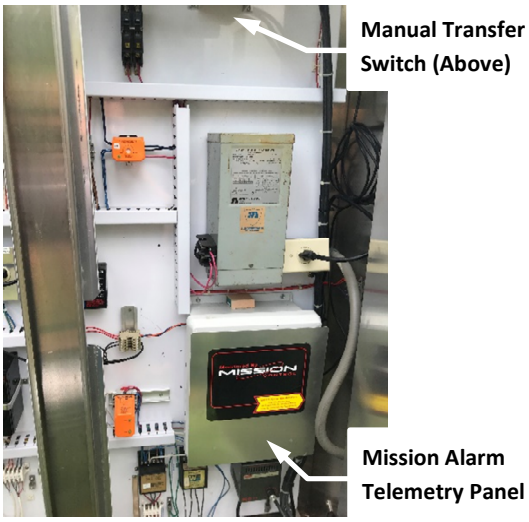
- Electrical Service
  - Electrical service is 208-volt, three phase.
  - Backup power is provided through a portable generator plug on the side of the panel.
- There is a main circuit breaker below the electric meter.
- The electrical enclosure houses the pump control panel, alarm telemetry panel, transformers, motor starters, and other miscellaneous electrical circuit breakers and relays.

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by a licensed electrician in accordance will all applicable industry standards and codes.

Electrical Enclosure

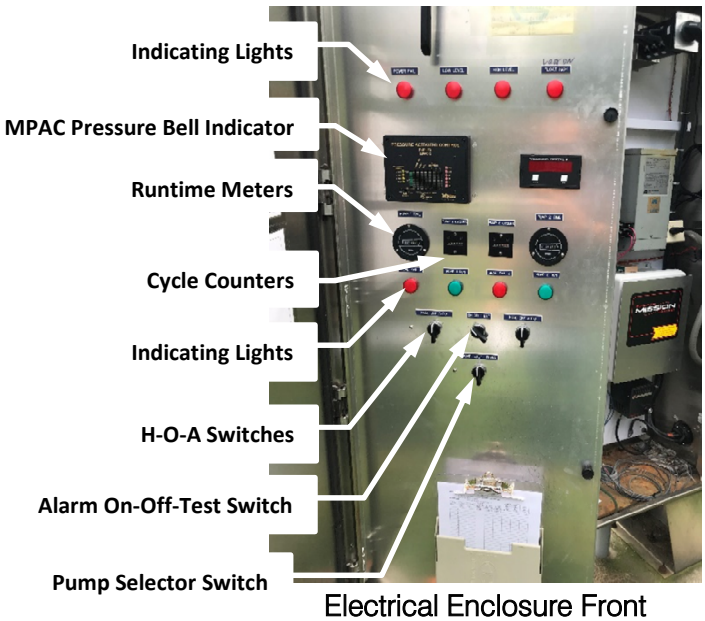


Left Side of Elec. Enclosure



Right Side of Elec. Enclosure

- Pump Control Panel is located on the left side cabinet of the electrical enclosure.
  - There is not a separate motor control center (MCC). The pump control panel houses all the typical motor control items.
  - Control panel was built by Myers (Ashland, OH).



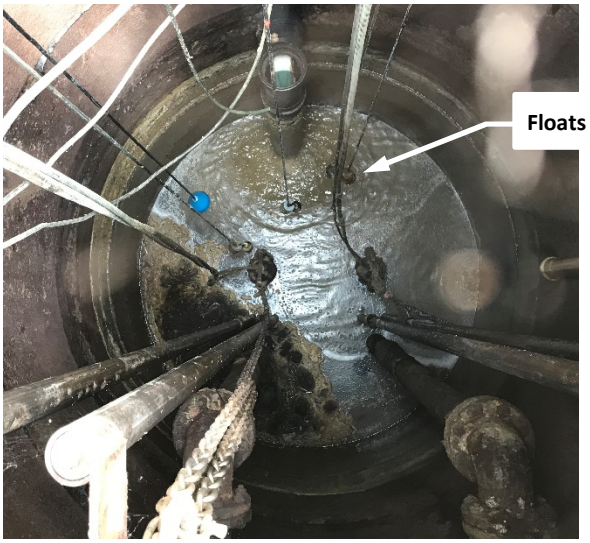
Electrical Enclosure Front

  - Control panel has the following switches/indicating lights
    - Main Control Panel breaker.
    - Pump 1/2 Hand-Off-Auto (H-O-A) three-way switches.
    - Alternation/Lead/Lag three-way switch (Pump 1, Alternate, Pump 2)
    - Pump 1/2 Run Incandescent Indicating Lights.
    - Pump 1/2 Seal Fail Incandescent Indicating Lights.
    - High Level and Low-Level Alarm Incandescent Indicating Lights (From MPAC Pressure Bell).
    - High Level Float Incandescent Indicating Lights

        - Operators have had issues with high level signals, so this indicating light has been modified to show when the lag pump is on.
        - Incandescent indicating lights are not standard anymore due to power consumption and lifespan. Industry standard are LED type indicating lights with push-to-test feature.
    - Pump 1/2 Runtime Meters.
    - Pump 1/2 Cycle Counter.
    - Alarm On-Off-Test three-way switch.
    - MPAC pressure bell controller and digital level display.
        - Town is having issues with these units. It appears that the pressure bell or controller unit are non-functional.
- Full voltage motor starters with overloads. It appears one of the starters is original and one has been replaced.

Pump Motor Starters

- Level Controls
    - The existing pump/level controls are from a MPAC Pressure Bell digital level controller and 2 backup floats (off, pump on), however, the MPAC Pressure Bell is non-functional. The system has been modified to be fully float controlled.



Wetwell Level Controls

- Alarm Telemetry
    - Station alarm(s) are transmitted through a cellular autodialer (Mission) mounted inside the electrical enclosure.
- Site Lighting
    - Site lighting is from a single LED bulb floodlight mounted adjacent to the wetwell. The switch is located on the side of the Pump Control Panel.

Site Lighting

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 248 gpm.
    - Pump 2 – 310 gpm.
    - Pump 1 & Pump 2 together – 343 gpm.

