Delaware Statewide Assessments of Wastewater Facilities and Current Status and Future Needs 2020 - 2025

Delaware Department of
Natural Resources and Environmental Control

Prepared by:

TETRA TECH

240 Continental Drive, Suite 200 | Newark, Delaware
and
10306 Eaton Place, Suite 340| Fairfax Virginia

Delaware Statewide Assessment of Wastewater Facilities

Current Status and Future Needs

2020 – 2025

Tetra Tech, Inc.

240 Continental Drive, Suite 200
Newark, DE

and

10306 Eaton Place, Suite 340
Fairfax, VA

April 2020

Table of Contents

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

ABS	Acrylonitrile Butadiene Styrene
ADMM	Average Daily Max Month
AMP	Asset Management Plan
BNR	Biological Nutrient Removal
BOD	Biochemical Oxygen Demand
BPW	Bureau of Public Works
CBOD	Carbonaceous Biochemical Oxygen Demand
CCTV	Closed Circuit Television
CIP	Capital Improvement Plan
CMMS	Computerized Maintenance Management Software
CMOM	Capacity Management Operation and Maintenance
CPCN	Certificates of Public Convenience and Necessity
CSO	Combined Sewer Overflows
CWA	Clean Water Act
CWAC	Clean Water Advisory Council
DHSS	Delaware Department of Health and Social Services
DNREC	Department of Natural Resources and Environmental Control
DRBC	Delaware River Basin Commission
DSWA	Delaware Solid Waste Authority
EDU	Equivalent Dwelling Units
ENR	Enhanced Nutrient Removers
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
GIS	Geographical Information System
GPD	Gallons Per Day
GPM	Gallons Per Minute
GPS	Global Positioning Unit
GWDS	Ground Water Discharge Section
IBRWF	Inland Bay Region
LA	Load Allocation
LTCP	Long Term Control Plan
MBBR	Moving Bed Biofilm Reactor
MGD	Million Gallons Per Day
MHI	Median Household Income
MOT	Middletown-Odessa-Townsend
MS4	Municipal Separate Storm Sewer System
NCC	New Castle County
NAICS	North American Industry Classification System
NPDES	National Pollutant Discharge Elimination System
OWTDS	On-Site Wastewater Treatment and Disposal Systems
RBC	Rotating Biological Contractors
PCB	Polychlorinated biphenyls
PSC	Public Services Commission
PSI	Phosphorus Site Index
PVC	Polyvinyl Chloride
RIB	Rapid Infiltration Basin

SBR	Sequential Batch Reactor
SCADA	Supervisory Control and Data Acquisition
SIU	Significant Industrial User
SRF	State Revolving Fund
SSO	Sanitary Sewer Overflow
STP	Sewage Treatment Plant
SWDS	Surface Water Discharge Section
SWM	Stormwater Management
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
UD	University of Delaware
UFS	Utility Financial Solutions
USDA-RUS	United States Department of Agriculture, Rural Utility Services
WIAC	Water Infrastructure Advisory Council
WIFIA	Water Infrastructure Finance and Innovation Act
WIP	Watershed Implementation Plans
WLA	Wasteload Allocation
WRF	Water Reclamation Facility
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

Overview

This study assessed Delaware's wastewater collection and treatment facilities at the county and state levels to determine their current status from technical and economic perspectives. The report is intended to encourage dialogue between the Water Infrastructure Advisory Council (WIAC), Department of Natural Resources and Environmental Control (DNREC), county governments, municipalities, authorities, and private utilities, by identifying immediate, short-term and long-term needs, the costs associated with those needs and the funding sources available to meet the needs. The study is also intended to point out trends and emerging issues, including promoting wastewater reuse and other innovative opportunities, with the goal of cost-effectively balancing human health and environmental protection in Delaware.

Wastewater System Infrastructure

There are 31 publicly owned wastewater collection systems in Delaware. Twenty-one of the public wastewater systems include a treatment plant and 10 of the public wastewater systems are collection-only systems. Of these 21 treatment plants, 14 facilities have surface water discharge permits and nine facilities have groundwater discharge permits. Ten privately-owned systems are also included in this assessment.

Table ES-1. Wastewater System Responsibilities and Ownership

Wastewater System	*Responsibilities*		*Ownership*			
	Collection	Treatment	Municipal	Authority	Private Investor	Private Non-Investor
New Castle County	**10**	**7**	**10**	**0**	**0**	**0**
Kent County	**7**	**1**	**6**	**1**	**0**	**0**
Sussex County	**14**	**13**	**14**	**1**	**0**	**0**
Private	**10**	**10**	**0**	**0**	**10**	**0**
State	**41**	**31**	**30**	**2**	**10**	**0**

The 21 public and 10 private wastewater treatment plants (WWTPs) provide centralized collection and treatment to a population of nearly 1 million. More than half of the systems with centralized collection are serviced at the Wilmington WWTP, which is the State's largest surface water discharger and provides secondary treatment before discharge. The average daily flow at the Wilmington WWTP is 68.7 MGD with a design capacity of 105 MGD. The other 6 treatment plants in New Castle County handle a total average daily flow of 3.4 MGD. The 14 public treatment plants in Kent and Sussex counties have average daily flows of 14.0 and 13.6 MGD, respectively.

The remaining 14 treatment plants that provide surface water discharges (besides the Wilmington WWTP) include one private facility. The average daily flow at these 14 facilities is about 25.0 MGD with a total design capacity of 45.6 MGD. The 7 municipal WWTPs and 9 private systems that discharge to groundwater have an average daily flow of 6.5 MGD and total design capacity of 12.8 MGD.

Table ES-2. Existing Plant Service and Flows

	Number of Treatment Plants	Average Daily Flow, MGD	Design Capacity, MGD
New Castle County	7	72.1	112.7
Kent County	1	14.0	20.0
Sussex County	13	13.6	29.5
Private	10	0.5	1.2

	Number of Treatment Plants	Average Daily Flow, MGD	Design Capacity, MGD
Total	31	100.2	163.4

In addition to the Wilmington WWTP, there are another 14 treatment plants (13 public and 1 private) that discharge to surface waters. The average daily flow at these facilities is 25 MGD. There are 7 public and 9 private WWTPs that have groundwater discharges.

Table ES-3. Existing Plant Service Flows by Discharge Type

	Number of Treatment Plants		Average Daily Flow, MGD	Design Capacity, MGD
	Public	Private		
Wilmington	1	0	68.7	105.0
Other Surface Water Dischargers	13	1	25.0	45.6
Groundwater Dischargers	**7**	9	6.5	12.8
Total	21	10	100.2	163.4

The study found that most wastewater service providers are concerned about the costs associated with managing their long-term investments while trying to meet increasingly stringent performance standards due to the Chesapeake Bay TMDL or other effluent requirements. Wastewater system owners and operators often need to decide between plant abandonment (regionalization) versus existing plant upgrades or new plant installations. Ultimately, these challenges are solved at the community level; however, WIAC and DNREC can facilitate these solutions by working with communities to:

- Develop long-term projections of effluent requirements and treatment levels
- Encourage communities to reevaluate the plant capacities and revise growth projections for overdesigned/oversized plants
- Promote water conservation to postpone or delay some capital investments
- Investigate the opportunity for optimizing public-private partnerships to better use existing infrastructure
- Encourage projects to reduce infiltration and inflow

Future Capital Improvement Plans and Financing Options

The total capital project costs reported for 2020-2025 for the State of Delaware is $1.134 Billion. These estimates are based on reported CIPs of $836.4M, $47.3M, and $250.5M for public wastewater systems in New Castle, Kent, and Sussex counties, respectively (Table ES-2). Private wastewater systems reported another $14M in capital costs. Some additional private wastewater system projects were identified, but no cost estimates were provided. Four wastewater systems did not report any capital costs for 2020-2025. Municipal separate storm sewer system (MS4) capital needs were only reported by 2 municipalities, both located in New Castle County. Wastewater and MS4 stormwater management projects expected to be funded through the Clean Water State Revolving Fund during the 2020-2025 period were reported as $35.54M.

Table ES-4. Reported Capital Project Costs ($M) for Wastewater and MS4 Needs, and SRF Requests, 2020-2025.

County	Wastewater Needs	MS4 Needs	Totals	SRF
New Castle County	$820.4	$16.0	$836.4	$26.9
Kent County	$47.3	$0	$47.3	$8.5

Sussex County	$250.5	$0	$251.5	$0
State Total	**$1,118.2**	**$16.0**	**$1,134.2**	**$35.4**

1. REPORT PURPOSE, METHODOLOGY AND BACKGROUND

Purpose

This report presents the results of the most recent assessment of wastewater facilities at a state and county level to identify the current status of Delaware's wastewater collection and treatment systems from technical and economic perspectives. The report is intended to encourage dialogue between the Clean Water Advisory Council (CWAC), Department of Natural Resources and Environmental Control (DNREC), county governments, municipalities and utilities by identifying immediate, short-term and long-term wastewater collection and treatment needs, the costs associated with those needs and the funding sources available to meet the needs.

The first statewide wastewater facilities assessment covering the period from 1995 through 1997 was conducted by the Financial Assistance Branch of DNREC. The Delaware Statewide Wastewater Facilities Assessment 2006-2011 was prepared by URS Corporation. Tetra Tech supported the 2011-2016 Delaware Statewide Assessment of Wastewater Facilities, published in 2012, and this current survey and assessment report (2020-2025) on behalf of DNREC. This report updates the 2012 assessment and supplements the earlier assessments with new information of interest to project stakeholders, including trends and emerging issues, with the goal of cost-effectively balancing human health and environmental protection in Delaware. The report is intended to provide DNREC with the information necessary to support local and statewide programs to improve the collection and treatment of wastewater in Delaware and maintain the high quality of services delivered to customers.

Methodology

Like previous clean water and drinking water needs assessments in Delaware, research underlying this report relied primarily on direct inquiry of wastewater system management and staff via survey, interviews and targeted information requests. These direct inquiries were supplemented using information extracted from previous needs assessment reports, other State of Delaware data collection efforts and other publicly-available sources of information.

The main steps used to collect relevant information and prepare this report include the following:

- Develop the survey questionnaire in collaboration with DNREC
- Distribute survey questionnaires to management contacts at municipal and private wastewater providers
- Receive and review survey responses
- Interview utility contacts to clarify and supplement survey responses
- Quality assure/control survey responses using notes prepared by all participating interviewers (with utility follow-up if/as necessary)
- Import survey data into an Excel based database
- Synthesize and analyze data and draft report

Survey

The wastewater needs assessment survey was developed by Tetra Tech in collaboration with DNREC. The survey was prepared and transmitted to utility contacts in "fillable .pdf" format to allow for automated extraction of entries into the Excel database.

A blank wastewater survey instrument is provided as Appendix A. The survey is subdivided into four thematic sections, as follows:

- **General**. Includes survey respondent contact information and characteristics, along with interview documentation.
- **Wastewater Collection and Treatment Systems**. Includes information about the collection, transmission, treatment, discharge or disposal method, and water quality issues.
- **Underserved Areas**. Where applicable, information has been provided about efforts survey respondents have made or their willingness to help underserved areas connect to central sewer systems in close proximity.
- **Municipal Separate Storm Sewer System (MS4) Program Status.** Available information was requested about the survey respondents' status as regulated MS4s by DNREC.
- **Finance**. Includes information about financial solvency and sustainability, fiscal management and affordability.

This topical breakdown is used to present much of the findings in subsequent sections of the report.

Interviews

In most cases, completed surveys were returned by respondents prior to conducting the interviews; however, it should be noted that the completeness of survey responses varied greatly between participants. Accordingly, the interviews served to normalize information resolution and completeness, although discrepancies between respondents still exist primarily due to differences in municipal or utility staff capacity and resources.

At least two members of the consulting team participated in each interview; in most cases, three or more team members participated, each independently taking notes so that interview data could be better verified for quality control purposes. From the municipality-utility side, participation in interviews was generally left to the discretion of the survey contact (typically a manager) and varied from one to more than five participants. In multiple cases, interview subjects followed-up with staff not present during the interview for clarification or supplemental information.

Interview format was generally open and informal, broadly following the survey format, but allowing space for elaboration of issues unique to the survey respondent.

Following the interview, the interviewers' notes were compared and consolidated, discrepancies were resolved internally or upon further clarification with municipality-utility representatives, and the notes were used to supplement the raw surveys provided by the survey respondents. The "finalized" surveys were used for data analysis and reporting.

Data Analysis

Although the survey (see Appendix A) and interview solicited quantitative data, the bulk of the information generated (and, it could be argued, the most valuable information) was qualitative in nature. Accordingly, the first step in data analysis (and presentation) was to distill the survey and interview data into summaries for each utility and/or system. These summaries constitute a major portion of the findings reflected in this report. Summaries for each utility are provided in the "county-level" sections of the report, which were then "rolled up" into a statewide summary. Significant findings from the surveys are reflected in the appropriate sections of the utility summaries. To the extent practical and useful, qualitative information has been summarized quantitatively to elucidate the prevalence of certain common findings among survey respondents (e.g., number of respondents using a certain technology).

Quantitative data are also summarized accordingly. These include, for example, wastewater influent strength, collection system age and condition, infiltration and inflow (I/I) information, treatment plant technologies, including nutrient removal, biosolids handling, and discharge type attributes and financial information including capital expenditure estimates, reserve account and debt limit figures and the like.

Where practical and useful, these quantitative data are presented using subtotals (e.g., by municipality and county) and totals (e.g., for the entire state). Other statistical measures are used where applicable although their practical significance was generally limited because of the type of data collected.

Background

Regulations for, Permitting of, and Enforcement on Wastewater Facilities

Federal Regulations

The Clean Water Act (CWA) regulates wastewater treatment facilities with surface water discharges through the National Pollutant Discharge Elimination System (NPDES) permit program pursuant to Section 402. The CWA nonpoint source management program provides guidance for managing on-site (septic) and other decentralized wastewater treatment systems. The Safe Drinking Water Act establishes the statutory framework for states to regulate subsurface disposal of effluent through groundwater permits.

Section 303(d) of the CWA requires establishment of lists of impaired waters and subsequent preparation and implementation of Total Maximum Daily Loads (TMDLs). A TMDL is the maximum amount of a pollutant that a body of water can receive and still meet water quality standards that protect humans and aquatic life. Delaware used the 303(d) list to create watershed-specific TMDLs so that surface water discharges that are located within a watershed subject to an approved TMDL must include a wasteload allocation (WLA) for the pollutant(s) named in the TMDL.

State Regulations

In an effort to better address regional concerns, DNREC has divided the State into four major basins: (1) Chesapeake Bay Basin; (2) Inland Bays/Atlantic Ocean Basin; (3) Delaware Bay and Estuary Basin; and (4) Piedmont Basin. Within each basin, Tributary Action Teams are formed to create Pollution Control Strategies, which are designed to achieve pollution load reductions required by TMDLs.

DNREC currently manages wastewater permitting, inspection, and enforcement through two sections—the Surface Water Discharges Section (SWDS) and the Groundwater Discharges Section (GWDS). The SWDS manages all NPDES permits (such as stream discharge or ocean outfall), and the GWDS manages all groundwater discharges. The GWDS has two branches—one to manage large facilities (spray irrigation and rapid infiltration basins [RIBs], and such), and one to manage individual or small systems (such as septic systems). Some facilities operate on dual permits, meaning that one treatment facility may deal with both divisions if they have multiple types of discharges (e.g., spray irrigation and NPDES).

Large wastewater treatment facilities are subject to the monitoring and reporting practices typical of any individual NPDES or groundwater discharge permit. For small- to medium-sized facilities, only monitoring may be required with a stated caveat or footnote. For instance, in some facilities the following language is common for phosphorus monitoring: “Groundwater discharges may also be subject to controls if excessive levels of soil phosphorus are present, as defined by the Delaware Nutrient Management Commission, in which case soil phosphorus levels must be tested in accordance with the University of Delaware (UD) soil testing methods. If the soil phosphorus levels become excessive, the permittee shall perform a Phosphorus Site Index (PSI) study of the site. The results of the PSI study must be submitted to the Groundwater Discharges Section within 30 days of completion of the study. Based on the results of the PSI study, the Groundwater Discharges Section may require the permittee to submit a plan for Groundwater Discharges Section review and approval detailing steps the permittee will take to reduce the phosphorus loading rates at the site.”

Regional TMDLs, State-Issued TMDLs and Other State or Regional Efforts Impacting Wastewater Facilities

Various TMDLs with their own WLAs and load allocations (LAs) have been established throughout Delaware by DNREC or the U.S. Environmental Protection Agency (EPA) over the past decade in effort to restore impaired waterways. While the majority of TMDLs in Delaware target nutrients and bacteria, other TMDLs include zinc and temperature, the major regional TMDL concern for wastewater facilities is the Chesapeake Bay TMDL because it addresses nutrient management. Wastewater treatment plants (WWTPs) and other regulated entities are required to adhere to the WLA assigned to them in these TMDLs. For a complete listing of Delaware TMDLs and more information, visit DNREC's website: http://www.dnrec.delaware.gov/swc/wa/Pages/WatershedAssessmentTMDLs.aspx.

Chesapeake Bay TMDL

Delaware is one of six Chesapeake Bay watershed states—along with Maryland, Virginia, West Virginia, Pennsylvania, and New York—and the District of Columbia that committed to a federal-state initiative to help restore the water quality of the Bay and its tidal waters by 2025. EPA led the effort to develop the 2010 TMDL for nutrients and sediment for the Chesapeake Bay.

As part of the Chesapeake Bay TMDL, each state was required to develop a series of three watershed implementation plans (WIPs) that detail how load allocations will be achieved and maintained now and in the future. Phase I and Phase II WIPs were submitted to EPA in November 2010 and March 2012, respectively. The Chesapeake Bay Program provided updated state planning targets in July 2018 based on corrections and modifications made to the Phase 6 Chesapeake Bay Watershed Model. The Phase III WIPs were developed to meet these new targets and were completed in August 2019. Delaware's Phase III WIP describes refined actions and controls to be implemented between 2019 and 2025 to achieve the applicable nitrogen and phosphorus water quality standards. With each successive WIP, the detail of load reduction goals and actions to achieve those goals has become increasingly more specific.

The 2025 Phase III WIP goals for Delaware's five WWTPs in the Chesapeake Bay watershed are based on the TMDL's WLAs with some modifications. A notable change to the implementation strategy for the Phase III WIP includes a decrease in the total nitrogen goal for the WWTPs. The current nutrient loads from these facilities are below the Phase II WIP goals, therefore, the Phase III WIP goals were decreased, while leaving room to allow for future growth. The five WWTPs are currently permitted to discharge nutrients and sediment. All WWTP facilities receive on-site inspections as well as an annual audit of their monitoring records by DNREC. The compliance rates are near 100% and are actively being maintained. No additional regulatory or enforcement authorities are needed to meet these compliance rates.

The Chesapeake Bay TMDL lists specific WLAs for point source discharges but includes provisions that allow for nutrient trading among dischargers. It is expected that this will allow aging facilities to redirect their flow to larger more capable facilities nearby and discontinue operation. There is also an existing trading agreement between two of the facilities exchanging nitrogen for phosphorus as one of the facilities has a larger nitrogen WLA than necessary for operations.

Delaware's On-Site Systems in the Chesapeake Bay Watershed

Since completion of the Phase II WIP in 2012, Delaware revised its Regulations Governing the Design, Installation and Operation of On-Site Wastewater Treatment and Disposal Systems (OWTDS). The OWTDS regulations were revised in 2014 to ensure that local water quality is maintained and/or local TMDLs are complied with to address anticipated new or increased nutrient loads from additional on-site wastewater systems.

The revised OWTDS regulations include a statewide inspection and pump-out program. Systems that fail inspection are required to be repaired, replaced, or upgraded, depending on location and date. In addition, septic tanks are required to be pumped out once every three years. The Phase III WIP goal for the inspection and pump-out program for small septic systems is based on this requirement. The goal is for one-third (33%) of all OWTDSs in the Chesapeake Bay watershed to be pumped out each year by 2025. In other words, all OWTDSs in the watershed will be pumped out once every three years.

Delaware's OWTDS regulations also require all systems within 1,000 feet of tidal waters and associated tidal wetlands in the Chesapeake Bay watershed to be upgraded with advanced treatment technologies when new OWTDSs are installed or when failing/malfunctioning systems are replaced. As a result, the Phase III WIP goal for advanced treatment upgrades has increased to 25% of the systems across the watershed (i.e., 3,983 advanced systems to be installed by 2025).

Delaware's 2014 OWTDS regulations also placed stricter controls on large systems. All large systems in Delaware are required to meet the applicable nitrogen and phosphorus performance standards based on the system size, age, and location.

OWTDSs will continue to be eliminated in the future through sewer connections in expanding sewer districts. The Phase III WIP goal is to eliminate a minimum of 350 septic systems through connection to sewer systems by 2020 and 600 systems by 2025. In addition to the revised OWTDS regulations, as of February 2019, New Castle County passed a one-year moratorium on septic systems in new developments. New subdivisions with greater than five lots in the Chesapeake Bay watershed in New Castle County will offer sewer connections rather than septic systems.

Inland Bays TMDL

Effective November 11, 2008, DNREC's Division of Water Resources, Watershed Assessment Section issued Statutory Authority: 7 Delaware Code Chapters 40, 60, 66, 70, and 72; and 29 Delaware Code §§ 8014(5) and 8025 - Regulations Governing the Pollution Control Strategy for the Indian River, Indian River Bay, Rehoboth Bay and Little Assawoman Bay watersheds. These regulations set new effluent performance standards that many WWTPs cannot meet with their existing equipment. Permitted discharges of nutrients into the Inland Bays or their tributaries will essentially be systematically eliminated through their NPDES renewal process. Point sources may choose to engage in water quality trading on a case-by-case basis in accordance with the following:

- Trades must occur within the same watershed (Indian River, Indian River Bay, Rehoboth Bay, or Little Assawoman Bay) as the point source discharge is located.
- Trades must involve a trading ratio of at least 2:1 between nonpoint sources and point sources.
- The nutrient load reduction involved in the trade must constitute reductions that occur beyond the baseline or the point or nonpoint source nutrient reductions required under the TMDL and this Pollution Control Strategy.

Delaware River/Estuary PCB TMDLs

Polychlorinated biphenyls (PCBs) have been widely dispersed throughout the environment by human activity, typically entering the atmosphere as a gas or spilling into soils and waterways and lodging in sediments. They continue to be generated as a by-product of some industrial processes. The sources of PCBs to the Delaware Estuary are multiple, including loadings from the air, the mainstem Delaware River above Trenton, New Jersey, tributaries to the Delaware River both above and below Trenton, industrial and municipal point source discharges, combined sewer overflows (CSOs), and stormwater runoff, including runoff from seriously contaminated sites.

The water quality standards that form the basis for the Stage 1 TMDLs for Zones 2 through 6 of the Delaware River Estuary are the current Delaware River Basin Commission (DRBC) water quality criteria for total PCBs for the protection of human health from carcinogenic effects. These criteria were identified as the TMDL targets by a letter dated April 16, 2003, from the Regional Administrators of EPA Regions 2 and 3 to the Executive Director of the DRBC. The criteria are 44.4 picograms per liter in Zones 2 and 3, 44.8 picograms per liter in Zone 4 and the upper portion of Zone 5, 7.9 picograms per liter in lower Zone 5, and 64 picograms per liter in Zone 6.

Significant reductions are required throughout the estuary to meet the Stage 1 TMDL as ambient concentrations of PCBs in the waterbody currently exceed the 2003 criteria by two to three orders of magnitude. For purposes of the Delaware River/Estuary TMDLs, point sources include all municipal and industrial discharges subject to regulation by the NPDES permit program, including CSOs and regulated stormwater discharges. All other discharges are considered nonpoint sources. The Total PCB WLA for zones 2–5 is 38.86 mg/day, which represents 10 percent of the total allocation (i.e., the WLA, LA plus the margin of safety). For Zone 6, the WLA is 13.12 mg/day (0.7 percent of the TMDL).

DRBC adopted an updated water quality criterion of 16 picograms/liter for PCBs in the Delaware Estuary and Bay in 2013[1]. This number is a uniform value for the entire Delaware Estuary and Bay (DRBC Water Quality Zones 2-6). New TMDLs (Stage 2 TMDLs) corresponding to the updated criterion are still under development as of this writing.

Other Common Issues, Impacts and Themes Affecting Wastewater Treatment in Delaware

Wastewater System Overview

The **Service Area** describes the geographic area within which the municipality, County, or utility provides wastewater collection and treatment services and other characteristics of the system operator's customers (e.g., numbers of different customer types). Sewer service area maps are presented in Appendix B.

Underserved Communities refer to geographic areas where residents lack access to reliable onsite or decentralized treatment or to an available centralized collection and treatment system. In the context of this report, underserved communities are those which project stakeholders seek to understand available options for wastewater services and their feasibility. All survey respondents were asked about their capacity to and interest in serving unserved areas or underserved communities. Those respondents in proximity to underserved communities identified in advance by the project stakeholders were asked specifically about any efforts to extend service to them.

Asset Management broadly describes a formalized process for business enterprises to proactively inventory, assess the criticality of, understand the condition of, and maintain, repair or replace system assets (infrastructure). In the context of this report, utilities were asked to describe their asset management efforts, including whether they are participating in Delaware's Asset Management Incentive Program, a five-year program where participants can receive funding to develop and implement asset management plans for their facilities. For water and wastewater utilities, "asset management" generally focuses most on underground assets (e.g., collection and transmission pipes for wastewater systems), but

[1] DRBC (Delaware river Basin Commission). 2019. Water Quality Information – PCBs. Accessed October 29, 2019: https://www.state.nj.us/drbc/quality/toxics/pcb.html

can and should also address other asset types, such as pump stations and various treatment-related infrastructure elements.

System Controls refer to electronic systems for controlling mechanical equipment and, ideally, monitoring system conditions. Survey respondents were specifically asked if they had a Supervisory Control and Data Acquisition (SCADA) system and, if so, which of their equipment and facilities it controls and monitors. Those respondents that do not have a SCADA system often provided information about control systems for individual equipment.

Finances

Revenue Generation refers to the ability of the survey respondent to recover costs related to sustainable operation of the wastewater enterprise. Respondents were asked specifically whether their revenue was sufficient and for information about their rate structures (customer rates being their main source of revenue).

Reserves refers to accounts set aside for specific activities related to the wastewater collection and treatment system, if applicable. Survey respondents were asked if they have reserve accounts and, if so, how (and how much) they were funded and whether use of reserve funds was restricted and, if so, how.

Capital Plans, in this context, relates to the process used by the wastewater entity to plan, fund and execute capital projects through a capital budget or a Capital Improvements Plan (CIP). Specifics about the actual capital plans and projects are generally addressed in the sections about specific system components and are compiled in Appendix C.

Issues Overview

The main focus of this report is to discuss issues associated with wastewater collection, treatment, and disposal such as regionalization of municipal wastewater, water reuse, environmental and human health, socioeconomic concerns, and then to provide some recommendations.

Delaware's wastewater systems are faced with many of the typical issues, concerns, and common themes as other systems throughout the region, if not the country or the world. These include wet weather flows and associated problems caused by I/I, elimination or control of combined sewer systems, municipal comprehensive plan and master planning efforts, wastewater regionalization efforts, working with private utilities and the Public Service Commission, decentralized systems, and implementing water reuse techniques.

Many collection systems in Delaware experience I/I problems that affect pump stations and treatment systems, including collection-only systems that affect a downstream system that provides the treatment. The cost to completely rehabilitate collection system I/I issues is often excessive, and the problem is typically addressed via studies that target areas to fix on an "ongoing, case-by-case" basis.

All three counties and most of Delaware's incorporated municipalities (those with 2,000 residents or greater) are required to discuss in their comprehensive plans how their wastewater is collected and treated. In addition, all three counties have some degree of regional wastewater master-planning efforts. With these regional planning efforts, Delaware has many successful collection-only systems that act as contract (or satellite) users to other systems that provide treatment. However, there is some debate over regionalization such as the costs of force main installations, electrical and maintenance costs of force mains and pump stations, the potential loss of revenue to a local government, various annexation (municipal boundary) issues, and the inability to find or implement local water reuse options.

In addition to county and municipal wastewater service and planning, there are two major non-governmental wastewater utilities, Artesian Wastewater Management, Inc. (Artesian) and Tidewater

Environmental Services, Inc. (Tidewater), that have wastewater systems of assorted sizes scattered about Delaware, mostly in Sussex County. Artesian and Tidewater also have their own planning and regionalization efforts. For this report, the terms "private utility" or "private firm" (or similar term) may also mean a "publicly traded corporation," which applies to both Artesian and Tidewater.

On July 6, 2004, legislation was enacted by the Delaware General Assembly, found at 74 Delaware Laws, Chapter 317, which granted Delaware's Public Service Commission jurisdiction to regulate non-governmental wastewater utilities having 50 or more customers in the aggregate. That authority includes the jurisdiction to grant and revoke Certificates of Public Convenience and Necessity (CPCNs). The commission has adopted rules, regulations and procedures necessary to implement this authority. While Artesian and Tidewater are the major non-governmental wastewater service providers, there are approximately nine other entities in Delaware holding CPCN rights. CPCN areas may or may not be active developments, because some areas are either under development, postponed, or simply holding rights for other reasons. CPCN areas are important to discuss because they can have major effects on regional planning efforts, both positive and negative.

Private utilities and companies also offer the opportunity for private-public partnerships. Private companies can provide both financial backing and technical expertise that a municipality or other government entity may not otherwise have. In addition, many municipal wastewater utilities contract private firms to operate their facilities. For instance, Wilmington contracts Veolia Water North America and Lewes contracts Severn Trent. Private-public partnerships regarding wastewater may also include other forms of government contracting, such as engineering, construction, reporting and laboratory work.

Aside from the centralized systems, there are about 80,000 individual or dual "on-site" septic systems and about 200 large decentralized or cluster community systems permitted through DNREC's Groundwater Division (a very small quantity of large systems are permitted through the Surface Water Division). Commercial or industrial systems are considered "large systems" as well. As previously stated, any system servicing 50 or more units is considered a regulated utility.

Delaware's most common forms of wastewater reuse are currently spray irrigation on harvested crops or limited access fields, and internal reuse within a wastewater facility. "Purple pipe" for unlimited access areas currently exists as spray facilities at golf courses, and some municipalities reported planning of purple pipe for residential lawns, parks, and institutional uses (e.g., spray for athletic fields). RIBs, drip irrigation fields, and similar groundwater systems are also currently being implemented, although the topic of aquifer recharge as water reuse is under debate. Spray or drip irrigation in forested areas (limited access or otherwise) is under current consideration by DNREC. Groundwater recharge such as deep-well injection, slow-rate infiltration basins, and other fresh water conservation concepts (such as shallow injection in bay areas to create a barrier against seawater) are also being incorporated into reports, studies, or discussions as potential effluent management options. Groundwater recharge systems were documented as "other" along with any miscellaneous renewable or "green" technologies that were documented during the survey.

Funding for Wastewater Facilities

The State has developed the Strategies for State Polices and Spending. The policy was developed to coordinate land use decision-making with the provision of infrastructure and services in a manner that makes the best use of natural and fiscal resources. The goal of the State Strategies is to act as a guide for adequate infrastructure provision throughout the State while minimizing the burden on the State's taxpayers.

State agencies are directed to fund only projects that are compliant with the strategies. To accomplish that, three general strategies have been developed:

1. Towns, cities, counties and the state are collectively involved in the infrastructure planning process;
2. Existing infrastructure should be used before new infrastructure is constructed; and
3. When it is necessary to expand existing infrastructure, it should be expanded in a logical manner that aims to serve first those areas closest to existing services.

These strategies have been used to analyze spatial data from state, county, and local agencies to create a state strategies map that depicts land in three main categories:

1. Lands not available for development or redevelopment;
2. Lands for which state and local policies do not favor growth; and
3. Lands for which state and local policies do favor growth.

These categories have been used to develop Investment Levels 1, 2, 3 and 4 provided with this report. All municipalities are directed to develop comprehensive plans, including land use and expansion of wastewater infrastructure that is in compliance with the State Strategies.

Municipal wastewater utilities within Delaware have access to federal, state, and local funding programs and mechanisms to help fund wastewater capital improvement projects. DNREC's Financial Assistance Branch was established to help municipalities understand and secure funding. In addition to administering the State Revolving [loan] Fund (SRF), other revenue and funding types are described briefly below, and detailed information about specific programs or sub-accounts is available through the Financial Assistance Branch or the Water Infrastructure Advisory Council (WIAC).

Revenue. Revenue generation of a wastewater utility typically covers day-to-day operations and maintenance (O&M) costs, small-scale projects or repairs, and paying off existing debt/interest. It involves billing customers, charging impact/tapping fees, collecting satellite user fees, partnering with industry, and other similar methods.

Traditional Debt. In effort to raise additional capital, municipalities can take out loans from banks like a personal loan and can issue municipal bonds into the bond market. Bonds issued against the assessed value of the municipality are often referred to as general obligation bonds, or "GO" bonds.

Grants or Subsidized Debt Programs. Several federal and state programs are available for wastewater improvement projects. There is a typical application/selection process, or a project will get placed on a Project Priority List. Those programs consist of the following:

1. Delaware Water Pollution Control Revolving Fund
2. Department of Agriculture - Rural Utility Services (USDA-RUS)
3. State Sources (21st Century Funds)
    a. Wastewater Management Account
        i. Affordable Sewer Grants
4. Non-Federal Administrative Account
    b. Wastewater Planning Matching Grants
    c. Surface Water Planning Matching Grants
    d. Community Water Quality Planning Grants

Water Infrastructure Finance and Innovation Act

The federal Water Infrastructure Finance and Innovation Act (WIFIA) program[2] is intended to accelerate investment in water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects. WIFIA can fund up to 49 percent of eligible projects costs and includes minimum project size thresholds for small and large communities. Based on EPA information, Delaware wastewater purveyors have not yet applied for WIFIA funding, although this might be an attractive future supplemental funding source for Delaware's wastewater providers with major capital needs.

Organization of the Report

Following this introductory section of this report is a statewide summary of the findings of the Assessment of Wastewater Facilities and Service Areas. Following the statewide summary section are four report sections that provide full details of each utility's enterprise: one section for each of the three Delaware counties (New Castle, Kent and Sussex) and one section covering private wastewater providers. These four sections also "roll up" and summarize the data at the appropriate level (e.g., for each county and for the private utilities as a group). Following these detailed sections is a "Conclusions and Recommendations" section, followed by a list of references and Appendices, all of which are cited and referenced in the report.

Overview of Wastewater Treatment Plant Stages

Conventional treatment plant process stages have become a debatable topic, particularly with the advent of "package systems," recirculation systems, and chemical injection systems that can provide multiple types of treatment (physical, chemical, and biological) at one time or within a contained system.

For this survey, the Food and Agriculture Organization (FAO) of the United Nations' Wastewater Treatment and Use in Agriculture - FAO Irrigation and Drainage Paper 47 (1992)[3] was used as a standardized method for determining level of treatment. Although the following is slightly dated, it serves as a basis to discuss the various systems throughout Delaware, which vary widely in age and type, from early treatment systems that began as primary but have been upgraded over the course of a century to new, "state-of-the art" systems.

Levels of Treatment

1. *Preliminary:* The objective of preliminary treatment is the removal of coarse solids and other large materials often found in raw wastewater. Often referred to as headworks, most if not all municipal plants in this survey have some type of preliminary treatment. Preliminary treatment was not reported in the survey.
2. *Primary:* The objective of primary treatment is the removal of settleable organic and inorganic solids by sedimentation, and the removal of materials that will float (scum) by skimming. In municipal plants, these are typically primary clarifiers or settlement chambers.
3. *Secondary:* The objective of secondary treatment is the further treatment of the effluent from primary treatment to remove the residual organics and suspended solids. In most cases, secondary treatment follows primary treatment and involves the removal of biodegradable dissolved and colloidal organic matter using aerobic biological treatment processes. It also includes secondary clarification. In municipal plants, these are typically activated biosolids, aerated lagoons, rotating biological contactors (RBCs), trickling filters, secondary clarifiers, or some other proprietary unit.

[2] See https://www.epa.gov/wifia for more information
[3] See http://www.fao.org/docrep/t0551e/t0551e05.htm for more information

4. *Tertiary:* Tertiary and/or advanced wastewater treatment is employed when specific wastewater constituents that cannot be removed by secondary treatment must be removed. Individual treatment processes are necessary to remove nitrogen, phosphorus, additional suspended solids, refractory organics, heavy metals and dissolved solids.
5. *Disinfection:* Disinfection normally involves the injection of a chlorine solution at the end of the treatment train. Ozone and ultraviolet irradiation can also be used for disinfection. Most, if not all, municipal plants have some type of disinfection or finishing process, although it was not reported in the survey.

Conventional levels of treatment have become a debatable topic with the advancement of wastewater treatment. During the survey many of the municipal wastewater entities reported successfully bypassing or removing primary treatment and going direct to secondary treatment.

Definitions of Other Key Terms Used in this Study

Nutrient removal: Nutrient management is a critical theme in Delaware's wastewater systems. Although nutrient removal is typically considered tertiary treatment, not all tertiary treatment is for nutrient removal. Furthermore, nutrient management is now commonly becoming part of secondary treatment or integrated into package systems (described below). The survey allowed for stating nitrogen and phosphorus management outside of conventional levels of treatment.

Package Systems: "Package systems" has become an unofficial term used loosely for various vendor-proprietary systems that integrate conventional secondary and tertiary treatments together. In Delaware, they are mostly implemented for nutrient management (often referred to as enhanced nitrogen removal (ENR) or biological nitrogen removal (BNR) or for added filtration. Package systems may be implemented in various sites and sizes, from "all-in-one" small cluster systems to large-scale municipal systems.

