PRELIMINARY ENGINEERING REPORT

Tuscarora Township – Phase I Sewer Expansion

Tuscarora Township

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Seal

TABLE OF CONTENTS

Attachments

1.0 Executive Summary

Tuscarora Township is requesting funding assistance through the US Department of Agriculture's Rural Development, Water and Waste Disposal Direct Loans and Grant Program. The purpose of this funding request is to enable the Township to expand the community's wastewater collection system from the downtown commercial district to the surrounding residential area to the west. The sewer expansion has been subdivided into two proposed phases, due to the size of the area to be served. The subject of this Preliminary Engineering Report (PER) is the Tuscarora Township – Phase I Sewer Expansion, which is the northerly half of the overall expansion. An overall service area map has been included as Attachment A, which depicts the proposed project in relation to the existing sewer system.

The Phase I service area includes the Columbus Beach Club at the northerly boundary, down to Mack Avenue to the south. The homes within this area currently rely upon private wells and individual drainfields. Due to a combination of environmental concerns including poor soil conditions, high groundwater, surface water proximity, and well isolation distances on relatively small lots, the majority of existing onsite wastewater disposal systems are non-conforming to current environmental health standards (Sanitary Code), which can contribute to the degradation of the surrounding water quality. The lack of sewer infrastructure has also become a limiting factor to population and economic growth.

The existing sewer system was designed and constructed with the intention of expansion into this residential area. This request would be the first expansion of the original system. In conjunction with a proposed expansion of the service area, an expansion of the wastewater treatment facility (WWTF) would be necessary to treat the additional flow.

The proposed project will provide a hybrid of gravity services and low pressure sewer (LPS) with individual grinder pumps. The service area encompasses approximately 121 acres and 226 EDUs on 202 assessment parcels. The Phase I expansion will include approximately 7,350 feet of new 8-inch gravity sewer, 22 manholes, approximately 10,400 feet of new force main sewer, 4 lift stations, 68 individual pumping stations, upgrades to increase capacity in the two existing lift stations, and an expansion of 48,000 gpd capacity at the existing WWTF.

The estimated project cost for Phase I is $6.325M, which includes both the treatment system expansion and the collection system costs. The project costs, when divided by the 226 EDUs in the service area equals an individual cost of about $28,000 per residential connection.

2.0 Project Planning

2.1 Project Summary – Existing Facility Description:

The existing WWTF consists of three major components, the first is a headworks building with trash and grit removal, a laboratory, blowers, the treatment process controls, and chemical feed equipment. Next is the 96,000 gpd treatment process unit, which is a proprietary Aero Mod, Inc. SEQUOX, modular treatment system with a dual process train and a decant storage tank with discharge pumping equipment. The treated wastewater is discharged to groundwater through 39,000 square feet of Rapid Infiltration Basins. The existing collection system encompasses primarily the commercial properties along the S. Straights Highway between M-68 to the south and the Indian River bridge to the north. There are two main pumping stations that transport the wastewater from the service area to the WWTF.

2.2 Project Summary – Proposed Facility Description:

The three major project components will be improved are as follows:

Headworks: The existing headworks building will be modified to add trash and grit removal capacity and efficiency, additional process controls will be integrated into the system and the chemical feed equipment will be modified for the increased capacity. The headworks modifications will also include work within the existing building to accommodate the new equipment and facilities.

Treatment: The treatment process unit will be expanded by adding another 48,000 gpd modular Aero Mod, Inc. SEQUOX unit, added decant storage capacity and additional discharge pumping equipment. The resulting treatment capacity will be 144,000 gpd to accommodate the additional Phase I service area. Finally, there will be a corresponding increase in the Rapid Infiltration Basins, expanding the footprint to 58,500 square feet for the increased discharge to groundwater.

Collection: The proposed improvements would add a new service area that will be primarily residential connections. The Phase I service area will have a section of gravity sewer services with approximately 7,350 feet of new 8-inch PVC gravity sewer, 22 manholes, 4 lift stations, and 6-inch PVC gravity service leads, serving 128 properties. There will also be an area of low pressure sewer with 10,400 feet of new HDPE force main, 11 cleanout/air relief structures, valves, and 68 individual grinder pump stations with 1.5” pressure service leads to 74 properties.

2.3 Project Location:

The proposed project will provide a municipal sewer system to the residential area west of the Indian River commercial corridor, building off of the existing infrastructure installed for this commercial sewer district. The proposed Phase I service area is generally located west of the commercial sewer district to the shore of Burt Lake. The area is bound by Mack Avenue to the south and the Columbus Beach Club to the North. The proposed service area encompasses approximately 121 acres and 202 properties. A map of the Phase I service area and property connections has been included as Attachment B.

2.4 Environmental Resources Present:

The project area has several environmental resources present that impact the design and construction of a sewer system. First there is Burt Lake along the eastern boundary, which is the primary receiving water body for the majority of soil erosion, runoff and/or contaminants generated within the project area. Then we have the Indian River, which flows out from Burt Lake. The Indian River must be crossed to reach the Columbus Beach Club and residential area east of the Club.

A secondary effect of having these water bodies within the project planning area is that much of the project area has high groundwater levels. The groundwater itself is a receiving body for contaminants, but it also impacts construction methods and techniques, requires specific design considerations for the installation of subsurface pumping stations, and impacts the selection of materials used within the construction.

Please find additional details pertaining to the environmental resources present in the Environmental Report, prepared by the Michigan Community Action Program and submitted to the USDA under a separate cover.

2.5 Population Trends:

According to the U.S. Census Bureau, the population of Tuscarora Township in 2010 was 3038 persons (1468 male - 1570 female), a decrease of 53 people or 1.7% compared to the 2000 census. For comparisons, the population of Cheboygan County decreased by 1.1% and the State decreased by 0.6% during the same decade. However, over 4 decades from 1960 to 2000, Tuscarora's population has experienced an average growth of 31.5% compared to a 16.4% average growth rate in Cheboygan County in the same time period.

The population density in Tuscarora Township in 2010 averaged 103 persons per square mile. For comparison, Cheboygan County had a population density of 36.5 persons per square mile and the State of Michigan had a population density of 174 persons per square mile. It is important to note that the census tally is conducted on April 1st and does not reflect the increased summer population. Approximately 35% of the total housing units in Tuscarora Township are classified as seasonal, recreational, or occasional use homes. If these residences conform to the average Township household size of 2.23, the summer population would be expected to increase by 1887 persons or over 60%.

The following table provides a summary of the population trend data:

Table 1. Population Trend

Service Area	*1990*	*2000*	*2010*	*Annual Growth*	*2020*	*2030*	*2040*	*2050*
Existing	237	244	244	0.0035%	249	252	256	259
Phase I	299	305	304	0.0065%	311	317	323	330
Total	536	549	548		560	569	579	589

2.6 Community Engagement Summary:

The need for a community system has been an ongoing discussion in the Township for decades, with the need for such a system increasing with population and water use. In the past, the Township has contracted engineering firms to conduct sewer studies; however, public opposition typically focusing on the cost, prevented the implementation of a public sewer system.

In 2012, the existing sewer system in the commercial district was approved by petition demonstrating support by 67% of the affected property owners. This allowed the Township to install the current infrastructure that can now be used for the contemplated expansion project. Based on the positive reception of the first phase of municipal sewer implementation in 2012, the Township set out to offer sewer service to the surrounding (primarily residential) areas.

Performance Engineers, Inc. (PEI) was contracted to assist the Township with the development of conceptual plans and associated cost estimates to begin the community engagement process. An informational hearing was held on July 6th, 2019 over the Fourth of July holiday weekend to encourage as much public participation as possible.

Based on this public meeting, the service areas under consideration were revised, honing in on the area with the greatest need and support.

At the Township's Board meeting on August 6, 2019 the Township approved the preparation and submittal of an application to the USDA Rural Development for the proposed project planning area, referred to as District 2. Subsequently, in March of 2021 discussions with USDA and the community led to the subdivision of District 2 into Phase I and a Phase II, divided at Mack Avenue.

The Township has a sewer committee, for which a board member has been appointed to report back to the elected officials on the progress of the project. The Township Board is provided with monthly sewer project updates and the committee disseminates information on the project through a newsletter.

There is a community group called Citizens and Homeowners for Indian River Progress (CHIRP), which was formed in 2017, and is provided with updates by the sewer committee. This citizen's group is actively promoting the project and the overall need for a municipal sewer solution in the project area. This group utilizes social media resources to communicate the project status to a variety of community members.

On April 6, 2021 the Township held a public hearing for the intent to file and application with the USDA. This hearing was another opportunity for the Township to hear both the support and opposition to the project. The result of the meeting was support to move forward with the application for Phase I.

On June 2, 2021 members of the sewer committee and PEI met with the local health department officials to review the project and engage the local health department in support of the municipal sewer. The health department subsequently issued a letter of support for the project and validated the assessment that over 50% of the properties within the proposed sewer district cannot meet the requirements of the existing Sanitary Code.

On July 3, 2021 the sewer committee held a special public meeting over the holiday weekend, which was well attended. On August 6, 2021 the project area was toured by Congressman Jack Bergman (MI-01).

The Township has continued to keep the sewer service area and the proposed USDA funding application on their regular agenda to provide the public with updates along the way.

3.0 Existing Facilities

3.1 Summary:

The existing WWTF consists of three major components, the first is a headworks building with trash and grit removal, a laboratory, blowers, the treatment process controls, and chemical feed equipment. Next is the 96,000 gpd treatment process unit, which is a Aero Mod, Inc. SEQUOX, modular treatment system with a dual process train and a decant storage tank with discharge pumping equipment. The treated wastewater is discharged to groundwater through 39,000 square feet of Rapid Infiltration Basins. The WWTF is permitted at 96,000 gpd and currently peaks at about 80% capacity during the summer tourist season. The existing collection system encompasses primarily the commercial properties along the S. Straights Highway. It is primarily gravity sewer with a few duplex pumping stations and associated force main piping. There are two main pumping stations that transport the wastewater from the service area to the WWTF. The WWTF is located on southeasterly of the service area, on the east side of I-75 approximately 1.5 miles from the service area. A map of the existing service area is included as Attachment C, along with a Sewer Summary sheet for the existing system.

3.2 History:

Tuscarora Township has been considering options for providing municipal sewer to its residents for over 50 years. There was a serious effort made in the 1970's to utilize Federal Water Pollution Control grant funding and a plan was developed, bid out, and found to be cost prohibitive. Another effort was made in the late 1990's with a similar result. It wasn't until Tuscarora Township obtained USDA grant and loan funding through the Rural Development program in 2012 that construction was begun on a municipal sewer project. Although this process was not without its own difficulties, it did move forward, and Tuscarora Township had a municipal sewer system available to primarily the commercial users along the S. Straights Highway area. The service area does also include the industrial park southeast of the WWTP and the Burt Lake State Park. It is this backbone of infrastructure that forms the basis for the proposed service area expansion.

3.3 Existing Conditions Summary:

The existing collection, treatment, and disposal system for Tuscarora Township is quite new, being constructed and placed into service in 2014. Since that time there have been no major facility upgrades, repairs, or expansions. The proposed project would be the first of this nature.

3.4 Existing Contract Disposal Customers:

There is one existing contract disposal customer and no new contract disposal customers proposed. The existing customer is the Burt Lake State Park, which pays a flat rate for its wastewater treatment and disposal. The Township plans to install a meter at their connection point in the future and eliminate the flat rate contract.

3.5 Financial Status:

The existing municipal sewer system has a current USDA loan, which means that the USDA maintains some level of oversight on the finances of the system. The Township has regular audits of its sewer accounts and fund balances, which are reported to the USDA. The Township has been meeting its financial obligations since the inception of the system. A copy of the relevant sewer portions of the Township's 2020 financial audit are included as Attachment D.

4.0 Need for the Project

4.1 Health & Sanitation Concerns:

The primary health and sanitation concern that is addressed by the proposed project is the fact that the homes within proposed service area currently rely upon private wells and individual drainfields. There are environmental resources present at the project location that place constraints on septic design, of primary concern is Burt Lake and the Indian River. The lake influences local groundwater table elevation for properties in the proposed service area. The high groundwater and poor soil infiltration are the primary environmental factors limiting onsite sewage disposal for many of the properties within the service area. The high groundwater level and proximity to the lake is also a situation of great concern for many of the properties that have existing onsite septic systems. Though these systems may not be in a failure mode where sewage is present at the surface, it is likely that many of the older septic systems do not adequately provide the aerobic conditions to allow for proper treatment by soil absorption systems.

Additional background information was collected during site visits to visually assess the surrounding environmental conditions. A key factor noticed is that there appears to be many artesian wells in the area, some of which were observed with a constant flow to the road ditch system. This appears to add to the overall high groundwater conditions observed in the area.

Performance Engineers prepared an evaluation of the suitability of the project area for onsite septic systems, which was provided to the local health department. In this evaluation, it was demonstrated that well over 50% of the properties within the proposed service area are unable to meet the current sanitary code requirements for a properly functioning and isolated onsite septic system. A copy of this report is included for reference as Attachment E, along with a map depicting the limitations graphically.

The proposed service area within Phases I and II cover a total of approximately 200 acres and 420 properties. Of this area, approximately 30 acres are public road right-of-way and 12 acres are water, leaving 158 acres for the 420 properties. If the properties were all equal in size, it would leave just over 0.37 acres per lot (about 16,400 sf) per lot. The USDA Soil Survey of Cheboygan County, Michigan maps approximately 77.7 acres of this area as unsuitable soils for onsite septic systems.

The local Sanitary Code (District Health Department 4, effective October 12, 2009) states as its purpose "*These regulations are hereby adopted for the purpose of protecting public health and the quality of the environment as it affects human health, and to prevent the occurrence of public health hazards, risks and nuisances*." Pursuant to that stated purpose, the Code contains design standards, special provisions, and requirements for the onsite discharge of sanitary sewage. The Code requirements for a compliant onsite septic system that were applied to the evaluation include the following:

- 100-ft surface water setback
- 50-ft well isolation
- 10-ft setback from property lines
- 10-ft setback from building foundation
- 50-ft setback from an intermittent wet area
- 24-in vertical isolation from bottom of aggregate to high groundwater
- Area shall be available for both the primary sewage disposal system & a replacement area
- The replacement area shall be large enough for a sewage disposal system that complies with the Code
- Structures, driveways, parking areas, etc. shall not be constructed over the drainfield area
- The design sizing information

When the Sanitary Code dimensional isolation requirements are applied to the proposed Phase I service area, the conclusion is that over 50% of the properties cannot meet the

Code requirements for a conforming onsite septic system. A map of the Phase I – Onsite Sanitary Limitations is included with Attachment E, which also has the NRCS soils map and soil series information. The evaluation report estimates that if all factors were accounted for, it would be closer to 65% or more of the properties that cannot meet the current Sanitary Code requirements. This clearly demonstrates the need for the project, not just for the properties it will serve, but for the receiving environment and all the public recreational users of these waters.

The local Health Department (District #4) has been consulted regarding this project. PEI met with the Environmental Health Director and Health Officer with representatives from the Township to discuss their original letter of support and to obtain an additional letter that clarified the Department's concurrence with the fact that over 50% of the properties within the Phase I service area cannot meet the current Sanitary Code provisions for an onsite sewage disposal system. Copies of these Health Department letters are included for reference as Attachment F, along with citizen comments and photographs supporting the impact of this health and sanitation issue.

5.0 Alternatives Considered

5.1 Alternative 1 – Gravity Sewer:

Alternative 1 – Gravity Sewer Description

The Township desires to be able to offer every resident connecting to the sewer with a gravity sewer lead as the most preferred sewer service method. In the Phase I residential area, typical gravity sewer collection infrastructure is the preferred means of sewer service. Since the terrain along the Indian River shoreline area is relatively flat, low-lying ground, construction of gravity collection system infrastructure became too costly in these areas. Therefore, this alternative includes some force main piping and duplex pumping stations that will be installed in the right-of-way and owned by the Township to serve these residents. However, the residents will be provided with a gravity service lead that connects to the Township duplex pumping station. In this way, no residents will be required to have an individual grinder pump station on their property.

Alternative 1 – Gravity Sewer Design Summary

The Township directed the preliminary engineering study to evaluate any and all possible technologies and methods for providing sewer service to the proposed sewer service area at the lowest cost to the resident. Taking this broad direction, many collection system options were evaluated. After much discussion and public comment, the Township heavily

weighed in favor of an alternative that does not require individual pumping equipment, preferring to have all of this located within the road right-of-way. Therefore, the design criteria associated with this alternative includes the following:

- Provide typical 8-inch gravity sewer main & 6-inch service leads everywhere that is technically feasible;
- Where terrain or groundwater conditions limit the feasibility of typical gravity sewer, force main piping will be installed;
- All residences on the force main route will be provided with a 6-inch gravity sewer lead to their property;
- The gravity sewer leads will then connect to Township owned duplex pumping stations installed in the right-of-way, which in turn will pump to the force main portions of the collection system;

The rationale behind this design criteria is that all customers are treated similarly by being provided with a 6-inch gravity lead on their property. The areas that require force main due to terrain or groundwater issues, would then have duplex pumps installed within the right-of-way. The Township would then need to supply the electrical services, access and protection of these duplex pumping stations. However, the majority of the service area would be connected to traditional gravity sewer collection piping and manholes. The gravity portions would pump back to the existing collection system through centrally located lift stations.

Alternative 1 – Gravity Sewer Map

A full-size map of the proposed gravity sewer collection system and associated pumping stations is included for reference as an Attachment G.

Alternative 1 – Gravity Sewer Environmental Impacts

The primary environmental impacts associated with this alternative are that it will require construction in areas that are near water bodies, it will require dewatering, and it will involve boring under water bodies. Each of these impacts are further addressed below.

The bulk of the construction will take place within road right-of-way where staging of excavated soil and restoration of disturbed ground will require special attention to ensure that this material is not eroded or otherwise discharged to adjacent ditches and stormwater conveyance systems that could ultimately impact the receiving waters of the

Indian River or Burt Lake. Soil erosion controls will include silt fencing, a stockpile management plan, and/or transport of excavation spoils off-site, as appropriate.

Where dewatering is required, control of the discharged groundwater poses a potential for erosion and possible direct discharge of sediment to the receiving water bodies. The impact of the dewatering activities will be mitigated by reducing the discharge velocity to non-erosive levels before release from the construction zone, use of well points for a more constant, but lower discharge flow rate, and the use of silt or sediment bags, as appropriate.

Finally, where it is necessary to cross the Indian River with a sewer pipe, this crossing will be done with directional drilling technology. This technology allows for the construction to proceed while tracking the actual location and depth of the pipe. A minimum of 5-feet depth below the river bottom will be maintained to prevent the accidental release of drilling fluids. This process may require permitting from the State and any additional permit requirements will be incorporated into the project.

Alternative 1 – Gravity Sewer Land Requirements

Since all project construction will occur within the road right-of-way, there is no additional land purchase requirement.

Alternative 1 – Gravity Sewer Construction Concerns

There is always the potential for construction problems associated with excavating in the road right-of-way, such as utility conflicts. With this project in particular, there are some areas of limited access in the platted roads, narrowed by deep ditches on either side. There is also a high groundwater level in the lower lying areas that will need to be handled with dewatering equipment. On the positive side, the service area does not have a public water supply system, so there is not a concern over maintaining separation from a water main.

Alternative 1 – Gravity Sewer Efficiency Summary

There is no potential for water reuse or efficiency and limited ability for energy efficiency associated with this alternative because the only power consumption is associated with the pumping stations.

Alternative 1 – Gravity Sewer Green Infrastructure Summary

There is not much opportunity for green infrastructure either with this alternative, or in comparison to the other alternatives.

Alternative 1 – Gravity Sewer Sustainability Summary

There is not much opportunity for sustainability measures associated with the collection system construction either independently, or in comparison between the alternatives. Although, there could be a case made that this alternative has some advantage in operational simplicity for the Homeowner by eliminating any pumping equipment on their property.

Alternative 1 – Gravity Sewer Cost Summary

The collection system infrastructure was quantified utilizing the Alternative 1 – Gravity Sewer Map. A detailed cost estimate was developed by assigning regional market pricing to the project, with an assumption made to accommodate inflation between the time of development and construction (assumed to be one year). The pricing was also adjusted to factor in local project conditions, such as the high groundwater table in parts of the project area and the limited working area in sections of the proposed construction.

The total construction cost for this alternative is estimated at $5,201,000 and the total project cost is $6.631M when engineering, legal, and contingency costs are added. This estimate was then used in conjunction with the USDA PER Summary Tables to make a cost comparison between the viable alternatives based on the NPV.

The detailed cost estimate has been included with the Alternative 1 – Gravity Sewer Map as a part of Attachment G.

Alternative 1 – Gravity Sewer O&M Summary

The costs associated with providing gravity services to all homes will require the Township to take on the utility costs associated with the pumping stations, as well as all of the routine maintenance activities and repair & replacement costs. The bulk of the costs are associated with the duplex pumping stations and the larger lift stations, with the routine maintenance of the gravity collection system being relatively inexpensive.

5.2 Alternative 2 – Gravity & Force Main Hybrid:

Alternative 2 – Gravity & FM Hybrid Description

This alternative encompasses the same traditional gravity sewer collection system for the residential area between the rivers as Alternative 1, but low pressure sewer (LPS) service would be utilized for the lower lying areas around the shoreline. The connections to the LPS would be made through individual grinder pump stations, these would be owned by the municipality. This project is still over 60% gravity sewer connections, with the lower terrain around the Burt Lake and Indian River shoreline being served with individual grinder pumps and low pressure sewer connections. It is understood that this alternative requires additional easements for situating an individual grinder pump package on the property.

Alternative 2 – Gravity & FM Hybrid Summary

The Township directed the preliminary engineering study to evaluate any and all possible technologies and methods for providing sewer service to the proposed sewer service area at the lowest cost to the resident. Taking this broad direction, many collection system options were evaluated. The design criteria associated with this alternative includes the following:

- Provide typical 8-inch gravity sewer main & 6-inch service leads everywhere that is technically feasible;
- Where terrain or groundwater conditions limit the feasibility of typical gravity sewer, force main piping will be installed;
- All residences on the force main route will be provided with a 1.5-inch low pressure sewer lead to their property;
- The owners within the pressure sewer area will have their own Township supplied pumping equipment and connection, which will pump directly to the force main portions of the collection system;

The rationale behind this design criteria is to utilize each of these two collection system technologies where conditions make one preferred over the other and then integrate the systems for pumping back to the existing collection system. This alternative allows for gravity sewer connections in areas where the terrain and groundwater conditions make this feasible and then directionally drilling a low pressure sewer force main into the flatter areas and areas of higher groundwater, where traditional gravity sewer construction would be more difficult and costly. The integration of the LPS force main back into the gravity collection system would be accomplished at manholes or lift stations. The LPS

connections would be made with individual grinder pumps and the gravity sewer portion would require lift stations to pump back up to the existing collection system.

Alternative 2 – Gravity & FM Hybrid Map

A full-size map of the proposed gravity & FM Hybrid sewer collection system and associated pumping stations is included as Attachment H.

Alternative 2 – Gravity & FM Hybrid Environmental Impacts

The primary environmental impacts associated with this alternative are that it will require construction in areas that are near water bodies, it will require dewatering, and it will involve boring under water bodies. Each of these impacts are further addressed below:

The bulk of the construction will take place within road right-of-way where staging of excavated soil and restoration of disturbed ground will require special attention to ensure that this material is not eroded or otherwise discharged to adjacent ditches and stormwater conveyance systems that could ultimately impact the receiving waters of the Indian River or Burt Lake. Soil erosion controls will include silt fencing, a stockpile management plan, and/or transport of excavation spoils off-site, as appropriate.

Where dewatering is required, control of the discharged groundwater poses a potential for erosion and possible direct discharge of sediment to the receiving water bodies. The impact of the dewatering activities will be mitigated by reducing the discharge velocity to non-erosive levels before release from the construction zone, use of well points for a more constant, but lower discharge flow rate, and the use of silt or sediment bags, as appropriate.

Finally, where it is necessary to cross the Indian River with a sewer pipe, this crossing will be done with directional drilling technology. This technology allows for the construction to proceed while tracking the actual location and depth of the pipe. A minimum of 5-feet depth below the river bottom will be maintained to prevent the accidental release of drilling fluids. This process may require permitting from the State and any additional permit requirements will be incorporated into the project.

Alternative 2 – Gravity & FM Hybrid Land Requirements

All of the sewer mains and public collection system components will be installed within the road right-of-way, so there is no additional land requirement. However, individual easements will be required for the installation of the individual pumping equipment and

connection to the force main. It has been assumed that a generic easement document would be provided to the property owners for execution prior to commencing with the project.

Alternative 2 – Gravity & FM Hybrid Construction Concerns

There is always the potential for construction problems associated with excavating in the road right-of-way, such as utility conflicts. With this project in particular, there are some areas of limited access in the platted roads, narrowed by deep ditches on either side. There is also a high groundwater level in the lower lying areas that will need to be handled with dewatering equipment. On the positive side, the service area does not have a public water supply system, so there is not a concern over maintaining separation from a water main. Another potential construction issue is the process of obtaining easements from the individual property owners for the installation of the pumping equipment and then performing construction and restoration where people have potentially landscaped or create tight working conditions for the installation.

Alternative 2 – Gravity & FM Hybrid Efficiency Summary

There is no potential for water reuse or efficiency and limited ability for energy efficiency associated with this alternative because the only power consumption is associated with the pumping stations.

Alternative 2 – Gravity & FM Hybrid Green Infrastructure Summary

There is not much opportunity for green infrastructure either with this alternative, or in comparison to the other alternatives.

Alternative 2 – Gravity & FM Hybrid Sustainability Summary

There is not really much opportunity for sustainability measures associated with the collection system construction either independently, or in comparison between the alternatives. Although, there could be a case made that this alternative has some advantage in operational simplicity for the Township by utilizing individual pumping equipment instead of equipment located within the right-of-way with its own electrical service.

Alternative 2 – Gravity & FM Hybrid Cost Summary

The collection system infrastructure was quantified utilizing the Alternative 2 – Hybrid Sewer Map. A detailed cost estimate was developed by assigning regional market pricing to the project, with an assumption made to accommodate inflation between the time of development and construction (assumed to be one year). The pricing was also adjusted

to factor in local project conditions, such as the high groundwater table in parts of the project area and the limited working area in sections of the proposed construction.

The total construction cost for this alternative is estimated at $4,962,200 and the total project cost is $6.325M when engineering, legal, and contingency costs are added. This estimate was then used in conjunction with the USDA PER Summary Tables to make a cost comparison between the viable alternatives based on the NPV.

The detailed cost estimate has been included with the Alternative 2 – Hybrid Sewer Map as a part of Attachment G.

Alternative 2 – Gravity & FM Hybrid O&M Summary

The costs associated with maintenance of the gravity sewer are minimal. The main cost items are associated with the weekly inspections and maintenance activities at the pumping stations. The maintenance of the individual grinder pumps requires some additional costs, but can be managed along with the larger lift stations and ancillary force main equipment.

5.3 Alternative 3 – LPS:

Alternative 3 - LPS Description

The Low Pressure Sewer (LPS) alternative is an evaluation of a collection system that utilizes individual grinder pumps to send wastewater directly from the point of generation into a force main. The primary benefit of this system is that the force main is relatively small diameter piping and can be installed at a minimum depth to prevent freezing, going up and down to follow the terrain. In the case of the service area, some of the sewer could be installed with directional drilling technology to minimize surface disturbance and the associated costs. This would also reduce the construction complications associated with the installation of deeper pipe in areas of high groundwater conditions.

Alternative 3 - LPS Design Summary

The Township directed the preliminary engineering study to evaluate any and all possible technologies and methods for providing sewer service to the proposed sewer District at the lowest cost to the resident. Taking this broad direction, many collection system options were evaluated. The design criteria associated with this alternative was not selected, but included the following:

- All residences will be provided with a 1.5-inch pressure sewer lead to their property;
- Run the force main piping within the road right-of-way maintaining minimum depth to prevent freezing;
- Directionally drill as much of the force main as possible to minimize surface disturbance costs;
- The owners within the pressure sewer area will be provided with individual pumping equipment and connected.

The rationale behind this design criteria is to provide each customer with a low pressure sewer connection at the lowest possible cost to the project as a whole. Although, this alternative reduces the number of more expensive larger lift stations, it creates a large number of individual pumping stations, which in aggregate is cost prohibitive.

Alternative 3 - LPS Map

A full-size map of the proposed low pressure sewer network and associated pumping stations is included for reference as Attachment I.

Alternative 3 - LPS Environmental Impacts

The primary environmental impacts associated with this alternative are that it will require construction in areas that are near water bodies, it will require dewatering, and it will involve boring under water bodies. Each of these impacts are further addressed below:

The bulk of the construction will take place within road right-of-ways where staging of excavated soil and restoration of disturbed ground will require special attention to ensure that this material is not eroded or otherwise discharged to adjacent ditches and stormwater conveyance systems that could ultimately impact the receiving waters of the Indian River or Burt Lake. Soil erosion controls will include silt fencing, a stockpile management plan, and/or transport of excavation spoils off-site, as appropriate.

Where dewatering is required, control of the discharged groundwater poses a potential for erosion and possible direct discharge of sediment to the receiving water bodies. The impact of the dewatering activities will be mitigated by reducing the discharge velocity to non-erosive levels before release from the construction zone, use of well points for a more constant, but lower discharge flow rate, and the use of silt or sediment bags, as appropriate.

Finally, where it is necessary to cross the Sturgeon River or Indian River with a sewer pipe, this crossing will be done with directional drilling technology. This technology allows for the construction to proceed while tracking the actual location and depth of the pipe. A minimum of 5-feet depth below the river bottom will be maintained to prevent the accidental release of drilling fluids. This process may require permitting from the State and any additional permit requirements will be incorporated into the project.

Alternative 3 - LPS Land Requirements

Since all project construction will occur within the road right-of-way, there is no additional land purchase requirement. However, this alternative does require the upfront effort to coordinate with the individual property owners for obtaining easements for installation of the equipment on their property.

Alternative 3 - LPS Construction Concerns

There is always the potential for construction problems associated with excavating in the road right-of-way, such as utility conflicts. With this project in particular, there are some areas of limited access in the platted roads, narrowed by deep ditches on either side. There is also a high groundwater level in the lower lying areas that will need to be handled with dewatering equipment. This alternative also relies upon a great deal of directional drilling, which adds uncertainty as to subsurface conditions being suitable for that process. On the positive side, the service area does not have a public water supply system, so there is not a concern over maintaining separation from a water main.

Alternative 3 - LPS Efficiency Summary

There is no potential for water reuse or efficiency and limited ability for energy efficiency associated with this alternative because the only power consumption is associated with the pumping stations.

Alternative 3 - LPS Green Infrastructure Summary

There is not much opportunity for green infrastructure either with this alternative, or in comparison to the other alternatives.

Alternative 3 - LPS Sustainability Summary

There is not much opportunity for sustainability measures associated with the collection system construction either independently, or in comparison between the alternatives. Although, there could be a case made that this alternative has some advantage in operational simplicity for the Township by placing the individual pumping equipment on

the actual owner's property and allowing them to essentially operate it, providing only maintenance and emergency response services.

Alternative 3 - LPS Cost Summary

The collection system infrastructure was quantified utilizing the Alternative 3 – LPS Sewer Map. A detailed cost estimate was developed by assigning regional market pricing to the project, with an assumption made to accommodate inflation between the time of development and construction (assumed to be one year). The pricing was also adjusted to factor in local project conditions, such as the high groundwater table in parts of the project area and the limited working area in sections of the proposed construction.

The total construction cost for this alternative is estimated at $5,516,500 and the total project cost is $7.033M when engineering, legal, and contingency costs are added. This estimate was then used in conjunction with the USDA PER Summary Tables to make a cost comparison between the viable alternatives based on the NPV.

The detailed cost estimate has been included with the Alternative 3 – LPS Sewer Map as a part of Attachment I.

Alternative 3 - LPS O&M Summary

While the operational cost associated with this alternative is low due to the pumping equipment being operated by the customers, the repair and maintenance cost is high to cover the planned replacement of the individual pumps on a 10-yr service life. The Township will also have some cost associated with the lift stations pumping back to the existing collection sewer system. There is also a complication in maintaining equipment that is located on private property. Even with an easement, servicing this equipment will be somewhat disruptive to the homeowner.

5.4 Alternative 4 – Vacuum Sewer:

Lack of Feasibility Determination

The use of vacuum sewer systems is uncommon in our region, but at the direction of the Township Board, this form of sewer collection was investigated. We reached out to a dealer for vacuum sewer equipment in Michigan and obtained additional information and pricing on a design concept developed by the supplier. The information that was provided indicates that valve pits would be shared between two adjacent properties for proper function of the system. The piping installation can be done at a somewhat shallow burial

depth, but it still must be in a similar 5-6 feet depth in order to prevent freezing issues. In conjunction with the piping and valve pits, this system requires a vacuum station that would be installed within the right-of-way. It is through these large vacuum stations that pumps are run to create the vacuum on the system. The installation of these stations is limited in this service area because of the required river crossing and the number of connections, which dictates the size of the station.

The overall pricing structure for the purchase of a vacuum sewer system is similar to the cost structure of the other collection system alternatives. However, the fact that the Township has already developed a sewer system that has gravity sewer, force main, and pump stations means that in order to integrate a vacuum sewer system into this new service area, it would require ongoing operations expertise that they currently do not have and maintenance for an entirely unique and extra set of equipment and components. It has been determined that there is not a significant cost savings to installing this form of collection system equipment that would offset the associated operational costs to add another type of unique equipment into an existing municipal system.

5.5 Treatment Alternative 1 – Existing System Expansion:

Treatment Alternative 1 – Existing System Expansion Description

The most logical solution to adding treatment capacity to the existing WWTF is to simply expand using the same treatment technology already in-place. The original plant was designed to be modular in that the AeroMod SESQUOX treatment system can be purchased in incremental (by-the-gallon) units. In the proposed project, the expansion requires an approximate fifty percent increase of the existing treatment plant capacity, therefore, another 48,000 gallon treatment package would be added and integrated into the balance of the facility controls, headworks, etc. The final disposal of the treated effluent would be to groundwater through an expansion of the existing rapid infiltration beds.

The costs associated with this expansion have been calculated based on a review and analysis of the original plant construction costs, discussions and price quote from the AeroMod supplier, and cost data analysis for the integration of the new unit into the existing system. The total estimated cost to complete this WWTF upgrade is $0.85M in Phase I, which includes the new AeroMod package, headworks modifications, upgrades to the chemical feed system, and an expansion of the rapid infiltration beds. Since the headworks upgrade will benefit the existing customers as well, this construction cost of

$245,000 has been separated and will be spilt between the proposed Phase I, Phase II, and existing customers.

Treatment Alternative 1 – Existing System Expansion Design Summary

The expansion of the WWTF using the existing treatment and disposal technology is pretty straight forward. The expansion must be able to be installed within the available land, integrate into the existing plant and controls, and produce effluent that meets or exceeds the EGLE discharge permit limitations.

The AeroMod supplier has provided the basis of design information included as Attachment J, for reference. This information has been developed from actual WWTF flow data and the original design, for which AeroMod was responsible.

Treatment Alternative 1 – Existing System Expansion Map

A schematic map of the proposed WWTF expansion has been developed and provided by the AeroMod supplier. This diagram is included with the attachment for reference. There are also maps of the process schematic and the rapid infiltration expansion site plan included as Appendices to this report.

Treatment Alternative 1 – Existing System Expansion Environmental Impacts

An expansion to the existing WWTF using the same treatment and disposal technology is not expected to have any significant impact to the environment. Although there will be an increase in the effluent load, the site has already been evaluated and deemed suitable for the discharge of effluent of the proposed (and permitted) characteristics. The availability of additional land will mitigate any effect of the increased concentration of effluent discharge to a specific location.

Treatment Alternative 1 – Existing System Expansion Land Requirements

The Township already owns approximately 54 acres where the existing WWTF is located. There is more than sufficient land available for the proposed expansion within this site. Therefore, no additional land will be required.

Treatment Alternative 1 – Existing System Expansion Construction Concerns

Due to the fact that the proposed alternative involves the expansion of an existing WWTF using the same manufacturer and supplier who originally supplied a modular system,

there is much less concern regarding construction issues than in the other alternatives. The primary construction issue of concern will be retrofitting the existing controls to integrate the new treatment process train. There is limited space within the existing building, so there will need to be appropriate coordination with the AeroMod supplier to ensure that the new and existing controls are properly integrated.

Treatment Alternative 1 – Existing System Expansion Efficiency Summary

The proposed alternative does not demand the use of any additional water, therefore water efficiency is not a concern. The AeroMod system does use aeration, which is a high energy consumption process. In order to maximize the energy efficiency of this alternative, the treatment process is subdivided into multiple parallel treatment trains. During periods of low use, primarily in the winter, parts of the plant can be shut down to conserve energy, while still achieving proper treatment of the seasonally reduced flow.

Treatment Alternative 1 – Existing System Expansion Green Infrastructure Summary

While there is no specifically "green infrastructure" element proposed, the project in its entirety is about preservation of the natural resources within the proposed service area. The active treatment of wastewater as opposed to passive septic systems discharging adjacent to the receiving waters, is an enormous step forward in preserving the natural environment.

Treatment Alternative 1 – Existing System Expansion Sustainability Summary

The sustainability of the proposed treatment and disposal alternative is deemed to be in excess of the 40-year design life of the facilities. The location of the site is also well suited for the future zoning and land use of the area, which adds to the longevity of the WWTF at this location.

Treatment Alternative 1 – Existing System Expansion Cost Summary

The proposed expansion of the WWTF using the existing treatment and disposal technology is the selected alternative for many reasons. One of which is the fact that the costs associated with this alternative are readily quantifiable and have a low risk of unforeseen issues. This treatment and disposal alternative is incorporated into the more detailed cost analysis provided for the project as a whole.

This treatment alternative was quantified utilizing the existing cost data, a quote from AeroMod and the site plan provided as Attachment J.

The total construction cost for this alternative is estimated at $850,000 and the total treatment system expansion cost is $1.079M when engineering, legal, and contingency costs are added. This estimate was then used in conjunction with the USDA PER Summary Tables to make a cost comparison between the viable alternatives based on the NPV.

The $850,000 cost for this treatment alternative has been integrated into the detailed estimates provided for the collection system alternatives so that those alternatives provide the completed total project cost.

Treatment Alternative 1 – Existing System Expansion O&M Summary

The operation and maintenance of this alternative is essentially an expansion of the existing O&M duties being performed now. The expansion with existing technology simplifies the future O&M procedures and process control. This also provides for a more reliable estimation of future costs because we have historical cost data to use. The O&M costs for the treatment plant are integrated into the overall operating budget for the completed project, first year of operation.

5.6 Treatment Alternative 2 – Parallel Lagoon:

Treatment Alternative 2 – Parallel Lagoon Description

The second alternative considered for treatment of the additional wastewater flow is to add some form of parallel treatment process and keep the existing AeroMod system as-is. The reason this alternative is considered viable is because of the seasonal variation in flow within the existing and proposed service areas. The idea would be to add an aerated lagoon that would primarily be used to buffer out the peak summer flow. The lagoon would be sized to store excess flow through the summer, knock down the BOD concentrations, and meter out flow back to the existing AeroMod plant at a lower strength for reduced treatment time. The effluent would then be sent for disposal into the slightly expanded rapid infiltration beds. This would require two approximately 1.5 acre lagoons, headworks modifications, smaller expansion of the rapid infiltration beds, and controls modifications to integrate the two treatment processes.

The estimated cost to implement this alternative is similar to the expansion using the same treatment technology. However, there are other factors that make this alternative less desirable. First, the WWTF site has not been fully evaluated for suitability for the

installation of lagoons. Though based on the available information, it does appear that there is a strong possibility that the site would support a lagoon. The second issue is that the existing WWTF is situated adjacent to the industrial park and the businesses within the industrial park may not be supportive of a lagoon system in their backyard, creating political issues that would need to be dealt with. Finally, the existing site approval and permitting through the State is based on the AeroMod system and the Township has been operating this system in compliance with their permit. Opening the door to additional review and permit modification adds uncertainty to the project, which for the savings is not deemed to be warranted.

Treatment Alternative 2 – Parallel Lagoon Design Summary

The design parameters used for evaluation of this alternative are based on storage of excess flow during the peak summer months. The existing customer base peaks out at around 80,000 gpd. The new service area is anticipated to peak at around 38,000 gpd. Since the existing plant capacity is 96,000 gpd, the excess summer flow would be stored in lagoons at a flow of approximately 40,000 gpd for 90 days during the summer. The requires approximately 3.6M gallons of storage. This volume would be provided in two 1.5-acre aerated lagoons, each with a storage capacity of about 2M gallons.

The added benefit of reducing the wastewater strength in the aeration lagoons has not been considered as a direct cost benefit, but does factor into the overall consideration of this alternative.

Treatment Alternative 2 – Parallel Lagoon Map

A schematic map of the proposed parallel lagoon and WWTF has been developed and included as Appendix K to this report.

Treatment Alternative 2 – Parallel Lagoon Environmental Impacts

There are two main environmental concerns related to the addition of aerated lagoons into the WWTF process. The first is that the lagoons create a potential disease vector created by insects, birds, and small animals that may come into contact with the lagoon and then carry contaminants off-site. The second is that the lagoons will generate sludge that will require maintenance dredging over time. This material will then have to be hauled off-site for proper disposal.

Treatment Alternative 2 – Parallel Lagoon Land Requirements

The proposed addition of lagoons to the treatment process would be the most intensive land use of the alternatives being evaluated. However, the Township owns approximately

65 acres around the existing WWTF and has sufficient area for the lagoons. Please see the Parallel Treatment Schematic Layout to see how the proposed lagoons would fit into the existing property and WWTF infrastructure.

Treatment Alternative 2 – Parallel Lagoon Construction Concerns

The construction of lagoons and integration of these lagoons into the existing site creates the most construction uncertainty of the alternatives evaluated. The available information from review USGS maps and previous hydrogeology data prepared for the existing plant indicates that the lagoons could be properly located on the site. However, the engineers from the previous study were not specifically evaluating the site for lagoon placement and thus there is some uncertainty surrounding special construction or additional site improvement efforts that may be required to make the site suitable for the lagoon system.

Treatment Alternative 2 – Parallel Lagoon Efficiency Summary

The energy efficiency of the aerated lagoon is assumed to be similar to the selected alternative (Aero-Mod package plant). There will be blowers required for aeration of the lagoon, which requires a lot of energy. However, the aeration would most likely occur only in one of the two lagoons at a time and would most likely not be run all year around. There is no proposed water recycling or reuse proposed with the project.

Treatment Alternative 2 – Parallel Lagoon Green Infrastructure Summary

There is some argument that could be made for this alternative as more sustainable or "green" than the other alternatives evaluated. The reasoning would be that the lagoons utilize a natural biological process for breakdown of the wastewater. This alternative also would allow for some evapotranspiration out of the lagoons, although this is traditionally thought to be offset by rainfall into the lagoon, the period where the parallel treatment has the most impact is usually a period of less rainfall.

Treatment Alternative 2 – Parallel Lagoon Sustainability Summary

This alternative would leverage the existing infrastructure to reduce the overall discharge footprint and feed the mechanical plant at a more efficient rate with a lower influent wastewater strength, taking some of the peaks out of the summer flow.

Treatment Alternative 2 – Parallel Lagoon Cost Summary

The estimated costs for adding a parallel lagoon treatment process to the existing WWTF are included in the attached estimate.

Treatment Alternative 2 – Parallel Lagoon O&M Summary

The operation of the WWTF with a parallel lagoon has some positive aspects and some negative aspects. The positive points include the fact that a lagoon requires relatively low operational oversight compared to a mechanical plant. There is also the large storage volume that would allow for repairs or emergencies to be addressed within the mechanical part of the plant with no disruption to the customers. Finally, the parallel treatment through a lagoon will lower the incoming wastewater strength and provide a more consistent flow to the mechanical plant.

The negative aspects include the requirement for an operator with both mechanical plant and lagoon experience and certifications, which in northern Michigan will further limit an already small pool of operators. The lagoon will require a whole separate set of maintenance procedures, repair parts and equipment, and oversight tasks that add to the list of requirements already being done. Finally, the lagoon will require periodic maintenance for sludge removal, which will be an ongoing cost.

5.7 Treatment Alternative 3 – Independent WWTF:

Lack of Feasibility Determination

The final alternative considered for treatment and disposal of the additional wastewater flow is to construct an independent WWTF and keep the two service areas separated. This alternative was evaluated and rejected, not because of the inability to develop a new treatment and disposal site, but because there is such economy in utilizing the existing wastewater collection and conveyance system that we could never overcome that cost in the development of a new site. Primarily, because there is no land available near the proposed service area that could be utilized. Therefore, a whole new conveyance system would be required to a new off-site location.

6.0 Selection of Alternative

6.1 Alternatives Life Cycle Cost Analysis:

The alternatives have been analyzed as a complete project with the collection system alternatives as the differentiating factor. All three of the life cycle cost analyses include the expansion of the existing WWTF as the selected treatment system option, since this option was the lowest life cycle cost alternative for the treatment system. The USDA

present worth analysis spreadsheets for the analysis are included for reference as Attachment L.

6.2 Non-Monetary Factors Summary:

While all WWTF projects involve non-monetary factors, these usually have the most impact when proposing a new facility. In this case we have proposed an expansion to an existing facility, which mitigates some of these concerns. The caveat being that proposing a lagoon could draw some social and regulatory concerns that would not be associated with the selected alternate (expand existing treatment technology). The following tables provide a matrix for evaluating the non-monetary factors.

Table 2. Collection Alternatives - Non-Monetary Factors

Alternative Name	*Social*	*Environmental*	*Regulatory*	*Operational*	*Total*	*Best*
Collection Alt 1 – Gravity Services	10	7	8	5	30	✓
Collection Alt 2 – Gravity & FM Hybrid	8	8	6	7	29	
Collection Alt 3 – Low Pressure Sewer	2	9	5	9	25	

Table 3. Treatment Alternatives - Non-Monetary Factors

Alternative Name	*Social*	*Environmental*	*Regulatory*	*Operational*	*Total*	*Best*
Treatment Alt 1 – Expansion of Existing	10	8	10	8	36	✓
Treatment Alt 2 – Add Parallel Treatment	3	6	3	6	18	

The non-monetary factors play a key role in the Township's alternative selection. Primarily, this is the social aspect of how the community would react to the requirement to have individual grinder pumps for connection to the Township sewer. The Township has received much public input and believes that this aspect of the alternative selection is very important.

6.3 Alternative Selection:

The selection of alternatives for the collection system and the treatment system has been made based on the best NPV for the Township. Although there was a desire within the community to provide all properties with a gravity sewer service lead at their property line, this proves to be a more costly alternative, despite the non-monetary factors which slightly favor the gravity service alternative. Therefore, the selected alternatives for the project

will be a gravity sewer and low pressure force main hybrid for the collection system and an expansion of the existing WWTF using the same treatment technology for the treatment alternative. The evaluation matrix is summarized in the table below.

Table 4. Alternative Selection Summary

Alternative Selected	*Alternative Name*	*NPV*	*Best NPV*	*Non-Monetary Value*	*Best Non-Monetary*
	Collection Alt 1 – Gravity Services	$ 4,106,675		30	✓
✓	Collection Alt 2 – Gravity & FM Hybrid	$ 3,753,515	✓	29	
	Collection Alt 3 – Low Pressure Sewer	$ 4,230,181		25	
✓	Treatment Alt 1 – Expansion of Existing	$ 4,514,985	✓	36	✓
	Treatment Alt 2 – Add Parallel Treatment	$ 5,338,436		18	

7.0 Proposed Project

7.1 Preliminary Design Summary:

Tuscarora Township directed the engineering evaluation to include all possible options for providing sewer service to the proposed expansion area. To that end, many alternatives were evaluated and eliminated. The selected alternative includes an expansion of the WWTF with the same modular technology currently used to accommodate the additional flow and an expansion of the rapid infiltration beds for discharge of the treated effluent to groundwater. Since the Township has already invested in these treatment and disposal methods, there is no economical alternative that could be found other than expanding the existing technology to accommodate the additional demand. On the collection system side, the recommended alternative is a hybrid of primarily gravity sewer system with low pressure sewer at the lower lying shoreline areas, where terrain and groundwater table conditions make gravity sewer cost prohibitive. Within the LPS, the residents will be provided with Township owned and maintained individual pumping stations.

7.2 Collection System:

In the Phase I residential area west of the existing commercial sewer district and bound between the Indian River and Mack Ave, typical gravity sewer collection infrastructure is

proposed. Since the terrain along the Indian River shoreline and Columbus Beach area is relatively flat, low-lying ground, construction of gravity collection system infrastructure became too costly in these areas. Therefore, this alternative includes some force main piping and individual pumping stations that will be owned by the Township to serve these residents.

The gravity sewer construction will include approximately 7,350 feet of new 8-inch PVC gravity sewer, 22 manholes, 4 lift stations, and 6-inch PVC gravity service leads, serving 117 properties. There will also be an area of low pressure sewer with 10,300 feet of new HDPE force main, 11 cleanout/air relief structures, valves, and 68 individual grinder pump stations with 1.5” pressure service leads. There will also be 17 services provided to vacant lots, six of these are within the LPS sewer area and 11 are within the gravity service area.

7.3 Treatment Summary:

The current plant has a 96,000 gpd AeroMod extended aeration system (patented SEQUOX technology) that will be duplicated to expand the plant capacity. The treatment plant is a prepackaged modular system, which was originally designed to be expandable. The current project will another 226 EDUs, or approximately 38,000 gpd in Phase I. Since the existing WWTP is already experiencing peak flows at 80% of plant capacity, an additional 48,000 gpd modular system is the minimum upgrade that would be adequate. The new design peak flow would be around 115,000 gpd and the plant capacity would be 144,000, leaving some room (approximately 20%) for increased use of the system. There will also be some modification to the headworks and the building associated with the expansion project to improve the trash and grit removal efficiency at the higher flows associated with the expansion.

7.4 Effluent Discharge:

The final effluent discharge is to groundwater through rapid infiltration basins. These structures consist of five earthen basins totaling approximately 39,000 square feet and are 2-feet deep for infiltration of the treated effluent. The proposed project will add 19,500 square feet of additional rapid infiltration basin capacity to accommodate the additional flow.

7.5 Project Schedule:

A project implementation schedule is included as Attachment M. This schedule assumes an 89 week project duration, where the first 40 weeks are pre-construction activities, such

as survey, design & permitting and the construction would occur over the remaining 49 weeks.

7.6 Land Rights:

Tuscarora Township already owns two parcels totaling 69.82 acres for the WWTF and disposal area. There would be no new property acquisition with the proposed project, only and expanded use within currently owned property. All of the collection system facilities will be installed within the public road right-of-way.

7.7 Permitting:

The proposed sewer collection system, WWTF expansion, and additional rapid infiltration basins will require a Part 41 Permit for Construction through the State of Michigan Department of Environment, Great Lakes, and Energy (EGLE). The additional demand will also require a modification to the existing Part 22 Groundwater Discharge Permit, also reviewed and issued through EGLE to increase the annual and daily discharge volumes.

Additional permits that will be required are a Soil Erosion permit through the County, a permit from EGLE for the river crossings, a permit from the County Road Commission for work within their right-of-way, a permit from MDOT for work within their right-of-way, and potentially a building permit from the County.

7.8 Sustainability Considerations:

The sustainability of the proposed project has been primarily implemented in the original construction project (existing sewer district). This is where decisions were made regarding the wastewater treatment technology, the siting of the WWTF and groundwater discharge, the evaluation of the receiving environment, etc. At this point, the proposed project is carrying forward the sustainability decisions previously made in regard to the wastewater treatment and disposal.

Where we are improving the sustainability of wastewater treatment is within the proposed service area. This area is currently served by onsite septic systems, a situation that is clearly not sustainable. Looking at development pressure and wastewater loading trends over the past 40 years indicates that this area is not suitable for individual onsite septic systems. Documentation of this is provided under the Need for Project section.

7.9 Project Cost Summary:

The proposed project has been thoroughly broken down to develop a detailed construction cost estimate (see attached Gravity & FM Hybrid cost estimate). Based on this construction cost estimate, the scale and scope of the project was used to develop cost estimates for the engineering, legal services, and bond counsel. Finally, a 10% contingency was added to account for the fluctuations in pricing and unforeseen circumstances that can develop as construction plans are produced.

The following table summarizes the engineer's opinion of probable cost:

TOTAL PROJECT CONSTRUCTION	$4,962,000
ENGINEERING, SURVEY, & CONTRACT ADMIN (16%)	$ 786,238
LEGAL & BOND COUNSEL (1.5%)	$ 80,762
TOTAL PROJECT COSTS	$5,829,000
10% CONTINGENCY	$ 496,000
TOTAL PROJECT COST ESTIMATE	$6,325,000

7.10 Income Summary:

The sewer system is currently supported by a user charge system that includes two categories; a quarterly O&M charge that covers all of the operating expenses and funds for RR&I and a Debt Retirement charge that covers repayment costs for the current USDA loan obligation. The rate structure for O&M expense had been slightly under-funded, with the difference made up through available reserve funds. However, the Township has implemented a rate increase to bring the O&M charges into alignment with costs.

The current user charges are $65.22/mo per EDU, broken down as follows:

O&M revenue = $32.64/mo
Debt Retirement = $32.58/mo

It should be noted that the most recent Operating Budget information was based on the income generated from the rates prior to the current increase. The current rates are anticipated to be self-supporting.

The proposed rate structure will continue the same two user charge categories; an O&M charge that covers all of the operating expenses and funds for RR&I, and a Debt Retirement charge that covers the repayment costs for the loan obligations.

The resulting user charges for the Phase I Sewer Customers are $123/mo per EDU, broken down as follows:

O&M revenue = $35/mo
Debt Retirement = $88/mo

An operating budget for the first year of operation is included as Attachment N. As seen within the budget, the O&M cost structure remains stable with the proposed project, it is the debt retirement that will be a large cost differential for the Phase I Sewer Customers.

7.11 Operation & Maintenance Cost Summary:

The proposed O&M budget has been developed through a review and analysis of the existing Township Sewer Fund budget reports. Since the current proposal will utilize the same treatment plant processes, disposal methodology, and collection system infrastructure type, we have extrapolated the cost implications of the expansion with a firm basis centered on the actual costs for running the existing system. This O&M budget is included in the overall operating budget, included as Attachment N to this report.

7.12 Existing Loan Commitment:

Tuscarora Township already has an existing UDSA loan that was acquired to develop the original WWTF, disposal site, and the existing sewer district collection system infrastructure. The original USDA funded project was a combination of grant and loan, where $3.0M came in grant funding and the Township took on a $4.5M loan. The Township is in the early stages of repayment, approximately 5-years into the 40-year loan. The Township has met all of its financial obligations associated with the funding.

7.13 Short Lived Asset Reserves:

The proposed project will add some short lived assets to the Township's infrastructure, which already has many of these asset categories already installed. This information is used to calculate a recommendation for the RR&I annual budget set-aside. See attached Short Lived Asset Summary, Attachment O.

8.0 Conclusions & Recommendations

Tuscarora Township has identified the need for municipal sewer in this area since the mid 1970's when the first effort was made to construct a sewer collection, treatment, and disposal system. This is primarily due to obvious limitations in appropriately placing onsite septic systems in this area due to a combination of small lot size and poor soil/groundwater conditions. In 2014 the Township made a huge step towards this goal with the first WWTF constructed near the industrial park and a collection system installed for the commercial properties with District 1. The success of this original project has led to widespread community interest and support for expanding the municipal sewer into the surrounding residential area, beginning with the proposed Tuscarora Township - Phase I Sewer Expansion. The key to this project is building off of the infrastructure installed with the original project, leveraging this to reduce the expansion costs.

Many collection system alternatives were evaluated, including the Township's desire to provide every homeowner with a gravity sewer service lead. However, the most cost effective solution to providing municipal sewer to the Phase I service area is a combination of gravity sewer and low pressure sewer with individual grinder pumps. On the treatment side, expansion utilizing the existing technology was the obvious alternative. The proposed collection and treatment system expansion for the Phase I service area is estimated to cost $6,325,000 to complete and will take over a 18 months to complete. However, the resultant benefit to both the residents in the Phase I service area and all the public recreational users of Burt Lake and the surrounding waterways will be significant as we abandon the poorly situated and struggling onsite septic systems in this watershed.

ATTACHMENT A

OVERALL PLAN

PROJECT SUMMARY

The purpose of this map is to depict the existing Tuscarora Township Sewer System infrastructure and potential expansion of the municipal sewer into the surrounding areas. There are four service areas that have been identified through the planning stage.

1. Phase I - The residential area west of the existing sewer, northerly half.
2. Phase II - The residential area west of the existing sewer, southerly half.
3. Future - Nabanois neighborhood.
4. Future - Marineland neighborhood.

Of these areas, Phase I and Phase II are proposed to move forward for preliminary engineering to determine the potential for feasibility of expansion.

LEGEND

- EXISTING SERVICE AREA BOUNDARY
- WEST RESIDENTIAL AREA BOUNDARY
- PHASE I & PHASE II BOUNDARY
- MARINELAND AREA BOUNDARY
- NABANOIS AREA BOUNDARY

PHASE I (227 EDUs)

PHASE II (185 EDUs)

DISTRICT 1 - EXISTING CUSTOMERS (500 EDUs)

FUTURE - MARINELAND NE (120 EDUs)

FUTURE - NABANOIS (40 EDUs)

WWTP

NORTH

0 250' 500'
GRAPHIC SCALE

K:\PROJECTS\5213\DRAWINGS\5213_BASE.DWG - OVERALL PLAN - PLOTTED 8/24/2021 11:01 AM BY AARON NORDMAN

AUTH	DATE	NO.	DESCRIPTION	AUTH	DATE	NO.	DESCRIPTION
PEI	04-02-2019	0	PRELIMINARY REVIEW				
PEI	07-06-2019	1	INFORMATIONAL MEETING				
AEN	10-30-19	2	PER SERVICE AREA				

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OWNER: TUSCARORA TOWNSHIP

SCALE: 0 250' 500' GRAPHIC SCALE

PROJECT: POTENTIAL SEWER DISTRICT EXPANSION
PRELIMINARY REVIEW

SHEET: OVERALL SERVICE AREA MAP

JOB NO. 19-5213

SHEET NO. 1 of 1

ATTACHMENT B

PROPERTY MAP PHASE I

LEGEND

DESCRIPTION	PROPOSED	*EXISTING*
BUILDING		
STORM SEWER	ST	ST
SANITARY SEWER	SAN	SAN
WATER	W	W
NATURAL GAS	G	G
UNDRGRND ELEC.	U/E	U/E
OVERHEAD ELEC.	E	E
UNDRGRND TEL.	U/T	U/T
WELL	W	W
MANHOLE	S W ST	S W ST
CATCH BASIN	CB CB	CB CB
FIRE HYDRANT		
UTILITY POLE		
LIGHT POLE		
CLEANOUT	CO	CO
WATER VALVE		
DECIDUOUS TREE		
CONIFEROUS TREE		
BUSH		
TREELINE		
DITCH OR SWALE		
ELEVATION	000.00	*000.00*
CONTOUR	000	*000*
PROPERTY LINE	℄	℄
UNIT LINE		
FENCE	X X	X X

ABBREVIATIONS

ASPH	- ASPHALT	IE	- INVERT ELEVATION
BF	- BARRIER FREE	LFT	- LINEAR FEET
BC	- BACK OF CURB	MH	- MANHOLE
BLDG	- BUILDING	PVC	- POLYVINYLCHLORIDE PIPE
B.M.	- BENCH MARK		
CFT	- CUBIC FEET	R	- RADIUS
C/C	- CENTER TO CENTER	RCP	- REINFORCED CONCRETE PIPE
CMP	- CORRUGATED METAL PIPE	RR	- RAILROAD
CONC	- CONCRETE	SAN	- SANITARY
DIP	- DUCTILE IRON PIPE	STL	- STEEL
FDN	- FOUNDATION	STM	- STORM
FFE	- FINISH FLOOR ELEVATION	T/C	- TOP OF CURB
		T/W	- TOP OF WALK
F.G.	- FINISH GRADE	T/WALL	- TOP OF WALL
HDPE	- HIGH DENSITY POLYETHYLENE	TE	- TOP/RIM ELEVATION
		TYP	- TYPICAL

