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March 31, 2020

Mr. Stuart Juppenlatz Fulton Financial Advisors One Penn Square Lancaster, PA 17602

> Re: West Goshen Sewer Authority Guaranteed Sewer Revenue Bonds Trust Indenture 2019 Annual Consulting Engineer's Report

Dear Mr. Juppenlatz:

In accordance with Section 5.02 of the June 27, 2017 trust indenture with the West Goshen Sewer Authority, please find the 2019 Annual Consulting Engineer's Report, as prepared by Herbert, Rowland & Grubic, Inc. enclosed for your use.

Please feel free to contact me at <u>jfox@hrg-inc.com</u> or at 717-564-1121 if you have any questions or concerns.

Sincerely,

Herbert, Rowland & Grubic, Inc.

Joshua T. Fox, P.E. Practice Area Leader | Water & Wastewater

HCK/JTF/rb 007608.0426

c: West Goshen Sewer Authority(w/Encl.) Mr. Casey LaLonde, Township Manager Mr. Ross Unruh, Solicitor HRG File (w/Encl.)



WEST GOSHEN SEWER AUTHORITY

2019 ANNUAL CONSULTING ENGINEER'S REPORT WASTEWATER SYSTEM

March 2020



BUILDING RELATIONSHIPS. DESIGNING SOLUTIONS.

2019 ANNUAL CONSULTING ENGINEER'S REPORT WEST GOSHEN SEWER AUTHORITY CHESTER COUNTY, PENNSYLVANIA

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1.0 INTRODUCTION

1.1 OVERVIEW OF WEST GOSHEN SEWER AUTHORITY SYSTEM

West Goshen Sewer Authority (Authority) owns, and West Goshen Township (Township) operates and maintains, the sanitary sewer system which provides public sanitary sewer service to West Goshen Township, as well as portions of West Whiteland Township, East Goshen Township, Westtown Township, and a shopping center in Thornbury Township.

In 2017, the Authority updated their intermunicipal agreements with East Goshen Township and Thornbury Township; in 2018, the intermunicipal agreement with West Whiteland Township was updated; and in 2019, the intermunicipal agreement with Westtown Township was updated.

1.1.1 COLLECTION & CONVEYANCE SYSTEM

The existing sanitary sewer collection system consists of over 200 miles of a combination of force main and gravity sewers ranging in size from 8-inches to 30-inches in diameter.

1.1.2 CONVEYANCE SYSTEM – PUMP STATIONS

The Authority currently owns ten (10) wastewater pump stations throughout the collection and conveyance system. The pump stations consist of wet pit submersible style pumps (pumps are located in the sewage being pumped) or dry pit submersible style pumps (pumps are located in a separate dry well physically separated from the liquid being pumped).

As part of the West Goshen Sewer Authority Capital Improvement Plan, the Woodcrest Pump Station #10 and force main were replaced in 2019. The Trinity Drive Pump Station and force main are scheduled to be upgraded in 2020 and the Taylor Run (#11) and the Westtown Way (#13) Pump Stations are currently undergoing engineering for their respective upgrades to begin in 2020.

Two (2) new pump stations were constructed in 2019 as part of the Woodlands at Greystone Development. This Development will eventually result in the abandonment of the Hamilton Woods Pump Station. Start-up activities for both Pump Stations were successfully completed. The Engineer is currently waiting on final record drawings and start-up reports from the Contractor/Developer for both stations prior to the dedication of the two pump stations to the Authority. These two (2) pump stations are currently known as Part Station A and Pump Station B.

1.1.3 WASTEWATER TREATMENT PLANT

The Wastewater Treatment Plant (WWTP) is currently rated for an Annual Average Flow capacity of 6.0 million gallons per day (MGD) with a maximum monthly hydraulic design capacity of 9.0 MGD and a peak flow capacity of 15.0 MGD. The facility operates under NPDES Permit No. PA0028584 with surface discharge of treated effluent to Goose Creek. The Annual Average Flow to the WWTP in 2019 was 5.756 MGD and the Maximum Monthly Flow was 7.319 MGD. The average monthly organic loading to the plant was 6,871 lbs., which is significantly lower than the facility's organic load capacity of approximately 17,514 lbs/day.

Unit processes employed at the WWTP include mechanical fine screening and vortex grit removal (upgraded in 2018), flow equalization, primary clarification, trickling filters (roughing), aeration, secondary clarification, polishing (tertiary) clarification, and ultraviolet light disinfection. Waste activated sludge (WAS) and primary sludge generated by the facility are stabilized via anaerobic digestion (Anaerobic Digester Replacement Project completed in 2019) and further dewatered via two (2) Ashbrook belt filter presses. The dewatered sludge is hauled to the Chester County Solids Waste Authority Landfill for disposal.

As provided in the 2019 Annual Wasteload Management Report (Chapter 94 Report) that will be submitted to the Pennsylvania Department of Environmental Protection (PADEP) in March 2020, the WWTP currently possesses additional hydraulic and organic treatment capacity to accommodate projected future growth and development within the surrounding communities and West Goshen Township.

Inflow and infiltration (I/I) continue to be an issue as could be seen in the increase in the annual average and maximum monthly average flows over the past few years. Deteriorated infrastructure in the collection system continues to be identified, inventoried, and rehabilitated or replaced by Township Staff.

As included in the Authority's Capital Improvement Program and allotted for in their capital expenditure schedule, certain unit processes and components of the treatment facility are scheduled to be rehabilitated or upgraded this 5-year planning term (2016-2021) due to deterioration from age and/or use.

Additionally, the pending implementation of a Total Maximum Daily Load (TMDL) for total phosphorus (TP) on point-source discharges within the Goose Creek watershed has required that the Authority significantly reduce the allowable discharge of TP from the WWTP from 2.0 mg/L; to the interim limit of 0.8 mg/L and prepare a plan to meet EPA's ultimate goal of reduction of TP to 0.04 mg/L.

An interim settlement agreement was reached by all parties in October 2018 to further reduce effluent TP from a monthly average of 0.8 mg/L to a monthly average of 0.1 mg/L by December 1, 2022 with the ultimate goal of demonstrating whether or not the US EPA approved tertiary treatment system can treat to levels of TP lower than 0.1 mg/L. The WWTP Phase 2 Improvements Project, which includes the installation of a COMAG System (Ballasted Flocculation and Clarification System) designed to reduce TP in the effluent, is currently under construction and is scheduled to be completed in February 2021 in accordance with the settlement agreement with EPA.

1.2 ASSESSMENT, NEEDS, AND DRIVERS

At the request of the Authority, and as required in the 2017 Bond Indenture, Herbert, Rowland & Grubic, Inc. (HRG) has completed the annual inspection and is providing a summary of the following:

- 1. Operating Data from 2019
- 2. Condition of the existing system

- 3. Improvements completed in 2019
- 4. Recommendations to improve operation, maintenance, or capital infrastructure

This report is intended to satisfy the Bond Indenture requirements as well as to provide an overview of the activities completed for the wastewater system for the Authority and the Township's Board of Supervisors.

2.0 ACKNOWLEDGEMENTS

HRG would like to thank Michael Moffa, Wastewater Superintendent; Jim Leon, Pump Stations Foreman; Bill Hardy, Plant Maintenance Foreman; and the Township Staff for their assistance in the preparation of this Report.

This Report was prepared by Helen Kenion, E.I.T. and Joshua T. Fox, P.E., of HRG and reviewed by Joshua T. Fox, P.E. and Township Staff prior to issuance.

3.0 ADDITIONAL INFORMATION USED TO COMPLETE THIS REPORT

3.1 2019 ANNUAL WASTELOAD MANAGEMENT REPORT (CHAPTER 94)

The 2019 Annual Wasteload Management Report was completed in accordance with Chapter 94 of Title 25 of the Pennsylvania Code and will be submitted to PA DEP by the March 31, 2020 deadline. The Report provides daily information on hydraulic loading for 2019, along with historical context of annual flows over the past five years. The report also provides:

- Detailed organic loading over 2019
- Information on sewer extensions completed or planned in the Township
- Information regarding the anticipated additional EDUs including the pump station with which each EDU is associated
- Detailed sewer system monitoring, maintenance, and repair efforts undertaken in 2019
- An overview of the condition of the sewer system
- Identification of any overflow events that occurred over the past year
- Information on the 10 pump stations in the system, including information about annual average and max daily flows, as well as projected max daily flows over the next two years
- Contributing municipalities' equivalent Municipal Wasteload Management data, specifically on collection and conveyance facilities tributary to the Authority's system.

3.2 NPDES PERMIT

The Authority has an existing NPDES Permit No. 0028584 (Permit). The Permit was set to expire on August 8, 2006 and a new permit has not yet been issued. The Permit sets forth the monitoring and reporting requirements for discharges from the West Goshen Sewage Treatment Plant (Site ID No. 449547), located at 848 South Concord Road, West Chester, PA 19382. The Permit provides Effluent Limitations for Phosphorus and Ammonia as N on an average monthly lbs/day basis. It also provides effluent limitations or reporting requirements for:

- Flow
- CBOD
- Suspended solids
- Fecal coliform
- Dissolved oxygen
- pH
- Copper, lead, and BIS phthalate

The effluent limitations and reporting requirements are based on an effluent discharge rate of 6.0 million gallons per day. A maximum monthly flow of 9.0 million gallons per day is the rated hydraulic capacity of the WWTP and is used to determine whether a hydraulic overload situation exists. An interim effluent limit of 0.8 mg/L (monthly average) TP went into effect on January 3, 2019 and an interim effluent limit of 0.1 mg/L (monthly average) TP goes into effect on December 1, 2022 based on the second interim settlement agreement with US EPA and DRN on the Goose Creek TMDL. As previously stated, the Authority is currently constructing a tertiary treatment system in order to meet the future TP limit of 0.1 mg/L (monthly average).