Treatment by Vegetation: DNREC currently permits spraying wastewater on crops or fields for nutrient management provided the proper soil and vegetation studies have been performed. This survey does not discuss macrophyte ponds (maturation ponds that incorporate floating, submerged or emergent aquatic plant species) or other "vegetative treatment methods" because they are not typically used in Delaware's large/municipal treatment systems.

Effluent: Once treated, wastewater effluent must be managed. In Delaware, most large wastewater systems either discharge their effluent as a point source discharge to surface water, spray irrigate it onto permitted fields, allow it to infiltrate in large basins, or implement a combination of these. Management of treated wastewater effluent is a key theme of this report, however, there is debate over effluent management terminology, specifically whether groundwater recharge can be deemed to be reuse. There appears to be a lack of common or accepted theme for what is deemed as effluent disposal, conservation, or reuse.

Sludge or Solids Management: Solids left over from the treatment process are typically run through some type of digestion process, dewatered, and then either disposed of at a landfill or reused in some way. Solids management was not part of this survey, although it is mentioned.

Pretreatment: Publicly owned treatment works are required to abide by the EPA's National Pretreatment Program. Although industrial or commercial pretreatment was not a focus of this survey, it was discussed by various municipalities, both with or without a publicly owned treatment works. EPA pretreatment guidelines should be universally applied, including its exemptions.

2. STATEWIDE SUMMARY/OVERVIEW

DNREC commissioned the development and implementation of a survey to perform an assessment of publicly and privately-owned wastewater facilities and service areas (hereafter wastewater systems). The survey was implemented in two stages, first a survey was provided to each wastewater system and second, an in-person site visit was conducted with representatives of each wastewater and drinking water system to complete updates to the survey.

Survey respondents provided the requested survey information at varying levels of completeness and detail, which necessitated scheduling follow-up calls or meetings to try to obtain uniform information from all participants. Data checks were undertaken for quality control and survey follow-ups were performed when data outliers were found, when an interpolation had to be made or if it was determined that an interviewee's response was incomplete.

Interpolated technical data related to wastewater collection and treatment was collected to complement the information provided by survey respondents to enhance the thoroughness of the presentation.

- Average flows of collection systems
- Average flows of treatment plants
- Census populations (anecdotal population served information was provided by some survey respondents)
- Wastewater infrastructure
- Service area size (square miles)

This section of the report provides an overview of the survey results separated into three main components—general information, infrastructure status, and financial data. Following this statewide summary, county and facility level details are provided beginning with Section 3.

General Information

In Delaware, there are 31 publicly owned wastewater systems. Two of the public wastewater systems are owned and operated by a regional authority, and the rest are municipally owned (see Table 2-1). Twenty-one of the public wastewater systems include a treatment plant, and 10 of the public wastewater systems are collection-only systems.[4] Of the 21 treatment plants, 14 have surface water discharge permits and 10 facilities have groundwater permits.[5] All 10 facilities with groundwater permits use storage lagoons for spray irrigation or rapid infiltration basins.

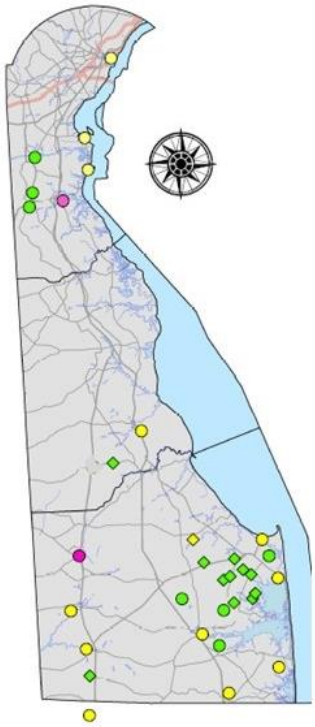
This survey also includes 10 operating privately-owned systems. Artesian owns 3 systems, all in eastern Sussex County, while the remaining 7 systems are owned by Tidewater, all in Sussex County. One Tidewater facility (Milton Regional) has a surface water discharge permit, while the remaining privately-owned systems have groundwater permits.

[4] The Delmar treatment plant, physically located in Maryland, is included in this assessment.

[5] Two facilities, Water Farm #1-MOT WWTP, owned and operated by New Castle County and the Bridgeville WWTF, have both surface water and groundwater discharge permits.

Table 2-1. Wastewater System Responsibilities and Ownership

Wastewater System	*Responsibilities*		*Ownership*			
	Collection	Treatment	Municipal	Authority	Private Investor	Private Non-Investor
New Castle County	10	7	10	0	0	0
Kent County	7	1	6	1	0	0
Sussex County	14	13	14	1	0	0
Private	10	10	0	0	10	0
State	41	31	30	2	10	0



Number of Collection and Treatment Systems

System Type	Collection		Treatment	
New Castle	10		7	
Kent	7	31	1	21
Sussex	14		13	
Private	10		10	
Total	**41**		**31**	

Treatment Systems by Discharge Type

	Surface		Ground		Both
New Castle	3		3		1
Kent	1	13	-	8	-
Sussex	9		5		1
Private	1		9		-
Total	**14**		**17**		**2**

Figure 2-1. Location and Type of Centralized Wastewater Treatment Infrastructure

Infrastructure Status

Population Served and Flows

The 21 public WWTPs provide centralized collection and treatment to a population of almost 1 million residents of Delaware (see Table 2-2 and Table 2-3). The Wilmington WWTP is the State's largest surface water discharger and provides secondary treatment before discharge. The average daily flow at the Wilmington WWTP is 68.7 MGD with a design capacity of 105 MGD. The other 6 treatment plants in New Castle County handle a total average daily flow of 3.4 MGD. The 14 public treatment plants in Kent and Sussex counties have average daily flows of 14.0 and 13.6 MGD, respectively.

The remaining 14 treatment plants that have surface water discharges (besides the Wilmington WWTP) include one private facility, and all but one facility (Port Penn) provides tertiary treatment.[6] The average daily flow at these 14 facilities is about 25.0 MGD with a total design capacity of 45.6 MGD. Eight of those 14 facilities (Middletown-Odessa-Townsend [MOT] Regional, Kent County Regional, Lewes, Rehoboth Beach, Delmar, Seaford, Laurel, and Millsboro) provide nitrogen removal and phosphorus removal.

The 7 municipal WWTPs and 9 private systems that have groundwater discharges have an average daily flow of 6.5 MGD and total design capacity of 12.8 MGD. The aggregate average daily flow treated by the 4 County-operated facilities with groundwater discharge is 4.5 MGD with a total design capacity of 9 MGD.

Table 2-2. Existing Plant Service and Flows

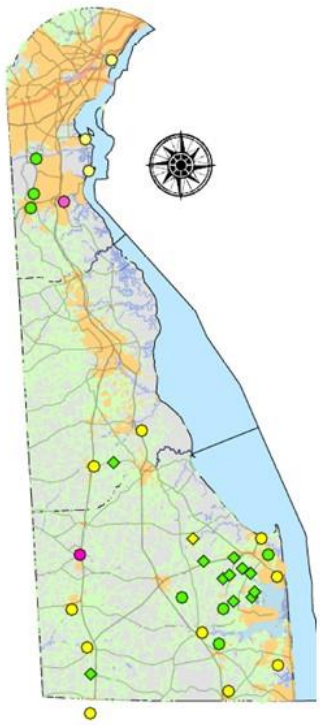
	Number of Treatment Plants	Average Daily Flow, MGD	Design Capacity, MGD
New Castle County	7	72.1	112.7
Kent County	1	14.0	20.0
Sussex County	13	13.6	29.5
Private	10	0.5	1.2
Total	31	100.2	163.4

Table 2-3. Existing Plant Service Flows[1] by Discharge Type

	Number of Treatment Plants		Average Daily Flow, MGD	Design Capacity, MGD
	Public	Private		
Wilmington	1	0	68.7	105.0
Other Surface Water Dischargers	13	1	25.0	45.6
Groundwater Dischargers	7	9	6.5	12.8
Total	21	10	100.2	163.4

[1] Flow information was split evenly for the two facilities with both surface and groundwater discharges.

[6] These 14 facilities include 2 facilities (Water Farm #1-MOT and Bridgeville) that have both surface and groundwater discharges. The Harrington plant has been converted to a pump station, conveying wastes to the Kent County Regional plant.



Treatment Levels and Nutrient Removal

	No. of Fac's	Secon-dary	Tertiary	N Limits	P Limits
Surface Water Discharges (or Both)					
N. Castle	5	5	3	1	1
Kent	1	1	1	1	1
Sussex	9	9	9	6	6
Private	1	1	1		
Total	**16**	**16**	**14**	**8**	8
Ground Water Discharges Only					
N. Castle	3	3	3	1	1
Kent	0	0	0	0	0
Sussex	5	5	2	4	0
Private	9	9			
Total	**17**	**17**	**5**	**5**	1

Figure 2-2. Levels of Treatment and Nutrient Removal

Infiltration and Inflow and Asset Management

Most the public entity survey respondents indicated that excessive infiltration and inflow (I/I) contributed to flow exceedances. Progress toward addressing I/I issues include ongoing investigations to quantify sources and magnitudes and a variety of rehabilitation/corrective actions. As expected, most of these investigations and remedial actions are incremental in nature, focusing on the most immediate issues commonly found in the older service areas.

A particularly challenging cause of I/I, indicated by several communities in all 3 counties, is wet weather events occurring in conjunction with coastal storms. Communities are taking various measures to increase resiliency to address this issue. Communities that rely on spray irrigation and other forms of disposal to groundwater noted recent high rainfall years as particularly challenging.

The municipalities in Table 2-4 have taken part in the State's asset management planning grant program:

Table 2-4. Asset Management Planning Grant Recipients

New Castle County	**Milford**	**Selbyville**
Sussex County	**Rehoboth Beach**	**Lewes**
Millsboro	**Clayton**	**Georgetown**
Smyrna	**Seaford**	**Harrington**

Wastewater System Revenue, Rates, and Planned Capital Expenditures

Wastewater system representatives were asked a series of questions about their current user rates, revenue, and future capital expenditures. As in the case of the infrastructure questions reviewed in the previous section, this section of the survey also included an expansion of scope from previous surveys.

Revenue Generation and User Rates

Wastewater system representatives were asked whether they were generating sufficient revenue to meet the cost of their wastewater enterprise without transfer from other enterprises. Most survey respondents indicated that their revenues were sufficient for the current or next fiscal year suggesting it was beyond the scope of the survey questions to seek out a longer-term horizon to revenue generation sufficiency.

Capital Project Costs

The total capital project costs from 2020-2025 for public wastewater entities in the State of Delaware are estimated at $1.118 Billion. These estimates are based on capital improvement plans with projected costs of $820.4M, $47.3M, and $250.5M for public wastewater systems in New Castle, Kent and Sussex Counties, respectively. An additional $14.0M for a private wastewater system project was identified.

Survey respondents reported that only 3.1 percent ($35.4M) of the reported $1.134.2 Billion of capital project costs for wastewater collection, conveyance, treatment, and disposal plus the reported $16.0M of MS4 stormwater needs (described further below) will be financed through requests to the Clean Water State Revolving Fund. Requests to USDA, bond issuance, municipal sinking funds, asset replacement costs savings, and current municipal budgets are the other sources identified, although no funding sources were reported for majority of reported capital projects.

NPDES Permits for Municipal Separate Storm Sewer Systems

The National Pollutant Discharge Elimination System (NPDES) Stormwater rules established by EPA in 1990 and 1998 under the Federal Clean Water Act requires permit coverage of all regulated MS4s that were designated in the initial Phase I regulation or Phase II located within the boundaries of Census-designated Urbanized Areas, based on the latest decennial Census. The 2010 Census results expanded the Urbanized Areas area within Delaware, which required DNREC to expand the universe of municipalities requiring NPDES Phase II MS4 permit coverage. Currently, the one Phase I and four Phase II MS4 permits in Delaware are individual permits; however, as the permitted universe continues to expand DNREC has decided to move Phase II MS4 coverage to a General Permit Program.

The $16M in stormwater capital needs are from Wilmington and Newark. Wilmington is a co-permittee under the New Castle County MS4 Phase I permit and Newark has its own Phase II permit. Other Phase II MS4s include Middletown, Dover, and Kent County (with Del Dot as a co-permittee). Clayton reported that they have been designated but have received a 5-year permit waiver and Seaford reported that they believe that they have been designated. Although most Phase II MS4 designations have not yet been made by DNREC, MS4 discharges continue to be an important contributor to water quality impairments driving TMDLs. Several jurisdictions have initiated studies and are receiving training; some municipalities have received grants and some of the other small (Phase II) MS4s reported some planning and capacity-building activities under their MS4 programs, or in preparation for the possibility that they will be designated, but these activities were either funded through grants or directly through existing municipal operating budgets.

See Table 2-5 for a summary of municipal wastewater, MS4 stormwater management (SWM) capital needs and anticipated SRF loan requests for the period 2020 – 2025.

Table 2-5. Reported Capital Project Costs, Including MS4 Needs (2020-2025)

Wastewater System	Reported Capital Project Costs ($M), 2020-2025				
	5-Yr CIP	SRF	MS4 Y/N	SWM Needs	Total[a]
New Castle County					
New Castle County owned systems [b]	$729.3	$0	Y	$0	$729.3
Middletown - Frog Hollow and Middletown WWTFs	$4.4	$0	Y	$0	$4.4
Wilmington WWTP	$82.1	$15.9	Y	$5.6	$98.0
Newark Sewer Authority (treated by Wilmington WWTP)	$4.6	$11.0	Y	$10.4	$15.0
Kent County					
Kent County Regional WWTP	$27.9	$0	Y	-	$27.9
Harrington (treated by Kent County WWTP)	$3.0	$0	N	-	$3.0
Camden-Wyoming Sewer and Water Authority (treated by Kent County WWTP)	$0.4	$0	N	-	$0.4
Dover Sewer Authority (treated by Kent County WWTP)	$8.3	$5.4	Y	$0	$8.3
Milford Sewer Authority (treated by Kent County WWTP)	$2.1	$0	N	$0	$2.1
Clayton (treated by Kent County WWTP)	$0.5	$0	Y	$0	$0.5
Smyrna (treated by Kent County WWTP)	$5.1	$3.1	N	-	$5.1
Sussex County					
Sussex County owned facilities [c]	$210.7	$0	N	-	$210.7
Lewes STP	$6.6	$0	N	-	$6.6
Rehoboth Beach STP	$0.8	$0	N	-	$0.8
Seaford WWTP	$28.6	$0	Y	$0	$28.6
Delmar WWTP	$2.5	$0	N	-	$2.5
Georgetown WRF	-	-	N	-	-
Bridgeville WWTF	$0.2	$0	N	-	$0.2
Greenwood (treated by Bridgeville WWTF)	-	-	N	-	-
Laurel STP	-	-	N	-	-
Millsboro WWTF	-	-	N	-	-
Selbyville WWTF	$1.1	-	N	-	$1.1
Summary					
New Castle County Total [a]	**$820.4**	**$26.9**	**4**	**$16.0**	**$836.4**
Kent County Total [a]	**$47.3**	**$8.5**	**3**	**$0**	**$47.3**
Sussex County Total [a]	**$250.5**	**$0**	**1**	**$0**	**$250.5**
State Total [a,d]	**$1,118.2**	**$35.4**	**8**	**$16.0**	**$1,134.2**

[a] Totals are 5-Yr CIP values plus projected MS4 capital spending; SRF is a subset of the totals.

[b] Capital needs for New Castle County were summarized at the county level for all New Castle County-owned facilities including Delaware City WWTP, Lea Eara Farms WWTP, Port Penn STP, MOT WWTP, Water Farm #2 collection system, and the North of the C&D Canal collection system.

[c] Capital needs for Sussex County were summarized at the county level for all Sussex County-owned facilities including Inland Bays WWTF, Piney Neck WWTF, South Coastal WWTF, Wolfe Neck WWTF, and Sussex County collection system. Many of the Sussex County projects will be funded by the County, who considers these to be "met" needs.

[d] State totals do not include reported capital needs for private facilities.

3. FACILITIES IN NEW CASTLE COUNTY

New Castle County Overview

There are 10 wastewater systems in New Castle County. Seven provide treatment and 3 are collection-only systems that transport waste to other municipalities for treatment, as shown in Table 3-1.

Table 3-1. Wastewater System Responsibilities

Wastewater System Owner and Facility Name	Collection	Treatment	Municipal
New Castle County - Delaware City WWTP	✓	✓	✓
New Castle County - Port Penn STP	✓	✓	✓
New Castle County - Water Farm #1 (aka MOT Regional WWTP)	✓	✓	✓
New Castle County - Lea Eara Farms WWTP	✓	✓	✓
Middletown - Frog Hollow WWTF	✓	✓	✓
Middletown – Middletown WWTP	✓	✓	✓
New Castle County Collection System - Water Farm #2 (treated by Middletown WWTP)	✓	-	✓
New Castle County - North of the C&D Canal treated by Wilmington	✓	-	✓
Wilmington – Wilmington WWTP	✓	✓	✓
Newark Sewer Authority Collection System (treated by Wilmington)	✓	-	✓

New Castle County owns and operates the Delaware City and the Port Penn collection systems and treatment plants, the MOT Regional collection system and WWTP (referred to as Water Farm #1) and the Lea Eara Farms WWTP. New Castle County also owns and operates two collection-only systems: the Water Farm #2 collection system, which discharges to and is treated by the Middletown WWTP, and the "North of the C&D Canal" collection system, which also accepts wastewater from Newark and discharges to and is treated by the Wilmington WWTP.

Middletown operates the Frog Hollow WWTP and the Middletown WWTP and receives waste as mentioned above, from the New Castle County-owned and operated Water Farm #2 collection system.

Wilmington operates the Wilmington WWTP, which receives waste from the Newark Sewer Authority collection system via New Castle County's "North of the Canal" collection system.

All treatment plants in New Castle County reported influent strength within the normal range (150–250 mg/L biochemical oxygen demand (BOD) and total suspended solids (TSS)) except for the Delaware City WWTP, which reported concentrations below normal (< 150 mg/L BOD and TSS).

All but two of the seven publicly owned treatment plants in New Castle County are equipped with on-site auxiliary backup power supply generators or portable generators. The three plants with on-site generators (Delaware City, Port Penn and Water Farm #1) use diesel fuel or gasoline. The Lea Eara Farms and Wilmington WWTPs rely on portable generators, although the Wilmington plant also has a secondary power feed from the grid. The Frog Hollow and the Middletown WWTFs have no backup power supplies.

New Castle County is in the early stages of establishing a risk-based asset management program. All sewer system evaluation study results have been entered into a computerized maintenance management software (CMMS), analyzed by a custom application which provides Operations and Engineering recommendations and prioritization. The asset management plan (AMP) is relatively new and does not extend to pumps yet. Their AMP-Granite CCTV is linked to GIS. New Castle County also uses a new program called SCREEN (by Jacobs) that uses the CCTV data to develop risk matrix for sewer system. New

Castle County has a big gap in use of CMMS. New Castle County has increased its use of pipe lining technology with a Siemens program to track overflows. There has been a reduction of overflows by 90% since last year (no wet weather overflows). Most of the system was built in the 1940s and 1950s; the oldest sewer pipes date from the 1920s, in Brandywine, north of Wilmington. The pump stations are generally in good condition.

New Castle County has two small contract users: Bethel, PA, and Chichester Township, PA, a very small contract. These are all metered in Bethel, although possibly not in Chichester. There are two points of entry from Newark into the New Castle County system and two points of entry into Wilmington's WWTP. Some New Castle County customers go directly through Wilmington's collection to the WWTP and the vast majority of wastewater flow goes to Wilmington.

The County has long implemented a capacity management operation and maintenance (CMOM) program prohibiting wet weather overflows and to control grease and roots. All CSOs have now been eliminated. The County has an active chemical root program and a grease program that uses sound waves to test for clogging limits, which is more efficient for meeting cleaning goals. The County is seeking facility upgrades to record overflows to document the decline in sanitary sewer overflows (SSOs) over past 10 years. Grease and roots are more of a problem. The use of pipe lining technologies has grown dramatically recently and could be considered a maintenance activity. The pump stations were reported to generally be in good condition.

New Castle County plans to upgrade and improve the Airport Road pump station (septage receiving site) and has plans to upgrade and improve billing and tracking. There is a capacity review process for new development. The County is close to replacing the pump station near Elsmere. Priority is the Christina River force main replacement. The highest priority is investigating a 45-year-old forcemain along the Christina River. It is a low-pressure main going from 48" to 84" sending flow to WWTP. The County is considering adding a temporary 24" to 84" bypass pipe that is close to 10 miles long. The cost is estimated to be $150M-$200M and this could be a top priority in the next few years.

The County plans to conduct substantial planning over the next 10-15 years and possibly submit a notice of intent to the State for review. The pipe is 2" - 2.5" thick and the County has used divers and can fill differences in pipe thickness. This pipe has no redundancy with petroleum pipe running over it, so a bypass would be required initially for visual inspection. This project would need to be phased over several years.

New Castle County (NCC) has multiple customer classes based on industrial codes. The County also runs an industrial pretreatment program to document that standards are being met. NCC has its own lab and does a lot of the monitoring in-house.

Underserved Areas

The County is planning and conducting studies in the service area just south of C&D canal and in the Newark area. These areas do not have very user friendly septic elimination systems since the program changed in mid-2000s. Nothing has been formalized yet. There are also lots of areas in the Chesapeake Bay watershed that have septic system issues. New Castle County has made commitment to eliminate septic systems. The County has had conservations with Newark about how to serve these areas.

MS4

New Castle County is a Phase I MS4 stormwater community and reports that stormwater needs are growing rapidly. The County has 22 watersheds; 2 are developing WIPs under their TMDLs (Christina and

Dragons Run). There are lots of stormwater activities in the Christina watershed. Del DOT is the primary co-permittee because systems are intertwined in many areas. Other co-permittees are the cities of New Castle, Wilmington, Delaware City, Bellafonte, Newport, and Elsmere.

Capital Project Costs and Financing Options for New Castle County-owned Systems

Current policy limits debt service for the wastewater enterprise fund to 20 percent of the operating budget for the wastewater enterprise fund. For FY2019, $22.9M or 28.6 percent was allocated for debt service. The percentage currently exceeds policy due to federally mandated sewer rehabilitation obligations, but the County retains its AAA bond rating.

New Castle County has two reserve accounts: (1) a Sewer Fund Budget Reserve Account; and (2) a Sewer Rate Stabilization Reserve Account. Customer billing is a countywide average computed by averaging metered water use, and commercial/industrial contracts are based on flow, BOD and suspended solids with billing multipliers.

There is one rate structure for all customers in New Castle County, although contract communities are billed differently. Reserve accounts are controlled by the County Finance Department and stabilization is a cash flow reserve. Customers are billed annually with bills computed based upon the consumption of water and the measured or estimated constituents and characteristics of the sewage. Sewer budget reserves are used for capital recovery. Non-residential users must estimate their wastewater constituent characteristics based on industrial category. NCC has been in discussion on how to better calculate rates but they have not been implemented yet.

Sufficient revenues are generated to meet the operating costs of wastewater activities. New Castle County has a Sewer Rate Stabilization Reserve Account and a Sewer Budget Reserve Account. All funds in the reserve account are restricted to wastewater activities. As of July 1, 2018, 33 percent of wastewater enterprise funds were in reserve accounts. The Rainy Day Fund Reserve is $15.9M and the Sewer Rate Stabilization Reserve is $10.7M for a total reserve of $26.6M ($26.6M / $80.1M Budget = 33 percent).

The Sewer Budget Reserve Account may be utilized to fund any unanticipated deficit in any given fiscal year or to provide funds required because of any revenue reduction enacted by the General Assembly or County Council. Use of these funds requires the approval by a 10/13 vote by County Council. The Sewer Rate Stabilization Reserve may be utilized to balance the annual operating budget or to cover budgeted sewer capital costs that would otherwise require the issuance of bonds or payment of a rate increase. Use of these funds requires a majority vote by County Council.

DE Code Title 29, Section 2209 (b) Such service charges shall, as near as the County Council deems practicable and equitable, be uniform throughout the area served by the sewerage system, and may be based or computed either on the consumption of water on or in connection with the real property, making due allowances for commercial use of water, or on the number and kind of water outlets on or in connection with the real property, or on the number and kind of plumbing or sewerage fixtures or facilities on or in connection with the real property, or on the number of persons residing or working on or otherwise connected or identified with the real property, or on other factors determining the type, class and amount of use or service of the sewerage system, or on any combination of any such factors.

The population of New Castle County is 559,335 and the median household income (MHI) is $68,336. The County's CIP includes over $729M of planned capital improvement projects for the 2020-2025 period (**Error! Reference source not found.**).

Table 3-2. New Castle County 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Mill Creek Interceptor Relief	$ 3,050,000
Kirkwood trunkline interceptor	$ 4,100,000
Brandywine interceptor renovation	$ 22,250,000
Muddy-6 Trunkline improvements	$ 1,800,000
Backwater valve improvement	$ 1,600,000
Holloway Terrace outfall	$ 1,600,000
SR 72 Sewer extension	$ 1,000,000
General sewer improvements	$ 9,725,000
Glasgow area sewer improvements	$ 1,700,000
Sewer system expansion	$ 250,000
Pump station rehabilitation	$ 21,563,000
Naamans Pump station upgrade	$ 1,200,000
Christiana Pump station upgrade	$ 1,000,000
Pump station electrical power distribution upgrade	$ 2,250,000
Richardson park pump station upgrade	$ 15,000,000
Christina River Force main	$ 121,025,000
Delaware City industrial sewer expansion	$ 7,500,000
Brandywine Hundred north rehab Phase I	$ 86,398,000
Brandywine Hundred south rehab Phase I	$ 77,834,000
Asset Management	$ 4,550,000
Turkey Run interceptor rehabilitation	$ 4,550,000
North Delaware interceptor system	$ 69,672,000
DelDOT coordination project II	$ 11,000,000
Sewer Repairs and Rehabilitation II	$ 14,100,000
Stoney creek basin rehabilitation	$ 4,650,000
Airport Road system rehabilitation	$ 23,376,000
Market street system rehabilitation	$ 3,300,000
Richardson park system rehabilitation	$ 8,860,000

Delaware city system rehabilitation	$ 1,300,000
Terminal avenue system rehabilitation	$ 14,894,000
Edgemoor system rehabilitation	$ 17,438,000
Port Penn system rehabilitation	$ 850,000
White clay system rehabilitation	$ 33,778,000
Wilmington system rehabilitation	$ 4,966,000
Water Farm 1 system rehabilitation	$ 6,429,000
Delaware City treatment plant rehab	$ 5,300,000
Septage receiving station upgrade	$ 1,600,000
Lea Eara Farms treatment plant closure	$ 6,750,000
Southern sewer service area	$ 111,121,000
Total	**$ 729,329,000**

Summaries of the New Castle County-operated systems follow.

New Castle County - Delaware City WWTP

The Delaware City WWTP is owned and operated by New Castle County. The Delaware City system consists of a 5-square-mile service area near the refineries that serves a population of 1,800 (567 households) and includes St. George's and the Governor Bacon Health Center that is being developed as mixed use. The system is composed of two sewer districts with three pump stations. The service area is being expanded to serve industrial-zoned parcels around the refinery. There is some industrial activity but not lot of industrial zoning. The County is working with potential buyers for light sewer service. A flow equalization tank was added to the head of the plant. There have been no treatment/process improvements since the last survey just some equipment replacement and added equalization. Sludge is dried and landfilled. The plant must monitor and report PCBs but has no limit.

The Delaware City WWTP provides secondary and tertiary treatment and has a surface water discharge that flows into the C&D Canal East portion of Delaware Bay (Watershed #11). The NPDES permit for this discharge (DE0021555) expires in July 2022. The plant's current design flow is 0.57 MGD, and the average daily flow is 0.38 MGD, or about 66 percent of design flow. Average Daily Max Month Flow (ADMM) over the past 12 months is 0.55MGD and peak flow is 11.1MGD. The anticipated flow for 2020 is 0.45MGD. The permit does not have effluent limits for nutrients (not subject to typical nitrogen-phosphorus TMDL requirements), but it has adopted BOD limits per DRBC recommendations. No industrial wastes are discharged to this facility.

The County has reduced I/I over the past 10 years through collector system replacement, main line and lateral lining. The source of I/I is mainly due to high-ground water table and the issue is most acute when

this coincides with coastal flooding. The Delaware City Sewer Rehabilitation capital improvement project is a multi-year and multi-project program to reduce existing I/I in the collector and trunk lines.

Port Penn STP

The Port Penn system is a 0.5-square-mile service area with one sewer district and one pump station. The Port Penn sewage treatment plant (STP) is a very small activated sludge plant, with limited growth potential and lots of wetlands in the area. The STP provides secondary treatment and discharges to the Delaware River. The NPDES permit for this discharge (DE0021539) expires in October 2022.

The plant's current design flow is 0.05MGD, and the average daily flow is 0.053MGD, or 106 percent of design flow. The permit does not have effluent limits for nutrients. Peak flow at the plant is 0.23 MGD and I/I has been identified in the Port Penn collector system. The Average Daily Max Month Flow over the past 12 months is 0.085MGD and the anticipated flow in 2020 is 0.05MGD.

The system has undergone some rehabilitation, mainly manhole frame and cover repairs, and is scheduled for some main line lining. I/I is mainly due to high groundwater table and inundation during rain events.

New Castle County - Middletown-Odessa-Townsend (MOT) Regional WWTP (Water Farm #1)

The MOT Regional WWTP, also known as Water Farm #1, is owned and operated by New Castle County. New Castle County provides secondary and tertiary treatment and nitrogen and phosphorus removal at the MOT Regional WWTP. This 22-square-mile service area consists of 4 sewer districts with 18 pump stations and 5 holding tanks with a total capacity of 61,000 gallons. The service area includes properties in Townsend and specific sections of the Southern Sewer service area. The MOT Regional WWTP also receives a small portion of Middletown's collection system, for which New Castle County bills the town.

The plant is equipped with an aerobic digester for handling solids and has a surface water discharge that flows into the Appoquinimink River in the Delaware Bay (Watershed #12). The NPDES permit for that discharge (DE0050547) expired on June 30, 2011. Nutrient effluent limits include removal of ammonia nitrogen, seasonal limits (May-November) for Total Kjeldahl Nitrogen (TKN) of 10.4 lbs./day average (15.6 lbs./day maximum) and 3,796 lbs./year average, and total phosphorous (TP) limits of 2.1 lbs./day average (4.2 lbs./day maximum). The facility also has a groundwater discharge permit (LTS 3005-93-06) that expired on July 27, 2011.

The plant's current design flow is 2.5 MGD, and the average daily flow is 0.57 MGD, or about 23 percent of design flow. Peak flow at the plant is 1.5 MGD, and no I/I issues were reported. The current population served is 11,786 for residents and 200 non-residents.

New Castle County - Lea Eara Farms WWTP

The Lea Eara Farms WWTP is owned and operated by New Castle County and includes a 65 square mile service area that is entirely south of the C&D Canal. The Service area is the largest growth zone in New Castel County, and is both residential and commercial. Most of the system is new, except for Odessa and Townsend. There are some inflow issues due to on-going construction. The County is starting to consider expanding capacity – high level study a couple years ago and is about to start the final study. The system is at about 60 percent capacity, so they will probably need to do something within next 5 years.

New Castle County provides secondary and tertiary treatment at the Lea Eara Farms WWTP, which is in the C&D Canal East portion of the Delaware Bay Watershed (#11). The facility has lagoon storage for spray

irrigation up to 1.33 MGD under Permit Number 359199-03 that expired in November 2019 and has a load-based NPDES Permit (Number 0050547) that expired in October 2017. The permit has effluent limits for carbonaceous biochemical oxygen demand (CBOD), TKN, and Phosphorus and was upgraded to a sequential batch reactor (SBR) about 10 years ago with lagoons for storage. They spray in summer and use a surface water discharge in the winter. They reported exceeding their TKN rolling average since the last survey.

The plant's current design flow is 1.83MGD, and the average daily flow is 1.1MGD, or 60 percent of design flow. Peak flow at the plant is 2.0MGD, the average daily maximum month flow over the past 12 months has been 1.3MGD.

The plant sprays on 180 acres and river discharge occurs seasonally (in winter) when effluent cannot be sprayed. The County is conducting a high-level study to consider upgrade options for expansion (i.e., more spray or river discharge). The County reported that one of the monitoring wells was out of compliance for nitrates because of a lagoon leak.

Lea Eara Farms was forced to take over a private system since the last survey. This system has been abandoned and the flow has been diverted. Parts of the service area is served by septic systems and some of the area is undeveloped (more growth is expected). A moratorium is in place for new septic developments. The County does not want to operate multiple small systems and would rather that developers install collection lines to connect to the New Castel County transmission lines.

The Route 9 corridor has some septic communities interspersed, especially around Newark, due to issues related to annexation. There have not been any septic elimination projects in the past 10 years. Most of the underserved communities are in the western part of the county in areas the ground is flat and pump stations are needed to serve those communities.

Middletown

Middletown (population 22,582) owns and operates two wastewater treatment plants, that together serve 10,300 households. Descriptions of the two plants are provided below, following the financing options section.

MS4

Middletown has an individual Phase II MS4 permit.

Financial Analysis

Middletown funds wastewater through user rates and customer charges. Capital related to growth is funded with impact fees. No transfers come from other enterprise funds. Sewage rates are based on water consumption and billed monthly at a flat rate of $17.18 for the first 3,330 gallons plus $5.16 per additional thousand gallons. There is also a "Customer Charge" that varies depending on service connection size (5/8" residential connection is $1.61 per month). Developer fees are used for capacity development.

Middletown's MHI is $87,375, and its total outstanding debt limit per the Charter is 15 percent of the total assessed value and of that number, 4 percent is allowed without a referendum. Middletown does not currently have a reserve fund specific to the Wastewater Fund. A rate study is being conducted by an outside consultant to establish the reserve fund. A policy will be developed to establish guidelines for the use of the funds.

Capital Project Costs and Financing Options

Middletown reported $4.4M in capital project costs for the 2020-2025 period (Table 3-3).

Middletown - Frog Hollow Wastewater Treatment Facility (WWTF)

The Frog Hollow/The Legends Golf Course Community WWTP in northeastern Middletown is a 0.5-square-mile service area consists of one sewer district with three pump stations that provides secondary and tertiary treatment and is in the Appoquinimink River subwatershed in the Delaware Bay Watershed (#12). The Frog Hollow WWTF consists of lagoons and Dynasand Filtering systems. The system is very consistent and very rarely goes out of compliance. The facility relies on lagoon storage, chlorination and spray irrigation. Effluent is sprayed for disposal but can be re-directed to the Middletown WWTP if needed during wet weather or when golf course has been winterized, or otherwise, if needed. Sludge was dredged from the lagoon since the last survey and is land applied under a DNREC permit. The facility has lagoon storage for spray irrigation for up to 250,000 gpd under Permit Number 359099-04 that expires on November 21, 2022.

The plant's current design flow is 0.25 MGD, and the average daily flow is 0.14 MGD, or 56 percent of design flow. Within the system's oldest sewer lines and manholes, the average daily flow 1.346, after rain event the highest I/I measured has been 1.6MGD or about 0.3MGD above normal flow at the plant. Manhole rings are the biggest source of I/I based on pressure tests. A town-wide asset management program is in place to help guide capital and O&M expenditures.

The permit includes a TN limit of 250 lbs./acre/year but no TP limit (nor is one anticipated). Peak flow at the plant is 0.34 MGD. Influent strength was reported to be below normal because the plant filters recycle to the headworks. The service area is predominantly residential, although the plant reported that it needs a more accurate breakdown between industrial and domestic flow. The plant reported 24.48 mg/L for ammonia nitrogen in its influent.

Middletown WWTP

Middletown also owns and operates the Middletown WWTP with an 11.8-square-mile service area consisting of two sewer districts with 24 pump stations. The plant also treats wastewater from the 17-square-mile collection system owned and operated by New Castle County, known as Water Farm #2 (discussed below). In addition, as noted previously, a small portion of Middletown's collection system, about 0.15 MGD, runs to the New Castle County-owned MOT WWTP (also known as Water Farm #1).

The plant provides secondary and tertiary treatment and has groundwater discharge points in the Appoquinimink River subwatershed in the Delaware Bay Watershed (#12) and the Sassafras River subwatershed in the Chesapeake Bay Watershed (#27). The facility has lagoon storage of up to 1.36MGD for spray irrigation under Permit Number 359298-13 that was issued in 2013. The permit has a TN daily maximum load limit of 493 lbs./acre/year with a daily mean of 211 lbs./acre/year.

The plant's current design flow is 2.5 MGD, and the average daily flow is 1.14 MGD, or about 45 percent of design flow. Peak flow at the plant is 1.63 MGD and the average daily maximum month flow over the past 12 months was reported as 1.38 MGD. The main spray fields are the Middletown Spray Fields, Middletown Park, Middletown Sports, and private farmers. The plant reported 7.11 mg/L for ammonia nitrogen in its influent and the plant reported a pH problem in its effluent due to photosynthesis within the lagoon, causing algal growth. Plastic shade balls have reduced problems to some extent. Flow from lagoon is pumped to RIBs and then to denitrification beds before being pumped to golf course.

The plant has submitted plans to state to increase their permit from 1.36 to 2.5MGD. Treated permit capacity was reduced from 1.8 MGD to 1.36 MGD in 2013 because the business agreement with the sports complex for field irrigation fell apart. The Town submitted plans to send flow to infiltration basins, so capacity was reduced. There are 9 RIBs now, 8 newly built RIBs and 2 are proposed (total 19 – RIBs) that are scheduled to be completed and in operation by June 2020. Treatment including denitrification may take longer because the Entex Media Filters (cloth filter) must be optimized based on weather.