PHASE I - PROPERTY IDENTIFICATIONS

1":200'

NORTH

PROPERTY IDENTIFICATION KEY	TOTAL	EDUs
VACANT LOT	17	17
RESIDENTIAL PROPERTY	174	177
NON-RESIDENTIAL PROPERTY	11	32
UNBUILDABLE LOTS	8	0
TOTAL BUILDABLE PARCELS	202	EDUs 226

Performance Engineers, Inc.
Civil / Structural Engineering
406 Petoskey Avenue Phone: (231) 547-2121
Charlevoix, Michigan 49720 Fax: (231) 547-0084
www.performanceeng.com

CONSULTANTS

TUSCARORA TOWNSHIP
DISTRICT 2 SERVICE AREA EXPANSION

OWNER
TUSCARORA TOWNSHIP
INDIAN RIVER, MICHIGAN

MARK	DATE	DESCRIPTION
0	5/03/2021	SETBACK RESTRICTIONS
1	6/28/21	PROPERTIES MAP
2	8/20/21	REVISED PER USDA INSPECTION

PROJECT NO:	19-5213
CAD DWG FILE:	5213_BASE
DRAWN BY:	PEI
DESIGNED BY:	BWM
CHECKED BY:	AEN

SEAL

SHEET TITLE

PHASE I
PROPERTIES MAP

PM-1

SHEET 1 OF 1

K:\PROJECTS\5213\DRAWINGS\5213_BASE.DWG - PROPERTY MAP PHASE I - PLOTTED 8/24/2021 10:02 AM BY AARON NORDMAN

ATTACHMENT C

EXISTING SERVICE AREA

& SEWER SUMMARY SHEET

Existing System Sewer Summary

Community Name: **Tuscarora Township**

NPDES Discharge Permit No. GW1810271

Collection Sewer: Gravity & FM

Type: (gravity, pressure, STED, vacuum)

Sewers	Footage	Material	Age	Condition	No. of Manholes	Age	Condition
8-inch	17700	PVC	7	good	72	7	good
FM	7400	HDPE	7	good	3	7	good

Lift Stations:

L.S. No.	Number	Pumping Capacity	Age	Condition
PS	2	300	7	good
Duplex	8	50	7	good

Treatment Type and Description: SEQUOX Package Plant

Units	Storage Volume	Sludge (ft)	No. of Aerators	Hp	Mechanical	Capacity	Age/Cond
Primary	NA				Anox. Tanks	12k gal	7 / good
Secondary	NA				Aeration Tanks	99k gal	7 / good
Tertiary	NA				Clarifier	40k gal	7 / good
					Digesters	61k gal	7 / good
					Storage/Decant	63k gal	7 / good

Discharge Type/Outfall: Rapid Infiltration Beds to Groundwater

Discharge Frequency: Continuous

Discharge Volume: 96k gpd

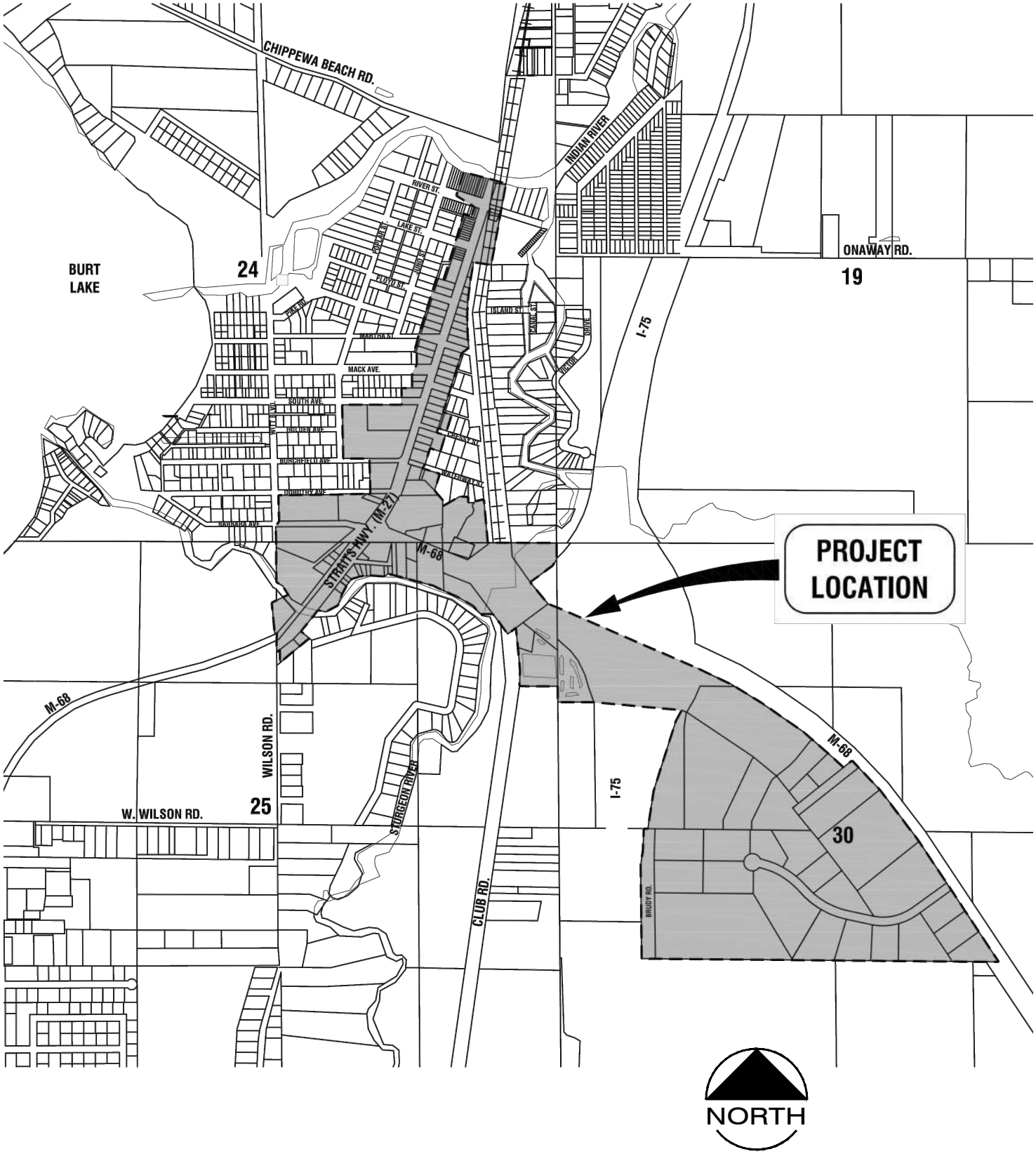
Discharge Effluent Criteria: 10.0 BOD/10.0 TSS/5.0 TIN/1.0 NH3/0.9 TP

Sewer Customer Information:

	No. of Existing Customers	Monthly Usage (gallons)	No. of Users after Project	Projected Total Usage
Residential Dwellings	45	216000	**219**	1051000
Other Users	100	1449000	**111**	1608000
Totals		1665000		2659000

Rate Structure:	Existing	Proposed	Average Monthly Billing at Current Rates (all customers)
Residential Customers:	33	35	
Commercial Customers:	82	84	
Bulk Customers:	2234	2234	**$82.20**

Yearly O & M Cost Before Improvements: **$156,000** Yearly O & M Cost After: **$175,100**



EXISTING FACILITIES SERVICE AREA

1":5000'

PER-1

2/27/20

ATTACHMENT D

2020 AUDIT, SEWER ONLY

TUSCARORA TOWNSHIP

Heart of the Inland Waterway

TOWNSHIP OF TUSCARORA, MICHIGAN

ANNUAL FINANCIAL REPORT

YEAR ENDED JUNE 30, 2020

GABRIDGE & CO

CERTIFIED PUBLIC ACCOUNTANTS

Township of Tuscarora
Statement of Net Position
Proprietary Funds
June 30, 2020

	Business-type Activities - Enterprise Funds
	Sewer
ASSETS	
Current Assets	
Cash and Cash Equivalents	$ 109,487
Accounts Receivable	41,608
Special Assessments	41,553
Total Current Assets	192,648
Noncurrent Assets	
Capital Assets not Being Depreciated	178,618
Capital Assets Being Depreciated, Net	5,488,476
Restricted Cash	352,407
Special Assessments	1,882,174
Total Assets	8,094,323
LIABILITIES	
Current Liabilities	
Accounts Payable	2,290
Accrued Interest	8,391
Current Portion of Long-term Debt	63,000
Total Current Liabilities	73,681
Noncurrent Liabilities	
Long-term Debt	1,855,000
Total Liabilities	1,928,681
NET POSITION	
Net Investment in Capital Assets	3,749,364
Restricted for:	
Repair, Replacement, Improvement	59,734
Additional Residential Equivalent Units	292,673
Unrestricted	2,063,871
Total Net Position	$ **6,165,642**

The Notes to the Financial Statements are an integral part of these financial statements.

Township of Tuscarora
Statement of Revenues, Expenses, and Changes in Net Position
Proprietary Funds
For the Year Ended June 30, 2020

	Business-type Activities - Enterprise Funds
	Sewer
Operating Revenues	
Charges for Services	$ 142,844
Total Operating Revenues	142,844
Operating Expenses	
Professional Fees	97,391
Utilities	31,418
Supplies	7,668
Repairs and Maintenance	18,126
Insurance	1,397
Depreciation	129,800
Total Operating Expenses	285,800
Operating Income (Loss)	(142,956)
Non-Operating Revenues (Expenses)	
Interest Income	72,362
Interest Expense	(54,043)
Net Non-Operating Revenues (Expenses)	18,319
Change In Net Position	**(124,637)**
Net Position at Beginning of Period	6,290,279
Net Position at End of Period	$ **6,165,642**

The Notes to the Financial Statements are an integral part of these financial statements.

Township of Tuscarora
Statement of Cash Flows
Proprietary Fund
For the Year Ended June 30, 2020

	Business-type Activities - Enterprise Fund
	Sewer
Cash Flows Used by Operating Activities	
Cash Received from Customers	$ 181,162
Cash Payments to Suppliers for Goods and Services	(171,747)
Net Cash Used by Operating Activities	9,415
Cash Flows from Non-capital and Related Financing Activities	
Interfund Balances	2,742
Net Cash Provided by Non-capital and Related Financing Activities	2,742
Cash Flows from Capital and Related Financing Activities	
Principal Paid	(178,000)
Interest Paid	(54,822)
Net Cash Used by Capital and Related Financing Activities	(232,822)
Cash Flows From Investing Activities	
Interest Income	72,362
Net Cash Provided by Investing Activities	72,362
Net Decrease in Cash and Equivalents	(148,303)
Cash and Equivalents - Beginning of Year	610,197
Cash and Equivalents - End of Year	$ 461,894
Reconciliation of Operating Loss to	
Net Cash Used by Operating Activities	
Operating Loss	$ (142,956)
Adjustments to Reconcile Operating Loss to Net Cash	
Used by Operating Activities	
Depreciation Expense	129,800
Changes in Assets and Liabilities	
Special Assessment Receivable	36,033
Accounts Receivable	2,285
Accounts Payable	(15,747)
Net Cash Used by Operating Activities	$ 9,415

The Notes to the Financial Statements are an integral part of these financial statements.

ATTACHMENT E

ONSITE SANITARY SUITABILITY EVALUATION

05.28.2021

District 2 Onsite Septic Suitability Review

To:
Michael Ridley
Tuscarora Township
Via email:
supervisor@tuscaroratwp.com

From:
Aaron Nordman
Performance Engineers
406 Petoskey Ave.
Charlevoix, MI 49720

Re:
District 2
Evaluation for Onsite Septic System Suitability

Project No.:
19-5213

Project Summary:

Performance Engineers, Inc. (PEI) has been working with Tuscarora Township on the feasibility of extending municipal sewer into the residential area west of their existing commercial sewer district. As part of this process, we have performed an evaluation of this area to assess the suitability of these properties for onsite septic systems. The basis for this determination is whether or not the properties can comply with the District Health Department No. 4 Sanitary Code regulations for onsite sewage treatment and disposal. A partial analysis (for the southerly service area) was provided to the Health Department for their review and comment on May 7, 2021. However, the Health Department declined to provide comment on that original submittal, citing the fact that evaluations are performed by the Health Department on a case-by-case basis, not neighborhood wide.

The basic issue is that we performed the original analysis on the southerly service area utilizing the dimensional setback requirements of the Code as the basis for evaluating compliance on a neighborhood-wide scale. As a follow up to that original submittal, we have since revised the phasing plan to set Phase I as the area north of Mack Avenue and Phase II would be the area south of Mack Avenue. We have also conducted a more thorough parcel by parcel dimensional analysis and included information on the soils present. This expanded analysis is presented here, along with our reference material.

Maps for Phase I and Phase II of the proposed sewer expansion are provided with this report for reference. The maps contain information related to the Sanitary Code setbacks, property dimensions, and the soils present in the area.

Background Information:

The proposed service area covers a total of approximately 200 acres and 420 properties. Of this area, approximately 30 acres are public road right-of-way and 12 acres are water, leaving 158 acres for the 420 properties. If the properties were all equal in size, it would leave just over 0.37 acres per lot (about 16,400 sf) per lot.

The USDA Soil Survey of Cheboygan County, Michigan maps approximately 77.7 acres of this area as unsuitable soils for onsite septic systems. This is based on the attached mapping of Grousehaven variant muck, Roscommon muck, and Udipsamments soils within the area. Although we recognize the fact that the USDA soil mapping is large in scale and cannot be applied to a specific site or localized area, we are also looking at this from a larger scale perspective to make generalized assumptions.

To:
Michael Ridley
Tuscarora Township
Via email:
supervisor@tuscaroratwp.com

From:
Aaron Nordman
Performance Engineers
406 Petoskey Ave.
Charlevoix, MI 49720

Re:
District 2
Evaluation for Onsite Septic System Suitability

Project No.:
19-5213

The local Sanitary Code (District Health Department 4, effective October 12, 2009) states as its purpose "*These regulations are hereby adopted for the purpose of protecting public health and the quality of the environment as it affects human health, and to prevent the occurrence of public health hazards, risks and nuisances*." Pursuant to that stated purpose, the Code contains design standards, special provisions, and requirements for the onsite discharge of sanitary sewage. The Code requirements for a compliant onsite septic system that PEI applied to this evaluation include the following:

- 100-ft surface water setback (Table 405)
- 50-ft well isolation (Table 405)
- 10-ft setback from property lines (Table 405)
- 10-ft setback from building foundation (Table 405)
- 50-ft setback from an intermittent wet area (Table 405)
- 24-in vertical isolation from bottom of aggregate to high groundwater (Table 409)
- Area shall be available for both the primary sewage disposal system & a replacement area (404.C)
- The replacement area shall be large enough for a sewage disposal system that complies with the Code (404.G)
- Structures, driveways, parking areas, etc. shall not be constructed over the drainfield area (404.D)
- The design sizing information in Section 410

Additional background information was collected during site visits to visually assess the surrounding environmental conditions. A key factor noticed is that there appears to be many artesian wells in the area, some of which were observed with a constant flow to the road ditch system (see attached photos). A subsequent review of well records from the area confirmed that this area is mainly drilled into an artesian aquifer with many flowing wells.

Basis for Determining Code Compliance:

The Code requires a 100-foot surface water setback, which renders about 114 (27%) of these properties non-compliant. The remaining 306 properties may be subject to additional setbacks related to the constant and/or intermittent flow of surrounding ditches (at least 51 additional properties are within 100 feet of a constantly flowing road ditch), but for our purposes, we will ignore this.

The Code requires a 10-foot setback from property lines, a 50-foot radius around a well, and 10-feet from a foundation. If we look at these minimum requirements and extrapolate this to a theoretically optimized lot, where the neighbor's well does not impact it, we estimate that any lot under about 10,000 sf would not reasonably be

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Via email:
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Re:
District 2
Evaluation for Onsite Septic System Suitability

Project No.:
19-5213

expected to meet the Code requirements for an onsite septic system. This assumption is based on the following dimensional information:

- Property line setback (150'x66' lot) requires 3,920 sf
- Well isolation (50' radius) requires 7,854 sf
- House footprint of 900 sf with 10-foot setback requires 2,500 sf
- Small driveway of 16' by 30' requires 480 sf
- Assume no garage, shed, or other accessory structures

So, the theoretical small house on a small lot described here requires 6,900 sf for just the driveway, house, and property setbacks. When you add the well envelope, the theoretical land required is 14,754 sf before you even begin to place an onsite septic system, which itself would require at least another 400 sf for a two-bedroom home in ideal conditions, plus an equally sized replacement system.

The reality is that any property under about 0.33 acres (14,000 sf) will have difficulty fitting everything on their site. However, in our conservative analysis, we identified 94 properties, outside of the surface water setback that are under 10,000 sf. This alone means that at least 208 properties (49.5%) cannot meet the Sanitary Code's dimensional requirements for proper setbacks and are thus non-conforming.

When you then apply the USDA soil survey information to the remaining properties, we find another 65 properties are located within area mapped as muck or made land. The Sanitary Code would prohibit the installation of a conforming onsite septic system on these soils (Section 410, deems these "unsuitable" without a variance). This would put the total number of non-conforming properties at 273 or 65% of the total 420 properties.

Summary of Findings:

Based on this analysis, it is obvious to us that the area is severely limited in regard to properties being able to install onsite septic systems that would adequately protect the surrounding environment and adjacent property owners from the potential impacts of an onsite septic system discharge, per the local Sanitary Code. There could be arguments made against our theoretical home and property dimensions, such as overlapping well envelopes or overlapping well and property line setbacks. However, this is why we have conservatively identified only the properties under 10,000 sf. and we did not take into account the Code requirement for a property to have not only room for the drainfield, but also an equivalent replacement area. Nor did we take into account the very likely scenario that many of these properties will have high groundwater conditions that require "mounded" drainfields that take up even more space. It is probably closer to

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Re:
District 2
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Project No.:
19-5213

75% of the properties in this area that would need some form of variance from strict application of the Code for a new or replacement onsite septic system.

PEI recognizes that the local Health Department can only make specific determinations on a case-by-case basis and that the Code gives them the ability to grant variances and approve alternative treatment systems. While these are more costly than a conventional system, it is our assumption that this is the most likely scenario for the majority of properties in the proposed District 2 service area. However, the setbacks, design criteria, and requirements cited here were promulgated for the protection of public health and the environment, as the stated purpose of the Code, and should not be discounted just because the Health Department has to have a means to deal with these existing situations.

PEI believes that we have clearly demonstrated that over 51% of the properties within the proposed service area have non-conforming septic systems based on application of Section 404 General Requirements of the Sanitary Code. This Section requires that "*All sewage shall be disposed in a sewage system meeting the requirements of this Code*". While we have done this dimensionally, utilizing aerial imagery, tax maps, well records, USDA Soil Maps, and AutoCAD software, we believe that an actual field investigation would only turn up additional issues.

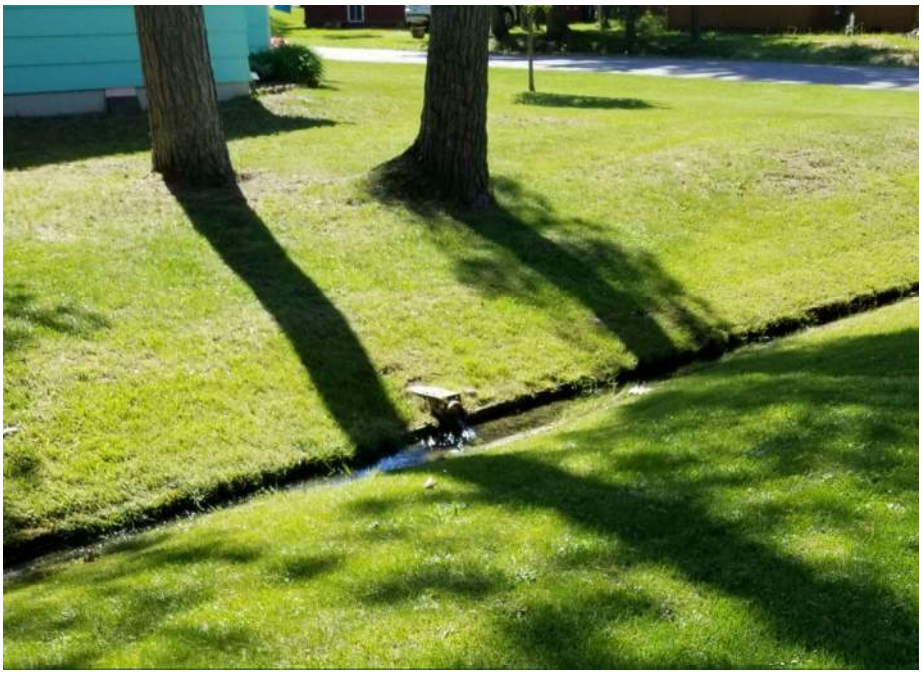
It is readily apparent why there has been such a demand for an expansion of the municipal sewer system into this residential area. Municipal sewer is the only viable way for the high density of properties within this area to reasonably be expected to discharge sanitary sewage without impact to the sensitive environment surrounding this location. We hope that you concur with our findings, but invite you to please provide any comment or additional information that you feel may not have been considered.

Sincerely,

Performance Engineers, Inc.

Aaron Nordman

Aaron Nordman, P.E.
Principal



One of several constant flows to road ditch system

Another example of constant ditch flow.

Upstream source of some ditch water all the way up at Poplar & Mack

Road ditch on Witt becomes substantial with successive upstream flows

Flow from Witt to Oak Glen that gets piped under mounds

Mounded drainfields directly over piped flow from ditch

Oak Glen Mounds over the piped flow from Witt Rd.

Another example of mounded drainfield with a direct discharge to road ditch under it.

Soil Map—Cheboygan County, Michigan
(Tuscarora Twp District 2 Soils Map)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cheboygan County, Michigan
Survey Area Data: Version 16, Jun 8, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Mar 31, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7	Grousehaven variant muck	8.9	4.1%
12B	Grayling sand, 0 to 8 percent slopes	11.2	5.2%
13B	Rubicon sand, 0 to 6 percent slopes	5.5	2.6%
13D	Rubicon sand, 6 to 18 percent slopes	14.5	6.7%
13F	Rubicon sand, 30 to 60 percent slopes	2.6	1.2%
27D	Cheboygan loamy sand, 12 to 30 percent slopes	5.1	2.4%
41A	Au Gres sand, 0 to 3 percent slopes	70.1	32.4%
56A	Riggsville loamy sand, 0 to 3 percent slopes	3.2	1.5%
61	Roscommon muck	50.4	23.3%
81	Udipsamments, nearly level to steep	18.4	8.5%
CswaaA	Croswell sand, 0 to 6 percent slopes	13.2	6.1%
W	Water	13.4	6.2%
Totals for Area of Interest		**216.5**	**100.0%**

TABLE 14.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "poor," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2--- Lupton	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
5--- Loxley	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus, too acid.
7--- Grousehaven Variant	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
8--- Tawas	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
9--- Greenwood	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
10--- Dawson	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
11B--- Kalkaska	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
11C--- Kalkaska	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
11D, 11F--- Kalkaska	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
12B--- Grayling	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
13B--- Rubicon	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
13C--- Rubicon	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

TABLE 14.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
49A Finch	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: seepage, wetness, too sandy.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, seepage, too sandy.
50A Bonduel	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: depth to rock, seepage, wetness.	Severe: wetness, seepage.	Poor: area reclaim, wetness, thin layer.
51A Otisco	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
52A Ogemaw	Severe: cemented pan, wetness, percs slowly.	Severe: seepage, cemented pan, wetness.	Severe: wetness, too clayey.	Severe: cemented pan, seepage, wetness.	Poor: cemented pan, too clayey, wetness.
55A Solona	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
56A Riggsville	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Severe: wetness.	Poor: wetness.
57A Brimley	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Poor: wetness.
58A Alstad	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
60A Rudyard	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
61 Roscommon	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
62 Wheatley	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, small stones.
63 Brevort	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding.
64 Burleigh	Severe: ponding, percs slowly, poor filter.	Severe: seepage, ponding.	Severe: ponding, too sandy.	Severe: seepage, ponding.	Poor: ponding.

LEGEND

DESCRIPTION	PROPOSED	*EXISTING*
BUILDING		
STORM SEWER	ST	ST
SANITARY SEWER	SAN	SAN
WATER	W	W
NATURAL GAS	G	G
UNDRGRND ELEC.	U/E	U/E
OVERHEAD ELEC.	E	E
UNDRGRND TEL.	U/T	U/T
WELL	W	W
MANHOLE	S W ST	S W ST
CATCH BASIN	CB	CB
FIRE HYDRANT		
UTILITY POLE		
LIGHT POLE		
CLEANOUT	CO	CO
WATER VALVE		
DECIDUOUS TREE		
CONIFEROUS TREE		
BUSH		
TREELINE		
DITCH OR SWALE		
ELEVATION	000.00	*000.00*
CONTOUR	000	*000*
PROPERTY LINE	℄	℄
UNIT LINE		
FENCE	X	X

ABBREVIATIONS

ASPH	- ASPHALT	IE	- INVERT ELEVATION
BF	- BARRIER FREE	LFT	- LINEAR FEET
BC	- BACK OF CURB	MH	- MANHOLE
BLDG	- BUILDING	PVC	- POLYVINYLCHLORIDE PIPE
B.M.	- BENCH MARK		
CFT	- CUBIC FEET	R	- RADIUS
C/C	- CENTER TO CENTER	RCP	- REINFORCED CONCRETE PIPE
CMP	- CORRUGATED METAL PIPE	RR	- RAILROAD
CONC	- CONCRETE	SAN	- SANITARY
DIP	- DUCTILE IRON PIPE	STL	- STEEL
FDN	- FOUNDATION	STM	- STORM
FFE	- FINISH FLOOR ELEVATION	T/C	- TOP OF CURB
		T/W	- TOP OF WALK
F.G.	- FINISH GRADE	T/WALL	- TOP OF WALL
HDPE	- HIGH DENSITY POLYETHYLENE	TE	- TOP/RIM ELEVATION
		TYP	- TYPICAL

SANITARY CODE REFERENCE, SECTION 405
(REQUIRED MINIMUM ISOLATION DISTANCES TO ABSORPTION BEDS AND TRENCHES)

- WELL - 50'
- BUILDING FOUNDATION - 10'
- SURFACE WATER - 100'
- PROPERTY LINE - 10'

PHASE I - ONSITE SANITARY LIMITATIONS
1":200'

NORTH

Performance Engineers, Inc.
Civil / Structural Engineering
406 Petoskey Avenue Phone: (231) 547-2121
Charlevoix, Michigan 49720 Fax: (231) 547-0084
www.performanceeng.com

CONSULTANTS

TUSCARORA TOWNSHIP
DISTRICT 2 SERVICE AREA EXPANSION

OWNER
TUSCARORA TOWNSHIP
INDIAN RIVER, MICHIGAN

MARK	DATE	DESCRIPTION
0	5/03/2021	SETBACK RESTRICTIONS

PROJECT NO:	19-5213
CAD DWG FILE:	5213_BASE
DRAWN BY:	PEI
DESIGNED BY:	BWM
CHECKED BY:	AEN

SEAL

SHEET TITLE

PHASE I
LIMITATIONS

C1

SHEET 1 OF 2

K:\PROJECTS\5213\DRAWINGS\5213_BASE.DWG - PHASE I - PLOTTED 5/29/2021 1:57 PM BY AARON NORDMAN

ATTACHMENT F

DOCUMENTATION OF HEALTH & SANITARY ISSUES,

HEALTH DEPARTMENT SUPPORT LETTERS, & CITIZEN COMMENTS

District Health Department No. 4

District Health Dept. #4
Providing
A Healthier Tomorrow
Since 1930

Alpena County
100 Woods Circle
Suite 200
Alpena, MI 49707
(989) 356-4507
Fax (989) 356-3529

Cheboygan County
Doris E. Reid Center
825 S. Huron St.
Suite 1
Cheboygan, MI 49721
(231) 627-8850
Fax (231) 627-9466

Montmorency County
P.O. Box 183
12519 State Street
Atlanta, MI 49709
(989) 785-4428
Fax (989) 785-2217

Presque Isle County
106 E. Huron
Suite A
Rogers City, MI 49779
(989) 734-4723
Fax (989) 734-3866

www.dhd4.org

Administrative Services
Alpena County
Office

Robert Kramer

Tuscarora Township Trustee

3546 S. Straits Hwy.

Indian River, MI. 49749

RE: Proposed Expansion

Indian River Municipal Sewer System

Tuscarora Township

Cheboygan County, MI.

Mr. Kramer,

This letter is in reference to the proposed expansion of the Indian River Municipal Sewer System. The proposed expansion location, delineated as Phase I and Phase II, encompasses the residential area west of the existing commercial sewer district. This area is a historic residential plat recorded prior to subdivision rules promulgation and thereby established without input or oversight by District Health Department #4 (DHD4) regarding onsite sewage disposal and water supply use. This residential area is unique in nature due to a high number of flowing wells, three sides bordered by surface water, extremely dense development on very small lots and a sometimes elevated seasonal high groundwater table, all which present very real issues when considering onsite sewage disposal. Were this area to be considered for new construction or development the majority (>50%) of these properties could not meet current code requirements and a much greater percentage could never meet the Subdivision Act Administrative Rules for onsite sewage disposal. An expansion of the Municipal System would remedy many of these specific site limitations in the residential area specified.

If you have any further questions or concerns don't hesitate to contact us.

Sincerely,

Kevin Prevost R.S.

Environmental Health Director

DHD4

CC: Denise Bryan, MPA

Kyle Keller R.S.

Aaron Nordman, PE

District Health Department No. 4

District Health Dept. #4
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Alpena County
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Fax (989) 785-2217

Presque Isle County
106 E. Huron
Suite A
Rogers City, MI 49779
(989) 734-4723
Fax (989) 734-3866

www.dhd4.org

Administrative Services
Alpena County
Office

March 31, 2020

Aaron Nordman, PE
Performance Engineers, Inc.
496 Petoskey Ave.
Charlevoix, MI. 49720

RE: Proposed Expansion
Indian River Municipal Sewer System
Tuscarora Township
Cheboygan County, Michigan

Dear Aaron,

I have reviewed your drawings of the proposed expansion to the municipal sewer system in Indian River, Michigan.

The expanded service area that encompasses the region due West of the Downtown corridor, between the Indian River to the North and the Sturgeon River to the South, is an area previously highlighted by District Health Department No. 4 (DHD4), as a problem area for onsite sewage disposal due to a high seasonal groundwater table and very small lots. These issues created lack of isolation for onsite sewage disposal systems from onsite water wells, property lines and surface water and in some cases, critically undersized sewage disposal systems.

The expanded sewer system in the area mentioned above would resolve some of these public health concerns and issues, help improve surface water quality and improve environmental conditions in the residential area.

DHD4 strongly supports the municipal sewer expansion in the area outlined above. If you have any questions please feel free to contact me in the Alpena office or Kyle Keller in the Cheboygan office.

Sincerely,

Kevin Prevost, R.S.
Environmental Health Director

Kyle Keller, R.S.
Environmental Sanitarian

Tuscarora Township
Indian River, MI
Sewer Project Target Area Photos
Sample Photos of Port-a-Johns in use

Tuscarora Township
Indian River, MI
Sewer Project Target Area
Citizen's Comments
(Last names redacted due to privacy concerns)

"Our drain field is over 37 years old. It is running slow and near failure, causing us to pump the septic tank every six months rather than 3-5 years. Because by code standard I don't have enough land to house a new drain field, I can not meet code. I will have to get a variance and go to additional expense of building a raised drain field. I could have spent this on a sewer system if we had one" – Nancy [redacted]

"Our Septic tank is over 60 years old. We have to now have it pumped annually. The person that services it says that it is barely hanging in there. He's projecting one more year, if we're lucky. So not only are we staring at the extra expense, but we also are limited to where we would place a new tank. Needless to say, our current property would lose a lot of utility with a raised drain field by our lakefront lot. We really need sewers ASAP." – Brian [redacted]

"I've lived in my home on South Ave for 42 years - I assume my septic and drain field has been here since the home was built. I had my septic pumped in December due to standing stinky water. Here we are less than 6 months later with standing water after a very small load of wash. I am a single 70 year old woman. I would say my demand on the system is very gentle. My neighbors to the west already have a raised drain field. I'm afraid I'm heading in that direction as well." – Kris [redacted]

Sewage Seepage

Tuscarora Township
Indian River, MI
Sewer Project Target Area
Citizen's Comments
(Last names redacted due to privacy concerns)

"Our raised septic field was first built in the 60's. It was serviced and rebuilt in 1991 because it was non-functioning (full of roots and leaking). It is 30 years old and failing. Sometimes there is effluent (leakage) around the mound. My understanding is that the cost to replace would be very expensive." – Mary [redacted]

"We live in a house on Burt Lake. Our septic system is 55 years old. The tank and drain field are about 30-40 feet from Burt Lake. The septic system was placed there when our house was built 55 years ago. We recently had a new well drilled and the health department told us that if the septic system failed we would need to have a new one installed on the far side of the house, away from the lake. It would be just about 50 feet from the well and would be about 30-40 feet from a canal that connects to the lake. It would not meet code, but that would be the best we could do given our lot size and placement." – Ted [redacted]

"…when I bought my house on the Sturgeon River the previous owner had her washer hoses draining in the back yard and her sink drained into a old tank that just went into the ground. Now I have a very small drain field and septic with grinder motor. I am just saying that my house was probably not the only one like this." Jeff [redacted]

"I have a 50-gallon septic tank! I am at the bottom of a sloped street and 1 block from the river. My drain field gets saturated and simply cannot work any time we have a good rain. I do not have space for even a raised drain field, it would have to be within 2 feet from my house. I often rent a porta-potty or pay to drain my tank. Last summer it was drained four times at $240. each drain." - Rhoda [redacted]

"We're not certain how old out septic field is but we've been having it pumped annually the past few years because like so many village residents we don't have enough space on our lot to install a new one that would comply with the current regulations. Therefore, to replace our drain field we'd need a variance and even with that we would be challenged to locate sufficient land." Bill [redacted]

"I purchased this cottage 25 years ago but it was built in 1941 We have always been very careful with the septic system due it's age. I do very little laundry at the cottage and use the laundromat for times when I need to do multiple loads. I made due with this situation when it was a summer place but now I live here year round and realize I am on borrowed time . Because by today's code I don't have enough land to house a new drain field. I will have to get a variance and go to additional expense of building a raised drain field" – Vicki [redacted]

ATTACHMENT G

ALTERNATE 1 – GRAVITY SEWER ESTIMATE & MAP

ALTERNATE 1 - GRAVITY SEWER SERVICE

ENGINEERS EST 8/23/21

No.	Unit	Description	TOTAL	Unit Price	Amount
1	LS	MOBILIZATION, MAX. ____	1.0	$ 250,000.00	$ 250,000.00
2	LS	TRAFFIC CONTROL	1.0	$ 35,000.00	$ 35,000.00
3	LS	CONSTRUCTION STAKING SP	1.0	$ 25,000.00	$ 25,000.00
4	STA	MACHINE GRADING, MOD	10.9	$ 3,250.00	$ 35,425.00
5	FT	CULV, REM, LESS THAN 24 INCH	300.0	$ 5.00	$ 1,500.00
6	FT	CURB AND GUTTER, REM	500.0	$ 3.50	$ 1,750.00
7	SYD	HMA, SURFACE, REM	6,200.0	$ 4.00	$ 24,800.00
8	SYD	HMA, SURFACE, PULVERIZE	24,300.0	$ 2.25	$ 54,675.00
9	SYD	PAVT, REM	500.0	$ 12.50	$ 6,250.00
10	EA	SIGN, TYPE III, ERECT, SALV	30.0	$ 100.00	$ 3,000.00
11	SYD	AGGREGATE BASE, REPLACE ONSITE MATERIALS, 6 INCH	21,300.0	$ 2.50	$ 53,250.00
12	SYD	AGGREGATE BASE, 6 INCH	6,200.0	$ 13.25	$ 82,150.00
13	SYD	SHOULDER CL II, 4 INCH	1,500.0	$ 13.25	$ 19,875.00
14	CYD	SUBGRADE UNDERCUTTING, TYPE II	750.0	$ 22.00	$ 16,500.00
15	FT	CULV, CL B, 12 INCH	300.0	$ 25.00	$ 7,500.00
16	FT	DEWATERING SYSTEM, TRENCH, WELL POINTS	3,700.0	$ 22.00	$ 81,400.00
17	FT	DEWATERING SYSTEM, TRENCH, OTHER	8,720.0	$ 12.00	$ 104,640.00
18	FT	SEWER, HPDE (SDR-11), 1 1/2 INCH	-	$ 13.50	$ -
19	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 1 1/2 INCH	-	$ 37.00	$ -
20	FT	SEWER, HPDE (SDR-11), 2 INCH	800.0	$ 21.00	$ 16,800.00
21	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 2 INCH	1,450.0	$ 40.00	$ 58,000.00
22	FT	SEWER, HPDE (SDR-11), 3 INCH	800.0	$ 23.50	$ 18,800.00
23	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 3 INCH	3,550.0	$ 61.00	$ 216,550.00
24	FT	SEWER, HPDE (SDR-11), 4 INCH	800.0	$ 28.00	$ 22,400.00
25	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 4 INCH	2,000.0	$ 70.00	$ 140,000.00
26	FT	SEWER SERVICE, PVC (SDR-26), 6 INCH	12,120.0	$ 18.50	$ 224,220.00
27	FT	SEWER, PVC (SDR-26), 8 INCH	10,250.0	$ 58.00	$ 594,500.00
28	EA	SEWER CLEANOUT, 6 INCH	6.0	$ 235.00	$ 1,410.00
29	EA	SAN STRUCTURE, 48 INCH DIA.	30.0	$ 4,800.00	$ 144,000.00
30	EA	SAN STRUCTURE, 60 INCH DIA., AIR RELIEF	2.0	$ 13,500.00	$ 27,000.00
31	EA	SAN STRUCTURE, 60 INCH DIA., CLEANOUT	3.0	$ 11,200.00	$ 33,600.00
32	EA	SAN STRUCTURE, 24 INCH DIA., CLEANOUT	8.0	$ 2,950.00	$ 23,600.00
33	EA	GATE VALVE AND BOX, 2 INCH	3.0	$ 3,000.00	$ 9,000.00
34	EA	GATE VALVE AND BOX, 3 INCH	6.0	$ 4,100.00	$ 24,600.00
35	EA	GATE VALVE AND BOX, 4 INCH	4.0	$ 5,200.00	$ 20,800.00
36	EA	LIFT STATION - A	2.0	$ 175,000.00	$ 350,000.00
37	EA	LIFT STATION - B	3.0	$ 70,000.00	$ 210,000.00
38	EA	SAN TIE INTO EX. STRUCTURE, COMPLETE	3.0	$ 7,500.00	$ 22,500.00
39	EA	PUMP STATION, DUPLEX, COMPLETE	12.0	$ 35,000.00	$ 420,000.00
40	EA	LIFT STATION, UPGRADES, COMPLETE	1.0	$ 180,000.00	$ 180,000.00
41	LS	TREATMENT PLANT	1.0	$ 850,000.00	$ 850,000.00
42	FT	CURB AND GUTTER, CONC, DET C4	200.0	$ 22.00	$ 4,400.00
43	SYD	DRIVEWAY, NONREINF CONC, 6 INCH	600.0	$ 52.00	$ 31,200.00
44	TON	HMA, 4E1, MOD, TOP	4,135.0	$ 120.00	$ 496,200.00
45	LS	SITE RESTORATION	1.0	$ 119,955.00	$ 119,955.00
46	EA	ABANDON SEPTIC TANK	185.0	$ 750.00	$ 138,750.00

TOTAL PROJECT	$	5,201,000.00
ENGINEERING, SURVEY, & CONTRACT ADMIN (16%)	$	832,000.00
LEGAL & BOND COUNSEL (1.5%)	$	78,000.00
TOTAL PROJECT COSTS	$	6,111,000.00
10% CONTINGENCY	$	520,000.00
TOTAL PROJECT COST ESTIMATE	**$**	**6,631,000.00**

PHASE I & PHASE II NORTH-SOUTH BOUNDARY

PHASE II - NORTH (226 EDUs)

PHASE II - SOUTH (185 EDUs)

INDIAN RIVER

COLUMBUS BEACH CLUB

The Greenside Grille at Indian River Golf Club

BURT LAKE

BURT LAKE STATE PARK

STURGEON RIVER

GRAPHIC SCALE 0 200' 400'

SERVICE AREA SUMMARY

THE SERVICE AREA IS COMPRISED OF THE PRIMARILY RESIDENTIAL PROPERTIES THAT ARE WEST OF THE EXISTING COMMERCIAL SEWER DISTRICT TO THE BURT LAKE SHORELINE. THE SERVICE AREA IS SUBDIVIDED INTO A PHASE I THAT INCLUDES THE PROPERTIES NORTH OF MACK AVENUE TO COLUMBUS BEACH CLUB AND A PHASE II THAT IS SOUTH OF MACK AVENUE TO THE STATE PARK. THIS AREA ENCOMPASSES APPROXIMATELY 200 ACRES AND 411 EDUs IN TOTAL. PHASE I IS 121 ACRES AND 226 EDUs AND PHASE II IS 75 ACRES AND 185 EDUs.

ADDITIONAL SERVICE AREA DETAILS INCLUDE THE FOLLOWING:

1) OF THE 411 REUs, 329 ARE PROPOSED TYPICAL GRAVITY SERVICE CONNECTIONS.
3) THE INCREASED SERVICE AREA WILL REQUIRE AN EXPANSION OF THE EXISTING WWTP, APPROXIMATELY DOUBLING THE CURRENT TREATMENT CAPACITY. THERE IS A 50% INCREASE IN PHASE I AND ANOTHER 50% IN PHASE II.
4) THE EXISTING LIFT STATIONS WILL BE UPGRADED TO ACCOMMODATE ADDITIONAL FLOW IN THE PHASE I PROJECT.

LEGEND

- (S) PROPOSED GRAVITY SEWER MANHOLE
- (CO) PROPOSED FORCE MAIN SEWER CLEANOUT
- (AR) PROPOSED FORCE MAIN SEWER AIR RELEASE
- (LS) PROPOSED LIFT STATION
- (DP) PROPOSED DUPLEX STATION
- (S) EXISTING GRAVITY SEWER MANHOLE
- (DP) EXISTING DUPLEX LIFT STATION

Performance Engineers, Inc.

Civil / Structural Engineering
406 Petoskey Avenue Phone: (231) 547-2121
Charlevoix, Michigan 49720 Fax: (231) 547-0084
www.performanceeng.com

CONSULTANTS

TUSCARORA TOWNSHIP
PHASE I SERVICE AREA EXPANSION
GRAVITY SERVICES MAP

OWNER
TUSCARORA TOWNSHIP
INDIAN RIVER, MICHIGAN

MARK	DATE	DESCRIPTION
0	04-02-2019	PRELIMINARY REVIEW
1	10-30-2019	PER SERVICE AREA
2	11-27-19	ELIMINATE INDIVIDUAL PUMPS
3	04-27-21	TWO PHASE PLAN

PROJECT NO:	19-5213
CAD DWG FILE:	5213_BASE
DRAWN BY:	PEI
DESIGNED BY:	BWM
CHECKED BY:	AEN

SEAL

SHEET TITLE

ALTERNATIVE 1
GRAVITY SERVICES

C1

SHEET 1 OF 1

K:\PROJECTS\5213\DRAWINGS\5213_BASE_AEN.DWG - SERVICE AREA - PLOTTED 8/24/2021 9:39 PM BY AARON NORDMAN

ATTACHMENT H

ALTERNATE 2 – HYBRID SEWER ESTIMATE & MAP

ALTERNATE 2- HYBRID GRAVITY - LPS

ENGINEERS EST 8/23/21

No.	Unit	Description	TOTAL	Unit Price	Amount
1	LS	MOBILIZATION, MAX. ____	1.0	$ 250,000.00	$ 250,000.00
2	LS	TRAFFIC CONTROL	1.0	$ 35,000.00	$ 35,000.00
3	LS	CONSTRUCTION STAKING SP	1.0	$ 25,000.00	$ 25,000.00
4	STA	MACHINE GRADING, MOD	6.8	$ 3,250.00	$ 22,100.00
5	FT	CULV, REM, LESS THAN 24 INCH	300.0	$ 5.00	$ 1,500.00
6	FT	CURB AND GUTTER, REM	200.0	$ 3.50	$ 700.00
7	SYD	HMA, SURFACE, REM	2,200.0	$ 4.00	$ 8,800.00
8	SYD	HMA, SURFACE, PULVERIZE	16,750.0	$ 2.25	$ 37,687.50
9	SYD	PAVT, REM	600.0	$ 12.50	$ 7,500.00
10	EA	SIGN, TYPE III, ERECT, SALV	30.0	$ 100.00	$ 3,000.00
11	SYD	AGGREGATE BASE, REPLACE ONSITE MATERIALS, 6 INCH	13,000.0	$ 2.50	$ 32,500.00
12	SYD	AGGREGATE BASE, 6 INCH	5,500.0	$ 13.25	$ 72,875.00
13	SYD	SHOULDER CL II, 4 INCH	500.0	$ 13.25	$ 6,625.00
14	CYD	SUBGRADE UNDERCUTTING, TYPE II	500.0	$ 22.00	$ 11,000.00
15	FT	CULV, CL B, 12 INCH	850.0	$ 25.00	$ 21,250.00
16	FT	DEWATERING SYSTEM, TRENCH, WELL POINTS	1,880.0	$ 22.00	$ 41,360.00
17	FT	DEWATERING SYSTEM, TRENCH, OTHER	4,600.0	$ 12.00	$ 55,200.00
18	FT	SEWER, HPDE (SDR-11), 1 1/2 INCH	2,400.0	$ 13.50	$ 32,400.00
19	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 1 1/2 INCH	5,000.0	$ 37.00	$ 185,000.00
20	FT	SEWER, HPDE (SDR-11), 2 INCH	-	$ 21.00	$ -
21	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 2 INCH	3,900.0	$ 40.00	$ 156,000.00
22	FT	SEWER, HPDE (SDR-11), 3 INCH	800.0	$ 23.50	$ 18,800.00
23	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 3 INCH	3,000.0	$ 61.00	$ 183,000.00
24	FT	SEWER, HPDE (SDR-11), 4 INCH	1,200.0	$ 28.00	$ 33,600.00
25	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 4 INCH	1,400.0	$ 70.00	$ 98,000.00
26	FT	SEWER SERVICE, PVC (SDR-26), 6 INCH	9,600.0	$ 18.50	$ 177,600.00
27	FT	SEWER, PVC (SDR-26), 8 INCH	7,350.0	$ 58.00	$ 426,300.00
28	EA	SEWER SERVICE, PRESSURE	74.0	$ 800.00	$ 59,200.00
29	EA	SAN STRUCTURE, 48 INCH DIA.	22.0	$ 4,800.00	$ 105,600.00
30	EA	SAN STRUCTURE, 60 INCH DIA., AIR RELIEF	2.0	$ 13,500.00	$ 27,000.00
31	EA	SAN STRUCTURE, 60 INCH DIA., CLEANOUT	2.0	$ 11,200.00	$ 22,400.00
32	EA	SAN STRUCTURE, 24 INCH DIA., CLEANOUT	7.0	$ 2,950.00	$ 20,650.00
33	EA	GATE VALVE AND BOX, 2 INCH	6.0	$ 3,000.00	$ 18,000.00
34	EA	GATE VALVE AND BOX, 3 INCH	3.0	$ 4,100.00	$ 12,300.00
35	EA	GATE VALVE AND BOX, 4 INCH	2.0	$ 5,200.00	$ 10,400.00
36	EA	LIFT STATION - A	1.0	$ 175,000.00	$ 175,000.00
37	EA	LIFT STATION - B	3.0	$ 70,000.00	$ 210,000.00
38	EA	SAN TIE INTO EX. STRUCTURE, COMPLETE	3.0	$ 7,500.00	$ 22,500.00
39	EA	PUMP STATION, INDIVIDUAL, COMPLETE	68.0	$ 10,000.00	$ 680,000.00
40	EA	LIFT STATION, UPGRADES, COMPLETE	1.0	$ 180,000.00	$ 180,000.00
41	LS	TREATMENT PLANT	1.0	$ 850,000.00	$ 850,000.00
42	FT	CURB AND GUTTER, CONC, DET C4	200.0	$ 22.00	$ 4,400.00
43	SYD	DRIVEWAY, NONREINF CONC, 6 INCH	600.0	$ 52.00	$ 31,200.00
44	TON	HMA, 4E1, MOD, TOP	3,015.0	$ 120.00	$ 361,800.00
45	LS	SITE RESTORATION	1.0	$ 90,002.50	$ 90,002.50
46	EA	ABANDON SEPTIC TANK	185.0	$ 750.00	$ 138,750.00

TOTAL PROJECT CONSTRUCTION	$	4,962,000.00
ENGINEERING, SURVEY, & CONTRACT ADMIN (16%)	$	786,238.00
LEGAL & BOND COUNSEL (1.5%)	$	80,762.00
TOTAL PROJECT COSTS	$	5,829,000.00
10% CONTINGENCY	$	496,000.00
TOTAL PROJECT COST ESTIMATE	**$**	**6,325,000.00**

LEGEND

DESCRIPTION	PROPOSED	*EXISTING*
BUILDING		
STORM SEWER	ST	ST
SANITARY SEWER	SAN	SAN
WATER	W	W
NATURAL GAS	G	G
UNDRGRND ELEC.	U/E	U/E
OVERHEAD ELEC.	E	E
UNDRGRND TEL.	U/T	U/T
WELL	W	W
MANHOLE	S W ST	S W ST
CATCH BASIN	CB	CB
FIRE HYDRANT		
UTILITY POLE		
LIGHT POLE		
CLEANOUT	CO	CO
WATER VALVE		
DECIDUOUS TREE		
CONIFEROUS TREE		
BUSH		
TREELINE		
DITCH OR SWALE		
ELEVATION	000.00	*000.00*
CONTOUR	000	*000*
PROPERTY LINE		
UNIT LINE		
FENCE	X	X

ABBREVIATIONS

ASPH	- ASPHALT	IE	- INVERT ELEVATION
BF	- BARRIER FREE	LFT	- LINEAR FEET
BC	- BACK OF CURB	MH	- MANHOLE
BLDG	- BUILDING	PVC	- POLYVINYLCHLORIDE PIPE
B.M.	- BENCH MARK		
CFT	- CUBIC FEET	R	- RADIUS
C/C	- CENTER TO CENTER	RCP	- REINFORCED CONCRETE PIPE
CMP	- CORRUGATED METAL PIPE	RR	- RAILROAD
CONC	- CONCRETE	SAN	- SANITARY
DIP	- DUCTILE IRON PIPE	STL	- STEEL
FDN	- FOUNDATION	STM	- STORM
FFE	- FINISH FLOOR ELEVATION	T/C	- TOP OF CURB
		T/W	- TOP OF WALK
F.G.	- FINISH GRADE	T/WALL	- TOP OF WALL
HDPE	- HIGH DENSITY POLYETHYLENE	TE	- TOP/RIM ELEVATION
		TYP	- TYPICAL

SERVICE AREA SUMMARY

THIS AREA ENCOMPASSES APPROXIMATELY 121 ACRES AND 226 EDUs ON 202 PROPERTIES. THIS PLAN REPRESENTS A HYBRID SERVICE AREA THAT HAS GRAVITY SEWER IS PROVIDED TO LOTS WHERE FEASIBLE AND LPS SERVICE IS PROVIDED TO THE LOWER LYING PROPERTIES, WHO WILL HAVE AN INDIVIDUAL GRINDER PUMP STATION.

ADDITIONAL SERVICE AREA DETAILS INCLUDE THE FOLLOWING:

1) THERE ARE 128 GRAVITY SERVICES PROPOSED, OF WHICH 11 WILL BE TO VACANT LOTS.
2) THERE ARE 74 LPS SERVICES PROPOSED, OF WHICH 6 WILL BE TO VACANT LOTS.
3) THE INCREASED SERVICE AREA WILL REQUIRE AN EXPANSION OF THE EXISTING WWTF, APPROXIMATELY A 50% INCREASE IN PHASE I.
4) THE EXISTING LIFT STATIONS WILL BE UPGRADED TO ACCOMMODATE ADDITIONAL FLOW IN THE PHASE I PROJECT.

PHASE I - SERVICE AREA

1":200'

NORTH

LEGEND

- (S) PROPOSED GRAVITY SEWER MANHOLE
- (CO) PROPOSED FORCE MAIN SEWER CLEANOUT
- (AR) PROPOSED FORCE MAIN SEWER AIR RELEASE
- (LS) PROPOSED LIFT STATION
- (DP) PROPOSED DUPLEX STATION
- (S) EXISTING GRAVITY SEWER MANHOLE
- (DP) EXISTING DUPLEX LIFT STATION

Performance Engineers, Inc.

Civil / Structural Engineering
406 Petoskey Avenue Phone: (231) 547-2121
Charlevoix, Michigan 49720 Fax: (231) 547-0084
www.performanceeng.com

CONSULTANTS

TUSCARORA TOWNSHIP
PHASE I SERVICE AREA EXPANSION
HYBRID SERVICES MAP

OWNER
TUSCARORA TOWNSHIP
INDIAN RIVER, MICHIGAN

MARK	DATE	DESCRIPTION
0	5/03/2021	SETBACK RESTRICTIONS
1	6/26/21	PROPERTIES MAP
2	8/20/21	REVISED PER USDA INSPECTION

PROJECT NO:	19-5213
CAD DWG FILE:	5213_BASE
DRAWN BY:	PEI
DESIGNED BY:	BWM
CHECKED BY:	AEN

SEAL

SHEET TITLE

ALTERNATIVE 2
HYBRID SERVICES

C1

SHEET 1 OF 1

K:\PROJECTS\5213\DRAWINGS\5213_BASE.DWG - PHASE I HYBRID MAP - PLOTTED 8/24/2021 9:40 PM BY AARON NORDMAN

ATTACHMENT I

ALTERNATE 3 – LPS ESTIMATE & MAP

ALTERNATIVE 3 - LOW PRESSURE SEWER

ENGINEERS EST 8/23/21

No.	Unit	Description	TOTAL	Unit Price	Amount
1	LS	MOBILIZATION, MAX. ____	1.0	$ 250,000.00	$ 250,000.00
2	LS	TRAFFIC CONTROL	1.0	$ 35,000.00	$ 35,000.00
3	LS	CONSTRUCTION STAKING SP	1.0	$ 25,000.00	$ 25,000.00
4	STA	MACHINE GRADING, MOD	4.2	$ 3,250.00	$ 13,650.00
5	FT	CULV, REM, LESS THAN 24 INCH	320.0	$ 5.00	$ 1,600.00
6	FT	CURB AND GUTTER, REM	200.0	$ 3.50	$ 700.00
7	SYD	HMA, SURFACE, REM	1,500.0	$ 4.00	$ 6,000.00
8	SYD	HMA, SURFACE, PULVERIZE	7,133.0	$ 2.25	$ 16,049.25
9	SYD	PAVT, REM	200.0	$ 12.50	$ 2,500.00
10	EA	SIGN, TYPE III, ERECT, SALV	25.0	$ 100.00	$ 2,500.00
11	SYD	AGGREGATE BASE, REPLACE ONSITE MATERIALS, 6 INCH	5,000.0	$ 2.50	$ 12,500.00
12	SYD	AGGREGATE BASE, 6 INCH	3,600.0	$ 13.25	$ 47,700.00
13	SYD	SHOULDER CL II, 4 INCH	200.0	$ 13.25	$ 2,650.00
14	CYD	SUBGRADE UNDERCUTTING, TYPE II	800.0	$ 22.00	$ 17,600.00
15	FT	CULV, CL B, 12 INCH	320.0	$ 25.00	$ 8,000.00
16	FT	DEWATERING SYSTEM, TRENCH, WELL POINTS	1,600.0	$ 22.00	$ 35,200.00
17	FT	DEWATERING SYSTEM, TRENCH, OTHER	2,500.0	$ 12.00	$ 30,000.00
18	FT	SEWER, HPDE (SDR-11), 1 1/2 INCH	2,000.0	$ 13.50	$ 27,000.00
19	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 1 1/2 INCH	16,500.0	$ 37.00	$ 610,500.00
20	FT	SEWER, HPDE (SDR-11), 2 INCH	1,600.0	$ 21.00	$ 33,600.00
21	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 2 INCH	4,400.0	$ 40.00	$ 176,000.00
22	FT	SEWER, HPDE (SDR-11), 3 INCH	1,500.0	$ 23.50	$ 35,250.00
23	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 3 INCH	5,800.0	$ 61.00	$ 353,800.00
24	FT	SEWER, HPDE (SDR-11), 4 INCH	600.0	$ 28.00	$ 16,800.00
25	FT	SEWER, DIRECTIONALY DRILLED, HPDE (SDR-11), 4 INCH	1,200.0	$ 70.00	$ 84,000.00
26	EA	SAN SERVICE, PRESSURE	185.0	$ 800.00	$ 148,000.00
27	EA	SAN STRUCTURE, 60 INCH DIA., AIR RELIEF	2.0	$ 13,500.00	$ 27,000.00
28	EA	SAN STRUCTURE, 60 INCH DIA., CLEANOUT	3.0	$ 11,200.00	$ 33,600.00
29	EA	SAN STRUCTURE, 24 INCH DIA., CLEANOUT	16.0	$ 2,950.00	$ 47,200.00
30	EA	GATE VALVE AND BOX, 2 INCH	2.0	$ 3,000.00	$ 6,000.00
31	EA	GATE VALVE AND BOX, 3 INCH	6.0	$ 4,100.00	$ 24,600.00
32	EA	GATE VALVE AND BOX, 4 INCH	12.0	$ 5,200.00	$ 62,400.00
33	EA	LIFT STATION - A	-	$ 175,000.00	$ -
34	EA	LIFT STATION - B	-	$ 70,000.00	$ -
35	EA	SAN TIE INTO EX. STRUCTURE, COMPLETE	1.0	$ 7,500.00	$ 7,500.00
36	EA	PUMP STATION, INDIVIDUAL, COMPLETE	185.0	$ 10,000.00	$ 1,850,000.00
37	EA	LIFT STATION, UPGRADES, COMPLETE	1.0	$ 180,000.00	$ 180,000.00
38	LS	TREATMENT PLANT	1.0	$ 850,000.00	$ 850,000.00
39	FT	CURB AND GUTTER, CONC, DET C4	200.0	$ 22.00	$ 4,400.00
40	SYD	DRIVEWAY, NONREINF CONC, 6 INCH	200.0	$ 52.00	$ 10,400.00
41	TON	HMA, 4E1, MOD, TOP	1,838.0	$ 120.00	$ 220,560.00
42	LS	SITE RESTORATION	1.0	$ 62,450.00	$ 62,450.00
43	EA	ABANDON SEPTIC TANK	185.0	$ 750.00	$ 138,750.00

TOTAL PROJECT	$ 5,516,459.25
ENGINEERING, SURVEY, & CONTRACT ADMIN (16%)	$ 882,633.48
LEGAL & BOND COUNSEL (1.5%)	$ 82,746.89
TOTAL PROJECT COSTS	$ 6,481,839.62
10% CONTINGENCY	$ 551,645.93
TOTAL PROJECT COST ESTIMATE	**$ 7,033,485.54**

SERVICE AREA SUMMARY

THE SERVICE AREA IS COMPRISED OF THE PRIMARILY RESIDENTIAL PROPERTIES THAT ARE WEST OF THE EXISTING COMMERCIAL SEWER DISTRICT TO THE BURT LAKE SHORELINE. THE SERVICE AREA IS SUBDIVIDED INTO A PHASE I THAT INCLUDES THE PROPERTIES NORTH OF MACK AVENUE TO COLUMBUS BEACH CLUB AND A PHASE II THAT IS SOUTH OF MACK AVENUE TO THE STATE PARK. THIS AREA ENCOMPASSES APPROXIMATELY 200 ACRES AND 411 EDUs IN TOTAL. PHASE I IS 121 ACRES AND 226 EDUs AND PHASE II IS 75 ACRES AND 185 EDUs.

ADDITIONAL SERVICE AREA DETAILS INCLUDE THE FOLLOWING:

1) ALL OF THE 411 EDUs ARE PROPOSED INDIVIDUAL GRINDER PUMP STATIONS.
2) THERE ARE NO NEW TOWNSHIP OWNED LIFT STATIONS.
3) THERE WILL BE OVER 28,000 FEET OF NEW FORCE MAIN WITH ANCILLARY EQUIPMENT.
3) THE INCREASED SERVICE AREA WILL REQUIRE AN EXPANSION OF THE EXISTING WWTF, APPROXIMATELY DOUBLING THE CURRENT TREATMENT CAPACITY (50% IN EACH PHASE).
4) THE EXISTING LIFT STATIONS WILL BE UPGRADED TO ACCOMMODATE ADDITIONAL FLOW.

LEGEND

- (S) PROPOSED GRAVITY SEWER MANHOLE
- (CO) PROPOSED FORCE MAIN SEWER CLEANOUT
- (AR) PROPOSED FORCE MAIN SEWER AIR RELEASE
- (LS) PROPOSED LIFT STATION
- (P) PROPOSED INDIVIDUAL PUMPING STATION
- (E) PROPOSED INDIVIDUAL EJECTOR PUMP
- (S) EXISTING GRAVITY SEWER MANHOLE
- (DP) EXISTING DUPLEX LIFT STATION

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CONSULTANTS

TUSCARORA TOWNSHIP
PHASE I SERVICE AREA EXPANSION

OWNER
TUSCARORA TOWNSHIP
INDIAN RIVER, MICHIGAN

MARK	DATE	DESCRIPTION
0	04-02-2019	PRELIMINARY REVIEW
1	10-30-2019	PER SERVICE AREA
2	02-27-2020	PER SUBMITTAL

PROJECT NO:	19-5213
CAD DWG FILE:	5213_BASE
DRAWN BY:	PEI
DESIGNED BY:	BWM
CHECKED BY:	AEN

SEAL

SHEET TITLE

ALTERNATE 3
LPS MAP

C1

SHEET 1 OF 1

K:\PROJECTS\5213\DRAWINGS\5213_BASE_LPS.DWG - SERVICE AREA - PLOTTED 8/24/2021 9:35 PM BY AARON NORDMAN

ATTACHMENT J

TREATMENT ALTERNATIVE 1 – EXPAND EXISTING

WWTF ESTIMATE & MAP

ENGINEER'S OPINION OF PROBABLE COST

Expand Existing WWTF

Item #	DESCRIPTION	UNITS	AMT	UNIT COST	TOTAL COST
	HEADWORKS				
1	4" Piping	LF	400.00	$32.00	$12,800.00
2	Valve Vault	EA	1.00	$7,500.00	$7,500.00
3	Equalization Tank	LS	1.00	$27,200.00	$27,200.00
4	Electrical Allowance	LS	1.00	$10,000.00	$10,000.00
5	Chemical Feed Upgrades	LS	1.00	$15,000.00	$15,000.00
6	Grit Removal/Screening Upgra	LS	1.00	$47,500.00	$47,500.00
9	Controls Integration	LS	1.00	$25,000.00	$25,000.00
				HEADWORKS SUBTOTAL	$145,000
	AEROMOD & DISCHARGE				
10	Misc. Clear & Grub	LS	1.00	$5,000.00	$5,000.00
11	Site Grading	LS	1.00	$8,500.00	$8,500.00
12	Misc. Restoration	LS	1.00	$12,500.00	$12,500.00
13	Monitoring Wells	EA	2.00	$2,500.00	$5,000.00
14	Rapid Infiltration Beds	SFT	19500.00	$4.00	$78,000.00
15	AeroMod Package	GAL	48000.00	$12.00	$576,000.00
16	Integration	LS	1.00	$20,000.00	$20,000.00
				AEROMOD & DISPOSAL SUBTOTAL	$705,000

CONST. TOTAL	$850,000

ENGINEERING, SURVEY, & CONTRACT ADMIN (16%)	$	136,000.00
LEGAL & BOND COUNSEL (1.5%)	$	12,750.00
TOTAL PROJECT COSTS	$	998,750.00
10% CONTINGENCY	$	80,250.00
TOTAL PROJECT COST ESTIMATE	**$**	**1,079,000.00**

Aero-Mod, Inc.

ACTIVATED SLUDGE DESIGN CALCULATIONS

Project: Tuscarora Twp, MI - Phase II
Engineer: Performance Engineering
Act. Sludge Process: SEQUOX BNR

Date: 5-Mar-19
Units: English

DESIGN CONDITIONS & PARAMETERS

	Influent	Clarifier Effluent
Flow (Q), MGD	**0.190**	
BOD_5, mg/l	**240**	**10.0**
BOD_5, lbs/day	380	15.8
BOD_L, mg/l	351	
TSS, mg/l	**280**	**10.0**
TSS, lbs/day	444	15.8
Ammonia-N, mg/l	**85.0**	**1.0**
Ammonia-N, lbs/day	134.7	1.6
TIN, mg/l		**5.0**
TIN, lbs/day		7.9
Phosphorus-P, mg/l	**15.0**	**0.9** *
Phosphorus-P, lbs/day	23.8	1.4
Net Alkalinity Loss, mg/l as $CaCO_3$		**(328)**

* Assumes Bio-P & Chemical Addition

Aeration Basin	
Retention Time, hours	**24.0**
Aeration Tank Volume, Mgal	0.190
MCRT, days	**18.0**
Wastewater Temperature, °C	8
Aerobic Digester	
Volume, % of Aeration Tank	64.0
Maximum Solids Conc., mg/l	15,000
Maximum Solids Conc., %	1.50%
Digester Temperature, °C	8
Sludge Holding Tank	
Volume, % of Aeration Tank	65.5
Maximum Solids Conc., mg/l	30,000
Maximum Solids Conc., %	3.00%

PROJECTED OPERATING CONDITIONS - AERATION BASIN

Mixed Liquor Suspended Solids, mg/l		**3,775**
Excess MLSS due to Phos-P Uptake/Removal, mg/l	214	
Mixed Liquor Volatile Suspended Solids, %		67%
F/M Ratio, lbs BOD_5/lb MLVSS		0.09
F/M Ratio, lbs BOD_5/lb MLSS		0.06
Organic Loading, lbs BOD_5/1000 cf of tank/day		15.0
Oxygen Requirements (Carbonaceous), mg/l/hr		8.37
Oxygen Requirements (Nitrogenous), mg/l/hr		16.10
Solids Production, lbs/day		332
WAS - Solids Wasted per Day, lbs/day		317
WAS - Solids Wasted per Day, gal/day @	0.38%	10,054

PROJECTED OPERATING CONDITIONS - AEROBIC DIGESTER

Volatile Solids Loading in Digester, lbs VSS/1,000 cf of tank/day	13
Volatile Solids Reduction in Digester, %	37%
Solids Wasted from Digester, lbs/day	237
Mass Solids Yield in Process & Digester per Mass Influent BOD_5, %	66%
Volume Wasted from Digester, gallons/day	1,891
Digester Sludge Age, days	**64**
Air Required for Stabilization, scfm	100
Air Required for Mixing @ 30 cfm/1000 cf	488

PROJECTED OPERATING CONDITIONS - SLUDGE HOLDING TANK

Thickened Sludge Age, days	**133**
Total Volative Solids Reduction in Digester & Sludge Holding Tank, %	40%
Solids Wasted from Sludge Holding Tank, lbs/day	233
Volume Wasted from Sludge Holding Tank, gallons/day	930

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project: Tuscarora Twp, MI - Phase II
Engineer: Performance Engineering
Diffuser Type Used: Tubular EPDM Fine Bubble

Date: 5-Mar-19
Units: English

	Design	Peak		Design	Peak
Q, MGD	0.190	0.190	TKN_o, mg/l	85.0	126.2
BOD_o, mg/l	240	379	$TKN_{assimilation}$, mg/l	12.8	12.8
BOD_{rem}, mg/l	240	379	TKN_{rem}, mg/l	85.0	126.2
BOD_{rem}, lb/day	380	600	TKN_{rem}, lb/day	134.7	200.0
O_2 Requirement, lb O_2/lb BOD_{rem}	1.500		O_2 Requirement, lb O_2/lb TKN_{rem}	4.60	

AERATION REQUIREMENTS - FIRST STAGE

	Design	Peak
Removal in First Stage	65%	72.5%
BOD_{oxy} - Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	15.4	27.2
TKN_{oxy} - Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	16.8	27.8
Actual Oxygenation Rate (AOR), lbs O_2/hr	**32.2**	**55.0**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**84.2**	**143.8**

SOR = [(AOR * $C_{s,20}$) / (α * $\Theta^{(T-20)}$ * (Tau * Ω * β * $C_{s,20}$ - C_L) * F)]

$C_{s,T,H}$	Actual Value of D.O. Saturation, mg/l	**9.08**	C_L	Residual D.O. Conc., mg/l	**2.0**
$C_{s,20}$	Steady State Value of D.O. Saturation, mg/l	9.08	T	Temperature of Water, °C	**20**
Tau	Oxygen Saturation Value ($C_{s,T,H}/C_{s,20}$)	1.000	F	Diffuser Fouling Factor	0.90
α	Alpha - Oxygen Transfer Correction Factor for Waste	0.60	Θ	Theta - Oxygen Transfer Coeff	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**620**
P_H	Atmospheric Pressure at Site Elevation, psi	14.37	Ω	Omega (P_H/P_s)	0.978

Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm — **309** | **527**

Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**13.0**
Transfer Efficiency per Foot of Submergence, %	**2.00%**		

Denitrification Credit = [Air Rqmt * (TKN_{oxy} / AOR) * 50% * ((TKN_o - TN_e) / TKN_o)], scfm — 76 | 128

TN_e = TKN_o / 2 (assumed when D.O. control is not used)

Total Aeration Required in Aeration Basin, scfm — **233** | **399**

Air Correction

icfm = scfm / [((T_{std} + 460) / (T_{air} + 460)) * ((P_H - (RH% * SVP_{Tair})) / (14.7 - ($RH\%_{std}$ * SVP_{std}))) * ((P_A / P_H)]

T_{std}, °F	68	T_{air}	Maximum Air Temperature, °F	**104**	
$RH\%_{std}$	36%	RH%	Maximum Relative Humidity, %	**90%**	
SVP_{std}, psi	0.34	SVP_{Tair}	Saturated Vapor Pressure of Air @ T_{air}, psi	1.058	
		P_A	Actual Atmospheric Pressure after Blower Inlet, psi	14.17	

Minimum Air Required for Mixing in First Stage Aeration Basin, cfm	119	Side Roll
Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm	135	Side Roll
Minimum Air Required for Operating Full Plant, cfm (mixing requirement for 24 hrs)	495	

	Design	Peak	Design	Peak
Aeration Pressure, in. H_2O			198	198
psi, std (does not include blower inlet/outlet)			**7.1**	**7.1**

		scfm	scfm	icfm	icfm
Aeration Basin - Fine Bubble		233	399	274	469
Aeration Basin - Coarse Bubble		221	269	261	317
Aerobic Digester Tank	(sequenced aeration)	244	244	244	244
Bio-P / Selector Tank		16	16	16	16
Clarifier RAS Airlift Pumps & Skimmers		62	62	62	62
	Total Air Required	776	990	857	1,108
	Total Air Available			**1,101**	**1,352**

POWER REQUIREMENTS

	Unit	Power	Power
Operating Power for Aeration Basin, HP	Blower	23.7	33.3
Operating Power for Digester, HP	Blower	10.8	10.4
Operating Power for Bio-P Fermentation Zone, HP	Blower	0.7	0.7
Operating Power for Clarifier, HP	Blower	2.8	2.6
Operating Power for Anaer. Selector Zone, HP	Mixer	0.7	0.7
Operating Power for Pneumatic System, HP	Air Compr.	0.4	0.4
Operating Power Required at Full Loading, HP		**39.1**	**48.1**

Minimum Power Required to Operate Full Plant , HP — **27.1**

Aero-Mod, Inc.

AERATION DESIGN CALCULATIONS

Project: Tuscarora Twp, MI - Phase II
Engineer: Performance Engineering
Diffuser Type Used: Stainless Steel Coarse Bubble

Date: 5-Mar-19
Units: English

AERATION REQUIREMENTS - SECOND & THIRD STAGE	**Design**	**Peak**
Removal in Second Stage	35%	27.5%
Oxygen Required for BOD [Q * BOD_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	8.3	10.3
Oxygen Required for TKN [Q * TKN_{rem} * 8.34 * O_2 Req. / 24], lbs O_2/hr	9.0	10.5
Actual Oxygenation Rate (AOR), lbs O_2/hr	**17.4**	**20.9**
Standard Oxygenation Rate (SOR), lbs O_2/hr	**32.7**	**39.3**

SOR = [(AOR * $C_{s,20}$) / (α * $\Theta^{(T-20)}$ * (Tau * Ω * β * $C_{s,20}$ - C_L) * F)]

Where:

$C_{s,T,H}$	Actual Value of D.O. Saturation, mg/l	9.08	**C_L**	Residual D.O. Conc, mg/l	**2.0**
$C_{s,20}$	Steady State Value of D.O. Saturation, mg/l	9.08	**T**	Temperature of Water, °C	20
Tau	Oxygen Saturation Value ($C_{s,T,H}/C_{s,20}$)	1.000	**F**	Diffuser Fouling Factor	1.00
α	Alpha - Oxygen Transfer Correction Factor for Waste	0.75	Θ	Theta - Oxygen Transfer Coeffi	1.024
β	Beta - Salinity-Surface Tension Correction Factor	0.95		Site Elevation, FASL	**620**
P_H	Atmospheric Pressure at Site Elevation, psi/FASL	14.37	Ω	Omega (P_H/P_s)	0.978

Air Requirement = [SOR / (Oxygen Density * TE% * Diffuser Depth) / 60], scfm — **271** | **326**

Where:

Oxygen Density, lbs O_2/cf	0.0175	Diffuser Depth Below Water Surface, ft	**13.5**
Transfer Efficiency per Foot of Submergence, %	**0.85%**		

Denitrification Credit = [Air Rqmt * (TKN_{oxy} / AOR) * 50% * ((TKN_o - TN_e) / TKN_o)], scfm — 50 | 57

Where: TN_e = TKN_o / 2 (assumed when D.O. control is not used)

Total Aeration Required in Aeration Basin, scfm — **221** | **269**

Air Correction

icfm = scfm / [((T_{std} + 460) / (T_{air} + 460)) * ((P_H - (RH% * SVP_{Tair})) / (14.7 - ($RH\%_{std}$ * SVP_{std}))) * ((P_A / P_H)]

Where:

T_{std}, °F	68	T_{air}	Maximum Air Temperature, °F	**104**	
$RH\%_{std}$	36%	RH%	Maximum Relative Humidity, %	**90%**	
SVP_{std}, psi	0.34	SVP_{Tair}	Saturated Vapor Pressure of Air @ T_{air}, psi	1.058	
		P_A	Actual Atmospheric Pressure after Blower Inlet, psi	14.17	

Minimum Air Required for Mixing in Second & Third Stage Aeration Basin, cfm — 135 | Side Roll

Aeration Pressure, in. H_2O — 189 | 189

psi, std (does not include blower inlet/outlet) — **6.8** | **6.8**

	Design scfm	**Peak** scfm	**Design** icfm	**Peak** icfm
Aeration Basin - Coarse Bubble	221	269	261	317

Aero-Mod, Inc.

CLARIFIER DESIGN CALCULATIONS

Project: Tuscarora Twp, MI - Phase II
Engineer: Performance Engineering
Clarifier Type Used: Split-ClarAtor

Date: 5-Mar-19
Units: English

FLOW CONDITIONS

Design Flow, MGD	0.190	
Peaking Factor, hourly	4.00	0.760 MGD
Duration, min	60	
Peaking Factor, sustained	2.00	0.380 MGD
Aeration Tank Volume, Mgal	0.190	
MLSS, mg/l	3,775	
Avg. RAS Recycle Rate, %	150%	

EQUIPMENT SIZING & SELECTION

Number of Clarifiers	**4**	Surface Area per Clarifier, sf	192
Clarifier Unit Model	**12192**	Total Surface Area, sf	**768**
Bridge Length, ft	12	Total Weir Length, ft	84
Clarifier Unit Width, ft	16	Tank Wall Depth, ft	16.0
Number of Units per Clarifier	1	Tank Water Depth, ft	14.0

SURFACE OVERFLOW RATE

	Design	
Design Flow, gpd/sf	**247**	
Peak Day Flow, gpd/sf	495	
Peak Hour Flow, gpd/sf	990	
Max. Flow Allowed Through Clarifier Orifice, gpd/sf	1,000	* Max allowed to leave clarifier

WEIR OVERFLOW RATE

Design Flow, gpd/lin. ft	**2,262**
Peak Flow, gpd/lin. ft	9,048

SOLIDS LOADING RATE

Design Flow, lbs/day/sf	**19.5**
Peak Flow, lbs/day/sf	42.8

RETENTION TIME - including RAS

Design Flow, hr	**4.1**
Peak Flow, hr	1.8

Aero-Mod, Inc.

TANKAGE DESIGN CALCULATIONS

Project: Tuscarora Twp, MI - Phase II ***Date:*** 5-Mar-19
Engineer: Performance Engineering ***Units:*** English
Tank Construction: Cast-in-Place Concrete

BIO-P / SELECTOR TANK

Fermentation	Volume Required, gal	**10,556**	
Number of Tanks	2	Tank Length, ft	7.42
Tank Wall Height, ft	16.0	Tank Width, ft	7.50
Tank Water Depth, ft	14.0	Total Volume, gallons	**11,650**
Freeboard, ft	2.0	Retention Time, min.	88
Anaerobic Selector	Volume Required, gal	**10,556**	
Number of Tanks	2	Tank Length, ft	7.42
Tank Wall Height, ft	16.0	Tank Width, ft	7.50
Tank Water Depth, ft	14.0	Total Volume, gallons	**11,650**
Freeboard, ft	2.0	Retention Time (Design + RAS), min.	35

AERATION TANK Volume Selected, gal **190,032**

Tank Wall Height, ft	16.0	Number of Trains	2
Tank Water Depth, ft	14.0	Number of Stages	2

Stage 1		*Stage 2*	
Number of Tanks	4	Number of Tanks	4
Tank Length, ft	13.00	Tank Length, ft	30.17
Tank Width, ft	16.33	Tank Width, ft	8.00
Area of Each Tank, sf	212	Area of Each Tank, sf	241
Total Volume, gallons	**88,942**	Total Volume, gallons	**101,090**

Total volume provided, gal **190,032**

CLARIFIER TANK

Number of Tanks	4	Tank Length, ft	12.0
Tank Wall Height, ft	16.0	Tank Width, ft	16.0
Tank Water Depth, ft	14.0	Total Volume, gallons	**80,425**

AEROBIC DIGESTER TANK Volume Selected, gal **121,692**

Number of Tanks	4	Tank Length, ft	25.5
Tank Wall Height, ft	16.0	Tank Width, ft	11.0
Tank Water Depth, ft	14.5	Total Volume, gallons	**121,692**

SLUDGE HOLDING TANK Volume Selected, gal **124,476**

Number of Tanks	2	Tank Length, ft	52.17
Tank Wall Height, ft	16.0	Tank Width, ft	14.5
Tank Water Depth, ft	14.5	Total Volume, gallons	**164,082**

OVERALL TANKAGE DIMENSIONS - New

Total Length, ft	60.33	Wall Thickness, in	14.0
Total Width, ft	53.33	Floor Thickness, in	18.0
Total Area, sf	3,218	Total Concrete for Walls, cy	**295**
Total Wall Length, LF	427	Total Concrete for Slab, cy	**192**
		Total Grout for Clarifier, cy	**18**

Aero-Mod, Inc.

EQUIPMENT AND SERVICES COST ESTIMATE

Project: Tuscarora Twp, MI - Phase II ***Date:*** 5-Mar-19
Engineer: Performance Engineering ***Units:*** English

EQUIPMENT SUPPLIED

AERATION EQUIPMENT

2	Aeration pd blower/sound enclosure package, 75 HP - 460 V, 3 ph	
4	SEQUOX aeration control butterfly valve, pneumatically-actuated	
4	SEQUOX aeration throttling butterfly valve, gear-operated	
2	Aeration throttling butterfly valve, gear-operated	
6	Wall mounted aeration assembly, Model WA-PF6-2	- First Stage Aeration Basins
6	Diffuser header for PF6 assembly	- First Stage Aeration Basins
10	Wall mounted aeration assembly, Model WA-HS2-2	- Second Stage Aeration Basins

BIO-P EQUIPMENT

1	Wall mounted aeration assembly, Model WAD-HSS2	
1	Wall mounted aeration assembly, Model WAD-HSS2A	
1	Bio-P Submersible Mixer - ___ HP - 230/460 V, 3 ph	- Anaerobic Selector Zone

CLARIFIER & RAS EQUIPMENT

2	Aero-Mod Split-ClarAtor Clarifier System - 192 sf/each	
2	Algae Control Transducer - 115V	

DIGESTION, SLUDGE HOLDING & WAS EQUIPMENT

2	WAS airlift pump, Model AL-400
2	Aeration control butterfly valve, pneumatically-actuated
2	Aeration control butterfly valve, gear-operated
6	Wall mounted aeration assembly, Model WAD-HS2-2
2	WAS airlift pump, Model AL-400L

ELECTRICAL & CONTROLS EQUIPMENT

1	SEQUOX Process Control Panel, Model SQC-200-RTU - 115 V
2	Blower control panel w/ Allen Bradley 6-pulse VFD - 460 V, 3 ph
1	D.O. Control System - probe analyzer w/ 2 rail-mounted DO probes
1	Bio-P Submersible Mixer control panel - 230/460 V, 3 ph

ANCILLARY EQUIPMENT

131	Wall mounted walkway & handrail, LF
2	Wall mounted stop plates & frames
LS	Spare Parts
LS	Interior tank installation materials - SS brackets, SS bolts, PVC wall inserts, pneumatic tubing, misc.

SERVICES

LS	Freight to jobsite
LS	Aero-Mod equipment dry inspection/equipment start-up & training, two (2) days
LS	Aero-Mod biological training, two (2) days
LS	Operator training school - 2 days at Aero-Mod facilities in Manhattan, KS

==========

TOTAL EQUIPMENT COST **$469,300**

EST'D INSTALLATION of Aero-Mod EQUIPMENT by Contractor $105,000

(Includes Interior Tank PVC Piping)

ESTIMATED CONCRETE TANK COST by Contractor $380,000

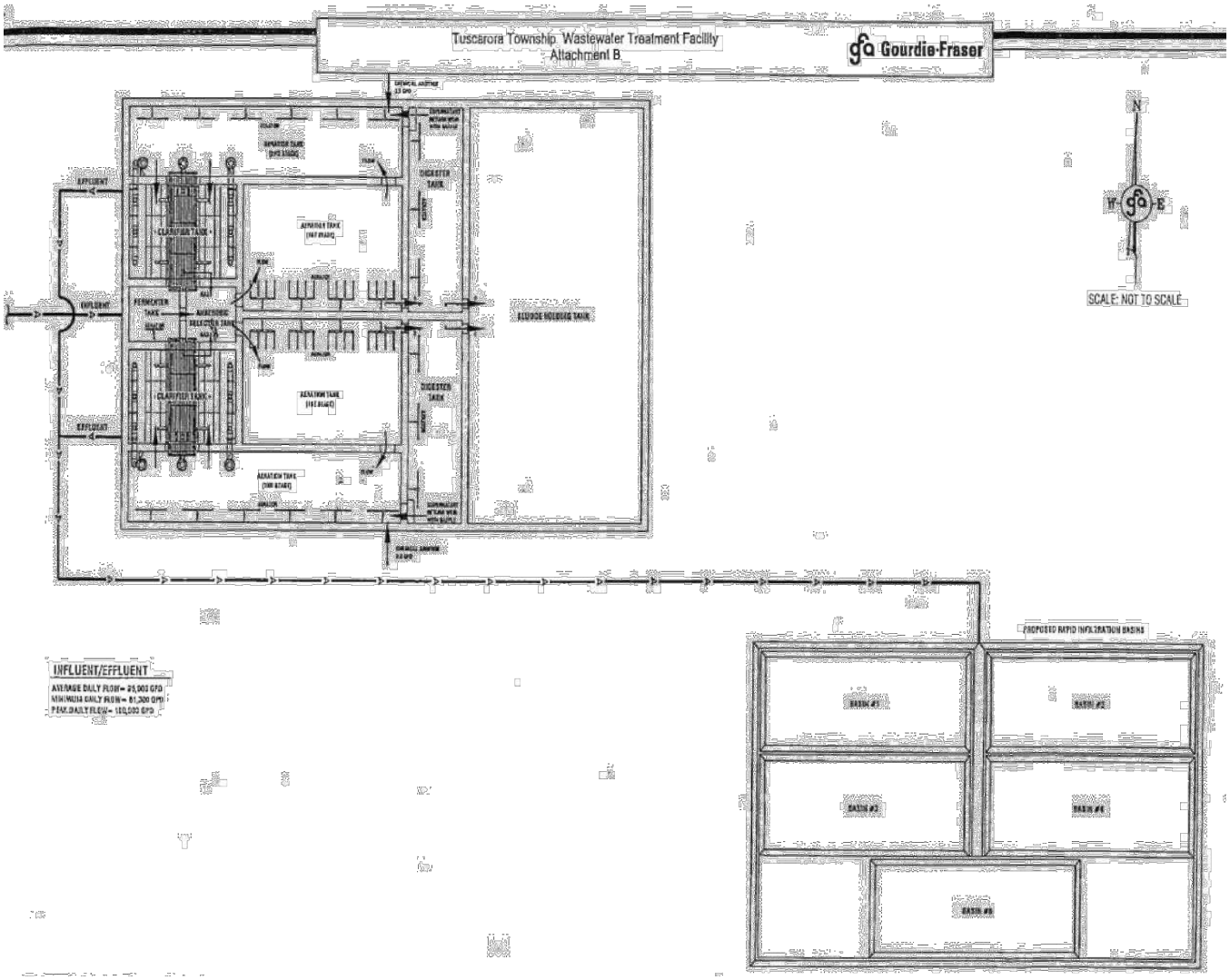
Concrete for Tank Walls, cy	295	
Installed Concrete Cost, $/cy	$800	
Concrete for Tank Slab, cy	192	
Installed Concrete Cost, $/cy	$700	
Grout for Clarifier Bottom, cy	18	
Installed Concrete Cost, $/cy	$550	

==========

ESTIMATED COST **$954,300**

PLEASE NOTE THE FOLLOWING

1. Buildings, site work, and auxiliary equipment are not included within this estimate.
2. No RAS pump station and associated electrical requirements are required.
3. Yard piping is not required between each Aero-Mod tank.
4. All associated walkways & handrail for the clarifier and tankage are included in the above estimate.
5. This estimate is valid for 90 days from the above date.

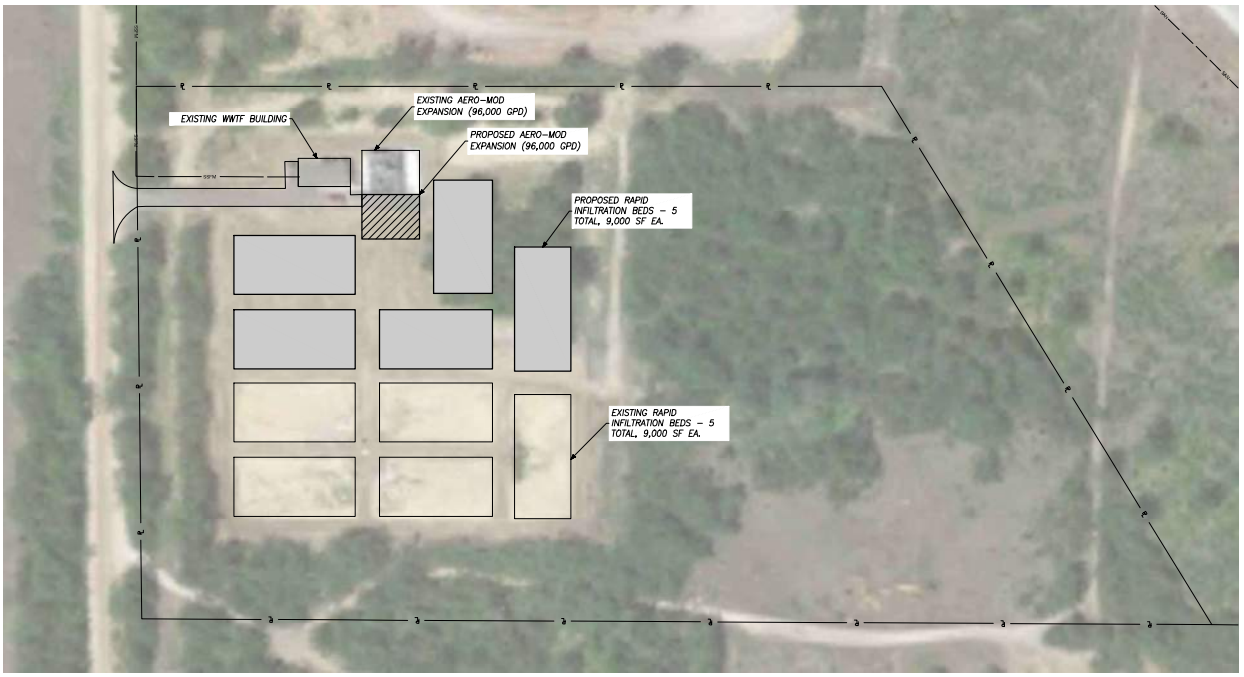


EXISTING FACILITIES WWTP PROCESS

NOT TO SCALE

PER-2

2/27/20



WWTF EXPANSION PLAN
1" = 30'

NORTH

Performance Engineers, Inc.
Civil / Structural Engineering
406 Petoskey Avenue
Phone: (231) 347-2121

CONSULTANTS

POTENTIAL SEWER DISTRICT EXPANSION
T.I.E.S. IMPORTA TOWNSHIP
DISTRICT 1

NUMBER	DATE	DESCRIPTION
1		

PROJECT NO: 14-273
CAD DWG FILE: 1427_Base2465
DRAWN BY: RD
DESIGNED BY: RD
CHECKED BY:

SEAL

SHEET TITLE
EXPANSION SCHEMA
SITE LAYOUT

PER-4

SHEET 1 OF 1

ATTACHMENT K

TREATMENT ALTERNATIVE 2 – PARALLEL TREATMENT

ESTIMATE & MAP

ENGINEER'S OPINION OF PROBABLE COST

PARALLEL TREATMENT - (2) 1.5 ACRE LAGOONS

Item #	DESCRIPTION	UNITS	AMT	UNIT COST	TOTAL COST
	HEADWORKS				
1	4" Piping	LF	400.00	$32.00	$12,800.00
2	Valve Vault	LS	1.00	$7,500.00	$7,500.00
3	Equalization Tank	LS	1.00	$27,200.00	$27,200.00
4	Electrical Allowance	LS	1.00	$10,000.00	$10,000.00
5	Chemical Feed Upgrades	LS	1.00	$15,000.00	$15,000.00
6	Grit Removal/Screening Upgra	LS	1.00	$47,500.00	$47,500.00
7	Controls	EA	1.00	$25,000.00	$25,000.00
				HEADWORKS SUBTOTAL	$145,000
	LAGOON				
8	Misc. Clear & Grub	LS	1.00	$7,500.00	$7,500.00
9	Site Grading & Access Drive	LS	1.00	$55,000.00	$55,000.00
10	Security Fencing	LF	2000.00	$15.00	$30,000.00
11	Misc. Restoration	LS	1.00	$12,500.00	$12,500.00
12	Monitoring Wells	EA	5.00	$2,500.00	$12,500.00
13	Unclassified Excavation	CYD	15000.00	$4.50	$67,500.00
14	Lagoon Construction	CYD	62500.00	$7.00	$437,500.00
15	Lagoon Liner	SFT	295000.00	$2.00	$590,000.00
16	Lagoon Piping per Cell	EA	2.00	$21,000.00	$42,000.00
17	Chemical Dosing	LS	1.00	$11,000.00	$11,000.00
18	Dosing Tank & Siphon	LS	1.00	$15,000.00	$15,000.00
19	Valve Vault	LS	3.00	$3,500.00	$10,500.00
20	Outfall Sturcture	EA	2.00	$7,500.00	$15,000.00
				LAGOON & DISPOSAL SUBTOTAL	$1,306,000

CONST. TOTAI	$1,318,500

:NGINEERING, SURVEY, & CONTRACT ADMIN (16%)	$	210,960.00
LEGAL & BOND COUNSEL (1.5%)	$	19,777.50
TOTAL PROJECT COSTS	$	1,549,237.50
10% CONTINGENCY	$	130,762.50
TOTAL PROJECT COST ESTIMATE	**$**	**1,680,000.00**

WWTF PARALLEL TREATMENT PLAN

1" : 50'

NORTH

Performance Engineers, Inc.

Civil / Structural Engineering

406 Petoskey Avenue
Charlevoix, Michigan 49720

Phone: (231) 547-2121
Fax: (231) 547-0084
www.performanceeng.com

CONSULTANTS

POTENTIAL SEWER DISTRICT EXPANSION

TUSCARORA TOWNSHIP
DISTRICT 1

OWNER
TUSCARORA TOWNSHIP
INDIAN RIVER, MICHIGAN

MARK	DATE	DESCRIPTION
.		

PROJECT NO:	19-5213
CAD DWG FILE:	5213_Base.DWG
DRAWN BY:	PEI
DESIGNED BY:	PEI
CHECKED BY:	

SEAL

SHEET TITLE

PARALLEL TREATMENT SCHEMATIC LAYOUT

PER-5

SHEET 1 OF 1

K:\PROJECTS\5213\DRAWINGS\5213_BASE.DWG - LAGOON ALTERNATE - PLOTTED 2/26/2020 2:26 PM BY AARON NORDMAN

ATTACHMENT L

PRESENT WORTH ANALYSIS

Present Worth Analysis & Short Lived Depreciation

(Total Alternatives Project Cost)

Community Name: Tuscarora Township - Phase I Sewer Expansion

Federal Discount Rate for Water Resources Planning (Interest Rate) i = -0.005

Number of Years, n = 20 years

Alternative 1 (Gravity):		**Alternative 2 (Hybrid):**		**Alternative 3 (LPS):**	
Initial Capital Costs =	$6,631,000	**Initial Capital Costs =**	$6,325,000	**Initial Capital Costs =**	$7,033,000
Annual Operations & Maintenance Costs =	$218,700	**Annual Operations & Maintenance Costs =**	$195,000	**Annual Operations & Maintenance Costs =**	$208,800
Future Salvage Value =	$1,000,000	**Future Salvage Value =**	$1,000,000	**Future Salvage Value =**	$1,000,000
Present Worth of 20 years of O & M =	$4,612,303	**Present Worth of 20 years of O & M =**	$4,112,479	**Present Worth of 20 years of O & M =**	$4,403,516
PW = Annual OM * $\frac{(1+i)^n-1}{i*(1+i)^n}$					
Present Worth of 20 yr Salvage Value =	$1,105,448	**Present Worth of 20 yr Salvage Value =**	$1,105,448	**Present Worth of 20 yr Salvage Value =**	$1,105,448
PW = FSV* $\frac{1}{(1+i)^n}$					
Alternate 1 Total Present Worth =	$10,137,855	**Alternative 2 Total Present Worth =**	$9,332,030	Alternative 3 **Total Present Worth =**	$10,331,067

Short Lived Depreciated Assets

(items listed, life expectancy, are just examples, use your own data)

Item	Years of Life Expectancy	Number of Units	Replacement Cost	Funds to Set Aside Yearly
Duplex Pumps	15	20	2000	$2,667
Individual Grinder Pumps	15	68	1600	$7,253
Lift Station Pumps	15	6	7500	$3,000
		Total RR&I Budget:		$12,920

Note:
This is not intended to include every piece of equipment in the system. It is to itemize the critical equipment or maintenance items that money should be set aside for via rates and charges.

No short lived assets with more than 15 years of life expectancy

ATTACHMENT M

PROJECT SCHEDULE

PROJECT IMPLEMENTATION SCHEDULE

Project: Phase I Sewer
Project No.: TBD
Owner: Tuscarora Twp
Preparation Date: 8/23/2021
Proposed Schedule: 3/1/22 to 11/15/23
Project Duration: 89 weeks

No.	Activity Description	Duration	PRE-CONSTRUCTION									CONSTRUCTION								POST-CONSTRUCTION			
			March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November
	Design & Permitting																						
1	Funding Approval	*	✧																				
2	Survey	30 days		◆—◆																			
3	Plan Development	75 days		◆—	—	—	◆																
4	Design Review with Owner	*					✧																
5	Final Design	25 days						◆—	◆														
6	Permitting	50 days					◆—	—	◆														
7	Prepare Bid Documents	15 days							◆—	◆													
8	Bid Documents Approval by Agency	*								✧													
9	Bid Solicitation	45 days								◆—	◆												
10	Contract Review and Approvals	5 days									◆◆												
11	Contract Award	*									✧												
	Construction																						
12	Pre-Construction Submittals	10 days										◆—◆											
13	Pre-Construction Meeting	*											✧										
14	Site Prep & Mobilization	15 days													◆—◆								
15	WWTF Upgrades	90 days											◆—	—	—	◆							
16	Gravity Sewer Residential Construction	150 days													◆—	—	—	—	—	◆			
18	Columbus Beach Area Construction	90 days														◆—	—	—	◆				
19	Substantial Completion	*																		✧			
20	Punch List & Restoration	60 days																		◆—	◆		
	Project Administration																						
21	Engineering Inspections - Periodic	190 days											◆—	—	—	—	—	—	—	◆			
22	Engineer Certification & As-Built Dwg	30 days																			◆—	◆	
23	Permit Closeouts	5 days																				◆◆	
24	Project Closeout	*																					✧

ATTACHMENT N

FIRST YEAR OPERATING BUDGET

Operating Budget
For First Full Year After Construction

(Alternate 2 - gravity & FM individual pumps)

Community Name: Tuscarora Township **County:** Cheboygan

Address:

3546 S. Straits Highway
Indian River, MI 49749

A. Applicant Fiscal Year: **From:** 10/1/2023 **To:** 10/1/2024

B. Operating Income:	**From**	**Sewer Rates & Charges:**	$230,676
		Other	$500
		Total Operating Income:	$231,176
C. Operating Expenses:			
		Utilities	$45,000
		Insurance/Audit	$2,000
		Contract Operations	$104,100
		Other - Lab or other Costs	$0
		Other - Vehicle Expenses	$0
		Administrative/Office	$0
		Repairs/Maintenance	$20,000
		Supplies	$4,000
		Engr. & Legal	$0
		Commodity Charges	$0
		Total Operating Expenses:	$175,100
D.		**Net Operating Income:**	$56,076
E. Non Operating Income:			
	Other:	Special Assessment - Existing	$119,000
	Other:	Special Assessment - Proposed	$221,200
	Other:	New Connections	$0
		Total Non Operating Income:	$340,200
F.		**Net Income**	$396,276
G. Expenditures/Transfers			
		Repair, Replacement & Improvement Fund	$12,920
		Bond Reserve	$0
		Existing USDA Loan Repayment	$113,350
		Proposed USDA Loan Repayment	$221,200
		Total Expenditures/Transfers:	$347,470
		Excess/Deficit over net income:	$48,806

ATTACHMENT O

SHORT LIVED ASSETS

Tuscarora Township – Phase I Sewer Expansion

Short Lived Depreciated Assets				(items listed, life expectancy, are just examples, use your own data)				
	Years of Life		**Number of**	**Replacement**	**Funds to Set**			
Item	**Expectancy**		**Units**	**Cost**	**Aside Yearly**		Note:	
Duplex Pumps	15		20	2000	$2,667		This is not intended to	
Individual Grinder Pumps	15		68	1600	$7,253		include every piece of	
Lift Station Pumps	15		6	7500	$3,000		equipment in the system.	
							It is to itemize the critical	
							equipment or maintenance	
							items that money should	
							be set aside for via	
							rates and charges.	
			Total RR&I Budget:		$12,920			
							No short lived assets with more than 15	
							years of life expectancy	