3.3 DRAFT TMDL REPORT

A report titled "Nutrient Total Maximum Daily Load in Goose Creek Watershed, Pennsylvania" was prepared by the US EPA and published June 30, 2008. The purpose of the report was to identify impairments and applicable water quality standards and use them to develop Total Maximum Daily Loads (TMDLs) for Goose Creek. The TMDL process establishes allowable loadings of pollutants, and as West Goshen contributes to the Goose Creek watershed, the effluent from the West Goshen WWTP would be subject to any potential TMDLs implemented for Goose Creek.

The TMDL was developed as an average concentration during the growing season from April to October, when the greatest risk for algae growth exists. After the analysis detailed in the report, it was determined that Goose Creek is an effluent-dominated stream regarding TP contributions. The report provides a target instream concentration of 0.04 mg/L TP, based on the analysis of historic flow data and the dry weather year of 2002. Total phosphorus reductions were applied to MS4 facilities and to wastewater treatment facilities with flows greater than 1.0 MGD, which includes the West Goshen WWTP.

The West Goshen WWTP is not required to adhere to the limits set forth in the report until their individual permit is revised to incorporate those limits. It should be noted that those projected limits as set forth in this document have been objected to by the Authority.

An interim settlement agreement was reached by all parties in October 2018 to further reduce effluent TP from a monthly average of 0.8 mg/L to a monthly average of 0.1 mg/L by December 1, 2022 with the ultimate goal of demonstrating whether or not the US EPA approved tertiary treatment system can treat to levels of TP lower than 0.1 mg/L.

4.0 CAPITAL IMPROVEMENT CAMPAIGN

4.1 CAPITAL IMPROVEMENT PLAN (CIP)

In 2015, the Township completed a comprehensive review of the wastewater collection, conveyance, and treatment system. The result indicated that significant improvements and capital investments were required to replace aged and deteriorated infrastructure, improve operations and personnel safety, and prepare for future treatment requirements. These recommendations were detailed in the 2015 CIP that was presented to and subsequently adopted by the Authority in 2016. Several capital improvements were started in 2016 using reserve funding. The Authority identified that their capital improvement campaign was going to require additional funding, outside of their existing reserve funds. As a result, the Authority sold sewer revenue and guaranteed sewer revenue bonds to secure \$17,000,000 in additional funding in 2017.

With 2020 being the end of the five year planning window, the Authority created a joint committee with the Township to review capital needs extended out past the current bond-funded Projects. As a result, they developed a 10-year capital improvements plan that will be re-evaluated in five (5) years. A copy of the 2021-2030 Capital Improvement Schedule is attached as Appendix A.

4.2 SUMMARY OF CAPITAL WORK COMPLETED IN 2019

As a result of the Authority's Capital Improvement Program the following work was completed and/or began in 2019:

- 2017 Sanitary Sewer System Repairs (Contract No. 17-5):
 - This Project generally includes:
 - Replacement of sewers between manholes 317 and 316
 - 8 sanitary sewer spot repairs; Caswallen Drive; Oak Circle; Isabel Lane;
 Spring Lane; Spring Valley Lane; Oak Lane; and Paoli Pike
 - 5,761 L.F. of 8-inch diameter cured-in-place pipe lining
 - 7,997 L.F. of 30-inch diameter cured-in-place pipe lining
 - Replacement of manholes 801-16; 801-14; and 326

- Rehabilitation of 54 manholes
- Replacement of three air release valves
- This Project was partially completed in 2018 and was completed and closed out in 2019.
- Anaerobic Digester Replacement Project (Contract Nos. 17-3, 17-6, and 17-7):
 - This Project generally includes replacement of:
 - Existing Primary and Secondary Anaerobic Digester
 - Digester mixing
 - Sludge recirculation pumps
 - Dual fuel source boiler
 - Gas conditioning equipment
 - NFPA and NEC improvements
 - Replace roof for the Operations Building
 - Waste gas burner
 - Improved controls and instrumentation
 - Replace primary (raw) sludge pumps
 - Replace deteriorated doors and windows, repairs to building, new finishes, and removal of asbestos containing materials
 - New waste-activated sludge return to Primary Clarifiers
 - New natural gas service
 - Driveway entrance improvements
 - This Project was substantially complete in 2019 and is expected to be closed out in 2020. Contract Nos. 17-6 and 17-7 have been closed.
- 2018 Sanitary Sewers Repair Project (Contract Nos. 18-2 and 18-3):
 - This Project generally includes:
 - Replacement of approximately 1,038 L.F. of 8-inch and 10-inch diameter sanitary sewer main
 - Replacement of one sanitary sewer manhole
 - Cured-in-place pipe lining of approximately 560 L.F. of 8-inch sanitary sewer main

- Rehabilitation of 12 manholes
- This Project was completed and closed out in 2019.
- Woodcrest/Downing Avenue Pump Station Replacement (Contract Nos. WC-1 and WC-2)
 - This Project generally includes:
 - Partial demolition of existing pump station structures
 - Construction of a new pump station with submersible duplex pumps
 - Replacement of existing onsite emergency power equipment
 - Replacement of existing force main
 - This Project was completed and closed out in 2019.
- 2019 Phase I Interceptor Repairs Project (Contract Nos. IP-1 and IP-2):
 - This Project generally includes:
 - Replacement of approximately 468 L.F. of 24-inch diameter sanitary sewer main
 - Replacement of two sanitary sewer manholes with polymer concrete manholes
 - Approximately 3,160 L.F. of cured-in-place pipe lining of a 24-inch and 30inch sanitary sewer main
 - Rehabilitation of 21 manholes
 - This Project was designed in 2019 and is scheduled to be completed in 2020.

5.0 WASTEWATER TREATMENT PLANT PRIORITIZATION

5.1 OVERVIEW

As described in Section 1.1.3, the WWTP required modifications and upgrades to replace aged and deteriorated equipment, improve operations, and comply with effluent requirements for TP reduction. While the WWTP currently has sufficient organic and hydraulic capacity, aging equipment and overall condition of various components and processes have led to the need for repair or replacement of several key components. An overview of the condition of each of the unit processes at the WWTP are noted below:

5.2 HEADWORKS

The WWTP headworks was upgraded in 2018.

Based on HRG's review of the WWTP and discussions with the Operations Staff, the following items have been noted:

5.2.1 INFLUENT SCREW PUMPS

- Gearboxes, motors, and grease pumps were replaced on all three (3) screw pumps in 2018. A new control panel was installed in the garage area and new explosion proof local disconnects and emergency stops were installed in the Headworks Screening Room in 2017.
- Lower bearing assemblies were installed in 2018.
- Screw pump flight shafts exhibited signs of rust and continued corrosion. Based on recommendations by the Township Staff they are being planned to be replaced one-ata-time in 2022, 2024, and 2026, respectively.
- We recommend that Staff document and perform routine operation and maintenance (O&M) work in accordance with the manufacturer's preventive maintenance (PM) schedules

5.2.2 MECHANICAL FINE SCREENS

- New mechanical fine screens were installed in 2017 and are currently in operation
- Signs of rust are already visible on the new equipment. We recommend that the tubes and cover be cleaned with citric acid to remove the rust and traces of iron causing the rust to protect the equipment in accordance with the O&M Manual
- We recommend that Staff document and perform routine operation and maintenance (O&M) work in accordance with the manufacturer's preventive maintenance (PM) schedules

5.2.3 GRIT REMOVAL SYSTEM

- The vortex grit removal system was installed in 2018 and is fully functional
- We recommend that Staff document and perform routine operation and maintenance (O&M) work in accordance with the manufacturer's preventive maintenance (PM) schedules

5.2.4 EQUALIZATION BASIN

- EQ Pump No. 1 was replaced in 2017
- EQ Blower No. 3 was rebuilt in 2017
- The equalization system is in good working order with no major deficiencies noted. The return activated sludge line was removed from the influent (EQ) and returned to the

Primary Clarifier Distribution Chamber. This was completed in 2019 as part of the Anaerobic Digester Replacement Project

- Return activated sludge pump No. 1 was rebuilt in 2019
- Influent equalization Pump No. 1 was rebuilt in 2019
- Influent equalization pump breaker and VFD were replaced in 2019
- The Authority should consider adding mechanical mixers and dissolved oxygen control system or a compressed gas mixing system to limit electrical consumption in the future; this could be submitted for future Commonwealth Financing Authority (CFA) Small Water and Sewer Project Grant.

5.3 SOLIDS HANDLING

The WWTP utilizes anaerobic digestion for stabilization of the WAS and primary sludge generated at the facility. The stabilized sludge is then further dewatered utilizing Ashbrook belt filter presses prior to ultimate landfill disposal. Additionally, the WWTP also includes a dissolved air floatation (DAF) system which is not currently in service.

• Waste pump motor No. 3 was rewound in 2019

5.3.1 ANAEROBIC DIGESTION FACILITIES

The anaerobic digestion process was completely overhauled as part of the Anaerobic Digester Replacement Project (Contract Nos. 17-3, 17-6, and 17-7) due to the age and condition of the existing facilities and several gas leaks that were identified in the existing building in 2017.

While the Operations Building remains, the previous digesters that shared a common wall with the building were demolished and new precast post-tensioned digesters were constructed. The new digesters closely mirror the previous digesters with a fixed steel cover for the Primary and a



floating gas-holder style steel cover the Secondary. Both Digesters were installed with two draft tube mixers provided in each digester to be able to run the Secondary as a Primary if needed for maintenance purposes. Other improvements include physical separation of the building, providing a physically separated space for the new gas conditioning equipment. Improvements to the Operations Building also included a new roof, now doors, new windows, and conversion

of the lab into office storage space, conversion of the lavatory into an electrical room, replacement of lighting and ventilation, and new finishes throughout.

Other process improvements include the replacement of the existing primary sludge pumps, replacement of process piping (both sludge and biogas), replacement of the boiler and heat exchanger, provision of natural gas for the new boiler, addition of alkalinity supplementation pump, and replacement of the sludge recirculation pumps. This work was completed in 2019 as specified in Section 4.2.