Middletown is using a consultant to develop a wastewater planning program to address I/I and asset management also relining manholes and pipe coating using a consultant). Old manholes, brick channels, and some brick cleanouts are thought to be the major sources of I/I. Middletown reported that the system experiences a 16 percent flow increase after rain events. All pumps are relatively new.

Table 3-3. Middletown 2020-2025 Capital Improvement Projects and Costs

CIP Item	Project Cost
Rapid Infiltration Basins	$ 1,002,500
Screen Rebuild	$ 86,000
Coat Screen Room	$ 25,000
Shade Balls for Frog Hollow	$ 500,000
Sports Complex Booster Station	$ 125,000
Driving Range Irrigation	$ 100,000
301 Pump Station Elimination/Rehab	$ 2,200,000
Denitrification - Phase II	$ 300,000
Spray Rig Upgrades – Electronic	$ 56,000
Rapid Infiltration Basins	$ 1,002,500
TOTAL	**$ 4,394,500**

New Castle County - Water Farm #2

Water Farm #2 is a 17-square-mile collection system that is owned and operated by New Castle County, consisting of one sewer district with three pump stations and a 1,000-gallon holding tank. While originally planned to discharge to MOT Regional WWTP (Water Farm #1), a transmission pipe was never installed because of the cost. Currently, this system discharges into the Middletown's collection system near Frog Hollow. The sewer service area is also referred to as the "Inner Core" of New Castle County's Southern Sewer service area. Average daily flows in the system are 0.02 MGD. Planning for constructing a treatment plant to serve the northeast of Middletown is on hold.

New Castle County - Service Area North of the C&D Canal (excluding Delaware City)

New Castle County owns and operates a 250-square-mile service area north of the C&D Canal (i.e., the County's "Wilmington Service Area") consisting of 9 sewer districts with 127 pump stations and 12 holding tanks with a total capacity of 75,000 gallons. This collection system receives wastewater from the

Newark's collection system, outfalls to Wilmington's collection system and is ultimately treated at the Wilmington's WWTP. Average daily flows in the system are 50 MGD with peak flows of 150 MGD. The County reported that I/I in the service area is acceptable, with localized cases of excessive I/I.

Growth area is primarily the southwest portion of the service area. Contract users include Newark, Bethel Township, and Lower Chichester. A capacity review process is in place for new development that is also used for I/I and wet weather response. Some contracts are based on metered water usage, other contracts are based on measure sewer flow. Actual sewer rates are established by those entities and contract revenue is total.

The service area includes 30 flow meters and has some meters that rotate through sewersheds to get more data and support additional data collection. To improve sewer service and reduce the wet weather I/I in the County sewer system, studies have been funded in each of the following sewer basins: North and South Brandywine Hundred, White Clay (Red Clay, Mill Creek, Pike Creek), South Christiana, Little Mill, South Delaware. Included in each study has been the installation of temporary meters at various locations within each basin to assess the influence of wet weather on the performance of the sewer system, and together with field investigation, develop plans and specifications for sewer rehabilitation.

Sewer rehabilitation is occurring through point repairs, mainline sewer lining, lateral lining, test and seal grouting and manhole rehabilitation has followed in many locations. Post sewer rehabilitation metering in the North and South Brandywine Hundred sewer basins has measured an average reduction of 62% in peak I/I. Hydrogen sulfide (H_2S) has been an issue in collection system and at the wastewater treatment plants that serve this collection system. The County manages a sampling and monitoring program for their collection system.

Wilmington WWTP

Wilmington's population is 70,635 and the WWTP has an 8.5-square-mile service area serving 28,556 households consisting of two sewer districts with three pump stations and a treatment plant, operated under contract by Veolia. The contract is nearing its end after 20 years and will be extended annually. The Wilmington WWTP serves the community within its municipal boundaries and provides Wastewater Treatment services to Newark and to New Castle County for its public sewer customers above the C&D Canal.

Wilmington is in litigation with New Castle County about the WWTP, which needs immediate electrical upgrades and considers all options to be on the table for financing. A portion of the wastewater load is coming from downstate poultry processing, so Wilmington may need to consider additional nutrient removal. The poultry processing waste is the second or third largest contributor to the Delaware Bay Estuary after Philadelphia.

The plant provides primary and secondary treatment, solids handling, and has a surface water discharge that flows into the mouth of Shellpot Creek at the Delaware River in the Piedmont Watershed (#2). The NPDES permit for this discharge (DE0020320) expired on September 30, 2019. The plant also provides solids handling and includes side-stream treatment for Nitrogen management, although no nutrient limits are in the permit. The permit includes 42 CSO discharge locations in the Christina River Watershed. The Delaware River Basin Commission is considering nutrient limits based upon an estuary study and modeling that is expected to take longer than 5 years to complete and implement.

The plant's secondary treatment current design flow is 105 MGD, and the average daily dry-weather flow is 68.7 MGD, including contract user flows, or about 65 percent of design flow. The plant also has a holding

tank with 3 MG of capacity, which is used to provide the equivalent of primary treatment for peak flows of up to 250 MGD during wet weather (168 MGD secondary).

New Castle County also owns and maintains a separate sanitary sewer collection system. I/I issues related to high tides and coastal storms is an issue but the County reported no dry weather flow issues. The County is budgeting $15M-$20M for brownfields upgrades and managing CSOs (sewer separation). The County is achieving a capture rate between 83 -and 86 percent, depending on wet weather condition variations each year, using a real-time control system that maximizes the use of the collection system for storage. The goal is to achieve, more consistently, about 85 percent, by volume (85 percent capture of annual average flow within collection system during storm events). The real-time control system for CSOs is being supplemented with a green infrastructure plan to maximize available system storage during wet weather. A draft of the plan has been submitted to the state and County will be refining and updating the plan over the next year. The system is operating under its 2015 CSO Long Term Control Plan (LTCP) that has been accepted by EPA and DNREC; however, the nine minimum controls and a green infrastructure plan are part of the LTCP that still has not received final approval.

The County identified about $70M in needs for the [Wilmington] plant, including electrical, nutrient removal, solids management (through a $36M SRF Loan), and a Class A sludge land application pilot with farmers that includes dust control. New Castle County's discharge to the Wilmington plant is in litigation due to water quality issues and it is not metered (so I/I is an issue).

MS4

Although Wilmington has a substantial combined sewer service area, its municipal separate storm sewer system (MS4) meets the definition of a regulated MS4 and the City is a co-permittee with the New Castle County-DelDOT Phase I MS4 Permit. Wilmington identified $3.6M for the Stormwater Drainage Management Program and another $2M for Stormwater Mitigation (Green Infrastructure) for the 2020-2025 period.

Financial Analysis

Wilmington's MHI is $40, 221 and customer billing is computed from metering using a 15,000 gal/quarter water usage. There is also a residential stormwater charge that averages $40.30/year (it is a tiered system based on lot size/type). About 26,000 parcels are affected by this charge, including approximately 3,000 properties that have stormwater contribution charges only (i.e., not connected to sewer).

Most commercial/industrial bills are computed the same way as residential customers, although about 40 "high-strength" customers are billed according to a sewer surcharge equation that takes into account flow, BOD, and TSS. Five industrial users are Noramco, ICI, Amtrak, Cherry Island and IPC. New Castle County is the biggest contract user.

Wilmington does not have funding adequate to pay cash and must finance capital projects. It has no borrowing limit, and capital projects are primarily funded through state revolving fund (SRF) loans, grants, or long-term GO bonds.

Capital Project Costs and Financing Options

Wilmington reported $82.2M in capital project costs for wastewater for the 2020-2025 period and identified $3.6M for the Stormwater Drainage Management Program, plus another $2M for Stormwater Mitigation (Green Infrastructure) for the years 2020-2025. To address capital project costs from 2020-2025, Wilmington reported that they anticipate requesting $15.9M from the Clean Water State Revolving

Fund, as well as grants and other cost-effective financing options. Table 3-4provides a list of reported capital projects and costs for the years 2020-2025.

Table 3-4. Wilmington 2020-2025 capital improvement projects and costs (wastewater & stormwater)

CIP Item	Project Cost
11th street pump station upgrade	$ 19,500,000
Annual minor sewer improvements	$ 4,500,000
Major sewer improvements	$ 12,000,000
WWTP Electrical improvements	$ 6,300,000
WWTP Infrastructure improvements	$ 36,800,000
South Wilmington Wetlands park	$ 2,000,000
Sewer separation project and flow monitoring	$ 1,000,000
MS4 Stormwater Capital Projects	**$5,600,000**
Total	**$ 87,700,000**

Newark

The population of Newark is 33,673 and the Newark Sewer Authority owns and operates a 15-square-mile service area serving approximately 11,000 households consisting of one sewer district with three pump stations. The population count does not include the approximately 20,000 University of Delaware students that are serviced by the system, representing about 36 percent of the service area. This collection system discharges into the New Castle County's "North of the C&D Canal" collection system and is ultimately treated at the Wilmington WWTP.

Average daily flow in the system is 3.5 MGD, determined by the flow meter records at the point wastewater is turned over to the New Castle County collection system. Newark is in the process of quantifying its I/I problem and has confirmed that it has no combined sewers.

Newark reported that it has no plans for sewer service area expansion but has a manhole rehabilitation and lid replacement project underway and an infiltration study planned. One of the biggest projects is purchasing a combination truck to complement the sewer jet it currently owns.

MS4

Newark is a Phase II stormwater community and they reported that their MS4 Program is the subject of an audit by EPA/DNREC. The University of Delaware is a co-permittee with Newark and the permit has been under an administratively extended since 2008. Newark implemented a stormwater utility for permit and flooding/drainage issues on January 1, 2018 and identified $10.4M in stormwater capital project costs for the 2020-2025 period. Newark indicated that $7.14 of that would be financed through the State Revolving Fund.

Financial Analysis

Newark's MHI is $54,590 and it does not have the ability to borrow for wastewater services, although it does for other public works services. Newark reported that revenues are thought to be sufficient at

current rates. Newark has a reserve account that is restricted to wastewater but has no internal restrictions. The reserve account is 180 percent of operating revenue (operating revenue is $4.1M and the reserve is $7.4M).

Customer billing is computed using water use metering, and commercial/industrial contracts are based on wastewater characteristics and strength (flow/BOD/TSS) with billing multipliers. Newark reported that it has no municipal contract users.

Capital Project Costs and Financing Options

Newark reported $4.6M in planned wastewater capital improvement project costs from 2020-2025 and expects to need approximately $3.9M of that amount to be funded through the State Revolving Fund. Newark also identified $10.4M in MS4 stormwater capital project costs for the 2020-2025 period and indicated that $7.14 of that would be financed through the State Revolving Fund. Table 3-5 provides a list of reported capital projects and costs for the 2020-2025 period.

Table 3-5. Newark 2020-2025 capital improvement projects and costs (wastewater & stormwater)

CIP Item	Project Cost
Sanitary Sewer Study and Repairs	$4,600,000
MS4 Stormwater Capital Projects	**$10,400,000**
Total	**$ 15,000,000**

4. FACILITIES IN KENT COUNTY

Seven municipally owned wastewater systems were included as part of the survey in Kent County, as shown in Table 4-1. The Kent County Regional WWTP treats wastewater from each of the following collection-only systems: Harrington, the Camden-Wyoming Sewer and Water Authority, the Dover Sewer Authority, the Milford Sewer Authority, Clayton, and Smyrna.

Table 4-1. Wastewater System Responsibilities

Wastewater System	Collection	Treatment	Municipal	Authority
Kent County Regional WWTP	✓	✓	✓	-
Harrington collection system; treated by Kent County Regional WWTP	✓	-	✓	-
Camden-Wyoming Sewer and Water Authority collection system; treated by Kent County Regional WWTP	✓	-	-	✓
Dover Sewer Authority collection system; treated by Kent County Regional WWTP	✓	-	✓	-
Milford Sewer Authority collection system; treated by Kent County Regional WWTP	✓	-	✓	-
Clayton collection system; treated by Kent County Regional WWTP	✓	-	✓	-
Smyrna collection system; treated by Kent County Regional WWTP	✓	-	✓	-

Kent County Regional WWTP

The population of Kent County is 178,550 and the Kent County Regional WWTP service area is 91.39 square miles (44.06 square miles comprises the Kent County Sewage Disposal District No. 1 with the balance primarily contract users). The system consists of 33 sewer districts with 105 pump stations. The plant also treats wastewater from the following collection-only systems: Camden-Wyoming Sewer and Water Authority, the Dover Sewer Authority, Harrington, the Milford Sewer Authority, Clayton and Smyrna.

The Kent County Regional WWTP provides primary, secondary, and tertiary treatment with nitrogen and phosphorus removal. The facility is equipped with downflow filtration, ferric injection before filtration, supplemental carbon addition to remove phosphate and biosolids handling. The plant has 6 clarifiers and experienced some overheating problems in the building so added a cover to resolve the issue. The plant is located near the Town of Frederica and has a surface water discharge to the Murderkill River and then into Delaware Bay (Watershed #19). The NPDES permit for this discharge (DE0020338) was last reissued on October 1, 2017 and expires on September 30, 2022.

The permit includes seasonal (May-September) effluent limits of 751 lbs./day average (1,126 lbs./day maximum) and 274,115 lbs./year for TN and seasonal (May-September) limits of 62.5 lbs./day average (93.7 lbs./day maximum), and 22,812 lbs./year for TP. The Kent County Regional plant reported its influent strength above normal (> 250 mg/L BOD and TSS) because of food processing wastes. The plant has not had non-compliance for two consecutive months but reported occasional problems with washout and toxic shock.

The plant's current design flow is 20.0 MGD and their permit is based on loading limits, not flow. Bower's Beach experiences increased flow during high tide and the plant can now handle more flow during wet weather (so hydraulically it can handle more than 20 MGD). The long-term average daily flow is 14.0

MGD, or about 70 percent of design flow, although the average was 17 MGD in 2017. Peak flow at the plant was reported as 30.0 MGD. BOD and TSS influent strength were reported to be above normal (>250 mg/L). Permit non-compliance for the plant has included being temporarily above its TN limit because of plant modifications and construction. Flow was reported as having been exceeded permit limits because of I/I. Bypasses are metered as required to meet permit limits at the outfall.

The plant has no metering on influent side; just on what is going out. A sand filter is used for phosphorus reduction and carbon is added for Nitrogen removal. The County is waiting to see how nitrogen TMDL could change requirements and is studying how quality that could influence their plan for nutrient treatment handling. The plant is equipped with on-site auxiliary backup power supply generators using diesel fuel or gasoline and generates 1.2 megawatts of solar power that is either used or put into the local grid. The plant has installed a 100K gpd reuse "capacity" for non-potable fire suppression system water.

Collection System

The County is conducting a pipe condition assessment program of pipes < 12" (mainly gravity) and has already completed a study of pipes >12" (gravity and force main) to help determine where to spend asset management money.

Harrington, Dover, and Smyrna are contract user cities. They are big enough to handle own systems and have multiple entry points in collection County system. Dover Airforce Base is now a district and needs to be mapped by the County since their pricing structure has changed.

Underserved Communities

Kent County's approach to expanding sewer service is non-traditional because the County generally works with developers. If communities are interested in being connected it is done through petition. The community gets billed per county code and a needs assessment is required but this cannot happen if community is not interested. Community interest must be by majority; however, the rest of the community may be forced to connect. DNREC/WIAC approached the County about septic system elimination and the County provided an underserved community list to DNREC. Communities work with their health departments to get information on failing systems and repairs. Notable activities since the last survey include:

- Perrysville and London Village are located next to each other and have received funding through USDA for 2 years for a septic elimination project.
- Houston and Marydel have shown interest and have petitioned for connecting to the County wastewater collection service. There has been little interest from other communities.
- Spruance City would have to be served by sewer coming from Smyrna and Southwood has an NPDES permit for its failed septic systems.
- If communities are interested to be connected to the County system it must be done through petition, per County Code and then the community gets billed.
- Sometimes septic elimination projects are implemented without communities going to DNREC.
- There are numerous tax ditches west of Dover, so there would be difficulties, primarily driven by the fact that the water table is within a foot of the surface.
- A needs assessment is required but this cannot happen if a community is not interested.
- The County thinks that USDA loans are favorable to SRF loans, which have higher rates.

MS4

Kent County has an individual Phase II MS4 permit. Del DOT is a primary co-permittee. Stormwater management ponds on private property are managed by the County because homeowner associations have no money for maintenance. Dover manages stormwater, but Stormwater Districts are outside of municipalities, so are not part of the MS4 permit. Stormwater issues on projects in Stormwater Districts are reviewed by the Kent County Conservation District.

Financial Analysis

Each of the 33 sewer districts has its own O&M rate that is based on sewer rate for individual districts. The rates are determined based on the formula: Equivalent Dwelling Unit (EDU) rate + O/M fee + debt fee. The first-rate increase in 12 years occurred in July 2019 and rates are EDU based per the county's tables/codes. Harrington, Dover, and Smyrna are contract users that pay for their infrastructure. Contract users are metered and charged extra. Impact fees are charged for system expansion. Each district has its own O&M rate. Billing is quarterly.

The county has 2 reserve accounts (sewer fund reserve and impact fees) that are restricted to use for public works improvements, including septic system elimination. The Sewer Fund is a proprietary fund, and all reserves belong to the sewer fund. Impact Fees are reserved for growth. Other reserves are for equipment replacement, emergency repairs, and anything related to the sewer fund. The debt borrowing limit is $438.45M and $50.3M has been used. Kent County's MHI is $57,647 and varies by area.

Capital Project Costs and Financing Options

Capital budgets are for 5 years and are mainly for improvements. The County reported $27.9M in capital project costs for 2020-2025. The County recognizes that it needs an asset management program to better track needs.

TMDLs might drive reuse considerations and the County is conducting a 20-year plan for wastewater that is evaluating RIBs, Bay outfall, and deep well injection. The County's 2 types of reserve accounts; the Sewer Fund Reserve and Impact fees. Impact fees can be used only if needed (i.e., they are restricted). The County is expanding sewer service in non-traditional ways by working with developers and DNREC has approached the County on septic system elimination.

The County has non-potable fire hydrants and storage tanks for reuse at the plant. The County reported that the plant needs to develop and implement local limits by March 2020. Kent County has requested an extension from DNREC. Significant Industrial Users (SIUs) [threshold 25,000 GPD] are required to pretreat (i.e., have permit); the Dogfish Head Brewery is a big hauler to the plant (has a permit); and the Harrington pump station sends flow to WWTP (have a pumping limit). Table 4-2 provides a list of reported capital project costs for Kent County for 2020-2025.

Table 4-2. Kent County 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
TMDL study for support of site specific water quality standards	$ 2,502,000
TMDL offsite nutrient reduction project- additional site	$ 300,000
Land acquisition & permitting to extend effluent flow limitations beyond stream discharge	$ 7,400,000
Replace pumps and valves at recycle pump stations 1 & 2	$ 25,000
Plant wide power generator	$ 3,618,000

Air blower system optimization	$ 2,131,000
Site lighting replacement	$ 77,000
Clarifier improvement sludge blanket detectors for 4 units	$ 73,100
Clarifier improvement Floor Rehabilitation - 2 units	$ 62,000
South Aeration Basin Liner Replacement	$ 770,000
Sand filter Covers for cells and cascade	$ 286,000
Clarifier Improvement - weir covers	$ 180,000
Solids Handling Building roof	$ 120,000
North aeration diffusers replacement	$ 190,000
North aeration basin liner and venting replacement	$ 360,000
Aeration basin diffuser replacement maintenance	$ 150,000
Clarifier 3 & 4 mechanism replacement	$ 800,000
Subtotal: Treatment Plant Upgrades	**$ 19,044,100**
Pipe condition assessment	**$ 100,000**
Double UN Hilltop area sanitary sewer expansion, Phase 2	$ 374,000
Milford Neck area sanitary sewer expansion	$ 1,188,000
Double Run area: Paris Villa/London Village Sanitary sewer expansion, Phase1	$ 2,526,000
Double Run area: Paris Villa/London Village Sanitary sewer expansion, Phase2	$ 1,684,000
Subtotal: Expansions	**$ 5,772,000**
Pump station 1 – Smyrna	$ 100,000
Pump station 3 - Dover	$ 175,000
Wet well capacity improvements	$ 500,000
Pump station 14 – Isaacs	$ 90,000
Pump station 1 – Smyrna	$ 200,000
Purchase Pumps for Various pump stations	$ 200,000
Relocate Control & Transfer switches for various pump stations	$ 40,000

Relocate septage screen and build pre-treatment system (with Denneys Road)	$ 1,600,000
Pump station #2 and 3 replacement	$ 75,000
Subtotal: Pump-Related	**$ 2,980,000**
Total	**$ 27,896,100**

Harrington

The population of Harrington is 3,643 and its sewer service area is 3.62 square miles consisting of two sewer districts (Harrington and Farmington) with 8 pump stations and a gravity flow system serving 2,052 households. Harrington closed it treatment plant and has tied into the Kent County force main since the last survey and is in the process of closing their lagoons and they have spare pumps for the lift station. Harrington will maintain the lift station (except for electrical). Average daily flow in the collection system is 0.5MGD. The Harrington collection system experiences major I/I issues that is being studied to find suspect areas. An asset management plan funded through USDA has identified the age of infrastructure.

MS4

Harrington reported that it has not been notified of its MS4 status by DNREC.

Financial Analysis

Harrington's sewer bills are computed based on EDU and metering. Harrington has a reserve account that is restricted to emergency repairs, construction and growth of its wastewater enterprise and is currently 9.7 percent of operating revenues. The long-term debt borrowing limit is $3,652,737; short term is $5,218,196; and is $26,090,981 overall. There is no limit allocated for the water enterprise and Harrington reported its MHI as $36,815 in the 2019 survey.

Capital Project Costs and Financing Options

Harrington reported a $320,000 capital project for a sewer improvement project in 2019 using a USDA grant and indicated $3M in reported capital projects for 2020-2025 (Table 4-3).

Table 4-3. Harrington 2020-2025 capital projects and costs

CIP Item	Project Cost
WWTP Lagoon closure	$ 3,000,000
Total	**$ 3,000,000**

Camden-Wyoming Sewer and Water Authority

The Camden-Wyoming Sewer and Water Authority is a Municipal Authority and is not directly affiliated with the towns of Camden and Wyoming and is not regulated by the PSC/CPCN for sewer. The combined population of Camden and Wyoming is 5,037. The Authority owns and operates a 3.8-square-mile service area composed of three sewer districts with 7 pump stations serving 1,335 households. The collection system discharges to the Kent County Regional WWTP.

Average daily flows in the system are 0.7 MGD with peak flows of 0.98 MGD. The system relies on gravity collection (pipe size 8-15" for approximately 27 miles); force main (4-10" for approximately 4 miles). The

towns of Camden and Wyoming are not on the same service main. Flow is metered at the Kent County Pump Station #14 and Nelly Stokes, are almost 20 percent of the flow.

I/I causes an approximately 40 percent increase over average flow for the predominant (mostly pre-1995) system of vitrified clay pipe) and only a 10 percent increase from post-1995 installations. Exfiltration is also an issue, and repairs are made when problems occur or known trouble areas are targeted.

The Authority reported that development is ongoing within its service area, and routine O&M and I/I issues are addressed as needed when they are found. The Authority cost-shares (reimburses) developers for repairs/upgrades that are associated with development. Fifty percent of impact fees are earmarked for improvements of the existing collection and conveyance system. The Authority completed a meter upgrade program in 2019 and conducts smoke testing to check for storm sewer connections. The Authority owns a vacuum truck/hydroexcavator and has also CCTV capabilities.

Underserved Communities

About 8 out parcels (enclaves) within the service area are not served, otherwise most parcels within Camden and Wyoming. Some unincorporated areas; Kent County unserved. Homes between Nellie Stoke's Elementary School and Lochmeath Way on Upper King Road and Lochmeath Way between Upper King Road of Rt. 13. The towns grow by annexation and the Authority has the capability to serve certain areas; e.g., the north side of Burwood Farms (now Tamarack), which is in Camden. Also, sewer (and water} service is available to Nelly Snopes School, Locksmith Road, and Bison Road between Upper King Rd and the railroad crossing, although these areas are potentially served through another CPCN.

MS4

The Camden-Wyoming Sewer and Water Authority does not own or operate a separate storm sewer system.

Financial Analysis

Sewer users are charged a flat rate of $52.09 per thousand gallons of usage plus a usage charge of $2.33 per thousand gallons used and a Kent County surcharge of $2.67 per thousand gallons used. Residential customers are billed quarterly, and non-residential customers are billed monthly. The Authority has a reserve account that is restricted to wastewater “emergency” repairs that must be 10 percent of operating revenues. The Authority’s contingency reserve fund works essentially like their own CIP.

The population-weighted average MHI is $65,440. The Authority does not have a set borrowing limit on wastewater enterprises; it is whatever can be supported by fees.

Capital Project Costs and Financing Options

The Camden-Wyoming Sewer and Water Authority reported $0.35M in capital project costs for the 2020-2025 period for septic elimination (Table 4-4).

Table 4-4. Camden-Wyoming Sewer and Water Authority 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Septic elimination	$ 350,000
Total	**$ 350,000**

Dover

The population of Dover is 38,079 and has a 23.4-square-mile service area consisting of one sewer district with 41 pump stations serving 13,349 households. The Dover collection system relies on the Kent County Regional WWTP for treatment. Average daily flows in the system are 5.4 MGD with peak flows of 8.3 MGD. Kent County mandates/manages industrial pre-treatment systems. The Dover Sewer Authority entered into a 10-year contract user agreement with the Kent County WWTP in 2006. I/I issues are present, and Dover purchased a truck and is doing "as you go" as a more cost-effective approach to addressing these issues. Capital projects include smoke testing/video and GIS to identify the I/I issues.

MS4

Dover has an individual Phase II MS4 permit.

Financial Analysis

Water and wastewater are accounted for in the same fund, which is currently meeting all debt covenants and financial obligations. Dover has a restricted reserve account that must keep a minimum of 8 percent plus 2 percent for capital improvements, and $0.5M for emergencies. There are two restrictions; one set by the City Council and one by ordinance.

Dover has no municipal contract users and bills all customers based on flow only. It also marks up customer's Kent County charges with a $1.05 surcharge for addressing I/I issues.

MHI in Dover is $49,738, and the Sewer Authority is not allowed to issue general obligation bonds so must rely on revenue bonds. There is no maximum borrowing limit, but the Authority must meet its debt covenant.

Capital Project Costs and Financing Options

Dover reported $8.3 M in capital project costs from 2020-2025 (Table 4-5). To address these capital project costs, Dover anticipates requesting $5.41M from the Clean Water State Revolving Fund and $240K from USDA, while $2.684M in other financing methods (transfers from the operating fund and impact fee reserves) were reported.

Table 4-5. Dover's 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Inflow/Infiltration removal	$ 4,000,000
Miscellaneous emergency sanitary sewer repairs	$ 500,000
Puncheon run pump station improvements	$ 643,000
US 13 East pump station #7 repairs	$ 280,400
College Road pump station replacement	$ 657,000
SCADA equipment tech upgrade	$ 308,000
Meter replacement	$ 700,000
Lepore Road sanitary sewer upgrade	$ 367,000
Turnberry Pump station replacement	$ 681,000

Heatherfield Pump station replacement	$ 85,000
Cedar Chase Pump station replacement	$ 89,000
Laurel Drive Pump station replacement	$ 20,000
Total	**$ 8,330,400**

Milford

The population of Milford is 11,353 and the Milford Sewer Authority has a 10.3 square mile service area consisting of three sewer districts and 16 pump stations serving approximately 4,000 households. Milford's collection system is pumped to Kent County (connection is near Police Station). Most of the system is acrylonitrile butadiene styrene (ABS) pipe, although some of the older downtown areas is terra cotta pipe. The system has 19 pump stations, all but one has a dedicated diesel auxiliary generator (one has a portable). Most pump stations have been replaced or refurbished over the last 5 years. Average daily flow in the collection system is 2.5MGD.

During major rainfall events, I/I percentages can reach up to 20-25 percent of Milford's total transmission. These are detected by pump flow alarms at the Shawnee Pump Station and the Truitt Avenue Pump Station. Milford reported that their biggest area of concern has been determined with hopes of repair in the future and have begun doing slip lining to resolve issues. Milford has contracted with Utility Financial Solutions (UFS) to conduct a wastewater infrastructure study.

Underserved Communities

Milford receives requests to provide service, but it ultimately comes down to who will pay and agrees to be annexed. Slaughter Beach recently contacted Milford and an engineering study was completed. Milford has about 6,000 approved building lots (some approved 10+ years ago) is seeing more building activity recently. The limit to sewer would be the ability to pump to Kent County. Most growth will be south and east (limited by the Bay). The southeast pump station was designed to pump directly to Kent County's collection system, which will free up some pump station capacity in the future. There are some lines just outside Milford's limits (e.g., Shawnee Acres).

MS4

Milford indicated that they have not been notified of MS4 designation by DNREC and reported that they do not have adequate mapping of their stormwater infrastructure.

Financial Analysis

Milford's wastewater customer billing is computed based on water metering, although some have separate sewer meters. Two large water users: Perdue (also recycles some water and meters their sewage flow) and Seawatch (maker of clam chowder, etc.), also meters their wastewater. Den Supply/Caulk Company's wastewater flow is not metered. Residential customers can have separate irrigation meters installed so they won't be billed for sewer charges for that water.

Milford's MHI is $52,576 and the monthly sewer the rate is a $10 base plus $2.78 per 1,000 gallons, plus a Kent County fee); outside town limits, the rate is a $15.00 base plus $4.17 per 1,000 gallons, plus a Kent County fee. The same rates apply to non-residential users and are only flow-based. Milford reported that sufficient revenues are being generated at current rates. They have a reserve account that is restricted

to wastewater and there are no restrictions on the wastewater reserve funds. Milford is currently working on a Fund Balance policy.

Capital Project Costs and Financing Options

The Milford reported $2.06M in capital project costs for 2020-2025 and no funding sources were indicated (Table 4-6).

Table 4-6. Milford's 2020-2025 capital projects and costs

CIP Item	Project Cost
SCADA Instrumentation Upgrades and Integration	$ 50,000
Targeted Inflow and Infiltration Investigation and Repair	$ 1,000,000
Pumping Station Hoist Replacements (3)	$ 10,000
SE 2nd Street Pump Station Replacement	$ 1,000,000
Total	**$ 2,060,000**

Clayton

Clayton's population is 3,392 and its wastewater service area consists of a 1.83 square-mile system with one sewer district and 8 pump stations serving 1,427 households. Clayton's asset management plan (AMP), prepared in 2018, projects 2,667 EDUs. The system has 2 holding tanks at Pump Station #1 with a total capacity of 300,000 gallons. Clayton's collection system relies on the Kent County Regional WWTP for treatment.

Average daily flows in the system are 0.23 MGD with peak flows of 0.35 MGD. Approximately half of the system flow is directed into Kent County's new collection system (0.058 MGD) and the other half goes through the Smyrna collection system and into Kent County's main collection system (0.173 MGD). Clayton completed I/I Studies in 1983 and 1986, undertook extensive rehabilitation work, but continues to see approximately a 25 percent increase in flow during extreme rain events (2"/24-hr).

A sewer asset management plan was completed in October 2018 that covers the collection system, pump stations, manholes, and force mains and identifies necessary upgrades for maintaining all sewer assets in the system. Clayton has its own power generation system so power failures at major pump stations is not an issue. Some of the pump stations are very small. System maintenance, including emergency response, is handled by Clayton staff with specific services from outside contractors with expertise as needed. Sewer infrastructure in new developments is paid for 100 percent by developers and installed by contractors working for the developer pursuant to Clayton's standards. Some old pumps have been replaced and the old cast iron parts of the collection system suffers from root instruction; CCTV is planned; the polyvinyl chloride (PVC) portion is in much better condition.

Underserved Communities

Clayton is entirely on a centralized sewer system. A portion of Clayton's collection system goes to the Smyrna collection system and the balance goes to the Kent County collection system and to the Kent County Regional WWTP. Clayton could extend service further, if needed.

MS4

Clayton reported that they are a newly designated MS4 in the Dover urbanized area but have received a 5-year waiver from DNREC and do not need to be covered by a general permit at this time. Clayton's MS4 discharges make a small contribution to Smyrna River, which has a TMDL. They received grant funding for GIS mapping of their stormwater system and to identify green infrastructure opportunities. Clayton has contributed to the implementation of the Smyrna River TMDL since the 1990s.

Financial Analysis

Rates are based on $16.50 for the first 2,000 gallons plus $6.00 or $6.50 for each additional 1,000 gallons. Metered usage and a fee are paid to Clayton who then pays Kent County. Long-term capital requirements are met through the annual capital budget with financing from developer contributions, use of system reserves, long-term debt, and general impact fees. Clayton has a reserve account that is restricted to wastewater infrastructure and represents 7 percent of overall expenditures and a debt borrowing limit of $850,000 per charter. Clayton's 2018 AMP recommended a reserve account of $289,000.

Clayton bills its customers according to metering water use, although some of unincorporated Kent County customers' billing is estimated. All customers are billed according to flow; no distinction is made between residential and non-residential. Clayton is billed by Smyrna at a metering station maintained by Clayton. Customers connected to the new sewer are billed quarterly, and those connected to the old sewer are billed monthly. Clayton's MHI is $64,922.

Capital Project Costs and Financing Options

Clayton reported $0.457M in capital projects for 2020-2025 (Table 4-7). Clayton's AMP also identified projects needed beyond 2025.

Table 4-7. Clayton 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Manhole Rehabilitation	$ 79,000
Sanitary Sewer Rehabilitation	$ 378,000
Total	**$ 457,000**

Smyrna

Smyrna has a population of 11,580 and a 6.01 square mile service area, which consists of a collection and transmission system and 16 pump stations serving approximately 3,400 households. Average daily flows in the system are 0.64 MGD, and the flow includes about half of Clayton, measured at Pump Station #1. Smyrna's collection system relies on the Kent County Regional WWTP for treatment. Smyrna did not report an I/I problem, and peak flow in the system was not reported. Smyrna is committed to providing adequate preventive maintenance to ensure that I/I does not become an issue.

Smyrna has developed a general comprehensive plan for ongoing collection and conveyance with new development. The first phase downtown rehabilitation project is complete and there are 9 projects funded by SRF loans, including rehabilitation, I/I, pump station upgrades and the North Duck Creek Extension. Smyrna is currently working to improve the program under a 5-year asset management plan grant obtained from DNREC. Smyrna is proactive with infrastructure renewal; based on system age and

condition assessment, they target sections of streets and upgrade all infrastructure (water, sewer, electric, and the road surface). Recently, new pipes were installed from north of Duck Creek to the Rest Area.

MS4

Smyrna has not been notified of the status of its MS4.

Financial Analysis

Smyrna bills all its customers according to metering water use and bills Clayton at a separate metering station maintained by Clayton. Kent County bills Smyrna for the full flow at Pump Station #1, which is maintained by Kent County.

Smyrna's MHI is $54,675 and it has an unrestricted reserve account (i.e., it is not reserved for wastewater) and a $3M rainy day fund that can be used for capital construction, but the Town Council must authorize its use. Smyrna has a borrowing limit that is 12 percent of its total assessed value of $900M and has only used $4.5M of its $108M debt allocation.

Capital Project Costs and Financing Options

Smyrna reported $5.1M in capital project costs for 2020-2025 (Table 4-8) and plans to use $3.079 from the Clean Water State Revolving Fund.

Table 4-8. Smyrna 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
East Commerce St utility sewers replacement project	$ 941,500
Wastewater asset management program	$ 30,000
North Main Street Sewer utility replacement project	$ 1,087,500
North Duck Creek western sewer project	$ 1,250,000
Smyrna Venture wastewater utility extension	$ 1,812,500
Total	**$ 5,121,500**

5. FACILITIES IN SUSSEX COUNTY

Sussex County Overview

Fifteen municipally owned wastewater systems were included as part of the survey in Sussex County, as shown in Table 5-1. Those 15 systems include 13 treatment plants and two collection systems (Greenwood is treated by the Bridgeville WWTP and relies on a Sussex County collection system).

Sussex County, with a population of 229,286, owns and operates four WWTPs and the associated collection systems (Inland Bays Regional WWTF, Piney Neck Regional WWTF, South Coastal Regional WWTF, and Wolfe Neck WWTF). Additional collection systems operated by Sussex County consist of six separate systems (Blades, Dewey Beach, Ellendale, Henlopen Acres, Woodlands of Millsboro, and Golf Village) that connect to other systems for treatment and are summarized for this report. In addition, Bethel is in the process of connecting or has connected to central systems but is not included in this assessment. Collection and/or treatment by Sussex County is provided to approximately 91,000 households.

All publicly owned treatment plants in Sussex County except for Rehoboth Beach are equipped with on-site auxiliary backup power supply generators (all generators use diesel or gasoline except for the Wolfe Neck WWTF, which operates on natural gas or propane). Rehoboth Beach has a second power feed from the same substation using a different transformer. All plants in Sussex County reported influent strength within the normal range (150–250 mg/L BOD and TSS) except for Selbyville, Seaford and Delmar. Selbyville reported the cause of its above normal influent strength as food processing wastes.

