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SEWER DISTRICT NO. 3—SOUTHWEST SEWER DISTRICT SERVICE AREA EXPANSION PROJECT (CP-8139)

FINAL FEASIBILITY REPORT

SEPTEMBER 2012

A Tri-Venture

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<u>Suffolk County Sewer District No. 3 – Southwest; Service Area Expansion Project</u>

<u>Feasibility Study</u>

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EXECUTIVE SUMMARY

In 2011, the Suffolk County Legislature authorized funding for the preparation of a Sewering Feasibility Study for the communities of Deer Park, North Babylon, West Babylon, Wyandanch, Wheatley Heights and West Islip. It was determined that the availability of sanitary sewers would help address the environmental and health concerns associated with on-site wastewater disposal systems and would have the potential to encourage business investment and increase workforce housing opportunities. The Study Area which includes portions of the Towns of Babylon and Islip is located contiguous to the currently sewered portions of the Suffolk County Sewer District No. 3 - Southwest. Future treatment capacity at the District's Bergen Point Wastewater Treatment Plant (WWTP) can be considered to service this area.

The Joint-Venture of Dvirka and Bartilucci Engineers and Architects, P.C. (D & B); Gannett Fleming Engineers, P.C. (GFE); and, LiRo Program and Construction Management, P.C., was retained by the Suffolk County Department of Public Works (SCDPW) to prepare the feasibility study. A report was generated for the Study Area that included an assessment of existing environmental conditions and current land usage; a projection of existing and future wastewater flows; as well as, a comprehensive sanitary sewering layout with projected construction costs.

The Study Area covers a sizable land area, and therefore a network of hydraulically interconnected sewer systems was created that encompassed the three naturally occurring sewer sheds. An array of physical and natural features was utilized in establishing sewering limits including: land contours, roadway system alignments, land use and environmental factors. As a result, individual sewer systems were developed for twenty-nine Sub-Areas, and installation and operational costs were estimated. Since the objective of the Study was to delineate and prioritize fundable project areas where sewering would have the most immediate and beneficial health, environmental and economic impact, a rating methodology was developed to identify the Sub-Areas with the greatest needs. In rating the Sub-Areas, factors including depth to groundwater; parcel density; closeness to streams and wetlands and economic revitalization opportunities were employed. Once scores were calculated, Sub-Areas were placed into one of three priority-based

Tiers, with Tier 1 representing the Sub-Area candidates that would derive the most immediate benefit from sewering.

The peak sewage flow that was used to lay out and size the sewage collection system could be expected to range between 12.0 – 15.9 mgd for the entire Study Area. However this range is recognizably conservative since the sewage generation rates utilized for each parcel were based upon the highest usage applied to zoning classification, that is, one family residential, and includes a 2.93 peaking factor as required by Ten State Standards for design of sewage systems. Utilizing a sewage flow of 300 gallons per day per parcel, and approximately 18,000 parcels in the Study Area, an estimated average daily flow from the entire Study Area would be 5.4 million gallons per day (MGD). As indicated, the twelve Tier 1 Sub-Areas should be the focus of future sewering efforts. The anticipated peak sewage flow for Tier 1 was calculated to be approximately 5.9 – 7.9 mgd. For these Tier 1 Sub-Areas, estimated average daily flow from the approximately 9,000 parcels would be 2.7 MGD. Since the SCDPW is expanding the Bergen Point WWTP by 10 mgd it is reasonable to project that a substantial portion of Tier 1 could be accommodated.

Financial constraints however may dictate the magnitude and timing of future sewering projects. In this regard, a further refinement of the Tier 1 Sub-Area listings was performed to identify the top candidates. Five Sub-Areas were identified within the Deer Park, North Babylon and Wyandanch communities that possessed the highest need factors. Cumulatively these areas will generate an estimated 3.4 – 4.5 mgd of peak sewage flow and impacted approximately 28% of the parcels within the Study Area. For these five Sub-Areas (5,106 parcels), it is anticipated the average daily flow would be approximately 1.53 MGD. The projected construction costs generated for such an effort was estimated at $861M. A total Tier 1 sewering project was projected to be approximately $1.4B. These figures include County sewer connection charges that include purchase of capacity and a shared cost of the existing infrastructure asset value.

1.0 INTRODUCTION

1.1 Study Objective

Pursuant to Suffolk County Resolution 822-2001, (**Appendix A**) dated August 28, 2001; the Suffolk County Department of Public Works (SCDPW) prepared a feasibility study to determine the viability of expanding the existing geographic limits of the Southwest Sewer District S.D. No.3 to provide sewer service for densely populated communities within the Towns of Babylon, Islip and Huntington, as well as other outlying communities with sewering needs. (**See Figure 1-1 – Study Area Map**) In response, *Feasibility Study for the Expansion of Suffolk County Sewer District (SCSD) No. 3 – Southwest* (dated June 19, 2002) was prepared by SCDPW technical staff. This Study presented an evaluation of the potential for sewering these areas and provided projected costs based upon the expansion of the existing Sewer District or the conveyance of sewage via separate contracts with the County.

On September 17, 2009, a Bond Resolution (No. 839-2009) (**Appendix B**) approved by the Suffolk County Legislature, authorized funding for a Sewering Feasibility Study to be undertaken for the communities of Deer Park, North Babylon, West Babylon, Wyandanch, Wheatley Heights and West Islip, all situated north of the current district boundary.

As a result of a SCDPW Request for Proposals (RFP), the County selected the Joint-Venture of Dvirka and Bartilucci Engineers and Architects, P.C. (D & B); Gannett Fleming Engineers, P.C. (GFE); and, LiRo Program and Construction Management, P.C. to undertake a feasibility study to develop the sewering infrastructure necessary to improve environmental and economic conditions, in the densely populated communities delineated above. Potential expansion of the SCSD No. 3 - Southwest sewer service area to accommodate these areas has been identified as a possible solution to address existing environmental and health concerns related to on-site wastewater disposal system discharges as well as to provide a stimulus for local economic opportunities.

This following feasibility study was developed by the Joint-Venture (JV) and includes an assessment of existing environmental conditions; an estimate of existing and projected wastewater flows; as well as a layout of potential sewering scenarios for the proposed study area with projected costs and scheduling. The overall objective of this study was to delineate and prioritize cost-effective, fundable project areas where sewering would have the most immediate and beneficial health, environmental and economic impacts.

1.2 Need for Sewers

Wastewater treatment in the densely populated, primarily residential Study Area is predominately handled by on-site treatment systems. Approximately seventy percent of Suffolk County's 1.5 million residents have an "on-site sanitary wastewater treatment and disposal system." These systems are comprised of a septic tank or cesspool for solids settling, connected to leaching pools to allow clarified water to seep into the ground. Homeowners must periodically pump out their septic tank and less frequently install a new leaching pool once drainage slows down. Many of the on-site systems in established communities are more than 40 years old, and as systems age, failure rates increase dramatically. This is especially the case where high groundwater conditions exist.

Due to the vital importance of maintaining the quality of Suffolk County's groundwater supplies, the Suffolk County Department of Health Services (SCDHS) has been tasked to regulate development that may pose a deleterious impact on this resource

The Study Area is located in Hydro-geologic Groundwater Management Zones I and VII. Suffolk County's Sanitary Code Article 6 limits discharges of wastewater (from conventional on-site systems) to 600 gallons a day/acre which basically corresponds to two single family residential lots per acre. In the Study Area, a large proportion of lot sizes are small (less than ¼ acre) and the accumulative impact of the contaminants discharged from these subsurface disposal systems; therefore, pose an environmental and health concern.

It has been determined, that the introduction of sanitary sewer systems throughout the Study Area would provide the long-term solution necessary to address these potential environmental and health concerns. Sewers would provide opportunities for smaller lot development which would facilitate the construction of more affordable, multi-family residential structures. In addition, sewering would have the positive impact of stimulating local business opportunities ultimately promoting and encouraging community sustainability.

As part of this study, peak sewage flows were calculated and gravity sewer mains were laid out for each street within the Study Area. Wastewater from these neighborhood systems would be conveyed to existing Suffolk County Sewer District (SCSD) No. 3 – Southwest interceptors that were originally sized and constructed to accept flow from the Study Area. Sewage generated in SCSD No. 3 is transported to the 30 million gallon/day (mgd) Bergen Point Wastewater Treatment Plant located in Babylon for treatment and ocean disposal. Daily wastewater flow to this plant currently averages approximately 26 mgd, however due to commitments from existing capital projects, current excess available capacity is less than 1 mgd. Plans are currently underway for the expansion of this facility to 40 mgd.

This report is a study and as such, there are no immediate economic or construction-related impacts associated with this exercise. For this reason, a Negative Declaration was issued by the Suffolk County Council of Environmental Quality (CEQ) in compliance with NY State Environmental Quality Review Act (SEQRA) requirements. The study represents the first step towards future implementation of a sanitary sewer infrastructure that could help improve area ground and surface water quality and support economic development and revitalization of the Study Area. In this report, priority areas for sewering are identified, and other wastewater management opportunities are delineated. The data provided will allow stakeholders to rationally assess the cost/benefit of sewers and to determine if the cost burden associated with such installations outweighs the negative impacts associated with the continued use and limitations of on-site wastewater treatment and disposal systems.

2.0 WORK PLAN

OVERVIEW

The Suffolk County Department of Public Works (SCDPW) has retained the Joint-Venture of Dvirka and Bartilucci Engineers and Architects, P.C. (D & B); Gannett Fleming Engineers, P.C. (GFE); and, LiRo Program and Construction Management, P.C. to conduct a study of the feasibility of improving wastewater management and providing sewage disposal opportunities within the Study Area. The impacted communities are located within the Townships of Babylon, Islip and Huntington and include Wyandanch, Wheatley Heights, West Babylon, North Babylon, Deer Park and West Islip. These densely developed, primarily residential communities currently rely on privately owned and operated on-site wastewater disposal systems, which include septic tanks or cesspools, often equipped with leaching fields. Over time the nitrogen-laden discharges from these units can result in contamination of the area's interconnected groundwater-waterway system.

The scope of the Study is to develop and analyze various wastewater management opportunities within Study Area boundaries that would reduce pollution of the environment and provide a stimulus for the local economy. Extensive studies have been performed over the last decade, which have documented the potentially deleterious, long-term impacts to Suffolk County's groundwater associated with on-site sanitary systems discharges. Regulations promulgated by the Suffolk County Department of Health Services (SCDHS) have restricted the size of on-site systems in an effort to preserve and safeguard the County's water resources. The focus of this evaluation follows previous recommendation that when applicable, the installation of local sanitary sewer systems would provide the most immediate and long-term beneficial approach in addressing wastewater management concerns. The Study Area is located within the original design service area for Suffolk County's Southwest Sewer District No. 3, and therefore existing interceptor systems were sized and situated to accept sewage generated from within the Study Area. In an effort to develop a comprehensive wastewater management strategy, the status of existing small sewage treatment plants (STPs) located within the Study Area was assessed to identify whether continued operation or potential abandonment would be a future option. In addition, in portions of the Study Area where wide scale groundwater pollution would be anticipated from the continued use of on-site systems, the options of introducing or employing innovative/alternative (enhanced treatment units) technologies were explored. The proposed wastewater management strategy developed for the Study Area considered the cost implications associated with sewering; factoring in the administrative and regulatory requirements to implement such scenarios. Potential sewering project candidates were prioritized based upon the severity of environmental factors associated with various hydro-geographic and physical conditions

This highly visible and anticipated project impacts many local and regional Stakeholders. For this reason, an important element of the study has been to provide an interested and educated public with a continued and readily accessible venue for obtaining information regarding the project's goals and approaches as well as the process leading up this Study's conclusions. A dedicated website has been developed and a series of public meetings have been scheduled to provide the necessary interaction.

2.1 Project Approach

Adhering to the findings and recommendations presented in the SCDPW's *Feasibility Study for the Expansion of Suffolk County Sewer District No. 3 – Southwest* (dated June 19, 2002), a technical strategy was developed to best develop logical sewering scenarios as well as establish a rationale for prioritizing and implementing such projects. Future sewer systems would convey wastewater to existing SCSD No.3 interceptors currently situated along the southern boundary of the Study Area. The following outline defines the methodology employed in this Feasibility Study:

2.1.1 Project Development - Data Collection and Review

This large geographic area is characterized by intertwined environmental, physical and socio-economic features (mixed residential/commercial communities), sub-divided into three distinct watersheds which are naturally defined by the area's topography. Three (3) sewersheds were identified, whose limits basically coincide with the watershed boundaries and each delineates specific areas where sewage collection systems would be defined. Sewersheds 107, 108 and 110 have been identified and each corresponds to existing SCSD No.3 interceptors. The goal of this project is to develop a comprehensive sewer system lay-out that would provide service to all parcels within the Study Area. A “gravity” type sewer system was selected for this analysis since such traditional systems typically experience fewer problems and generally require significantly less maintenance. When designing a sewer conveyance system that utilizes gravity to transport flow, it is essential to follow natural topography typically paralleling descending roadway grades. Fortunately in the Study Area, land contours in each sewershed naturally slope from high points to low points that parallel the alignment of local streams and waterways. In many cases, primary roadways followed similar pathways abutting area waterways. For this effort, topographical data existing in Geographic Information Systems (GIS) managed by the various Townships was utilized. Data identifying the general depth to groundwater data was similarly obtained. Shallow depth to groundwater represented a vital component in this evaluation since such data would typically be indicative of those parcels with the highest potential to experience on-site system issues or failures.

In the course of the data collection, additional information was amassed that included, but not limited to:

- Current land use and zoning data including parcel size and designated use
- Local demographics
- Environmental features including lakes, streams and wetlands
- Existing sewage treatment plant (STP) locations, capacity and operational status
- Existing water well locations and water consumption data.

2.1.2 Establish Base Lines

Collected data was reviewed, formatted and incorporated into a GIS program that was designed to be compatible with the County’s GIS system. The introduction of data in a layered format allowed for the review and comparison of existing natural and physical features throughout the Study Area. This configuration of information provided flexibility to assess varying information individually or cumulatively, and was a vital component in establishing distinct sewering system boundaries.

2.1.3 Estimate Present and Future Wastewater Flows

Within each sewershed, “Sub-Areas” were developed that could hydraulically accommodate the installation of sewer systems. A Sub-Area was defined as a geographic area that exhibited a commonality of natural and physical features that would facilitate the installation of a gravity sewer system. Surface topography and roadway configuration were major factors in defining such areas. Once the layered physical data was assessed, Sub-Area boundaries were generated and then it was possible to generate anticipated wastewater flows. Since a detailed survey of all properties and their current use was not possible for this study, it became prudent to employ a “conservative” approach, whereby each parcel was designated as one-family residency. *S*uch a property classification typically is associated with a significantly higher wastewater generation rate than comparable commercial or industry properties. Utilizing this approach, a worst case scenario (greatest anticipated flow) was created. For comparison purposes, three residential wastewater generation rates were utilized as follows:

- For present flow, actual winter (2010) water consumption data per parcel as provided by the Suffolk County Water Authority. A winter figure is utilized since it typically is more representative of normal consumption since excess water use associated with landscaping and other exterior uses is not included.
- For future or theoretical flow calculations, 300 gallon/day (gpd) per parcel – recommendation of the SCDHS
- Also, for future or theoretical flow calculations, 225 gpd per parcel - historically measured by the SCDPW

Utilizing this data, projected wastewater flows for each “Sub-Area” were calculated and pipe sizes determined. Anticipated flows for each Sub-Area were generated.

2.1.4 Implement SEQRA Requirement

Under New York’s State Environmental Quality Review Act, the preparation of an Environmental Assessment Form was required to identify the intent of the feasibility study and to define its purpose as well as to address potential environmental impacts related to sewering. The availability of sanitary sewers would potentially provide greater environmental preservation, safeguard human health while increasing business investment and workforce housing opportunities.

2.1.5 Evaluate Sewer Design Options

The overall approach to sewering employed in this study was to develop a comprehensive gravity sewer system for each sewershed that would result in the generation of projected wastewater flows and construction costs. The use of conventional gravity sewers for the entire Study Area was chosen since such systems typically possess the least long-term operation and maintenance costs. However, capital costs could be greater for some areas if deep trenching and dewatering are required for the sewer installation. To realize the most cost-effective plan, case by case evaluations will be made during the detailed design phase that may result in the use of an alternate piping technology (such as pressure or vacuum sewers).

For this study, individual sewer system layouts were developed for each Sub-Area, and then adjoining systems were interconnected to provide a logical and hydraulically functional network of sewers within each sewershed. To convey the sewage from the various areas, gravity trunk lines were introduced that would ultimately transport the wastewater to the existing Suffolk County Sewer District No. 3 - Southwest interceptor terminal manholes. From there sewage would flow to the County's Bergen Point WWTP. Included in the analysis was an evaluation of existing data regarding existing STPs situated within the Study Area and their potential incorporation in the overall sewering plans. While "gravity" systems were utilized for the entire Study Area, it is recognized that the associated construction costs represent a worst case scenario and in certain situations costs could be reduced by employing alternate sewering technologies. Due to shallow ground water conditions throughout the Study Area, the cost estimates reflected the need for deep trenches with extensive dewatering operations to accommodate the gravity systems. During the design phase, opportunities may exist to incorporate pressure sewers and/or small pump stations/force mains to elevate the piping system. This may result in substantial cost savings in regard to the installation, though long term operation and maintenance costs may be higher.

2.1.6 Evaluate Financial Opportunities and Legal/Regulatory Requirement

Securing financing for a sewer project will be difficult in the current economic climate. Property owners ultimately will be required to share in the costs of the construction; County connections fees as well as individual hook-up costs, which if no federal, state or local government financial assistance is provided, could result in a significant financial burden on a community. Funding potential derived from municipal bonding, local taxing, state loan programs and grant opportunities have been looked at and discussed. Legal and administrative considerations associated with either creating a separate sewer district or possible inclusion into the existing Suffolk County Sewer District No. 3 – Southwest, as well as other connection opportunities have been explored and the pros and cons of each have been identified.

2.1.7 Cost Options

To assess the financial implication associated with sewering for each of the Sub-Areas, projected costs to collect transport and treat wastewater have been developed. Due to the time anticipated to implement sewering projects, cost figures presented in this study have been escalated to projected year 2020 dollar values.

2.1.8 Present Recommendations and Overall Schedule

A total of twenty-nine (29) Sub-Areas have been created within the three sewersheds. In each Sub-Area, gravity sewer systems have been defined; wastewater flow projected; and, estimated costs generated. Since funding as well as available plant capacity is restrictive, Sub-Areas were prioritized to identify the candidates where demonstrated concerns were most apparent. The determination of need was primarily driven by potential environmental and health concerns. To best present these findings, each Sub-Area was placed into one of three, priority-based Tiers, with Tier 1 representing the Sub-Area candidates exhibiting the most immediate need for sewering. To prioritize the Sub-Areas, a weighted matrix format was chosen, utilizing four sewering factors, that is:

1) depth to groundwater,
2) parcel density,
3) proximity to streams and wetlands; and,

4) economic revitalization opportunities.

Scores were assigned to each of the twenty-nine Sub-Areas, and based upon these results, priority Tiers were assembled.

2.2 Public Involvement

2.2.1 Designated Website

Public involvement in the preparation of this Feasibility Study was essential due to the potential physical and financial impacts on local communities that are associated with the implementation of sewering projects. To maximize public exposure and stakeholder involvement for the Suffolk County Sewer District No. 3 – Southwest Service Area Expansion Project, a project specific website (http://swsuffolksewers.org/) was created that would increase project visibility and allow for regular status updates. Efforts were made to create a "user friendly" site configuration that would remain active for the duration of the project. For individuals without personal computers, the site could be accessed at local libraries.

2.2.2 Public Meetings

To maintain continuous interaction with all involved parties three (3) public meetings were scheduled over the duration of the study to provide updates on the status of the Feasibility Report as well as offer the public and local stakeholders' the opportunity to comment. The first public meeting was held on February 16, 2012 at the Bergen Point WWTP to provide an introduction to the public and project stakeholders about the Feasibility Study and explain the project goals. The first meeting was attended by approximately 70 stakeholders, elected officials, SCDPW staff and members of the general public.

The second public meeting was held on July 31, 2012 at the Babylon Town Hall Annex to provide a status report of the Feasibility Study and convey initial findings and conclusions. The second meeting was attended by over 80 stakeholders, elected officials, SCDPW staff and members of the general public.

The third and final public meeting was held on October 10, 2012 at the Babylon Town Hall Annex to present the Final Feasibility Report to the public.

3.0 PROJECT DEVELOPMENT

3.1 Demographics and Physical Factors

3.1.1 Characteristics of Study Area – Study Area and Sewershed Boundaries

The Study Area is presented on **Figure 3-1** and includes Wyandanch, Wheatley Heights, West Babylon, North Babylon, West Islip and Deer Park. The Study Area is approximately 14.3 square miles. The east border of the Study Area is Udall Road and Brookdale Avenue. The Southern State Parkway bounds the southern border of the Study Area. The west border of the Study Area is Wellwood Ave. The north border is comprised of the Huntington/Babylon Town line. There are three intercepting sewers that are situated at the southern border of the Study Area – Interceptors 107, 108 and 110. Three sewersheds are depicted on **Figure 3-1** based on the planned routes of these interceptors completed in 1975 and the topographic contours of the Study Area. Interceptor 107 was planned to be constructed under the Southern State Parkway and terminate at Edison Avenue, near the Babylon Landfill. Interceptor 108 was planned to be constructed under the Southern State Parkway, paralleling Belmont Lake, then north on W. 24th Street to Straight Path. Interceptor 110 was constructed to the north side of the Southern State Parkway with a terminal manhole at Kime Avenue. Interceptor 110 was planned to be constructed to the north from Kime Avenue along Arbour Street and Brookdale Avenue to Secotogue Road and then parallel the Sagtikos Parkway to the Pilgrim State Hospital site (outside the Study Area).

3.1.2 Main Roadways

There are several State and county roads and other major roadways identified in the study area. The identified major roads consist of Suffolk County Roads #2 (Straight Path), #3 (Wellwood Avenue), and #4 (Commack Road). New York State Route 231 (Deer Park Avenue) transects the Study Area in a north/south direction. The Southern State Parkway borders the Study Area to the south. Interceptors 107 and 108 will need to be extended under the parkway, likely using pipe jacking or other trenchless technology.

3.1.3 Natural Features (Wetlands, Streams, Groundwater, Topography)

The study area consists of approximately 189 acres of wetlands and 47 acres of surface water body area. Surface waters within the area include the Carll's River, Sampawams Creek, Geiger Pond, the Guggenheim Lakes and Belmont Lake. Geiger Pond is approximately two (2) acres, while both the Guggenheim Lakes and Belmont Lake are approximately eight (8) acres. Similar to the groundwater, the surface water quality is also a major concern as contaminated groundwater can potentially flow into surface water bodies and cause further contamination and pose potential human health concerns. Therefore, the expansion of the District's sewer system and the reduction of individual onsite disposal systems can provide the benefit of greater environmental protection of groundwater and surface water resources.

A review of the study area indicates that the water table is approximately zero (0) to 125 feet below the ground surface. Accordingly, there are areas within the study area that have a relatively high groundwater level and an increased potential for groundwater contamination due to failing septic systems. Based on a comparison of groundwater contamination potentials between septic systems and a piped network sewage system, the expansion of the District's sewer system can be beneficial since it can provide a higher level of protection against groundwater contamination than individual septic systems. In addition, the costs of constructing and maintaining a sewer system are generally lower than the costs of groundwater remediation.

3.1.4 Demographics

The census data summarized for the six communities listed below is presented as a total for that census area. For example, only a small portion of West Islip is included in the Study Area for this project, yet census data is reported for the entire community. Demographic percentages presented, median income and median home values should be consistent for the smaller portions of the census area included in this study.

West Babylon

According to the 2010 census data, there were 43,213 people, 14,537 households and 10,575 families residing in West Babylon. The racial makeup of West Babylon was 79.9% White, 11.2% African American, 0.2% Native American, 2.7% Asian, 2.3% mixed race and 3.7% other. The average household size was 2.93 and the average family size was 3.43. The median age in the Town of West Babylon was 40 years old, with 5.6% under the age of 5, 31.7% between the ages of 5 and 30, 48.5% between the ages of 30 and 65 and 14.2% above the age of 65.

Household combined income for West Babylon according to the 2010 census was:

- $100,000 to $149,000 – 24.0%
- $150,000 to $199,999 – 7.3%
- $200,000 or more – 5.4%

At the low end of the scale, 4.5% of households earned a combined income of less than $10,000. Overall, the mean household income in West Babylon was $87,513 while the median household income was $79,591. Approximately 5.2% of the population of West Babylon was living below the poverty level. Of all families, 3.2% were living below the poverty line.

The 2010 census data also indicates that in West Babylon 96.3% of housing units were occupied and 3.7% were vacant. Of the occupied units, 73.2% were owner occupied while 26.8% were renter occupied. The vacancy rate among homeowner units was 1.2% while the vacancy rate among rental units was 4.1%.

According to the 2010 census owner occupied housing units were valued as follows:

- $300,000 to $499,999 - 73.8%;
- $500,000 to $999,999 – 11.1%
- $1,000,000 or more – 0.4%

At the low end of the scale, 1.6% of owner occupied housing units were valued at less than $50,000. Overall, the median value of houses in West Babylon is $378,800.

In addition, according to the 2010 census, approximately 32.5% of the rental units, in West Babylon had a gross monthly rental rate of between $1,000 and $1,499. Approximately 38.0% had a gross monthly rental rate of $1,500 or more. Overall, the median gross monthly rental rate was $1,448 a month.

North Babylon

The 2010 census data indicates that there were 17,509 people, 6,136 households and 4,548 families residing in North Babylon. The racial makeup of North Babylon was approximately 84.9% White, 6.2% African American, 0.1% Native American, 4.1% Asian, 1.9% mixed race and 2.8% other. The average household size was 2.85 and the average family size was 3.30. The median age in the Town of North Babylon was 40.9 years old, with 5.6% under the age of 5, 30.0% between the ages of 5 and 30, 50.5% between the ages of 30 and 65 and 13.9% above the age of 65.

Household combined income for North Babylon according to the 2010 census was:

- $100,000 to $149,000 – 26.1%
- $150,000 to $199,999 – 10.7%
- $200,000 or more – 3.4%

At the low end of the scale, 2.0% of households earned a combined income of less than $10,000. Overall, the mean household income in West Babylon was $91,736 while the median household income was $82,745. According to the 2010 Census, approximately 6.0% of the population was living below the poverty level. Of all families, 5.0% were living below the poverty line.

The 2010 census data also indicates that 96.2% of housing units in North Babylon were occupied while 3.8% were vacant. Of the occupied units, 82.9% were owner occupied while 17.1% were renter occupied. The vacancy rate among homeowner units was 1.1% while the vacancy rate among rental units was 8.7%.

According to the 2010 census owner occupied housing units were valued as follows:

- $300,000 to $499,999 – 77.1%

- $500,000 to $999,999 – 8.1%
- $1,000,000 or more – 0.0%

At the low end of the scale, 1.8%, were valued at less than $50,000. Overall, the median value of houses in North Babylon is $379,800.

In addition, according to the 2010 census, approximately 32.4% of the rental units in North Babylon had a gross monthly rental rate of between $1,000 and $1,499. Approximately 61.9% had a gross monthly rental rate of $1,500 or more. Overall, the median gross monthly rental rate was $1,643 a month.

<u>Wyandanch</u>

The 2010 census data indicates that there were 11,647 people, 2,926 households and 2,379 families residing in Wyandanch. The racial makeup of Wyandanch was 16.4% White, 65.0% African American, 1.0% Native American, 1.2% Asian, 4.1% mixed race and 12.3% other. The average household size was 3.95 and the average family size was 4.07. The median age in Wyandanch was 30.4 years old, with 8.7% under the age of 5, 40.6% between the ages of 5 and 30, 42.8% between the ages of 30 and 65 and 7.9% above the age of 65.

Household combined income for Wyandanch according to the 2010 census was:

- $100,000 to $149,000 – 12.2%
- $150,000 to $199,999 – 4.0%
- $200,000 or more – 1.4%

At the low end of the scale, 7.8% of households earned a combined income of less than $10,000. Overall, the mean household income in Wyandanch was $63,149 while the median household income was $54,052. According to the 2010 Census, approximately 16.2% of the population was living below the poverty level. Of all families, 12.9% were living below the poverty line.

The 2010 census data also indicates that in Wyandanch 92.7% of housing units were occupied while 7.3% were vacant. Of the occupied units, 58.7% were owner occupied while 41.3% were renter occupied. The vacancy rate among homeowner units was 2.4% while the vacancy rate among rental units was 4.7%.

According to the 2010 census, owner occupied housing units were valued as follows:

- $300,000 to $499,999 – 45.3%
- $500,000 to $999,999 – 3.6%
- $1,000,000 or more – 0.4%

At the low end of the scale, 3.0%, were valued at less than $50,000. Overall, the median value of houses in Wyandanch is $296,700.

In addition, according to the 2010 census, 30.5% of the rental units in Wyandanch had a gross monthly rental rate of between $1,000 and $1,499. Approximately 46.6% had a gross monthly rental rate of $1,500 or more. Overall, the median gross monthly rental rate was $1,430 a month.

<u>Wheatley Heights</u>

The 2010 census data indicates there were 5,130 people, 1,480 households and 1,179 families residing in Wheatley Heights. The racial makeup of Wheatley Heights was 30.3% White, 54.6% African American, 0.5% Native American, 5.6% Asian, 4.2% mixed race and 4.8% other. The average household size was 3.43 and the average family size was 3.83. The median age in the Town of Wheatley Heights was 37.2 years old, with 5.6% under the age of 5, 37.2% between the ages of 5 and 30, 47.1% between the ages of 30 and 65 and 10.2% above the age of 65.

Household combined income for Wheatley Heights according to the 2010 census was:

- $100,000 to $149,000 – 26.3%
- $150,000 to $199,999 – 14.6%
- $200,000 or more – 5.2%

At the low end of the scale, 2.1% of households earned a combined income of less than $10,000. Overall, the mean household income in Wheatley Heights was $99,513 while the median household income was $88,191. According to the 2010 Census, approximately 4.3% of the population was living below the poverty level. Of all families, 3.5% were living below the poverty line.

The 2010 census data also indicates that in Wheatley Heights 97.6% of households were occupied while 2.4% were vacant. Of the occupied units, 85.5% were owner occupied while 14.5% were renter occupied. The vacancy rate among homeowner units was 1.1% while the vacancy rate among rental units was 5.7%.

According to the 2010 census, owner occupied housing units were valued as follows:

- $300,000 to $499,999 – 37.1%
- $500,000 to $999,999 – 50%
- $1,000,000 or more – 0.6%

At the low end of the scale 0.7% of housing units were valued between $50,000 and $99,999. There were no units valued at less than $50,000. Overall, the median value of houses in Wheatley Heights is $502,900.

In addition, according to the 2010 census, approximately 28.9% of the rental units in Wheatley Heights had a gross monthly rental rate of between $1,000 and $1,499. Approximately 41.2% of rental units had a gross monthly rental rate of $1,500 or more. Overall, the median gross monthly rental rate was $1,213 a month.

Deer Park

The 2010 census data indicates that there were 27,745 people, 9,383 households and 7,093 families residing in Deer Park. The racial makeup of Deer Park was 74.9% White, 12.0% African American, 0.2% Native American, 6.8% Asian, 2.6% mixed race and 3.5% other. The average household size was 2.95 and the average family size was 3.41. The median age in Deer Park was 40.7 years old, with 5.4% under the age of 5, 31.6% between the ages of 5 and 30, 47.2% between the ages of 30 and 65 and 15.8% above the age of 65.

Household combined income for Deer Park according to the 2010 census was:

- $100,000 and $149,000 – 24.1%
- $150,000 to $199,999 – 9.0%
- $200,000 or more – 4.8%

At the low end of the scale, 4.7% of households earned a combined income of less than $10,000. Overall, the mean household income in West Babylon was $86,821 while the median household income was $78,325. According to the 2010 Census, approximately 6.0% of the population was living below the poverty level. Of all families, 5.1% were living below the poverty line.

The 2010 census data also indicates that in Deer Park 96.6% of housing units were occupied while 3.4% were vacant. Of the occupied units, 7,579 or 80.8% were owner occupied while 1,804 or 19.2% were renter occupied. The vacancy rate among homeowner units was 1.0% while the vacancy rate among rental units was 5.1%.

According to the 2010 census, owner occupied housing units were valued as follows:

- $300,000 to $499,999 – 82.3%
- $500,000 to $999,999 – 9.3%
- $1,000,000 or more – 0.6%

At the low end of the scale, 1.0%, of housing units were valued at less than $50,000. Overall, the median value of houses in Deer Park is $393,600.

In addition, according to the 2010 census, approximately 39.2% of the rental units in Deer Park had a gross monthly rental rate of between $1,000 and $1,499. Approximately 31.5% had a gross monthly rental rate of $1,500 or more. Overall, the median gross monthly rental rate was $1,294 a month.

West Islip

The 2010 census data indicates that there were 28,335 people, 9,040 households and 7,459 families residing in West Islip. The racial makeup of the Town was 95.9% White, 0.6% African American, 1.7% Asian, 1.1% mixed race and 0.7% other. The average household size was 3.09 and the average family size was 3.43. The median age in the Town of West Islip was 41.3 years old, with 5.4% under the age of 5, 32.2% between the ages of 5 and 30, 48.6% between the ages of 30 and 65 and 13.8% above the age of 65.

Household combined income for West Islip according to the 2010 census was:

- $100,000 to $149,000 – 25.1%
- $150,000 to $199,999 – 13.5%
- $200,000 or more – 10.6%

At the low end of the scale, 2.0% of households earned a combined income of less than $10,000. Overall, the mean household income in West Islip was $117,238 while the median household income was $97,242. According to the 2010 Census, approximately 3.0% of the population was living below the poverty level. Of all families, 2.6% were living below the poverty line.

The 2010 Census data also indicates that in West Islip, 97.6% of housing units were occupied, 2.4% were vacant. Of the occupied units, 92.2% were owner occupied while 7.8% were renter occupied. The vacancy rate among homeowner units was 0.8% while the vacancy rate among rental units was 3.8%.

According to the 2010 census, owner occupied housing units were valued as follows:

- $300,000 to $499,999 – 60.1%
- $500,000 to $999,999 – 31.5%
- $1,000,000 or more – 4.0%

At the low end of the scale, 0.9% of housing units were valued at less than $50,000. Overall, the median value of houses in West Islip is $455,600.

In addition, according to the 2010 census, approximately 24.6% of the rental units, in West Islip had a gross monthly rental rate of between $1,000 and $1,499. Approximately 26.4% had a gross monthly rental rate of $1,500 or more. Overall, the median gross monthly rental rate was $1,429 a month.

3.1.5 Land Use/Zoning Overview, Lot Size/Population

The study area consists of a 14.3 square mile area, located north of the Southern State Parkway, within the communities of Wyandanch/Wheatley Heights, Deer Park, North Babylon, West Babylon and West Islip and consists of approximately 18,100 lots.

Land use is dominated by residential lots (85%), followed by open space, vacant or surface waters (10%), then industrial (3%), commercial (1.6%) and finally institutional (0.4%). Over 73% of the residential properties in the Study Area are 0.25 acre or less, and approximately 93.5% are 0.50 acre or less. There are isolated industrial and commercial areas within the study area. Commercial areas are found along Deer Park Avenue and Straight Path. Industrial land uses are concentrated within the northeast quadrant of the Study Area namely along Brook Avenue, Marcus Boulevard, Wyandanch Avenue, and Long Island Avenue; and in the surrounding area of the Babylon landfill in the southwest portion of the Study Area.

The Study Area is within the Towns of Babylon and Islip. Zoning maps were acquired for the portions of the Study Area and zoning designations were input into the GIS database for the project. The zoning designations and land use for the Study Area are shown on **Figure 3-2.**

3.2 Need For Centralized Treatment Facilities

3.2.1 Past Studies/Reports Supporting Sewering for Area

Since the formation of S.D. #3 – Southwest in the 1970s, planning for expansion of the sewered areas was initiated. Planned routes of future extensions of interceptors 107, 108 and 110 into the Study Area were contemplated and mapped by Suffolk County DPW. Reports reviewed for this study include the following:

1. Comprehensive Sewerage Studies – Five Western Towns, Suffolk County, NY, 1967
   a. Appendix H – Recharge Studies, 1965
   b. Appendix A – Alternate Studies, Disposal District No. 1
2. Feasibility Study for the Expansion of Suffolk County Sewer District No. 3 – Southwest, June 2002
3. Report of the Suffolk County Sewer Agency concerning the need for sewers in the Southwest portion of Suffolk County, March 1965
4. Report on the Need and Feasibility for Public Sewerage Disposal Facilities in Western Suffolk, January 1962

5. LI 2008 Study
6. Long Island Groundwater Management Plan
7. Suffolk County Water Resources Management Plan
8. Flow Augmentation Needs Study

3.2.2 Health and Environmental Concerns

The high density of small (<0.5 acre) residential parcels within the Study Area coupled with high groundwater tables within portions of the three sewersheds, is cause for concern for failing onsite systems that may contribute to groundwater contamination with waterborne microorganisms, metals, organic compounds, nutrients, pharmaceuticals, and personal care product chemicals. The proximity of many of the high density residential, commercial and industrial properties to perennial water courses, ponds and lakes, also poses a potential public health concern from human contact along and on these water bodies. Environmental degradation of these natural resources from pollutant loadings in excess of their natural attenuation capabilities is also a cause for concern. However, further study of these potential impacts can be evaluated during the environmental review and assessment process (SEQRA) prior to funding actions, preliminary and final design, and implementation of the future expansion of a sewer system in high priority (Tier 1) sub-areas of the Study Area.

Implementation of the Tier 1 sewer projects will likely reduce introduction of pollutants to both the groundwater regime in that locality as well as to surface water bodies and water courses in the immediate area. Introduction of these pollutants upgradient of the Tier 1 sub-areas will likely continue, but with a programmatic approach to on-site system maintenance and installation of enhanced systems required for new developments or replacements of existing on-site systems, these pollutant loadings will be reduced.

3.2.3 Economic Stagnation

Local downtown business areas have suffered due to the economic downturn beginning in 2008, and have had difficulty recovering due to declining consumer spending and lack of investment of capital into existing and new businesses. Contributing to the economic stagnation is the inability of existing or future commercial and industrial facilities to expand or intensify their current activities due to limitations on their existing on-site sewage treatment systems and the SCDHS codes and regulations. While most dramatically experienced in the business community, a secondary impact has been the decline in new residential construction, especially in the area of affordable, workforce housing.

Several projects underway in Suffolk County to revitalize downtown areas by either connecting portions of the local downtown business district to an existing treatment plant (e.g. Wyandanch Rising to Bergen Point, or Patchogue to the Patchogue WTP) or creating a new district and construction of a new treatment plant (e.g. Ronkonkoma Hub) can provide a significant economic impetus to draw capital investment and entrepreneurial opportunities to these areas, where higher parcel use (e.g. sewage discharge increases per square foot of floor space) options will be made available to commercial and industrial entities. It must be emphasized that this approach to alleviate economic stagnation in the Study Area downtown business districts is not to the exclusion of residential property owners adjacent to these areas. Typically, downtown business districts are located on main thoroughfares with wide streets. Many of these streets would tend to have larger trunk sewers constructed in them with the ability of the neighboring residential areas to connect via laterals along the perpendicular and parallel side streets.

Commercial and industrial connection fees and tax burden shares are typically higher than a residential connection and will tend to reduce the overall financial burden to residential users.

3.2.4 Social Support

This feasibility study was developed based on the needs and desires of the residents, business owners, and community groups within the Study Area through the actions of their elected County legislators. Community meetings held as part of this study indicate public support for sewers in the Study Area. Prioritization of sewer sub-areas, as described in Section 3.5, will indicate that a phased approach to this project will be most economical and affordable method to sewer the highest priority areas (Tier 1 areas).

As with any large capital construction program there will be ample opportunity for public and stakeholder input at various stages of the project, such as, public scoping sessions for SEQRA, public comment periods as part of the EIS process, and at public hearings at the state, county and local levels related to funding, permitting or approval actions. A comprehensive, pro-active public outreach and public education program will be essential to gain and maintain public support for this large capital construction program.

3.3 Wastewater Management Opportunities/Alternatives

3.3.1 Suffolk County Sewer District No. 3 - Southwest Service Area

Suffolk County Sewer District No. 3 - Southwest (SCSD No. 3 – Southwest) is located in the southwestern quadrant of the County and includes portions of the Towns of Islip, Babylon and a small area of Huntington. The District includes an area of approximately 57 square miles, with approximately 800 miles of sewer lines and 14 remote pumping stations. The existing SCSD No. 3 – Southwest service area is approximately 95% residential. The Feasibility Study will provide cost information regarding the needed sanitary sewage collection and conveyance systems required to extend sewer service to the areas of Deer Park, North Babylon, West Babylon, Wyandanch, Wheatley Heights and West Islip.

The SCDPW has indicated that a substantial part of future capacity at the Bergen Point WWTP facility will be designated to accommodate sewering projects within the project Study Area. This available capacity will represent a major portion of the 10 mgd expansion project currently underway, which will bring the overall plant capacity to 40 mgd.

3.3.2 Creation of Sewershed Sub-Areas

3.3.2.1 Overview

On-site wastewater disposal systems (cesspools and septic tanks) account for over 90 percent of the wastewater treatment employed in the Study Area. While the ultimate goal of this study is to create sewer systems that would service all residential and commercial parcels, the practicality and economic feasibility of achieving 100% attainment of this goal is unrealistic especially in the current financial climate. To best maintain public health, environmental preservation and economic growth, a comprehensive wastewater management approach for the Study Area is essential to monitor and control the deleterious impacts associated with ground water discharges emanating from on-site wastewater disposal systems and small local treatment plants. Such controls will ultimately provide opportunities for relief from Suffolk County Sanitary Code Article 6 restrictions.

In order to best develop manageable sewer projects, the Study Area was segmented into three sewersheds, each mirroring a naturally defined watershed. The sewersheds were delineated as Sewersheds 107, 108 and 110 with each corresponding to an existing SCSD No. 3 – Southwest interceptor that terminated at the southern project boundary (Southern State Parkway). Geographically each sewershed covers a large tract of land with surfaces naturally descending to area waterways. This suggests that groundwater profiles would parallel the general contours and interface with the same water bodies. Depth to groundwater ranges varied significantly throughout the Study Area. However, definite trends were evident, with the shallowest locations being at and adjacent to water bodies and wetlands (see **Figure 3-3**). Further subdivisions were made within each sewershed as well, to create more "implementable" and "fundable" local sewer systems, which were designated as "Sub-Areas". A Sub-Area was defined as a geographic area that exhibited a commonality of natural and physical features that would facilitate the installation of a "gravity" sewer system. Surface topography and roadway configuration were major factors in defining each area's boundaries. Once the Geographic Information System (GIS) data was assessed, it was possible to map out distinct Sub-Areas. Once the limits were defined and the number of parcels delineated it was possible to generate anticipated wastewater flows for each Sub-Area. Since a detailed survey of all properties and their current use was not possible for this study, it was necessary to employ a "conservative" approach in calculating wastewater flows, whereby each parcel was designated as one-family resident usage. Such a property classification typically is characterized with a significantly higher wastewater generation rate than comparable commercial or industry properties. Utilizing this approach, it was possible to develop a worst case scenario (greatest anticipated flow).

As a result twenty-nine Sub-Areas (see **Figure 3-4**) were identified for potential sewering within the three (3) sewersheds as follows:

Number of Sub-Areas by Sewershed

SEWERSHEDS	PROPOSED SEWERING SUB-AREAS
Interceptor 110	11
Interceptor 108	16
Interceptor 107	2
Total	**29**

3.3.2.2 Methodology

Utilizing physical data derived for the Study Area from the GIS it was possible to create logical boundaries for defining the Sub-Areas. While in each sewershed Sub-Areas would naturally be hydro-geologically interconnected, it was essential to sub-divide each sewershed to create stand-alone and manageable projects. Each prospective Sub-Area candidate would contain a fundable sewer system that could either stand-alone or be grouped with adjoining Sub-Areas to provide more cost-effective design opportunities. Major features utilized in defining the Sub-Areas included:

- Land Contours
- Roadway System Alignments
- Land Use
- Environmental Factors

As indicated, twenty-nine Sub-Areas were created and each exhibited one or more common feature. Due to the large expanse of undevelopable land (cemeteries and landfill), only two (2) Sub-Areas were delineated in Sewershed 107 and consisted of existing residential parcels. In Sewersheds 108 and 110, the land use is predominately residential and the configuration of the Sub-Areas were readily definable by roadway routes and land contours

It is important to note that the boundary lines established for each Sub-Area are approximations that were based upon an assessment of various physical features coupled with the application of engineering principles for designing sewer systems. It is recognized that detailed groundwater contamination data, a major identification of immediate need, is currently limited at best. During the design stage opportunities will exist to expand or reconfigure sewering system limits to take into account identified problem areas in contiguous Sub-Areas.

The following natural and physical features within the Study Area were evaluated when developing the Sub-Area boundaries.

Land Contours

The Study Area is characterized by a terrain composed of moderate to gentle slopes that are generally sloped towards low lying areas that border waterways and wetlands. The natural watersheds that exist were utilized to divide the large Study Area into sewersheds. The grading profile of the area was a paramount tool in establishing the proper placement and configuration of proposed “gravity” sewer systems.

Roadway Systems Alignments

Roadway alignments in most cases provided the defining boundaries for most “Sub-Areas”. Not atypical, many thoroughfares in the area were constructed along contour lines to provide a more level riding surface. The steeper roadways follow the natural slope of the area. In the development of a gravity sewer system, roadway slopes will dictate the most cost-effective alignment. Placing gravity sewers on streets that follow contours often require deeper lines to accommodate house connections from the down slope properties. The shallower a sewer can be installed the less installation cost can be expected. Deep sewers, especially in areas where ground water levels are high, typically require deeper and wider trenches and removal of the groundwater (dewatering) to install the pipe and connect the parcels, both increasing installation time and overall cost.

Land Use

The land use characteristics within this area greatly impact sewer installation alternatives and overall system costs. Sizes of a large percentage of residential and neighborhood commercial parcels in the Study Area are typically a quarter acre or less. This is quite dense for a groundwater management area within Suffolk County, where minimum recommended lot sizes are one-half acre. Such density would support the need for sewers. Projected sewage flow generation from residential communities is typically the highest for the various land use classifications. Sewer system therefore must be designed to accommodate the larger flows. Therefore downstream trunk lines and interceptor piping can be expected to be larger and more costly to install.

Environmental Factors

The Study Area is characterized by predominantly high ground water levels. The highest groundwater levels (less than 12 feet below grade) happen to be situated below the most densely developed residential areas, possessing lot sizes of a quarter acre or less. As such the number of on-site wastewater disposal systems discharging to the groundwater is substantial, resulting in a greater potential for subsurface contamination. For this reason, such areas represent strong candidates for future sewering efforts. Unfortunately supporting groundwater quality data is sporadic and incomplete. Information obtained from the SCDHS showed no particular pattern of contamination within the Study Area that would help identify critical locations and/or establish an emerging trend. If an issue with an on-site system were reported it is unclear as to the reason or frequency of the problem.

Sewer systems would substantially help to improve water quality by removing additional pollutants from the area’s ground and surface waters. The elimination of millions of gallons of subsurface discharge from these on-site systems in certain locations, however, could potentially have a long term impact on existing ground water levels by removing a major source of recharge. The possible impacts from lowering of the groundwater table which may impact stream headwaters, ponds and wetlands would have to be evaluated in greater detail. Potential mitigation efforts to minimize impacts related to lowering of the groundwater level may include increased utilization of green infrastructure design methods such as bioswales or rain gardens, permeable pavements, or other facilities to increase recharge of stormwater to the groundwater regime.

3.3.3 Proposed Installation of New Sewer Systems With Interceptors To SCSD No. 3 – Southwest Facilities – Conveyance System Options

Three collection and conveyance system options were evaluated for the project: 1) gravity, 2) pressure and 3) vacuum. Due to operational and maintenance concerns expressed by the SCDPW, vacuum collection systems were not considered any further than a preliminary stage of analysis.

Gravity systems are designed with large intercepting sewers feeding to the treatment facility at Bergen Point. Smaller diameter lateral sewers would be laid out to collect sewage to low points in the sanitary drainage area where sewage would be either conveyed to the interceptor sewer or pumped via force main to a point where it would be collected by a trunk sewer or interceptor sewer. All sewer pipes are anticipated to be 8-inch to 48-inch SDR 35 PVC pipe. House connections are anticipated to be 6-inch SDR 35 PVC pipe. Connections to Interceptors 107 and 108 on the south side of the Southern State Parkway will be jacked or micro-tunneled.

Pressure systems are typically installed in areas where there is rocky soil, hilly terrain, high water tables or flat, low-lying areas. A substantial portion of the Study Area is characterized by a high water table and/or flat low lying areas. Also, some residential and commercial properties adjacent to streams and ponds are at a lower elevation than the roadway and these locations could be considered for an isolated pressure sewer system. This would be desirable in order to keep the gravity system as shallow as possible to reduce the cost of installation and reduce the need for excessive dewatering.

Advantages to pressure systems include:

1) Shallower depth of installation
2) Smaller pipe diameters
3) Reduced excavation, shoring, dewatering, and restoration costs
4) Up to 20% in design and construction cost savings compared to a gravity system

Disadvantages to pressure systems are:

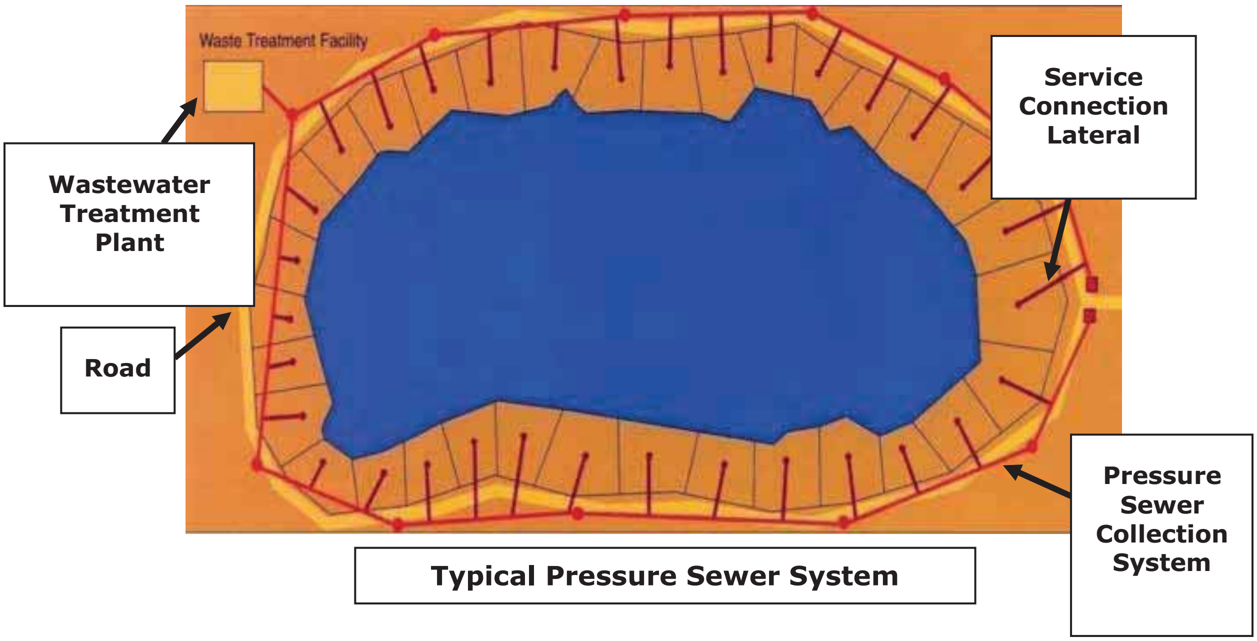
1) Long-term operation and maintenance costs for the grinder pump unit and control system.

2) Initial capital outlay of $4,000 to $6,000 to the customer for the grinder pump unit plus the cost of piping.

3) Selection of appropriate grinder pump type based on design of the pressure system (e.g. centrifugal vs. positive displacement)

One case study indicated that over an 8.5 year operational history, there was a service call out request of approximately 4.2% of the operating units. Of those call outs, approximately 70% required repair or replacement of the grinder pump unit or other component at an average repair cost to the owner of approximately $400. Figure 3.5 below shows a schematic layout of simplified pressure sewer system surrounding a lake with a direct connection to the treatment facility.

Figure 3-5: Typical Pressure Sewer System Layout



It was determined that the most conservative sewer plan be evaluated during the feasibility report, which would be a complete gravity system with interspersed pumping stations as needed. Individual detailed design of the Sub-Areas can address utilizing alternative pressure sewer configurations, or additional pumping stations to raise the elevation of the sewer system in order to reduce construction costs.

3.3.4 Utilization of Existing Sewage Treatment Plants

Within the Study Area boundaries, fifteen (15) privately operated sewage treatment plants (STP) are currently in operation (**see Figure 3-6**). These facilities range in size, handling wastewater facilities from small commercial establishments such as laundromats to larger industrial parcels. Two (2) local plants handle flows from residential complexes, namely Quail Run (Sub-Area 110-6) and Belmont Villas (Sub-Area 108-8). Since the completion of sewering projects could take years to realize, utilizing extra capacity at existing plants should be pursued as an interim consideration.

Discharges from poorly operating STPs represent a potential source of groundwater and surface water contamination. While such facilities are monitored by the SCDHS and the NYSDEC to insure compliance with specific treatment limits, periodic and/or chronic non-compliance is not uncommon. Often costs to the owner associated with providing continuous maintenance making repairs and/or addressing more stringent groundwater discharge standards of operation can be prohibitive. For this reason, consolidating flows from small STPs into future sewer systems is a logical step, and should be incorporated into the overall wastewater management strategy for the Study Area.

As part of this study, efforts were made to obtain existing data on local treatment facilities and assess their potential for future expansion, though available data was quite limited (see **Appendix C**). While field visits to these facilities was not possible during this Study, the existing data from the SCDHS and the United States Environmental Protection Agency's (USEPA) website, *Enforcement and Compliance History On-Line (epa-echo.gov)* was reviewed. Data collected for most facilities was limited. Future site specific evaluations and discussions with the owners of viable STP candidates to provide supplemental wastewater treatment needs in the future will be necessary to determine if their use is realistic. Certain factors such as environmental constraints, site accessibility and spatial limitations are essential in determining whether such facilities offer cost-effective sewage treatment options. The best long-term candidates are those that could provide opportunities for interim treatment services and ultimately could accommodate modular expansion to address developing wastewater needs. To pursue such opportunities, a cursory evaluation should be performed for each plant that has long term potential. At a minimum, key elements of this assessment should be:

- Discuss with owners their interest in accepting additional flow.
- Perform detailed on-site evaluations of existing sewage treatment plants (STPs) to assess effectiveness of current treatment and disposal practices; dedicated and unallocated flow capacities; spatial opportunities for expansion; process needs and accessibility.
- Prepare preliminary cost estimates for providing upgraded or new treatment facilities and associated sewer systems to accommodate interim and long term needs.

- If available capacity exists or the facility can be expanded, identify potential wastewater contributors.

As indicated, the use of these facilities to accommodate existing or short term wastewater needs within the area may provide an immediate or short term solution as the sewering options are being considered. Ultimately, it may prove cost-effective to abandon these local facilities and consolidate such flows into the future Sub-Area sewer systems.

Within the Study Area boundaries, multiple STPs exist. Fifteen (15) privately run facilities service local businesses and residential complexes (**see Appendix C**).

A review of permitted and average daily flow records of facilities where data is available reveal the existence of unutilized capacity (See **Table 3-1**). Whether this capacity would be available to provide wastewater treatment service within the Study Area would require further evaluation and discussions with the STP owner. Any negotiation with existing STP owners/operators regarding future connections may be more productive, if coordinated at a time when their facility is anticipating necessary or mandated plant upgrades or improvements.

While the likelihood of securing all the available capacity at local STPs may be remote, the possibilities should be pursued, especially those that are in Sub-Areas that are not candidates for sewering in the immediate future. However for future planning purposes, **Table 3-1** indicates the extra capacity at each facility where data from 2010 records was available. Hypothetically if all unutilized flow were available, it could provide wastewater treatment opportunities for a substantial number of residential units, that is, approximately 1,112 dwelling units (DU) at 300 gallons/day (gpd) per parcel. If a 225 gpd per parcel figure was utilized, approximately 1,483 DU could be serviced with the additional capacity. This capacity, if it were to be utilized to support commercial/business development may provide a substantial portion of the Study Area's potential wastewater needs. Using a typical sewage factor of .06 gpd/sf of office space, the identified capacity of 333,875 gpd could service almost 5,500,000 sf of commercial development.

The cost effectiveness of utilizing Study Area wastewater facilities would need to be analyzed and would depend upon many factors including: the current condition of STPs and anticipated improvements; any permitting or legal restriction or limitations; the fees and duration associated with its use; and the costs of sewage conveyance, among others.

Table 3-1: Study Area STPs –Unutilized Capacity

STP Name	Permitted Flow 2010 gpd (1)	Average Daily Flow 2010 gpd (1)	Unutilized Capacity gpd	Equivalent Development Opportunities Residential @ 300 gpd/DU	Tier Sub-Area
Pinelawn Power	350,000	108,000	242,000	806	**Tier 3** **107-2**
Quail Run Homeowner's Association	86,000	34,000	52,000	173	**Tier 2** **110-6**
Somerset Woods Associates	30,000	17,000	13,000	43	**Tier 1** **108-1**
Deer Park Car Wash	9,100	3,700	5,400	18	**Tier 2** **110-5**
RSM Electron Power	2,750	2,675	75	0	**Tier 3** **110-10**
TOTAL	**507,850**	**173,975**	**333,875**	**1,112 Units**	

(1) Based upon 2010 SCDHS and USEPA data for 2010

As indicated, connecting to existing STPs would require the installation of wastewater collection and conveyance systems. This can be an expensive component of the overall wastewater system, and must be planned such that systems are compatible with Study Area long-term wastewater management strategies. It would be envisioned, as sewer systems are installed, that many of these local STPs may elect to cease operation and connect into the Bergen Point WWTP. This would especially be the case in Sub-Areas which contain high groundwater levels and are initially chosen for sewering installations. Depending upon the alignment of the future sewer system, a hookup of some of these facilities may require the conversion of these STPs to pump stations and possibly the installation of force mains. STP facilities that are functioning well and are located in areas where future sewering is not imminent, represent the best candidates for expansion.

3.3.5 Installation of Alternative On-Site Wastewater Disposal Systems

3.3.5.1 Existing On-Site Wastewater Disposal Systems

The majority of properties within the Study Area rely upon on-site wastewater disposal systems to process sewage. The use of on-site systems is not atypical for Suffolk County where over two-thirds of properties possess cesspools or septic tanks. On-site wastewater disposal processes are designed to remove contaminants from wastewater with the liquid component (effluent) being discharged to the ground. The most common on-site wastewater disposal system utilized by residences in Suffolk County is the septic tank system. A typical system consists of four components:

Wastewater Piping System: piping utilized to transport wastewater flow by gravity from the house to an in-ground septic tank.

- Septic tank: a buried chamber used to allow the decomposition of the solid component of sewage. The solids settle to the bottom of the tank where stabilization and anaerobic decomposition of the organic material occurs. Wastewater effluent leaves the septic tank through an outlet located at the top of the tank and is distributed via gravity to the leaching field.

- Leaching Field: a designated drainage area that receives piped effluent from the septic tank. The effluent is allowed to infiltration to the soil.

- Soils: effluent comes in contact with the soil which serves as a filter for removing bacteria, viruses and nutrients. Soil must possess adequate percolation rates to handle typical household flows (SCDHS recommended 300 gpd).

The anaerobic bacteria's decomposition of the solids in the tank allows sufficient breakdown of the organic material so that the soil can absorb the effluent without clogging the drainage area. However, these conditions may only be accomplished in a properly designed system that takes into account a regular maintenance routine program for periodic inspection and routine removal of septage from the tank. Cleaning of the septic tank is typically necessary when enough scum accumulates in the top of the tank and/or about one-third of the bottom of the tank is filled with sludge. Routine maintenance is essential for insuring that the treatment efficiency of the unit is retained. Septic systems however do not remove all solids from the wastewater and a portion of the solids will enter the leaching field. Ultimately the soils can lose their percolating capacity resulting in potential clogging of the leaching field. As a system fails, odors can develop and chronic backups can occur. The environmental implications can be severe as accelerated levels of contaminants and pathogens infiltrate into local streams and groundwater.

Cesspool systems are typically constructed of precast concrete leaching rings that are buried and connected to the sanitary house connection. These systems will typically consist of a main cesspool with an overflow pool connected to it. Older cesspool systems were constructed of cement block. Periodic pump out of cesspool systems is essential to maintaining their treatment capacity and avoiding backups into the residence.

3.3.5.2 Problems with On-Site Wastewater Treatment

The absence of a proper on-site wastewater disposal system maintenance program results in an effluent with a high level of solid material that, when entering the leaching field, overloads the soil with excess nutrients and contaminants. Maintenance of such systems is often left to the discretion of the property owner, who typically responds only after chronic backups start occurring. Currently no regulatory monitoring/maintenance program is in place. In Suffolk County, the majority of the on-site units discharge wastewater effluents to lands that lie above protected water supply aquifers. The cumulative impact of these discharges has been demonstrated throughout the County to be a primary source of excessive nitrogen contamination (in the form of nitrates) entering these aquifers. When maintenance of on-site systems is neglected, they can no longer provide proper treatment of the influent wastewater. The result is the release of untreated organic matter to the drainage area at levels at which the soil is not capable of processing. As a result, untreated human waste as well as other contaminants reach interconnected surface water bodies and groundwater aquifers causing the degradation in the quality of these waters.

The Study Area is situated in Hydro-geologic Groundwater Management Zones I and VII, where minimum lot sizes for new development are regulated at ½ acre. Present restrictions on on-site system capacity have been imposed by SCDHS for residential and commercial developments within these zones to insure that contaminants, such as nitrates, do not impact protected ground water supplies. On-site wastewater disposal systems can produce an effluent with nitrogen concentration of approximately 40-45 mg/l which is a much higher concentration compared to STPs with advanced treatment that can remove nitrogen to a concentration of 5 mg/l and lower. Newer alternate on-site systems have been reported to reduce the nitrogen level to less than 10 mg/l.

The Study Area is densely populated and possesses zones of very shallow groundwater (less than 7 feet from ground surface) and environmental features such as wetlands and streams. Currently most parcels in the Study area are less that ½ acre in area with a large percentage of these being less than ¼ acre. The result is a larger number of on-site systems concentrated in a smaller area and greater potential for groundwater contamination.

3.3.5.3 New Technologies

On-Site wastewater disposal systems that are not properly designed, located and/or maintained can contribute with pathogenic contamination of soils, surface waters, and groundwater, jeopardizing drinking water aquifers sources and surface waters for wildlife habitat. For the Study Area, the presence of an easily accessible regional treatment plant and a network of amply sized interceptors provide a viable solution for the future management of wastewater. The availability of sewers will enhance economic opportunities, encourage work force housing construction and provide relief from restrictive groundwater protection mandates. However, conventional sewer systems are costly and may not be practical or cost-effective for the entire Study Area. For this reason, innovative approaches to deal with wastewater management throughout the Study Area, especially in areas where the depth to groundwater is substantial, may be worth exploring.

Currently, the SCDHS is evaluating new technological alternatives to the conventional on-site septic tank or cesspool. Many of the more innovative treatment systems require a separation of the gray and black water components at the source. It is understood that as part of SCDHS's comprehensive study, various enhanced on-site systems have been evaluated to date, both Nitrex[1] and BESST systems were approved as acceptable systems for small package WWTPs. The Massachusetts Department of Environmental Protection (MADEP) has been a leader in the northeast in identifying innovative on-site treatment and soil absorption systems. Currently over 30% of Massachusetts utilizes on-site wastewater disposal systems and the use of innovative and alternative technologies is prevalent in areas where nitrogen-sensitive groundwater resources must be protected. One such technology, currently approved for use by the MADEP, the Ruck CFT system, possesses nitrogen removal capabilities. Unfortunately many of the newer systems require substantial land and are quite expensive to install and operate. As newer, more cost-effective on-site wastewater disposal options are developed and approved, such systems should be utilized for all system replacements as well as for new development.

Retrofitting existing homes in the Study Area with newer nitrogen reducing septic systems is most likely not realistic due to both cost and spatial issues.

3.3.5.4 Future Management of On-Site Systems:

Managing on-site wastewater disposal systems will be an essential component in insuring the preservation of human health and the environment. With limited funding, full scale sewering of the Study-Area, at least in the foreseeable future appears unrealistic. Therefore, a less costly strategy appears necessary that will provide short and long term management of the on-site wastewater disposal systems in the Study Area. The priority to protect public health and control the impacts of on-site wastewater discharges on groundwater quality is further enhanced by the recent emergence of groundwater contamination allegedly emanating from household

[1] The Nitrex system needs to be supplemented by a pre-treatment nitrification system converting ammonia to nitrate.

pharmaceuticals and personal care products providing a further impetus to control on-site system discharges. Some potential opportunities that may be instituted at the sewer district level include:

- The creation of a District-wide program to monitor and/or regulate the processing and frequency of the pump-out of septage waste may be an effective control method. All property owners would be required to pump-out on-site systems on a set schedule, depending on various localized environmental conditions. All scavenger waste haulers servicing the area would be required to register with the district and provide documentation of each pump-out undertaken. Possibly an agreed upon rate could be negotiated with the haulers that would insure a fair and consistent fee for cleanout services. An equitable charge may encourage more property owners to comply with such a program. Data regarding system failures and frequency of pump-outs would provide supporting documentation when competing for funding to install future sewer systems.

- Local policies could be developed that will provide the Sewer District with the authority to require the use of future SCDHS approved alternate on-site wastewater disposal systems (which provide greater removal capacities) when existing systems are being replaced or new development is proposed.

- Routine groundwater and stream water quality sampling programs should be coordinated with the County that would help the district identify emerging problem areas.

3.4 PROJECTED WASTEWATER QUANTITIES IN STUDY AREA

3.4.1 Water Consumption Records

The Suffolk County Water Authority (SCWA) was contacted by the SCDPW and the Joint Venture to provide the most recent available water consumption records for parcel within the Study Area. The Joint Venture (JV) was provided the 2010 water consumption billing records for the water accounts associated with the parcels included in the GIS system acquired from Suffolk County and managed by the JV. To develop a sense of current sewage that may be generated by a typical Study Area parcel, water usage data on an average daily basis was analyzed by the JV for the first quarter of 2010 data (January through March). This data period was selected for use because it would most closely correspond to expected daily sewage flows since it would be devoid of extraneous seasonal water usage associated with irrigation, swimming pool filling or make-up water, car washing, or other water usage that would not typically reach a sanitary sewer system. The JV also examined the water consumption records for the second and third quarters of 2010 to see the increase in documented usage compared to the first quarter consumption records.

This method of estimating flows by Sub-Area was developed as a check to ensure that extraneous flows were not being missed when using the conservative 300 gallons per parcel per day figure as described in Section 3.4.2. For example, an illegal multi-family dwelling or non-conforming property use (e.g. commercial property in a residential zoned area), may exhibit far higher sewage flows than the 300 gallons per parcel.

The SCWA billing data was incorporated into the GIS system and layers developed by the JV for this study. Each SCWA water account was mapped as a node on the Study Area map. Water account nodes were mapped within their respective Sub-areas and the Sub-area daily average flows were calculated from the winter 2010 quarterly billing data provided by SCWA. **Table 3-2** below summarizes the results for each sewershed.

Table 3-2 – Average water consumption data summary by sewershed per SCWA account in gallons per day (GPD)

Sewershed	% Residential	1st Quarter (GPD)	2nd Quarter (GPD)	3rd Quarter (GPD)
107	43.6%	295	384	591
108	96.0%	198	334	607
110	93.2%	229	324	586

Evaluating the average water consumption data per SCWA water account indicates that usage is consistent with the 225 to 300 gallon per parcel per day estimates the JV used for the conceptual sewer system layouts and sizing. The higher average consumption amount of 295 gpd in Sewershed 107 could be attributed to the high number of commercial and light industrial land uses within this area in the vicinity of the Babylon landfill that could have high baseline water consumption throughout the year.

3.4.2 Projected Wastewater Flows – SCDHS and SCDPW Typical Generation Rates

3.4.2.1 Calculation of Wastewater Flow Rates for Study Area

The Study Area consists of three (3) sewersheds, each corresponding to an existing wastewater interceptor installed along the southern boundary (Southern State Parkway) of the Study Area. Gravity sewer conveyance systems were designed for each of the sewersheds which connected into the SCSD No. 3 interceptors. Sewage generated in each sewershed was collected from the northern limits of the Study Area. Parcel data was generated from the GIS mapping assembled for this Report. The three (3) Sewersheds (107, 108 and 110) are mainly composed of high density single family residences. Since the total percentage of commercial and institutional properties (including park and recreational areas) is significantly small in comparison to the single family residential parcels, it was logical that the flow analysis be based on single family residences. A wastewater flow generation rate of 300 gallons per day (gpd) per parcel as required by the SCDHS was used. **Table 3-3 - Projected Wastewater Flow by Sub-Area,** presents the wastewater flow analysis by Sub-Area, and is included in the Tables section in the back of this report. To identify the flow quantities necessary to size the proposed wastewater collection and conveyance system, a peaking factor of 2.93 was applied to the anticipated average daily flow (consistent with Ten State Design Standards).

Designating all parcels within the Study Area as residential provided a total flow that would be expected to be conservative. It is anticipated that a reduction of the proposed design flows presented in this Report will be possible as a more detailed analysis of the existing land use is conducted during the design phase. For comparison purposes, a flow rate of 225 gpd for single family residential units was applied. This figure was projected by the Suffolk County Department of Public Works (SCDPW) and is considered more representative of Suffolk County wastewater generation. **Table 3-4 - Projected Wastewater Flows - Ranges by Sub-Area** shows the comparison of projected flows by Sub-Area, and is included in the Tables section in the back of this report.

The projected flow accumulated as a result of the installation of the new sanitary gravity conveyance systems throughout sewershed 107, 108, and 110 exceeds the current short term projected capacity of the SCSD No. 3 Bergen Point WWTP. As a result a tier analysis was conducted to prioritize the areas that have showed the greatest urgency for sewers. The development of the prioritization factors are discussed in Section 3.5.1. **Table 3-5 - Projected Flows by Tiers** shows the comparison of projected flows by Tiers, and is included in the Tables section in the back of this report.

3.4.2.2 Presentation of Wastewater Flow Data

As indicated, for this preliminary calculation of wastewater flow for the Study Area, it was assumed that all parcels were designated as one-family residential properties. This method is conservative, but representative of the area where over 90 percent of the developed properties are residential in nature. During the design phase, each parcel can be analyzed and more accurate wastewater flow data can be calculated utilizing SCDHS wastewater generation rates for the various parcel usage designation. For the purposes of this Study the data provided offers a fair depiction of the relative needs in each Sub-Area and Tier. The use of two typically utilized one-family residential wastewater generation rates for Suffolk County provides a range of flows that can be expected.

3.4.3 Buildout Scenario – Proposed Zoning – Potential Development

The Study Area consists of three (3) sewersheds, each corresponding to an existing wastewater interceptor installed along the southern boundary (Southern State Parkway) of the Study Area. The Study Area is significantly developed with a range of residential, commercial, industrial, institutional and recreational uses. There are localities within the Study Area that may be available for redevelopment or conversion from commercial to mixed use development, however the flow projections developed and discussed in Section 3.4.2, should be sufficient to cover future redevelopment in these cases.

Existing open space and parkland are not likely to be developed as alienation of parkland is an arduous and politically unfavorable process that will require extensive environmental review and approval from the NYS Legislature. Other areas of potential rezoning or redevelopment include:

1) Industrial Development area north of CR 57, along Brook Avenue
2) Open Space bounded by Commack Road and Long Island Avenue, in the northeast portion of the Study Area.
3) Open Space in Wyandanch/Wheatley Heights area bounded by Colonial Springs Road and Conklin Avenue.
4) Colonial Springs Golf Club
5) Commercial/Light Industrial area along Wyandanch Avenue between Straight Path and Belmont Avenue.
6) New Montefiore Cemetery (east portion appears unused)
7) Expansion of Tanger Outlet Mall at the Arches
8) Open Space in the northwest quadrant of the Study Area, bounded by Nicolls Road, Little East Neck Road, the Long Island Rail Road, and N. 28th Street.

With the installation of sewers, current zoning may change to permit greater density and a variety of mixed use designations and thus offer greater opportunities for commercial/industrial expansion and the construction of multi-family residential complexes (workforce housing).

3.5 PRIORITIZING SUB-AREA SEWER SYSTEMS – SEWERING APPROACHES

3.5.1 Development of Project Tiers

When defining boundaries for each Sub-Area, an array of physical and natural features were taken into consideration including, land contours, roadway system alignments, land use and environmental factors. Once limits were delineated, sewer layouts for each Sub-Area were developed, in each case employing "gravity" piping technologies. A basic design criterion for each sewershed was that individual systems were to be hydraulically interconnected. Since funding as well as available plant capacity is restrictive, Sub-Areas were prioritized to identify those where apparent or potential needs were most evident. To best present these findings, each Sub-Area was rated utilizing a matrix type format and placed into one of three, priority-based

Tiers, with Tier 1 representing the Sub-Area candidates exhibiting the most immediate need for sewering.

To perform a consistent evaluation of the Sub-Areas, it was necessary to identify the primary sewering factors that would support the need for sewers. Four (4) sewering factors were identified with two (2) factors being considered primary and two (2) factors secondary. The primary factors were assigned higher numerical values (weight) when developing the matrix scoring system. For each factor, criteria were established and various numerical values assigned. The intent in developing the criteria was to provide profiles of various existing conditions that would help define each factor.

When assessing sewering potential, certain factors intuitively carry more importance since they are associated with the overall effectiveness and cumulative impact of individual on-site wastewater disposal systems, a major focus for the area. The two primary sewering factors, 1) depth to groundwater and 2) parcel density, were found most important, since they provided the most revealing and comparative data that could be utilized as a basis for defining the immediacy for sewering among the Sub-Areas. Two secondary sewering factors were also identified, that is, 1) proximity to streams and wetlands, as well as 2) potential for economic revitalization opportunities, since they represent a definite impact on the decision to sewer.

3.5.1.1 Evaluation Methodology

A matrix format was utilized to calculate scores for each established sewering factor, which when totaled would provide a basis for rating the twenty-nine (29) Sub-Areas. For each factor, a list of technical criteria was developed that described various physical and natural characteristics existing within the Study Area. The intent of this exercise was to provide generalized descriptions that could be used in the prioritization of sewering candidates. Scores for each factor were totaled producing a rating value for each Sub-Area. The higher the score tallied for a Sub-Area, the greater the risk of health and environmental concerns.

The Sub-Areas were placed in three (3) Tiers, with Tier 1 representing the Sub-Areas candidates with the highest score and hence the greatest immediate need. Tier 2 and 3 candidates were delineated as well, and each of these was identified as future sewering possibilities. The number of Tier 1 facilities that would proceed to design and construction would be dependent upon funding capabilities and available plant capacity. (**See Figure 3-7: Sub-Areas by Tier**)

3.5.1.2 Development of Sewering Factors –Weighted Rating System

In preparing this assessment, it was recognized that certain natural and physical conditions within the Study Area are major elements when considering the need for sewers. Thus, weighted criteria were developed and applied to select Primary and Secondary Sewering Factors. The intent was to place a greater emphasis on those factors that intuitively exert the most influence on determining when sewers are required. **Table 3-6** identifies the sewering factors utilized in this analysis and the range of scoring.

Table 3-6: Scoring Range by Factor

SEWERING FACTORS	WEIGHTED RANGE APPLIED TO CRITERIA
Primary:	
Depth to groundwater	10 (most severe) - 0 (least severe)
Parcel density	10 (most severe) - 0 (least severe)
Secondary :	
Closeness to streams and wetlands	5(most severe) - 0 (least severe)
Economic revitalization opportunities,	5 (most severe) - 0 (least severe)

3.5.1.3 Primary Factor Criteria Descriptions

Depth to Groundwater: Within the Study Area, the depth to groundwater varies significantly, though the majority of the Sub-Areas are characterized with groundwater elevation less than 20 feet from grade. Many of the lowest areas, which are situated near streams and wetlands, are also where many of the smaller sized residential lots are located and therefore contain the greatest concentration of on-site wastewater systems. **See Figure 3.3: Groundwater Depth Map** which illustrates the concentration of smaller sized residential lots in these areas. **Table 3.7** below contains descriptions of the criteria used for assessing the impacts of groundwater depth.

Table 3-7: Depth to Groundwater - Criteria

RATING VALUE	CRITERIA DESCRIPTION
10	Groundwater in approximately 75% of Sub-Area is at a depth of 7 feet or less, with the remainder primarily less than 12 feet
8	Groundwater in approximately 50% of Sub-Area is at a depth of 7 feet or less, with the remainder primarily less than 12 feet
6	Groundwater in approximately 25% of Sub-Area is at a depth of 7 feet or less, with the remainder primarily less than 12 feet
4	Groundwater in primarily at a depth of less than 12 feet throughout the entire Sub-Area
2	Groundwater in primarily at a depth of less than 20 feet throughout the entire Sub-Area
0	Groundwater depth throughout the Sub-Area is primarily above 20 feet.

Parcel Density: The primary land use in the Study Area consists of single family residential properties. Lot sizes are generally less than the minimum lot size of ½ acre established by Suffolk County's Sanitary Code Article 6 for developments within Hydro-geologic Groundwater Management Zones I and VII (the Study Area). Typical parcel sizes are well under ½ acre with a large percentage less than ¼ acre. The smaller the lot sizes the more on-site wastewater systems will be present, resulting in a substantial increase of effluent flow generated per acre. This will create a greater stress on the area's groundwater and surface water quality. For rating purposes the criteria focuses on "developable" parcels and removes parks and designated open space areas from the evaluation of a Sub-Area. **(See Figure 3-8: Parcel by Acre Size). Table 3-8** below contains descriptions of the criteria used for assessing Sub-Area density.

Table 3-8: Parcel Density - Criteria

RATING VALUE	CRITERIA DESCRIPTION
10	Approximately 90% of developable parcels within the Sub-Area are ½ acre or less with at least 50% less than ¼ acre.
8	Approximately 90% of developable parcels within the Sub-Area are ½ acre or less with at least 25% less than ¼ acre.
6	Approximately 90% of developable parcels within the Sub-Area are less than ½ acre
4	Approximately 60% of developable parcels within the Sub-Area are less than ½ acre
2	Approximately 30% of developable parcels within the Sub-Area are less than ½ acre
0	Developable parcels within the Sub-Area are generally greater than ½ acre.

3.5.1.4 Secondary Factor Criteria Descriptions:

Proximity to Streams and Wetlands: The Study Area is composed of three (3) distinct watersheds characterized by moderate to steeply descending land surfaces culminating at naturally forming streams and wetlands. The portion of the flow in these water bodies is attributable to adjoining groundwater supplies. Therefore contaminants entering the groundwater from effluent derived from on-site wastewater disposal systems have the potential of negatively impacting these waterways. **Table 3-9** below contains criteria descriptions used for assessing proximity to water bodies or wetlands.

Table 3-9: Proximity to Streams and Wetlands - Criteria

RATING VALUE	CRITERIA DESCRIPTION
5	Boundary of Sub-Area is contiguous to a stream or wetland
4	Boundary of Sub-Area is located within 1000 feet of a stream or wetland
3	Boundary of Sub-Area is located within 2000 feet of a stream or wetland
2	Boundary of Sub-Area is located within 3000 feet of a stream or wetland
1	Boundary of Sub-Area is located within 4000 feet of a stream or wetland
0	Boundary of Sub-Area is located beyond 4000 feet of a stream or wetland

Economic Revitalization Opportunities: Because of the restrictions on development brought about by regulation to preserve and protect Suffolk County's drinking water aquifer system, the future stability and vitality of Suffolk County's economy will be dependent upon on the availability of sanitary sewers. The Study Area is predominantly served by on-site wastewater disposal systems. Lot size restrictions related to on-site treatment have seriously impacted opportunities to attract new or expand commercial and industrial developments and have stymied efforts to construct, higher density, affordable housing complexes. A secondary impact of installing sewers within the predominantly residential area will be the availability of sewers to accommodate future growth potential. Table 3.9 includes the criteria used to evaluate Sub-Areas related to economic revitalization opportunities.

Table 3-10: Economic Revitalization Opportunities - Criteria

RATING VALUE	CRITERIA DESCRIPTION
5	Approximately 50% of the Study Area is zoned for commercial and industry.
4	Approximately 40% of the Study Area is zoned for commercial and industry.
3	Approximately 30% of the Study Area is zoned for commercial and industry.
2	Approximately 20% of the Study Area is zoned for commercial and industry.
1	Approximately 10% of the Study Area is zoned for commercial and industry.
0	Minimal parcels exist that would be available to accommodate future development.

3.5.1.5 Sub-Area Scoring

Scores were tallied for each Sub-Area, and the results of this exercise are detailed in **Table 3-11: Sub-Area Scoring Matrix**, contained in the Tables section at the back of this report. Sub-Areas were displayed by sewershed. Scores ranged from a high of 24 to a low of 0, with the highest scores representing areas where the primary factors for need are most evident. The maximum score attainable is "30". It is important to note the following qualifying points:

- As previously discussed, the boundaries for the Sub-Areas were established based upon the commonality of physical and environmental features in the Study Area. The limits of any future sewer project will be defined by hydraulics and an assessment of immediate need within the Sub-Area as well as contiguous areas. Additional field investigations, including possible groundwater quality testing may need to be undertaken to establish more concise and scientifically supported limits.

- Percentage delineations utilized in defining criteria were established by evaluating environmental and land use data presented on GIS mapping. The ranges presented represent a reasonable breakdown of Study Area conditions. When assigning scores for each Sub-Area, surfaces were scaled and applicable percentages were approximated for each factor. It is recognized that these are estimates and scores can vary to a degree for each Sub-Area. However, they provide an overall guide for identifying the Sub-Areas where conditions appear most severe.

3.5.1.6 Tier Designation

The Sub-Areas were placed in three (3) Tiers. Sub-Areas that received the highest scores were identified as Tier 1, and these represented the areas with the greatest potential for future health and environmental degradation. As such, Tier 1 locations were considered the most viable candidates for sewering. While a substantial number of the twenty-nine (29) Sub-Areas were designated as Tier 1 candidates, it is understood that due to restrictions related to funding capabilities and available plant capacity, future refinement of the Tier 1 list of candidates may be required to provide a fundable prioritization strategy. Sub-Areas identified as Tier 2 or Tier 3 candidates are considered to have a less overall potential for environmental degradation to occur as a result of failing on-site systems. These areas are viewed as less likely to require sewers in the near future. However, future environmental data (ground and surface water sampling) may support sewering for isolated areas located within Tier 2 or Tier 3 Sub-Areas.

A description of the scoring levels utilized in assigning Sub-Areas to the three Tiers is presented in **Table 3-12: Tier Designation – Scoring Levels.**

Table 3-12: TIER DESIGNATION - SCORING LEVELS

TIER	DESCRIPTION
1	**<u>Score of 14 or greater:</u>** Tier 1 candidates are those Sub-Areas where the highest potential environmental concerns exist. As such, these Sub-Areas should be considered as the highest priority for sewering and should be the focus of initial financing. Tier 1 candidates are characterized by densely populated communities, on relatively small parcels of land with most having an on-site wastewater system. The number of on-site wastewater disposal systems per acre greatly exceeds SCDHS standards. Groundwater elevations are very close to grade and the cumulative effect of on-site system discharges would potentially be most deleterious.
2	**<u>Score of 10 to 13:</u>** Tier 2 sewering candidates are those Sub-Areas where potential environmental concerns appear less significant, and the need for extensive sewer systems is not immediately warranted. Tier 2 candidates are typically contingent to the Tier 1 areas. During detailed design phases for Tier 1 sewering projects, the expansion of proposed systems to accept wastewater from isolated problem areas or proposed economic revitalization projects within Tier 2 Sub-Areas including failing local STPs may be considered. Tier 2 candidates would typically be characterized by highly populated communities, with most parcels being ½ acre or less in size. Depth to groundwater is typically within 12 to 20 feet of the surface, and offers a greater filtering zone for on-site wastewater disposal system effluent. The number of on-site systems per acre generally exceeds SCDHS standards and as such the cumulative effect of system discharges could be deleterious. Tier 2 Sub-Areas would be considered as candidates for sewering in the future assuming plant capacity is made available. Maintenance of on-site systems as part of a Study Area wide Wastewater Management Program would be an effective method for reducing potential environmental concerns.
3	**<u>Score of 9 or less:</u>** Tier 3 sewering candidates are those Sub-Areas where lot sizes are generally consistent with the ½ acre minimum size required by the SCDHS. The depth to groundwater typically exceeds 20 feet and potential environmental degradation from on-site wastewater disposal systems would appear less likely, and thus the need for extensive sewer systems is not currently warranted. During detailed design phases for Tier 1 or Tier 2 sewering projects, the expansion of proposed systems to accept sewage from proposed economic revitalization projects or failing local STPs may be considered. Tier 3 Sub-Areas would least likely be considered as candidates for large scale sewering projects. Maintenance of on-site systems as part of a Study Area wide Wastewater Management Program would be an effective method for reducing potential health and environmental issues.

The twenty-nine (29) Sub-Areas were evaluated and rated and then placed in the appropriate Tier. A breakdown by Tier is shown in **Table 3-13** below:

Table 3-13: Tier Breakdown

TIER DESIGNATION	NUMBER OF SUB-AREAS
1	12
2	9
3	8
TOTAL	**29**

3.5.2 Wastewater Management Strategy By Tiers

Providing and/or enhancing wastewater treatment opportunities within the Study Area, remains a key component in improving water quality; deterring potential environmental degradation, providing affordable workforce housing consistent with current density and if vacant parcels are identified, as well as stimulating economic development. To achieve this goal, it is necessary to identify cost-effective approaches to utilize, coordinate and consolidate existing wastewater management facilities and activities within the Study Area as well as utilize the available treatment capacity at the Bergen Point Wastewater Treatment Plant (WWTP).

The focus of this Study was to develop individual sewering systems for each of the identified Sub-Areas. The systems would be hydraulically interrelated and all would tie-into existing SCSD No.3 interceptors, where sewage would flow to the Bergen Point WWTP for treatment. Estimated costs were prepared for each system, and based upon an array of physical and environmental factors, sewer systems were prioritized for projected need. Sub-Areas were placed in various Tiers, with Tier 1 representing the highest priority sewering candidates.

Based upon available data and an assessment made of the various treatment opportunities available within the Study Area, it was possible to develop an overall wastewater management strategy that would provide a guide for future sewering efforts. The following is a listing of various wastewater management approaches proposed for the three (3) Tiers.

3.5.2.1 Proposed Wastewater Management Strategy for Tier 1 Sub-Areas

Tier 1 Sub-Areas represent the locations within the Study Area where sewering appears most warranted. **Table 3-14: Tier 1 Sub-Areas** below summarizes the scores and impacted communities for each Sub-Area.

Table 3-14: Tier 1 - Sub-Areas

Sewershed	Sub-Area	Scoring (1)	Impacted Communities
108	1	20	North Babylon
	2	24	North Babylon
	3	21	Deer Park
	5	15	Wyandanch
	7	15	Deer Park
	8	16	West Babylon
	11	20	Wyandanch
	12	14	Wyandanch; Wheatley Heights
110	1	15	West Islip
	2	22	North Babylon
	3	14	Deer Park
	4	17	Deer Park
Total	**12**		

(1) Maximum score achievable is 30.

The projected daily average wastewater flow generated within Tier 1 Sub-Areas comprised of 9,004 parcels will be approximately 2.7 mgd

Wastewater management strategies for Tier 1 Sub-Areas include the following:

A. Proceed into the preparation of detailed design phase for constructing sewer systems which would collect sewage from all residential, commercial and industrial parcels within Tier 1 Sub-Areas. Based upon projections of the SCDPW, approximately 5.0 mgd of capacity would be available for the Study Area upon completion of the current 10 mgd upgrade of the Bergen Point plant. The anticipated peak wastewater flow for Tier 1 is 5.9 to 7.9 mgd, however this represents a conservative range since the sewage generation rate utilized for each parcel is based upon the highest usage for a zoning classification, that is, one family residential. Realistically, due to funding constraints and available plant capacity, it is recognized that sewering all Tier 1 candidates in the immediate future will not be feasible. Therefore to delineate and prioritize the Sub-Areas within Tier 1 by order of need, it may prove prudent, as an initial task to perform a comprehensive groundwater and stream sampling effort as well as an analysis of future planned development to help delineate and prioritize all Tier 1 Sub-Areas.

B. While the recommendation of this Study is to provide sewers for each of the Tier 1 Sub-Areas, the time frame for such a goal has yet to be determined. In areas not scheduled for sewering in the immediate future, the managing of on-site wastewater disposal systems will be an essential component to ensure environment and human health preservation. With limited funding, a more practical and implementable strategy appears necessary to provide initial relief as well as a method for controlling the impacts associated with the on-site wastewater disposal systems within the Study Area. The creation of a District-wide program with jurisdictional authority to monitor and manage the processing of pump-out septage waste from on-site systems may be an effective control method. However the implementation of such an initiative will be directly dependent upon the availability of capacity at scavenger waste facilities within a reasonable distance from the Study Area. The impetus to control such discharges is further enhanced by the emerging public concern regarding potential impact on the groundwater quality from household pharmaceuticals and personal care products. An initial step would be to monitor and regulate the processing and frequency of the septage waste pump-outs. Since the practicality and economic feasibility of providing sewers for all the Tier 1 Sub-Areas may not be physically or financially possible in the immediate future, due to the environment issues associated with this Tier, the management of pump-out waste generated from on-site wastewater disposal systems should be a priority in protecting public health and controlling the impacts of wastewater discharges on groundwater quality. Program policies could be further developed that will provide the sewer district with the ability to require the use of future SCDHS approved alternate (enhanced treatment units) on-site systems (which provide greater treatment capacities) when existing on-site wastewater disposal systems are being replaced or new development is proposed. Such applications may result in relief from the SCDHS, minimum parcel size designation, allowing greater developmental density.

C. Four (4) local sewage treatment facilities were identified within the Tier 1 Sub-Areas. Data availability regarding plant capacities and operational efficiency was limited during this Study, though there is indication that some available capacity may exist. An initial task during the future engineering phase would be to evaluate each facility in detail including meeting with each owner/operator to discuss the merits of connecting into the proposed local sewer system. Also the feasibility of accepting wastewater from adjoining parcels in the interim or as a long term wastewater treatment option would be pursued. The latter would be of most relevance for STPs located in Sub-Areas not immediately slated for sewers. In certain cases, a financially-beneficial opportunity may exist for an STP to expand plant capacity to provide wastewater treatment service to an adjoining community.

3.5.2.2 Proposed Wastewater Management Strategy for Tier 2 Sub-Areas

Tier 2 Sub-Areas represent the locations within the Study Area where future sewering may be warranted based upon the funding availability and anticipated development. **Table 3.15** below summarizes the scores and impacted communities for each Tier 2 Sub-Area.

Table 3-15: Tier 2 - Sub-Areas

Sewershed	Sub-Area	Scoring (1)	Impacted Communities
107	2	11	West Babylon
108	4	12	Wyandanch
	10	12	Wyandanch
	15	10	Deer Park
	16	12	Deer Park
110	5	13	Deer Park
	6	10	Deer Park
	7	10	Deer Park
	8	13	Deer Park
Total	**9**		

(1) Maximum score achievable is 30.

The projected daily average wastewater flow generated within Tier 2 Sub-Areas comprised of 5,119 parcels would be approximately 1.54 mgd.

Wastewater management strategies for Tier 2 Sub-Areas include:

A. Considering designated Bergen Point Wastewater Treatment Plant capacity allocations, it is probable that Tier 2 Sub-Area sewer system projects will not require an additional expansion of the plant to accommodate the anticipated average daily flow of 1.54 mgd. As indicated in the Tier 1 discussion above, projected flows generated within this Study are conservative. As Tier 1 sewer projects are designed and flows more accurately calculated, some opportunities for Tier 2 Sub-Area sewering efforts may materialize. As indicated, the boundaries established for the each Sub-Area remain flexible and should serve as a guide when developing each sewer project. It is probable that upon future groundwater and stream water quality sampling efforts that pockets of contamination will be identified within Tier 2 Sub-Areas that would justify inclusion in a contiguous Tier 1 sewering installation.

B. If a high-density residential (work-force housing) development and/or commercial/industrial complex is being proposed for Tier 2 Sub-Areas and if the use of available capacity at the Bergen Point plant can be justified, a hook-up to a contiguous Tier 1 interceptor can be undertaken. The installation costs and associated fees would be the responsibility of the developer or commercial/industrial user.

C. The future management of on-site sewage disposal systems will be an essential component in insuring environment and human health preservation in Tier 2 Sub-Areas. With limited funding, a non-infrastructure installation strategy appears necessary to provide long-term relief as well as control the impacts associated with the on-site systems. As indicated for Tier 1, the creation of a District-wide program to monitor pump-outs from on-site systems represents an effective control method. However the implementation of such an initiative will be directly dependent upon the availability of capacity at scavenger waste facilities within a reasonable distance from the Study Area. The Sewer District’s ability to require the use of future SCDHS approved alternate (enhanced treatment units) on-site systems (which provide greater treatment capacities) when existing on-site systems are being replaced or new development will help maintain groundwater quality. Such applications may result in relief from the SCDHS minimum parcel size designation, allowing greater developmental density.

D. Six (6) local sewage treatment facilities were identified within the Tier 2 Sub-Areas. Similar to Tier 1, data availability regarding plant capacities and operational efficiency was limited during this Study, though there is indication that some available capacity may exist. Future efforts to evaluate each facility in detail including meeting with each owner/operator to discuss the feasibility of accepting wastewater from adjoining parcels as a long term wastewater treatment option should be pursued. In certain cases, a financially-beneficial opportunity may exist for an STP to expand plant capacity to provide wastewater treatment service to an adjoining community.

3.5.2.3 Proposed Wastewater Management Strategy for Tier 3 Sub-Areas

Tier 3 Sub-Areas represent the locations within the Study Area where future sewering appears least likely based upon an assessment of overall environmental conditions. **Table 3-16** below summarizes the scores and impacted communities for each Sub-Area.

Table 3-16: Tier 3 Sub-Areas

Sewershed	Sub-Area	Scoring (1)	Impacted Communities
107	1	7	West Babylon
108	6	9	Deer Park
	9	8	Wyandanch
	13	9	Wheatley Heights
	14	8	Wheatley Heights
110	9	9	Deer Park
	10	10	Deer Park
	11	0	Deer Park
Total	**9**		

(1) Maximum score achievable is 30.

The projected average wastewater flow generated within Tier 3 Sub-Areas comprised of 3,200 parcels would be approximately 0.96 mgd.

Proposed wastewater management strategies include the following:

A. Tier 3 Sub-Areas represent locations within the Study Area where depth to groundwater and proximity to waterways is considered to be least problematic in regard to on-site wastewater system discharges. In most cases, minimum lot sizes are consistent with SCDHS requirements and no area of immediate need has been identified. Providing sewers for these outlying Sub-Areas would potentially require a further expansion of the Bergen Point plant to accommodate a projected additional 0.96 mgd of sewage flow. While less probable than Tier 2 areas, if future groundwater and stream water quality sampling efforts identify pockets of contamination, the possibility of connecting into contiguous Tier 1 or Tier 2 sewering installations can be considered.

B. If a high-density residential (work-force housing) development and/or commercial/industrial complex is being proposed for Tier 3 Sub-Areas and if the use of available capacity at the Bergen Point plant can be justified, a hook-up to a contiguous Tier 1 interceptor can be undertaken. The installation costs and associated fees would be the responsibility of the developer or commercial/industrial user.

C. As in Tier 2, the future management of on-site sewage disposal systems will be an essential component in insuring environment and human health preservation. The creation of a District-wide program to monitor pump-outs from on-site systems represents an effective control method. However the implementation of such an initiative will be directly dependent upon the availability of capacity at scavenger waste facilities within a reasonable distance from the Study Area. The Sewer District's ability to require the use of future SCDHS approved alternate on-site systems (which provide greater treatment capacities) when existing on-site systems are being replaced or new development will help maintain groundwater quality. Such applications may result in relief from the SCDHS, minimum parcel size designation, allowing greater developmental density.

D. Five (5) local sewage treatment facilities were located within the Tier 3 Sub-Areas. Similar to Tiers 1 and 2, data availability regarding plant capacities and operational efficiency was limited during this Study, though there is indication that some available capacity may exist. Future efforts to evaluate each facility in detail including meeting with each owner/operator to discuss the feasibility of accepting wastewater from adjoining parcels as a long term wastewater treatment option should be pursued. In certain cases, a financially-beneficial opportunity may exist for an STP to expand plant capacity to provide wastewater treatment service to an adjoining community.

3.5.2.4 Interpretation of Scoring

When viewing the scores it is important to recognize that the values attained represent a level of overall need that would help prioritize the Sub-Areas based upon common physical and natural factors. Once the exercise was completed, the scores provided a clear grouping of potential sewering candidates. Some observations are as follows:

A. The highest scoring Sub-Areas, as would be expected, were characterized by dense development and possessed high groundwater conditions and closeness to a waterway. A sizable separation (3 points) between the top five candidates in Tier 1 and the remaining Tier 1 Sub-Areas was evident. Based upon the scoring criteria established, it would be difficult to reassign scores for the lower Tier 1 areas that would result in elevating these Sub-Areas to the upper group, although these lower candidates do share many of the issues but to a lower scale.

B. The scoring demarcation between the Tiers is less pronounced (see **Tables 3-14, 3-15 and 3-16**). The cut-off scores between Tiers was based upon a review of the total scores coupled with a closer assessment of the individual scores attained for each factor. For example Tier 3 Sub-Areas generally were characterized as having the least impacts with no conditions being considered as severe. Tier 2 Sub-Areas generally had lower impacts for most factors though factors were identified that could be considered severe.

C. The priority scoring system developed utilized physical and natural features to produce a ranking methodology. While it represents a guide in establishing a strategy for pursuing future sewering projects, it is recognized that supporting physical data (ground and water quality sampling efforts) would further refine and/or reposition the slate of candidates.

3.5.3 Environmental Conditions and Impacts

As mentioned previously, there are a variety of situations and conditions that need to be addressed on a preliminary basis as a means of prioritizing sewer installation in the Sub-Areas included in this study. These conditions include the following:

- Groundwater Quality Issues
- Shallow Groundwater Table
- Failing/Problematic On-Site Systems
- Surface Water Quality
- Streamflow Augmentation Issues
- Anticipated Economic Development
- Construction Costs

Attempts can be made to prioritize these criteria but it must be recognized that such prioritization may not be objectively developed since the dynamics of the study areas vary and the tendency would shift to a more subjective basis. For example, should failing on-site systems receive priority regardless of construction costs and/or should impacts to groundwater quality supersede reductions in stream flow or the potential for economic development in a particular area? These issues are discussed in further detail in Section 5.7 of this Feasibility Study.

As indicated throughout this Feasibility Study, the development of a Sewer Prioritization Plan is a preliminary first step toward the installation of sewers. Detailed studies for the sewersheds under consideration must be developed as a preface to the preparation of detailed plans and specifications as well as updated detailed cost estimates. The project(s) can then be bid and awarded and construction would commence. Environmental issues addressed under SEQRA associated with the actual sewer installation must also be addressed prior to permit acquisition, acquisition of state or federal funding and construction.

Road opening permits (with associated conditions) must be obtained from the municipal entities (State, County, Town, Village) claiming jurisdiction. Sub-surface utilities may also require relocation to facilitate effective sewer routing.

Maintenance and protection of vehicular and pedestrian traffic must be developed for safety and security during construction as well as continued ingress and egress in the affected area. Adequate provisions must also be provided for emergency vehicle access (police, fire) as well as municipal functions (garbage collection).

NYSDEC requirements must also be addressed for dewatering, encroachment on tidal wetland areas and stormwater runoff requirements.

Noise and dust can be anticipated during construction requiring effective containment on a continuous basis.

Lastly, sewer connection fees, annual O & M costs and related fees must be developed and incorporated into the plan. These costs are in addition to the costs and requirements mandated by the SCDHS for the abandonment of existing on-site disposal systems upon connection to the public sewer.

3.5.4 Community Impact of Sewering

Public acceptance of any project is important and in some cases mandatory. A public hearing for a sewer project is necessary and therefore public notification and input prior to the hearing is very important and will take place.

Any proposed public hearing will focus on the work to be done, the financial aspects and the benefits of the project. Construction of sewers in developed areas may lead to nuisance conditions and the public must be made aware of the potential for dust, noise and inconvenience. Annual costs would include connection fees, user fees and debt service. Environmental benefits of protecting the groundwater and reducing potential health concerns would be compared to the impact of lowering the groundwater levels through Ocean disposal versus recharge. Incentives for economic development would also be evaluated. Cost savings and benefits to homeowners with chronic on-site treatment system back-ups and failures will be emphasized during public hearings and open comment periods for the sewer projects.

4.0 TECHNICAL INFORMATION

4.1 Design Data by Sub-Area

4.1.1 Approach

This large geographic area encompassed by the Study Area is characterized by intertwined environmental, physical and socio-economic features, sub-divided into three (3) distinct watersheds which are naturally defined by the area's topography. Three (3) sewersheds were identified, whose limits basically coincide with the watershed boundaries and each delineates specific areas where sewage collection systems would be defined. Sewersheds 107, 108 and 110 have been identified and each corresponds to an existing SCSD No.3 interceptor. The goal of this project is to develop a comprehensive sewer system lay-out that would provide service to all parcels within the Study Area. A "gravity" type sewer system was selected for this analysis since such traditional systems typically experience fewer problems and generally require significantly less maintenance. When designing a sewer conveyance system that utilizes gravity to transport flow, it is essential to follow natural topography typically paralleling descending roadway grades. Fortunately in the Study Area, contours in each sewershed naturally slope from high points to low points that parallel the alignment of local creeks / waterways. In many cases, primary roadways followed similar pathways abutting area waterways. For this effort, topographical data existing in Geographic Information Systems (GIS) managed by the various Townships was utilized. Data identifying the general depth to groundwater data was similarly obtained. Shallow depth to groundwater represented a vital component in this evaluation since such data would typically be indicative of those parcels with the highest potential to experience on-site system issues or failures.

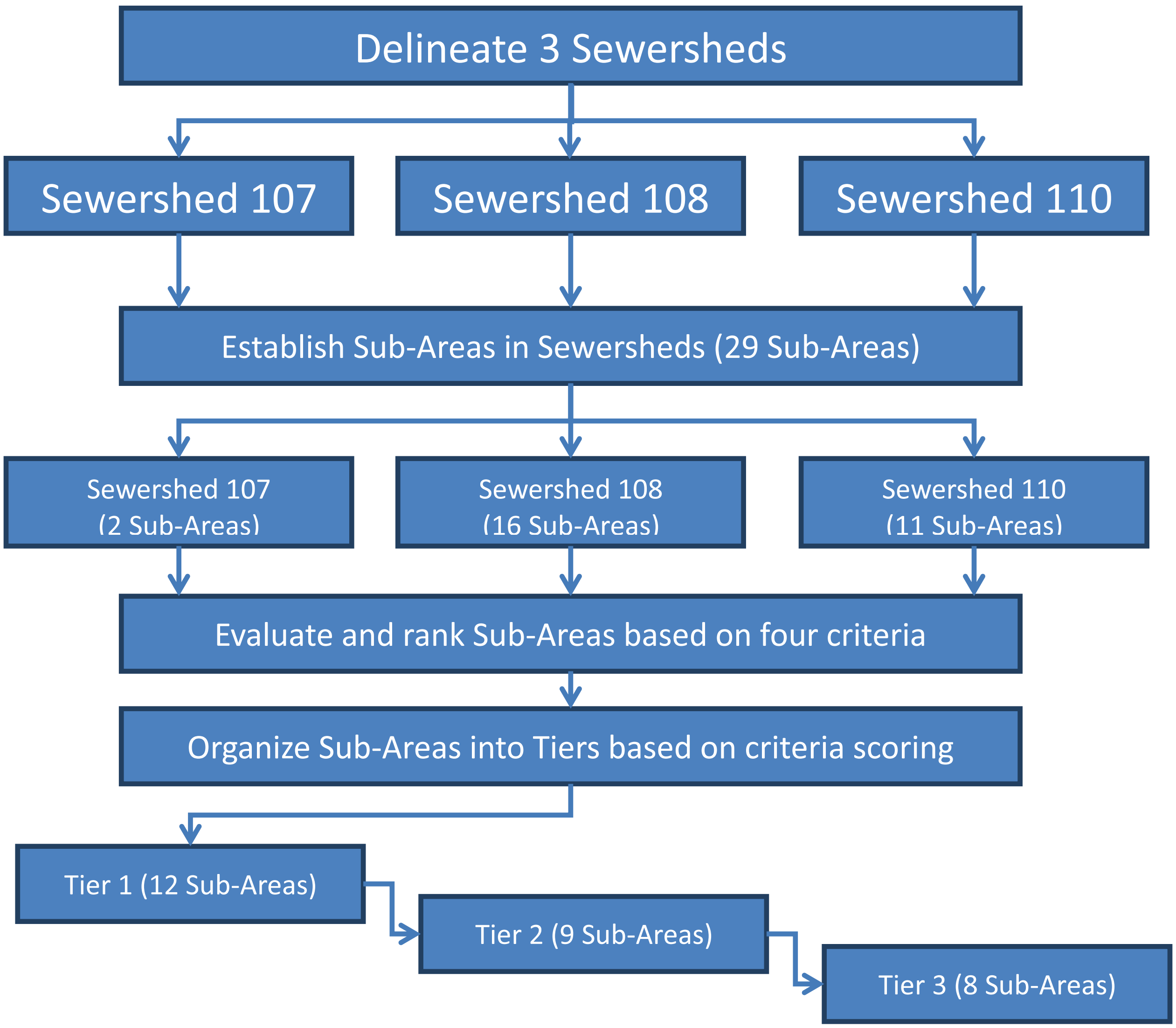
4.1.2 Sewersheds Sub-Areas

The three (3) sewersheds 107, 108 and 110 that comprise the Study Area were partitioned into smaller subdivisions called Sub-Areas which were defined by geographic and environmental characteristics. Each Sub-Area was created to facilitate the installation of "gravity" type sewers which could be install as shallow as possible by mirroring the natural contour elevations of the roadways. The Study Area extends approximately 3 miles north of the Southern State Parkway.

At the northern boundary of this area, the ground elevations are approximately 90 feet above mean sea level and generally descend towards the southern limits, to an elevation of approximately 40 feet above mean sea level. This naturally occurring change in elevation supports the design of the gravity sewers for this area, allowing the substantial portion of the sewer system to be placed at shallower depth.

Figure 4-1 below shows a flow chart illustrating the process by which the sewersheds were established, sub-areas were determined and the three Tiers of Sub-Areas were developed.

Figure 4-1: Sewershed Development



4.1.3 Gravity Sewers

For each Sub-Area, a gravity sewer system layout was developed consistent with Ten State Standards and Suffolk County Department of Public Works requirements. The gravity sewers proposed consisted of polyvinyl chloride (PVC) Class SDR 35 pipe. The piping alignment primarily followed the center-line of roadways. The minimum pipe diameter utilized was eight (8) inches which is a common collection pipe utilized to service residential streets. As pipes merged, larger diameter mains were necessary to transport the accumulated flow. The sizing for the piping system was determined based on a flow analysis that considering a wastewater generation rate of 300 gallons per day per household with a peak factor of 2.93. This figure is consistent with the requirements established by the SCDHS. For design purposes, all parcels within the Study Area were considered as one-family residential properties, since such a designation represents the highest per parcel wastewater generation rate. As such the total amount of projected sewage flow is very conservative, but provides a sewer system that is capable of handling fluctuations in land use and zoning classifications in the future.

Gravity sewers were designed to reach a mean velocity of 2 feet per seconds(fps), which avoids the deposition of solids material in the pipes. For the pipe sizing exercise, the Manning formula was used, where the roughness coefficient "n" corresponds to 0.013. Cleanout manholes were positioned at a distance no greater than 400 feet from each other. Manholes were also provided wherever a pipe layout changed direction; the size of the pipe is increased or at any point where two or more pipes join.

