CONESTOGA-ROVERS
& ASSOCIATES

WATER & WASTEWATER CAPITAL IMPROVEMENT PLAN

CITY OF AUBURN, NEW YORK

DRAFT

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The Cayuga County Regional Water & Wastewater Taskforce

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1.0 INTRODUCTION

1.1 BACKGROUND

The Cayuga Regional Water & Sewer Authority Implementation Project is an ongoing collaborative initiative between the City of Auburn, the Towns of Aurelius, Fleming, Owasco, Sennett, Throop, and the Cayuga County Water and Sewer Authority (collectively "project partners" or "participants"). The project, funded under the NYS Local Government Efficiency (LGE) High Priority Planning Grant Program, has been exploring the potential implementation of a consolidated water and sewer service provider throughout Central Cayuga County.

Cayuga County is located in the Finger Lakes Region of Central New York, approximately 20 miles west of the City of Syracuse. Geographically it extends southward from Lake Ontario to the three Finger Lakes: Cayuga Lake, Owasco Lake, and Skaneateles Lake. The project partners comprise the core geographic, population, and business center of the County.

Currently, the City of Auburn provides most of the water and wastewater treatment and transmission services among the project participants. The City provides wholesale water service to the Towns of Aurelius, Throop, Sennett, and the Cayuga County Water and Sewer Authority (CCWSA). The Town of Owasco has its own water treatment plant and sells bulk water to the Town of Fleming and some individual customers in the Town of Springport. Local distribution is provided by each of the individual communities to their residents.

For wastewater, the City provides wholesale treatment services to the Towns of Owasco, Fleming, Sennett and Aurelius. The CCWSA does not offer wastewater services within the study area and the Town of Throop has no public wastewater system. The local collection services are provided by each of the individual communities to their residents.

In late 2010, the participants were awarded a NYS LGE Implementation Grant for the purpose of developing and implementing a new Regional Water and Sewer Agency (the "Regional Agency"). Shortly thereafter, the participants appointed a Taskforce to complete the project, comprised of two members from each community. Ultimately, the Taskforce was charged with developing the final policies, governance, and organizational structure for the Regional Agency.

The Taskforce developed a conceptual regional service delivery model for both water and wastewater services. This concept anticipated that a new Regional Agency would take ownership of and/or operate all major regional assets. These regional assets were

identified as the City's major water and wastewater treatment and transmission assets which currently provide service to multiple communities. The Regional Agency would provide retail service to the City and lease management or wholesale services to each of the remaining participants.

One of the challenges facing the participants prior to consolidation was determining the condition and level of potential necessary investment related to the regional assets. The City's water and wastewater systems are aging and in some instances beyond their anticipated useful life. Due to age, natural wear and tear, and in some instances deferred investment, many of the City's water and wastewater assets are in need of repair, replacement, or rehabilitation. Without such improvements, service levels will deteriorate and the systems will eventually be unable to meet regulatory obligations.

1.2 SCOPE

Due to the concerns identified above, the Taskforce retained CRA Infrastructure & Engineering, Inc. (CRA) to complete a high-level condition assessment and Capital Improvement Plan (CIP) for the City's regional water and wastewater assets that service the wholesale communities. These assets may potentially become the assets of a new Regional Agency if the consolidation occurs.

The condition assessment included a review of all regional assets as identified during the Cost of Services Analysis completed earlier in the project. The assessment was based on available maintenance records, interviews with staff, and walk-through inspections where access was available.

A risk-based prioritization model was developed to determine the relative order in which any capital needs were to be addressed. Ultimately, a recommended schedule of capital projects was prepared based on a 10-year target for completion.

1.3 METHODOLOGY

The project methodology consisted of ten primary steps, shown in Figure No.1. A brief description of each step is provided below.

Figure No. 1 Project Methodology

Steps 1 & 2 - Data Collection and Asset Inventory

The project began with a broad review of various data and other available information aimed at identifying major observable/reportable deficiencies. During this period, CRA personnel toured the City of Auburn Water Purification Plant (or "Water Treatment Plan") and Pollution Control Facility (or "Wastewater Treatment Plant"), as well as conducted interviews with supervisory staff and management.

In conjunction with the data collection and information review, an asset inventory was developed. Certain basic data for each asset was recorded (as available) such as age, material, manufacturer, size, or capacity. Table No. 1 illustrates the Asset Inventory.

Asset Inventory	Physical Asset Desciption			
	Original Construction Date	Asset Category	Size/Capacity/ Length	Model/ Manufacturer
Solids Handling Facility				
a. Structure, Façade and Roof	1934, 72, 96	Buildings & Superstructures	NA	
b. Electrical Systems		Electrical Systems		
c. HVAC & Plumbing	1972	Building Mechanical		Weil McLaw LGB #2
- Odor Control		Mechanical Treatment Equipment		
d. Incinerator & anc. components	1998	Mechanical Treatment Equipment		MHF 05714
e. Sludge Thickeners				
- Waste Table	1972	Mechanical Treatment Equipment		
- Thickener	1996	Mechanical Treatment Equipment		
- Holding Tank No. 1	1972	Structural Treatment Equipment		
- Holding Tank No. 2	1972	Structural Treatment Equipment		
f. Belt Filter Presses				
- Filter Press No. A	1996	Mechanical Treatment Equipment		Belt Dewatering Press
- Filter Press No. B	1988	Mechanical Treatment Equipment		Belt Dewatering Press
g. Filter Press Feed Pumps				
- Feed Pump No. 1	1996	Pumps	60hp	Komline Sancerson
- Feed Pump No. 2	1996	Pumps	60hp	Komline Sancerson
- Feed Pump No. 3	1996	Pumps	60hp	Komline Sancerson
h. Schwing System	1996	Mechanical Treatment Equipment		Schwing
i. Sludge Bunker Screws	1996	Mechanical Treatment Equipment		Dodge SAF XT 526

Table No. 1 Asset Inventory (Illustrative Only)

Steps 3 – Physical Inspection

The inspection of above ground assets was performed by a team of CRA personnel. City Supervisory staff provided in depth tours of the facilities during which visible conditions were noted and photographed. Operational conditions and evident deterioration were discussed. Several interviews with operations and management staff were conducted relative to the water treatment facility, the distribution system, the water pollution control facility, the collection system and the stormwater overflow facilities.

Steps 4 & 5 - Condition Scoring, Review and Validation

Following the inspection and in conjunction with staff interviews, each major asset was assigned a numeric condition score. The scoring was performed by both City staff and CRA. Based on best judgment and institutional and industry knowledge, scores were independently assigned to each asset. The scores were then compared, and further

discussion and/or evaluation was performed for those assets which were scored differently. This approach was intended to bring a broad perspective and mitigate any individual biases in the scoring process. The condition scoring was a scale of 1 to 5, based on the known or visible conditions of each asset as defined in Table No. 2 below.

Condition Rating			
General Condition Rating	**Description**	**Visible/Known Defects**	**Level of Service**
1	Excellent	Perfect condition-no defects	No interruptions- highest service levels always maintained
2	Good	Minor defects only	No interruptions- moderate service levels always maintained
3	Fair	Moderate defects only	Occasional service interruptions and/or reduced level of service
4	Poor	Major defects only	Diminished and/or occasional unsatisfactory levels of service
5	Very Poor	Critical defects	Frequent service interruptions and/or unsatisfactory levels of service

Table No. 2 – Asset Condition Evaluation Scoring

In addition to the condition score, a maintenance score was also assigned to each major asset or piece of equipment. Once again, City and CRA staff independently scored the assets. The maintenance scoring, also on a scale of 1 to 5, attempted to capture the level of maintenance (preventative or reactive) historically applied to each asset as defined in Table No. 3 below.

Maintenance Rating			
Maintenance Evaluation Rating	**Description**	**Planned/Preventative Maintenance**	**Dependability**
1	Excellent	Meets or exceeds manufacturer's recommendations	No Problems
2	Good	Meets manufacturer's recommendations	Minor delays for parts/service
3	Fair	Satisfies most of manufacturer's recommendations	Parts generally available, some delays and serviceable
4	Poor	Satisfies some of manufacturer's recommendations	Parts difficult to get or difficult to service
5	Very Poor	Has not satisfied most of manufacturer's recommendations	Parts unavailable or no longer serviceable

Table No. 3 – Asset Maintenance Rating Scale

Steps 6 & 7 - Asset Renewal Schedule and Near Term Project Development

Based on the average of the condition and maintenance scoring, the project team determined remaining useful life projections for all of the major regional assets as shown in Table No. 4. However, since the specific remaining useful life of assets cannot be determined with absolute precision, this exercise was used to approximate the timeframe during which the assets will most likely need to be rehabilitated, repaired, or replaced. The results were used to identify "near-term" and "long-term" assets, which can be defined as follows:

- Near-Term Assets – assets that are projected to require renewal, rehabilitation, or replacement in approximately 10 years or less based on the condition, maintenance, operations review, and industry-based useful life projections.

- Long-Term Assets – assets that are projected to require renewal, rehabilitation, or replacement in a period likely to be greater than 10 years based on the condition, maintenance, operations review, and industry-based useful life projections.

Ultimately, the "near-term" assets were developed into a series of prospective capital improvement projects based on location and construction-related bundling. The

necessary capital projects include upgrades, replacement, and/or rehabilitation of existing assets. In addition to the specific projects, several maintenance items and asset improvement programs were recommended to address long-term asset renewal needs. Finally, several specialized engineering studies were recommended for specific areas that may also provide significant benefit to the Regional Agency. The list of projects was reviewed with City staff and management in an effort to include all appropriate project needs.

Asset Category	Renewal Schedule (Years)				
Condition Score	1	2	3	4	5
Actuators	20	15	10	5	0
Backflow Prevention	20	15	10	5	0
Building Mechanical	20	15	10	5	0
Buildings & Superstructures	50	38	25	13	0
Chemical Systems	20	15	10	5	0
Electrical Systems	20	15	10	5	0
Filters	40	30	20	10	0
Galleries, Tunnels & Wells	50	38	25	13	0
Intake Structures	50	38	25	13	0
Instrumentation & Monitoring Equipment	20	15	10	5	0
Internal Plant Piping	60	45	30	15	0
Mechanical Water Treatment Equipment	30	23	15	8	0
Meters	20	15	10	5	0
Motors	20	15	10	5	0
Plant Valves	40	30	20	10	0
Property & Roadways	40	30	20	10	0
Pumps	30	23	15	8	0
SCADA System	20	15	10	5	0
Security	20	15	10	5	0
Structural Water Treatment Equipment	50	38	25	13	0
Transportation Equipment/Vehicles	10	8	5	3	0
Variable Speed Drives	20	15	10	5	0
Water Storage Tanks	60	45	30	15	0
Buried Valves	40	30	20	10	0
Distribution/Collection Pipe	60	45	30	15	0
Hydrants	60	45	30	15	0
Transmission/Conveyance Pipe - Primary (20" +)	60	45	30	15	0
Transmission/Conveyance Pipe - Secondary (10"-16")	60	45	30	15	0

Table No. 4 – Estimated Asset Renewal Schedule

Step 8 - Risk Assessment & Prioritization

Each of the prospective capital projects were then evaluated based on the risk posed to the community. Risk was determined based on two criteria: the consequence of asset failure and the probability of asset failure. A score was assigned to each criteria and the product of the two scores determined relative project priority. This type of risk-based analysis was adapted from *Implementing Asset Management, A Practical Guide (2007)*, prepared by several of the leading industry associations. This approach is a common methodology considered as best practices for asset management and capital planning. It aims to objectively prioritize projects and helps ensure that the most necessary projects are completed first. The consequence of failure score was based on the anticipated impact that an asset failure would have on six different categories, whereas the probability of failure scoring included four categories. See Tables No. 5 and 6 below.

While the individual project scoring can be subjective, the comprehensive nature of the categories tends to improve the objectivity of the results. Furthermore, project scoring was performed independently by CRA and City staff and combined so that individual preferences did not significantly influence prioritization. This was important because project prioritization was the critical factor used to determine which projects will be scheduled first. In addition, this risk-based prioritization system simplified a complex analysis and produced a user-friendly method to determine an optimized project schedule.

Consequence of Failure						
Consequence Category	Weight	1	2	4	7	10
		Negligible	Low	Moderate	Major	Severe
Health & Safety	0.20	No injuries or adverse health effects or negligible risk of injury.	No lost-time injuries and/or medical attention or low risk of injury.	Lost-time injury and/or medical attention or moderate risk of injury.	Serious injury and/or Hospitalization required or major risk of injury.	Loss of life.
Regulatory Compliance	0.20	100% compliance with permits or can readily comply with regulations.	Technical violation but no enforcement action or minor difficulty complying with regulations.	Violation with minor enforcement action or moderate difficulty complying with regulations.	Violation with enforcement action and fines or major difficulty complying with regulations.	Major violation resulting in a consent order or cannot comply with regulations.
Financial Impacts	0.15	No immediate financial impact or no anticipated cost.	Absorbed within budget line item (Less than $5,000).	Absorbed within current budget ($5,000 to $10,000).	May require transfer from reserves (Less than $50,000).	May require new borrowing or impact rates (More than $50,000).
Public Relations and Community Impact	0.15	No overall public effect or community concerns. Event only of interest to individuals.	Minor community interest. (i.e.. traffic, dust, noise).	Moderate community interest. May be local media reports.	Community wide discussion. Loss of community confidence. Broad negative media coverage.	Public or government investigation. Extensive media coverage. Management changes demanded.
Service Level	0.20	No service disruption expected.	Small number of customers experiencing a minor service disruption or lasting for a short period of time (< 2 hours).	Moderate number of customers experiencing a significant disruption or lasting for a moderate period of time (< 12 hours).	Significant disruption or over an extended period of time (< 24 hours).	Major system-wide disruption or lasting over an extended period of time (> 24 hours).
Human Resources	0.10	Negligible effect to staff and management.	Minor nuisance to staff's day-to-day activities.	Increased stress, manual activities and longer shift requirements.	Significantly increased stress on staff and management. Disgruntled employees.	Staff and management not capable of, or willing to, operate facilities.

Table No. 5 – Consequence of Failure Scoring

Likelihood of Failure						
Category	Weight	1	2	4	7	10
		Negligible	Unlikely	Possible	Likely	Very Likely
Physical Condition	0.60	Very Good Condition. Brand new with no defects or signs of deterioration.	Good Condition. Sound physical condition with minor defects and/or slight signs of early wear.	Fair Condition. Acceptable physical condition with evident deterioration and/or moderate defects.	Poor Condition. Failure likely in the short-term, shows abnormal deterioration and/or major defects.	Very Poor Condition. Asset has failed or failure is imminent.
Performance	0.20	Current performance exceeds system requirements. Able to meet average and peak capacity needs, can accommodate future needs.	Current performance meets system requirements. Able to meet average capacity needs but is maxed out during peak events. Will likely meet future needs.	Current performance is adequate to satisfy system requirements. Consistently functioning at or beyond its intended ability. May not be able to meet future needs.	Current performance is insufficient to satisfy system requirements. Unable to meet peak capacity needs, will not meet future additional needs.	Current performance is unacceptable, fails to satisfy system requirements, unable to meet current average capacity needs.
O&M Protocols	0.00	O&M protocols and documentation are complete, up-to-date, written, and easily accessible.	O&M protocols and documentation are complete, up-to-date, written, but are not easily accessible.	O&M protocols and documentation are written but not complete, out-of-date and or not easily accessible.	O&M protocols and documentation are written but not complete, out-of-date and location is unknown.	No written O&M protocols and documentation exists.
Maintenance	0.15	Maintenance exceeds manufacturer's recommendations or planned maintenance as a percent of total maintenance is > 90%.	Maintenance meets manufacturer's recommendations or planned maintenance as a percent of total maintenance is > 75%.	Maintenance satisfies most of manufacturer's recommendations or planned maintenance as a percent of total maintenance is 50%-75%.	Maintenance satisfies some of manufacturer's recommendations or planned maintenance as a percent of total maintenance is 25%-50%.	Maintenance has not satisfied most of manufacturer's recommendations or planned maintenance as a percent of total maintenance is <25%.

Table No. 6 – Likelihood of Failure Scoring

Step 9 - Capital Cost Estimates

Next, the construction cost of each individual project was estimated. A basic scope of work for each project was prepared. Estimated construction costs were prepared based on previously-completed similar work, discussions with manufacturers' representatives and contractors, and a review of current market prices and construction costs. Typical allocations for Contingencies, Legal, Engineering, and Administrative (CLEA) costs were also included.

Step 10 - Capital Improvement Plan

Finally, a 10-year schedule of specific capital projects and their associated annual costs was developed. The schedule was prepared based on the risk profile of each project and a smoothed projection of annual expenditures. Various schedule alternatives can easily be adapted from the framework presented.

2.0 RECOMMENDED CAPITAL PROJECTS

Based on the Regional Asset condition assessment and risk analysis described above, a prioritized CIP was prepared. It is important to note that the CIP represents a snapshot of known/observable utility conditions as of late 2012. Due to the dynamic nature of utility operations, these project needs will change overtime. Furthermore, several of the projects identified will require additional analysis, beyond the scope of this study, to determine the exact scope of necessary improvements and clarify final costs. Finally, the projects and associated costs identified herein are presented in 2013 dollars and should be reviewed and updated on an annual basis. Auburn's water/wastewater utility needs will continually evolve as projects are completed and new concerns and/or requirements arise. The recommended capital projects are segmented into six categories of regional assets, including:

- Water Treatment Plant - Assets in this category consist of the Owasco Lake Intake, Upper Pumping Station, Transmission Main to the Treatment Plant, the Slow Sand and Rapid Sand Treatment Plants and related facilities, the 3 MG clearwell, Transmission Main to the Lower Pumping Station, and the Lower Pumping Station and its related facilities.
- Water Transmission System - Assets in this category consist of the 10.5 MG reservoir, transmission mains within the City of Auburn to wholesale delivery points, and meters.
- Other Water System Recommendations - This category consists of other water system recommendations, including maintenance items and additional engineering evaluations.
- Wastewater Treatment Plant - Assets in this category consist of the facilities at the Auburn Water Pollution Control Facility, including the Preliminary Treatment Facility, Primary Settling Tanks, Aeration Tanks, Solids Handling Facility, Final Settling Tanks, Overflow Retention Facility, Septage Receiving Facility, UV Disinfection, and all associated piping and equipment.
- Wastewater Interceptor Collection System - Assets in this category consist of the three major interceptor lines, secondary sanitary collection pipe, four individual high-rate CSO treatment facilities, and a wet weather flow storage and release facility.
- Other Sewer System Recommendations - This category consists of other sewer system-related recommendations, including maintenance items and further engineering evaluations.

2.1 RECOMMENDED WATER TREATMENT PLANT PROJECTS

- Lower Pumping Station Pump Rehabilitation
  - Estimated Cost: $203,000
  - Description: The high service pumps were installed in 1968 and have never been thoroughly rehabilitated or refurbished. Due to the age of the pumps, it is likely that efficiencies are poor and failure probabilities are elevated. Currently, the pumps cannot be serviced due to broken isolation valves. The loss of any one of these pumps could result in a catastrophic loss of system pressure and supply. The recommended project includes the completed rehabilitation of the high service pumps. It is important to note that this critical project can only be completed after the isolation valves have been repaired

- Lower Pumping Station Valve Replacement
  - Estimated Cost: $457,000
  - Description: The ten (10) isolation valves at the lower pumping station are not functional. Some valves are frozen and cannot be turned, while others do not seat properly and leak. The inoperable valves range in size from 14 inches to 24 inches. They include both the influent and effluent valves for the entire station, and the suction and discharge valves for pumps 2, 5, and 6. Due to the broken valves, the high service pumps cannot be isolated for maintenance and repair. Furthermore, in the event of an eventual pump failure or malfunction, isolation and repairs would not be immediately possible. This could cause a major loss of system pressure and supply and could cause the pipe gallery to be flooded. Finally, an emergency repair would be extremely difficult and likely result in an extended service outage. The proposed project includes the installation of new isolation valves on both sides of each high-service pump and on the influent and effluent header lines. It is important to note that this project will require careful planning and logistical support. Access in and out of the lower pipe gallery will be very difficult and temporary by-pass may be necessary. It is possible that this job will be staged so that the pumping station is offline for only short periods of time.

- Vacuum Priming Systems Replacement
  - Estimated Cost: $81,000
  - Description: The existing priming systems for the low-lift pumps and the backwash pump are aging and require an inordinate amount of maintenance. The backwash priming system runs continuously and is worn more than the upper pump station. The existing priming systems keep the low-lift and backwash pumps primed. Loss of prime would result in the inability to run the pumps. This would cut off the City's supply capability or limit treatment to the slow sand system. The recommended project included the replacement of the existing priming systems with new similar skid-mounted units.

- Backwash Pump Replacement and Rehabilitation
  - Estimated Cost: $60,000
  - Description: The backwash pump is original, installed when the plant was constructed. The pump is aging and has never been refurbished. A backup pump has been purchased but sits idle and cannot economically be installed parallel to existing pump. The existing backwash pump is the only mechanism to backwash the filters. Continued use without rehabilitation will increase the likelihood of asset failure. In the event of failure a pump change would be difficult and may require several days. This would result in the loss of rapid filtration capacity and the City's supply would be severely limited. The recommended project includes, at a minimum, the replacement of the existing pump with the backup pump. In addition, the old pump would be sent out for complete rehabilitation. This project should be combined with the Flume Wall Rehab because both will require the rapid sand system to be down for several days. An alternative item would include the permanent installation of the second backwash pump in parallel with the existing pump following rehabilitation. However, this installation would be much more costly and would require significantly more time.

- Rapid Sand Flume Wall Repairs
  - Estimated Cost: $91,000
  - Description: The south concrete wall of the rapid sand influent flume and overflow chamber is showing signs of fatigue and decay. Concrete is cracked and water is leaching through. Staff believes that the channel was not originally designed to be under pressure but, due to a plant retrofit, the flume is now subject to pressure. The flume is the sole influent to the rapid sand filter process, a critical component of the City's water supply system. In 2009, following a structural evaluation it was determined that failure was not imminent however, continued leaching and cracking will result in structural damage and ultimately failure. In addition, the Department of Health has been pressuring the City to repair the flume wall before the damage becomes severe. The proposed project includes the rehabilitation of the concrete flume wall by repairing the spalled and/or loose concrete and sealing any inside cracks.

- Slow Sand Filter Building Exterior Renovation
  - Estimated Cost: $41,000
  - Description: The Slow Sand Filter Building was constructed in the late 1910s. The structure is original and more than 80 years old. The exterior walls and concrete walkways are aging and have experienced significant deterioration and resulted in poor aesthetics for an historic building. The slow sand filter building is a critical component of the City's water supply system. Continued deterioration may contribute to long-term structural deterioration or result in further damage to the building, particularly from environmental conditions. The recommended project includes the rehabilitation of concrete walkways and spot repairs to the stucco building facade to mitigate future deterioration and improve building aesthetics.

- Raw Water Transmission Line Inspection
  - Estimated Cost: $95,000
  - Description: The transmission main from the Upper Pumping Station to the Filtration Plant on Swift Street consists of approximately 8,800 feet of original 24-inch cast-iron pipe. The first 400 feet of transmission main is a new 30-inch-diameter pipe installed as part of the re-construction of the Owasco Lake Seawall Project, completed in 2001. The pipe size increases to 36 inches at the point

where it crosses over the Owasco Lake Outlet adjacent to the State Dam, and is reduced to 30 inches before entering the rapid-sand filtration plant. The pipeline is the sole source of raw water for the City of Auburn and its customers. A break in this line would interrupt the City's water supply. There have been two major breaks in this line over the past 15 years. However, the breaks were reportedly caused by hydraulic transients (pressure spikes), resulting from operational conditions. Staff report that these conditions can be avoided in the future; however, due to the critical nature of the raw water line, it is recommended that an inspection of the line be completed to carefully evaluate its condition. The inspection should include underwater video, with sonar, of a representative length of pipe. In addition, several test pits and wall thickness tests should be completed.

- Zebra Mussel Control System Replacement
  - Estimated Cost: $569,000
  - Description: The zebra mussel control system is showing deterioration. The chemical storage tank walls are thinning and pipe connections are leaking. In addition, one of the two chemical feed lines to the water intake is plugged. The system is critical to prevent the adverse impacts of zebra mussel propagation, including: loss of hydraulic capacity, degradation of intake structure, and increased potential for disinfection by-products. It is recommended that the City replace the entire zebra mussel control system, including: chemical storage tanks, piping, feeder lines, and chemical pumps. Any project should consider the possibility of replacing the liquid chlorine system with a dry system.

- Lower Pumping Station Heating System Replacement
  - Estimated Cost: $27,000
  - Description: The current heating units are out of order and do not provide climate control. Furthermore, the heating units are mounted high above the floor, making maintenance/repair difficult. Currently, the building is unintentionally heated by the waste heat of the VFDs. The recommended project includes the replacement of two natural gas heating units with new high-efficiency heaters.

2.2 RECOMMENDED WATER TRANSMISSION & DISTRIBUTION PROJECTS

- Master Meter Change Out Program
  - Estimated Cost: $233,000
  - Description: There are 11 active and 4 inactive interconnections between the City and the neighboring community water systems. Many of the master meters at the

interconnections are outdated, broken, missing, and/or not functioning properly. The inaccurate measurement of flow can result in billing errors and inequitable charges among customers. In addition, water meters will typically under-register flow over time, which may result in financial loss for the City. The recommended project includes the replacement or installation of 11 new master meters at the active interconnections.

- Transmission & Distribution Replacement Program
  - Estimated Cost: Up to $1,650,000 annually; 43% Regional and 57% City
  - Description: The Cost of Service Analysis completed last year determined that approximately 43% of the City's transmission and distribution system provides regional benefit. Consequently, 43% of the capital needs associated with the transmission and distribution system are included in this capital plan as regional.

    Much of the water transmission and distribution system is more than 100 years old and many pipes are showing deterioration. An annual replacement of aging distribution lines is recommended to ensure service levels are maintained over time. Lack of investment would exacerbate the situation and would reduce the system's reliability and service levels. It is recommended that the City begin an annual replacement of 1 percent to 2 percent of waterlines, targeting the most critical and poor-condition areas. This approach will allow the City to replace its transmission and distribution system over the next 50 to 100 years. The program should include the replacement of hydrants and valves within project areas.

    Although the distribution system is not considered regional, it is noted that three specific sections were highlighted (due to their undersize or break frequency) during meetings with staff and are recommended for replacement including; Corcran Drive dead-end, Dunning Avenue from Clymer to the City line, and Throop from Swift St. to Roberts Road.

- Annual Valve Turning and Replacement Program
  - Estimated Cost: $60,000
  - Description: Currently, valves are replaced as a maintenance item but the City may consider them as capital due to the total cost and long period of usefulness. Many transmission and distribution valves are in excess of 100 years old and are in a deteriorated condition. In the last 2 years, more than 60 valves have broken or were discovered broken during water main repairs. Lack of attention and further deterioration will limit the ability to isolate leaks and cause greater damage and service outages. It is recommended that the City begin an annual valve exercising program. This normal maintenance activity would extend the

life of the City's assets. However, such a program will invariably discover and/or cause additional valve failure. Thus, it is further recommended that the City plan to purchase between 30 to 40 valves annually, so that repairs of broken valves can be completed by City staff in a timely manner. Furthermore, it is recommended as part to the pipeline replacement program that all valves along any new pipe be replaced. This approach would allow the City to replace all of its valves within the next 50 to 100 years.

- Annual Hydrant Replacement Program
  - Estimated Cost: $81,000
  - Description: Many of the City's hydrants are also in excess of 100 years old. An annual replacement/rehab program of non-functioning hydrants should be conducted. Currently, hydrants are repaired within the annual maintenance budgets. In the last 2 years more than 80 hydrants have broken or been discovered broken and had to be replaced. Lack of attention and further deterioration will limit the fire protection for localized areas within the City. It is recommended that the City continue its hydrant maintenance program. This normal maintenance activity will extend the life of the City's assets. It is further recommended, that the City plan to purchase between 40 and 50 hydrants annually such that repairs of broken hydrants can be completed by City staff in a timely manner. Furthermore, it is recommended as part to the pipeline replacement program that all hydrants along any new pipe be replaced. This approach will allow the City to replace all of its hydrants within the next 50 to 100 years.

2.3 OTHER WATER SYSTEM RECOMMENDATIONS

- Security Improvements – Capital Project Consideration
  - Description: Due to the sensitive nature of water treatment and with regard to public health, it is imperative that treatment plant security remain a principal issue. A detailed risk assessment was completed in 2007 to comply with EPA requirements. The results of the risk assessment are confidential, but several security improvements have been recommended.

- SCADA and Telemetry Upgrades – Recommended Maintenance Item
  - Description: As with all computer systems, SCADA and Telemetry hardware and software become outdated over time. The system was updated in 2011, but based on the rapid change in computer hardware and software technology, it is recommended that the Water Treatment Plant's SCADA system be regularly maintained and updated as necessary. Typically, this includes maintenance

contracts with a system/software provider that allows for new release updates and support. Furthermore, the City should consider housing its operational and data storage systems on a dedicated computer or system separate from the day-to-day administrative business computing with full back-up capabilities.

- Slow Sand Filter Outfall Modifications – Recommended Maintenance Item
  - Description: The 20-inch diameter slow sand filter drain line has a 12-inch valve that restricts the flow and occasionally causes flooding in the filter basement. The drain line has a very shallow slope, and the 12-inch valve causes a significant flow restriction. This restriction may have also caused the accumulation of filter media in the drain line. Consequently, the normal filter drainage and other run-off that moves through this drain line can back-up and flood the basement, which submerges all of the valving and piping in the basement. This condition will result in deterioration of the slow sand system. It is recommended that the 12-inch valve is replaced with a 20-inch valve. This item is most likely a maintenance item that can be completed by City staff.

- Reservoir Roof Rehabilitation – Recommended Maintenance Item
  - Description: The reservoir building roof is aging and has deteriorated. Lack of attention and continued deterioration will eventually result in structural damage. It is recommended that the roof be replaced or rehabilitated. This is an item that can likely be completed by City staff.

- Treatment Plant Valve Program – Recommended Maintenance Item
  - Description: All valves in the slow sand facility are original and almost 100 years old, while the valves in the rapid sand building are approximately 30 years old. A valve exercise program is recommended and should be incorporated into standard operating procedures. This will prolong the life of the valves and allow smooth operations. Furthermore, replacement valves and contingency repair plans should be in place in case of valve failures.

- VFD Replacement Program – Recommended Maintenance Item
  - Description: Variable Frequency Drives (VFD) are typically rated to last 10 to 12 years under normal operating conditions. Due to the high cost, relatively short lifespan, and integral role these components play in the overall plant process, it is advisable to have a regular cycle of VFD replacements. This approach

will stagger the investment associated with VFDs and time replacements to achieve maximum life.

- Increase Pressure on East Side of City – Recommended Study
  - Description: A small area on the east side of the City regularly experiences low pressure due to increased elevation relative to the existing storage reservoir. A hydraulic evaluation of the distribution system and potential solutions is recommended. Possible improvements may include construction of an elevated storage tank and/or a booster pump station.

- Lagoon Sludge Disposal – Recommended Study
  - Description: The 250gpm sludge discharge pumps at the lagoon have not worked properly for many years and are not in use. The original design does not appear to have accounted for the naturally occurring debris that is found in and around the lagoon, and the pumps clog very quickly. The lagoon continues to fill with sludge that cannot be pumped to the sewer as designed. Periodically, the lagoon must be manually cleaned at significant cost. Furthermore, staff believes that a new gravity feed from the plant may be feasible to direct the sludge directly to the sanitary system, eliminating the need for pumping and storage at the lagoon. Moreover, the ongoing energy evaluation at the dam may eventually determine that the lagoon may be needed for other purposes. It is recommended that a study be done to determine the optimal means of disposing sludge from the treatment plant to the sewer system or other destination.

- Reservoir Baffle System – Recommended Evaluation
  - Description: The current baffle system in the 3MG finished water storage reservoir is necessary for chlorine contact time. The baffles are made of hemlock boards and are approximately 14 feet high. The baffles were replaced in 1978, but a diving inspection in 2007 indicated some deterioration and a few fallen baffles. A diving team is expected to make some repairs later this year. The divers should be instructed to document the overall current condition of the baffle system to determine if and when the baffles should be replaced. A synthetic baffle system is recommended when the baffles require replacement.

- Structural Evaluation of the Slow Sand Filters and Building – Recommended Study
  - Description: The slow sand filters and original filter house were constructed in the early 1900s. Both are beginning to show signs of structural decline. Staff report that the structure was examined approximately 15 years ago and no immediate concern was identified. However, cracking between the support columns and arches above the filter beds was observed. Furthermore, the filters are leaking at several construction joints, reportedly as a result of deteriorated copper water stops. These items should be investigated by a structural engineer to determine if further deterioration may result and to identify any necessary corrective action.

- Taste and Odor Control – Recommended Study
  - Description: A top complaint fielded by water plant personnel is regarding taste and odor issues during the late summer months. In addition, the local Department of Health has identified the presence of blue-green algae in the lake and has previously mandated the use of activated carbon. Odor control is a common issue in municipal water treatment and can be treated with various chemicals and/or technologies, including: hydrogen peroxide, chlorine dioxide, soda ash, ultraviolet (UV) disinfection, and others. Preliminary consideration seems to indicate that a UV system with chlorine dioxide may prove most effective. Furthermore, a UV system would increase water quality by treating waterborne pathogens such as bacteria, viruses, and parasites, including Cryptosporidium or Giardia, which can be resistant to conventional chemical disinfection. In addition, UV disinfection may help reduce the use of chlorine and thereby reduce the formation of harmful disinfection by-products (DBPs). Such DBP will likely be subject to increased regulation in the future. Since there are several alternatives that may address taste and odor, and since disinfection may be linked to the outcome, a more detailed evaluation is recommended so that the City achieves the greatest benefit for the lowest cost.

- Radio Meter Technology – Recommended Study
  - Description: Although the individual customer water meters are not considered as regional assets, it is noted that the City derives most of its water revenue based on meter readings. The City has a well-established meter replacement program which helps to ensure measurement accuracy. However, metering technology has evolved rapidly in recent years with significant advances. It is recommended that the City consider a radio read system to improve reading

efficiencies, better data management, improved billing practices, and customer service options.

2.4 RECOMMENDED WASTEWATER TREATMENT PLANT PROJECTS

Please note that several of the following projects relate to sludge processing or the solids handling building. Although many of these projects are critically necessary, it may be more cost effective in the long term if the City were to consider the construction of a new solids handling facility rather than investing in a piecemeal manner to correct many of the deficiencies in this part of the process. Please see the recommendation for a Sludge Handling Facility Replacement Study under Section 2.6.

- Solids Handling Building Heating and Ventilation System Replacement
  - Estimated Cost: $735,000
  - Description: The current odor control system is deteriorated and the technology is outdated. The system is used simply as an air exchange with no odor control. There should be certain rates of air exchange for health and safety purposes. It is likely that the current regulations require more frequent air exchanges (30 changes/hour) than the system can currently deliver. A failure of this system would result in a PESH violation and a safety hazard. Furthermore, the boiler system and hot water piping are also severely deteriorated due to age. One of two boilers has completely failed and out of service. Climate control is extremely important to preserve and extend the useful life of the assets. Lack of climate control will accelerate deterioration. The recommended project includes a new air exchange and odor control system, possibly with new technology such as carbon or bio filters. Also, the boilers, hot water piping and exhaust fans should be replaced. This project must be coordinated with other sludge handling improvements.

- UV System Rehabilitation and Algae Control
  - Estimated Cost: $675,000
  - Description: The UV system has been problematic for some time. One bank of lamps is out of service, and annual maintenance costs are excessive. Lamps and ballasts regularly require replacement. Currently, aftermarket parts are used in an effort to keep replacement costs down. In addition, the electrical and control panels have deteriorated due to frequent maintenance reducing their weather tolerance. The PLC also continues to malfunction.

    The system configuration and algae growth are also problematic. The orientation of lamps combined with algae growth in the aeration tank causes a hydraulic restriction, which reduces treatment capacity and results in flooding/damage to the ballasts and communication boards during high flow events. Lack of attention will perpetuate the flooding and will accelerate asset deterioration, reduce efficiencies, and increase operating and maintenance costs.

    The recommended project is to upgrade the UV system ($135,000) and construct a pre-engineered building ($540,000) to shield the tank from sunlight and mitigate the algae growth. However, this approach will only extend the useful life of the UV system by 5 to 10 years.

    Alternatively, the full replacement of the UV system is estimated at $1,100,000 which may provide newer technology, greater efficiencies and up to 20 years of useful life. However the cost ratios should be closely examined before such an investment.

    An alternative algae mitigation approach could be to construct a geo membrane tank cover ($675,000) on stainless steel framing to shield the tank from sunlight. Further alternatives include ultra sonic systems at lower costs, but may cause a buildup of dead algae and increased maintenance.

- Belt Press Replacement
  - Estimated Cost: $1,350,000
  - Description: One of the two belt filter presses is no longer operational. The equipment is outdated and parts are extremely difficult to acquire. The remaining press has experienced significant deterioration and requires frequent maintenance to maintain operating levels. This is a critical treatment process

with no redundancy. Asset failure would interrupt the ability to treat wastewater. Asset failure would cause the City to incur significantly higher costs to treat and dispose sludge. Equipment would need to be rented to continue treatment or liquid sludge would need to be transported to a different facility for treatment and disposal. The recommended project is to replace both belt filter presses.

- Cross Collector and Long Conveyor Screw Replacement
  - Estimated Cost: $297,000
  - Description: The Cross Collector and Long Conveyor Screws are 15 years old and have experienced significant deterioration and severe wear. The equipment requires frequent maintenance to maintain operating levels. The equipment is outdated and difficult maintain. This is critical treatment equipment with no redundancy. Asset failure would interrupt the ability to handle sludge and would result in significantly increased disposal costs. The recommended project is to replace the Cross Collector and Long Conveyor Screw System.

- Storage & Release Facility and CSO Facility Improvements
  - Estimated Cost: $655,000
  - Description: The electrical, control, pumping, and chemical systems at each stormwater facility have deteriorated and are no longer functional. The electrical and control systems are in the same room as chemical storage, which has resulted in accelerated deterioration. Furthermore, the chemical system is not used frequently, which makes it difficult to maintain. Due to the loss of functionality, chemical treatment cannot currently be provided. This could result in a violation of CCDOH requirements during a major wet weather event. The proposed project includes the separation of electrical and control systems from chemical storage. In addition, replacement of the pumping, electrical, control, and chemical systems is recommended. The project should

consider the use of a different technology - i.e. dry system, to increase safety and reduce corrosion.

- Gravity Thickener Rehabilitation
  - Estimated Cost: $68,000
  - Description: Significant deterioration is evident on the center shaft and arms of the gravity thickener. The protective coating is worn off and is no longer effective. The steel arms are corroded and assets are nearing the end of their useful life. Continued deterioration may have an adverse impact to the thickener treatment process. The inability to thicken sludge will result in significantly higher disposal costs. Failure of this asset will prevent the processing/removal of any sludge (both primary and secondary). This could cause the sludge to go septic or carry-over out of the plant and create major process and odor problems. The recommended project includes the replacement of the center shaft, arms, and protective coating.

- Schwing Sludge Handling System Replacement
  - Estimated Cost: $495,000
  - Description: The system has experienced significant deterioration and requires frequent maintenance to maintain operating levels. The equipment is outdated and difficult maintain. Requires regular maintenance. This is a critical component in sludge processing and disposal, with no redundancy. Asset failure will interrupt the ability to treat wastewater. The City will incur significantly higher costs to dispose sludge. In the event of major failure, additional equipment may need to be rented to continue treatment. Alternatively, liquid sludge may need to be transported to a different facility for treatment and disposal. The recommended project is a full replacement of the sludge handling system.

- Scum Mixer Rehabilitation
  - Estimated Cost: $41,000
  - Description: The scum mixer has deteriorated due to normal wear and tear and has exceeded its anticipated useful life. The equipment is now

maintenance-intensive and the rotating blades are almost completely worn off. Thus, mixing may not be complete. Asset failure would impact treatment processes and could lead to oil and grease permit violations. Grease may not be effectively removed and may carry-over into the aeration stage. This may potentially plug the membrane. The recommended project includes full replacement of the scum mixer.

- Grit Classifier Replacement
  - Estimated Cost: $405,000
  - Description: Both grit classifiers have deteriorated due to age, continued use, and the nature of the application. The troughs are rotting and the screws are leaking. The classifiers are maintenance-intensive, requiring significant resources to maintain and operate. The removal of grit is a critical process to protect downstream assets and extend the life of the WWTP. If the classifiers are not functioning properly, inorganic material can enter the biological processes. When clogged, several staff are required to restore service. The recommended project is to replace the grit classifiers with new equipment and to upgrade related system controls. The project should also examine the potential for alternative technology.

- Sludge Polymer System Replacement
  - Estimated Cost: $102,000
  - Description: Both the original and a subsequent replacement polymer system are no longer functional. The current system is a temporary rented system. It does not allow dosing optimization, which may increase costs. The addition of polymer greatly enhances the sludge processing. Asset failure would result in more costly sludge disposal. The recommended project is to replace with a more permanent system with improved location and controls. The project could be combined with other sludge handling improvements.

- Waste Water Treatment Plan Roof Rehabilitation
  - Estimated Cost: $975,000
  - Description: The WPCP was constructed in the 1970s. Many of the various building roofs are leaking, have passed their warranty period, and have been patched multiple times. The roofs are generally membrane-type that have been in service for 30 years or more, and are approaching the end of their useful life. Continued leakage will accelerate deterioration of the buildings and internal assets. The recommended project is to replace the membrane roof covering the precast concrete of the Administration, Influent, Solids Handling, Settled Sewage, Gallery 3, Recirculation, and Aeration Buildings. Some roof improvements may be packaged with the potential HVAC upgrades at some locations.

- Settled Sewage Pumps Rehabilitation
  - Estimated Cost: $133,000
  - Description: The settled sewage pumps have significantly deteriorated due to normal wear and use. One pump has recently experienced bearing failure. Continued deterioration may decrease pump efficiency and require increased maintenance to meet operating requirements. Only 2 of 3 pumps are currently operating, increasing process vulnerability. If another failure occurs, the City may have to by-pass treatment. The proposed project is to rebuild the three 175HP pumps, replace the seals, impellers, and wear parts.

- Final Settling Tank Improvements
  - Estimated Cost: $837,000
  - Description: The mechanical arms in all four tanks are showing corrosion and deterioration from wear and tear. The equipment requires significant rehabilitation. Historically, the mechanical arms break regularly during the winter due to deterioration. The recommended project includes the replacement of the tank arms, application of a new protective

coating, and the installation of new VFD's. An alternative would be the rehabilitation of the mechanical arms, including sand blasting, new sections and protective coating but the useful life would be much shorter than replacement.

In addition, the 3-foot concrete retrofit wall that raised the hydraulic grade within the settling tanks is spalling along the joint with the original concrete. When the tanks are at full capacity, the water level reaches above the retrofit, and this could cause future structural problems for the tanks. The project should also include some minor concrete repairs.

- Septage Pipe Repair
  - Estimated Cost: $14,000
  - Description: Approximately 100 feet of septage piping was recently replaced due to repeated breaks. The pipe is now leaking within the concrete where it passes from the pipe gallery to the discharge. Continued leaking may result in structural deterioration or damage to the concrete wall. The recommended project will replace the deteriorated portion of pipe and repair concrete as necessary.

- Waste Water Treatment Plant Door Replacements
  - Estimated Cost: $50,000
  - Description: Approximately 20 of the pre-hung framed doors throughout the plant and CSO facilities have deteriorated and are no longer functional. The broken doors pose safety and security risks. Furthermore, exposure to the elements at certain locations may result in long-term damage to the buildings. Also, damage may result from extreme temperatures and/or dust and dirt, causing VFDs to overheat. These conditions can shorten the life of many expensive assets. The recommended project includes replacement of specific doors throughout the plant.

- Recirculation Building HVAC System Replacement
  - Estimated Cost: $49,000
  - Description: The 1972 HVAC system is nearing the end of its useful life and is maintenance-intensive. The manufacturer is out of business and spare parts are difficult to acquire. Climate control is extremely important to preserve and extend the useful life of the City's assets. Lack of climate control will accelerate deterioration. It is recommended that the system be replaced.

- Settled Sewage Facility HV System Replacement
  - Estimated Cost: $54,000
  - Description: The HVAC system is nearing the end of its useful life and is no longer efficient. Temperature controls are ineffective and the roof fan and louvers don't work. Furthermore, it is difficult to get spare parts. Climate control is extremely important to preserve and extend the useful life of the City's assets. Lack of climate control will accelerate asset deterioration and temperature extremes can damage VFDs. It is recommended that the City replace the HV system.

- Storage & Release Facility and CSO Facility Roof Rehabilitation
  - Estimated Cost: $430,000
  - Description: The roofs at each CSO and the Storage and Release Facilities (five buildings) have deteriorated and are now leaking. Continued leaking will result in structural deterioration and/or other damage to each of the buildings. The recommended project includes the replacement of the membrane roofing at each facility. It is recommended that this project be completed in conjunction with the chemical and control system rehabilitation project.

- Aeration Building HV System Replacement
  - Estimated Cost: $79,000
  - Description: The HVAC system is nearing the end of its useful life and is maintenance-intensive. The bearings on blowers have overheated in the past. Climate control is extremely important to preserve and extend the useful life of the City's assets. Lack of climate control will accelerate deterioration. It is recommended that the system be replaced.

- Screenings Handling Improvements
  - Estimated Cost: $405,000
  - Description: Current screenings are conveyed upward vertically via hydraulic ram and dropped onto a conveyer system. Due to the steep upward angle, the system gets clogged in the spring and fall, requiring screenings to be transported via pushcart. The current method

requires intensive maintenance and cannot be used during certain seasons due to fallen leaves. Proposed improvements would replace the current conveyance system with an alternative that uses a covered trough rather than pipe to move the screenings.

- Administration Building Odor Control System Replacement
  - Estimated Cost: $237,000
  - Description: The existing Administration Building scrubber, meant for interior odor control, no longer functions properly. Staff reports that venting and clean air intakes are not located appropriately. The recommended project includes a new unit and realignment of the ductwork.

2.5 RECOMMENDED SEWER COLLECTION SYSTEM PROJECTS

- Wholesale Master Meter Change Out Program
  - Estimated Cost: $470,000
  - Description: There are approximately 20 interconnections with neighboring sanitary systems. Many of the meters at the interconnections with the City's wholesale customers are missing, outdated, broken, and/or not functioning properly. The inaccurate measurement of flow can result in billing errors and inequitable charges between customers. In addition, under/over measurement may result in financial loss for the community. Moreover, the inaccurate measurement of wastewater flow has long been a cause for disagreement between communities. The recommended project includes the replacement of most wholesale meters.

- Owasco Street Manholes
  - Estimated Cost: $160,000
  - Description: The existing manholes on the South Interceptor are old brick manholes that are too small for crew or equipment to utilize. This condition prevents proper maintenance of the Interceptor. Replacement of the existing six manholes between Francis and Haven with larger diameter manholes at a depth of approximately 20 feet is recommended.

- Columbus Street Manholes
  - Estimated Cost: $160,000
  - Description: The existing manholes on the South Interceptor are old brick manholes that are too small for crew or equipment to utilize. This condition prevents proper maintenance of the Interceptor. It is recommended that the City

replace the existing six manholes between Underwood and Genesee with larger diameter manholes at a depth of approximately 20 feet.

- South Interceptor Improvements
  - Estimated Cost: $207,000
  - Description: The line from Chapman Avenue to Bailey Street is blocked by heavy root growth and has excessive levels of inflow and infiltration. This condition causes backups and unnecessary stormwater flows to enter the system. The existing line is both 18 and 22 inches in diameter along this section. It is recommended that the City replace this section of the interceptor with a new 22-inch line.

- Owasco Interceptor Improvements
  - Estimated Cost: $418,000
  - Description: The line from CSO #5 to the dead-end of Wadsworth Street is blocked by very heavy root growth. It runs parallel to a newer line and staff has constructed an overflow point to relieve the regular backups into the newer line. The existing clay line is 24 inches in diameter along this section. It is recommended that the City replace this section of the interceptor with a new 24-inch line.

- Pipeline Replacement Program
  - Estimated Cost: Up to $2,270,000 annually, depending on length of pipe repaired each year.
  - Description: The Cost of Service Study completed last year determined that approximately 40 percent (by inch-mile) of the City's collection system is considered regional. Consequently, 40 percent of the capital investment needs identified herein are considered regional.

    There are approximately 109 miles of pipe lines in the current pipe network; approximately 70 percent of the pipes are at least 130 years old and are being increasingly spot-repaired. Continued aging along with normal wear and tear and certain environmental conditions will inevitably reduce service levels and increase failure rates. The recommended project includes a regular annual investment to replace up to two percent of pipe, which would take 50 years to complete.

2.6 OTHER SEWER SYSTEM RECOMMENDATIONS

- Chain and Flight Replacement – Recommended Maintenance Item
  - Description: The chain and flights on the primary clarifiers are regularly worn due to the nature of this application. In-house staff has been replacing these assets over the last year and are approximately two thirds complete. It is recommended that the program continue and the remaining chain and flights be replaced.

- VFD Replacement Program – Recommended Maintenance Item
  - Description: Variable Frequency Drives (VFD) are typically rated to last 10-12 years under normal operating conditions. Due to the high cost, relatively short lifespan, and integral role these components play in the overall plant process, it is advisable to have an regular VFD replacement program. In recent years, in-house staff has replaced approximately 85 percent of the VFDs and are scheduled to replace the remainder this year. It is recommended that this program be continued. There are 48 VFDs, with 6 deemed critical by staff. Previously, in-house staff have installed some VFDs and contracted with vendors to program the units.

- Source Power Redundancy – Recommended Evaluation
  - Description: The wastewater plant has only a single transformer to provide power from the Co-Gen Plant. Furthermore, the current generator is not sized properly to receive power from the grid. Due to a reported lead time of six months or greater to acquire a new transformer, it is recommend that the City consider installing a second transformer sized to receive power from the grid. Staff report that this item is currently under consideration as part of another energy capital improvement study.

- Septage Receiving Station Upgrade – Recommended Study
  - Description: The WPCP currently receives septage from various haulers. This generates significant revenues for the City. There may be potential to increase revenues if the septage processing system were enhanced. Currently, septage is unloaded by gravity from haulers to a 10,000-gallon holding tank at

approximately 400gpm. Septage is pumped from the holding tank to the head of the treatment plant. The pumps run at approximately 150gpm, which is significantly slower than the unloading rates. There is a potential for increased septage delivery and associated revenues if the receiving station can process greater volumes quickly. Proposed improvements include increasing the number of receptacles to receive septage from haulers. Install new piping to accommodate a meter so that septage is measured accurately (currently, drivers report volumes delivered). Install an automated billing system that could be tied into the SCADA system. The recommended project is to perform a technical and financial analysis of the costs and revenue opportunities relative to septage before making capital improvements.

- Water Pollution Control Plant Odor Control – Recommended Study
  - Description: The WPCP has several processes which create excessive odorous discharges. During certain atmospheric conditions these odors can become a nuisance to staff and create a serious quality of life issue in the surrounding neighborhoods. It is recommended that the City of Auburn commission a study to review available technologies, which could limit the extent of odors emanating from particular pollution control processes.

- Sludge Handling Facility Replacement Study
  - Description: The entire sludge handling facility and system is worn and in some cases severely deteriorated. In addition, many of the original systems have been abandoned while others are beyond their anticipated useful life. Some of the abandoned systems include: the incinerator, the original polymer system, the scrubber, and others. Some of the systems that are broken or failing include the belt press, the boiler and hot water piping, the roof, and other systems. Some of the systems that are aging and will need to be replaced soon include the schwing system, the conveyor screws, the air exchange, and others. It would be extremely expensive to replace all of these systems. In fact, almost $3,500,000 of recommended improvements have been identified in this CIP.

    Furthermore, the building is much larger than necessary due to the abandoned systems; thus, temperature control costs are inefficient. In addition, sludge must be conveyed over long distances to store or to load the transport trucks, which is also inefficient. As a result of all these items, a study is recommended to examine the potential of constructing a new energy-efficient sludge handling

facility, rather than replacing the existing systems piecemeal, which would not address many of the core efficiency issues.

- State Street Pipe Replacement – Recommended Maintenance Item
  - Description: Staff reports that the sewer main on State Street is beginning to fail and is a constant maintenance issue. Some of this will be replaced under the York Street project. It is recommended that the remaining problem area (12-inch pipe) between York and Monroe be completed by City Staff.

3.0 AVERAGE ANNUAL INVESTMENT BENCHMARKING

Since municipal utility systems include long-lived assets with operational periods that extend over several decades, it is appropriate to develop annual investment benchmarks for planning and budgeting purposes. In concept, the City's assets both depreciate and deteriorate over time. Depreciation is an accounting concept related to the initial investment and return against asset value. Deterioration relates to the physical life of an asset, which in many cases may extend beyond the accounting period of depreciation. For purposes of capital planning, an asset's useful life is significantly more relevant than the depreciation of the asset's value. Specifically, when the anticipated useful life of an asset is known, a utility can plan for its replacement over the life of the asset and avoid major financial disruptions.

A common framework used to improve financial and capital planning is to compare the remaining useful life with the replacement cost of the asset. This approach allows a community to determine an annualized investment necessary to replace its assets by the end of their useful life. This can be a very informative benchmark applied to measure the investment strategies of the utility. It can provide a conceptual average annual investment figure, which will achieve a sustainable operation.

For purposes of this report, the 2008 CIP was used as a basis to determine the current replacement costs and remaining useful life of the City's regional assets. In the 2008 CIP, the replacement value of the City's systems was estimated based on an EPA cost model and other construction data. At that time, the estimated replacement value of the City's systems (not including the lift stations and storm water piping) was $369,870,000. To reflect the 2013 estimated replacement value of these same systems, the ENR Construction Cost Index was used to convert to current dollars. The current estimated replacement value is $416,254,000.

In order to determine the conceptual average annual investment that the City should make to achieve a sustainable operation, the remaining life of each asset was estimated. This was based on the asset's original life expectancy, age, current condition, and engineering judgment. A blended asset age for several major categories was estimated and then subtracted from the original life expectancy of each category to estimate the remaining life. A recommended average annual capital investment was determined by dividing the replacement value by the estimated remaining life. Table No.s 7 and 8 show the current estimated replacement value and the annual investment required to offset the annual loss of useful life.

Major Asset Group	Estimated Replacement Value (2008)	Estimated Replacement Value (2013)	Original Life Expectancy (yr)	Estimated Blended Age (2013)	Estimated Remaining Life (2013)	Useful Life Based Annual Investment (2013)	Minimum Annualized Investment for New Assets
Water Plant (Rapid Sand) Structure (Est 60% Total Value)	$ 17,230,000	$ 19,297,600	125	40	85	**$ 228,000**	**$ 154,381**
Water Plant (Rapid Sand) Mechanical & Equipment (Est. 40% Total Value)	$ 11,490,000	$ 12,868,800	50	25	25	**$ 515,000**	**$ 257,376**
Water Plant (Slow Sand) Structure (Est 60% Total Value)	$ 9,910,000	$ 11,099,200	125	70	55	**$ 202,000**	**$ 88,794**
Water Plant (Slow Sand) Mechanical & Equipment (Est. 40% Total Value)	$ 6,610,000	$ 7,403,200	50	25	25	**$ 297,000**	**$ 148,064**
Water System Pump Stations	$ 9,030,000	$ 10,113,600	75	50	25	**$ 405,000**	**$ 134,848**
Potable Water Storage	$ 8,600,000	$ 9,632,000	100	50	50	**$ 193,000**	**$ 96,320**
Transmission & Distribution System (43% Regional)	$ 73,730,000	$ 82,577,600	125	75	50	**$ 1,652,000**	**$ 660,621**
Total Water Assets	**$ 136,600,000**	**$ 152,992,000**				**$ 3,492,000**	**$ 1,540,403**

Table No. 7 – Average Annual Water Investment Level Benchmark

Major Asset Group	Estimated Replacement Value (2008)	Estimated Replacement Value (2013)	Original Life Expectancy (yr)	Estimated Blended Age (2013)	Estimated Remaining Life (2013)	Useful Life Based Annual Investment (2013)	Minimum Annualized Investment for New Assets (2013)
Sewer Plant Structure	$ 78,590,000	$ 88,020,800	125	50	75	**$ 1,173,611**	**$ 704,166**
Sewer Plant Equipment	$ 52,390,000	$ 58,676,800	50	25	25	**$ 2,347,072**	**$ 1,173,536**
Retention Facility & CSOs	$ 800,000	$ 2,896,000	125	50	75	**$ 38,613**	**$ 23,168**
Collection System (40%Regional)	$ 101,490,000	$ 113,668,800	125	80	50	**$ 2,273,376**	**$ 909,350**
Total Sewer Assets	**$ 233,270,000**	**$ 263,262,400**				**$ 5,832,672**	**$ 2,810,221**

Table No. 8 - Average Annual Sewer Investment Level Benchmark

Based on the current replacement value and the original life expectancy of the City's assets, a minimum annualized investment of $1.54 and $2.81 million for water and sewer, respectively, should be made annually. This level of investment would be appropriate for a newly-constructed system. However, based on the remaining life expectancy of the City's assets (many of which are quite old), a recommended investment of $3.5 and $5.8 million for water and sewer, respectively, should be made

annually (see Useful Life-Based Annual Investment). In the event that the City evaluates the condition of its assets regularly and adequately funds its maintenance programs the recommended annual capital reinvestment might appropriately fall somewhere between the two metrics. Due to the conceptual nature of this metric, it should be used as a benchmark for capital spending and not as a rigid investment strategy. Ultimately, failure to properly reinvest and/or maintain the water and sewer assets will result in declining service levels and failures.

It is acknowledged that the conceptual average annual recommended investment is significantly higher than what the City has historically reinvested in its water and sewer systems. Furthermore, due to the current economic challenges facing the City, it will be difficult to immediately begin to invest at these recommended higher levels. However, it is further acknowledged that many of the City's assets are beyond their original intended life span and cannot reasonably be expected to function effectively for many more years. Thus, it is recommended that the City begin to increase its reinvestment in water and sewer at a minimum such that 1 to 2 percent of the system is replaced annually. This would put the City on a path to replace its assets over the next 50 to 100 years.

4.0 CAPITAL IMPROVEMENT PLAN

4.1. CAPITAL PROJECT SCORING

Based on the condition assessment and bundling of projects as described on the Methodology, the required capital projects were evaluated for risk. Scores were assigned for each project by both City staff and CRA. Table Nos. 9 and 10 below show the blended scoring in each category associated with the Consequence and Likelihood of failure for each project. The project risk score was developed from the product of the Consequence and Likelihood of failure scores. The projects are ranked from highest risk to lowest risk. Project prioritization and ultimately scheduling should generally be to address the higher risk projects first.

Project Name	Consequence of Failure							Likelihood of Failure					Risk Score
	0.25	0.20	0.20	0.15	0.10	0.10	1.00	0.60	0.20	0.00	0.20	1.00	
	Health & Safety	Regulatory Compliance	Financial Impacts	Public Relations and Community	Service Level	Human Resources	CONSEQUENCE SCORE	Physical Condition	Performance	O&M Protocols	Maintenance	LIKELIHOOD SCORE	
Lower Pumping Station Pump Rehabilitation	5	5	10	8	10	9	7.35	7	6	1	8	7.00	51.45
Lower Pumping Station Valve Replacement	2	1	10	2	1	10	4.10	10	7	1	9	9.20	37.72
Vacuum Priming Systems Replacement	1	7	10	8	8	8	6.45	6	5	1	5	5.60	36.12
Backwash Pump Replacement and Rehab	1	7	10	8	8	8	6.45	5	5	1	5	5.00	32.25
Raw Water Transmission Line Inspection	5	5	10	9	9	8	7.30	5	4	1	3	4.40	32.12
Annual Hydrant Replacement Program	1	3	8	4	4	4	3.85	6	5	1	8	6.20	23.87
Trans. & Distribution Replacement Program	1	1	8	5	5	5	3.80	6	4	1	8	6.00	22.80
Annual Valve Turning & Replace. Program	1	1	6	4	4	5	3.15	6	7	1	8	6.60	20.79
Zebra Mussel Control System Replacement	2	2	4	3	1	4	2.65	8	5	1	7	7.20	19.08
Master Meter Change Out Program	1	1	10	7	1	1	3.70	5	5	1	5	5.00	18.50
Lower PS Heating System Replacement	2	1	1	1	1	5	1.65	8	8	1	6	7.60	12.54
Rapid Sand Flume Wall Repairs	1	2	4	3	2	4	2.50	6	1	1	1	4.00	10.00
Slow Sand Building Exterior Renovation	2	1	2	2	1	2	1.70	6	4	1	4	5.20	8.84

Table No. 9 - Water Project Risk Scores

Project Name	Consequence of Failure							Likelihood of Failure					Risk Score
	0.25	0.20	0.20	0.15	0.10	0.10	1.00	0.60	0.20	0.00	0.20	1.00	
	Health & Safety	Regulatory Compliance	Financial Impacts	Public Relations and Community	Service Level	Human Resources	CONSEQUENCE SCORE	Physical Condition	Performance	O&M Protocols	Maintenance	LIKELIHOOD SCORE	
Solids Handling HV System Replacement	7	7	9	1	1	7	5.90	7	8	1	7	7.20	42.48
UV System Rehab. and Algae Control	4	10	9	6	1	4	6.20	6	4	1	8	6.00	37.20
Belt Press Replacement	3	5	10	3	1	5	4.80	9	7	1	4	7.60	36.48
Cross Collector and Conveyor Screw Replacement	3	5	10	1	1	5	4.50	8	7	1	7	7.60	34.20
Gravity Thickener Rehabilitation	2	10	7	4	1	5	5.10	7	5	1	5	6.20	31.62
Schwing Sludge Handling System Replacement	3	5	10	1	1	5	4.50	7	5	1	5	6.20	27.90
Scum Mixer Rehabilitation	2	6	5	1	1	4	3.35	9	9	1	5	8.20	27.47
Storage & Release Facility and CSO Facility Improvements	1	8	5	3	1	4	3.80	7	8	5	7	7.20	27.36
Grit Classifier Replacement	5	3	4	2	1	7	3.75	7	7	1	7	7.00	26.25
Sludge Polymer System Replacement	3	5	4	1	1	7	3.50	8	7	1	5	7.20	25.20
WWTP Roof Rehabilitation	4	1	7	1	1	4	3.25	8	7	1	7	7.60	24.70
Settling Tanks Improvements	2	7	4	1	1	5	3.45	8	4	1	5	6.60	22.77
Settled Sewage Pumps Rehabilitation	1	8	5	2	1	5	3.75	7	7	1	2	6.00	22.50
Pipeline Replacement Program	2	4	8	5	4	5	4.55	4	4	4	7	4.60	20.93
Wholesale Master Meter Changeout Program	1	2	10	2	1	2	3.25	5	7	7	7	5.80	18.85
WWTP Door Replacements	3	1	4	2	1	4	2.55	8	7	1	1	6.40	16.32
Admin. Building Odor Control System Replacement	2	2	1	2	1	4	1.90	9	9	1	5	8.20	15.58
Septage Pipe Repair	3	2	2	1	1	4	2.20	8	7	1	1	6.40	14.08
Settled Sewage Facility HV System Replacement	3	1	2	1	1	4	2.00	7	7	1	7	7.00	14.00
Aeration Building HV System Replacement	3	1	2	1	1	4	2.00	7	7	1	7	7.00	14.00
Recirculation Building HV System Replacement	3	1	2	1	1	4	2.00	7	7	1	7	7.00	14.00
South Interceptor Improvements	1	2	3	1	1	3	1.80	5	6	5	5	5.20	9.36
Owasco Interceptor Improvements	1	2	3	1	1	3	1.80	5	6	5	5	5.20	9.36
Storage & Release Facility and CSO Facility Roof Rehabilitation	1	1	1	1	1	5	1.40	8	7	1	1	6.40	8.96
Screenings Handling Improvement	1	1	2	1	1	4	1.50	4	4	5	4	4.00	6.00
Owasco Street Manholes	2	1	1	1	1	1	1.25	5	6	1	1	4.40	5.50
Columbus Street Manholes	2	1	1	1	1	1	1.25	5	6	1	1	4.40	5.50

Table No. 10 - Sewer Project Risk Scores

The results of the risk analysis are also shown graphically by plotting the respective Consequence and Likelihood scores on a matrix of High (red), Medium (yellow), and Low (green) Risk. Those projects that have both a high Consequence and Probability of Failure fall within a high-risk area of the chart and should be addressed first. The charts show high-risk projects in the top right corner and progressively lower risk projects moving diagonally towards the bottom left corner.

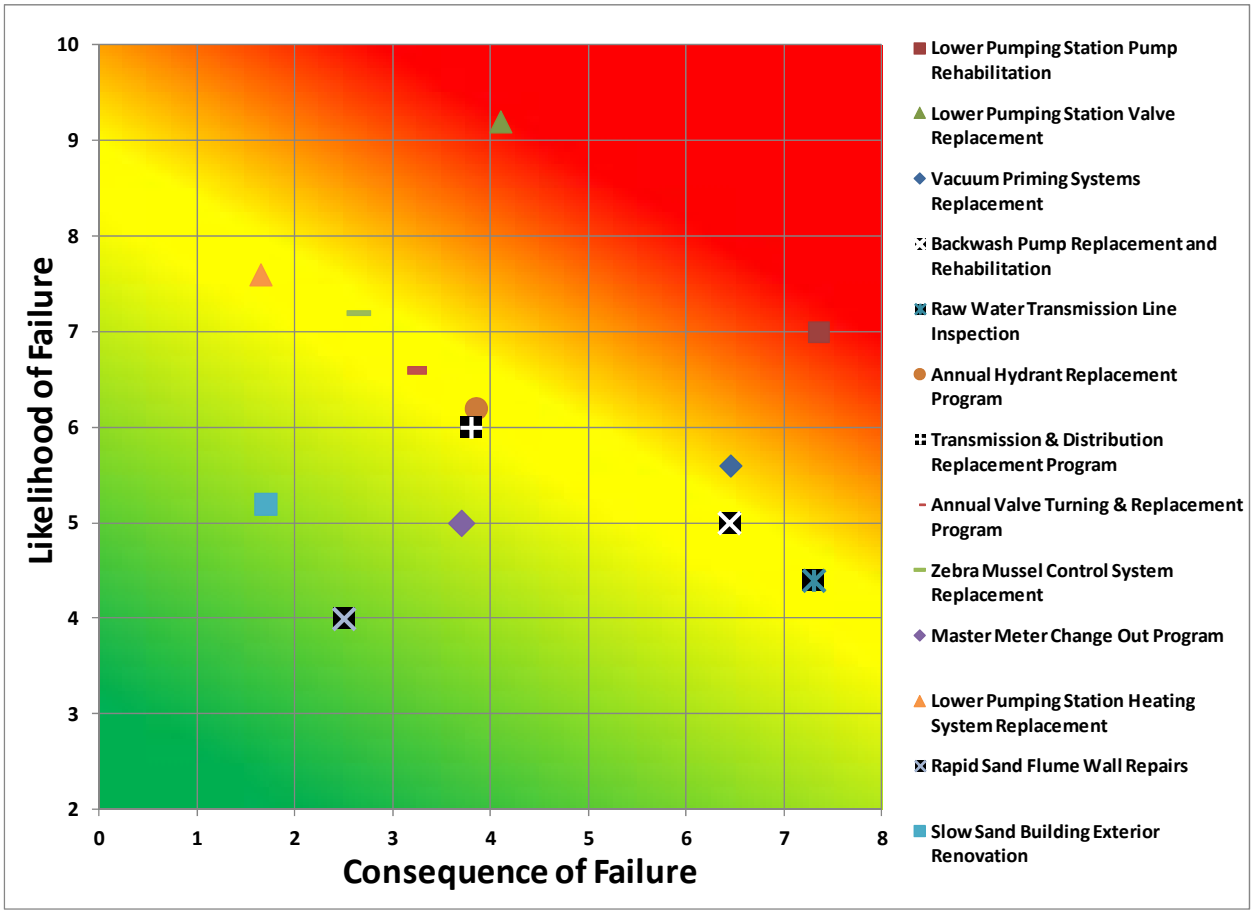

Figure No. 2 - Water Projects Consequence Vs. Likelihood of Failure

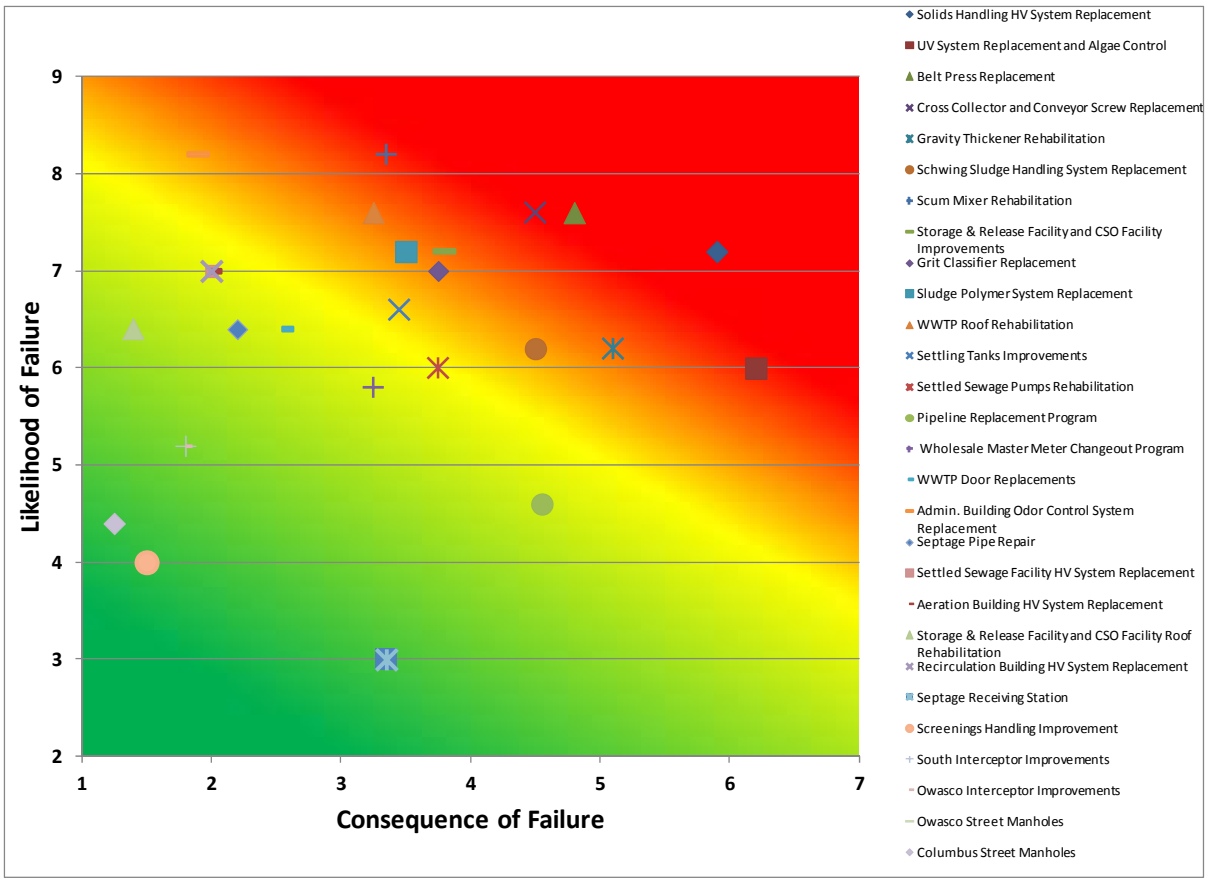

Figure No. 3 - Wastewater System Consequence Vs. Likelihood of Failure

4.2 SCHEDULE OF CAPITAL INVESTMENT

Finally, a 10-year schedule of specific capital projects and their associated annual costs was developed. The schedule was prepared with several objectives, including:

- Address all currently-identified deficiencies within a 10-year schedule.
- Complete high-priority projects first.
- Increase capital investments such that annual investment levels are greater than the minimum recommended investment level; and assets are replaced in accordance with remaining life schedules.
- Initiate replacement/rehabilitation programs for long life distribution and collection system assets.

The following table shows the recommended investment approach that addresses the needs of the City's water and wastewater systems over the next 10 years. It is important to note that the exact level of satisfactory annual investment is not a precise predictable value. It must be reviewed annually against asset condition and service levels.

Project Name	Risk Score	Estimated Cost	Ten Year Capital Improvement Plan											Total
			2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	
Water Projects														
Lower Pumping Station Pump Rehabilitation	51.45	$ 203,000		$ 203,000										**$ 203,000**
Lower Pumping Station Valve Replacement	37.72	$ 457,000	$ 457,000											**$ 457,000**
Vacuum Priming Systems Replacement	36.12	$ 81,000			$ 81,000									**$ 81,000**
Backwash Pump Replacement and Rehabilitation	32.25	$ 60,000			$ 60,000									**$ 60,000**
Raw Water Transmission Line Inspection	32.12	$ 95,000			95000									**$ 95,000**
Hydrant Replacement Program	23.87	$ 81,000	$ 40,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	$ 81,000	**$ 850,000**
Annual Pipe Replacement Program (43% Regional)	22.80	$ 1,650,000	$ 400,000	$ 600,000	$ 600,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000	**$ 7,200,000**
Valve Replacement Program	20.79	$ 60,000	$ 30,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	**$ 630,000**
Zebra Mussel Control System Replacement	19.08	$ 569,000					$ 113,800	$ 455,200						**$ 569,000**
Master Meter Change Out Program	18.50	$ 233,000				$ 116,500	$ 116,500							**$ 233,000**
Lower Pumping Station Heating System Replacement	12.54	$ 27,000			$ 27,000									**$ 27,000**
Rapid Sand Flume Wall Repairs	10.00	$ 91,000				$ 91,000								**$ 91,000**
Slow Sand Building Exterior Renovation	8.84	$ 41,000					$ 41,000							**$ 41,000**
Sub Total Water Projects		**$ 3,648,000**	**$ 927,000**	**$ 944,000**	**$1,004,000**	**$1,048,500**	**$1,112,300**	**$1,296,200**	**$ 841,000**	**$ 841,000**	**$ 841,000**	**$ 841,000**	**$ 841,000**	**$ 10,537,000**
Waste Water Projects														
Solids Handling HV System Replacement	42.48	$ 735,000	$ 367,500	$ 367,500										**$ 735,000**
UV System Rehab. and Algae Control	37.20	$ 675,000		$ 135,000	$ 540,000									**$ 675,000**
Belt Press Replacement	36.48	$ 1,350,000		$ 270,000	$ 1,080,000									**$ 1,350,000**
Cross Collector and Conveyor Screw Replacement	34.20	$ 297,000				$ 297,000								**$ 297,000**
Gravity Thickener Rehabilitation	31.62	$ 68,000					$ 68,000							**$ 68,000**
Schwing Sludge Handling System Replacement	27.90	$ 495,000				$ 495,000								**$ 495,000**
Scum Mixer Rehabilitation	27.47	$ 41,000	$ 41,000											**$ -**
Storage & Release Facility and CSO Facility Improvements	27.36	$ 655,000				$ 655,000								**$ 655,000**
Grit Classifier Replacement	26.25	$ 405,000					$ 405,000							**$ 405,000**
Sludge Polymer System Replacement	25.20	$ 102,000	$ 102,000											**$ 102,000**
WWTP Roof Rehabilitation	24.70	$ 975,000					$ 975,000							**$ 975,000**
Final Settling Tank Improvements	22.77	$ 837,000						$ 837,000						**$ 837,000**
Settled Sewage Pumps Rehabilitation	22.50	$ 133,000						$ 133,000						**$ 133,000**
Pipeline Replacement Program (40% Regional)	20.93	$ 2,270,000	$ 600,000	$ 600,000	$ 400,000	$ 700,000	$ 700,000	$ 800,000	$ 900,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	$ 1,000,000	**$ 8,700,000**
Wholesale Master Meter Changeout Program	18.85	$ 480,000				$ 240,000	$ 240,000							**$ 480,000**
WWTP Door Replacements	16.32	$ 50,000						$ 50,000						**$ 50,000**
Admin. Building Odor Control System Replacement	15.58	$ 237,000						$ 237,000						**$ 237,000**
Septage Pipe Repair	14.08	$ 14,000		$ 14,000										**$ 14,000**
Settled Sewage Facility HV System Replacement	14.00	$ 54,000							$ 54,000					**$ 54,000**
Aeration Building HV System Replacement	14.00	$ 79,000							$ 79,000					**$ 79,000**
Recirculation Building HV System Replacement	14.00	$ 49,000							$ 49,000					**$ 49,000**
Storage & Release Facility and CSO Facility Roof Rehabilitation	8.96	$ 430,000							$ 430,000					**$ 430,000**
Screenings Handling Improvement	6.00	$ 405,000							$ 405,000					**$ 405,000**
Owasco Street Manholes	6.00	$ 160,000								$ 160,000				**$ 160,000**
Columbus Street Manholes	6.00	$ 160,000								$ 160,000				**$ 160,000**
South Interceptor Improvements	6.00	$ 207,000								$ 207,000				**$ 207,000**
Owasco Interceptor Improvement	6.00	$ 418,000								$ 418,000				**$ 418,000**
Sub Total Waster Water Projects		**$ 11,781,000**	**$1,110,500**	**$1,386,500**	**$2,020,000**	**$2,387,000**	**$2,388,000**	**$2,057,000**	**$1,917,000**	**$1,945,000**	**$1,000,000**	**$1,000,000**	**$1,000,000**	**$ 18,211,000**
Total Capital Plan		**$ 15,429,000**	**$2,037,500**	**$2,330,500**	**$3,024,000**	**$3,435,500**	**$3,500,300**	**$3,353,200**	**$2,758,000**	**$2,786,000**	**$1,841,000**	**$1,841,000**	**$1,841,000**	**$ 28,748,000**

Table No. 11 - Capital Improvement Plan