Table 5-1. Wastewater System Responsibilities

Wastewater System	Collection	Treatment	Municipal	Authority
Lewes STP	✓	✓	-	✓
Rehoboth Beach STP	✓	✓	✓	-
Seaford WWTP	✓	✓	✓	-
Delmar WWTP	✓	✓	✓	-
Sussex County - Inland Bays Regional WWTF	✓	✓	✓	-
Sussex County - Piney Neck Regional WWTF	✓	✓	✓	-
Sussex County - South Coastal Regional WWTF	✓	✓	✓	-
Sussex County - Wolfe Neck WWTF	✓	✓	✓	-
Georgetown WRF	✓	✓	✓	-
Bridgeville WWTF	✓	✓	✓	-
Greenwood Collection System (treated by the Bridgeville WWTF)	✓	-	✓	-
Laurel STP	✓	✓	✓	-
Millsboro WWTF	✓	✓	✓	-
Selbyville WWTF	✓	✓	✓	-
Other Sussex County Collection Systems	✓	-	✓	-

Underserved Areas

Most work has been associated with the Bridgeville area, but the County is also working with Diamond Acres, Mount Joy, Cool Springs, Coverdale Crossroads. Others include Jimtown, which is already being served; Diamond Acres (South of Millsboro); and Coverdale Crossroads. The petition process requires 50 signatures initiated by local jurisdictions or through State mandate.

Eight septic elimination projects are in currently process for a total of $2.52M; these are Lochwood, Sherwood Forest South, Dirickson Creek Rd., Country Club Village, Seawood, Gosling Creek Purchase, Slaughter Beach, and Blackwater Village.

The following 8 septic elimination projects have recently been funded in communities in Sussex County using County various combinations of County, SRF, and USDA funds:

Concord Rd./Route 13 crossing	$800K	Sussex County
Western Sussex	$13.4M	SRF
Herring Creek	$22M	USDA
Chapel Branch	$5M	Sussex County
Joy Beach	$6.5M	USDA / SRF
Mulberry Knoll	$3.5M	USDA / SRF
Wolfe Runne	$4.25M	SRF
Mallard Creek	$2.28M	USDA

Funding sources for the following 5 additional septic elimination projects have not yet been identified:

Branch/Autumn/Tucks Rd.	$3.6M
Tanglewood	$900K
Oaks Acres/BYPS#5	$2.6M
Millville-Beaver Dam Rd.	$1.6M
Bethany Forest	$2.5M

MS4

Sussex County reported that they do not operate their own MS4.

Financial Analysis

The MHI in Sussex County is $57,901 and varies considerably by service area. Sussex County bills all its customers according to EDUs; there is no difference between residential and commercial/industrial billing. The County charges an availability service charge that varies by district, but the operation and maintenance charge is the same throughout the service area.

Capital Project Costs and Financing Options for Sussex County-owned Systems

Sussex County reported $210.7M in capital project costs planned for 2020-2025 for a variety of wastewater, collection, conveyance, treatment, and disposal. The County indicated that the majority of projects will be funded by the County, thus considers these to be “met” needs. Table 5-2 provides a list of reported capital project costs for 2020-2025.

Table 5-2. Sussex County 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
IBRWF- Spray demand loop	$ 14,650,000
IBRWF- Treatment disposal expansion	$ 25,500,000
IBRWF- Regional biosolids/septage	$ 14,800,000
IBRWF- Land improvements	$ 2,300,000
SCRWF-Capacity Expansion	$ 34,000,000
SCRWF-Compliance Upgrades	$ 14,000,000
Piney Neck-Compliance Upgrades	$ 6,500,000
Piney Neck –Lagoon Conversions	$ 2,750,000
WNRWF-Conversion	$ 13,900,000
Pump station #203/4 & Transmission to RB	$ 3,500,000
Rehoboth WWTP Phase II	$ 9,000,000
LBPW WWTP Expansion Participation	$ 850,000
Concord Road/Route 13 Commercial	$ 800,000
Western Sussex Sewer District	$ 13,400,000
Herring Creek Sewer Area	$ 22,000,000
Chapel Branch	$ 5,000,000
Joy Beach	$ 6,500,000
Mulberry Knoll	$ 3,500,000
Wolfe Runne	$ 4,250,000
Holts Landing Expansion – Mallard Creek	$ 2,280,000
Branch/Autumn/Tucks Roads	$ 3,600,000
Tanglewood-Bayard PS #1	$ 900,000
Oak Acres-Bayard PS #5	$ 2,600,000
Millville Expansion – Beaver Dam	$ 1,600,000
Bethany Forest Sewer Area	$ 2,500,000
Total	**$ 210,680,000**

Lewes STP

The population of Lewes is 3,233 and the Lewes Sewage Treatment Plant (STP) is managed by the Bureau of Public Works (BPW) and is contract-operated by Whitemarsh (Tidewater), who also inspects and maintains the system. The service area is 5.5 square miles serving 1,528 households. The plant also treats 400,000 gpd from the Sussex County operated Wolfneck Regional WWTP during the non-growing season months because that plant must land apply its effluent. The plant provides secondary and tertiary treatment, as well as nitrogen and phosphorus removal and has a surface water discharge that flows into the C&D Canal (as part of the Broadkill River Watershed) and then into Delaware Bay (Watershed #22). The treatment system consists of anoxic-oxic nutrient removal followed by micro-filtration (Zeon) down to 5 microns, a system that has been in place for 12 years and requires periodic clearing with bubbles. The permit for this discharge (WPCC 3075G174) expires on October 31, 2023. The permit includes a daily mean TN limit of 100 lbs./day and a daily mean TP limit of 25 lbs./day.

The plant's current design flow is 1.5 MGD, and the average daily flow is 0.745 MGD, or just under 50 percent of the plant's design flow. The plant reported that 90 percent of the flow is from domestic sources. Peak flow at the plant is 2.25 MGD, and all I/I and combined sewer issues have been resolved since the last survey. The plant can handle most coastal flooding events.

Underserved Communities

Donovan Smith Trailer Park has 130 lots, but only 82-89 are useable due to failing septic issues. The community is below the poverty level and seeking State grants for funding at 1.5% MHI. All households will qualify at that rate.

MS4

Lewis has not been notified by DNREC about MS4 designation, but the BPW is aware that delegation as a small MS4 may be coming and is the process of planning for that possibility. The BPW continues to work with Lewis, the University of Delaware, and other appropriate State and federal agencies to improve stormwater practices and policies in the areas served by the BPW. The stormwater fee covers maintenance to keep the stormwater pipes open throughout the service area and ensures that major road arteries are kept open in times of rain events for the "greater good of the community."

- Residential: $5
- Commercial: $10
- Industrial: $20

This fee only meets current operational and maintenance needs for the backbone system.

Financial Analysis

The Lewes MHI is $72,474. Revenues were reported to be sufficient according to recently raised rates. Lewis has a restricted reserve account valued at 54 percent of operating revenues. The cash reserve policy is 25 percent for O&M and 2 percent for net asset cost and risk management. Also, 15 percent of the current capital budget is for future project funding, and 15 percent is set aside for the 5-year CIP.

Lewis bills all its customers according to metering water use and has no industry or contract users and no pretreatment systems. Commercial customers are billed the same way as residents, but commercial users' fees are higher.

Capital Project Costs and Financing Options

Lewes reported $6.5M in capital project costs for the 2020-2025 period (Table 5-3).

Table 5-3. Lewes 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Sewer Main Replacement/Renewal	$ 2,130,000
Sewer Lift Station Renewal	$ 365,000
Sewer Main Grouting/Lining	$ 300,000
Devries Circle	$ 415,000
Manhole Replacement/Rehab	$ 258,180
Savannah Road- Donovans to Meter Station	$ 395,000
Nutrient Trade	$ 116,038
Replace MCC/Upgrade Drives and Programmable Logic Controller in Headworks	$ 150,000
Drying Bed Cover	$ 80,000
Drying Bed Expansion	$ 115,000
Train Wall Polyuria	$ 20,000
Filter Press	$ 225,000
Micro Filter Zenon Replacement	$ 1,515,000
PDP Effluent Pumps-Recondition	$ 193,397
Outfall Pipe Repair	$ 290,000
Total	**$ 6,567,615**

Rehoboth Beach STP

The year-round population of Rehoboth Beach is 1,520 and the Rehoboth Beach Sewage Treatment Plant (STP) has a 2 square mile service area that consists of four sewer districts with 7 pump stations serving approximately 3,200 households. The STP serves a population of over 50,000 during peak summer periods. The plant provides primary, secondary, and tertiary treatment and nitrogen and phosphorus removal and the ocean outfall that went into service in May 2018 is 6,000 ft from shore. There is a diffuser at the end of the outfall. The NPDES permit for that discharge (DE0020028) expires on June 30, 2022. Permit limits include 24,300 lbs./year of N and 5,308 lbs./year of TP to meet the TMDL.

Payment for the outfall is over 20-30 years with 3-phases of accompanying plant upgrades. The next phase would include upgrade for additional capacity within plant. The outfall can handle the additional capacity. Wastewater flows are currently only marginally higher than in 2010 (not many houses have been built). The current design flow is 3.4 MGD and the average daily flow is 1.125 MGD. Peak flow is 2.8 MGD or about 82 percent of design flow.

Rehoboth Beach reported that 100 percent of flow is from domestic sources and that the collection system experiences some problems associated with large rain events combined with high tides; otherwise there are very few I/I problems. The occur most frequently in the lower elevation, north part of town and in extreme cases, form Dewey Beach. Part of Rehoboth Beach's actions for resiliency has been the installation of two storage tanks; one 500K gallons and the other 1M gallons.

Rehoboth Beach is working with the County on what to do with biosolids; upgrading to Class A sludge and will decide in conjunction with Sussex County how responsibilities will be shared so there is no duplication of work. They are currently land applying liquid biosolids.

Underserved Areas

Rehoboth Beach did not report any nearby unserved communities or areas with failing onsite systems.

MS4

The City has not been notified by DNREC about MS4 designation.

Financial Analysis

MHI in Rehoboth Beach is $85,729 and sewer rates are currently based on water use, but a rate study is in progress. Rehoboth Beach is in the process of redoing its reserve "contingency funds" while doing the rate study. They are paying off the debt for the 4 contracts (Ocean outfall, force main, pump station, and plant improvements). The pump station and plant improvements are the same contractor. Rehoboth Beach reported that rates will increase in the future to finance the cost of the planned ocean outfall.

Rehoboth Beach has a debt borrowing limit for its wastewater enterprise of $52M and $42M is currently available. They also have a restricted reserve account that is earmarked for emergency repairs at the wastewater treatment plant.

Capital Project Costs and Financing Options

Rehoboth Beach reported $0.773M in planned capital project costs for 2020-2025, including sewer line replacement (Table 5-4). No specific funding sources were indicated, although the CIP included a discussion on enterprise funds and general obligation bonds.

Table 5-4. Rehoboth Beach 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Air compressor	$ 23,000
Sewer Line Replacement Program	$ 750,000
Total	**$ 773,000**

Seaford WWTP

The population of Seaford is 7,861 and the Seaford WWTP service area is 5.86 square miles, consisting of two sewer districts (Blades and Seaford) serving 3,435 households. The plant provides primary, secondary, and tertiary treatment; nitrogen and phosphorus removal; and has a surface water discharge that flows into the Nanticoke River and then into the Chesapeake Bay (Watershed #31).

The plant provides solids handling; the NPDES permit for that discharge (DE0020265) expires on October 31, 2020. The permit includes a seasonal (May-September) TN limit of 135 lbs./day and 51,795 lbs./year and a TP limit of 33.6 lbs./day average (50 lbs./day maximum) and 2 mg/L average (3 mg/L maximum). The plant reported that receiving hauled septage has led to higher than average BOD. Seaford trades nutrients with Invista (former Dupont Plant).

The plant's current design flow is 2 MGD, and the average daily flow is 1.076 MGD, or 53.8 percent of design flow. Peak flow at the plant is 2.514 MGD, with 5.3 percent of the plant's flow comprised of domestic sources as of March 2019.

Seaford has an Asset Management Plan developed under the State grant that indicates I/I issues occur during rain events (increasing flow to the plant by up to 2 MGD). Funding is ongoing for the various I/I issues related to different sewer types. The worst area is Seaford's "Old Town" (central area). The combined sewer system was eliminated in early 2000s. Completed priorities since the last survey were addressing I/I found via TV and smoke testing, evaluating capacity upgrades to accommodate growth and meeting WLAs under the Chesapeake Bay TMDL. Seaford is considering impact and user fees, SRF and local bonds as funding sources.

Underserved Areas

Seaford reported that it is willing to serve Concord if the State runs the lines. It is in the County's service area plan. The connection of Bridgeville/Greenwood sewer to Seaford's collection system is expected in October 2020, which will increase its service area by an additional 5.35 square miles. The Sussex County-owned Blades collection system is already treated by the Seaford plant.

MS4

Seaford indicated that they believe they have been designated as an MS4 and are aware that they may be receiving an MS4 stormwater permit in the future.

Financial Analysis

Seaford's MHI is $44,886 and it bills its customers a flat rate for sewer of $44.99 based on 9,000 gallons using EDU and metered water use. Seaford has a debt borrowing limit of $2M per year without referendum and a restricted reserve account for emergency repairs or future capital projects such as wastewater treatment upgrades, lift stations, etc.

Capital Project Costs and Financing Options

Seaford's Route 13 North Water and Sewer Extension Project includes installation of approximately 5,600 feet of 16" water main, from its existing location north of Duck in Car Wash, under the branch to the Dolby farm where proposed lift station #16 would be installed. The project will also install approximately 4,550 feet of 12" gravity sewer main to the south side of the branch to serve the annexed, but largely undeveloped areas along Sussex Highway. This project would provide water and sewer service to all annexed properties along the east side of Route 13 and will add maximum development potential for the commercial properties on the north end of Seaford. Engineering for the project is almost complete and the estimated cost is $1.9M. The "sewer only" cost was not available, so was assumed to be 50 percent. At the time of the survey, Seaford had secured $0.5M from a Bond Bill and plans to apply for SRF loans, hopefully with some principal forgiveness.

The Route 13 South Sewer Extension project will provide water and sewer service south from Dairy Queen to the old Ice Plant at an estimated cost of $0.623M. The "sewer only" cost was not available, so was

assumed to be 50 percent. Seaford is contemplating lumping this project into the Route 13 North water and sewer project.

Seaford has also identified a future project that includes expansion and upgrades of the WWTP to 3 MGD, enhanced nutrient removal process, leachate & septage handling, and sludge processing operation. This will be necessary because, as mentioned above, the Seaford Plant is expecting to begin treating wastewater from Bridgeville and Greenwood by October 2020. Seaford is anticipating completing preliminary design by January 31, 2023, and the cost for that has yet to be determined. Final design is expected to be complete by January 31, 2025, and those costs have yet to be determined. Seaford will start the process for project referendum by July 31, 2025, and project funding would be secured by January 31, 2026. Construction of the proposed expansion and upgrades should begin by January 31, 2027, with initial estimates for construction at $28M.

Seaford reported $28.6M in capital project costs for 2020-2025 (Table 5-5).

Table 5-5. Seaford 2020-2025 capital projects and costs

CIP Item	Project Cost
Rt. 13 south sewer extension	$ 623,000
WWTP - expansion/upgrades to 3 MGD, enhanced nutrient removal, leachate septage handling, sludge processing	$ 28,000,000
Total	**$ 28,623,000**

Delmar WWTP (Maryland)

The population of Delmar, DE, is 1,796 and the Delmar WWTP services 3,285 households within the Delmar municipal limits (partly in Maryland and Delaware) and two small residential areas and MHPs in Wicomico County, Maryland. Delmar has a utility commission that governs wastewater and drinking water in both states, although the wastewater discharge point is in Maryland. The Delmar, Maryland, service area is 7 square miles and consists of two sewer districts with 11 pump stations.

The Delmar WWTP provides secondary and tertiary treatment and has a surface water discharge that flows into the Wicomico River and then into the Chesapeake Bay (Watershed #31). The plant provides phosphorus, nitrogen and ammonia removal, solids handling; the discharge permit (10-DP-0593) for this discharge expires on March 31, 2022.

The Delmar WWTP's current design flow is 0.85 MGD, and the average daily flow is 0.498 MGD, or about 58.5 percent of design flow. Peak flow at the Delmar WWTP is 3.1 MGD, and It has exceeded its current design flow capacity for 2 or more consecutive months during the past 2 years. Town has had difficulty meeting Nitrogen and Phosphorous limits due to high flow and wash out of biomass due to I/I.

The WWTP is experiencing significant issues, in part from the large volume of water infiltrating through the system. Delmar has had I/I studies performed, from which they are using the report as a tool to assist with addressing some of the problem areas, with the slip-lining process. Delmar acknowledges that the system experiences I/I because of old lines and manholes, but also indicated that there has been greater than average precipitation during the past 2 years. Delmar has applied to the State seeking funds to replace severely deteriorated old terracotta pipes throughout the collection system.

I/I has led to influent screen failure, disruption of the sand filter for denitrification, and the tertiary clarifier, preventing the system from meeting its Nitrogen limits. The system has a 404,000-gallon surge tank in addition to the 130,000-gallon equalization tank.

Underserved Areas

Delmar has no current plans to extend sewer service but is willing to provide new service to nearby underserved areas if it is tied to annexation, but there is little demand.

MS4

Delmar indicated that it had not yet been made aware of any MS4 stormwater requirements or obligations.

Financial Analysis

MHI in Delmar is $34,211 and the Town bills all its customers using a combination of metered water use, a non-metered mobile home park (Breckenridge), and flat fee per EDU. Commercial use is metered and converted to EDU using flow only. The rate is $5.50/1,000 gallons.

There is a combined reserve account for drinking water and wastewater tied to connection fees that is tracked and divided among each service. Delmar estimates that 64 percent of the reserve is related to wastewater. Funds are used in emergency situations as well as planned upgrades to the treatment facility or collection system. Based upon Delmar's last General Obligation Bond, in the amount of $883,786, the legal debt margin was $7,343,030.

Capital Project Costs and Financing Options

Delmar identified nearly $2.5M in capital project costs for 2020-2025 (Table 5-6) and indicated that they rely on general obligation bonds to fund wastewater needs.

Table 5-6. Delmar 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Repair the Lift/Screen	$ 275,000
Convert Surge Tank to EQ Basin	$ 75,000
Replace - Level Control - Auto On/Off	$ 4,000
Replace Pump / Repair Existing Pump for spare	$ 32,000
Replace Sluice Gate Valve/Stem	$ 5,000
Repair Exterior Wall and Roof	$ 25,000
Replace Ceiling and Floor Tile	$ 15,000
Upgrade the Lab, Table, Cabinets, Equipment	$ 35,000
Repair (4) Mixers @$4,000 EA.	$ 16,000
Sluice Gate/Valve & Stem Replacement	$ 5,000
Prepare the Sweep/Arm/Motor	$ 40,000
(4) Panel Boards @ $3200 ea./$1000 Install	$ 13,800
Replace - Flume Valves	$ 5,500
Replace – Valves	$ 5,000

Cleaning Rebuild Motor/gear boxes	$ 35,000
Replace Blowers in Digestor	$ 20,000
Upgrade Kim Scann EFF Pump	$ 8,000
Replace exhaust fan heater in Sand Filter	$ 15,000
Replace Side Panels	$ 45,000
Replace Doors - Swing Out vs Roll Ups	$ 40,000
Replace w/ LED	$ 10,000
Repair and Repave Entrance Roadway/Culverts/Parking Lot	$ 35,000
SCADA System - all lift stations	$ 31,265
Sewer Main replacement	$ 1,302,033
Slip Lining 1100 LF	$ 240,000
Slip Lining Manholes	$ 140,000
Total	**$ 2,472,598**

Inland Bays Regional WWTF

Sussex County owns and operates the Inland Bays Regional WWTF, which has a 15.87-square-mile service area consisting of 3 sewer districts with 87 pump stations, serving a summertime population of approximately 30,000. The plant provides secondary and tertiary treatment; nitrogen removal; and is in the Rehoboth Bay/Inland Bays/Atlantic Ocean Watershed (#39). The facility is an activated sludge plant with Parkson Biolac (biological nitrogen removal) that has been added since the last survey.

The Inland Bays plant currently does not have a limit on TN in Effluent. Total N average for 2018 was 6.04mg/l. The total amount of Nitrogen applied to each spray field shall not exceed 250lbs/year. equipped with storage lagoons for spray irrigation on 8 fields and has a groundwater discharge permit (LTS 5004-90-12), which expired on July 12, 2017.

The plant's current design flow is 2.0 MGD reflecting three phases of planned expansion through 2030. The average daily flow is 1.0 MGD in winter and 1.4 MGD in summer. Peak flow at the plant is 3.7 MGD. The plant reported that 89 percent of its flow is from domestic sources. The plant indicated that it has effluent problems during periods of high precipitation due to groundwater within 2' of the surface.

Financial Analysis

Sussex County bills all its customers according to EDUs; there is no difference between residential and commercial/industrial billing.

Capital Project Costs and Financing Options

Sussex County owns and operates the Inland Bays WWTP. Information on capital project costs and financing is included within the discussion about Sussex County and presented in Table 5-2.

Piney Neck Regional WWTF

Sussex County owns and operates the Piney Neck Regional WWTF, which has a 3.66-square-mile service area consisting of 1 sewer district with 7 pump stations, serving a summertime population of approximately 3,500. The plant provides secondary treatment and is located in the Indian River Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#42). The plant is equipped with storage lagoons for spray irrigation; the groundwater discharge permit for this facility (359224-03) expires on December 8, 2020. The permit includes TN limits of 300 and 350 lbs./acre/year for field and spray irrigation for outfalls 001 and 002, respectively.

The Piney Neck Regional WWTF's current design flow is 0.2 MGD, and the average daily flow is 0.1505 MGD, or about 75 percent of design flow. Because the plant experiences seasonal flow variations, it has seasonal flow limits of 0.166 MGD (summer) and 0.141 MGD (winter). Peak flow at the plant is 0.1 MGD, and the system reports no excess I/I problems.

Financial Analysis

Sussex County bills all its customers according to EDUs; there is no difference between residential and commercial/industrial billing.

Capital Project Costs and Financing Options

Sussex County owns and operates the Piney Neck Regional WWTP. Information on capital project costs and financing is included within the discussion about Sussex County and presented in Table 5-2.

South Coastal Regional WWTF

Sussex County owns and operates the South Coastal Regional WWTF, which has a 33.17-square-mile service area consisting of 14 sewer districts with 106 pump stations, serving a summertime population of approximately 70,000. The plant provides secondary and tertiary treatment; it is in the Little Assawoman Bay/Inland Bays/Atlantic Ocean Watershed (#45) but discharges directly to the Atlantic Ocean via an ocean outfall at (N38.524007, W74.95669) (lat/longs are approximate). The NPDES permit for this discharge (DE0050008) expired on May 21, 2016. The permit does not include nutrient effluent limits nor does the plant anticipate them in the future.

The plant's current design flow is 9 MGD; the average daily flow is 2.5 MGD, or about 28 percent of design flow. The plant experiences significant seasonal variation because of servicing beach resort communities. Winter flows average 2.5 MGD, while summer flows average 3.0 MGD. The plant can handle a flow of 14 MGD, whereas the ocean outfall is designed for a maximum flow of 22 MGD. Selbyville is using 1.5 MGD of the outfall capacity (Selbyville says it is authorized up to 2 MGD). Peak flow at the plant is 6.0 MGD, and the plant reports that 100 percent of its flow is from domestic sources. The County also indicated that all I/I issues have been resolved by slip lining all concrete pipes and using inserts.

Financial Analysis

Sussex County bills all its customers according to EDUs; there is no difference between residential and commercial/industrial billing.

Capital Project Costs and Financing Options

Sussex County owns and operates the South Coastal Regional WWTF. Information on capital project costs and financing is included within the discussion about Sussex County and presented in Table 5-2.

Wolfe Neck WWTF

Sussex County owns and operates the Wolfe Neck WWTF, which has a 19.94-square-mile service area consisting of 1 sewer district with 89 pump stations, serving a summertime population of approximately 40,000. The plant provides secondary treatment and is in the Lewes-Rehoboth Canal subwatershed in the Inland Bays/Atlantic Ocean Watershed (#38). The plant is equipped with storage lagoons for spray irrigation; the groundwater discharge permit for the facility (LTS 505-95-12) expired on August 1, 2017. The Wolfe Neck WWTF permit includes a TN limit of 396 lbs./acre/year.

The Wolfe Neck WWTF's current design flow is 4 MGD, and the seasonal average peak flows are 2.23 MGD (summer – based on ability to spray irrigate) and 1.529 MGD (winter). Average daily flow is 1.52 MGD, or 38 percent of design flow. Peak flow at the Wolfe Neck WWTF is 2.5 MGD.

Financial Analysis

Sussex County bills all its customers according to EDUs; there is no difference between residential and commercial/industrial billing.

Capital Project Costs and Financing Options

Sussex County owns and operates the Wolfe Neck WWTP. Information on capital project costs and financing is included within the discussion about Sussex County and presented in Table 5-2.

Georgetown WRF

The population of Georgetown is 7,427 and the Georgetown Water Reclamation Facility (WRF) has a service area of 4.5 square miles, consisting of three sewer districts with 21 pump stations. The plant provides secondary and tertiary treatment plus nitrogen removal and is in the Indian River subwatershed in the Inland Bays/Atlantic Ocean Watershed (#40). The plant receives waste from Georgetown proper and the Sussex County-owned and operated Ellendale system including the force main to Georgetown. The wastewater treatment system consists of headworks and grit chamber located at the Stevenson's Lane (the old plant that had a stream discharge) followed by a Biolac System and then storage in lagoons (one is 95 MG and the other is 76 MG) and then pumped to the spray irrigation location (fields or woods). There is a 45,000-gallon equalization tank at the Stevenson's Lane location.

The groundwater discharge permit for the facility (359297-09) expires on January 19, 2022. The permit includes BOD, TSS, and Fecal Coliform limits. The plant's current design flow is 1.3 MGD, and the average daily flow is 0.9211 MGD, or about 71 percent of design flow. It relies on spray Irrigation because of the Inland Bays restrictions. The Town reported that 96 percent of influent flows are from domestic sources and a typical average strength of the influent wastewater NH3-N of 45.8 mg/L.

Peak flow at the plant is 1.6 MGD. Georgetown's service area includes, terracotta pipe, plastic pipe, and ductile iron pipe. The Town completed renewal of about 70 percent of its collection system in 2014 (I/I repair, pipe relining, manhole rebuilding, jetting, and CCTV). The 30 percent remaining will consist of repairing or replacing old lift stations. Flows have been reduced from about 1.2 MGD to 900,000 gpd. Georgetown is currently working with KCI on an asset management plan with GIS.

The only agricultural land owner around the wastewater plant is Baxter farm, which the Georgetown currently sprays on at rates of 160 LBS/acre/year for Nitrogen and 95 percent spray irrigation in summer. Georgetown has some storage and disposal concerns because the farmer whose land has effluent sprayed on it really only wants to take the effluent during the growing season. Although the farmer's agreement provides for an additional payment if he takes >110 MG, but he is not motivated by that.

MS4

Georgetown reported that they are aware that they may be designated as an MS4 but indicated that they have not taken any steps towards preparing for establishing a program. Georgetown has maps of their storm drainage system going back to 1936, although they are not comprehensive. The Soil & Water Conservation District reviews/approves development plans for SWM through Georgetown's Planning & Zoning Department.

Underserved Areas

Georgetown extended service for Ellendale, which was previously underserved. Georgetown also provides service to Sussex Tech High School, Sussex Central High School, and industrial park, the State Correctional Institute (prison) and 2 subdivisions (Golf Village with 50-60 houses and Woods at Walls Creek (30 houses). Georgetown is still growing but has limited capacity for its own growth at the treatment plant. Mount Joy has a few houses with failing septic systems, but these would be more likely to connect to the County system.

Financial Analysis

Georgetown's MHI is $47,376 and sewer rates are $6.04 per 1000 gallons used; $27.00 in increments of every 3,000 gallons used; plus a $2.35 sewer debt service fee. Revenues generated were reported to be sufficient according to current rates. Georgetown has two reserve accounts, a sewer deprecation account and a sewer impact fee account. Georgetown bills all its customers using a combination of metered water use (some commercial customers have sewer meters, and some have water meters) and EDUs by agreement with Sussex County (Ellendale).

Per charter, the bonded indebtedness shall not at any time exceed in the aggregate the total sum of 75 percent of the assessed value of real property. Sewer debt was reported as 59 percent of the town-wide budget.

Capital Project Costs and Financing Options

Georgetown did not report capital project costs needed for 2020-2025 and funds it needs through municipal sinking funds or other asset replacement cost savings.

Bridgeville WWTF

Bridgeville has a population of 2,366 and owns and operates a collection system, receives wastewater from Greenwood, and currently treats this wastewater at its WWTF. The Bridgeville service area is 2.38 square miles and consists of two sewer districts with two pump stations serving 1,295 households. Greenwood has a service area of 0.69 square miles consisting of 1 sewer district with 2 pump stations serving 548 households.

The Bridgeville WWTF currently provides secondary and tertiary treatment and has solids-handling equipment. In addition to serving Bridgeville, the plant receives 0.08 MGD of wastewater from Greenwood's collection system (before a 1989 agreement, the plant received 0.086 MGD; and the agreement is for flow only, no BOD or TSS). The current design flow of the Bridgeville WWTF is 0.8 MGD, the average daily flow is 0.287 MGD, or about 35 percent of design flow, and the peak flow is 0.41 MGD. In addition to having an on-site auxiliary generator for backup power, the plant is also equipped with a portable generator.

The plant has a surface water discharge (as well as a groundwater discharge) that flows into the Nanticoke River and then into the Chesapeake Bay (Watershed #31). The facility's NPDES permit (DE0020249)

expired on January 31, 2012, and its groundwater discharge permit (LTS 5006-07-09) expired on February 12, 2014. The NPDES permit includes effluent limits of 52.9 lbs./day (seasonal limit from May-November) and 19,312 lbs./year for TN and 13.4 lbs./day (seasonal from May-November) and 4,909 lbs./year for TP; the plant has experienced non-compliance with both limits. The groundwater permit has a limit for TN of 300 lbs./acre/year. Current projections show ultimate build-out at 5,646 EDUs, which equates to 1.167 MGD. The plant currently has WLAs from TMDLs for BOD5, TN, TP, and bacteria (enterococcus). The Town has been advised that BNR and biological or chemical phosphorus removal will be necessary to meet WLAs under the Chesapeake Bay TMDL.

Sussex County plans to install a new lift station, which will be put into service at the WWTF location. Design of an interceptor to take this wastewater to Seaford is underway and is likely to come online by October 2020. One clarifier and a chlorine contact basin are to remain to handle any emergency or surge in flows.

MS4

Bridgeville reported that it believes that the DNREC MS4 program will be implemented in Bridgeville soon because it is close to hitting the population density threshold.

Financial Analysis

The Bridgeville MHI is $51,713 and they are still billing customers until the service switches over to Seaford. Sewer is billed as per water bill and is $7 per thousand gallons. Bridgeville rents pool meters out to fill pools and customers do not have to pay wastewater for that usage. All wastewater connection issues now go through Sussex Co. (e.g., approve plans for wastewater for new apartment complexes).

Bridgeville has a restricted reserve account with a requirement for it to be at least 15 percent of operating revenue. There are no formal restrictions other than expenditures must be for repairs only. Also, Greenwood pays into a sinking fund (1 percent per year) for repairs in Bridgeville that the Town Council must approve.

Bridgeville bills its customers according to metered flow (for commercial and contract users), or by self-reporting via a pretreatment ordinance for industrial users. Flow-based rates consider BOD, nutrients and TSS.

Capital Project Costs and Financing Options

Bridgeville reported $0.2M in capital project costs for 2020-2025 (Table 5-7).

Table 5-7. Bridgeville 2020-2025 capital projects and costs

CIP Item	Project Cost
WW-Miscellaneous	$ 200,000
Total	**$ 200,000**

Greenwood

Greenwood owned and operated a collection system that was treated by the Bridgeville WWTP until the summer of 2019, at which time Sussex County created a sewer district and took over operation of the collection system. Greenwood has a population of 1,118 and a service area is 0.69 square miles consisting of 1 sewer district with 2 pump stations serving 548 households.

The current design flow of the Greenwood collection system is 0.086 MGD, with an average daily flow of 0.085 MGD, and a peak flow of 0.12 MGD. During the survey, Greenwood acknowledged having an I/I problem that accounts for a 33 percent increase in instantaneous wet-weather discharges. Camera studies have been performed and some areas have been fixed, but all I/I problem areas have not yet been identified.

MS4

Greenwood reported that it has not been notified by DNREC about MS4 designation.

Financial Analysis

Greenwood's MHI is $49,554 and the average annual sewer rate is $696. Greenwood has a restricted reserve account with a requirement for it to be at least 15 percent of operating revenue. There are no formal restrictions other than expenditures must be for emergency repairs only. Also, Greenwood pays into a sinking fund (1 percent per year) for repairs in Bridgeville that the Town Council must approve.

Greenwood bills its customers according to EDUs and has no industrial contracts, while commercial billing is flow-based (1 meter unit/200 gallons/day).

Capital Project Costs and Financing Options

No project costs or financing information was reported by Greenwood, although they indicated that it needed to retain its wastewater revenues for it to be able to continue to provide drinking water service.

Laurel

The population of Laurel is 4,394 and the sewage treatment plant (STP) has a service area of 2.73 square miles, consisting of 1 sewer district with 3 pump stations. The plant provides secondary and tertiary treatment as well as nitrogen and phosphorus removal and has a surface water discharge that flows into the Broad Creek and then into the Chesapeake Bay (Watershed #35). The NPDES permit for this discharge (DE0020125) expires on October 31, 2021. The permit includes daily mean limits for TN of 23.4 lbs./day and for TP of 5.84 lbs./day.

The plant's current design flow is 0.7 MGD and the average daily flow is 0.453 MGD, or 65 percent of design flow. TMDL WLAs include BOD5, TN, TP and enterococcus. Peak flow at the Laurel STP is 0.868 MGD; I/I problems have been identified.

MS4

Laurel reported that it has not yet been notified by DNREC about MS4 designation.

Financial Analysis

Laurel's MHI is $34,291 and bills all its customers according to metered water use. Commercial and industrial customer billing is metered like residential customers but at a different water-use rate (there are no sewer meters).

Revenues generated were reported to be sufficient according to current rates. Laurel has an unrestricted reserve account that is 1 percent of operating revenue. The reserve is a water and wastewater capital reserve for projects from leftover impact fees, and such. There is no active O&M enterprise reserve fund.

Capital Project Costs and Financing Options

Laurel has no current CIP, but sewer annexation is occurring in growth areas, and undeveloped lots are in town. Priority needs include typical O&M, miscellaneous I/I repair and meeting WLAs under the

Chesapeake Bay TMDL. Longer term (i.e., 10 years) needs include solids handling (filter press), partial separation and reducing inflow to the combined sewer, and plant capacity upgrades. Laurel did not report capital project costs during this survey.

Millsboro WWTF

Millsboro has a population of 4,446 and the WWTF has a service area of 3.71 square miles, consisting of one sewer district with 11 pump stations. The plant also serves 2 contact users (Sussex County-Woodlands of Millsboro (57 households) and a State facility - the Stockley Center). Millsboro is located within the Indian River Bay in the Inland Bays/Atlantic Ocean Watershed (#40). The Millsboro WWTF provides secondary and tertiary treatment plus nitrogen and phosphorus removal and discharges via spray irrigation and on-site RIBs. The plant also provides ultra-filtration membrane bioreactors and solids-handling equipment.

Millsboro has two different discharge permits with differing permit limitations even though the sampling requirements in both permits is from the same point at the facility. The spray irrigation permit (DE-528516-06) is on a consumption basis and the RIBs permit (DE-528516-05) has a permit capacity of 0.6 MGD. Both permits expire on July 30, 2020. The RIBs design flow is 1.8 MGD based on groundwater monitoring. The current design flow is 1.15 MGD and the average daily flow is 1.12 MGD.

Millsboro reported that 85 percent of average daily flow is from domestic sources and that the average daily maximum month flow over the past 12 months was 0.69 MGD. Millsboro also reported that the plant had not exceeded its design flow capacity for 2 or more consecutive months in the past 2 years and that its influent wastewater strength is normal (150-250 mg/L BOD and TSS) with 40.35 mg/L NH3-N.

The WWTP treats for nitrogen (nitrification and denitrification) and for phosphorus (non-organic only). There is a partial bypass at the plant due to I/I, and the bypass treatment and goes to chlorination and UV disinfection. Millsboro reported that the plant had some compliance problems during the past 3 years with TSS, Enterococcus/Fecal Coliforms, BOD, and TN from these partial bypasses, that result in toxic shock. According to Millsboro, the problems were exacerbated by low temperature, and the stringent permit limits for TN, BOD, and TSS.

The Millsboro collection system dates from 1912 with clay pipe, which is being rehabilitated or replaced and asbestos cement pipe from 1963, with which there are concerns about cement failure, according to an I/I study. The Stockley Center, a special needs facility and State offices run by the State DHSS, is served by original 1912 clay pipe and is thought to be a major source of I/I. Millsboro is currently landfilling sludge and is looking into producing Class A or B dry biosolids.

Millsboro's wastewater facility master plan indicates a 3.3 MGD ultimate capacity utilizing equalization and reuse although Permit capacity is up to 1.12 MGD. The existing WWTP will not be able to handle flow from Plantation Lake development. The process is design for 3 MGD and the master plan to look at developing a new WWTP to handle increased flow. Using GPS-X model to handle additional flow and loading at existing WWTP. Millsboro is looking at new land for surface discharge for new flow from development. One option being looked at is having the developer provide a 3-line system for using reclaimed water (purple line) handle additional flow from WWTP discharge and would reduce the issues of where to discharge treated water.

MS4

Millsboro reported that it has not been notified by DNREC about whether it will be a regulated MS4.