For each Sub-Area, the piping layout was determined based on topographical characteristics, allowing the wastewater to flow from a point of higher elevation to a lower elevation. By employing this measure, the design allows for a shallower system whereby the sewer can be typically placed within 6 feet of ground elevation. Each Sub-Area is designed to function as an independent system though contiguous Sub-Areas are hydraulically interconnected as they converge into the larger interceptor pipes.

Appendix D includes a detailed design work sheet, corresponding sewer layout plan, and cost estimate for each Sub-Area. **Appendix E** is SCDPW's Special Sewer Permit Application required for all future sewer hookups into the public system. Of special note is Condition 11 on Page 2 of 6 that requires the installation of backflow prevention devices on all sewer connections in areas that are subject to chronic backups.

4.1.4 Interceptors

Each sewershed is serviced by an existing SCSD No. 3 interceptor that terminates at a manhole that abuts the Southern State Parkway. Sewage generated in the Study Area will enter one of these interceptors where the wastewater will be conveyed to the Bergen Point WWTP for processing and disposal.

Currently under construction is the Straight Path (County Road (CR) 2) Interceptor as part of the Wyandanch Rising Project.

Currently under construction by the Town of Babylon is the installation of 21,400 linear feet of sewage interceptor along Straight Path ranging in diameter from 8 to 24 inches PVC pipe composed of both gravity piping and force main (including a pump station at Irving Place). The project is being undertaken to provide relief from failing on-site wastewater disposal systems for approximately 110 residences as well as a commercial business district along Straight Path. In addition, the new system will accept leachate collected at the Town of Babylon Solid Waste Management Landfill. The wastewater will be transport to the existing SCSD No. 3 interceptor (30 inch diameter) manhole located at 17th Street and 12th Avenue in West Babylon. The connection will require jacking below the Southern State Parkway. The average daily wastewater design flow associated with this project is approximately 380,000 gpd. The service area for this project is primarily along Straight Path, though the Town of Babylon has indicated that the piping system was designed to accommodate additional users.

The existing County interceptors and sizes are listed in **Table 4-1:**

Table 4-1: Existing SCSD No. 3 – Southwest Interceptors

INTERCEPTOR DESIGNATION	DIAMETER IN INCHES	TERMINUS MANHOLE LOCATION	INTENDED SERVICE AREA
Interceptor 110 V1-7A	48	North of Southern State Parkway at Kime Avenue	North Babylon and West Islip
Interceptor 108 VI-7B	48	South of Southern State Parkway at Lewis Avenue	Wyandanch and Wheatley Heights
Interceptor 107 VI -7C	30	South of Southern State Parkway at 17th Street and 12th Avenue in West Babylon (1)	Wyandanch and Wheatley Heights

(1) Straight Path Sewer Project will be jacking below Parkway with new sewer to tie into Interceptor 107.

It is expected that approximately 7.0 mgd will be collected from Tier 1 which consists of 12 Sub-Areas. Subsequently, approximately 4.5 mgd is expected to be collected from Tier 2 with a total of 9 Sub-Areas. Finally, about a flow 2.5 mgd is anticipated to be collected during the installation of the Tier 3 system, totaling 14.0 mgd for the Study Area.

4.1.5 Future Detailed Design Options

The sewer designs prepared for the various Sub-Areas are preliminary and provide an order of magnitude cost associated with the installation of gravity type sewer systems for the various Sub-Areas. It is recognized that as Sub-Areas are selected for detailed design, more cost effective alignment options may be developed by combining areas as well as by utilizing non-gravity piping techniques.

In certain Sub-Areas or segments of Sub-Areas, topographical irregularities such as undulating and steeply pitched road surfaces may result in deep cuts (possibly in groundwater) to install a traditional gravity sewer. Variations in grade could have a significant impact on defining the depth of the sewers, as well as where pumping stations and force mains may be required. Obviously, to reduce a perpetual operation and maintenance burden, the intent should be to maximize the use of gravity systems in lieu of force mains and less conventional low-pressure (with grinder pumps) sewers. However, such alternate sewers often result in the least disruption of the existing roadways; reduce problems associated with unique roadway grading issues; and, provide flexibility in accommodating future system expansions.

In certain circumstances the elevation of the waste line existing in a single house or commercial building or a complex of structures may preclude a conventional hook-up to a proposed gravity sewer system. Also the distance the waste line must travel between a structure and the proposed sewer alignment may impact the design. Installation of individual pressure services may need to be incorporated into a project. Such site specific installations often result in higher capital and maintenance costs for the property owner.

Wastewater generated from parcels adjacent to streams and wetland areas may require pumping to connect into the main gravity sewer collector. Many of these parcels are located at an elevation lower than the road elevation and the use of individual pumps would be considered within the sewering evaluation during the design phase. It is also anticipated that during design, an analysis will need to be completed to compare the alternative of installing pumping stations to allow pipes be installed at a shallower elevation at those areas where the depth of the proposed sewers are deeper.

4.2 Cost Data by Sub-Area

Costs for the various project areas were extrapolated by developing basic elemental cost components for the major construction items. These major construction elements are as follows:

- Traffic Control costs during construction
- Dewatering costs (based on assumed durations)
- Pavement removals and restoration
- Sewer Pipe installations (not including excavation)
- Trench excavation for piping based on depth
- Manhole structure excavation costs (based on assumed manhole invert depths)
- Manhole structure installation costs (based on assumed manhole invert depths)

Supplementary costs developed for the report included house connection costs that are the responsibility of the property owners. These costs vary based on the length of the house connection pipe to the house trap. See **Table 4-2** for a cost summary for house connections based on length of connection. To ease the burden on the individual property owners, a consideration should be given to inclusion of these house connection costs – summarized in Table 4.2 – in the total project cost, i.e., the amount eligible for both loan and grant funding applications. If this recommendation is implemented, one-time house connection costs will be paid in small installments over time, as part of the annual sewer fee.

See **Appendix D** for detailed cost information by Sub-Area.

5.0 LEGAL / ADMINISTRATIVE CONSIDERATIONS

5.1 Suffolk County Sewer Use Ordinance

The Suffolk County Sewer Use Ordinance describes the requirements for installation of a house connection and connecting to a county sewer. The installation and connection to the sewer stub must be witnessed by a SCDPW authorized inspector.

5.2 Suffolk County Code – Chapter 740 – Sewers

Chapter 740 includes the requirements for permitting, construction, discharges, user charges, connection fees, rates and surcharges to connect and discharge to a Suffolk County sewer.

5.3 Suffolk County Sewer District No. 3 – Southwest Expansion Alternates

Upon approval of sewer installation in a particular study area, consideration must then be given to how the sewer installation will proceed. There are three (3) alternates to be considered:

- Inclusion into SCSD No. 3 – Southwest
- Formation of a separate Sewer District
- Tie in as an Independent Customer

These three (3) alternates have been reviewed by the County in the past. The first alternative is summarized below; the second and third alternatives are described in sections 5.4 and 5.5 of the report.

New York State County Law, Article 5-A, empowers each county to establish or extend county districts. It details procedures for establishing a district, applying to the State Comptroller and setting up a rate schedule. Section 274, contains the procedures to be followed for a district extension and provides an indication on how costs of the original district applies to the extension. The cost of such an extension is described as including a proportion of the cost of existing facilities of the original district, as the County Legislature shall determine (connection fee). The original district was established by a permissive referendum. The County Attorney's office has previously advised that if the boundaries are to be extended a permissive referendum is required, however, only the persons residing in the areas of the proposed extension are eligible to vote on a referendum. The reason is that these residents must bear the costs of the facilities to serve the extension. The residents of the newly extended service area would also be required to share in the user fees that are associated with operation and maintenance of the sewage collection and treatment systems.

Various sections of the County Law provide for the steps leading to a boundary extension.

- Section 253 discusses the petition process
- Section 254 discusses the preparation necessary for a public hearing
- Section 256 discusses the hearing resolution leading to the permissive referendum
- Section 258 provides for the approval by the New York State Department of Audit and Control

There are technical, environmental, legal and legislative aspects that need to be addressed during the extension process. Technical aspects include procurement of consulting firms to complete the planning, design, permitting and construction management of the project. Environmental aspects include procurement of consultant services to assist with the environmental review, engineering reports, Environmental Assessment Form, scoping sessions and public meetings, field investigations, DEIS and FEIS findings, and then completing the SEQRA process through issuing a positive or negative declaration. Legal aspects will commence once the SEQRA process is complete and will include public information meetings, public hearings, findings resolutions and legislature votes, petition process to expand the district, resolution for a special election, application to the NYS Comptroller, and acceptance by the Comptroller. Program financial aspects will commence once the Comptroller approves district expansion, such that funding resolutions are initiated by Suffolk County or other forms of funding are identified and secured.

5.4 Formation of a Separate Sewer District

New York State County Law, Article 5-A, empowers each county to establish county districts. Similar technical, environmental, legal and legislative aspects would apply to formation of a new district as those described above for SCSD No.3 expansion. However, it should be considered that in the current economic conditions and political climate, formation of additional taxing districts could be a more difficult undertaking at the state and local levels.

5.5 Tie-in as an Independent Customer

Applications from developers of parcels outside the boundaries of County districts requesting connection to a district are considered by the Sewer Agency. Conceptual Certification can be granted for those developments that have not received a SEQRA determination. This category is not binding and allows the developer to know what the Agency would do if Formal Approval was requested, after the SEQRA process is complete. Projects that request connection to County districts are evaluated by the Agency staff with respect to the District's capacity, with recommendations made to the Agency. Once the SEQRA process is complete another application is made to the Agency and Formal Approval is possible. Formal Approval leads to a connection agreement that is ratified by the Legislature. The agreement contains the conditions that must be met by the contractee and includes an offer of dedication of sanitary facilities and payment of a onetime connection fee, among other conditions. The connection fee is presently $30 per gallon per day of capacity. User fees are the same as the District parcels plus a five percent administrative fee. It is possible for the connection fee payment to be spread over a number of years. The contractees must provide the necessary facilities (sewers, pumping stations, etc.) to convey their sewage to the District. The standard connection agreement includes clauses that may require the contractees to bear the cost of the plant expansion and share in any improvements.

This option will be problematic and more costly for SCDPW to manage and administer because it would require an individual contract for each connection.

5.6 Permitting

A variety of federal, State, and local permits, registrations and approvals will be required to initiate the project from design through construction and commissioning. A preliminary table of State and Federal permits has been identified for the project and is included in **Table 5-1**, below. Permit issuance is typically contingent upon completion of the SEQRA process, or possibly the NEPA process if federal funding is involved. It is likely an Environmental Impact Statement will be required for this multi-phased sewering program as there may be significant impacts related to wetlands, dewatering during construction, economics, traffic, noise, property acquisition, historic and cultural resources, natural resources, and the flow augmentation needs study (FANS).

Table 5-1 – Anticipated State and Federal Permit List

Agency	Permit	Responsible Party	Milestone
USACOE	NWP-6: Survey Activities	Designer / Contractor	Prior to boring activities or survey work
USACOE	NWP-13: Bank Stabilization	Designer / Contractor	Prior to construction
USACOE	NWP-27: Aquatic Habitat Restoration, Establishment, and Enhancement Activities	Designer / Contractor	Prior to construction
USACOE	NWP-33: Temporary Construction, Access, and Dewatering	Designer / Contractor	Prior to construction
NYSDEC	ECL Article 15, Title 15; NYCRR Title 6, Part 608.2; Protection of Waters Permit; Stream Disturbance	Designer / Contractor	Prior to construction
NYSDEC	ECL Article 124; NYCRR Title 6, Parts 663-665; Freshwater Wetlands Permit	Designer / Contractor	Prior to construction
USFWS	CFR Title 50, Part 17; Endangered Species Act; Informal Consultation	Designer	Prior to Design
NYSOPRHP	National Historic Preservation Act of 1966 Section 106; Consultation	Designer	Prior to Design
USDOI	CFR Title 36, Part 800, National Historic Preservation Act of 1966 Section 106; Consultation required if Federal funding is used	Designer	Prior to Design
NYSDEC	ECL Article 15; Title 15; NYCRR Title 6, Part 602; Long Island Well Permit	Designer / Contractor	Prior to construction
NYSDEC	ECL Article 17; Title 7 and 8; Article 70 NYCRR Title 6, Parts 750-757; SPDES General Permit for Stormwater Discharges from Construction Activities; and SWPPP	Designer / Contractor	Prior to construction
NYSDEC	CFR Title 40; ECL Article 17, Title 7 and 8; NYCRR Title 6, Part 750-757; SPDES permit modification for Bergen Point WWTP	SCDPW	Prior to construction
NYSDOT	NYS Highway Law Article 52; Highway Work Permit for Non-Utility Work	Designer / Contractor	During design
NYSDOT	NYS Highway Law Article 52; Highway Work Permit for Utility Work	Designer / Contractor	Prior to construction

5.7 Environmental Assessment Form (EAF) / Environmental Impact Statement (EIS)

As part of the JV's scope for this feasibility study an Environmental Assessment Form (Long Form) was prepared to describe the actions associated with this study and identified potential outcomes from the study results. The preparation of the proposed feasibility study was recommended to be considered a Type II action under SEQRA. The Suffolk County Council on

Environmental Quality's recommendation at its November 16, 2011 meeting to the County Legislature was the feasibility study project (CP 8139) is considered a Type II Action under SEQRA. See **Appendix F** for copies of the CEQ transmittal memorandum from R. Lawrence Swanson, CEQ Chairperson, the CEQ resolution of November 16, 2011 and the Environmental Assessment Form.

At the conclusion of this feasibility study, if a determination is made to move forward with the proposed phased approach to sewering Sub-Areas developed in this study, a positive declaration will likely be made which would trigger preparation of a draft environmental impact statement (DEIS) under SEQRA. This would also be the case if federal funding is secured under the National Environmental Policy Act (NEPA) for such a project.

Potential significant areas of study for a DEIS would include the following:

1) Land Use, Zoning and Public Policy
2) Socioeconomic Conditions
3) Community Facilities and Services
4) Open Space
5) Historic and Cultural Resources
6) Natural Resources
7) Hazardous Materials
8) Water and Sewer Infrastructure
9) Solid Waste and Sanitation Services
10) Energy
11) Transportation
12) Air Quality
13) Greenhouse Gas Emissions
14) Noise
15) Public Health
16) Neighborhood Character
17) Construction Impacts
18) Alternatives

Other specific topics of study that may require additional study during the DEIS process include the Flow Augmentation Needs (FAN) Study, potential impacts to Great South Bay salinity by reducing stream flow from the newly sewered areas, and utilization of green infrastructure initiatives to augment stormwater recharge within newly sewered areas.

6.0 SCHEDULE

6.1 Implementation Strategy

For a sewering program of the scope and magnitude contemplated, a carefully planned implementation strategy will save capital costs and enhance the schedule for completion of the program. Each Sub-Area in Tiers 1, 2 and 3, are interrelated and will need to be designed, constructed and commissioned in a logical, cost-effective manner. The highest ranked Sub-Areas, for sewersheds 108 and 110 were 108-2 (25 points) and 110-2 (22 points). These two Sub-Areas are located north of other Sub-Areas (108-1 and 110-1) that are closer to the Interceptor terminal manholes in the vicinity of the Southern State Parkway. Interceptors 108 and 110, would have to be extended to serve the highest ranked Sub-Areas. If sufficient funding is available, the intermediate, but lower ranked Sub-Areas (e.g. 108-1 and 110-1) could be sewered when Interceptors 108 and 110 are extended to the north. A more detailed implementation strategy will be the subject of future studies and environmental review.

6.1.1 Typical Sub-Area Schedule

A typical Sub-Area sewer district formation, EIS, design, construction and commissioning schedule has been developed to illustrate the time frame to begin sewering the Tier 1 Sub-Areas. See **Figure 6-1,** SD No. 3 – Southwest Expansion Schedule, for this typical schedule.

Project activities within a sewershed and among Sub-Areas will not likely occur in parallel due to several factors such as availability of local, state and federal funding; County or locality bonding capacity; potential construction issues and constraints stemming from SEQRA review and findings in the EIS process; or availability of ample qualified construction contractors such that bids aren’t inflated due to high demand.

7.0 COST OPTIONS AND TRENDS

7.1 Capital Costs

Cost Mark-up Factors Allocated to Major Cost Components:

The base costs include several allocated markup percentages which are discussed in the following paragraphs.

Overhead and Profit (Allocated into component costs): The costs developed include industry standard "Overhead and Profit" on labor of 21% (overhead assumed at 11% and profit 10%). A profit on materials of 10 percent was utilized.

Design Contingency (Allocated into component costs): A design contingency of 15 percent is allocated into the cost component items. This contingency value is a place holder for monetary costs that will be associated with details that will be developed during the design process and which are not specifically covered under the major construction items that were utilized in developing the costs for the study report.

Escalation (Allocated into component costs): The data utilized in developing component costs is based on the year 2011. An Escalation factor of 4% has been allocated into the major construction item costs. This escalation value will in effect bring unit costs to represent pricing for the midpoint of the year 2012. Additional escalation factors will need to be included when agency budgets are prepared and the construction is prioritized. Current trends appear to indicate that escalation percentages for the next few years (2-3 years) are in the range of 3 to 4 percent per year. Costs presented in the tables in this report are escalated to a year 2020 construction start.

Cost Mark-up Factors Required but Not Allocated to Major Cost Components:

General Condition Costs: The base cost items do not contain a General Conditions cost markup factor. The General Condition costs were added on the totals generated by the components costs associated with the individual geographic sub areas as follows:

- Contracts 20 to 30 million dollars: markup factor of 9%
- Contracts 40 to 50 million dollars: markup factor of 7%
- Contracts 600 million dollars: markup factor of 5%

Construction Contingency: A construction contingency is normally allocated by the client to cover unknown conditions which are encountered during construction. The major cost components used to develop estimates do not include a "Construction Contingency" for field conditions. It is assumed that the owner will allocate a contingency based on the final contract documents. Normally a "Construction Contingency" of 10% would be allocated to cover unknown field conditions or changes to the design during construction.