Based on the reviewed information, the original design flow rates are not known. Because of this it is difficult to determine if there may be issues with the pump's operation. Overflows were not mentioned during discussions with the operators, nor was there evidence of flood levels at the wetwell. This can be indicative of the pumps output being adequate for the current influent flows to the station, however, further investigation/review is recommended to verify pump capacity is adequate.

Recommendations

- Review the need for fencing around the site for security/safety. Due to the location in a residential area, fencing for security purposes may not be required, but it may be recommended for safety concerns around the wetwell (hazardous area) and live electrical equipment. This is not a requirement, as it may not be aesthetically pleasing for the surrounding abutters.
- New submersible transducer with backup floats should be installed for wetwell level/pump control. The existing MPAC pressure bell pump controller should be removed.
    - Submersible transducer should be installed in a PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.

- The pumps are assumed to be original (~13 years old) and nearing the end of useful life of rotating mechanical equipment (typ. 20 years). It is recommended to start planning on pump replacements at the station to ensure long-term reliability.
    - During pump replacement design, verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- It is recommended to replace the existing pump control panel with a new PLC based control panel during any station upgrade. The new panel would include new properly sized variable frequency drives (VFDs) or soft starters, eliminating the start/run capacitors.
- The ductile iron wetwell and vault piping should be epoxy painted to prevent further external corrosion.
- A bypass connection should be installed.
    - Review the wetwell sizing to ensure a bypass could be installed in the existing structure. If not, review the potential for a separate bypass vault or an external bypass connection.
- Install bollards around the electrical enclosure for traffic protection.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

M E M O R A N D U M

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

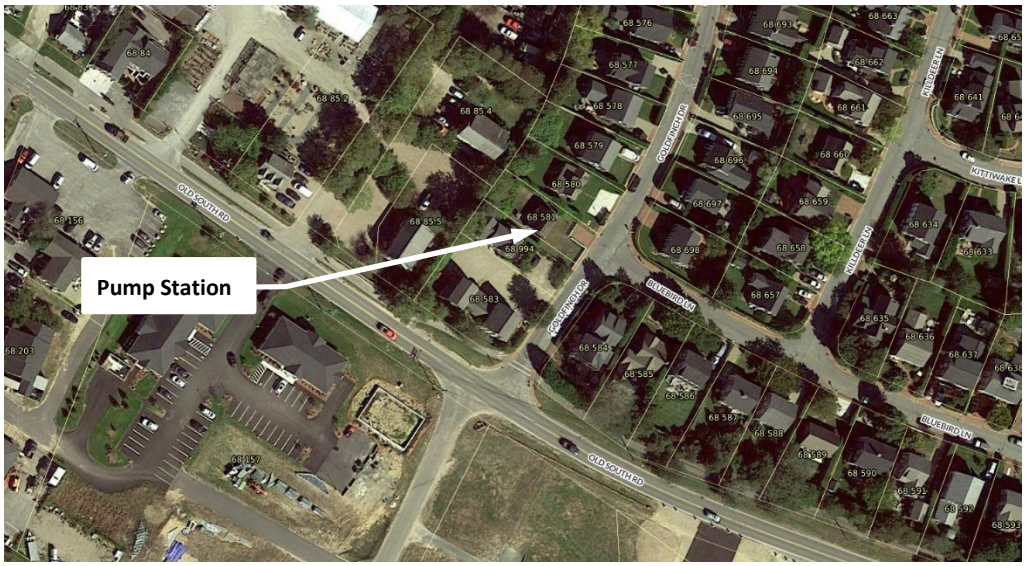
SUBJECT: South Valley Pump Station Evaluation

CC:

Weston & Sampson performed a field visit to the South Valley Pump Station on 08/01/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The South Valley Pump Station is located at #95 Goldfinch Drive near the intersection with Bluebird Lane. Records provided by the Town indicate that the pump station was constructed in approximately 1989 (30 years old) to serve the South Valley subdivision area. The building houses the pump/level controls, motor control center (MCC), generator, alarm panel and other miscellaneous electrical equipment. The pumps/motors, process piping and valves are housed in the below grade steel can structure. The interior of the building is split into two rooms, separating the generator from the MCC and pump controls. The below grade steel can structure is entered by an access tube located to the rear of the building.



South Valley Pump Station Aerial Photo

South Valley Pump Station Site Photo

Civil/Site Observations

- The site is a located on a town owned lot. There is a small paved driveway that allows vehicle parking at the front of the site. A white fence (approximately 3-feet high) surrounds the front of the site and the parking area.
- Pumps, controls, electrical equipment is housed in a single-level, concrete block building with a below grade steel can type pump pit.
- The building has a peaked wood roof and cedar shingle siding.
    - The doors and windows appear to be original to the building and are starting to deteriorate and are not energy efficient.

South Valley Pump Station Doors & Windows

    - The cedar shingles are aged and deteriorating. Some have begun to separate off the building.

South Valley Pump Station Siding

- The roof is deteriorated, missing shingles and appears original to the station.

South Valley Pump Station Building Roof

- Paint on trim pieces has begun to peel.

South Valley Pump Station Trim

- Access to the wetwell or rear of the site is very limited. There is a 3-foot high wooden fence, and trees blocking full access.

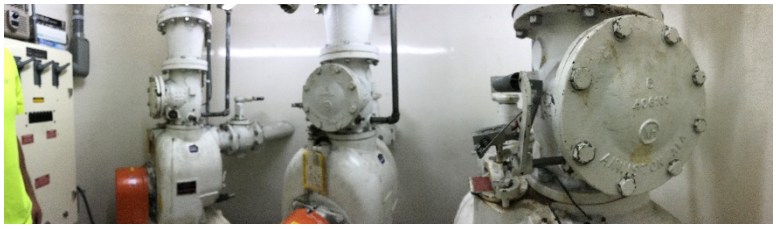
South Valley Pump Access to Rear of Site

- Precast wetwell size and condition was not able to be determined in the field due to the riser section at the top of the structure.

- Per records from the Town, the wetwell size is 10'x10'.
- Wetwell access is via a standard manhole frame and cover.
- Grease was starting to form on the wetwell surface.

Wetwell

- Pumps are located in a below grade fiberglass can structure.
    - Access is through the structure entrance tube via an aluminum ladder.
    - Structure and wall paint are in good condition.



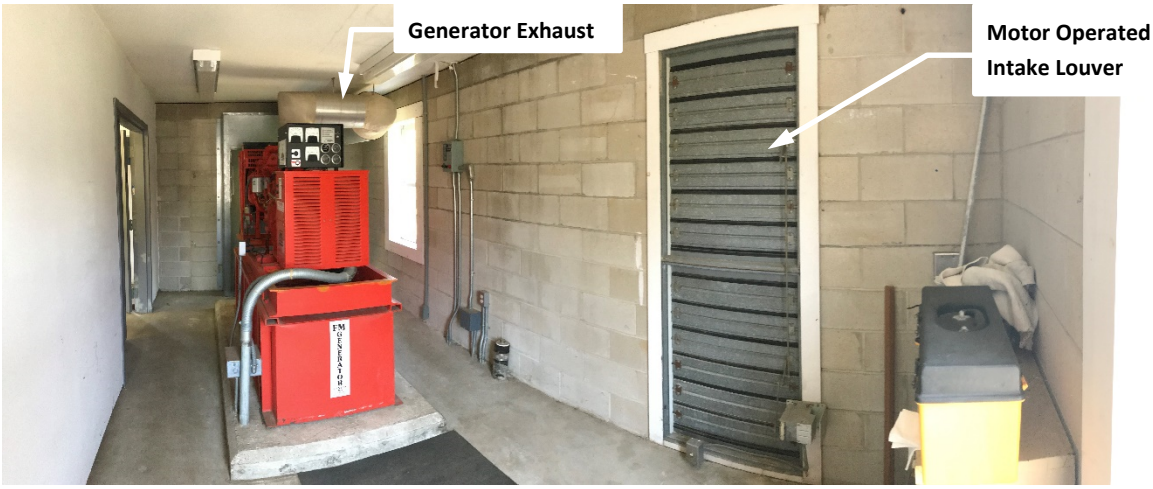
Below Grade Pump Vault

Mechanical/Process Observations

- Ventilation
    - There is no wetwell ventilation.
    - Control Side Building Interior
        - Exhaust fan is located in the "attic" potion of the control side of the building (high on the north side wall). Originally it appears the building interior was open to the roof, however, it appears drywall has now been installed for a "ceiling" to the building. Operators remove the attic access panel in the summer to allow proper ventilation in the building (closed in winter).
        - Exhaust fan was functioning during the visit. System should be reviewed to ensure it meets code with regard to air changes and the attic access panel system as installed.

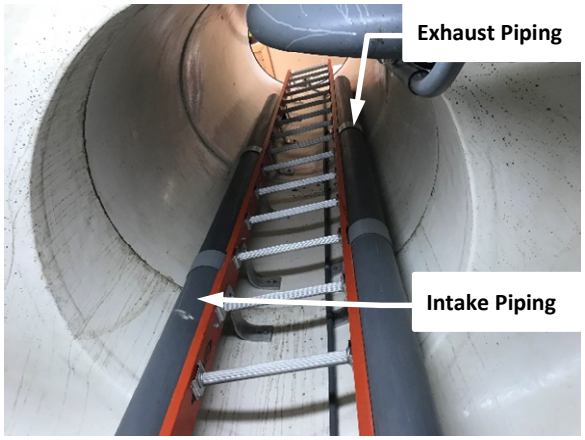
- Motor operated intake louver is located on the rear wall. Unit was locked open during visit. It was not clear as to if this was on purpose due to the summer weather, or if the operator was non-functional.

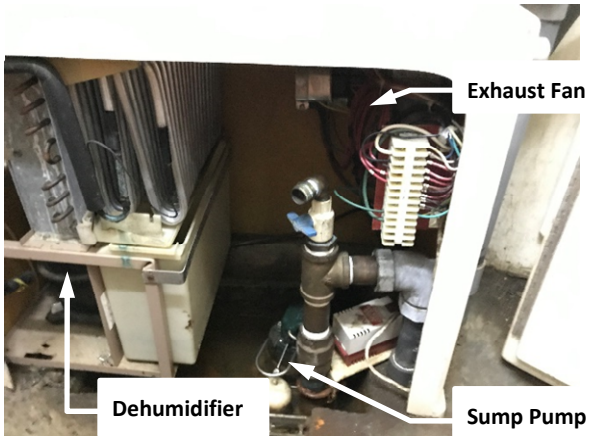
- Generator Side Building Interior
  - Motor operated intake louver for the generator on rear wall. Generator exhausts through rear wall as well. Louver was functioning during visit.
  - Motor operated intake louver on the side wall. Louver was functioning during visit.



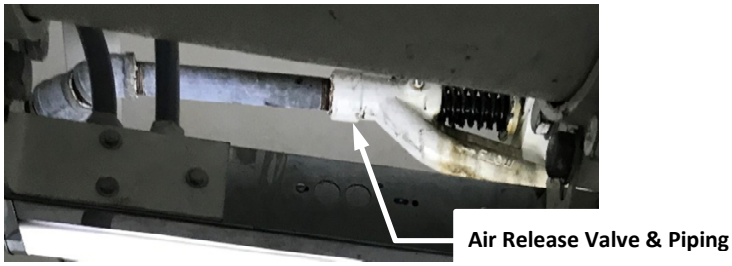
- Pump Vault Ventilation
  - The pump vault has a 4" PVC intake and exhaust pipe that run parallel to the ladder.

- At the bottom of the ladder, is a removable step enclosure that houses the exhaust fan, sump pump and dehumidifier for the vault. The exhaust fan was functioning during the visit.





- Wastewater Pump Equipment
  - Pumps are Gorman Rupp suction lift type pumps, Model T6A3-B, per available records. These pumps appear to be original to the station (1989, 30 years old).
  - Pump motors are 40 horsepower, three phase.
  - Pump #1 and #2 appeared to be operating satisfactorily. Pump #3 was loud during operation.
  - Sump pump in pump vault was operational during the visit and appeared in satisfactory condition.
- Piping, Gates and Valves
  - Pump air release valves were operational and in satisfactory condition.
    - Air release valve piping into the wetwell is galvanized metal. These will eventually corrode in a wastewater application.



Valve Vault

  - Suction and discharge piping and valves in the pump vault are in good condition and appear to be operating satisfactorily.
    - There is some minor paint peeling noted, but nothing that would affect operation.

- Wetwell piping condition could not be observed due to the riser section on the wetwell.
- There is a vertical bypass connection at the station.

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
  - Electrical service is 480-volt, three phase per available records.
  - Pad mounted transformer in the rear of the site.
  - The original automatic transfer switch (ATS) was retrofitted with an ASCO replacement ATS (unknown date).

Automatic Transfer Switch

- Main Electrical service comes into the MCC in the above grade building.
  - MCC houses pump motor starters.
    - Pump #1 and #3 are older auto transformer reduced voltage type starters, which appear to be original to the station.
    - Pump #2's starter had failed (date unknown), and the starter was replaced with a solid-state soft starter.

Pump Motor Starters in MCC Cabinet

    - Runtime meters located on the starter cabinets.

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by an licensed electrician in accordance will all applicable industry standards and codes.

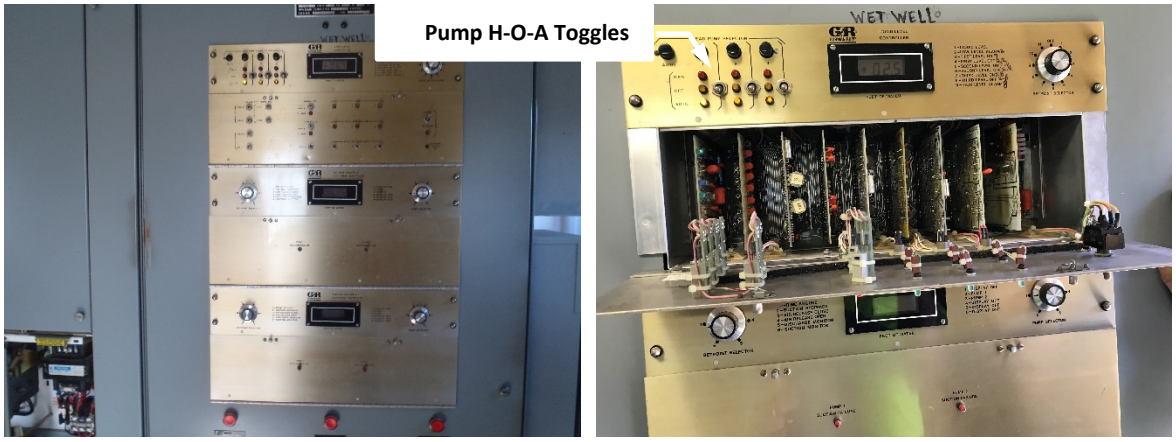
- Standby Generator and Automatic Transfer Switch (ATS)
    - Generator is located inside the above grade building in a separate 'generator room'.
    - Generator is 100 kW diesel fuel type, manufactured by DMT Corporation, model no. DMT 100CA.
    - Records for the generator servicing were not observed during the site visit.
    - Generator is original to the station (1989, ~30 years old) and ran satisfactory during visit.

    - Diesel fuel is supplied by a belly tank below the generator.
    - The original automatic transfer switch (ATS) was retrofitted with an ASCO replacement ATS (unknown date).

Automatic Transfer Switch

- Pump Control Panel
    - Panel was built by Gorman Rupp and is original to the station.
        - The panel is outdated and most likely obsolete, making replacement parts difficult to obtain.
    - Panel is located at the end of the MCC cabinet.
    - Control panel has the following switches/indicating lights
        - Pump 1/2/3 Hand-Off-Auto (H-O-A) 3-way toggle switches.
        - Pump 1/2/3 Run Incandescent Indicating Lights.
        - Pump 1/2/3 High Temperature Incandescent Indicating Lights.
        - Pump 1/2/3 Suction Failure

- Incandescent indicating lights are not standard anymore due to power consumption and lifespan. Industry standard are LED type indicating lights with push-to-test feature.
- Lead Pump/Auto selector buttons
- Digital wetwell level display (from bubbler system).
- Alarm Silence switch.

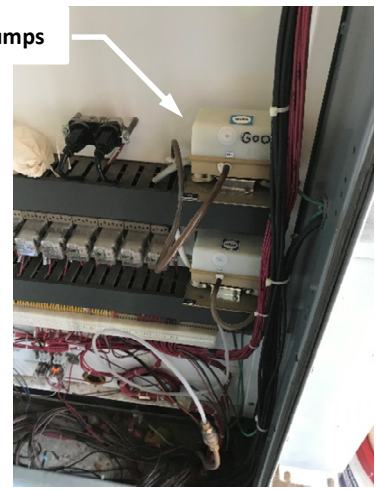


Pump Control Panel

- There is a secondary pump disconnect panel in the lower pump vault. This panel provides does not provide direct control of the pumps; however, it provides a way to de-energize the pumps at the lower pump vault area.

Secondary Pump Control Panel

- Level Controls
  - The existing pump/level controls are from a bubbler system.
    - The bubbler system reed style air pump is located in the pump control panel.



Pump Control Panel Interior

- Building lighting is fluorescent ballast style.
    - Emergency lighting was non-functional during visit (when power was turned off during testing).
- Flow meter was non-functional during the visit.
- Alarm Telemetry
    - Station alarm(s) are transmitted through a custom radio alarm telemetry system. The panel was built by Electrical Installations, Inc. (EEI). Radio antenna mast is mounted on the Unistrut support.
        - The alarm panel includes an Allen-Bradley Micro Logix 1500 Programmable Logic Controller (PLC), with custom programming to transmit the alarm signals relayed from the pump control panel.

Alarm Telemetry Panel

- Other
    - Potable water supply backflow preventor should be reviewed to ensure the inspections are up to date.
    - There were no observed carbon monoxide detectors at the station.
    - Shop sink is original to the station, but in satisfactory condition.

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 521gpm.
    - Pump 2 – 470 gpm
    - Pump 3 – 531 gpm
    - Pump 1 & 2 together – 647 gpm

While there are outside factors that can cause differing drawdown flows between pumps (i.e. larger variations in influent flows during testing), the drawdown flows are a good indication of pump condition, as any damaged/worn pump components and/or clogging can result in lower flow outputs.

Recommendations

- Access to the rear of the site/wetwell should be reviewed. Because of the location in a residential area, the aesthetics of removing the fence/trees for better access may not be feasible.
- Consider adding a static wetwell gooseneck style vent to prevent concrete corrosion from the buildup of hydrogen sulfide inside the wetwell. A replaceable carbon filter can be added to the vent if odors are a concern.
- Replace roof with new asphalt shingles.
- Ventilation system should be reviewed to ensure code compliance, attic panel function and proper operation so as to provide adequate airflow.
- Existing pump control panel in the above grade building is dated and requires replacement.
    - The panel should be upgraded to a newer version of the Gorman Rupp EPS control panel (or other type electronic pump controller). The new panel should be able to be retrofitted in the same location as the existing panel.
- Replace the bubbler system with a new submersible transducer with backup floats. While bubbler systems are still utilized in the industry, mostly based on operator preference/familiarity, submersible transducer type systems typically have less O&M (i.e. no air pump).
    - Submersible transducer should be installed in a PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A redundant level control system should be considered to provide increased reliability at this higher flow station. This could be provided by installation of two submersible transducers (primary/secondary), or potentially utilizing the existing bubbler system as a standby backup to a new transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.
- The pumps are ~30-years old and are past useful life for mechanical equipment (~20 years). It is assumed that the staff has performed routine maintenance on the pumps and re-builds as necessary.
    - Review re-build records and perform as necessary to avoid pump failures. Pump rotating assemblies and wear plates should be replaced (if they have not been recently).

    - Because of the noise coming from Pump #3 while operating, it is recommended to replace the full rotating assembly and all wear plates on the Gorman Rupp pump.
- Verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- The starters for Pump 1 and Pump 3 are now past their expected useful life and should be replaced with solid state soft starters (similar to Pump 2), which are more reliable than the auto transformer type.
    - The old capacitor/line reactor panel for the original auto transformer starters should be removed once all the old style full voltage starters are removed to avoid future confusion, as the equipment is not needed with the new starters.
- Replace air release valve piping to brass, stainless or PVC.
- Review the feasibility and energy payback period for new energy efficient doors and windows. Install as needed.
- New LED lighting would most likely lower electricity costs for the station. Payback period and feasibility of LED replacements should be further reviewed, and lighting should be replaced as needed. Rebates may also be available for the installation of LED lighting.
- LED emergency lighting with battery backup should be installed to ensure lighting at all times when the station loses power.
- Due to the age of the flowmeter it should be replaced to ensure future repairs are feasible and replacement parts will be available. The type of meter and the location of installation should be reviewed to ensure the readings are accurate.
- Ensure the generator is being serviced at recommended intervals to ensure the generator will operate and standby power is always available at the station.
    - Operators indicate that the generator is sufficiently operating; however, it is now 30-years old. While a good maintenance plan will extend the life of the generator, a plan to eventually replace the generator should be examined due to its 30-year old age.
- Inspection/calibration should be performed by the water department to ensure the potable water backflow preventer is operating effectively. Tags should be placed on the backflow preventer to show date of last inspection.
- For building and operator safety, combination smoke/carbon monoxide detectors should be installed and tied into the station alarm system, especially with the generator located inside the building.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

M E M O R A N D U M

TO: David Gray, Sewer Director

FROM: Weston & Sampson

DATE: September 17, 2019

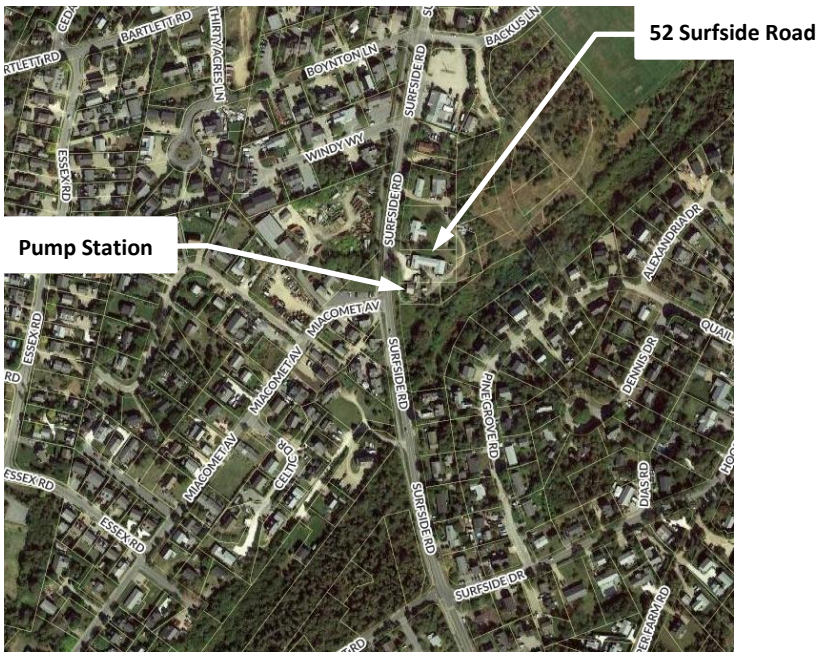
SUBJECT: Surfside Road Pump Station Evaluation

CC:

Weston & Sampson performed a field visit to the Surfside Road Pump Station on 07/31/19.

The purpose of this visit was to evaluate the condition of the existing equipment, determination of the existing station capacity (i.e. pump output) and review any operational issues and/or concerns. Below is a summary of our observations and general comments on the conditions of the major equipment items.

The Surfside Road Pump Station (PS) is located at #54 Surfside Road near the intersection of Miacomet Avenue. Access to the station is through an easement at #52 Surfside Road. The pump station was constructed in approximately 1986. The building houses the pump/level controls, motor control center (MCC), generator, alarm panel and other miscellaneous electrical equipment. The pumps/motors, process piping and valves are housed in the below grade steel can structure. The below grade steel can structure is entered by an access tube located to the rear of the building.



Surfside Road Pump Station Aerial Photo

Surfside Road Pump Station Site Photo

Civil/Site Observations

- The site is a located on a town easement on #52 Surfside Road. There is a common unpaved driveway for both sites.
- There is no fence at the site.
- Pumps, controls, electrical equipment is housed in a single-level, concrete block building with a below grade fiberglass can.
- The building has a peaked wood roof with asphalt shingles and cedar shingle siding.
    - The windows appear to be original to the building and are deteriorating and not energy efficient.

Surfside Road Pump Station Doors & Windows

    - The cedar shingles are aged and deteriorating. Some have begun to separate off the building.

Surfside Road Pump Station Cedar Shingles

- The trim and gutters are rotting.

Surfside Pump Station Gutters

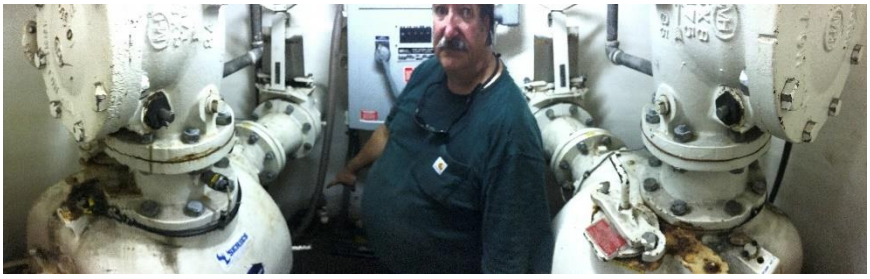
- The roof appears to be in satisfactory condition but was only visually inspected from the ground level during the visit.
- Paint on trim pieces has begun to peel.

Surfside Road Pump Station Trim

- Precast wetwell size was not able to be determined in the field due to the riser section at the top of the structure.
    - The wetwell size is 10’ diameter.
    - Wetwell access is via a standard manhole frame and cover.
    - Grease balls have formed and were floating on the water surface.

Wetwell

- Pumps are located in a below grade fiberglass can type vault structure.
    - Access is through the structure entrance tube via an aluminum ladder.
    - Structure and wall paint are in good condition.



Below Grade Pump Vault

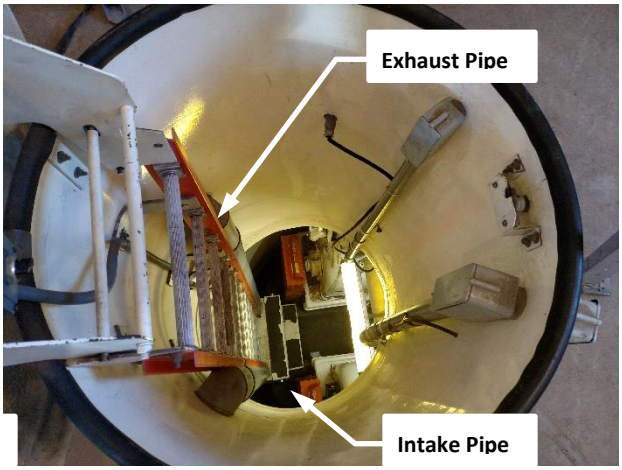
Mechanical/Process Observations

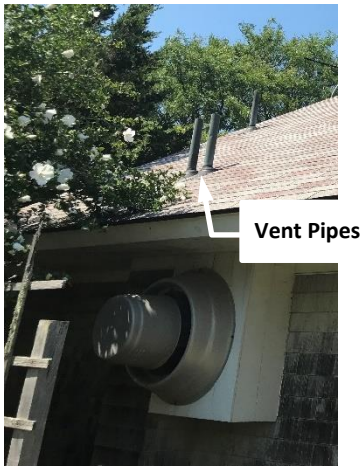
- Ventilation
    - There is a static wetwell vent
    - Building Interior
        - Exhaust fan is located on the rear of the building. The fan is a sidewall mounted exhaust fan with a wall louver. The fan was functioning during the visit. System should be reviewed to ensure it meets code with regard to air changes and the access panel system as installed.

- Two motor operated intake louvers are located on the front wall under the windows on either side of the front door. Units were functioning during the visit.

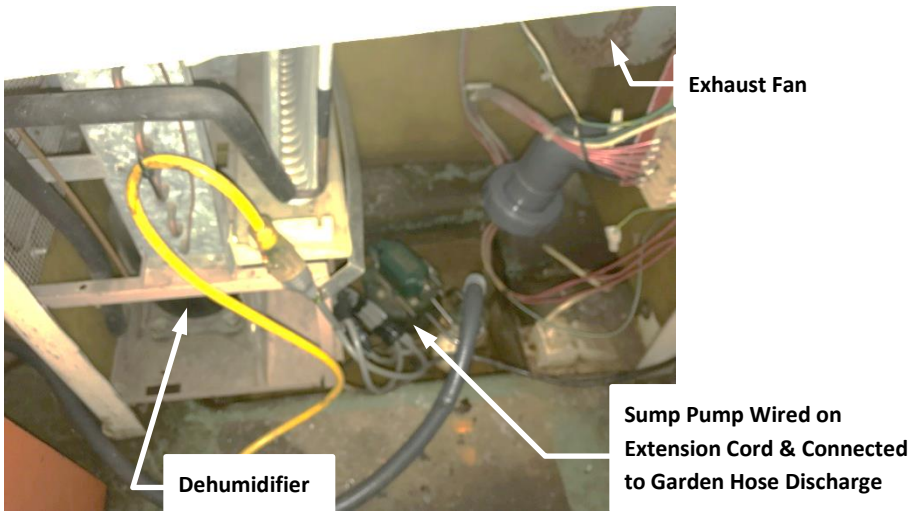
- Louver for the generator on rear wall. Generator exhausts through side wall. Louver was functioning during visit.

- Pump Vault Ventilation
  - The pump vault has a 6" intake and exhaust pipe that run parallel to the ladder. These pipes appear to terminate through the roof from a built-out bulkhead at the rear exterior of the building.





- At the bottom of the ladder, is a removable step enclosure that houses the exhaust fan, sump pump and dehumidifier for the vault. The exhaust fan was functioning during the visit.



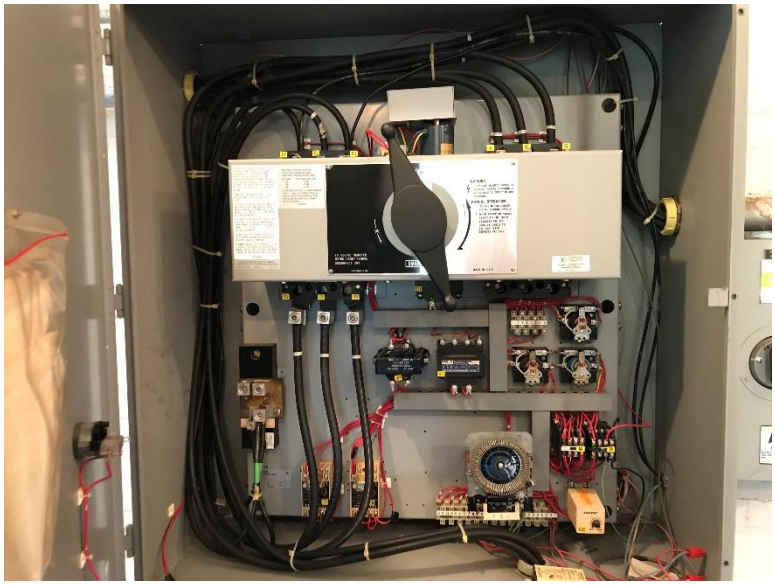
- Wastewater Pump Equipment
    - Pumps are Gorman Rupp suction lift type pumps, Model T6A3-B, per available records. These pumps appear to be original to the station (1986, ~33 years old).
    - Pump motors are 40 horsepower, three phase.
    - Pumps #1 and #2 appeared to be operating satisfactorily.

    - Sump pump in pump vault was operational during the visit, however, it appears there are issues with the discharge piping and electrical wiring, as the existing sump pump is tied into a garden hose that discharges to the sink in the above grade building and the existing pump is connected to an extension cord that is plugged into the receptacle on the pump pit control panel.
- Piping, Gates and Valves
    - Pump air release valves were operational and in satisfactory condition.
    - Suction and discharge piping and valves in the pump vault appear to be operating satisfactorily.
        - There is some paint peeling and surface corrosion noted.

- Wetwell piping condition could not be observed due to the riser section on the wetwell.
- There is a vertical bypass connection at the station.

Electrical & Instrumentation & Controls (I&C) Observations[1]

- Electrical Service
  - Electrical service is 480-volt, three phase per available records.



Automatic Transfer Switch

- Main Electrical service comes into the MCC in the above grade building.
  - MCC houses pump motor starters.

[1] Note that the electrical observations were performed based on general knowledge in similar pump station projects. The station was not evaluated by an electrical engineer and/or electrician for compliance with all electrical codes/standards. Any observations/recommendations should be reviewed under the electrical upgrade design and any upgrade design should be performed by a certified electrical engineer and installed by an licensed electrician in accordance will all applicable industry standards and codes.

- Pumps #1 and #2 are older auto transformer reduced voltage type starters, which appear to be original to the station.

Pump Motor Starters in MCC Cabinet

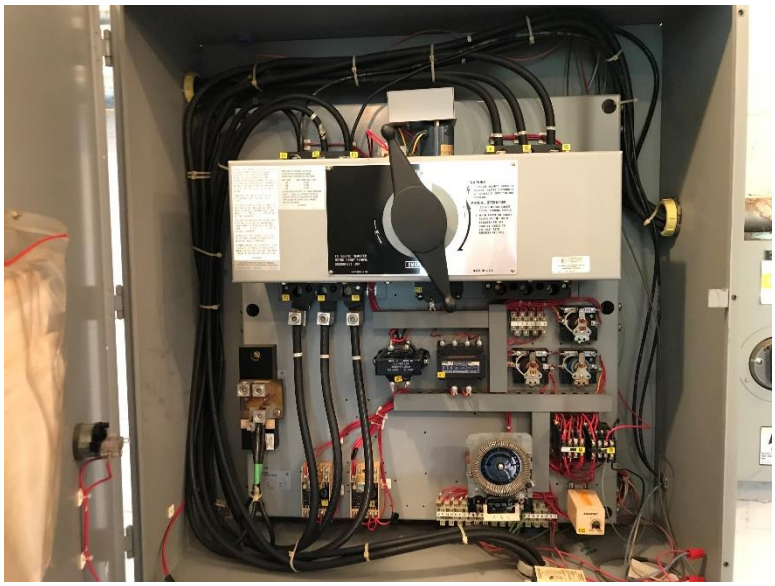
- Runtime meters located on the starter cabinets.

- Standby Generator and Automatic Transfer Switch (ATS)
  - Generator is located inside the above grade building.
  - Generator is 75 kW diesel fuel type, manufactured by Superior, model no. 75R161.
  - Records for the generator servicing were not observed during the site visit.
  - Generator is original to the station (~33 years old) and ran satisfactory during visit.

- Diesel fuel is supplied by an exterior underground storage tank, that feeds a day tank located on the inside of the building.
  - New regulations regarding underground storage tanks have come out, and it is very likely that the tank is required to be removed.
  - Day tank has a separate containment area for spilled/leaking fuel.

Generator Day Tank

- The automatic transfer switch (ATS) is original to the station. From discussions with the operators, the ATS is obsolete and spare parts difficult to obtain.



Automatic Transfer Switch

- Pump Control Panel
  - Panel was built by Gorman Rupp and is original to the station.
    - The panel is outdated and most likely obsolete, making replacement parts difficult to obtain.
  - Panel is located at the end of the MCC cabinet.
  - Control panel has the following switches/indicating lights
    - Pump 1/2/3 Hand-Off-Auto (H-O-A) 3-way toggle switches.
    - Pump 1/2/3 Run Incandescent Indicating Lights.
    - Pump 1/2/3 High Temperature Incandescent Indicating Lights.
    - Pump 1/2/3 Suction Failure
      - Incandescent indicating lights are not standard anymore due to power consumption and lifespan. Industry standard are LED type indicating lights with push-to-test feature.
    - Lead Pump/Auto selector buttons

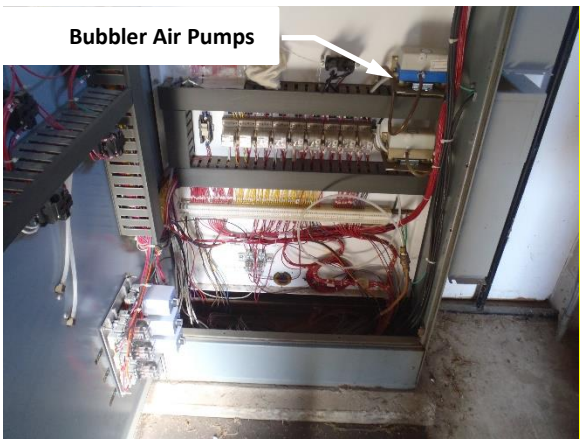
- Digital wetwell level display (from bubbler system).
- Alarm Silence switch.

Pump Control Panel

- There is a secondary pump power distribution panel in the lower pump vault. This panel does not provide direct control of the pumps; however, it provides disconnects for the pumps (and other electrical equipment) in the lower pump vault area.

Secondary Pump Control Panel

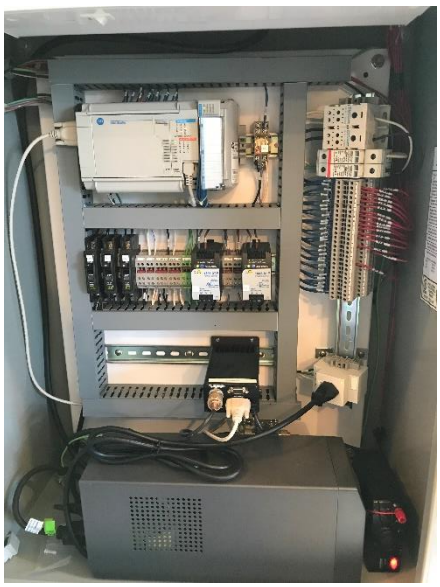
- Level Controls
  - The existing pump/level controls are from a bubbler system.
    - The bubbler system reed style air pump is located in the pump control panel.



Pump Control Panel Interior

- Building lighting is incandescent ceiling mounted bulbs.
- There is a Polysonics Ultrasonic Flow meter on the discharge piping, with the transmitter/paper charts in the above grade building. The flow meter was functional during the visit, however, based on the drawdown data does not appear to be calibrated/reading correctly.

- Alarm Telemetry
    - Station alarm(s) are transmitted through a custom radio SCADA alarm telemetry system. The panel was built by Electrical Installations, Inc. (EEI). Radio antenna mast is mounted on the Unistrut support.
        - The alarm panel includes an Allen-Bradley Micro Logix 1500 Programmable Logic Controller (PLC), with custom programming to transmit the alarm signals relayed from the pump control panel.



Alarm Telemetry Panel

- Other
    - Potable water supply backflow preventor should be reviewed to ensure the inspections are up to date.
    - There were no observed smoke/carbon monoxide detectors at the station.
    - Shop sink is original to the station, but in satisfactory condition.

Pump Station Capacity Observations

- Drawdown testing was performed during the site visit. Average pump output are as follows.
    - Pump 1 – 458 gpm (flowmeter reading was 750 gpm).
    - Pump 2 – 540 gpm (flowmeter reading was 740 gpm)

While there are outside factors that can cause differing drawdown flows between pumps (i.e. larger variations in influent flows during testing), the drawdown flows are a good indication of pump condition, as any damaged/worn pump components and/or clogging can result in lower flow outputs.

Recommendations

- Roof is nearing useful life. Consider replacement with new asphalt shingles.
- Ventilation system should be reviewed to ensure code compliance and proper operation so as to provide adequate airflow and to not exceed operating temperature ranges of electrical.
- Existing pump control panel in the above grade building is dated and requires replacement.
    - The panel should be upgraded to a newer version of the Gorman Rupp EPS control panel (or other type electronic pump controller). The new panel should be able to be retrofitted in the same location as the existing panel.
- Replace the bubbler system with a new submersible transducer with backup floats. While bubbler systems are still utilized in the industry, mostly based on operator preference/familiarity, submersible transducer type systems typically have less O&M (i.e. no air pump).
    - Submersible transducer should be installed in a 6-inch (min) PVC stilling well to prevent grease and rags from collecting on the transducer.
    - A redundant level control system should be considered to provide increased reliability at this higher flow station. This could be provided by installation of two submersible transducers (primary/secondary), or potentially utilizing the existing bubbler system as a standby backup to a new transducer.
    - A single backup float can be utilized for a high level/flood signal (on transducer failure). The float can also trigger the pumps to run off of manually adjustable timers (in the control panel) once the float disengages. By utilizing only the single high-level float, it keeps the float out of the wastewater during normal operation, lowering the chance of the float to catch or stick with grease and rags.
- The pumps are ~33-years old and are past useful life for mechanical equipment (typ. 20 years). It is assumed that the staff has performed routine maintenance on the pumps and re-builds as necessary.
    - Review re-build records and perform as necessary to avoid pump failures. Pump rotating assemblies and wear plates should be replaced (if they have not been recently).
- Verify that the pump outputs/hydraulics are sufficient for all current and future flows.
- The starters for Pump 1 and Pump 2 are now past their expected useful life and should be replaced with solid state soft starters, which are more reliable than the auto transformer type.
    - The old capacitor/line reactor panel for the original auto transformer starters should be removed once all the old full voltage starters are removed to avoid future confusion, as the equipment is not needed with the new starters.
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- Inspection/calibration should be performed by the water department to ensure the potable water backflow preventer is operating effectively. Tags should be placed on the backflow preventer to show date of last inspection.
- For building and operator safety, combination smoke/carbon monoxide detectors should be installed and tied into the station alarm system, especially with the generator located inside the building.
- There were grease balls noted in the wetwell. If grease issues continue to persist, a Fats/Oils/Grease program should be reviewed and implemented for the area's tributary to this station.
    - In addition, if grease is an ongoing issue in the wetwell, grease mitigation items can be reviewed such as air bubble mixing or addition of chemicals.
- New underground storage tank requirements (as of 2017) will require the underground fuel tank to be removed and testing to ensure no leaks have occurred.