Financial Analysis

Millsboro's MHI is $43,750 and the sewer rate is $6.50/K gal plus a lump sum annexation fee. Revenue generated by fees collected is less than expenses. Millsboro bills all its customers according to metered water use; some residents have separate meters for irrigation use. Commercial and industrial customers billing is based on flow only, although there are pretreatment requirements and standards in the ordinance, and testing is done at laboratories. The Stockley Hospital, the school and the Woodlands have sewer meters.

Capital Project Costs and Financing Options

Millsboro did not report capital project costs for this survey.

Selbyville

Selbyville's population is 2,496 and the wastewater service area is 1.4 square miles, consisting of two sewer districts with 28 pump stations with 2 diversion/equalization lagoons with a total capacity of 20M gallons, serving 1,243 households. The treatment plant provides secondary and tertiary treatment and is in the Little Assawoman Bay/Inland Bays/Atlantic Ocean Watershed (#45), although the effluent is discharged to the Atlantic Ocean via a connection to Sussex County's South Coastal ocean outfall approximately 17 miles from the facility (post-treatment).

The NPDES permit for that discharge (NPDES Permit #DE0020010/DE Permit #WPCC 3076F/74) was issued in 2017 and expires in 2022. The permits do not include effluent limits for nutrients nor does the Town anticipate them. The plant reported an equipment failure-related non-compliance incident with excursions of its TSS, total residual chlorine and BOD limits. Mountaire poultry processing plant and other commercial businesses account for about 77 percent of flow into the Selbyville WWTF. Mountaire Farms has a moving bed biofilm reactor (MBBR) system (last updated in 2007) to pretreat the wastewater it discharges to the Selbyville system. They have local limits and sample daily for BOD, TKN, TSS, and oil and grease.

The Selbyville wastewater treatment plant (WWTP) current design flow is 2.0 MGD, and the average daily flow is from 1 to 1.5 MGD. Peak flow at the plant is 1.5 MGD, and I/I was reported to be less than 10 percent, although it has not been studied. Land application and additional surface discharges are not allowed in the coastal watershed, so this is challenging for Selbyville. The system requires better flow monitoring and lagoon/WWTP coordination.

The plant was last upgraded in 2011 (MMBR, aeration, polymers), and reported that their grit chambers need to be replaced. Currently, one oxidation ditch is currently online, and a second could be put online in 3-5 years if they add pumps and capacity. The SCADA system needs to be upgraded and the generators need to be connected to the SCADA system and the WWTP is planning to phase in more pump stations and SCADA infrastructure.

Selbyville is currently in year 2 of is asset management program and is doing some CCTV work on sewer mains, although only has completed a small portion so far. There is a major pump station on Church Street. Selbyville realizes that it may need to take a closer look at I/I issues if the conventional methods do not provide enough information (possibly modelling).

MS4

Selbyville reported that it has not been notified about its designation status under the MS4 program by the State.

Financial Analysis

Selbyville's MHI is $49,107 and revenues generated were reported to be sufficient according to current rates. Selbyville has an unrestricted reserve account that is 84 percent of operating revenue (not required). Impact fees are assessed for new users. The Selbyville WWTF service area's MHI is $45,1326, according to the 2019 survey. Selbyville has a borrowing limit if 50 percent of appraised value of all real property.

Selbyville bills its customers according to metered water use at a multiplier of 1.043 for in-town customers and 1.089 for out-of-town customers. Commercial users are billed the same as residential, although the Selbyville has a separate, special agreement with on large industrial user (Mountaire). Average annual bills are $355.48 for in-town users and $405.92 for out-of-town users.

Capital Project Costs and Financing Options

Selbyville's reserve account can be used for capital improvements, "Any capital expansion costs that are required to plan, design, acquire and construct facilities with adequate capacity to serve new users of the wastewater distribution system." Emergency projects are funded by impact fees. Selbyville has been meeting operational costs without exceeding its budget. The I/I studies are not considered to be maintenance related issues. Selbyville reported total budgeted expenses for wastewater of $1.23M in 2018 and $1.493M in 2019.

Selbyville's CIP identified $1.1M in capital projects for the 2020-2025 period (Table 5-8) and the Comprehensive Plan has preliminary designs for future needs beyond 2025. Highlights of the plan are that it focuses on new development and elimination of failing on-site septic systems. Historical projects have included pump station construction, sewer main installation, and wastewater treatment plant upgrades, mostly using Clean Water State Revolving Fund loans. Future capital projects identified for consideration include:

- Oxidation Ditch Upgrades, diffusers, slide gates ($60,000-$100,000)
- Magnesium Hydroxide, pH System, Chemical addition ($18,000-$20,000)
- Headworks grit chamber upgrades- removal system ($100,000)
- Sludge pump for Site B ($10,000)

Table 5-8. Selbyville 2020-2025 Capital Projects and Costs

CIP Item	Project Cost
Force main replacement	$ 1,100,000
Total	**$ 1,100,000**

Other Sussex County Collection Systems

Sussex County also operates its collection system in six other sewer districts (Blades, Dewey Beach, Ellendale, Henlopen Acres, Woodlands of Millsboro, and Golf Village). Combined, those service areas encompass 5.6 square miles and have 20 pump stations. The Blades district is treated by the Seaford WWTP, Ellendale is treated by Georgetown WRF, and Dewey Beach and Henlopen Acres are treated by the Rehoboth STP. The Bethel collection system is also owned and operated by Sussex County, but was not included in this report. No I/I issues were reported in any of these four districts.

Financial Analysis

Sussex County bills all its customers according to EDUs; there is no difference between residential and commercial/industrial billing.

Capital Project Costs and Financing Options

Information on capital project costs and financing for these sewer districts is included within the discussion about Sussex County and presented in Table 5-2.

6. PRIVATE FACILITIES

The two largest private purveyors of collection and treatment in Delaware are Artesian Wastewater Management, Inc. (Artesian) and Tidewater Environmental Services, Inc. (Tidewater). These two entities were included in the survey. Other private service providers are:

- Chapel Green Homeowners Association
- Excel Property Management, LLC
- The Hamlet at Dirickson Pond, LLC
- Inland Bays Preservation Company
- Moore Grant Sanitation, Inc.
- Oak Crest Farms
- Utility Systems, Inc.
- Suez Water
- Wastewater Utilities, Inc.
- YMG Corporation

Ten private systems operated by Artesian and Tidewater were included in the survey. Artesian owns 3 systems, all in eastern Sussex County. Tidewater owns 7 systems, one in Kent County and the rest in Sussex County.

Table 6-1. Private Facilities Summary

Private Wastewater Systems	Service Area (square miles)	Pump Stations	Holding Tanks	Hold Tank Capacity (gallons)	Sewer Districts
Artesian - Beaver Creek	0.64	5	0	0	1
Artesian - Heron Bay	0.58	2	0	0	1
Artesian - Stonewater Creek	1.00	4	0	0	1
Tidewater - Bay Front Regional	0.75	3	0	0	2
Tidewater – The Ridings at Rehoboth	0.45	2	0	0	1
Tidewater - Country Grove	0.25	2	0	0	1
Tidewater - Hart's Landing	0.25	2	0	0	1
Tidewater - Milton Regional	1.65	11	0	0	1
Tidewater – The Plantations	0.34	5	0	0	2
Tidewater - The Retreat at Love Creek	0.25	2	0	0	1
Total	**6.16**	**38**	**0**	**0**	**12**

Most of the private facilities are relatively new and do not experience problems, although Tidewater's Milton Regional facility reported I/I issues that have at least partly been addressed. All the privately owned and operated facilities reported having on-site generators as an auxiliary treatment plant backup power supply, except for the Tidewater – Breeder's Crown facility and the Tidewater – Wandendale

Proposed facility, which has multiple electrical feeds available. Four facilities also have portable generators including the Tidewater – Breeder's Crown facility.

All the private facilities receive 100 percent of average daily flow from domestic sources, except for the Tidewater – Milton Regional facility, which receives 5 percent from a brewery and other commercial/industrial sources. The Tidewater – Milton Regional facility is also the only privately owned municipal NPDES permitted surface water discharger in Delaware.

Billing for all facilities is based on EDU, except for Tidewater – Milton Regional, which is based on water meters.

Artesian

All 3 WWTPs use SBR treatment systems and meet standards for land application. The facilities do not have NPDES permits, rather have State groundwater permits. Some of Artesian's collection systems have interconnection with Sussex County so the company can send wastewater flow to the County, although Artesian's long term vision is to get all flow to outfall.

Most of systems are 12-15 years old tops, so are made from PVC pipe. Most I/I is a result of construction, so is temporary (e.g., storms / inflow), which is less than 10% of dry weather flow. Artesian reported that their system experiences some backflow due to stormwater.

Artesian contracts out biosolids and plans in the future to build its own biosolids facility. They also have an agreement for biosolids with the County. The vast majority of customers are residential. SCADA is available at all plants and lift stations and Artesian plans to upgrade the SCADA systems of their wastewater treatment plants and interconnect them with each other. There is currently some interconnection of the system with the Sussex County system.

Underserved Areas

Artesian is servicing development growth to Georgetown and has a CPCN as well as cooperative agreements with the County for sharing their WWTPs for treatment and disposal of waste regionally.

Capital Project Costs and Financing Options

Artesian reported $8.3 M in capital projects for 2019; $4.911 M in planned capital projects for 2020; and $0.432 M in planned capital projects for 2021.

Artesian – Beaver Creek

Artesian's Beaver Creek facility has a service area of 0.64 square miles and consists of one sewer district with 5 pump stations. The facility provides secondary treatment plus nitrogen removal and is in the Broadkill River subwatershed in the Delaware Bay Watershed (#22). The groundwater discharge permit for this facility (359014-063590H) expires on February 8, 2023. Daily maximum TN limits of 25.2 mg/L and daily maximum TP limits of 9.42 mg/L are included in this facility's groundwater permit.

The plant's current design flow is 0.15 MGD, and the average daily flow is 0.06383 MGD, or about 43 percent of design flow. Peak flow at the plant was reported as 0.109906 MGD and the average daily maximum month flow over the past 12-months is 0.085725 MGD. No I/I issues were reported and influent strength was reported to be above normal (> 250 mg/L BOD and TSS). There is some interconnection of the system with the Sussex County system.

Financial Analysis

Artesian bills its customers according to EDU using a monthly flat impact fee per connection.

Artesian – Heron Bay

Artesian's Heron Bay facility has a service area of 0.58 square mile and consists of one sewer district with 2 pump stations. The facility provides secondary treatment plus nitrogen removal and is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The groundwater discharge permit for this facility (359142-03) expires on May 29, 2022. Daily maximum TN limits of 15.7 mg/L; no TP limit is included, but it is monitored monthly.

The plant's current design flow is 0.097 MGD, and the average daily flow is 0.0245 MGD, or about 25 percent of design flow. No I/I issues were reported and the average daily maximum month flow over the past 12-months is 0.028 MGD. Influent strength was reported to be above normal (> 250 mg/L BOD and TSS) and the influent strength of NH3-N was reported as 62.19 mg/L. There is some interconnection of the system with the Sussex County system.

Financial Analysis

Artesian bills its customers according to EDU using a monthly flat impact fee per connection.

Artesian – Stonewater Creek

Artesian's Stonewater Creek facility has a service area of 1.00 square mile and consists of one sewer district with 4 pump stations. The facility provides secondary treatment plus nitrogen removal and is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The groundwater discharge permit for this facility (20221-02) expires on September 30, 2020. A daily maximum TN limit of 10.5 mg/L is included in this facility's groundwater permit; no TP limit is included, but monthly monitoring is required.

The plant's current design flow is 0.225 MGD, and the average daily flow is 0.080545 MGD, or about 36 percent of design flow. No I/I issues were reported and influent strength was reported to be above normal (> 250 mg/L BOD and TSS) and the influent strength of NH3-N was reported as 62.3 mg/L. There are some interconnections with the Sussex County system.

Financial Analysis

Artesian bills its customers according to EDU using a monthly flat impact fee per connection.

Tidewater

Tidewater operates the following 7 systems and surveys have been completed for each system. Six of the 7 are community systems. Most at operating at about half capacity, although they communities are built out.

- Bay Front – 108K gpd
- Country Grove – 54K gpd
- Harts Landing – 39.15K gpd
- Milton – 350K gpd
- The Plantations – 98K gpd
- The Retreat at Love Creek – 483K gpd
- The Ridings at Rehoboth – 70K gpd

Wastewater collection and conveyance is almost all gravity/conventional, although they have a few grinder systems. The groundwater standard for soil treatment systems was lowered to 5 mg/L TN from

10 mg/L. Membrane bioreactors are the preferred technology to meet the 10 mg/L limit, followed by spray irrigation. All systems require groundwater monitoring wells; and for spray, bucket lysimeter (to composite sample). A suction lysimeter can be used for other technologies. The system follows DNREC guidelines for meeting monthly nutrient balancing.

Tidewater provides wastewater service in Milton, where wastewater service is billed based on use water use data and billed quarterly (facilities charge plus metered volume).

The Public Service Commission (PSC) requires that any wastewater system serving over 50 lots must be maintained as a regulated utility. Tidewater has an approved statewide tariff (a PSC regulatory document) and wastewater service fees are billed forward (i.e., not in arrears). Community systems vary by facility, billed monthly ($800-1000/year).

Middlesex Water Company (Tidewater's parent company) provides funds as a combination of equity contribution or debt to establish a capital structure that is consistent with public utility regulatory practices.

Underserved Areas

Tidewater has extended service to one underserved community in 18 years: Quaint Acres. Docket 15 – 2006 provides that to extend to serve new areas, growth must pay for itself (i.e., developers pay for new line, new plant if required). Tidewater reported that it would be beneficial if WIAC or DNREC mandated connections or provided funding. Tidewater was recently awarded construction contract, using SRF funding to defray some costs. Tidewater can serve communities if they are within their CPCN and is very interested in working with DNREC on this if the PSC would waive the docket.

Tidewater – Bay Front Regional

Tidewater's Bay Front Regional facility has a service area of 0.75 square mile and consists of one sewer district with 3 pump stations serving a population of 957 (319 households). The plant technology is a membrane bioreactor that is approximately 12 years old with a 4-stage Bardenpho design for nitrogen removal. Rapid infiltration beds (RIBs) is used for disposal and spare beds are already fully constructed.

The facility provides secondary and tertiary treatment plus nitrogen removal and is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The groundwater discharge permit (359008-04) for this facility expires on January 1, 2023. Annual average daily mean TN limits of 10 mg/L are included in this facility's groundwater permit; no TP limit is included.

The plant's current design flow is 0.108 MGD, and the average daily flow is 0.029953 MGD, or about 28 percent of design flow. Peak flow at the plant was reported as 0.037 and the average daily maximum month flow over the past 12-months is 0.034 MGD. No I/I issues were reported. Influent strength was reported to be above normal (> 250 mg/L BOD and TSS), the influent strength of NH3-N was reported as 45 mg/L, and TN of 65 mg/L.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection.

Tidewater – The Ridings at Rehoboth

The Ridings at Rehoboth has a service area of 0.45 square mile and consists of one sewer district with 2 pump stations serving a population of 224. The facility provides secondary treatment plus nitrogen removal using a dual sequential batch reactor (SBR), cycled to optimize nitrogen removal, controlled aeration, and aerobic sludge storage. Improvements made to the aeration and dosing beds control system

were made in 2017-2018. The plant is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The groundwater discharge permit for this facility (359286-04) expired on August 26, 2019. TN limits of 10 mg/L are included in the expired facility's groundwater permit; no TP limit is included.

The plant's current design flow is 0.07 MGD, and the average daily flow is 0.0224 MGD, or about 32 percent of design flow. Peak flow at the plant is 0.113 and the average daily maximum month flow over the past 12-months is 0.031 MGD. No I/I issues were reported. Influent strength was reported to be above normal (>250 mg/L BOD and TSS), the influent strength of NH3-N was reported as 50 mg/L and TN as 65 mg/L.

The collection system is PVC pipe and relies on gravity flow to the community lift station or plant lift station and force main to the treatment plant.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection.

Tidewater – Country Grove

Tidewater's Country Grove facility has a service area of 0.25 square mile and consists of one sewer district with 2 pump stations serving a population of 198 (66 households). The facility provides secondary treatment plus nitrogen removal and is in the Broad Creek sub watershed in the Chesapeake Bay Watershed (#35). The plant's technology is Dual Sequential Batch Reactors (only one is in use at present) with RIBs disposal. The groundwater discharge permit for this facility (204220-OPB) expired on November 5, 2017. A new permit is pending. Average annual daily mean TN limits of 10 mg/L are included in this facility's expired groundwater permit; no TP limit is included.

The plant's current design flow is 0.054 MGD, and the average daily flow is 0.016198 MGD. The average daily maximum month flow over the past 12-months is 0.02 MGD. No I/I issues were reported. Influent strength was reported to be about normal (150-250 mg/L BOD and TSS) and the influent strength of NH3-N was reported as 30 mg/L.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection.

Tidewater – Hart's Landing

Tidewater's Hart's Landing facility has a service area of 0.25 square mile and consists of one sewer district with 2 pump stations serving a population of 429 (143 households). The facility provides secondary and tertiary treatment plus nitrogen removal and is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The plant's technology is a membrane bioreactor that is approximately 15 years old with a 4-stage Bardenpho design for nitrogen removal and drip dispersal disposal beds. The groundwater discharge permit for this facility (359119-02) expires on November 1, 2022. Average annual TN limits of 10 mg/L are included in this facility's groundwater permit; no TP limit is included.

The plant's current design flow is 0.03915 MGD, and the average daily flow is 0.019259 MGD, or about 49 percent of design flow. The average daily maximum month flow over the past 12-months is 0.031 MGD. No I/I issues were reported. Influent strength was reported to be about normal (150-250 mg/L BOD and TSS), the influent strength of NH3-N was reported as 35 mg/L and 45 mg/L for TN.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection.

Tidewater – Milton Regional

Tidewater's Milton Regional facility has a service area of 3 square miles and consists of 3 sewer districts with 10 pump stations serving a population of 5,193 (1,731 households). The facility provides primary, secondary, and tertiary treatment and some solids handling. The plant's technology consists of grit removal, primary sedimentation, rotating biological contactors (4 in series), chemical addition, secondary sedimentation, sand filters, chlorination-dechlorination, anaerobic sludge storage, and centrifuge for dewatering. It has a surface water discharge to the Broadkill River and then to Delaware Bay (Watershed #22). The NPDES permit for this discharge (0021491) expired on April 30, 2016. Daily mean TN and TP loads in the expired permit are 36.5 and 13.1 lbs. per day, respectively.

The plant's current design flow is 0.35 MGD, and the average daily flow is 0.17648 MGD, or about 50 percent of design flow. Peak flow at the plant is 0.462. No I/I issues were reported. Influent strength was reported to be above normal (> 250 mg/L BOD and TSS) and the influent strength of NH3-N was reported as 40 mg/L.

The Milton collection system is made from various piping material (clay, PVC) in gravity and force main. The 9 lift stations all feed to Front Street main lift station which supplies to the plant. There are no known combined sewers. Smoke testing and sewer camera work has been performed, which led to re-lining projects. Older collection system includes some areas of clay pipe and brick lined manholes, and low-lying river front community allows for some I/I. Typical rain event may result in flow increases of 10-15% of average daily flow. Several re-lining projects completed and underway of piping and manholes.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection. Tidewater reported that a new plant is needed in Milton and identified $14.5M in capital needs for 2020–2025.

Tidewater – The Plantations

The Plantations has a service area of 0.34 square mile and consists of one sewer district with 5 pump stations. The facility provides secondary treatment and relies on an aerobic pond, 2 large storage lagoons, chlorine disinfection, and spray irrigation to 5 Zones on over 20 acres. The plant is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The groundwater discharge permit for this facility (359229-04) expired on March 4, 2019. The expired permit limits TN in sprayed effluent to 340 lbs./year and the facility is required to demonstrate nutrient uptake based upon crop uptake and harvest rates. Monitoring Wells and Lysimeters are used to confirm nutrient uptake rates.

The plant's current design flow is 0.098 MGD, and the average daily flow is 0.038 MGD, or about 63 percent of design flow. Peak flow at the plant is 0.062 and the average daily maximum month flow over the past 12-months is 0.0756 MGD. No I/I issues were reported. Influent strength was reported to be about normal (150-250 mg/L BOD and TSS) and the influent strength of NH3-N was reported as 30 mg/L.

There are two collection systems, East and West. East is comprised of PVC gravity flowing through 2 lift stations, to the aerobic pond. West is comprised of PVC gravity flowing through 3 lift stations, to the aerobic pond.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection.

Tidewater – The Retreat and Love Creek

Tidewater's Retreat at Love Creek facility has a service area of 0.25 square mile and consists of one sewer district with two pump stations serving a population of 155. The facility provides secondary treatment plus nitrogen removal and is in the Rehoboth Bay subwatershed in the Inland Bays/Atlantic Ocean Watershed (#39). The plant's technology is a dual sequential batch reactor (SBR), cycled to optimize nitrogen removal with controlled aeration and aerobic sludge storage. Improvements were made to the aeration and dosing beds control system in 2017-2018. The groundwater discharge permit for this facility (359285-02) expires on November 15, 2020. TN limits of 10 mg/L are included in this facility's groundwater permit; no TP limit is included.

The plant's current design flow is 0.0483 MGD, and the average daily flow is 0.0175 MGD, or about 36 percent of design flow. Peak flow at the plant is 0.0297 MGD and the average daily maximum month flow over the past 12-months is 0.02 MGD. No I/I issues were reported. Influent strength was reported to be above normal (>250 mg/L BOD and TSS), the influent strength of NH3-N was reported as 50 mg/L and TN as 70 mg/L.

Financial Analysis

Tidewater bills its customers according to EDU using a monthly flat impact fee per connection.

7. CONCLUSIONS AND RECOMMENDATIONS

Wastewater – General Findings

- Most wastewater service providers are concerned about the costs associated with managing their long-term investments while trying to meet increasingly stringent performance standards or uncertain future standards.
- The decisions faced by the owner or operator require them to determine how well upgrades or new installations are expected to perform against unknown future standards—and furthermore, making judgment calls on whether upgrades or installations will themselves be upgradable later.

Future Growth

- Regionalization and interconnectivity versus plant expansion or new plant installations
- Ability to discharge to surface or groundwater (RIBs or Spray)
- Relationship between public and private enterprises

Wastewater Treatment Plants

- Treatment level and treatment type vary throughout Delaware and plants vary widely in age, discharge type, permit limits, facility size and flow rate.
- Better coordination is needed between private and public treatment facilities.
- Enhanced nutrient removal to meet the Chesapeake Bay TMDL and other effluent requirements continue to be a major focus. Most plants meet current permit limits but are concerned about future limits.

Wastewater Treatment Plant Recommendations

- Develop a long-term projection of effluent requirements/treatment levels throughout Delaware to help decision-makers compare plant abandonment to plant upgrades versus regionalization.
- Reevaluate plant capacities and revise growth projections for overdesigned/oversized plants (e.g., private plants in new, underdeveloped communities).
- Consider whether “right-sizing” plants is viable for controlling costs (e.g., mothballing certain elements or phasing in treatment capacity).
- Look for opportunities to treat municipal wastewater at private plants, which may both improve the operation and finances at the private plants and alleviate excess flows at municipal plants.

Collection Systems and Service Areas

- Have multiple types of ownership and contract agreements (several types exist in Delaware)
- Collection systems require nearly continuous maintenance and upgrades, particularly systems with force mains and pump stations. In addition, force main/pump station systems generally require a substantial amount of electricity to function.
- Many older systems have infiltration and inflow (I/I) issues and most have asset management plans, but some do not.
- A particularly challenging cause of I/I, indicated by several communities in all 3 counties, is wet weather events occurring in conjunction with coastal storms.
- Communities that rely on spray irrigation and other forms of disposal to groundwater noted recent high rainfall years as particularly challenging.

Collection System and Service Area Recommendations

- Communities are taking various measures to increase resiliency to address I/I issues. Since I/I can be a major factor causing flows that exceed treatment capacity and can lead to other issues such as SSOs, WIAC should consider establishing policies that comprehensively address I/I, as well as prioritize and incentive I/I projects.
- Consider polices that prioritize and encourage I/I projects (policy, loan and grant application reviews; progressive rate structure for contract users).
- DNREC should use its discretion in evaluating loan and grant applications to encourage that I/I issues get resolved before approving other loans or grants for increased treatment plant capacity (compare cost-feasible I/I projects to “no action”).
- WIAC and DNREC should develop policy that universally addresses the notion of how a regional plant can influence a contract user to resolve I/I issues.
- Facilitate development of satellite user contract agreements where applicable, especially where nutrient regulations are becoming more stringent (Chesapeake Bay and Inland Bays).
- Consider performing a study on industrial discharges into municipal sewers, especially in areas where PCBs are an upcoming TMDL concern for municipal WWTP’s (wastestream characterization opportunities, pollution prevention, pretreatment requirements and industrial wastewater reuse).

Wastewater Finance and Future Capital

- Rates vary among municipal and private wastewater across the state. In areas where anticipated growth projections have not been realized, fewer rate payers are available to share the cost burden necessitating higher rates.
- The internal information collection and reporting practices, capabilities and organizations of municipal service providers varies, from no reporting mechanisms to extreme detail, resulting in inadequate data quality available for the survey. Examples include:
    - The survey results were difficult to determine when small replacements/enhancements go from being O&M to “a project”

  - How should a provider report minor capital improvement project funding (e.g., a 3-year plan to do small projects throughout multiple plants or collection systems)?
  - How long-term strategies such as I/I or major plant upgrades are reported.
  - Inconsistent timeline-reporting (some municipalities have a 0-2-year outlook; some have a 20-year outlook).
  - Some municipalities reported ongoing or previous expenses that are yet to be paid for as part of their future funding needs

- Some municipalities stated that it is easier to take advantage of private loans or to issue bonds than to apply for SRF funds or competitive grants

- Some municipalities stated that it is easier to take advantage of private loans or to issue bonds than to apply for SRF funds or competitive grants

Wastewater Finance and Future Capital Recommendations

- Consider available options for optimizing the use of public-private partnerships if/when the base assumptions under which many of the private or small systems were developed never come to pass (i.e., what to do if growth projections are not met so that small facilities can still be part of a sustainable, long-term approach?).
- Continuously track rates (annually or otherwise deemed appropriate) and have better rates coordination between the PSC and DNREC.
- Solicit a better understanding of break-even on short-term or annual O&M / small projects budgets compared to long term planning budgets.
- Enhance survey questions asked about reserve accounts and expenditure information (CIPs and whether costs associated with basic O&M expenditures are within budget or are being borrowed) and solicit a better break-out of capital reserve types.
- Increase awareness of the Federal Water Infrastructure Finance and Innovation Act (WIFIA) as well as other potentially-available federal funds for wastewater infrastructure.

Overarching Recommendations

- DNREC and WIAC should continue to meet their statutory requirements to coordinate directly with municipalities regarding long-term planning for existing and future treatment standards and identify/create funding mechanisms to fund projects or technical transfer efforts and further guidance to help municipalities to meet the standards, including future nutrient effluent limits based on TMDLs.
- DNREC should continue to coordinate CIP funding cycles with municipalities; DNREC and WIAC should continuously monitor:
  - Indicators of new development
  - Changes in available existing capacity

- Changes in per capita flow rates.

APPENDIX A. WASTEWATER SURVEY TEMPLATE

Delaware Wastewater Study - System Report

ID:

Entity ID:

A. General

1. **Contact(s):**
   a. **Name:**
   b. **Title:**
   c. **Email:**
   d. **Telephone:**
   e. **Fax:**

2. **Interviewer Name:**

3. **Interview Date:**

4. **Entity responsibilities (check all that apply):**

☐Collection
☐Transmission
☐Treatment
☐Solids
☐Other (Describe):

5. **Is entity responsible for multiple water supplies or treatment plants? (If "yes", the survey must be filled out for each supply/treatment system)**

6. **Ownership**

Ø Municipal
Ø Municipal Authority
Ø Private Investor Owned
Ø Private Non-Investor Owned
Ø Other (Describe)

7. **Does the entity have the capacity to extend sewer to nearby underserved communities?**

Ø Yes Ø No

If yes; are there any plans in future to extend sewer to nearby underserved communities?

8. **General Comments**

B. Treatment Plant

1. **Wastewater Treatment Plant Name:**

2. **Physical Address:**

3. **General Level of Treatment (check all that apply):**

☐Primary treatment
☐Secondary treatment
☐Tertiary treatment
☐Nitrogen removal
☐Phosphorus removal
☐Other (Describe)

4. **What is the source of treatment plant back-up power (check all that apply):**

☐On-site Generator (diesel/gasoline)
☐On-site Generator (natural gas from main)
☐On-site Generator (propane / natural gas from tank)
☐Portable Generator
☐Battery
☐None
☐Other (Describe)

5. **Permit Information: General (Fill out the Table for each permit ID)**

Permit ID	Permit Type	Discharge Type	Discharge Location	Watershed	Latitude (decimal degree)	Longitude (decimal degree)	Permit Capacity	Permit Issuance Date	Permit Expiration Date

6. **Treatment Plant Capacity:**

   Current Design Flow (MGD): _____

   Average Daily Flow (MGD): _____

   Peak Flow (MGD): _____

   % of Average Daily Flow from Domestic Source: _____

   Average Daily Max Month Flow (ADMM) over the past 12 months: _____

   Anticipated Flow in 2020 (MGD): _____

7. **Has the plant exceeded its current design flow capacity for 2 or more consecutive months in the past 2 years?**
   ☐ Yes
   ☐ No

8. **Are the flows greater than the permitted limit due to excessive infiltration and inflow (I/I)? (See Service Area Question #11 to describe I/I problem)**
   ☐ Yes
   ☐ No

9. **Permit Limits**

Outfall	Parameter	Load			Concentration				Measurement Frequency	Sample Type
		Daily Mean	Daily Max	Units	Daily Min	Daily Mean	Daily Max	Units		

Influent Wastewater Strength

10. **Over the last 12 months, what was the typical average strength of the influent wastewater BOD and TSS?**

    ☐ About Normal (150-250 mg/l BOD and TSS)

    ☐ Above Normal (>250 mg/l BOD and TSS) Reason: _____

    ☐ Below Normal (<150 mg/l BOD and TSS) Reason: _____

Nitrification

11. What is the typical average strength of the influent wastewater NH3-N?

12. Is the facility required to remove ammonia nitrogen (NH3-N, nitrification)?

13. Has the facility been in non-compliance for ammonia nitrogen for 2 or more consecutive months within the last 2 years?

14. What was the cause of the non-compliance with the ammonia nitrogen limits?

☐ Wash out of biomass due to inflow and infiltration
☐ Equipment failure
☐ Design issues
☐ Operational issues
☐ Unknown
☐ Other (Explain)
☐ Low alkalinity
☐ Low dissolved oxygen
☐ Low temperature
☐ Toxic shock

Total Nitrogen

15. Does the facility or anticipate having (within 5 years) total nitrogen limits in the permit based on TMDL or other control strategies?

☒ Yes, actual limits in place

☒ No limits currently, ANTICIPATE limits.

☒ No limits currently, DO NOT ANTICIPATE limits.

16. Does the facility have or anticipate having (within 5 years) total nitrogen limits in the permit based on TMDL or other control strategies?

17. Do you anticipate any problems in complying with the ANTICIPATED total nitrogen limits?

18. What problems do you anticipate?

Total Phosphorus

19. Does the facility have or anticipate having (within 5 years) total phosphorus limits in the permit based on TMDL or other control strategies?

☐ Yes, actual limits in place

☐ No limits currently, ANTICIPATE limits.

☐ No limits currently, DO NOT ANTICIPATE limits.

20. Has the facility experienced problems in meeting actual total phosphorus limits within the last 2 years?

21. Do you anticipate any problems in complying with the ANTICIPATED total phosphorus limits?

22. What problems do you anticipate?

Effluent Problems

23. Has the facility experienced non-compliance with any other parameters for 2 or more consecutive months within the last 2 years (excluding ammonia nitrogen, total nitrogen, and phosphorus)?

☐ pH ☐ cBOD ☐ TSS ☐ Enterococcus/Fecal Coliforms
☐ Metals (any) ☐ PCBs ☐ Total Residual Chlorine
☐ Other (Explain):

24. What was the cause of the above non-compliance?

☐ Wash out of biomass due to inflow and infiltration ☐ Low temperature
☐ Toxic shock ☐ Operational issues
☐ Equipment failure ☐ Design issues
☐ Unknown
☐ Other (explain)

25. General Treatment Plant comments:

C. Service Area

1. **Service area, square miles:**

2. **Number of pump stations (fill out one column per pump station below):**

Pump station					
Pump station size (gallons)					
Pump size (horse power)					
Pump output (gallons per minute)					

3. **What is the source of back-up power at pump stations?**

☐ On-site Generator (diesel/gasoline) ☐ Portable Generator
☐ On-site Generator (natural gas from main) ☐ Battery
☐ On-site Generator (propane/natural from tank) ☐ None
☐ Other (Explain):

4. **Number of holding tanks:**

5. **Sewer districts included in service area (in whole or in part):**

City/ Town	Contract User	Percent Service Area	Number of Households	Average Sewer Rate ($/Yr)*	Total Annual Residential Revenue ($)

***Basis of sewer charges:**

☐ Metered water usage
☐ Other (explain)

6. **Population Served:**

Population	Current	Future (2030)
Resident		
Non-Resident		
TOTAL		

7. **Is the service area map digitized?**

8. **Has the service area map been provided as part of this survey? Please attach or send.**

9. **Provide a narrative description and status of the service area (include information about your combined sewer system, if applicable).**

10. **Describe your system's I / I problem (include details on flow or percent flow to help quantify the issue).**

11. **Does your entity have an asset management program? If Yes; please describe.**

12. **Other Service Area Comments:**

D. Finance

1. **Is sufficient revenue being generated to meet the cost of the wastewater enterprise without transfers from other enterprises?**
2. **If the revenue is not sufficient, please explain why:**
3. **Do you have a reserve account?**
4. **Is your reserve account, or a portion of the reserve account, restricted to the wastewater enterprise?**
5. **What is the percent value (%) in the wastewater reserve account when compared to the overall?**
6. **Reserve account restrictions / comments (example: "emergency repairs only"):**

7. **How are residential customer rates/bills computed (check all that apply)?**

☐EDU ☐Metered ☐Tap Size ☐Front-footage assessment

☐Other (Describe):

8. **How are commercial, industrial, and contract user rates/bills computed (check all that apply)?**

9. **Median Household Income (MHI) ($/year)**

10. **How much additional revenue could be generated per year if residential water charges were increased to:**

1.5 Percent of MHI

2.0 Percent of MHI

2.5 Percent of MHI

11. **What is the debt borrowing limit ($)?**

12. **How much of this limit ($) is allocated to the wastewater enterprise?**

13. **How much of this limit ($) available to the wastewater enterprise is used overall?**

14. **Finance, Borrowing Limit and Debt Comments:**

E. Reuse

1. **Has this reporting entity evaluated opportunities for reuse via:**

Reuse	No	No, but not interested	Yes, but not viable	Yes, some planning performed	Yes, currently implementing some reuse now
Land application for agricultural use					
Commercial/industrial use					
Residential use					
Municipal wastewater sludge reuse					
N/A-Additional reuse method not specified					

2. **Comments (options considered, opportunities, barriers):**

3. **If interested in beneficial reuse via irrigation, can the domestic wastewater effluent consistently meet the effluent limitations for Unlimited Public Access Sites as required in Part II, B, Section 303, (2) c of the Guidance and Regulations Governing the Land Treatment of Wastes?**

   ☐ Yes

   ☐ No

4. **Comments (to further explain your response to #3):**

5. **What is the availability and potential interest of owners of agricultural lands nearby for irrigation?**

6. **What are the current permit requirements that may be satisfied with a wastewater reuse alternative(s) to the current situation?**

7. **What are the necessary wastewater facilities upgrades needed and associated costs for wastewater reuse options?**

Description	Cost Estimates ($)

8. **If reuse is not an option, what other methods are available to manage effluent?**

9. **List any other reuse, green technologies, or energy efficiency upgrades that the wastewater enterprise has, or plans to have, and the funding strategy used to implement or convert to new technologies (examples: methane capture, solar panels, N/P pelletizing):**

APPENDIX B. WASTEWATER UTILITY SERVICE AREA MAPS

1.0 WASTEWATER REPORT FIGURES

Below are the figures for the Wastewater report for entities. Below Table 1 are countywide area maps for New Castle County (Figure 1), Kent County (Figure 2), and Sussex County (Figure 3). Following those figures are figures associated with all individual service entities included in Table 1.

Table 1. Drinking water utilities in Delaware.