Labor Costs

The base labor cost component utilized for developing costs assumes that contract work will be performed in accordance with prevailing wage rates for New York State in the Suffolk County locality. The estimating software program wage rate table has been appended to incorporate prevailing wages that are in effect for the year 2011. The escalation noted previously factors a 4 percent increase so that unit costs represent the year 2012.

Discussion of Detailed Cost Components

Traffic Control during Construction: Four separate traffic control cost components were built in the unit pricing. There will be many different scenarios where traffic control will need to be developed, however for simplicity this study includes the following traffic control scenarios:

- Typical Maintenance and Protection of Traffic (MPT) for a 100 foot long trench open for two to three days
- Typical MPT for a 100 foot long trench open for one week (Dewatering Operations required)
- Typical MPT for a shallow manhole structure with one day installation where no dewatering is required
- Typical MPT for a deep manhole structure with three day installation where dewatering is required

Dewatering Operations: The project area is located where groundwater may be within 3 to7 feet of the roadway surface and as a result dewatering operations will be necessary during construction to install piping and manhole structures. Two scenarios for dewatering operations have been included to account for the expected dewatering operations as follows:

- Dewatering well point system for 100 lineal feet of trenching
- Supplemental dewatering required at deep manhole structures

Pavement removals and restoration: It has been assumed for the cost study that pipe trenches will be installed at the center line of existing roadways. Consequently, the contractor needs to saw cut and remove asphalt pavements and stone base course. Once the pipe is installed the surface pavement will need to be restored. Resurfacing of roadways has not been priced and the cost components do not assume major removal and restoration of curbs or sidewalks. The following cost assemblies were included to represent pavement restoration cost:

- Pavement Demolition and Disposal + Hauling Times + Repair Trench - 5' wide
- Pavement Demolition and Disposal + Hauling Times + Repair Trench - 5.17' wide
- Pavement Demolition and Disposal + Hauling Times + Repair Trench - 5.33' wide
- Pavement Demolition and Disposal Offsite + Repair Trench @ Manhole 4' Dia.

Pipe materials: Sewerage piping was assumed to be PVC (SDR 35) pipe, ranging in diameter (inside) from 6 inches to 15 inches. Laterals to individual homes extending to the curb line utilized 6 inch pipe. No dewatering was assumed to be required for house connection lateral piping as it was assumed this piping will be placed at shallow depths.

Trench Excavations for Pipe: A typical trench length of 100 lineal feet was assumed to develop pricing for trenching excavation and backfilling operations. The trench depth interval selected for pricing is 2 feet and depths ranged from five feet to approximately 27 feet. The typical trench excavation cost component assumes all excavation will be sheeted with either wood or steel sheeting. Wood sheeting was selected where no dewatering issues were identified and interlocking steel sheeting was assumed at locations where trench dewatering is required. Backfill costs assume that excavated material can be reused as backfill, thus no net import of fill material other than that required for bedding is assumed.

Manhole Structure Excavation: Similar to the preceding trench excavation operation, manhole excavation depth interval selected for pricing is 2 feet and depths ranged from five feet to approximately 27 feet. The typical trench excavation cost component assumes all excavation will be sheeted with either wood or steel sheeting. Wood sheeting was selected where no dewatering issues were identified and interlocking steel sheeting was assumed at locations where trench dewatering is required. Backfill costs assume that excavated material can be reused as backfill, thus no net import of fill material other than that required for bedding is assumed as required. Disposal/Recycling costs were added to account for the removal of excavated material replaced by the manhole structure.

Manhole Structure Installation: The study assumed all manhole structures would be precast. Shallow manholes structures were sized at 4 foot diameter and deeper structures utilized a combination of 4 and 5 foot sections.

Estimate Exclusions

1. The estimate does not include allowances for major utility relocations (water mains, gas mains, electrical ducts, storm drains, telephone, etc.) that may be required if it is determined that utilities will interfere with sewer pipe installation.
2. In addition as noted in the assumptions above the estimate assumes all excavated material can be reused and it is suitable for backfill.
3. The excavation costs assume that there is no soil contamination that needs to be properly managed and disposed.

The costs assume only roadway restoration within the trench area is required. The repaving or resurfacing of the entire street width has not been included. Cost data was tabulated and is presented in spreadsheets contained in the Tables section in the back of this report.

7.2 Operations and Maintenance Costs

Operations and maintenance (O&M) costs for a gravity sewer system would typically include programmatic sewer cleaning, isolated repairs, removal of obstructions, pumping station maintenance and operation costs, and manhole repairs. O&M costs are estimated to be $4,200/mile of sewer per year. For the entire Tier 1 Area, there are approximately 100 miles of sewers planned for approximately 9,000 parcels, which translates to approximately $47 per parcel per year. For comparison, the estimated annual O&M cost paid by a typical property owner within the current Sewer District No. 3 – Southwest is approximately $40 per year.

7.3 Planning/Design Costs

Planning and Design Costs are estimated at 15% of construction costs.

7.4 Suffolk County Connection Fee

The Suffolk County Connection Fee is presently set at $30 per gallon per day of flow. For a single family home, Suffolk County utilizes a 300 gallon per day flow for single family homes, so a connection fee would be $9,000. This fee was included in the project costs presented in the cost estimate tables since it is a separate fee that is paid by the user. The total connection fee by Sub-Area was estimated by identifying the number of parcels and multiplying that total by the $9,000 fee.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Rationale for Sewering

Over the last decades, comprehensive studies have been undertaken which have identified the potentially deleterious, long-term impacts to Suffolk County's groundwater associated with on-site wastewater systems discharges. Regulations promulgated by the Suffolk County Department of Health Services (SCDHS) have restricted the size of on-site systems in an effort to preserve and safeguard the County's water resources. In the Study Area, over 90% of the parcels rely on on-site systems.

The scope of this Study was to develop and analyze various wastewater management opportunities within Study Area boundaries that would help reduce human health concerns, maintain the quality of area water resources and potentially provide a stimulus for the local economy. The primary goal of this evaluation was to design a sanitary sewer system for the Study Area, which had been previously identified as the preferred approach for achieving immediate and long-term environmental and economic benefits. The Study Area was considered for future service when the original district was created. The Study Area is a candidate to utilize future capacity at the District's Bergen Point Wastewater Treatment Plant.

As presented in this study, certain physical and natural conditions exist within the Study Area which are detrimental to human health and the two significant characteristics of this area were identified that would support the installation of sewers as an effective means of managing wastewater discharges.

- Depth to Groundwater: Within the Study Area, the depth to groundwater varies significantly, with the majority (over 70%) of the area characterized by groundwater elevations less than 20 feet from grade. Many of the lowest areas where groundwater can be found at less than 7 feet from the surface are situated near streams and wetlands, where on-site system discharges have the highest potential impact on local water systems. Unfortunately, small lot sizes and dense development are also found in these low areas. The result is a greater concentration of on-site wastewater systems per acre.

- Parcel Density: The primary land use in the Study Area consists of single family residential properties. Lot sizes are predominantly less than ½ acre, the minimum lot size required by Suffolk County's Sanitary Code Article 6 for developments within Hydro-geologic Groundwater Management Zones I and VII as delineated for the Study Area. Typical parcel sizes are well under ½ acre with a large percentage less than ¼ acre. The smaller the lot size and the denser the development, the more on-site wastewater systems will be present, resulting in a substantial increase in effluent flow generated per acre. This will create a greater stress on the area's groundwater and surface water quality.

Since the majority of buildable lots in low lying areas are currently developed, efforts to institute more restrictive zoning requirements at this time would appear to be unproductive. To reduce the deleterious impacts associated with on-site system discharges it will be necessary to remove these contaminants from entering the ground. Sewering remains the most effective means for accomplishing this goal.

8.2 Sewering Scenarios

A product of this study was to develop a sewer system that would service all parcels within the Study Area including all residential and commercial properties. Due to economic constraints as well as overall need, constructing such a large sewering project would neither be feasible nor realistic. For this reason, it was necessary to subdivide the Study Area into manageable sewer projects. Thus the Study Area was segmented into three sewersheds, each mirroring a naturally occurring watershed. The sewersheds were delineated as Sewersheds 107, 108 and 110 with each corresponding to an existing SCSD No. 3 interceptor that terminated at the southern project boundary (Southern State Parkway). Within each sewershed, further subdivisions were made to create more "implementable" and "fundable" local sewer systems, which were designated as "Sub-Areas". A Sub-Area was defined as a geographic area that exhibited a commonality of natural and physical features that would facilitate the installation of a "gravity" sewer system. Utilizing existing GIS data, it was possible to delineate twenty-nine Sub-Areas that were distinct yet were hydraulically interconnected. Future projects could be implemented individually or combined as necessary. **Table 8-1** below summarizes the projected total sewage flow and cost associated with providing sewers within each sewershed.

Table 8-1: Total Sewage Flow and Construction Cost by Sewershed

SEWERSHED	PROPOSED SEWERING SUB-AREAS	PROJECTED PEAK SEWAGE FLOW (MGD) (1) (rounded)	PROJECTED AVERAGE DAILY SEWAGE FLOW (MGD) (rounded)	PROJECTED CONSTRUCTION COST (2) (rounded)
110	11	2.4-3.2	0.8-1.1	$344M
108	16	9.1-12.1	3.1-4.2	$1,347M
107	2	0.5-0.6	0.2	$39M
Sub-Total	**29**	**12.0-15.9**	**4.1-5.5**	**$1,730M**
20% Engineering, Legal and Administrative				$346M
Total				**$2,076M**

(1) As indicated in this study, flows are considered to be conservative. The range represents typical one family residential property wastewater generation rates of 225 gallons per day and 300 gallons per day as utilized by the SCDPW and the SCDHS, respectively. For the peak flow (used in the sizing of the sewers) a 2.93 factor is applied to the average daily flow. In addition, to establish a worst case scenario, it was assumed that each parcel in the Study Area was designated as one family residence, and a high wastewater generation rate is associated with this use. During future detailed design efforts, a more precise assessment of existing and proposed land use classifications will allow the calculation of more exact flow figures.

(2) Cost estimates were based on current construction figures escalated for a year 2020 construction. Sewer pipe sizing was determined using average daily flow multiplied by a 2.93 peaking factor as per Ten State Standards. Cost also includes construction of interceptor extensions. The costs may potentially be reduced by utilizing non-gravity sewer options as well as combining Sub-Areas sewering projects. However costs do not reflect other roadway and utility improvements that may be considered when the sewer systems are installed.

(3) See **Tables 8-5 through 8-8** for summary of cost opinions by Tier.

8.3 Phased Approach to Sewering

Since funding limitations and available plant capacity will impact the County's ability to provide sewers for all Sub-Areas, it was necessary to prioritize Sub-Areas to identify those where apparent or potential needs were most evident and where immediate concern may be warranted. To best present these findings, each Sub-Area was rated utilizing a matrix format that focused upon four sewering factors including depth to groundwater, parcel density, proximity to streams and wetlands, as well as potential for economic revitalization opportunities. Once scores were generated, Sub-Areas were placed into one of three, priority-based Tiers, with Tier 1 representing the Sub-Area candidates exhibiting the most immediate need for sewering. **Table 8-2** below summarizes the projected total sewage flow and associated construction costs associated with providing sewers within each Tier.

Table 8-2: Total Sewage Flow and Construction Cost by Tier

TIER	PROPOSED SEWERING SUB-AREAS	PROJECTED PEAK SEWAGE FLOW (MGD) (1) (rounded)	PROJECTED AVERAGE DAILY SEWAGE FLOW (MGD) (rounded)	PROJECTED CONSTRUCTION COST (2)
Tier 1	12	5.9-7.9	2.0-2.7	$1,106M
Tier 2	9	3.9-5.2	1.4-1.8	$300M
Tier 3	8	2.1-2.8	0.7-1.0	$250M
Interceptor Extensions (107, 108 and 110)				$74M
Sub-Total	**29**	**12.0-15.9**	**4.1-5.5**	**$1,730M**
20% Engineering, Legal and Administrative				$346M
Total				**$2,076M**

(1) See Comment (1) from Table 8-1
(2) See Comment (2) from Table 8-1
(3) See **Tables 8-5 through 8-8** for summary of cost opinions by Tier.

Sub-Areas designated as Tier 1 represent the highest priority locations within the Study Area and should be the focus of future sewering efforts. Based upon projections of the SCDPW, a significant portion of the expansion capacity would be available for the Study Area upon completion of the current 10 mgd upgrade of the Bergen Point WWTP. It has been estimated that the sewer system that would service Tier 1 Sub-Areas would have the ability to handle a peak wastewater flow ranging from 5.9 – 7.9 mgd. This corresponds to an average daily flow in the range of 2.0-2.7 mgd. However these figures are conservative since the sewage generation rate utilized for each parcel is based upon the highest usage for a zoning classification, that is, one family residential. Realistically, due to funding constraints and available plant capacity, it is recognized that sewering all Tier 1 candidates in the immediate future will not be feasible. **Table 8-3** below places the Sub-Areas in order of need based upon scores generated within this report. As indicated, an initial grouping of Sub-Areas was identified as priority locations. As indicated this represents a guide, and a comprehensive groundwater and stream sampling effort may be required to confirm/support the order of selection.

Table 8-3: Tier 1 - Sub-Areas Prioritized by Score

SEWERSHED/ SUB-AREA	LOCATION	SCORE	PROJECTED PEAK SEWAGE FLOW (MGD) (1) (rounded)	PROJECTED AVERAGE DAILY SEWAGE FLOW (MGD) (rounded)	PROJECTED CONST. COST (2)
INITIAL PHASE OF TIER 1 PROJECTS					
108-2	North Babylon	24	.60-.80	.20-.27	$142M
110-2	North Babylon	22	.41-.55	.14-.19	$83M
108-3	Deer Park	21	1.27-1.69	.43-.57	$235M
108-1	North Babylon	20	.40-.53	.14-.18	$98M
108-11	Wyandanch	20	.71-.95	.24-.32	$100M
Interceptor Expansions (108 and 110 only)					$71M
20% Engineering, Legal and Administrative					$132M
TOTAL			**3.39-4.52 MGD**	**1.15-1.53 MGD**	**$861M (1)**
REMAINING TIER 1 PROJECTS					
110-4	Deer Park	17	.33-.44	.11-.15	$48M
108-8	West Babylon	16	.59-.79	.20-.27	$142M
108-5	Deer Park	15	.22-.29	.07-.10	$34M
108-7	Deer Park	15	.17-.22	.06-.08	$11M
110-1	West Islip	15	.34-.46	.12-.16	$40M
108-12	Wyandanch/ Wheatley Heights.	14	.71-.95	.24-.32	$135M
110-3	Deer Park	14	.20-.27	.07-.09	$36M
20% Engineering, Legal and Administrative					$89M
TOTAL			**2.56-3.42 MGD**	**.87-1.17 MGD**	**$535M**

(1) See Comment (1) from Table 8-1.
(2) See Comment (2) from Table 8-1.
(3) See **Tables 8-5 through 8-8** for summary of cost opinions by Tier.

It is important to note that of the 18,127 parcels depicted on the GIS within the Study Area, approximately 50% or 9,000 (see **Table 8-4** below) properties are situated within Tier 1 Sub-Areas. Approximately 28% would be included within the initial phase of sewering identified in **Table 8-3** above.

Table 8-4: TIER 1 Sewering – Impacted Parcels

TIER 1 SUB-AREAS	LOCATION	PARCELS	PERCENT (%) of STUDY AREA IMPACTED
108-2	North Babylon	908	
110-2	North Babylon	619	
108-3	Deer Park	1,891	
108-1	North Babylon	606	
108-11	Wyandanch	1,082	
SUBTOTAL		**5,106**	**28%**
110-4	Deer Park	506	
108-8	West Babylon	900	
108-5	Deer Park	330	
108-7	Deer Park	260	
110-1	West Islip	518	
108-12	Wyandanch/Wheatley Heights	1,082	
110-3	Deer Park	302	
SUBTOTAL		**3,898**	**22%**
TOTAL		**9,004**	**50%**

8.4 Infrastructure Requirements

Based on discussion in previous sections of this report, the Bergen Point WWTP may have sufficient capacity to accept sewage flows for the first phase of Tier 1 Sub-Areas being sewered and connected at Interceptors 108 and 110. New infrastructure within the Sub-Areas will consist of house connections (paid by the user), lateral sewers, trunk sewers and extensions of the interceptors. Manholes are planned at approximately 400 feet spacing. Pumping stations will be constructed at select locations in order to keep portions of the sewered areas at manageable and cost effective depths without excessive construction costs for excavation and dewatering. Utility relocations will be necessary in certain instances, but will be avoided when possible during detailed design.

8.5 Legal Requirements

Legal requirements for district expansion, formation and connection as a contractee has been discussed in Chapter 5.0. As depicted in **Figure 6-1**, it is evident that the legal aspects of expanding or creating a sewer district will likely be on the critical path of the project schedule because legislative approval, special election approval and NYS Comptroller approval must be obtained following SEQRA approval in order to appropriate funding for design, construction and construction management of the sewer system and interceptor extensions.

8.6 Social Impact

Installation of sanitary sewers within the Tier 1 Sub-Areas of the Study Area, will assist some homeowners who are burdened with chronic on-site wastewater system failures and back-ups. Newly sewered residential areas will experience an increase in home value, the ability to make home improvements or extensions that would not have otherwise been possible with a failing on-site system. Adjacent commercial and light industrial areas that are able to connect to the sewer may have the opportunity to expand or enhance their operations or building footprint, thereby creating more employment opportunity, enhancing the tax base, and reversing the declining economic condition in some of the Study Area locales. These type of changes emanating from sewering Tier 1 Sub-Areas, can instill a sense of community pride, economic growth, and possible entrepreneurial opportunity on a local level.

8.7 Environmental Impact

As discussed in Chapters 3.0 and 5.2, environmental impacts for this sewering program will likely go through an extensive SEQRA review process culminating in DEIS and FEIS documents, whereby an array of analyses and studies will be conducted to ensure that potential significant environmental impacts are identified and can be mitigated through engineering design, best management practices, or other means. The SEQRA process strives to include public outreach and participation in the environmental review and decision making process. In addition, because several State and federal permit actions will be needed to implement the project, there will also be opportunity for community and stakeholder involvement at that level as well. It is apparent that the environmental improvements (groundwater and surface water quality enhancement), public health improvements (elimination of failing or marginal on-site systems), and economic / social enhancements gained through sewering some of the highest priority Sub-