Contract 17-3 continues to complete final items necessary to close-out the construction contract.

5.3.2 BELT FILTER PRESSES & ASSOCIATED DEWATERING EQUIPMENT

Stabilized sludge from the anaerobic digestion facilities is dewatered via two Ashbrook 2.2-meter belt filter presses. Sludge dewatering is currently performed approximately 4 to 5 days per week resulting in 490.28 dry metric tons disposed of in 2019 at the Chester County Solids Waste Authority Landfill. Another 84.75 dry metric tons of liquid sludge was hauled to Pottstown WWTP for further treatment and disposal. This higher than usual amount of sludge disposal was due to the emptying of one digester tank for replacement of the tank. The original Type 85 Ashbrook belt filter press was installed in the late 1980s and is scheduled for replacement with a screw press in 2020.

The following is included in the Dewatering System Upgrade, included as part of the Authority's Wastewater Treatment Plant Phase II Improvements:

- Rehabilitation of the digested sludge wet well
- Replacement of the dewatering system sludge feed pumps
- Replacement of the existing belt presses with screw presses
- Replacement of the dewatered sludge conveyors
- Replacement of the existing polymer mixing and metering system
- Supervisory control and data acquisition for dewatering system
- General building improvements in the belt filter press area are required including new paint, new corrosion resistant doors and hardware, new lighting, and new mechanical/HVAC systems.
- SCADA equipment should be installed to alert WWTP of dewatering equipment failure and record operating parameters.

The Township Staff continues to perform preventative maintenance on the dewatering equipment.

5.4 CLARIFIERS

5.4.1 PRIMARY CLARIFIERS

The existing WWTP includes three (3) primary clarifiers, three (3) final clarifiers, and three (3) tertiary (polishing) clarifiers as components of the overall treatment process.

The three (3) primary clarifiers are 70-ft diameter circular center-feed style spiral scraper clarifiers. Two (2) of the three (3) clarifiers were constructed with the original WWTP construction in circa. 1961. The third primary clarifier was constructed in 1975 during the first major expansion project. Primary Clarifier Nos. 1 and 2 appear to be in fair condition.

Primary Clarifier No. 3 was repaired and put back into service in 2017. This clarifier is now in good condition. The launders in all three (3) clarifiers were epoxy coated in 2019.

The Township Staff routinely completes preventative maintenance on the clarifiers. All clarifier launders and weirs get cleaned on a regular basis year round.

5.4.2 FINAL CLARIFIERS

The three (3) final clarifiers are 70-ft diameter circular center-feed style spiral scraper clarifiers. Two (2) of the three (3) were constructed circa. 1975 and follow the aeration basins in the treatment process. The third final clarifier was constructed in 2000 during the expansion of the WWTP that increased capacity from 4.5 MGD to 6.0 MGD ADF. All three (3) clarifiers appear to be in fair to good condition.

The clarifier drives and associated clarifier equipment for the two (2) clarifiers constructed in 1975 appear to be original Dorr Oliver equipment. The third clarifier constructed in 2000 is original Envirodyne equipment. The structural support bridges also appear to be original and are in fair condition.

A Ortho Phosphorus meter and pH meter were installed on Final Clarifier No. 3 to control the rate of chemical feed for PAC and hydrated lime, respectively as a part of the Enhanced Chemical Addition Project that was completed in 2018.

All clarifier launders and weirs get cleaned on a regular basis year round. The Township Staff routinely completes preventative maintenance.

5.4.3 TERTIARY (POLISHING) CLARIFIERS

The three (3) tertiary clarifiers are 60-ft diameter circular center-feed style spiral scraper clarifiers. Two (2) of the three (3) clarifiers were constructed with the original WWTP construction in circa. 1961 as final clarifiers following the trickling filters in the treatment process. After modifications and expansion of the WWTP in 2000 the final clarifiers were converted to tertiary clarifiers for "polishing" of the effluent prior to disinfection.

All three (3) clarifiers were taken off-line in the summer of 2017 to be inspected. The Tertiary Clarifiers are expected to be taken off-line permanently and demolished in 2020 following installation of the new smaller dimeter clarifiers being constructed as part of the new Tertiary Treatment System (COMAG System).

5.4.4 CLARIFIER RECOMMENDATIONS

• Three clarifier drives will be replaced beginning in 2021 and being completed in 2025.

5.5 TRICKLING FILTER

The WWTP process includes two (2) roughing trickling filters, 110-ft in diameter with plastic filter media. The roughing filters are intended to reduce the organic loading through distribution of wastewater over fixed film biology that grows on the surface area of the filter media. The wastewater then drains through the underdrain system to the Plant Intermediate Pump Station where it is then pumped to the Aeration Basins.

The tricking filter distribution arms and slag media were replaced with new distribution arms and plastic filter media during the WWTP Upgrade in 2000. The tricking filters require the bearings to be replaced. These are scheduled to be completed in 2020.

The trickling filters are in good condition and with routine maintenance and replacement of wear items, can continue to operate for another 5-10 years.

The Township Staff regularly cleans the orifices to ensure equal distribution of primary settled wastewater over the media.

5.6 AERATION (BLOWERS AND AERATION TANKS)

The WWTP utilizes three (3) 125 horsepower 18 psig positive displacement blowers to provide compressed air (capacity of 3,340 scfm each) to the existing aeration tanks through a 16-inch diameter air pipe. The blowers are able to operate at two (2) variable speeds, high and low.

The blowers were installed in 1975 during expansion of the WWTP with repairs and replacement parts provided as needed. Preventative maintenance is completed regularly for the existing blowers including regularly changing oil, cleaning air filters, etc. In 2019, aeration blowers No. 2 and No. 3 were rebuilt.



One (1) blower provides enough air for treatment and mixing of the existing aeration tanks with the second blower providing a swing-stand-by for redundancy, and the third able to provide the required air for the aerobic digester that was removed in 2017.

The 16-inch diameter buried aeration piping from the Blower Building to the Aeration Tanks is actively leaking and is visibly rising from the ground when saturated following a rain event. This pipe should be repaired in 2020 prior to new paving being installed in 2021.

The existing aeration tanks and blowers provide the WWTP with the ability to be modified to achieve greater levels of treatment, including denitrification, if necessary in the future with

structural modifications to the existing tanks, the addition of mixers and internal mixed liquor recycle pumps, and advanced controls. Potential future regulatory changes should be considered when making any modifications to this process, including any changes that would implement a total nitrogen effluent limit.

In addition to the blowers, the aeration system utilizes return activated sludge (RAS) and waste activated sludge (WAS) pumps to maintain an adequate inventory of mixed liquor for the system to be healthy and work properly. One (1) RAS pump was rebuilt, shaft repaired, and impeller balanced in 2018. One (1) RAS pump was rebuilt in 2019 as well.

Recommendations:

- Continue with preventative maintenance and maintain an inventory of parts to be able to keep blowers in service
- Replace 16-inch diameter buried aeration piping between Blower Building and Aeration Tank
- Reinstall handrail at Aeration Tanks where it was previously removed or damaged

A Small Water and Sewer Grant was awarded to the Authority from CFA for 85 percent funding for the following improvements:

• Install a new 75 horsepower, high efficiency blower with variable frequency drive and dissolved oxygen control system. This Project is intended to reduce the operating cost of the facility.

5.7 PLANT INTERMEDIATE PUMP STATION

The Plant Intermediate Pump Station collects wastewater received from the underdrain system of the trickling filters (full forward flow) and conveys the flow to the Aeration Basins for secondary biological treatment by way of three (3) 75 HP dry-pit submersible pumps (3800 GPM @ 46 ft TDH @ 885 RPM).

We recommend that all pumping, pumps, and associated equipment be painted and labeled in 2020.

5.8 DISINFECTION SYSTEM

Disinfection is achieved through in-channel ultraviolet (UV) light, controlled through a motoractuated weir that controls the contact time the treated effluent is in contact with the UV light. The Township Staff routinely completes preventative maintenance for the system. In 2019, 14 UV ballasts and 50 UV bulbs were replaced. The control system is scheduled to be replaced and upgraded in 2020.

5.9 ELECTRICAL

5.9.1 STANDBY GENERATOR REPLACEMENT

Two (2) new 500kw diesel powered outdoor enclosed generators with Trystar Permanent Docking Station and automatic transfer switch were installed at the WWTP in 2017. New Trystar rotary switches were installed at the Headworks Building and Operations Building in 2018. These switches allow for each individual building and associated equipment to run off individual stand0by generators should the need exist.

5.9.2 ELECTRICAL SAFETY IMPROVEMENTS

None of the existing facilities owned by the Authority are labeled with arc flash or electrical shock hazard warnings with the exception of the new electrical equipment installed at the Headworks Building and as part of the Anaerobic Digester Replacement and Enhanced Chemical Addition Projects. The National Electric Code, Article 110.16, requires all electrical equipment that is likely to require examination, adjustment, servicing, or maintenance while energized to be field marked to warn qualified persons of potential electric arc flash hazards. This does not necessarily mean that an Arc Flash Hazard Analysis (AFHA) is required at every location.

To save costs and to bring the facilities into compliance with the NEC, general labels can be applied to all electrical equipment and a safety program can be developed. The employer is required to implement and document an overall safety program that directs activity appropriate for the electrical hazards, voltage, energy level, and circuit conditions per NFPA 70E, Standard for Electrical Safety in the Workplace. There are specific requirements for training for all employees who face a risk of electrical hazard that is not reduced to a safe level by applicable electrical installation requirements. These employees must be trained to understand the specific hazards associated with electrical energy.