Utility	County or Private	Wastewater Map Details	Figure
Artesian	Private	Service area map, 2019	Figure 4
Tidewater	Private	Service area map, 2019	Figure 5
Middletown	New Castle	Zoning map, 2019	Figure 6
New Castle County	New Castle	No map provided in 2019, service area extent, features, and pipelines approximated based on data from 2009	Figure 7
Newark	New Castle	Service area map, 2019	Figure 8
Wilmington	New Castle	No map provided in 2019, service area extent, features, and pipelines approximated based on data from 2009	Figure 9
Camden-Wyoming	Kent	Service area pipelines map, 2019	Figure 10
Clayton	Kent	Service area pipelines map, 2019	Figure 11
Dover	Kent	CPCN boundary map, 2019	Figure 12
Harrington	Kent	Service area pipelines map, 2019	Figure 13
Kent County	Kent	Service area map, 2019	Figure 14
Milford	Kent	Service area map, 2019	Figure 15
Smyrna	Kent	No map provided in 2019, sewer pipes presented as of 2009	Figure 16
Bridgeville	Sussex	No map provided in 2019, sewer pipes and pump stations presented as of 2009	Figure 17
Delmar	Sussex	Service area pipelines map, 2019	Figure 18
Georgetown	Sussex	Service area pipelines map, 2019	Figure 19
Greenwood	Sussex	No map provided in 2019, sewer pipes and pump stations presented as of 2009	Figure 20
Laurel	Sussex	Service area pipelines map, 2019	Figure 21
Lewes	Sussex	Service area pipelines map, 2019	Figure 22
Millsboro	Sussex	Service area pipelines map, 2019	Figure 23
Rehoboth Beach	Sussex	Service area pipelines map, 2019	Figure 24
Seaford	Sussex	Service area pipelines map, 2019	Figure 25
Selbyville	Sussex	Service area pipelines map, 2019	Figure 26
Sussex County	Sussex	No map provided in 2019, service areas identified based on shapefiles from 2009	Figure 27

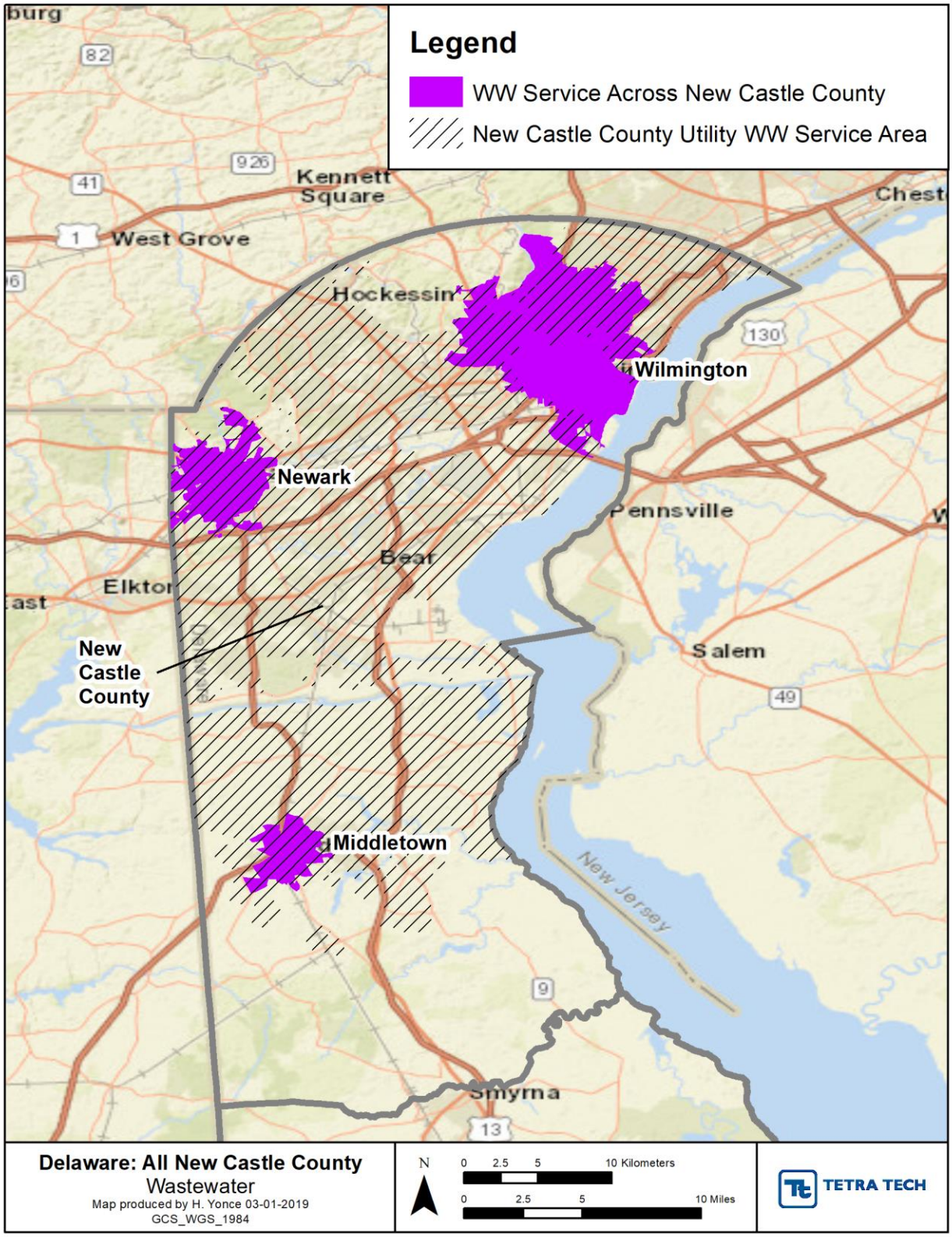


Figure 1. Map of Wastewater utility locations in New Castle County (private utility coverage is excluded, see individual private utility maps for service area information).

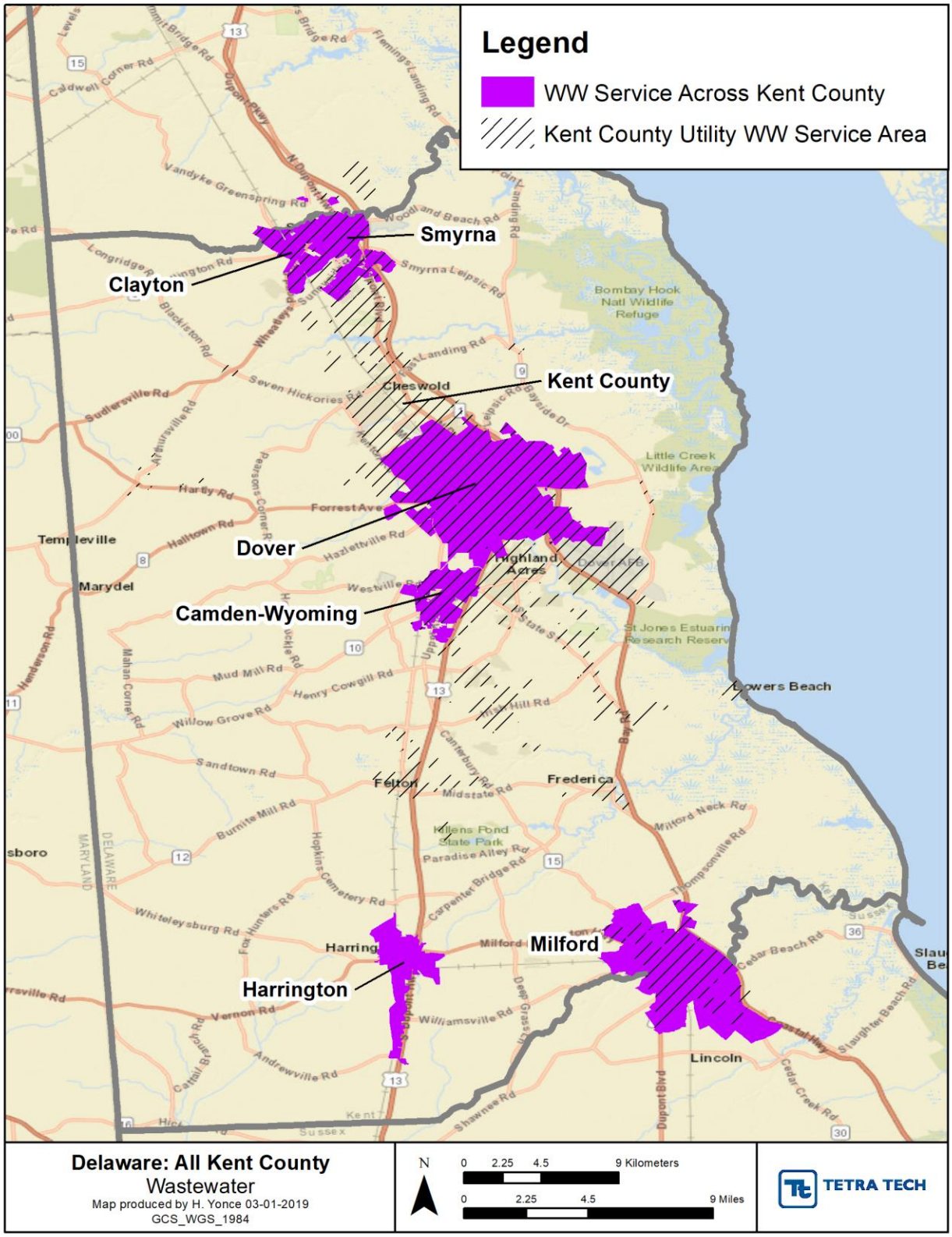


Figure 2. Map of Wastewater utility locations in Kent County (private utility coverage is excluded, see individual private utility maps for service area information).

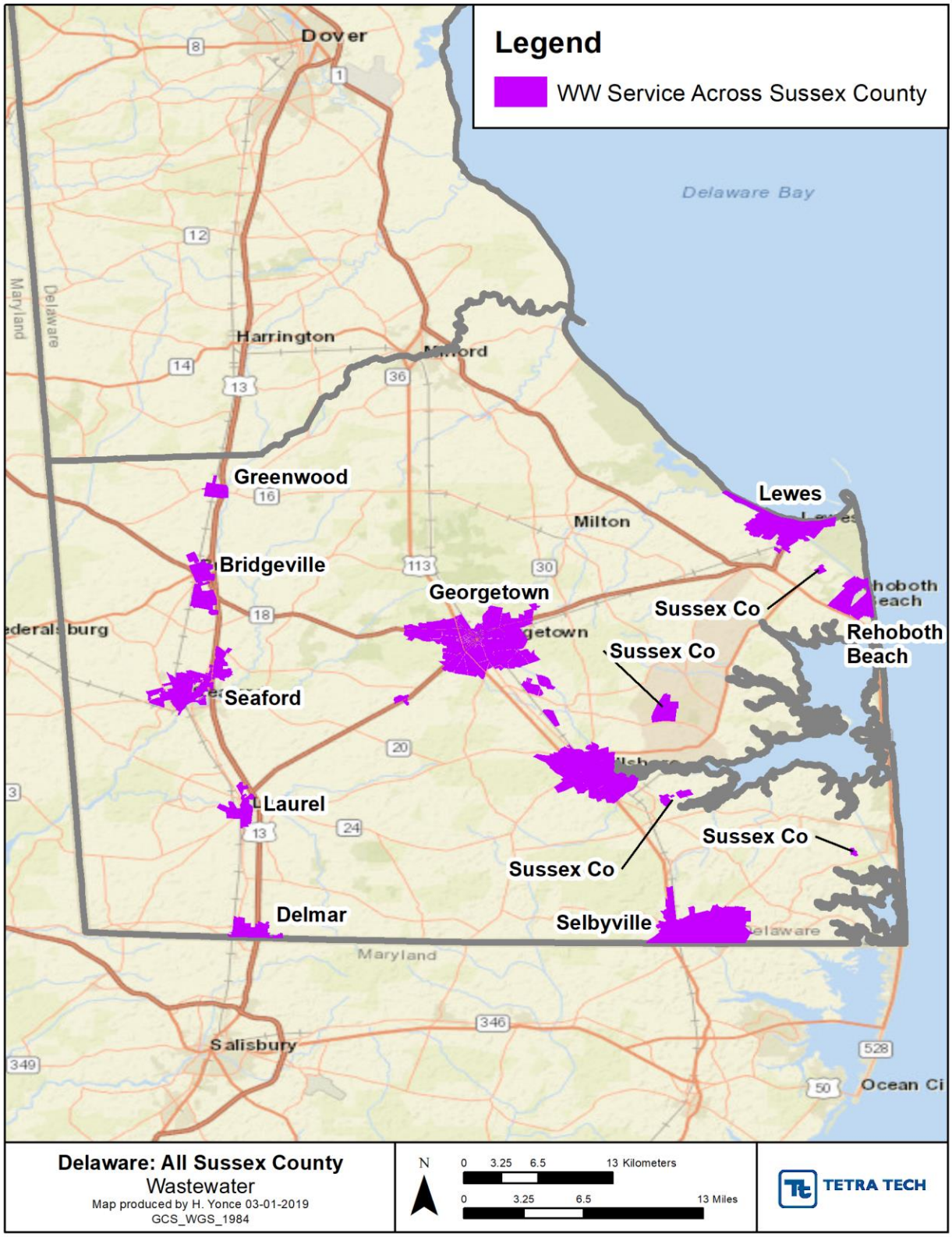


Figure 3. Map of Wastewater utility locations in Sussex County (private utility coverage is excluded, see individual private utility maps for service area information).

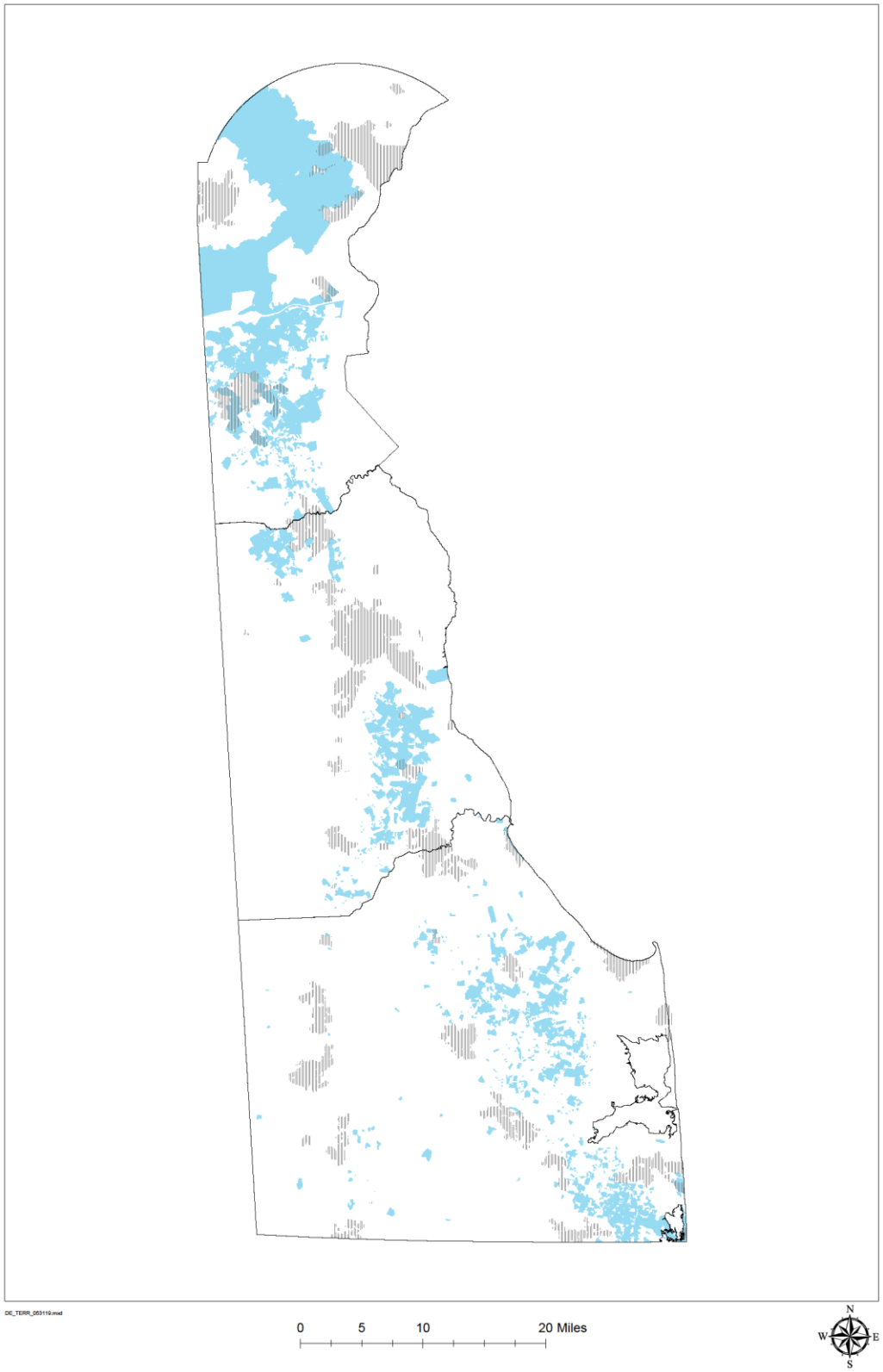


Figure 4. Map of Wastewater utility service area statewide: private utility Artesian (provided in 2019).

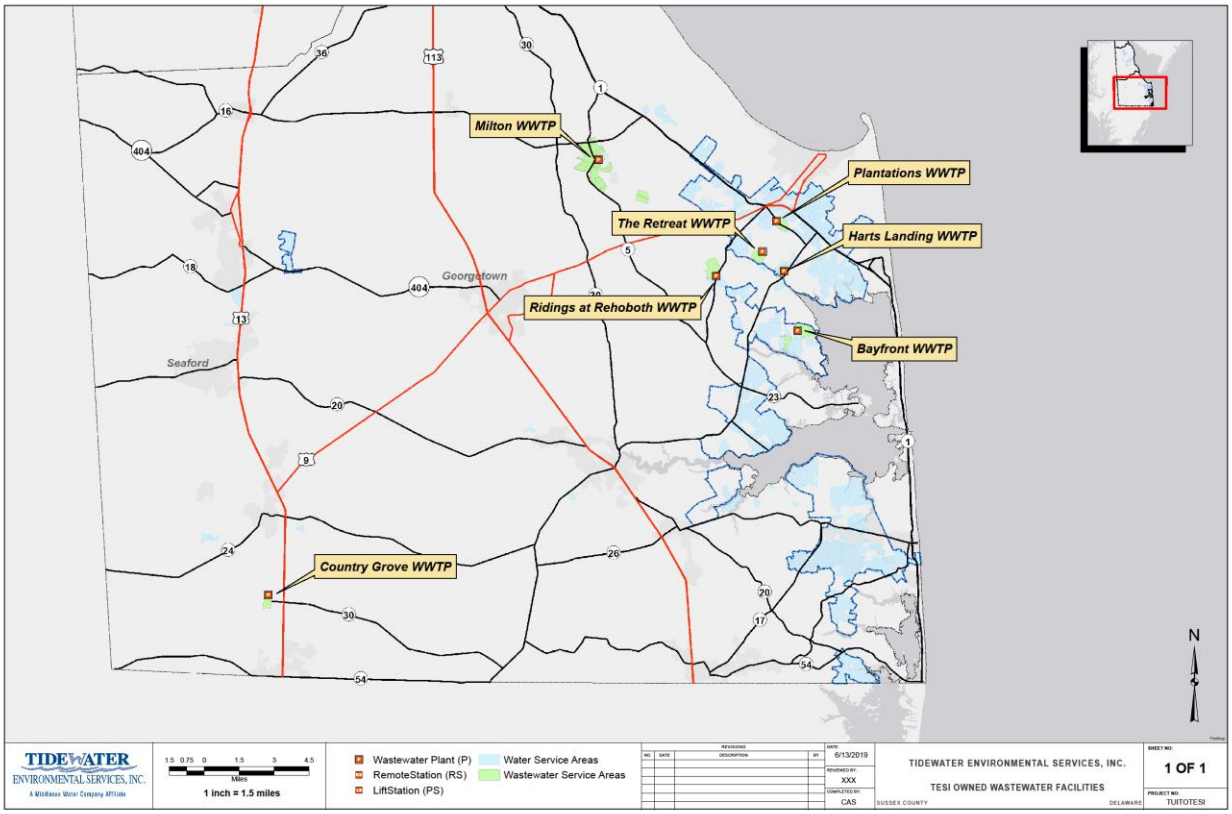


Figure 5. Map of Wastewater utility service area statewide: private utility Tidewater (provided in 2019).

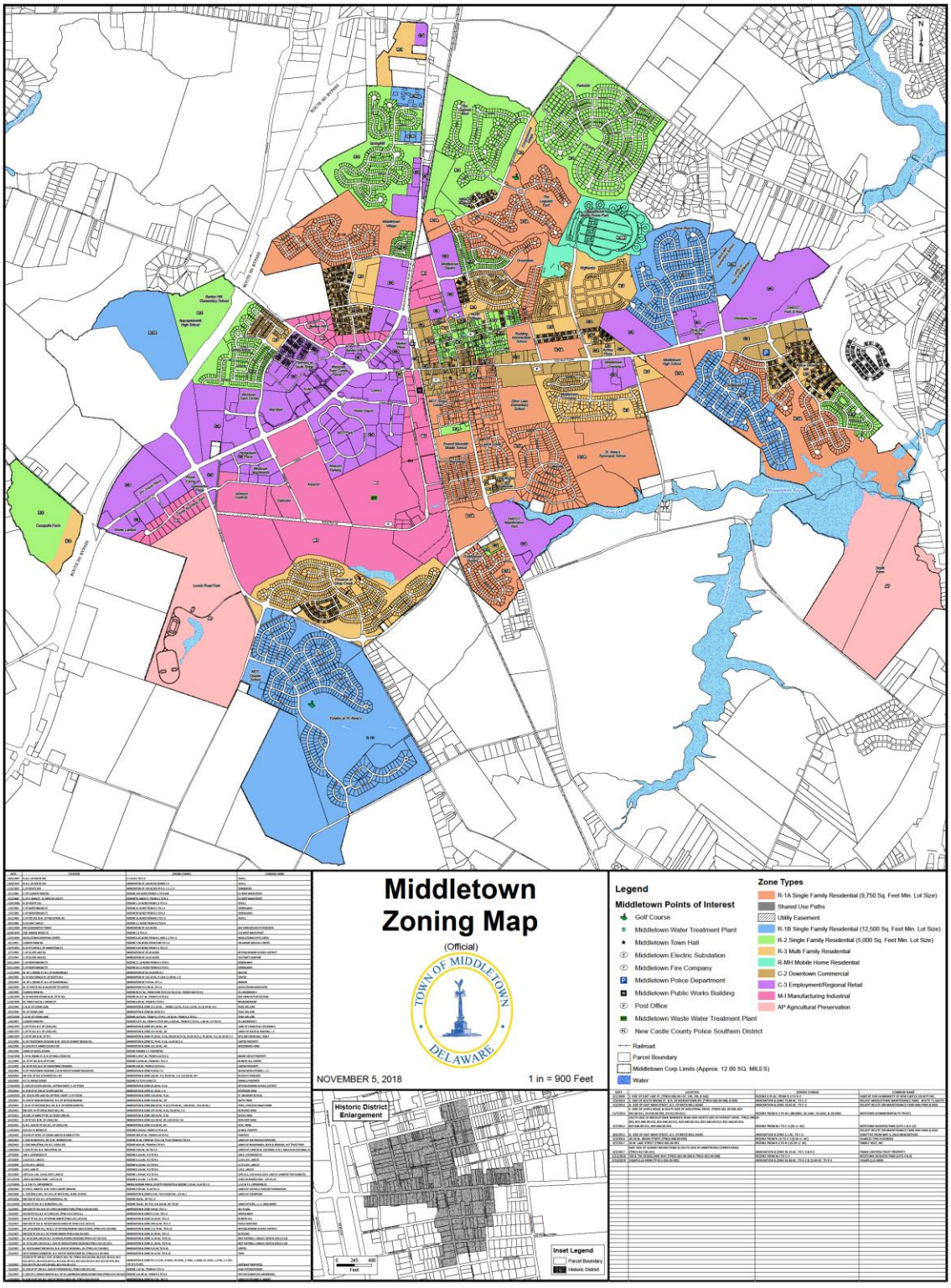


Figure 6. Map of Wastewater utility service area in New Castle County: Middletown (zoning map provided in 2019, no water service or pipes maps).

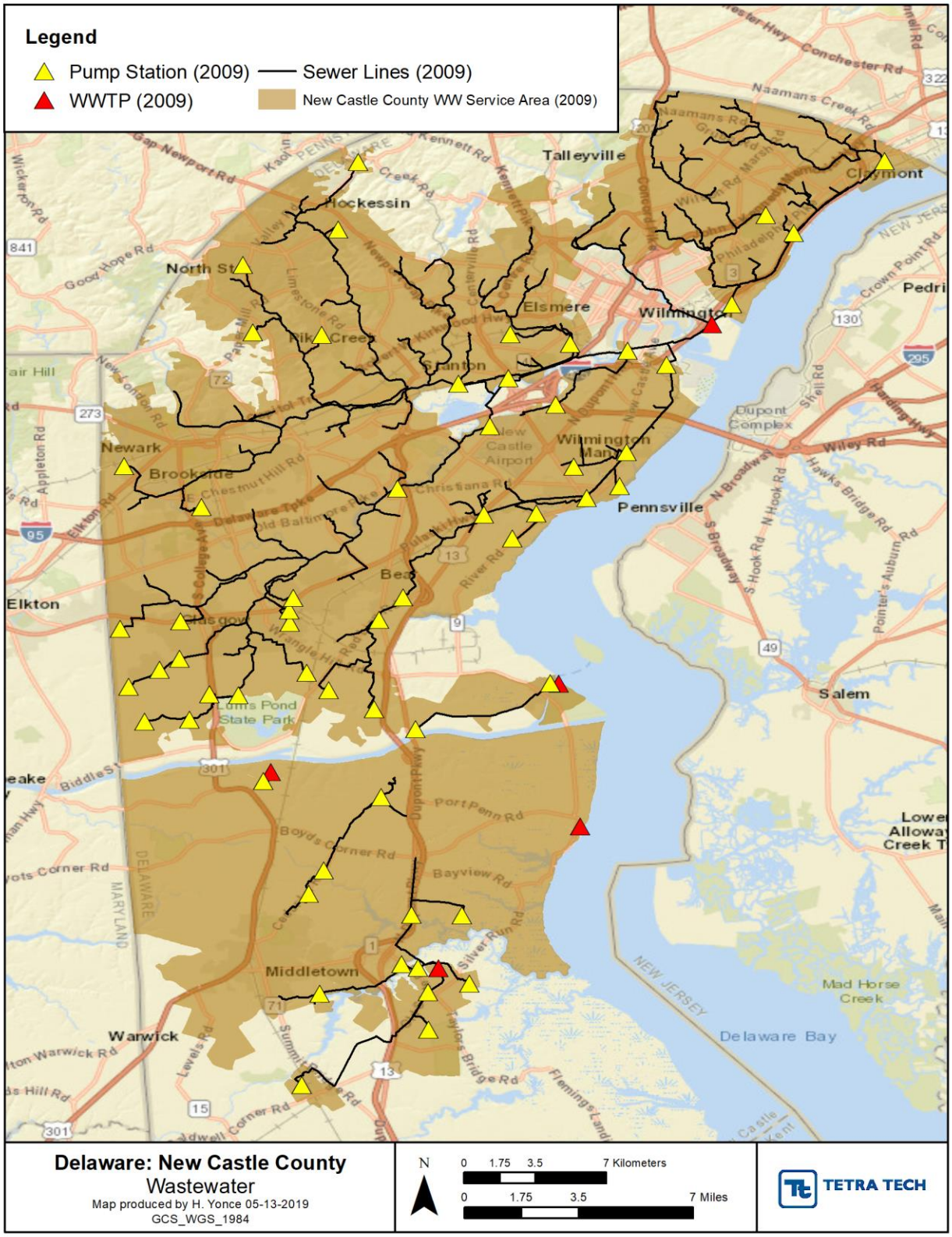


Figure 7. Map of Wastewater utility service area in New Castle County: New Castle County (no map provided in 2019, map shows service area and features as of 2009).

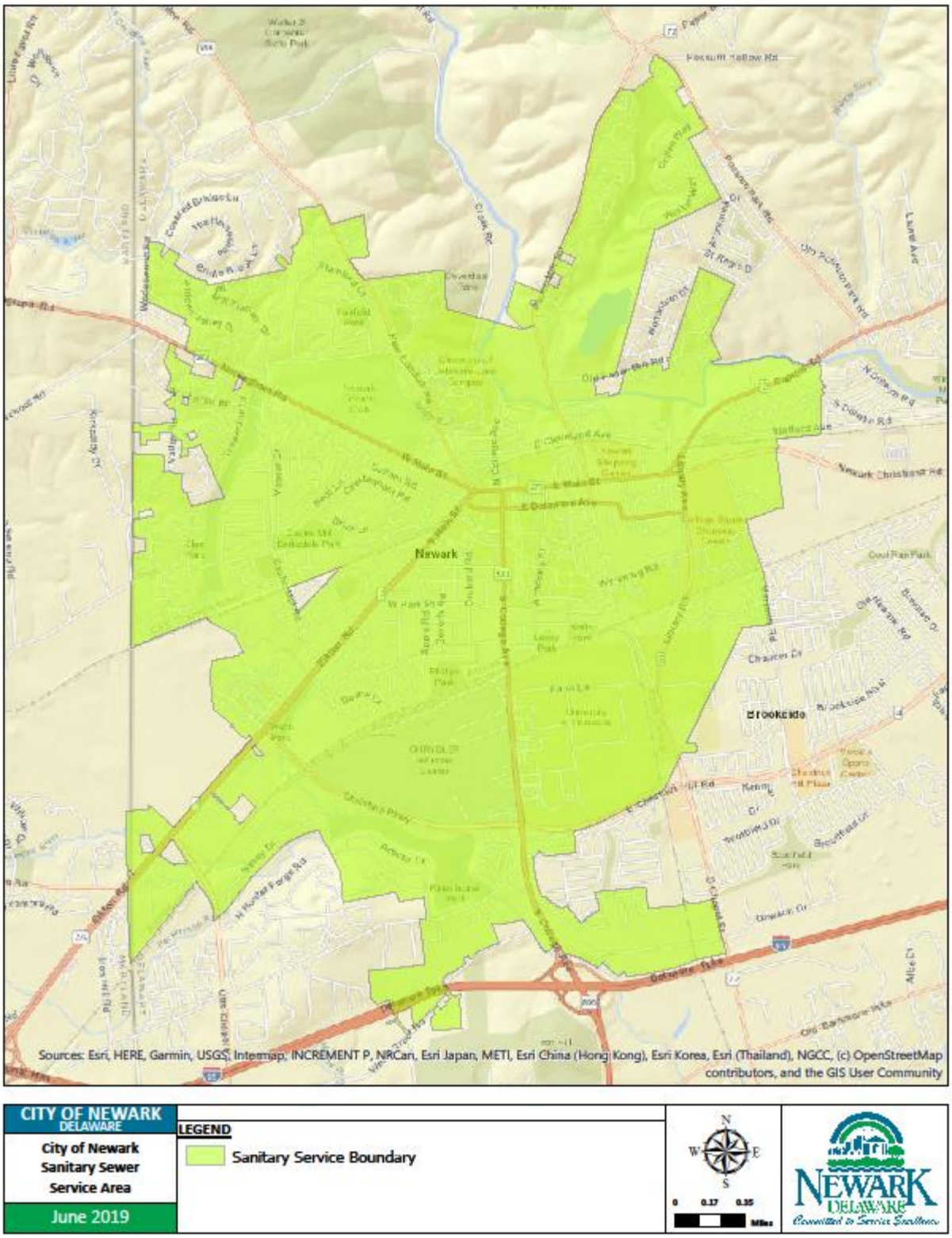


Figure 8. Map of Wastewater utility service area in New Castle County: Newark (provided in 2019).

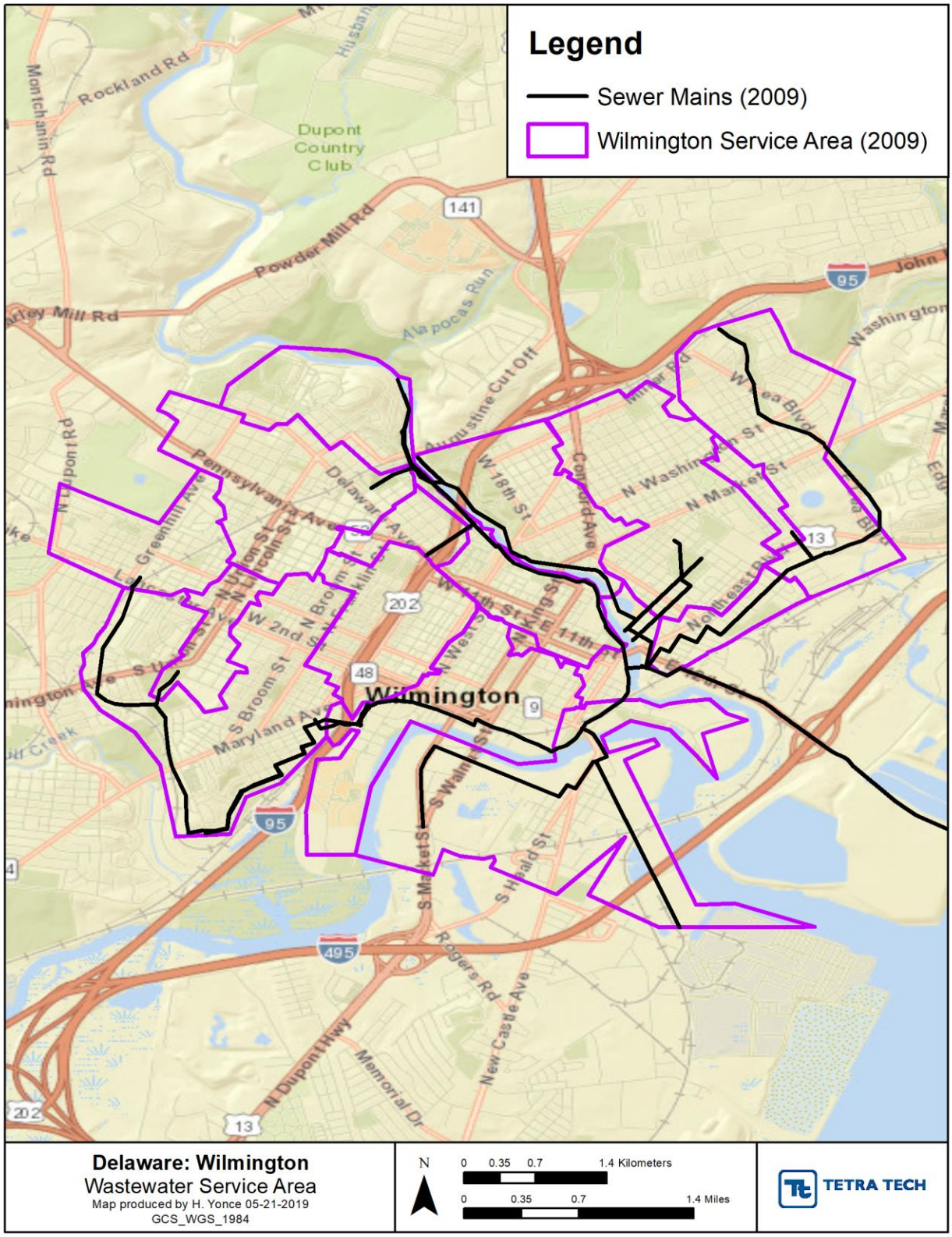


Figure 9. Map of Wastewater utility service area in New Castle County: Wilmington (no map provided in 2019, map shows service area and features as of 2009).

Figure 10. Map of Wastewater utility service area in Kent County: Camden-Wyoming (provided in 2019).

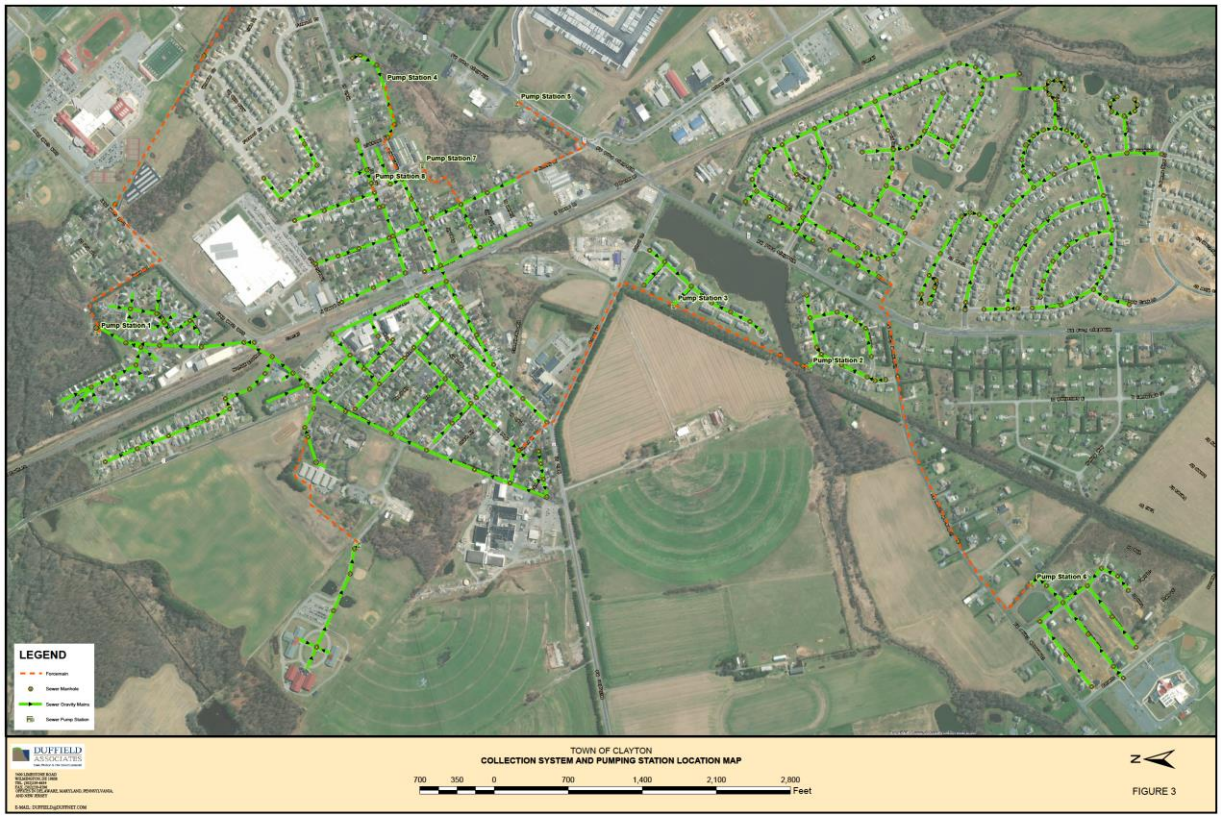


Figure 11. Map of Wastewater utility service area in Kent County: Clayton (provided in 2019).

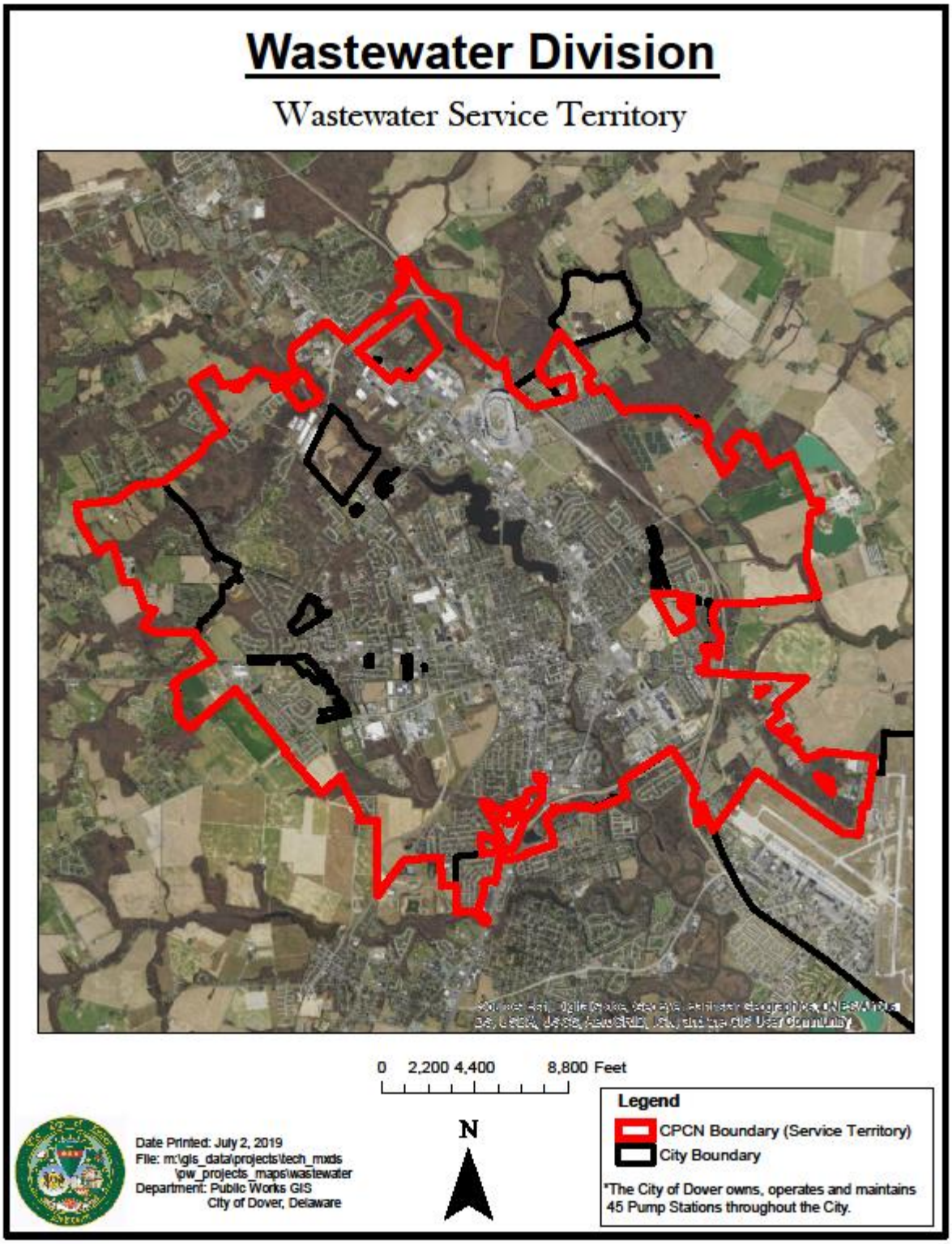


Figure 12. Map of Wastewater utility service area in Kent County: Dover (CPCN coverage provided in 2019, not wastewater service extent or pipelines)

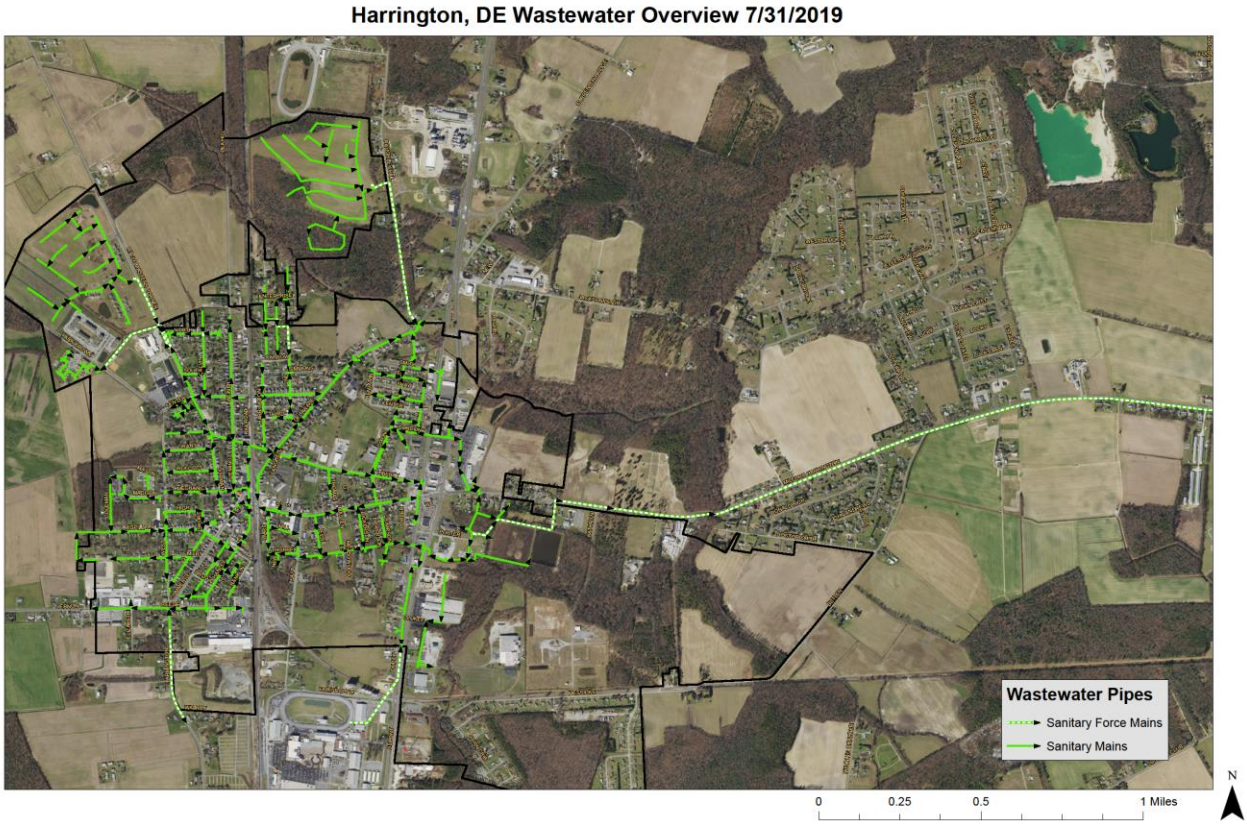


Figure 13. Map of Wastewater utility service area in Kent County: Harrington (provided in 2019).

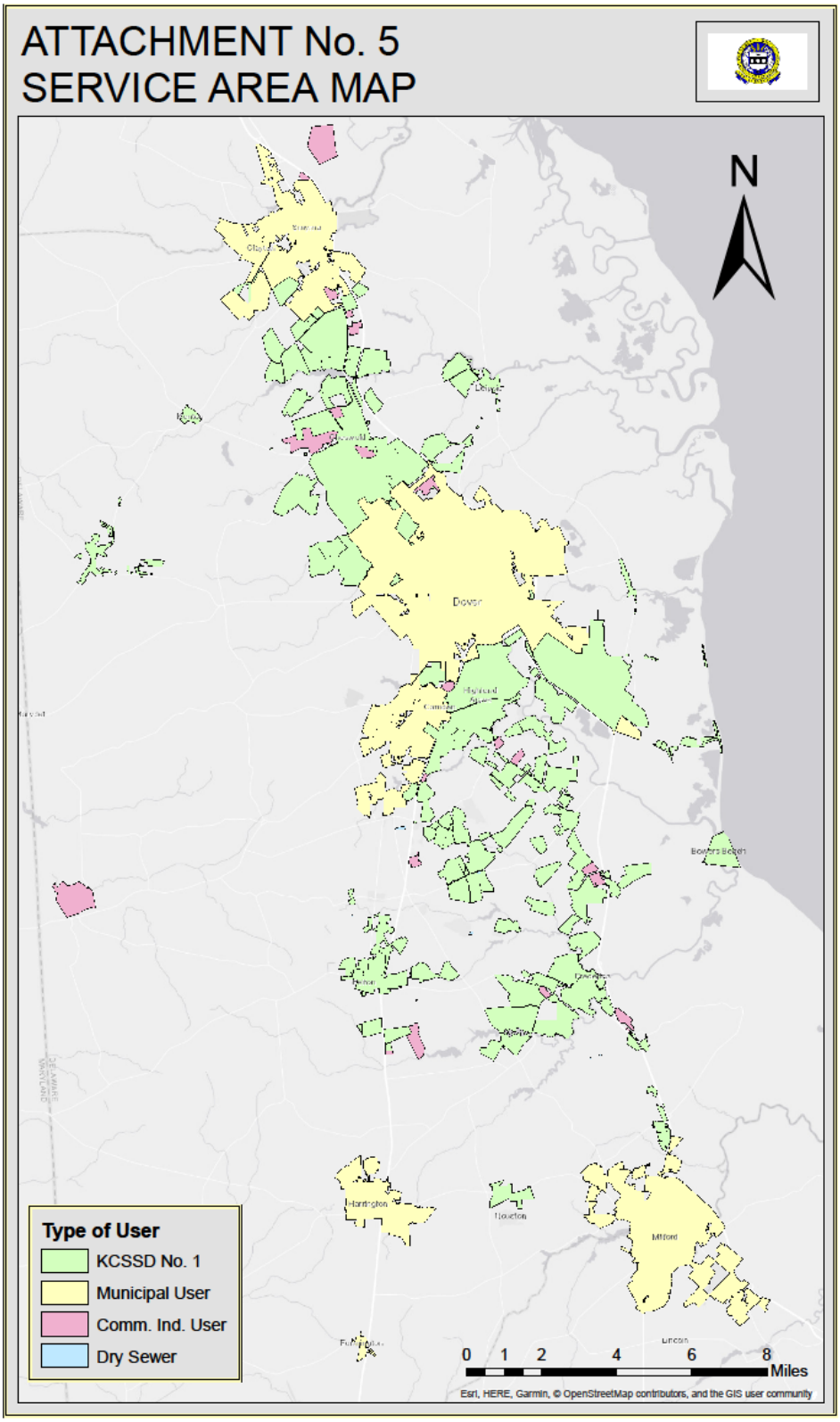


Figure 14. Map of Wastewater utility service area in Kent County: Kent County (provided in 2019).

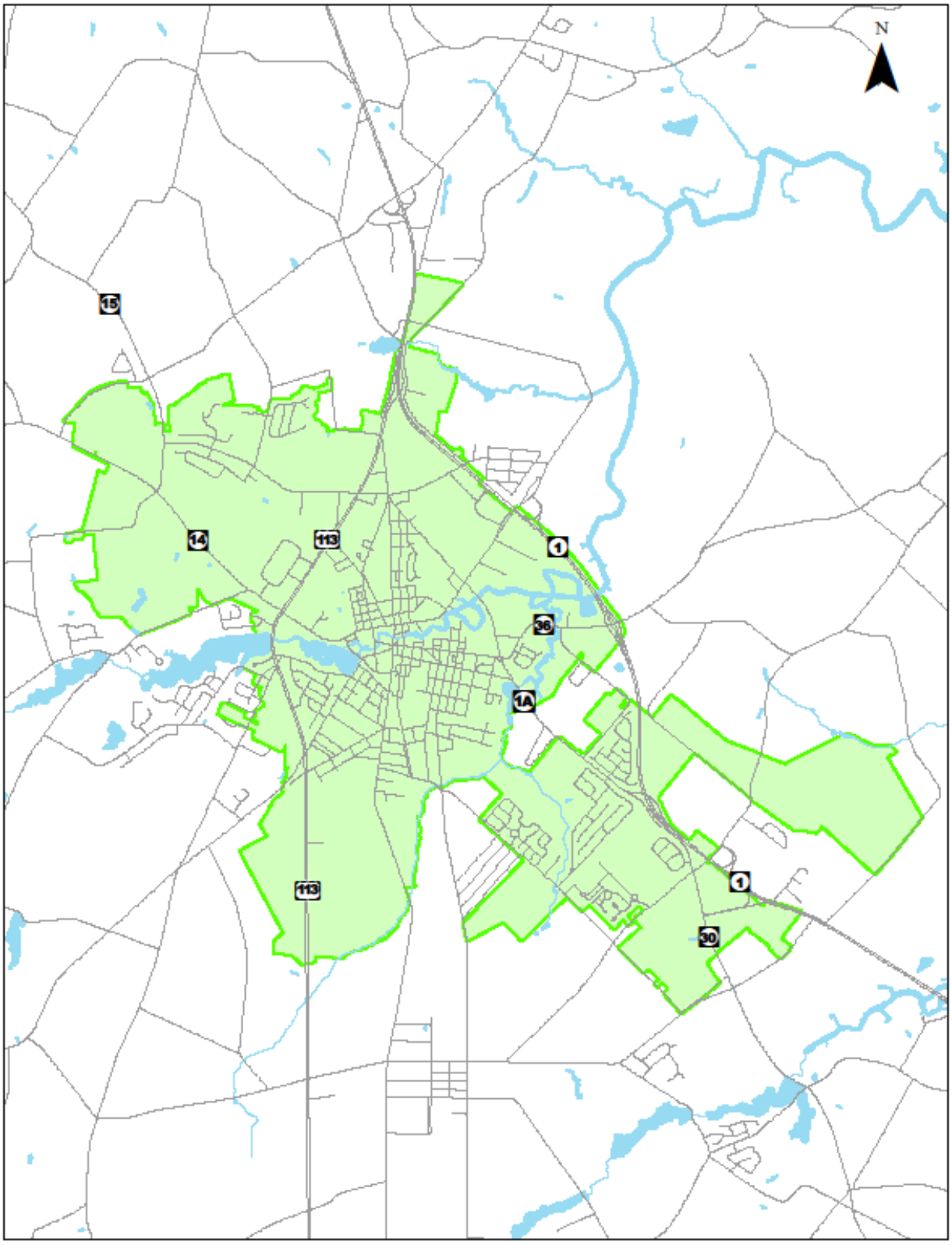


Figure 15. Map of Wastewater utility service area in Kent County: Milford (provided in 2019).

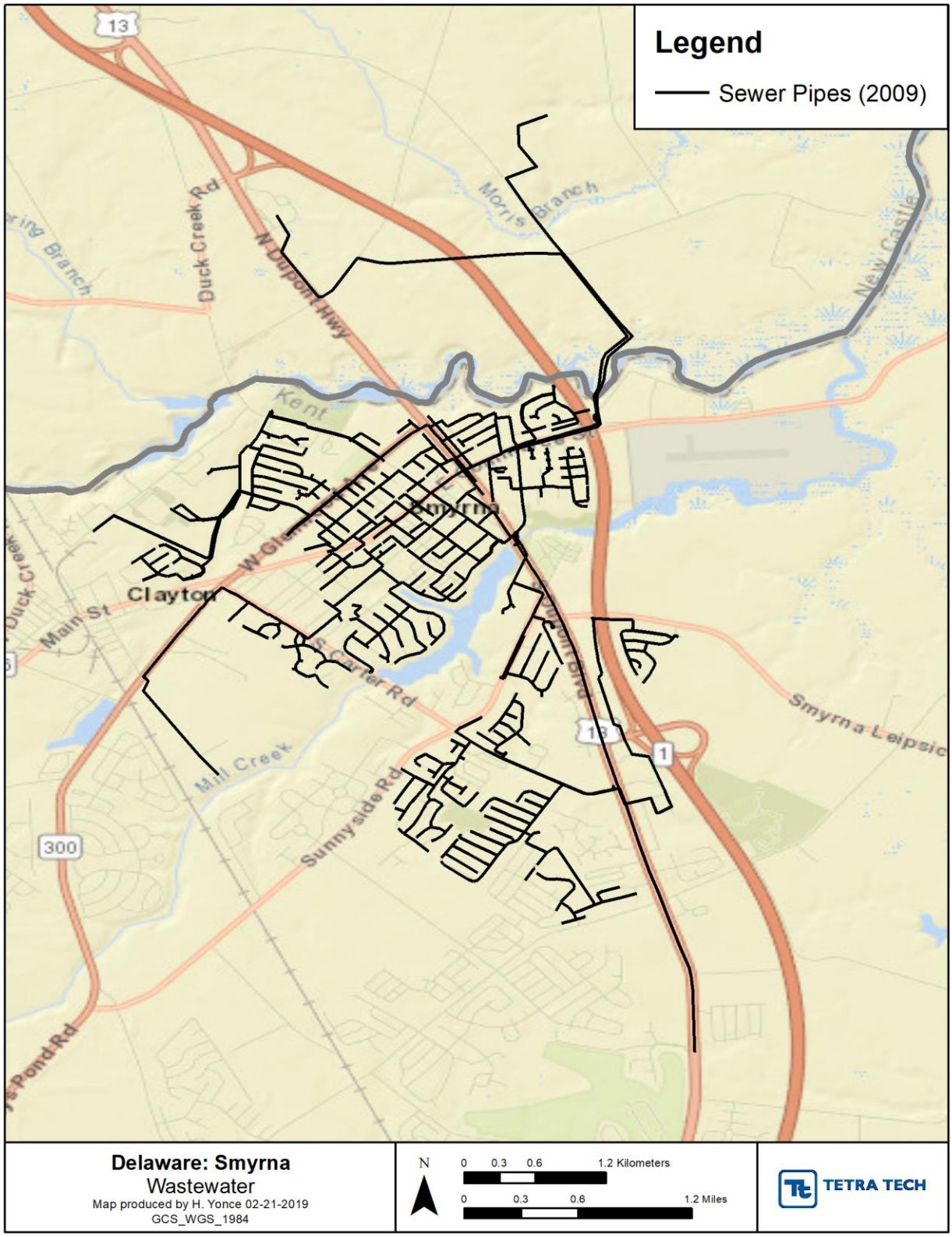


Figure 16. Map of Wastewater utility service area in Kent County: Smyrna (no map was provided in 2019, sewer lines are shown here as of 2009).

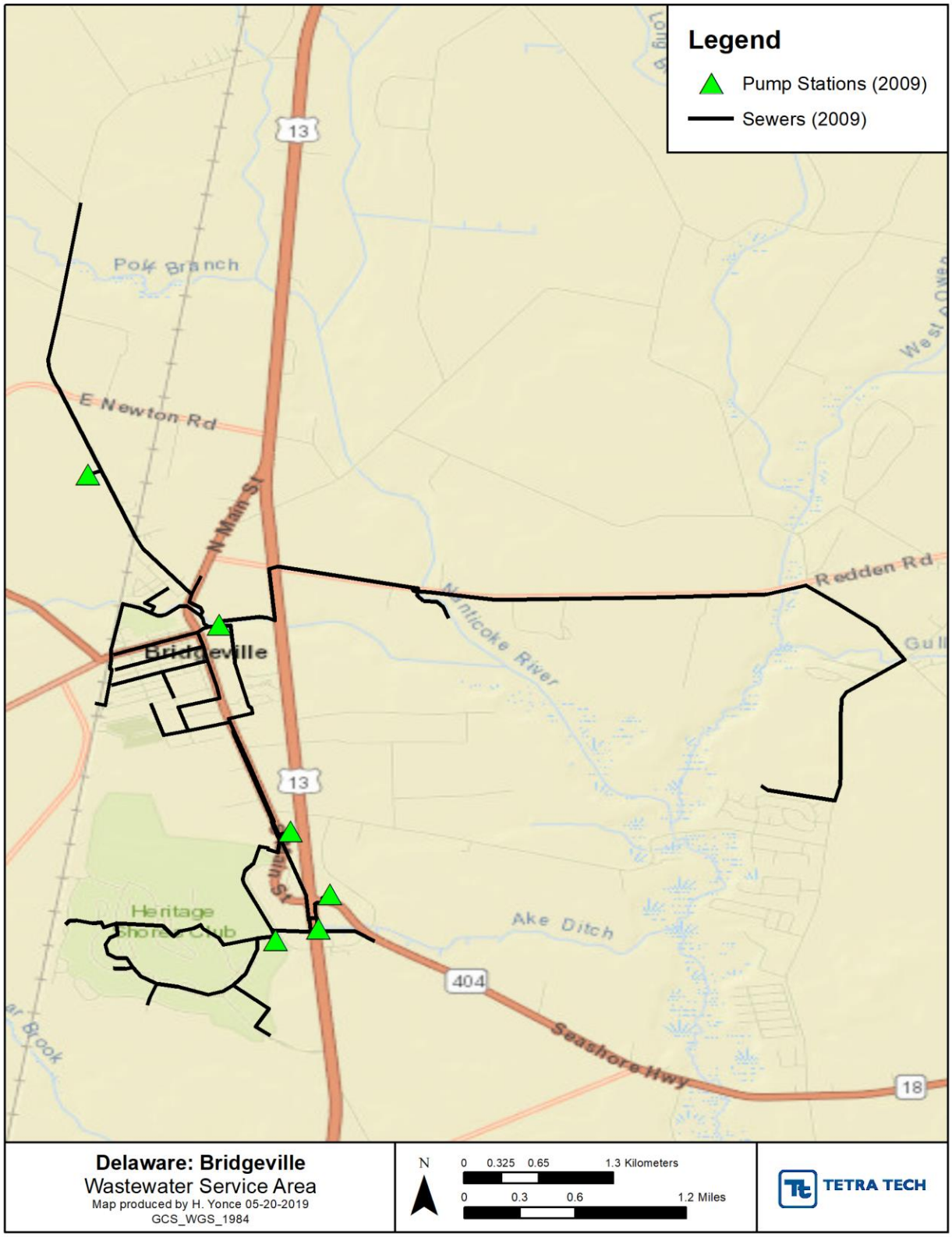


Figure 17. Map of Wastewater utility service area in Sussex County: Bridgeville (no map was provided in 2019, sewer lines and pump stations are shown as of 2009).

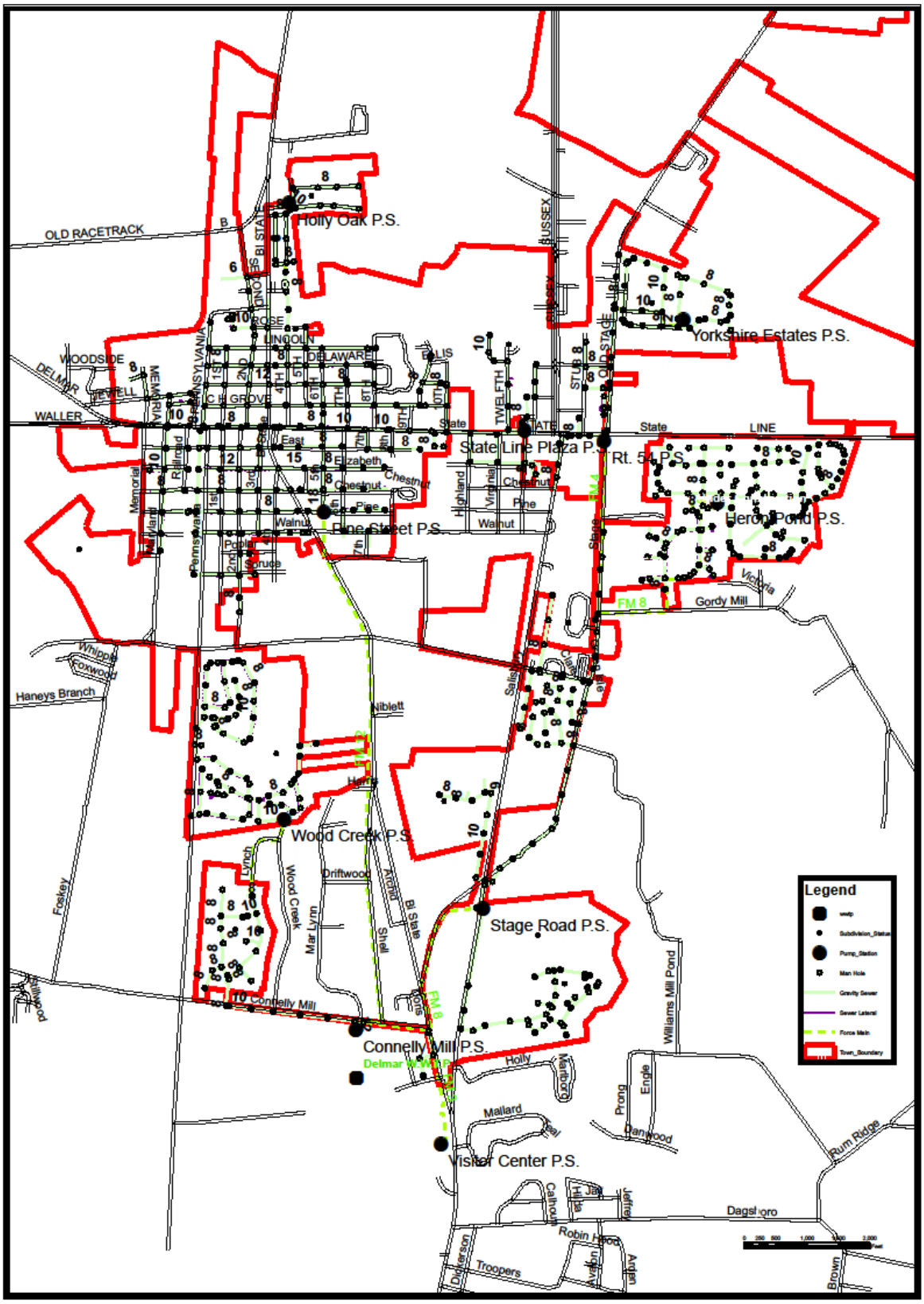


Figure 18. Map of Wastewater utility service area in Sussex County: Delmar (provided in 2019).

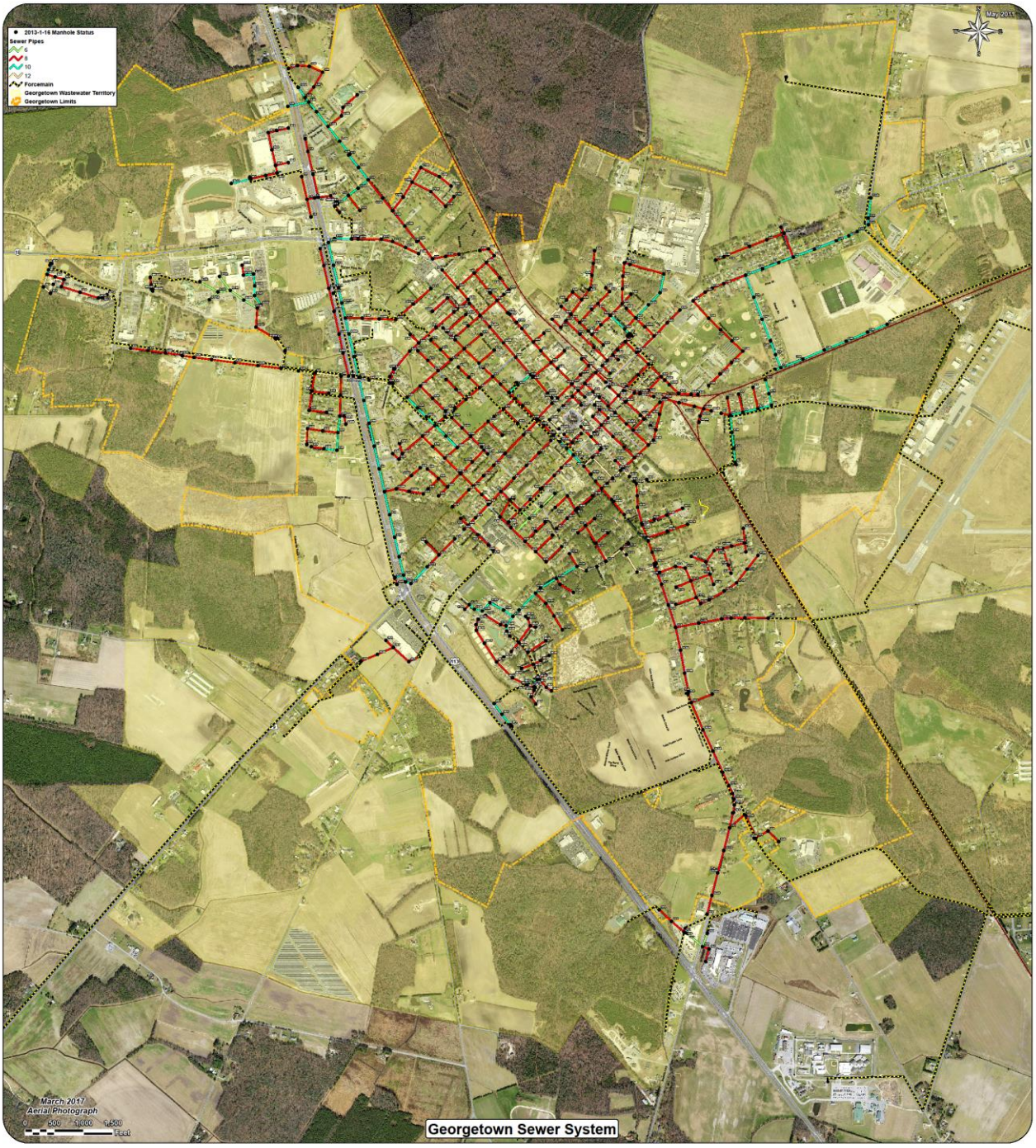


Figure 19. Map of Wastewater utility service area in Sussex County: Georgetown (provided in 2019).

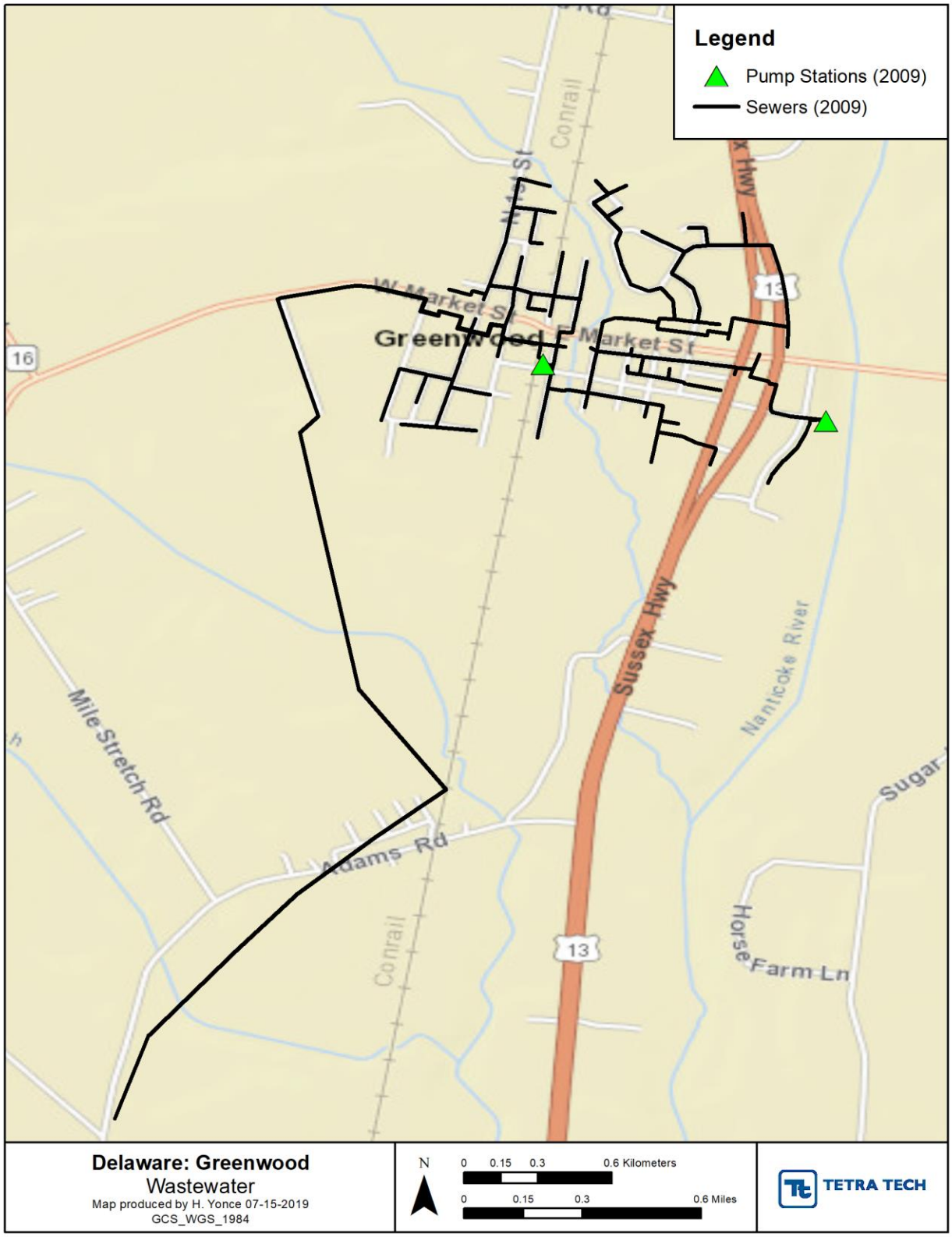


Figure 20. Map of Wastewater utility service area in Sussex County: Greenwood (No map provided, sewer pipes and pump stations presented as of 2009)

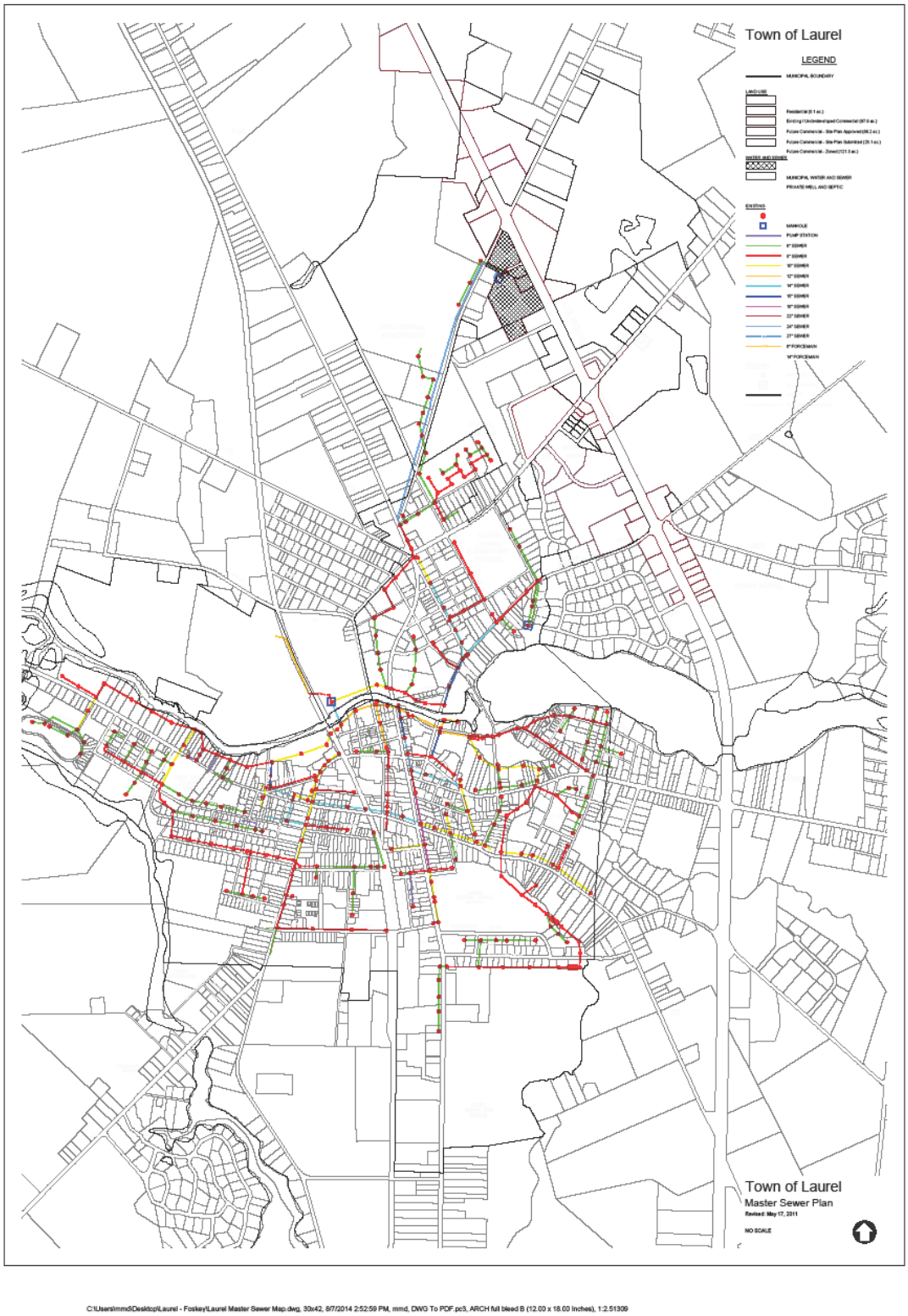


Figure 21. Map of Wastewater utility service area in Sussex County: Laurel (provided in 2019).