With a developed safety program, there are Tables within NFPA 70E that can be used to determine required personal protective equipment (PPE) levels for equipment required to be serviced. These tables provide pre-defined levels of PPE, which are based on the available short circuit current and the speed of the overcurrent protective device. In order to properly apply the tables from NFPA 70E, some degree of electrical calculations must be performed and the tables could be subject to misuse if they are applied without knowledge of the necessary calculations.

It is this reason that an AFHA complying with the guidelines of IEEE 1584 conducted by an Engineer is recommended. This type of study would label each piece of equipment in a facility with the incident energy level at that specific point in the distribution system. The amount of incident energy determines the exact PPE required to service the particular equipment that is labeled. A fair amount of data collection is required to complete an AFHA study as the existing equipment's manufacturer and model must be surveyed, along with required settings for the entire distribution system. Conductor lengths and sizes must be determined for feeder circuits and conduit types documented.

We recommend that an Arc Flash Study be completed and labeling be installed at the WWTP in 2020. The Pump Stations should be completed as the motor control centers are replaced.

6.0 PUMP STATIONS

The Authority owns and the Township operates and maintains ten (10) wastewater pump stations throughout the collection and conveyance system. The approved Woodlands at Greystone

Development includes the construction of two new submersible style pump stations and will result in the decommissioning of the Hamilton Woods Pump Station. Construction of Pump Stations A and B was completed in 2019. Start-up activities for both Pump Stations were successfully completed. The Engineer is currently waiting on final record drawings and start-up reports form the Contractor/Developer for both stations before the pump stations are dedicated to the Authority.

The pump stations were constructed as the West Goshen Township wastewater collection and conveyance system was expanded throughout the Township. The oldest pump stations date back to the early 1960's and repairs and upgrades to the pump stations have been made since that time.

The West Goshen Chapter 94 Report for 2019 identified that the Percent of Max Daily Pump Rate at the Projected 2-Year Max Daily Flow range from 14% to 89%. It should be noted that the flows at the pump stations are based primarily upon recording daily pump run times at a defined pump rate and do not take into account when multiple pumps run simultaneously. Therefore, some of the projections are artificially high. A few pump stations have discharge flow meters and daily flows are based upon recording totalizer flow meter readings. These methods of flow measurements provide a daily reading of flows through the pump station; however, they do not provide an ability to determine the peak flows to the pump station throughout the day.

PADEP requires that each pump station should be capable of handling the peak instantaneous flows tributary to the pump station. Given that some pump stations have had max daily flows greater than 85% in past years, it is likely that these pump stations are experiencing peak influent flows during the day that are greater than the pump stations are rated for. As a result, these pump stations should continue to be monitored, influent flow measured, and inflow and infiltration reduced tributary to the stations. The Authority has purchased multiple portable area-velocity open channel flow meters for use in measuring flow(s) throughout the collection and conveyance system.

6.1 #1 MONTGOMERY AVENUE

The Montgomery Avenue Pump Station is a dry pit submersible style pump station constructed in the early 1960's. The pump station structure consists of a below grade concrete dry well and wet well, brick masonry building, and precast concrete plank flat roof decking with a rubber roof. A brick masonry screening room containing equipment to screen the influent wastewater into the pump station wet well was later added (construction date unknown). The screening equipment has since been removed and replaced with a hydraulic driven influent sewage grinder. The sewage grinder is designed to reduce the size of the debris to be pumped



in order to minimize the potential for clogging of the pumps, and to convey the debris to the WWTP instead of removing it from the waste stream at the pump station.

This pump station was initially constructed as a duplex (2 identical pumps) station with shaft driven pumps. In 2008, new dry pit submersible style pumps (pump motors connected directly to the pumps) were installed. In addition, a third pump (wet pit submersible) was installed directly in the wet well and a separate header pipe was installed and connected into the existing force main. Township Staff indicated that the third pump was added due to capacity issues experienced at the pump station. The pump station now operates as a triplex style pump station. According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 175 gpm or (252,000 gallons per day [gpd]), and the Projected 2-Year Max Daily Flow capacity is 80%.

The Township staff rebuilt Pump No. 1 in 2019.

Installation of a pump station force main bypass connection was completed in 2017. The bypass connection allows the ability to use the existing force main through use of a bypass pump(s) in the event that the existing pumps are inoperable, and the ability to use the existing pumps to through use of pump and haul or a temporary force main in the event the existing force main is inoperable.

Based on HRG's review of the pump station and through discussion with the Township Staff, the following deficiencies were noted at the Montgomery Avenue Pump Station. Proposed repairs and rehabilitation items are also listed below:

- Raw wastewater is conveyed through the screening room below grade vault where the sewage grinder is located. An open grating access hatch, personnel access hatch, and HVAC ductwork penetrations through the floor to the below grade raw wastewater conveyed are located within this room, resulting in a NEC Class I Div. I hazardous area electrical classification. The sewage grinder hydraulic power pack and control panel, electrical equipment, and HVAC equipment located within this room are not rated for use in hazardous areas and significant corrosion of the electrical components was observed.
 - Proposed improvement Upgrade electrical and HVAC equipment to meet hazardous area requirements. Relocate sewage grinder hydraulic power pack and control panel out of the hazardous rated area. Due to available space requirements and noise associated with the sewage grinder hydraulic power pack, another option may be the installation of a new wall in the screening room to physically separate this equipment from the below grade vault.
- Operations staff reports that the water service hose bib located in the screening room freezes during the winter. As a result, operations staff drains this unit in the winter to prevent freezing restricting its use.
 - Proposed improvement Install new water service designed for exterior rated use.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. Further investigation is needed to determine the extent of the concrete deterioration throughout the wet well, and this investigation should also include the screen room below grade vault.

- Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.
- Operations Staff reported and HRG observed significant grease accumulation in the wet well. Operation staff noted that they currently pump down the wet well and try to pump the grease to the WWTP. Operations Staff reported that this pump station receives wastewater from a number of restaurants and fast-food establishments.
 - Proposed improvement Investigate requiring/enforcing grease removal at these establishments to remove grease before it enters the wastewater collection system. Also look at installation of a wet well mixing system to keep grease in suspension in the wastewater.
- Concrete cracking, deterioration and exposed rebar in the precast concrete roof planks was observed.



Montgomery Avenue Concrete Deterioration

- Proposed improvement Repair/replace damaged precast concrete roof planks.
- The screening room rollup door jamb is rotting out at its base.
 - Proposed improvement Repair existing door jamb.
- Repointing of the brick mortar joints around the exterior of the building is needed.
 - Proposed improvement Repoint existing brick mortar joints.
- The existing windows and doors in the pump room structure are original. This building is heated in the winter and upgrading of these facilities to new energy efficient units would be beneficial.
 - Proposed improvement Replace existing door and windows.
- HRG observed infiltration on the intermediate level of the dry well at the force main discharge location and near the HVAC ductwork.
 - Proposed improvement Seal leaking wall penetrations.

- Corrosion of the building roof access ladder was observed.
 - Proposed improvements Repaint existing ladder.
- A force main valve box located immediately outside of the pump room entrance door is elevated and creates a tripping hazard.
 - Proposed improvements Adjust valve box to match finished grade.
- Township Staff have noted that the pump station has flooded twice in the past 20 years. Staff have sand bags prepared to attempt to keep water from entering the pump dry well.
 - Proposed improvements Seal/block penetrations in wet well access hatch and the screening room to prevent the inflow of water here as well.
- A method of monitoring flows through the pump station should be provided.
 - Proposed improvements Install discharge flow meter. Due to configuration of pump header discharge piping in the dry well, there does not appear to be enough room to install the flow meter in the existing building. Therefore, the installation of a manhole or vault on the force main outside the building to house the flow meter would be required. This work would also require repairs to the chain link fencing and site paving.
- Gas detection equipment (to verify suitable atmosphere) was not observed in the screen building room or the wet well. Operations staff frequently enter these areas when checking and maintaining the pump station.
 - Proposed equipment Install gas detection equipment in the screening room. Consideration for installation of gas detection equipment in the wet well should also be given.
- Two of the three existing pumps were installed in 2008. Mechanical equipment typically has an expected service life of 20 years.
- Installation of lighting and a fall protection support system in the wet well should also be considered to improve safety at the station.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station

Major improvements for the Montgomery Avenue Pump Station are scheduled for 2027. The Township Staff will continue routine operation and maintenance and repair and replacement of wear parts as needed.

6.2 #2 TRINITY DRIVE

The Trinity Drive Pump Station originally consisted of a below ground pumping station initially constructed in the early 1960's. The below ground pump station was replaced with a wet pit

submersible style pump station in 1993. The pump station consists of an 8' diameter concrete wet well that contains two (2) submersible pumps and a separate concrete valve and flow meter vault.

According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 150 gpm or (216,000 gallons per day [gpd]); and the Projected 2-Year Max Daily Flow capacity is 50%.

The Township Staff is required to manually operate this pump station by cycling the operation the pumps daily. In the event the pump in the automatic mode would fail, this would require the Township Staff to visit the pump station to put the backup pump into operation.

Township Staff also believe that the existing 4-inch diameter force main, installed in the early 1960s is contributing to the high head conditions impacting the existing pumps and should be replaced. Based on record drawings, it appears that this force main is constructed of cast iron pipe. In order to increase the force main to a 6-inch diameter pipe, the pumping rate would have to increase to a minimum 180 gpm in order to achieve a minimum 2 feet per second velocity as required by PA DEP.

The replacement of the existing Trinity Drive Pump Station and associated forcemain is currently being designed and has been permitted for construction. It is anticipated that construction will begin in 2020 and completed in 2021.

6.3 #3 SPRUCE AVENUE

The Spruce Avenue Pump Station was originally constructed in the early 1960's. The pump station was rehabilitated with a wet pit submersible style pump station in 1985. The pump station consists of an influent screening manhole, a 9' diameter concrete wet well that contains two (identical) submersible pumps and a separate concrete valve and flow meter vault. The wet well originally contained a trash basket to capture large solids in an effort to protect the pumps. The influent screening manhole contains a fixed trash basket requiring manual cleaning to remove and dispose of the solids captured.

According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 710 gpm or (1,022,400 gallons per day [gpd]) and the Projected 2-Year Max Daily Flow capacity is 52%.

According to the 1983 Drawings a new 10-inch diameter force main was installed as part of the rehabilitation project and the 1960's era 6-inch diameter force main was abandoned.

Installation of a pump station force main bypass connection was completed in 2017. The bypass connection allows the ability to use the existing force main through use of a bypass pump(s) in the event that the existing pumps are inoperable, and the ability to use the existing pumps through use of pump and haul or a temporary force main in the event the existing force main is inoperable.

Based on HRG's review of the pump station and through discussion with the Township Staff, the following deficiencies were noted at the Spruce Avenue Pump Station and proposed repairs and rehabilitation items are listed below:

- Raw wastewater is conveyed through the screening manhole and into the wet well, and a drain connects the valve vault to the wet well, resulting in a NEC Class I Div. I hazardous area electrical classification. The electrical lighting contained within these areas are not rated for use in hazardous areas and significant corrosion of the electrical components was observed.
 - Proposed improvement Upgrade electrical equipment to meet hazardous area requirements.
- Township Staff have noted that the influent trash basket requires constant cleaning to remove debris. In order to fully remove debris, Township staff must enter the screening manhole.
 - Proposed improvement Demolish the existing fixed trash basket screen and platform in the screening manhole and replace with an influent sewage grinder. Since there is no building at this site, the use of a hydraulic power pack driven unit is not recommended due to the noise associated with the units, and a hazardous rated immersible motor driven unit would be recommended. This installation would also require the installation of a new access hatch for removal of the sewage grinder.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the screening manhole. Concrete deterioration has led to exposed rebar in the concrete.
 - Proposed improvement Repair deteriorated concrete and install liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.
- Township Staff reports that the water service to the pump station site no longer functions.
 - Proposed improvement Install new water service to the pump station site.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. Concrete deterioration has led to exposed rebar in the concrete.
 - Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.
- Township Staff reported and HRG observed grease accumulation in the wet well. Operation staff noted that they currently pump down the wet well and try to pump the grease to the WWTP.

- Proposed improvement Investigate requiring/enforcing grease removal at establishments to remove grease before it enters the wastewater collection system. Also investigate the installation of a wet well mixing system to keep grease in suspension in the wastewater and prevent from accumulating in the wet well.
- Township Staff reports that run off from Spruce Avenue drains to the pump station site causing debris buildup at the pump station fence entrance swing gate. This debris buildup prevents opening of the swing gate until the Township staff can get equipment to remove or shovel the debris away from the gate.
 - Proposed improvement Site improvements to redirect drainage from Spruce Avenue around the pump station site.
- The existing diesel fuel tank for the emergency generator is buried. Township staff have been removing the buried diesel fuel tanks at the other pump station sites and replacing them with above grade fuel tanks. Township staff would like to install an above grade diesel fuel tank at this site as well.
- It is not known if the existing pumps that were installed in 1985 have been replaced. Mechanical equipment typically has an expected service life of 20 years. If these pumps are original, replacement of these pumps within the next five years should be considered.
- Installation of a fall protection support system in the wet well should be considered.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station.

The pumps for the Spruce Avenue Pump Station are scheduled to be replaced in 2020, 2021, and 2022. The Township Staff will continue routine operation and maintenance and repair and replacement of wear parts as needed.

6.4 #6 Ellis Lane

The Ellis Lane Pump Station is a dry pit submersible style pump station constructed in the early 1960's. The pump station structure consists of a below grade concrete dry well and wet well, brick masonry building, and precast concrete plank flat roof decking with a rubber roof. A brick masonry screening room containing equipment to screen the influent wastewater into the pump station wet well was later added (construction date unknown). The screening equipment has since been removed and replaced with a hydraulic driven influent sewage grinder. The sewage grinder is designed to reduce the size of the debris to be pumped in order to minimize the potential for clogging of the pumps, and convey the debris to the WWTP instead of removing from the waste stream at the pump station.

This pump station was initially constructed as a duplex (2 identical pumps) station with shaft driven pumps. In 1991, new dry pit submersible style pumps (pump motors connected directly to the pumps) were installed. According to the West Goshen Chapter 94 Report for 2018, this

pump station has a capacity of 655 gpm or (943,200 gallons per day [gpd]) and the projected 2-Year Max Daily Flow capacity is 89%. The Township Staff has purchased a strap-on style flow meter to more accurately measure flows at this pump station.

The Township Staff rebuilt Pump No. 1 and Pump No. 2 in 2019.

Based on HRG's review of the pump station and through discussion with the Township Staff, the following deficiencies were noted at the Ellis Lane Pump Station and proposed repairs and rehabilitation items are listed below:

- Raw wastewater is conveyed through the screening room below grade vault where the sewage grinder is located. An open grating access hatch, personnel access hatch, and HVAC ductwork penetrations through the floor to the below grade raw wastewater are located within this room, resulting in a NEC Class I Div. I hazardous area electrical classification. The sewage grinder hydraulic power pack and control panel, electrical equipment, and HVAC equipment located within this room are not rated for use in hazardous areas and significant corrosion of the electrical components was observed.
 - Proposed improvement Upgrade electrical and HVAC equipment to meet hazardous area requirements. Relocate sewage grinder hydraulic power pack and control panel out of the hazardous rated area. Due to available space requirements and noise associated with the sewage grinder hydraulic power pack, another option may be the installation of a new wall in the screening room to physically separate this equipment from the below grade vault.
- Township Staff reports that the water service hose bib located in the screening room freezes during the winter. As a result, operations staff drains this unit in the winter to prevent freezing restricting its use.
 - Proposed improvement Install new water service designed for exterior rated use.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. Further investigation is needed to determine the extent of the concrete deterioration throughout the wet well, and this investigation should also include the screen room below grade vault.
 - Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration. Replace existing wet well access ladder and wet well access hatches.
- Abandoned pipe and HVAC penetrations in the existing building should be blocked in.
- The screening room rollup door jamb is rotting out at its base.
 - Proposed improvement Repair existing door jamb.
- Repointing of the brick mortar joints around the exterior of the building is needed.

- Proposed improvement Repoint existing brick mortar joints.
- The existing windows and doors in the pump and screening room structures are original. These buildings are heated in the winter and upgrading of these facilities to new energy efficient units would be beneficial.
 - Proposed improvement Replace existing door and windows.
- The elevated equipment pads that had supported the pump motors on the ground level floor are still present and create a tripping hazard.
 - Proposed improvement Demolish the elevated equipment pads to provide a level floor.
- Infiltration on the intermediate level of the dry well at the force main discharge location was observed.
 - Proposed improvement Seal leaking wall penetrations.
- Some of the pump support and header piping concrete thrust blocks on the pump level of the pump building have deteriorated and separated from the floor.
 - Proposed improvement Install new pump support and header piping concrete thrust supports.
- Corrosion of the building roof access ladder was observed.
 - Proposed improvements Repaint existing ladder.
- The existing roof scuppers have detached from the building.
 - Proposed improvements Reattach existing scuppers to the building or replace with new scuppers and downspouts.
- The sidewalk along the rear of the building has cracked and heaved. This is most likely due to the downspout discharge onto the sidewalk and the slope of the surrounding grade not allowing for drainage.
 - Proposed improvements Regrade area to provide drainage away from the building and replace the sidewalk.
- A method of monitoring flows through the pump station should be provided.
 - Proposed improvements Install discharge flow meter. Due to configuration of pump header discharge piping in the dry well, there doesn't appear to be enough room to install the flow meter in the existing building. Therefore, the installation of a manhole or vault on the force main outside the building to house the flow meter would be required. This work would also require repairs to the chain link fencing and site paving.

- Gas detection equipment (to verify suitable atmosphere) was not observed in the screen building room or the wet well. Operations staff frequently enter these areas when checking and maintaining the pump station.
 - Proposed equipment Install gas detection equipment in the screening room.
 Consideration for installation of gas detection equipment in the wet well should also be given.
- Installation of lighting and a fall protection support system in the wet well should also be considered.
- Holes in the existing chain link fence fabric were observed and should be repaired or new fence fabric installed.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station.

Installation of a pump station force main bypass connection was completed in 2017. The bypass connection allows the ability to use the existing force main through use of a bypass pump(s) in the event that the existing pumps are inoperable, and the ability to use the existing pumps through use of pump and haul or a temporary force main in the event the existing force main is inoperable.

Major improvements for the Ellis Lane Pump Station are scheduled for 2025. The Township Staff will continue routine operation and maintenance and repair and replacement of wear parts as needed.

6.5 #10 WOODCREST (DOWNING AVENUE)

The Woodcrest (Downing Avenue) Pump Station previously consisted of a below ground pumping station constructed in 1976. In 2019, this pump station was replaced with a typical submersible style pump station. The station now consists of a 6' by 8' concrete wet well that contains a sewage grinder and two (identical) dry pit submersible pumps.

According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 100 gpm or (144,000 gallons per day [gpd]) and the Projected 2-Year Max Daily Flow capacity is 14%.



6.6 #11 TAYLOR RUN

The Taylor Run Pump Station is a dry pit submersible style pump station constructed in the mid 1970's. The pump station structure consists of a single brick masonry building containing a

concrete dry well and wet well. The wet well portion of the building originally contained equipment to screen the influent wastewater.

This pump station was initially constructed as a duplex series style station with shaft driven pumps (4 total) with provisions for the installation of a third set of pumps (6 total) in the future. Due to high head operating condition of the pump station, series pumping is utilized. It is unknown when the third set of pumps (dry pit submersible style) were installed. In 2003, alterations and additions were made to the pump station including replacing the original four shaft driven pumps with new dry pit submersible style pumps (pump motors connected directly to the pumps) replacement of valves and associated piping, removal of the screening equipment and replacement with a hydraulic driven influent sewage grinder, and installation of overhead steel bridge crane system for pump removal. According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 2,000 gpm or (2,880,000 gallons per day [gpd]) and the Projected 2-Year Max Daily Flow capacity is 85%.

Two (2) sanitary sewer overflows occurred at the Taylor Run Pump Station in 2019. Both events were properly reported to PA DEP. One of the overflows was a result of an emergency generator failure. The generator and automatic transfer switch are planned to be replaced in 2020. The other sewer over flow was due to a heavy rain event. No corrective action report has been requested by PA DEP; however the Township Staff is proactively inspecting tributary areas to identify sources of I/I.

Township staff replaced the cooling jacket on Pump 1A in 2019.

Based on HRG's review of the pump station and through discussion with the operations staff, the following deficiencies were noted at the Taylor Run Pump Station. Proposed repairs and rehabilitation items are listed.

- The pump station portion of the building containing all of the electrical gear, emergency generator, and pumps is not physically separated from the wet well portion of the building; a door connects these areas, resulting in a NEC Class I Div. I hazardous area electrical classification for the entire structure. All of the electrical and HVAC equipment in the dry well and the wet well are not rated for use in hazardous areas. In addition, significant corrosion of the electrical components in the wet well was observed.
 - Proposed improvement Block doorway between pump room and wet well to physically separate wet well from the rest of the building. Upgrade electrical and HVAC equipment in the wet well to meet hazardous area requirements. Relocate sewage grinder hydraulic power pack out of the hazardous rated area.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. Further investigation is needed to determine the extent of the concrete deterioration throughout the wet well.
 - Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.

- The existing windows and doors in the building are original. The building is heated in the winter and upgrading of these facilities to new energy efficient units would be beneficial.
 - Proposed improvement Replace existing door and windows.
- All HVAC equipment in the building is original and Township staff reports that various units no longer function.
 - Proposed improvement Repair, replace and upgrade existing HVAC equipment. Block in any building penetrations no longer needed.
- HRG observed infiltration on the pump level of the dry well at various locations.
 - Proposed improvement Seal leaking wall penetrations.
- Township Staff reported and HRG confirmed with the equipment representative that the existing Safetronics VFDs are no longer supported by the manufacturer and obtaining parts to repair is very difficult.
 - Proposed improvement Install new VFDs.
- HRG observed that the existing electrical conduit on the pump level of the dry well has corroded and failed.
 - Proposed improvement Install new electrical conduit, including lights, switches, and outlets.
- The existing emergency generator is original to the pump station. Township Staff have requested that the existing generator be replaced and prefer the installation of an exterior rated emergency generator. The generator's radiator was re-coed in 2019.
- The existing diesel fuel tank for the emergency generator is buried. The existing underground diesel tank has been emptied and was closed-in-place in 1998. The Township Staff is currently utilizing an above-ground tank located outside on the south side of the building. If the emergency generator is replaced with an exterior rated unit, a subbase fuel tank can be combined into the base for the new generator and the existing above-grade and buried fuel tanks will be removed.
- The existing electrical motor control center (MCC) is original to the station and Township Staff have requested replacement of the existing MCC. Replacement of the electrical MCC should be considered.
- A method of monitoring flows through the pump station should be provided.
 - Proposed improvements Install discharge flow meter. Due to configuration of pump header discharge piping in the dry well, the installation of a standard magnetic flow meter may not be possible due to straight pipe requirement before and after the meter, but a Toshiba Mount Anywhere magnetic flow meter which doesn't have the same straight pipe requirements could be installed.

- Gas detection equipment (to verify suitable atmosphere) was not observed in the wet well. Operations staff frequently enter these areas when checking and maintaining the pump station.
 - Proposed equipment Install gas detection equipment in the wet well.
- The existing pumps were installed in 2003. Mechanical equipment typically has an expected service life of 20 years. Replacement of these pumps due to age within the next five years is not anticipated.
- Holes in the existing chain link fence fabric were observed and should be repaired or new fence fabric installed.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station.
- The pump station asphalt pavement was previously milled for a new overlay. Township staff noted that the overlay is planned to be completed after exterior electrical transformer work is conducted.
- The existing medium voltage service is owned/maintained by the Authority/Township. The service should be replaced. One option is to replace the medium voltage gear in kind, and West Goshen will retain ownership and maintenance responsibilities for the service. The second option would be to convert the station to receive secondary power from the utility, transferring ownership and maintenance to the utility. The first option has a higher up-front capital investment, while the second option would have a smaller initial cost with higher periodic costs to the utility. Given the fact that West Goshen must subcontract the maintenance work, it is recommended that the conversion to secondary power be done.

Installation of a pump station force main bypass connection was completed in 2017. The bypass connection allows the ability to use the existing force main through use of a bypass pump(s) in the event that the existing pumps are inoperable, and the ability to use the existing pumps through use of pump and haul or a temporary force main in the event the existing force main is inoperable.

Improvements for the Taylor Run Pump Station are scheduled for 2020, 2021, and 2022. The Township Staff will continue routine operation and maintenance and repair and replacement of wear parts as needed.

6.7 #12 WASHINGTON STREET

The Washington Street Pump Station is a dry pit submersible style pump station constructed in the late 1970's. The pump station structure consists of a single brick masonry building containing a concrete dry well and an exterior concrete wet well that shares a common wall with the building.

This pump station was initially constructed as a duplex style station with shaft driven pumps with provisions for the installation of a third pump in the future. It is unknown when the third of pump

was installed. The current pumps were installed in 2008. The current pumps consist of two – 200 HP shaft driven pumps and one – 75 HP shaft driven jockey pump. The wet well initially contained an influent comminutor, this has since been replaced with a hydraulic driven influent sewage grinder. According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 3,800 gpm or (5,472,000 gallons per day [gpd]) and the projected 2-Year Max Daily Flow capacity is 55%. The Township Staff has purchased a strap-on style flow meter to more accurately measure flows at this pump station.

Based on HRG's review of the pump station and through discussion with the Township Staff, the following deficiencies were noted at the Washington Street Pump Station. Proposed repairs and rehabilitation items are listed.

- The wet well contains raw waste which results in a NEC Class I Div. I hazardous area electrical classification. The electrical lighting in the wet well is not rated for use in hazardous areas. In addition, significant corrosion of the electrical components in the wet well was observed.
 - Proposed improvement – Upgrade electrical equipment in the wet well to meet hazardous area requirements.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. Further investigation is needed to determine the extent of the concrete deterioration throughout the wet well.



Washington Street Equipment

- Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.
- HRG observed staining on the front of the building that appeared to come from a roof leak. Township Staff noted that the flat roof was replaced in the past few years. Further investigation should be conducted to determine if the staining is from an active leak and appropriate repairs made based upon the results.
- All HVAC equipment in the building is original and Township staff reports that various units no longer function.

- Proposed improvement Repair, replace and upgrade existing HVAC equipment. Block in any building penetrations no longer needed.
- HRG observed that the existing electrical conduit on the pump level of the dry well has corroded and failed.
 - Proposed improvement Install new electrical conduit, including lights, switches, and outlets.
- The existing emergency generator is original to the pump station. Township Staff have requested that the existing generator be replaced and prefer the installation of an exterior rated emergency generator.
- The existing diesel fuel tank for the emergency generator is located and vented inside of the building. This fuel tank should be vented outside of the pump station. If the emergency generator is replaced with an exterior rated unit, a subbase fuel tank can be combined into the base for the new generator.
- The existing electrical motor control center (MCC) and motor starters appear to be original to the station and Township Staff have requested replacement of the existing MCC and motor starters. Replacement of the electrical MCC and motor starters should be considered.
- A method of monitoring flows through the pump station should be provided.
 - Proposed improvements Install discharge flow meter. Due to configuration of pump header discharge piping in the dry well, the installation of a standard magnetic flow meter may not be possible due to straight pipe requirement before and after the meter, but a Toshiba Mount Anywhere magnetic flow meter which doesn't have the same straight pipe requirements could be installed.
- Gas detection equipment (to verify suitable atmosphere) was not observed in the wet well. Operations staff frequently enter these areas when checking and maintaining the pump station.
 - Proposed equipment Install gas detection equipment in the wet well.
- The existing pumps were installed in 2008. Mechanical equipment typically has an expected service life of 20 years. Replacement of these pumps due to age within the next five years is not anticipated. Township Staff have been transitioning from shaft driven pumps to dry pit submersible style pumps as pump stations are upgraded. Future upgrades to this station should consider evaluating this transition here as well.
- Holes in the existing chain link fence fabric were observed and should be repaired or new fence fabric installed. In addition, the swing gate on the fence should be replaced.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station.

- The storm sewer/drainage pipe across the pump station driveway appears to be in need of replacement.
- Township Staff reported that they have received odor complaints from residents near the intersection of Circle Avenue and Lauber Lane. An air release valve for the force main is located at this intersection.
 - Proposed improvement Installation of chemical addition equipment at the pump station to inject chemicals, such as Thioguard (magnesium hydroxide) into the wastewater to mitigate the generation of odor in the force main.
- The existing medium voltage service is owned/maintained by the Authority/Township. The service should be replaced. One option is to replace the medium voltage gear in kind, and West Goshen will retain ownership and maintenance responsibilities for the service. The second option would be to convert the station to receive secondary power from the utility, transferring ownership and maintenance to the utility. The first option has a higher up-front capital investment, while the second option would have a smaller initial cost with higher periodic costs to the utility. Given the fact that West Goshen must subcontract the maintenance work, it is recommended that the conversion to secondary power be done.

Installation of a pump station force main bypass connection was completed in 2017. The bypass connection allows the ability to use the existing force main through use of a bypass pump(s) in the event that the existing pumps are inoperable, and the ability to use the existing pumps through use of pump and haul or a temporary force main in the event the existing force main is inoperable.

Major improvements for the Washington Street Pump Station are scheduled for 2029 and 2030. The Township Staff will continue routine operation and maintenance and repair and replacement of wear parts as needed.

6.8 #13 WESTTOWN WAY

The Westtown Way Pump Station is a dry pit submersible style pump station constructed in the late 1970's. The pump station structure consists of a single brick masonry building containing a concrete dry well and an exterior concrete wet well that shares a common wall with the building.

This pump station was initially constructed as a duplex style station with shaft driven pumps with provisions for the installation of a third pump in the future. It is unknown when the third of pump was installed, but in the current pumps were installed in 2001. The current pumps consist of two – shaft driven pumps and one dry pit submersible pump. The wet well initially contained an influent comminutor, this has since been replaced with a hydraulic driven influent sewage grinder. According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 5,400 gpm or (7,776,000 gallons per day [gpd]) and the projected 2-Year Max Daily Flow capacity is 45%.

Based on HRG's review of the pump station and through discussion with the Township Staff, the following deficiencies were noted at the Westtown Way Pump Station and proposed repairs and rehabilitation items are listed below:

The current means and method of pump and motor removal at the pump station is very difficult as the floor openings are not located above the pumps. This requires Township Staff to have to maneuver the pumps and motors horizontally in order to lift the pumps out. Township Staff reported that an employee was injured during this work in the past. The installation of a pump removal system similar to that installed at Taylor Run Pump Station should be considered. For purposes of this Plan we have not included an estimated cost of this system. A study must be



Westtown Way Equipment

performed to determine the structural requirements needed for the pump removal system and what if any improvements must be made to the building to support it.

- The wet well contains raw waste which results in a NEC Class I Div. I hazardous area electrical classification. The electrical lighting in the wet well is not rated for use in hazardous areas. In addition, significant corrosion of the electrical components in the wet well was observed.
 - Proposed improvement Upgrade electrical equipment in the wet well to meet hazardous area requirements.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. Further investigation is needed to determine the extent of the concrete deterioration throughout the wet well.
 - Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.
- Township Staff reported and HRG observed grease accumulation in the wet well. Operation staff noted that they currently pump down the wet well and try to pump the grease to the WWTP.
 - Proposed improvement Investigate requiring/enforcing grease removal at establishments to remove grease before it enters the wastewater collection system. Also investigate the installation of a wet well mixing system to keep

grease in suspension in the wastewater and prevent from accumulating in the wet well.

- Township Staff noted that they have discovered significant amounts of grit settling out in the influent channel and interceptor piping upstream of the pump station. The headloss associated with the influent sewage grinder can cause water to backup into the interceptor piping.
 - Proposed improvement Relocation of the influent sewage grinder to the end of the influent channel to reduce the headloss impact. This may require the installation of new a new railing system to support the sewage grinder.
- The existing windows in the building are original. The building is heated in the winter and upgrading of these facilities to new energy efficient units would be beneficial.
 - Proposed improvement Replace existing windows.
- All HVAC equipment in the building is original and Township Staff reports that various units no longer function.
 - Proposed improvement Repair, replace and upgrade existing HVAC equipment. Block in any building penetrations no longer needed.
- HRG observed infiltration on the pump level of the dry well at various locations.
 - Proposed improvement Seal leaking wall penetrations.
- Township Staff reported that the floor drain piping in the building is no longer functioning and that they have tried to unclog it but have been unsuccessful.
 - Proposed improvement Cut new floor drain piping into the floor.
- Township Staff reported that the existing force main discharge gate valve has failed in the open position and can no longer close when necessary.
 - Proposed improvement Replace existing valve with a new gate valve. This will require the installation of a temporary line stop or new valve outside of the pump station in order to prevent wastewater from draining out of the force main. In addition, a means of maintaining flow through the pump station during this work must be provided.
- The existing emergency generator is original to the pump station. Township staff have requested that the existing generator be replaced and prefer the installation of an exterior rated emergency generator.
- The existing diesel fuel tank for the emergency generator is located outside above the wet well. If the emergency generator is replaced with an exterior rated unit, a subbase fuel tank can be combined into the base for the new generator.

- Township staff reported and HRG confirmed with the equipment representative that the existing Safetronics VFDs are no longer supported by the manufacturer and obtaining parts to repair is very difficult.
 - Proposed improvement Install new VFDs.
- The existing electrical motor control center (MCC) appear to be original to the station and Township staff have requested replacement of the existing MCC. Replacement of the electrical MCC should be considered.
- A method of monitoring flows through the pump station should be provided.
 - Proposed improvements Install discharge flow meter. Due to configuration of pump header discharge piping in the dry well, the installation of a standard magnetic flow meter may not be possible due to straight pipe requirement before and after the meter, but a Toshiba Mount Anywhere magnetic flow meter which doesn't have the same straight pipe requirements could be installed.
- Gas detection equipment (to verify suitable atmosphere) was not observed in the wet well. Operations staff frequently enter these areas when checking and maintaining the pump station.
 - Proposed equipment Install gas detection equipment in the wet well.
- The existing pumps were installed in 2001. Mechanical equipment typically has an expected service life of 20 years. Replacement of these pumps due to age within the next five years is not anticipated, however the pump age is approaching 20 years. Township staff have been transitioning from shaft driven pumps to dry pit submersible style pumps as pump stations are upgraded. Future upgrades to this station should consider evaluating this transition here as well. Township staff have also noted that due to the high head operating conditions associated with this pump station, the switching to series pumping (6 total pumps) may be beneficial. A study to evaluate the effectiveness of switching to a series pumping configuration would have to be performed.
- Holes in the existing chain link fence fabric around the electrical switchgear were observed and should be repaired or new fence fabric installed.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station.
- The existing medium voltage service is owned/maintained by the Authority/Township. The service should be replaced. One option is to replace the medium voltage gear in kind, and West Goshen will retain ownership and maintenance responsibilities for the service. The second option would be to convert the station to receive secondary power from the utility, transferring ownership and maintenance to the utility. The first option has a higher up-front capital investment, while the second option would have a smaller initial cost with higher periodic costs to the utility. Given the fact that West Goshen must

subcontract the maintenance work, it is recommended that the conversion to secondary power be done.

• The louver over the wet well should be modified so the base of the louver is more than 18 inches above the top of the wet well tank. The louver size can be reduced, as it is currently sized to allow aspiration of the indoor generator. If the indoor unit is replaced with an outdoor unit, the louver size can be reduced.

Installation of a pump station force main bypass connection was completed in 2017. The bypass connection allows the ability to use the existing force main through use of a bypass pump(s) in the event that the existing pumps are inoperable, and the ability to use the existing pumps through use of pump and haul or a temporary force main in the event the existing force main is inoperable.

The improvements for the Westttown Way Pump Station ae currently being designed and are expected to be completed in 2021.

6.9 #16 FERN HILL (NORTHEAST)

The Fern Hill (Northeast) Pump Station is a wet pit submersible style pump station constructed in the early 1990's. The pump station structure consists of a below grade concrete screening area and wet well with an above grade brick masonry building to house the electric and control panels, an overhang area to cover an emergency generator, and a screening disposal overhang. The screening equipment has since been removed and replaced with a hydraulic driven influent sewage grinder. The sewage grinder is designed to reduce the size of the debris to be pumped in order to minimize the potential for clogging of the pumps, and convey the debris to the WWTP instead of removing from the waste stream at the pump station. An above grade diesel fuel tank for the emergency generator was placed under the screening disposal overhang.

This pump station was initially constructed as a triplex (3 identical pumps) station with submersible pumps. In 2006, new submersible style pumps were installed. According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 2,100 gpm or (3,024,000 gallons per day [gpd]); and the Projected 2-Year Max Daily Flow capacity is 43%

Pump No. 2 was rebuilt in 2019. The existing sewage grinder is not functioning and the Township Staff is currently using the manual bar screen.

Based on HRG's review of the pump station and through discussion with the Township Staff, the following deficiencies were noted at the Fern Hill (Northeast) Pump Station. Proposed repairs and rehabilitation items are listed.

• The wet well contains raw waste which results in a NEC Class I Div. I hazardous area electrical classification. The electrical lighting in the wet well is not rated for use in hazardous areas. In addition, significant corrosion of the electrical components in the wet well was observed.

- Proposed improvement Upgrade electrical equipment in the wet well to meet hazardous area requirements.
- The wet well is not physically separated from the electrical room. Additional work should be done to physically separate the electrical gear and provide a safe environment. For example, the wire rope hoist is not explosion proof.
- Concrete and ferrous metal deterioration from exposure to hydrogen sulfide gas was observed in the wet well. HRG observed and Township Staff reported that the header piping and valves in the wet well are experiencing severe corrosion. Township staff noted that



Fern Hill Equipment

they have epoxy painted this pipe and valves the past, but the painting has not held up. Further investigation is needed to determine the extent of the concrete and pipe deterioration throughout the wet well.

- Proposed improvement Complete investigation to determine full extent of concrete and ferrous metal deterioration. Repair deteriorated concrete and possibly add liner to prevent future deterioration. Repair and replace ferrous metal as necessary and coat/paint to prevent future deterioration.
- HVAC equipment should be provided in the wet well to provide the proper air changes per hour when Township staff is working in the wet well.
- Infiltration at various locations in the wet well was observed.
 - Proposed improvement Seal leaking wall locations.
- Multiple holes in the shingle roof were observed. These holes have allowed water to enter and damage the ceiling panels above the generator.
 - Proposed improvement Install new roof, mitigate any water damage, and repair ceiling.
- The existing emergency generator is original to the pump station. Township staff have requested that the existing generator be replaced and prefer the installation of an exterior rated emergency generator.
- The existing diesel fuel tank for the emergency generator is located under the screening disposal overhang above the wet well. If the emergency generator is replaced with an

exterior rated unit, a subbase fuel tank can be combined into the base for the new generator.

- Proposed improvements Replace existing discharge flow meter. Due to configuration
 of pump header discharge piping in the dry well, the installation of a standard magnetic
 flow meter may not be possible due to straight pipe requirement before and after the
 meter, but a Toshiba Mount Anywhere magnetic flow meter which doesn't have the
 same straight pipe requirements could be installed. Install new data recorder to record
 operation of the pump station throughout the day.
- Gas detection equipment (to verify suitable atmosphere) was not observed in the wet well. Operations staff frequently enter these areas when checking and maintaining the pump station.
 - Proposed equipment Install gas detection equipment in the wet well.
- The existing pumps were installed in 2006. Mechanical equipment typically has an expected service life of 20 years. Replacement of these pumps due to age within the next five years is not anticipated.
- Consider installation of a data logger or influent flow meter to monitor influent flows to the pump station.

Major improvements for the Fern Hill Pump Station are scheduled for 2022 and 2023 and a spare pump is being purchased in 2020. The Township Staff will continue routine operation and maintenance and repair and replacement of wear parts as needed. The sewage grinder replacement should be prioritized for 2020.

6.10 #17 HAMILTON WOODS

The Hamilton Woods Pump Station is a submersible style pump station that consists of a concrete wet well that contains two submersible pumps and a separate concrete valve and flow meter vault. The wet well originally contained a trash basket to capture large solids in an effort to protect the pumps. The trash basket required manual cleaning to remove and dispose of the solids captured. Township Staff have since removed the trash basket and reported to HRG that they have not had issues with large solids clogging the pumps.

According to the West Goshen Chapter 94 Report for 2019, this pump station has a capacity of 240 gpm or (345,600 gallons per day [gpd]) and the projected 2-Year Max Daily Flow capacity is 23%.

This pump station is planned to be decommissioned following completion of the Woodlands at Greystone Development. The decommissioning is currently unfunded in the existing budget.

7.0 COLLECTION SYSTEM

The existing sanitary sewer collection system consists of over 200 miles of a combination of force mains and gravity sewers ranging in size from 8-inches to 30-inches in diameter. Much of the collection system was built in the 1960's and is constructed of asbestos cement and terra-cotta.

The terra-cotta is generally located within Township and State rights-of-way while the asbestos cement pipe is generally located within backyards and off-road rights-of-ways. The terra-cotta pipe is highly susceptible to leakage due to the number and types of joints while the asbestos cement pipe is highly prone to failure. The larger diameter interceptor piping is mainly comprised of reinforced concrete.

Due to the age and documented existing conditions of the sanitary sewer system, the Township Staff has been diligently working to clean and inspect as much of the system as possible each year, until the entire system has been inspected. They have concentrated their efforts to-date on known problem areas and areas within the Township that are scheduled to be paved over the next 5 years, to eliminate repaying areas to make necessary repairs.

In 2019, the Township cleaned 48,956 feet and televised 46,565 feet of sewer main. Areas that could be repaired by Township Staff were planned for and repaired. The following details some of the major sewer line maintenance and repair activities in 2019 outside of the scheduled capital improvements projects:

- Repaired partially collapsed residential lateral
- Raised MH 1200 at Washington Street Pumping Station
- Sealed abandoned lateral on South Five Points Road
- Installed pipe patch on Five Points Road
- Detected and required resident to disconnect an illegally connected sump pump
- Raised and sealed 3 manholes
- Sealed crack in pipe upstream of MH 898-A1
- Replaced 12 linear feet of 8-inch gravity line
- Replaced approximately 63 frames and lids
- Repaired 11 manholes

In addition to the Township's efforts, Redzone Robotics, LLC completed Multi-Sensor Inspections (MSI) of the Authority's interceptors (approximately 20,000 LF of 20-inch to 30-inch diameter sanitary sewer main). The MSI utilized CCTV for visual inspection, sonar to detect debris in the interceptors and any obstructions below the water level, and it identified various levels of corrosion in each section of pipe between manholes through laser profiling. The laser profiling was used to measure the actual inside diameter of the pipe. Using an area or reference point within the pipe that is closest to the original diameter and shape of the pipe, the laser profiling determines areas within the pipe where the diameter of shape of the pipe is altered. This data was compared to the wall thickness for standard ACP and RCP. This data was utilized to develop prioritized repair recommendations for Authority's interceptors.

The estimated reduction of I/I, as prepared by the Township, is 133,320 gpd during dry weather and 337,680 gpd during periods of wet weather.

Areas that could not be repaired by Township Staff were included in an annual repair project. In 2019, the following areas were repaired under Contract Nos. 18-2 and 18-3:

- Replacement of 864 L.F. of 10-inch diameter sewer main
- Replacement of 174 L.F. of 8-inch diameter sewer main

- Replacement of one (1) manhole
- Cured-in-place pipe lining of approximately 560 L.F. of 8-inch diameter sewer main
- Manhole rehabilitation of 12 manholes

The following emergency sewer repairs were completed in 2019:

- Replacement of 866 L.F. of 14-inch diameter sewer main along S. Five Points Road
- Replacement of one (1) manhole along S. Five Points Road
- Manhole rehabilitation of 3 manholes along S. Five Points Road

In addition, the following repairs were designed and are planned for 2020 as part of the Phase I Interceptor Repairs Project:

- Replacement of 468 L.F. of 24-inch diameter sewer main
- Replacement of 2 manholes
- Cured-in-place pipe lining of approximately 3,160 L.F. of 24-inch and 30-inch diameter sewer main
- Rehabilitation of 21 manholes

Two (2) grant applications have been submitted to the CFA for sewer collection and conveyance rehabilitation projects. The first application was submitted for the Small Water and Sewer Project Grant for rehabilitation of approximately 2,400 linear feet of 14-inch diameter asbestos cement pipe though the cemetery downstream of the S. Five Points Road sewer collapse and replacement of several air release valves on sewer force mains. The second application is for rehabilitation of approximately 8,500 linear feet of 20 through 30-inch diameter interceptor piping.

We recommend that the Authority continue to repair, replace, or rehabilitate sanitary sewer mains, interceptors, and manholes that have been identified to need repair during the inspections completed by the Township Staff. We also recommend that the Township Staff continue to focus I/I Rehabilitation efforts tributary to the Taylor Run P.S.



WEST GOSHEN SEWER AUTHORITY CAPITAL IMPROVEMENT SCHEDULE 2021-2030																				
Project		Projected Expenses											Contributing Mu	nicipalities		Funding Sources				
		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	East Goshen 16.67%	West Whiteland 13.667%	Westtown 8.833%	Thornbury 0.1584%	Total WGSA	Reserve/Tapping Fees Township	Grant	Other
Miscellaneous Capital Improvements		\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$75,000	\$13,752.75	\$112,752.75	\$72,872.25	\$1,306.80	\$624,315.45			
Priority A Interceptor Rehabilitation	\$1,400,000	\$1,400,000											\$16,062.72	\$189,956.02	\$6,468.49	Ð	\$1,187,512.77	\$1,187,512.77		
Priority B Interceptor Rehabilitation	\$2,432,000				\$1,216,000	\$1,216,000							\$44,109.54	\$321,379.61	\$90,245.28	3	\$1,976,265.57			
UV Controls	\$90,000	\$40,000	\$50,000																	
Effluent Flow Meter	\$20,000	\$20,000																		
Trickling Filter Bearing Replacement	\$29,149	\$29,149																		
Clarifier Drive Replacement & Rehab.	\$453,000		\$132,319		\$132,319		\$132,319						\$6,617.25	\$54,251.91	\$35,063.08	\$628.78	\$300,394.49			
Screw Pump Replacement	\$364,767		\$24,809	\$137,827		\$137,827		\$137,827					\$7,306.30	\$59,901.17	\$38,714.20	\$694.25	\$331,674.61			
Primary Transformer Replacement	\$200,000			\$211,600									\$3,527.37	\$28,919.37	\$18,690.63	\$335.17	\$160,127.45			
Cemetary Sewer Rehabilitation & ARV Replacement	\$220,000		\$220,000																\$220,000.00	J
Sanitary Sewer Rehabilitation / Repairs	\$4,155,000		\$540,000	\$540,000	\$100,000	\$75,000	\$540,000	\$540,000	\$540,000	\$540,000	\$200,000	\$540,000					\$4,155,000.00			
Taylor Run Pump Station Improvements	\$700,552	\$361,052.00	\$210,945	\$89,401			\$57,250							\$98,217.62			\$620,430.38			
Fern Hill Pump Station Spare Pump Purchase	\$30,000	\$30,000												\$4,100.10			\$25,899.90			
Fern Hill Pump Station Improvements	\$955,000		\$186,855	\$519,043	\$519,043									\$167,412.59			\$1,057,527.71			
Spruce Avenue Pump Station Pump Replacement	\$75,000	\$37,500	\$38,588	\$31,000													\$107,087.50			
Ellis Lane Pump Station Improvements	\$482,000					\$99,340	\$551,890										\$651,230.20			
Montgomery Avenue Pump Station Improvements	\$353,000							\$76,439	\$424,659								\$501,097.62			
Spruce Avenue Pump Station Improvements	\$493,590									\$112,035	\$622,417						\$734,452.05			
Washington Street Pump Station Improvements	\$1,101,000									\$124,952	\$694,181	\$694,181		\$206,824.55			\$1,306,488.94			
	TOTALS	\$1,992,701	\$1,478,515	\$1,603,871	\$2,042,361	\$1,603,167	\$1,356,459	\$829,266	\$1,039,659	\$851,988	\$1,591,597	\$1,309,181	\$91,376	5 \$1,243,716	\$262,054	\$2,965	\$13,739,505			

Projected Capital Reserve @ Year End

Notes: Inflation Rate 2.9% per year after 2020 Engineering Costs Based on 18% of Estimated Construction

Clarifier Rehabilitation Assumed Engineering Completed for Primary Clarifiers (Typ) and Final Clarifiers (Typ)