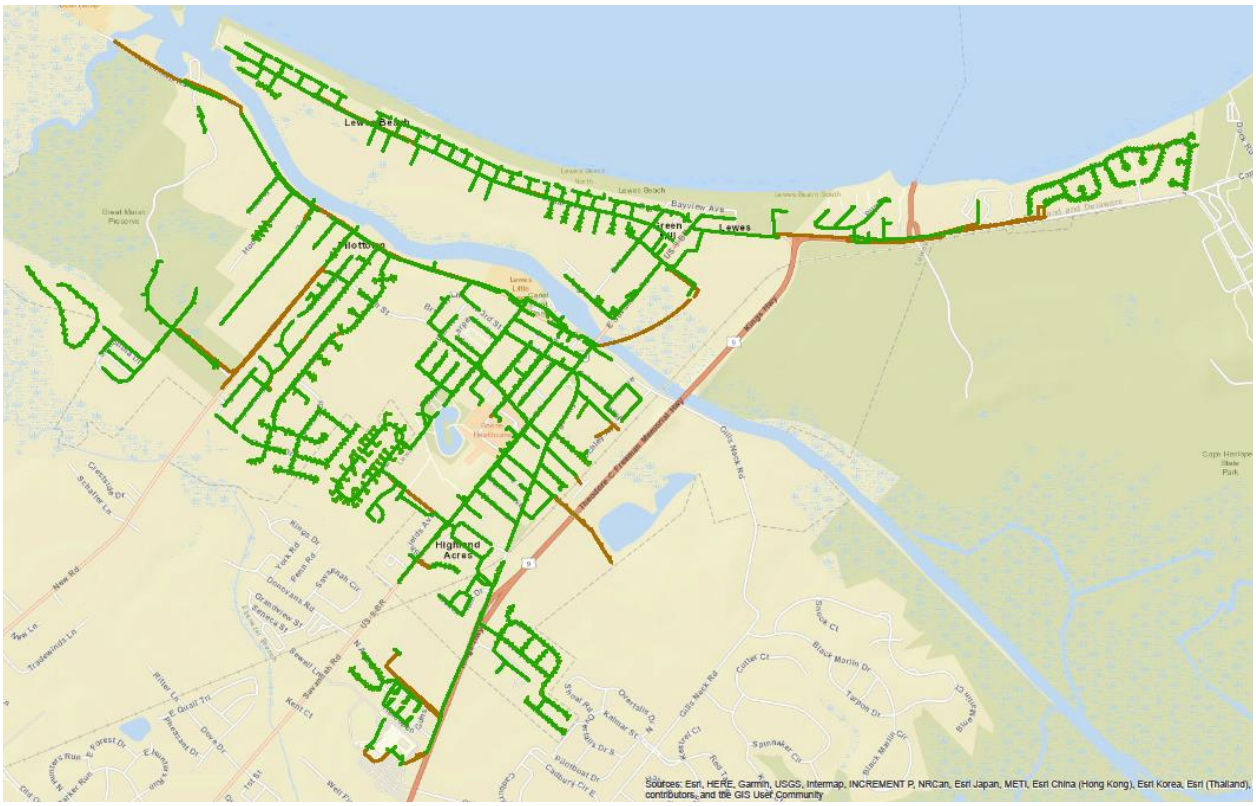


Figure 22. Map of Wastewater utility service area in Sussex County: Lewes (provided in 2019).

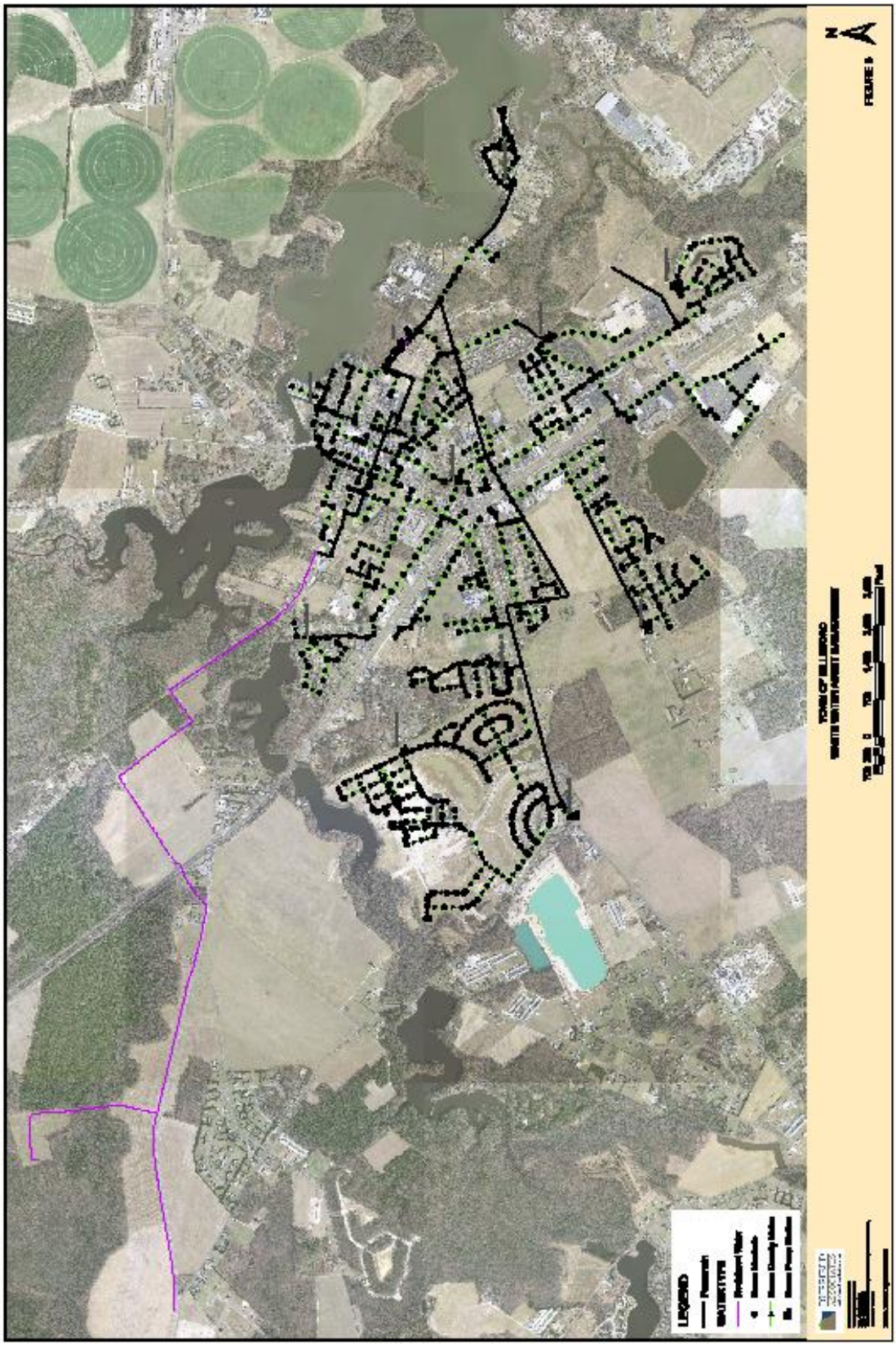


Figure 23. Map of Wastewater utility service area in Sussex County: Millsboro (provided in 2019).

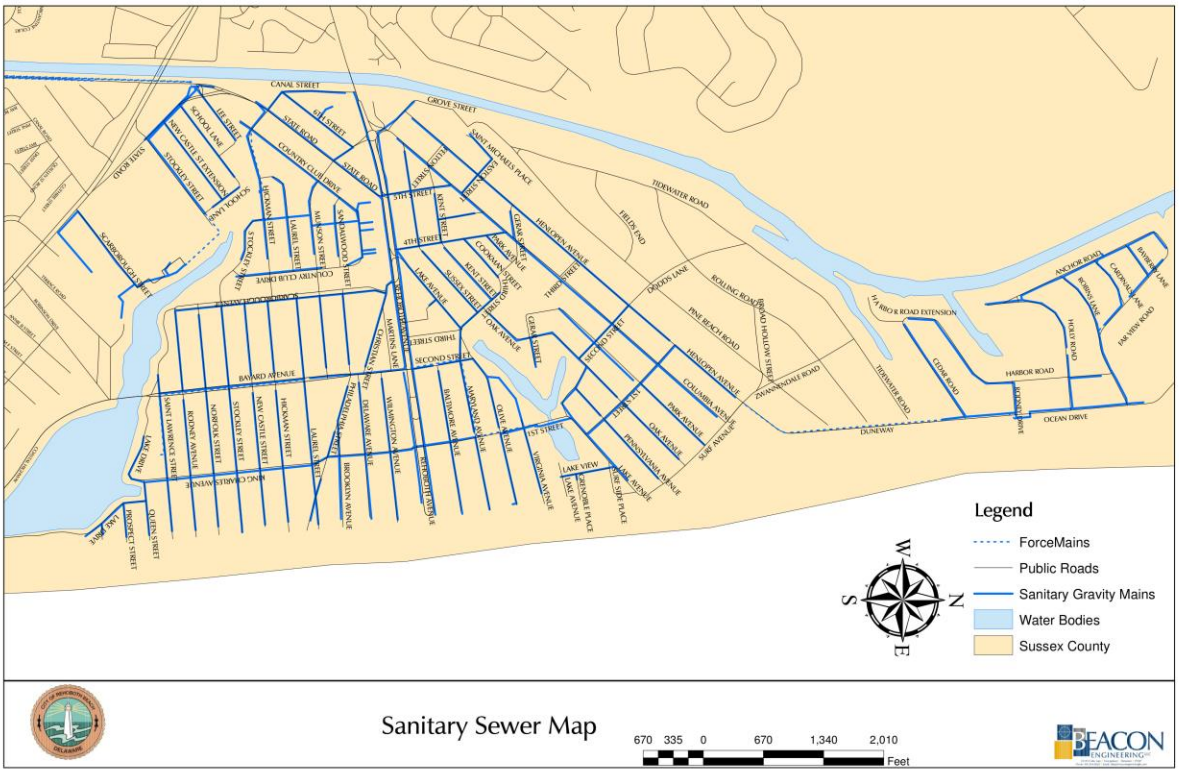


Figure 24. Map of Wastewater utility service area in Sussex County: Rehoboth Beach (provided in 2019).

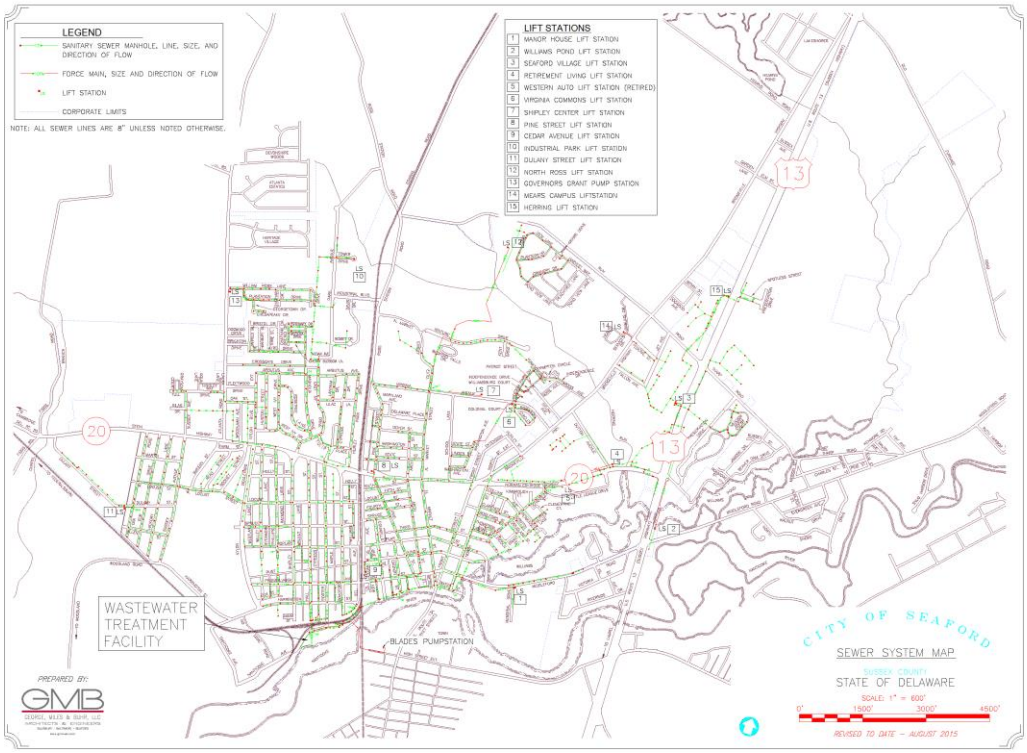


Figure 25. Map of Wastewater utility service area in Sussex County: Seaford (provided in 2019).

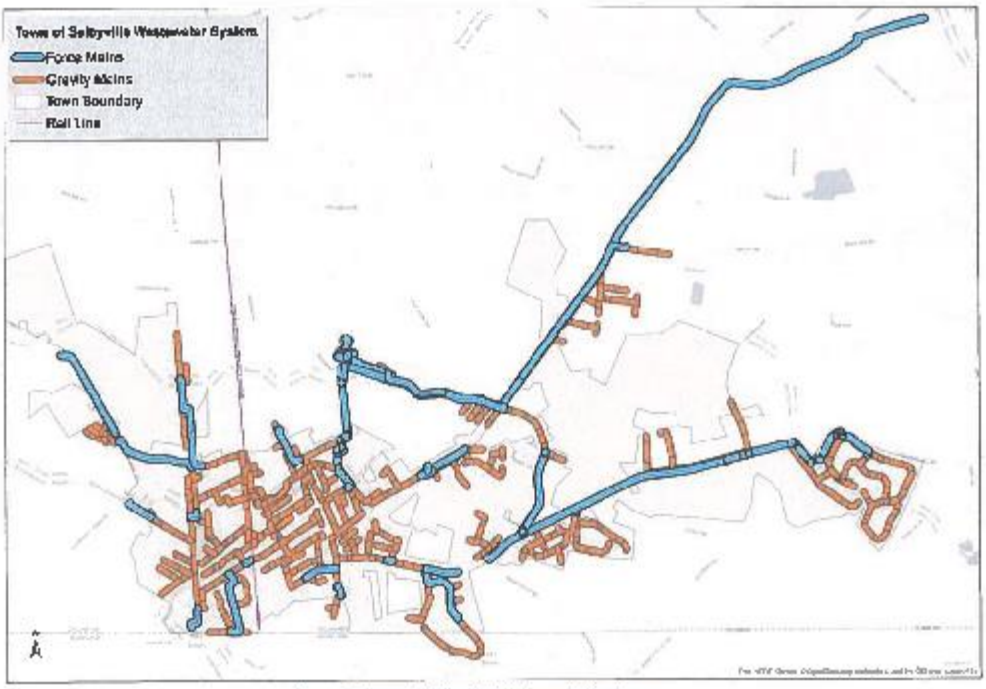


Figure 2: Town of Selbyville Wastewater System

Figure 26. Map of Wastewater utility service area in Sussex County: Selbyville (provided in 2019)

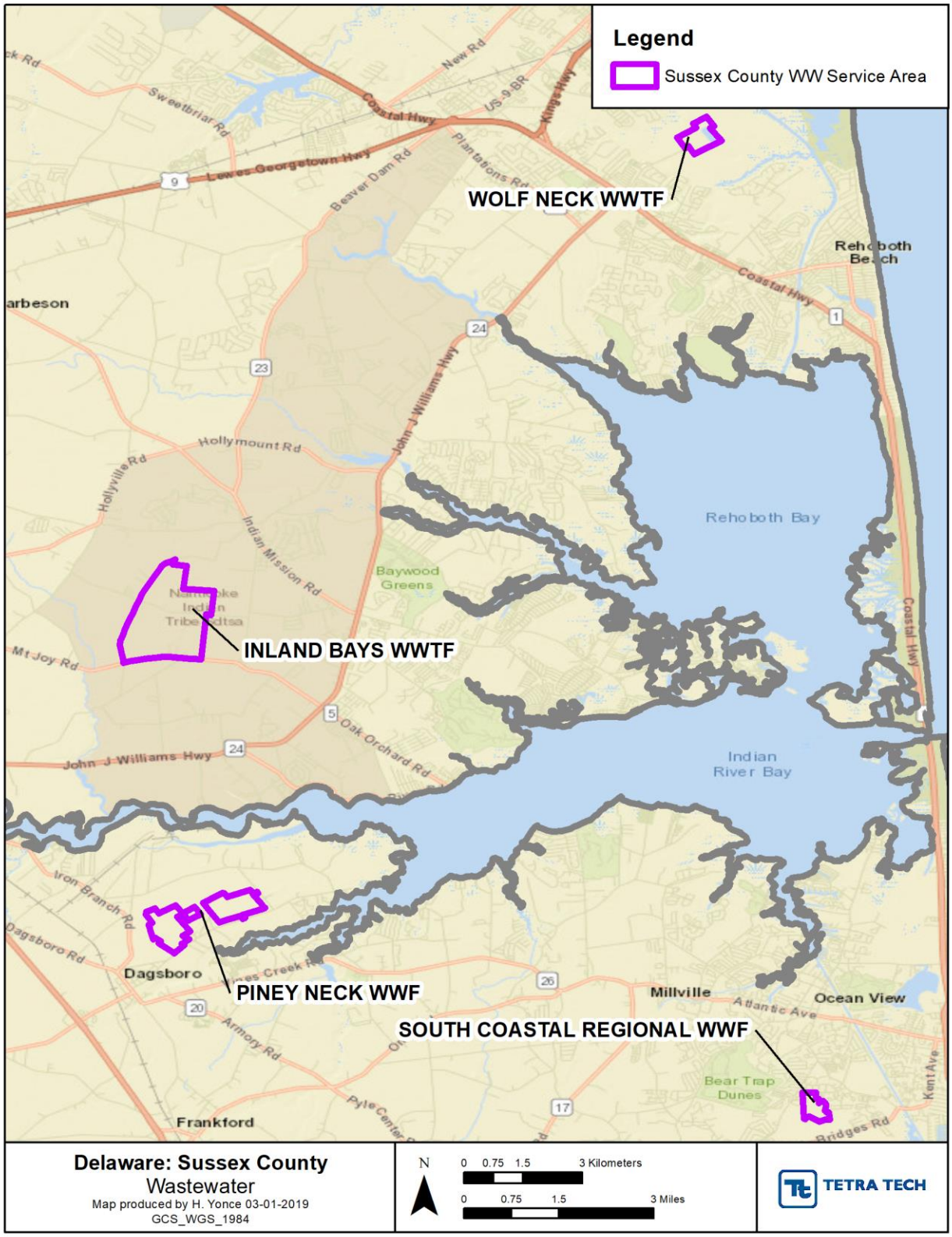
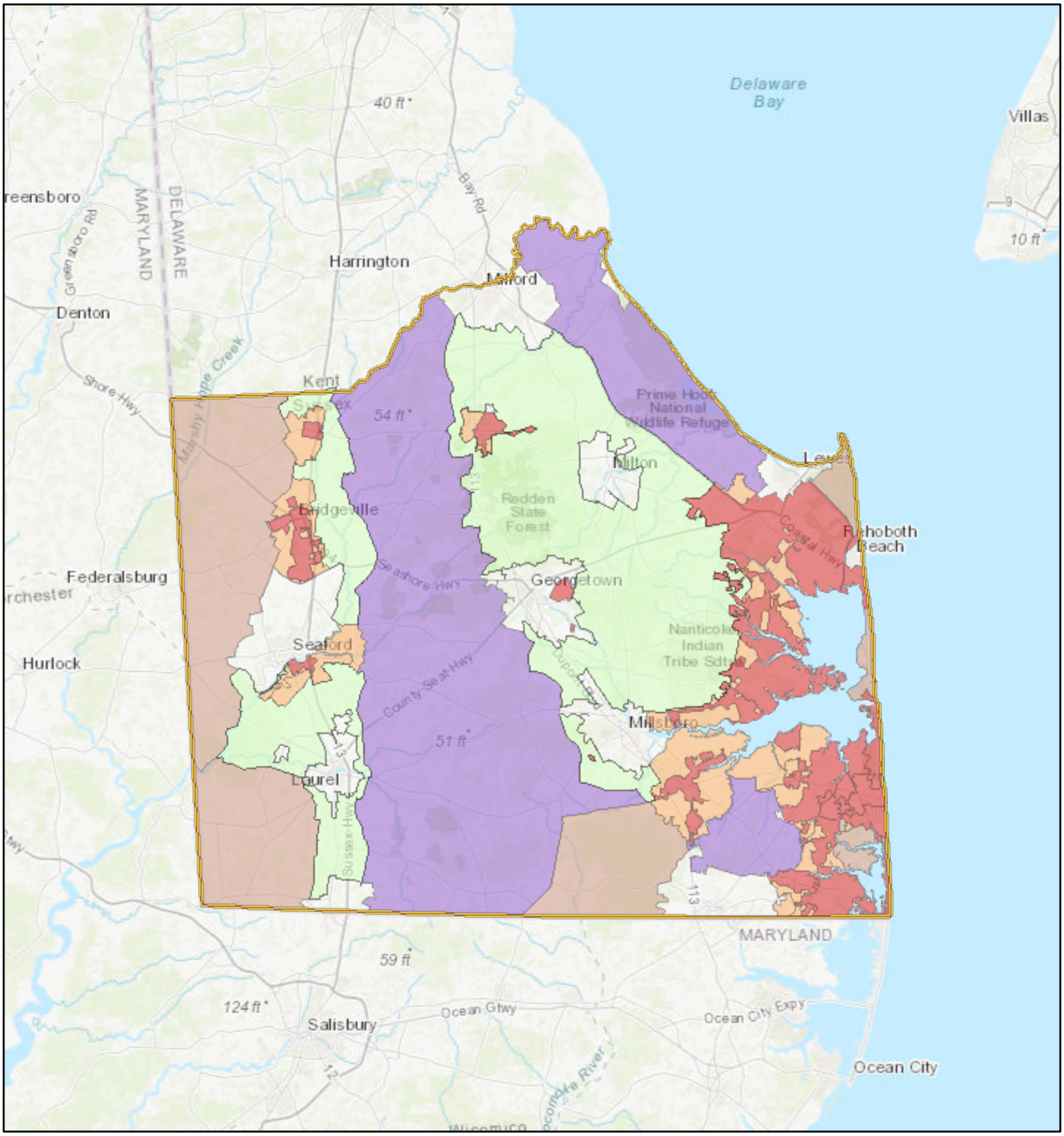


Figure 27. Map of Wastewater utility service area in Sussex County: Sussex County (no map provided in 2019, service areas identified from 2009 data).

Sussex County



April 8, 2020

1:577,791

0 3.75 7.5 15 mi

0 5 10 20 km

County Boundaries

Sewer Tiers

- Tier 1 - Sussex County Unified Sanitary Sewer District
- Tier 2 - Sussex County Planning Area
- Tier 3 - Coordinated CPCN Areas
- Tier 4 - System Optional Areas
- Tier 5 - Regulated On-site Area

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community, Sussex County Government

APPENDIX C. 2020-2025 WASTEWATER CAPITAL IMPROVEMENT PLAN (CIP) COMPILATION

WW Needs Summary (State FY 2020 - FY 2025)

NEW CASTLE COUNTY	WW
New Castle County (NCC)	$ 729,329,000
Newark	$ 4,600,000
Delaware City	Served by NCC
New Castle	Served by NCC
Middletown	$ 4,394,500
Wilmington	$ 82,100,000
Subtotal	**$ 820,423,500**
KENT COUNTY	
Kent County	$ 27,896,100
Camden-Wyoming	$ 350,000
Harrington	$ 3,000,000
Dover	$ 8,330,400
Felton	Served by Kent County
Frederica	Served by Kent County
Magnolia	No CIP
Milford	$ 2,060,000
Clayton	$ 457,000
Smyrna	$ 5,121,500
Subtotal	**$ 47,215,000**
SUSSEX COUNTY	
Bethany Beach	Served by Sussex County
Blades	Served by Sussex County
Bridgeville	$ 200,000
Lewes	$ 6,567,615
Rehoboth Beach	$ 773,000
Seaford	$ 28,623,000
Dagsboro	Served by Sussex County
Delmar	$ 2,472,598
Frankford	Served by Sussex County
Greenwood	To be served by Sussex County
Henlopen Acres	Served by Sussex County
Milton	No CIP
Sussex County	$ 210,680,000
Dewey	Served by Sussex County
Sussex Shores	Served by Sussex County
Georgetown	No CIP
Laurel	N/A
Millsboro	No CIP
Selbyville	$ 1,100,000
Subtotal	**$ 250,416,213**
PRIVATE	
United Water	N/A
Artesian	No CIP
Tidewater	$ 14,500,000
Subtotal	**$ 14,500,000**
DE State Combined Totals	**$ 1,132,554,713**

N/A – No response

No CIP – Do not have a CIP (OR) it is currently in development stage.

NEW CASTLE COUNTY	CIP PROJECTS FOR FY 2020 - FY 2025	TOTAL PROJECT COST
New Castle County	Mill Creek Interceptor Relief	$ 3,050,000
	Kirkwood trunkline interceptor	$ 4,100,000
	Brandywine interceptor renovation	$ 22,250,000
	Muddy-6 Trunkline improvements	$ 1,800,000
	Backwater valve improvement	$ 1,600,000
	Holloway Terrace outfall	$ 1,600,000
	SR 72 Sewer extension	$ 1,000,000
	General sewer improvements	$ 9,725,000
	Glasgow area sewer improvements	$ 1,700,000
	Sewer system expansion	$ 250,000
	Pump station rehabilitation	$ 21,563,000
	Naamans Pump station upgrade	$ 1,200,000
	Christiana Pump station upgrade	$ 1,000,000
	Pump station electrical power distribution upgrade	$ 2,250,000
	Richardson park pump station upgrade	$ 15,000,000
	Christina River Force main	$ 121,025,000
	Delaware City industrial sewer expansion	$ 7,500,000
	Brandywine Hundred north rehab Phase I	$ 86,398,000
	Brandywine Hundred south rehab Phase I	$ 77,834,000
	Asset Management	$ 4,550,000
	Turkey Run interceptor rehabiliation	$ 4,550,000
	North Delaware interceptor system	$ 69,672,000
	DelDOT coordination project II	$ 11,000,000
	Sewer Repairs and Rehabilitation II	$ 14,100,000
	Stoney creek basin rehabilitation	$ 4,650,000
	Airport Road system rehabilitation	$ 23,376,000
	Market street system rehabiliation	$ 3,300,000
	Richardson park system rehabilitation	$ 8,860,000
	Delaware city system rehabilitation	$ 1,300,000
	Terminal avenue system rehabilitation	$ 14,894,000
	Edgemoor system rehabilitation	$ 17,438,000
	Port Penn system rehabilitation	$ 850,000
	White clay system rehabilitation	$ 33,778,000
	Wilmington system rehabilitation	$ 4,966,000
	Water Farm 1 system rehabilitation	$ 6,429,000
	Delaware City treatment plant rehab	$ 5,300,000
	Septage receiving station upgrade	$ 1,600,000
	Lea Eara Farms treatment plant closure	$ 6,750,000
	Southern sewer service area	$ 111,121,000
	Subtotal	**$ 729,329,000**

Notes:

Newark	Sanitary Sewer Study and Repairs	$ 4,600,000
	Subtotal	**$ 4,600,000**

Notes:

Middletown	Rapid Infiltration Basins	$	1,002,500
	Screen Rebuild	$	86,000
	Coat Screen Room	$	25,000
	Shade Balls for Frog Hollow	$	500,000
	Sports Complex Booster Station	$	125,000
	Driving Range Irrigation	$	100,000
	301 Pump Station Elimination/Rehab	$	2,200,000
	Denitrification - Phase II	$	300,000
	Spray Rig Upgrades - Electronic	$	56,000
	Subtotal	**$**	**4,394,500**

Notes:

Wilmington	11th street pump station upgrade	$	19,500,000
	Annual minor sewer improvements	$	4,500,000
	Major sewer improvements	$	12,000,000
	WWTP Electrical improvements	$	6,300,000
	WWTP Infrastructure improvements	$	36,800,000
	South Wilmington Wetlands park	$	2,000,000
	Sewer seperation project and flow monitoring	$	1,000,000
	Subtotal	**$**	**82,100,000**

Notes:

KENT COUNTY	CIP PROJECTS FOR FY 2020 - FY 2025	TOTAL PROJECT COST
Kent County	TMDL study for support of site specific water quality standards	$ 2,502,000
	TMDL offsite nutrient reduction project- additional site	$ 300,000
	Land acquisition & permitting to extend effluent flow limitations beyond stream discharge	$ 7,400,000
	Replace pumps and valves at recycle pump stations 1 & 2	$ 25,000
	Plant wide power generator	$ 3,618,000
	Air blower system optimization	$ 2,131,000
	Site lighting replacement	$ 77,000
	Clarifier improvement sludge blanket detectors for 4 units	$ 73,100
	Clarifier improvement Floor Rehabiliation - 2 units	$ 62,000
	South Aeration Basin Liner Replacement	$ 770,000
	Sandfilter Covers for cells and cascade	$ 286,000
	Clarifier Improvement - weir covers	$ 180,000
	Solids Handling Building roof	$ 120,000
	North aeration diffusers replacement	$ 190,000
	North aeration basin liner and venting replacement	$ 360,000
	Aeration basin diffuser replacement maintenance	$ 150,000
	Clarifier 3 & 4 mechanism replacement	$ 800,000
	Total Treatment Plant Upgrades	**$ 19,044,100**
	Pipe condition assessment	$ 100,000
		$ 100,000
	Double UN Hilltop area sanitary sewer expansion, Phase 2	$ 374,000
	Milford Neck area sanitary sewer expansion	$ 1,188,000
	Double Run area: Paris Villa/London Village Sanitary sewer expansion,Phase1	$ 2,526,000
	Double Run area: Paris Villa/London Village Sanitary sewer expansion,Phase2	$ 1,684,000
		$ 5,772,000
	Pump station 1 - Smyrna	$ 100,000
	Pump station 3 - Dover	$ 175,000
	Wet well capacity improvements	$ 500,000
	Pump station 14 - Isaacs	$ 90,000
	Pump station 1 - Smyrna	$ 200,000
	Purchase Pumps for Various pump stations	$ 200,000
	Relocate Control & Transfer switches for various pump stations	$ 40,000
	Relocate septage screen and build pre-treatment system (w denneys road)	$ 1,600,000
	Pump station #2 and 3 replacement	$ 75,000
		$ 2,980,000
	Subtotal	**$ 27,896,100**

Notes:

Camden-Wyoming	Septic elimination	$ 350,000
	Subtotal	**$ 350,000**

Notes:

Harrington	WWTP Lagoon closure	$ 3,000,000
	Subtotal	**$ 3,000,000**

Notes:

Dover	Inflow/Infiltration removal	$	4,000,000
	Miscellaneous emergency sanitary sewer repairs	$	500,000
	Puncheon run pump station improvements	$	643,000
	US 13 East pump station #7 repairs	$	280,400
	College Road pump station replacement	$	657,000
	SCADA equipment tech upgrade	$	308,000
	Meter replacement	$	700,000
	Lepore Road sanitary sewer upgrade	$	367,000
	Turnberry Pump station replacement	$	681,000
	Heatherfield Pump station replacement	$	85,000
	Cedar Chase Pump station replacement	$	89,000
	Laurel Drive Pump station replacement	$	20,000
	Subtotal	**$**	**8,330,400**

Notes:

Milford	SCADA Instrumentation Upgrades & Integration	$	50,000
	Targeted Inflow and Infiltration Investigation & Repair	$	1,000,000
	Pumping Station Hoist Replacements (3)	$	10,000
	SE 2nd Street Pump Station Replacement	$	1,000,000
	Subtotal	**$**	**2,060,000**

Notes:

Clayton	Manhole Rehabilitation	$	79,000
	Sanitary Sewer Rehabilitation	$	378,000
	Subtotal	**$**	**457,000**

Notes:

Smyrna	East Commerce St utility sewers replacement project		941,500
	Wastewater asset management program		30,000
	North main streeet Sewer utility replacement project		1,087,500
	North duck creek western sewer project		1,250,000
	Smyrna Venture wastewater utility extension		1,812,500
	Subtotal	**$**	**5,121,500**

Notes:

SUSSEX COUNTY	CIP PROJECTS FOR FY 2020 - FY 2025	TOTAL PROJECT COST
Bridgeville	WW-Miscellaneous	$ 200,000
	Subtotal	**$ 200,000**

Notes:

Lewes	Sewer Main Replacement/Renewal	$ 2,130,000
	Sewer Lift Station Renewal	$ 365,000
	Sewer Main Grouting/Lining	$ 300,000
	Devries Circle	$ 415,000
	Manhole Replacement/Rehab	$ 258,180
	Savannah Road- Donovans to Meter Station	$ 395,000
	Nutrient Trade	$ 116,038
	Replace MCC/Upgrade Drives and PLC in Headworks	$ 150,000
	Drying Bed Cover	$ 80,000
	Drying Bed Expansion	$ 115,000
	Train Wall Polyuria	$ 20,000
	Filter Press	$ 225,000
	Micro Filter Zenon Replacement	$ 1,515,000
	PDP Effluent Pumps-Recondition	$ 193,397
	Outfall Pipe Repair	$ 290,000
	Subtotal	**$ 6,567,615**

Notes:

Rehoboth Beach	Air compressor	$ 23,000
	Sewer Line Replacement Program	$ 750,000
	Subtotal	**$ 773,000**

Notes:

Seaford	Rt 13 south sewer extension	$ 623,000
	WWTP - expansion/upgrades to 3 MGD, enhanced nutrient remova, leachate septage handling, sludge processing	$ 28,000,000
	Subtotal	**$ 28,623,000**

Notes:

Delmar	Repair the Lift/Screen	$	275,000
	Convert Surge Tank to EQ Basin	$	75,000
	Replace - Level Control - Auto On/Off	$	4,000
	Replace Pump / Repair Existing Pump for spare	$	32,000
	Replace Sluice Gate Valve/Stem	$	5,000
	Repair Exterior Wall and Roof	$	25,000
	Replace Ceiling and Floor Tile	$	15,000
	Upgrade the Lab, Table, Cabinets, Equipment	$	35,000
	Repair (4) Mixers @$4,000 EA.	$	16,000
	Sluice Gate/Valve & Stem Replacement	$	5,000
	Prepare the Sweep/Arm/Motor	$	40,000
	(4) Panel Boards @ $3200 ea/$1000 Install	$	13,800
	Replace - Flume Valves	$	5,500
	Replace - Valves	$	5,000
	Cleaning Rebuild Motor/gear boxes	$	35,000
	Replace Blowers	$	20,000
	Upgrade/	$	8,000
	Replace Exhaust fan & heater	$	15,000
	Replace Side Panels	$	45,000
	Replace Doors - Swing Out vs Roll Ups	$	40,000
	Replace w/ LED	$	10,000
	Repair and Repave	$	35,000
	Skata System - all lift stations	$	31,265
	Sewer Main replacement	$	1,302,033
	Slip Lining 1100 LF	$	240,000
	Slip Lining Manholes	$	140,000
	Subtotal	**$**	**2,472,598**

Notes:

Sussex County	IBRWF- Spray demand loop	$	14,650,000
	IBRWF- Treament disposal expansion	$	25,500,000
	IBRWF- Regional biosolids/septage	$	14,800,000
	IBRWF- Land improvements	$	2,300,000
	SCRWF-Capacity Expansion	$	34,000,000
	SCRWF-Compliance Upgrades	$	14,000,000
	Piney Neck-Compliance Upgrades	$	6,500,000
	Piney Neck –Lagoon Conversions	$	2,750,000
	WNRWF-Conversion	$	13,900,000
	Pump station #203/4 & Transmission to RB	$	3,500,000
	Rehoboth WWTP Phase II	$	9,000,000
	LBPW WWTP Expansion Participation	$	850,000
	Concord Road/Route 13 Commercial	$	800,000
	Western Sussex Sewer District	$	13,400,000
	Herring Creek Sewer Area	$	22,000,000
	Chapel Branch	$	5,000,000
	Joy Beach	$	6,500,000
	Mulberry Knoll	$	3,500,000
	Wolfe Runne	$	4,250,000
	Holts Landing Expansion – Mallard Creek	$	2,280,000
	Branch/Autumn/Tucks Roads	$	3,600,000
	Tanglewood-Bayard PS #1	$	900,000
	Oak Acres-Bayard PS #5	$	2,600,000
	Millville Expansion – Beaver Dam	$	1,600,000
	Bethany Forest Sewer Area	$	2,500,000
	Subtotal	**$**	**210,680,000**

Notes:

Selbyville	Force main replacement	$	1,100,000
	Subtotal	**$**	**1,100,000**

Notes:

Private WW CIP Projects for the Next Five Years

Private	CIP PROJECTS FOR FY 2020 - FY 2025	TOTAL PROJECT COST
United Water	NO CIP	-

Notes:

Artesian	NO CIP	-

Notes:

Tidewater	New Plant in Milton + Miscellaneous WW needs	$	14,500,000
	Subtotal	$	14,500,000

Notes: