Town of Nashville

PRELIMINARY ENGINEERING REPORT

SANITARY SEWER REHABILITATION & WWTP IMPROVEMENTS

PREPARED FOR

Indiana Finance Authority – State Revolving Fund

ms consultants, inc.
engineers, architects, planners

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1.0 EXECUTIVE SUMMARY

The purpose of this report is to present scope of work proposed for the Town of Nashville Sanitary Sewer Rehabilitation and WWTP Improvements Project (the Project). The information contained in this report is considered to be the foundation for the preliminary design the Project. The primary objective of the Project is twofold. First, the Project is to mitigate future sanitary sewer overflows (SSO), in accordance with their current NPDES Permit, through removal of inflow & infiltration into the system. Second, the Project is to remove or elevate key components of the wastewater treatment system outside of the 100-year floodplain.

1.1 BASIS OF DESIGN

The Town of Nashville (the Town) is an older community with separate sanitary and storm sewer systems constructed before 1961. Prior to 1961, sanitary sewage was conveyed through the stormwater system and likely discharged to the North Fork of Salt Creek or Greasy Creek. When the separate sanitary sewer system was constructed, sanitary sewer connections were relocated and separated from storm systems. The construction of this sanitary system was through the use of vitrified clay pipe. As the collection system aged, sewers became prone to deterioration of pipe joints and micro cracks in the pipe, all leading to infiltration of groundwater. Combine a high ground water table with an aging collection system and the results can be a high volume of clear water, Inflow and Infiltration (I&I), entering the collection system.

The Town's Wastewater Treatment Plant (the WWTP) was also constructed in or around 1961, along with the collection system. This facility was expanded and improved upon up until 2010, with the last expansion. The latest expansion expanded capacity of the treatment facility as a whole; however, certain components of the plant were not expanded. Additionally, certain components of the facility were left in the floodplain where they have been adversely impacted by floods. Additionally, the Town is currently under and Agreed Order (see Appendix E) to relocate WWTP components outside or above the floodplain.

1.2 COLLECTION SYSTEM REHABILITATION

The selected plan includes the rehabilitation of the existing gravity sewer collection system. The existing system consists of gravity sewers, constructed of vitrified clay pipe, and precast concrete manholes. The gravity sewer portion of the system will be lined with a cured-in-place pipe liner. Additionally, the existing manholes will have their top castings raised above the floodplain and leaking joints sealed. Any manholes found to be in an advanced stage of deterioration will be lined with an epoxy liner system.

Finally, the collection system includes the replacement of the Brown County Inn and Washington Street Lift Stations. The Brown County Inn lift station is located in an unsuitable location adjacent to a walking trail and behind a tourist attraction. This lift station is nearing the end of its service lift and the pumping capacity of the station is nearing exceedance. The forcemain serving this lift station is also at the end of its expected service life and requires replacement. The Washington Street Lift Station has reached the end of its service life as evidenced by a recent pipe collapse in February 2023

WWTP Improvements

Overall, the WWTP is performing well and not in need of extensive process changes. The proposed improvements are designed to improve performance and reliability in the sludge processing system. Additionally, the

improvements are designed to achieve compliance with an IDEM Agreed Order to remove processes from the floodway. Improvements to the WWTP include:

- **New Aerobic Digester** - The existing sludge digestion system lacks aerated volume to properly digest sludge. This requires the facility to dewater and landfill a larger volume of material than necessary.

- **Digestion Equipment** – New equipment will be installed to accommodate the new digester tankage. This equipment includes the following:

    - **Digester Blowers and diffusers**
    - **Mechanical Thickening**
    - **Mechanical Dewatering**
    - **Sludge Pumps**
    - **Polymer Injection Unit(s)**

- **Sludge Dewatering Building** – The existing dewatering method consists of sludge drying beds inside the floodway/floodplain. A new building will be constructed above the floodway/floodplain to house the new sludge processing equipment previously mentioned.

- **New Decant Pump Station** – The existing decant pump station is original to the plant (1967) and below the floodway/floodplain. A new one will be constructed to raise it above the floodway/floodplain and provide additional pumping capacity.

- **Chemical Storage Building** - A new chemical storage building will be constructed to remove the existing bulk chemical storage tanks from the floodway/floodplain.

- **Demolition** – A number of structures will be demolished to remove them from the floodway/floodplain. The primary reason for this is to remove any possible environmental contamination from the floodway/floodplain. The structures to be removed include, but are not limited to, the following:

    - Sludge Drying Beds (2 Areas)
    - Blower Building
    - Existing Decant Pump Station
    - Various concrete pads

2.0 PROJECT PLANNING

2.1 CURRENT FACILITY

The existing sanitary sewer collection system is comprised of vitrified clay pipe gravity sewers, which convey flow to two (2) main lift stations. The two lift stations, Washington St. & Brown County Inn, both pump raw sewage directly to the Town's Wastewater Treatment Plant (WWTP). The gravity system is primarily comprised of 8-inch diameter lines with a small section of 10-inch sewer connected to the Washington Street Lift Station. Both lift stations discharge to the Headworks Structure of the WWTP.

The WWTP is a minor municipal wastewater treatment plant (NPDES Permit No. IN0023876), with a design average daily flow (ADF) of 0.60 MGD and peak hourly flow (PHF) of 1.82 MGD. This facility's primary treatment is comprised of a mechanical fine screen, aerated lagoon, two final clarifiers, UV disinfection and post aeration. The facility's sludge treatment is comprised of aerobic digestion and sludge drying beds with final disposal of biosolids in a landfill. The facility does have the option to land apply biosolids through a Land Application Permit.

Table 2-1 below includes a summary of Monthly Reports of Operations for 2017 – 2019.

Table 2-1 – Existing Wastewater Treatment Plant Performance Metrics

PERFORMANCE METRIC	INFLUENT	EFFLUENT	EFFLUENT LIMITS		TREATMENT PERFORMANCE
			SUMMER	WINTER	
FLOW (MGD)	---	0.34	---	---	---
$cBOD_5$ (MG/L)	197	2.38	20	25	98.8%
TOTAL SUSPENDED SOLIDS (MG/L)	152	6.03	24	30	96.0%
PHOSPHORUS (MG/L)	4.42	0.55	1.0	1.0	87.6%
AMMONIA (MG/L)	17.23	0.11	1.2	1.8	99.4%

2.2 LOCATION

The Town of Nashville (the Town) is situated along the North Fork of Salt Creek in Brown County Indiana. The Town is approximately 19 miles east of Bloomington, IN at the intersection of State Road 46 and State Road 135. According to the U.S. Census Bureau, in 2010 the population was 803 people and has a total area of 1.42 sq. miles as shown in Table 2-2. The planning area is a mix of residential and commercial businesses where surface elevations in the planning area range from 600 to 750 feet above sea level. The WWTP is situated in the southeastern portion of the Town adjacent to the North Fork of Salt Creek. This plant treats all wastewater produced from the planning area. Figure 2-1 – Existing General Location Map is included in Appendix A.

Table 2-2 – Current Population Data

SERVICE AREA	POPULATION	SQUARE MILES
Town of Nashville, IN	803[1]	1.42

Notes:
1 – U.S. Census 2010

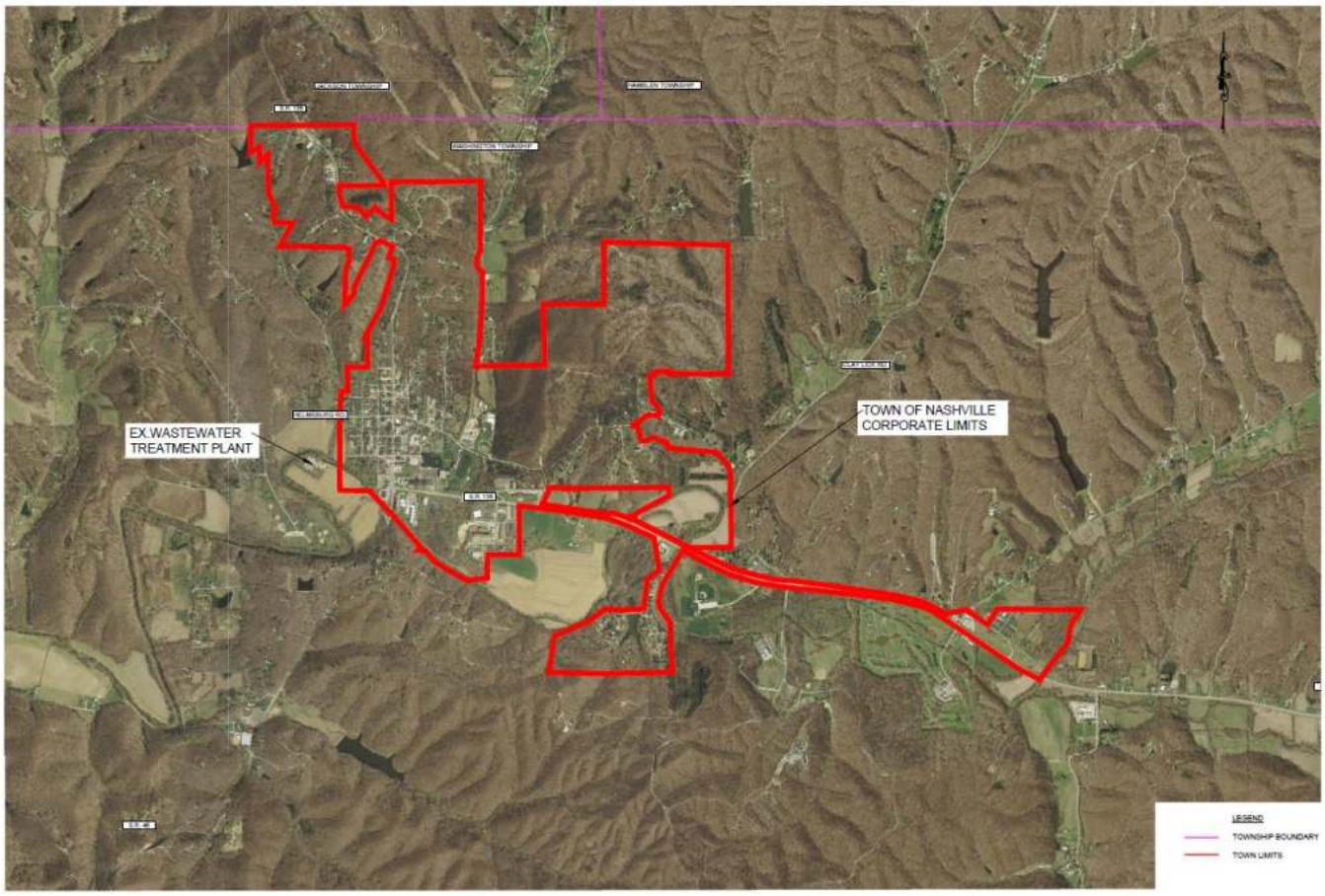


Figure 2-1 – Existing General Location Map

The Study Area encompasses a number of existing lift station sewersheds within the Town. These lift station sewersheds are listed as follows:

Table 2-3 - USGS Quadrangle Map Reference

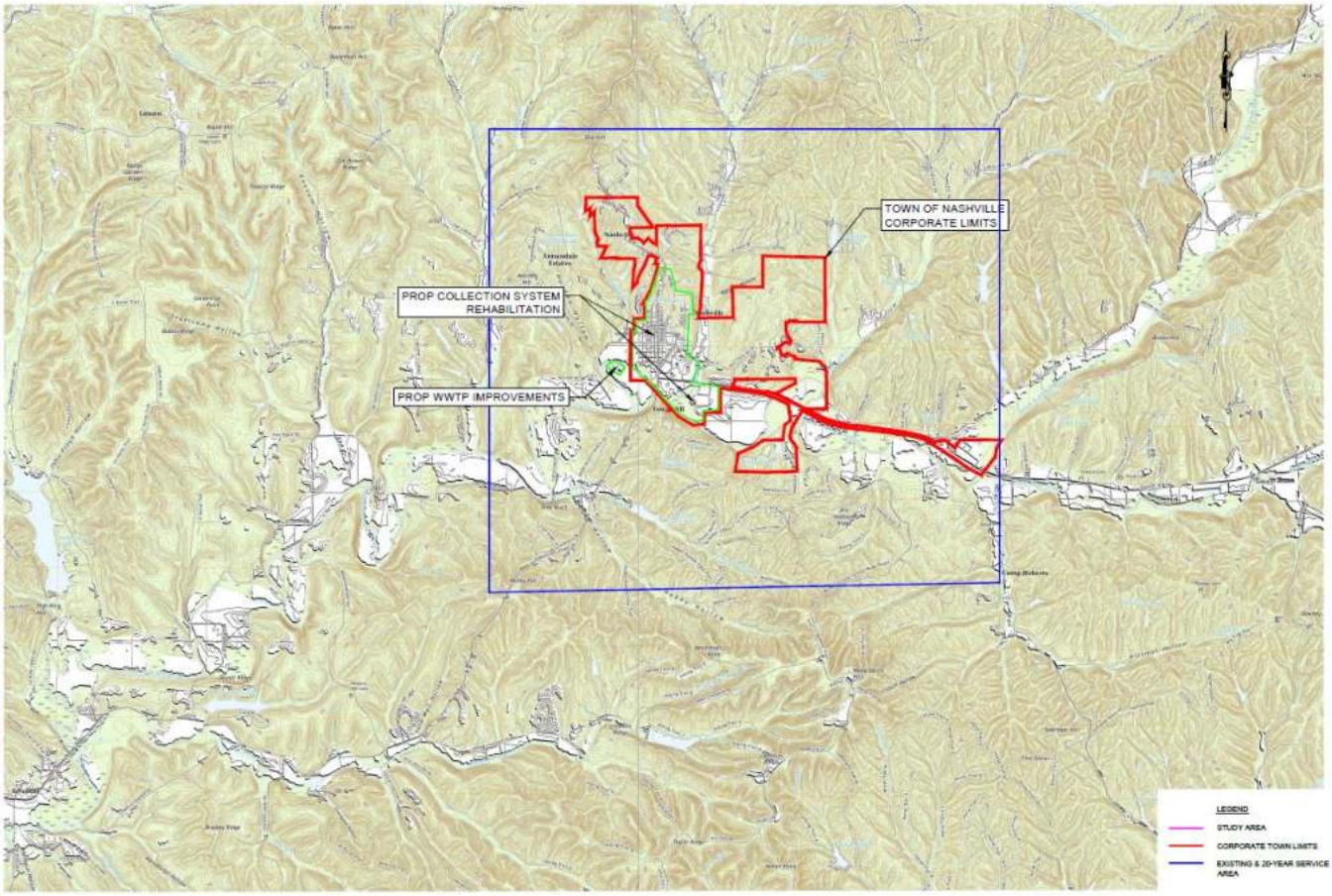
Lift Station Sewershed	USGS Quadrangle
Washington Street Lift Station	Belmont
Brown County Inn Lift Station	Nashville
Parkview Lift Station	Nashville

The sewersheds serviced by the Town are better described as follows:

- USGS Nashville Quadrangle map & Belmont Quadrangle map
- Township 9N, Range 3E: Sections 18, 19, 20, 21, 28, 29 & 30.

A United States Geological Survey (USGS) quadrangle map identifying the Study Area is included in Appendix A, Figure 2-2 and below.

Figure 2-2 - USGS Quadrangle Map



2.3 ENVIRONMENTAL RESOURCES

The following items were considered in the design:

- North Fork of Salt Creek, Greasy Creek and the surrounding floodplain
- Regulated wetlands are not present on the site
- No known endangered species will be affected by the project

Additional details of the resources can be found in a separate environmental assessment report document.

2.4 POPULATION TRENDS

The population trends in Brown County and townships in the Nashville Sewer Service Areas were collected from a number of sources. These sources include the U.S. Census Bureau, Indiana Business Research Center (IBRC), and STATS Indiana. A comprehensive set of resource data used for population projections can be found in Appendix C.

Population information gathered from Stats Indiana was used in this report, as this data source utilizes U.S. Census Bureau information. The Brown County population in 1970 was 30,870, 1980 was 36,466, 1990 was 38,147, 2000

was 46,107, and in 2010 the population was 56,640. The Washington Township area of the County experienced the majority of the growth from 1990 through 2000. However, the 2000 census showed a decrease of 22 people leaving the metropolitan area (Nashville) or a loss of 2.70%. Historical trends for Brown County population for the period from 1970 through 2010 are show in ***Table 2-4***.

Table 2-4 –Population Trend Data

SERVICE AREA	1970	1980	1990	2000	2010	AVG. DECENNIAL GROWTH (%)
Brown County	9,057	12,377	14,080	14,957	15,242	2.37%
Jackson Township	2,658	3,774	4,151	4,151	4,002	4.86%
Washington Township	3,442	4,031	4,478	4,433	4,896	3.96%
Hamblen Township	2,007	3,365	4,032	4,591	4,336	4.28%
Town of Nashville	527	705	873	825	803	5.35%

Notes:
1 – The data source utilized for this information was STATS Indiana (https://www.stats.indiana.edu/population)

The population of Nashville in the year 2010 was 803 people. In the latest available U.S. Census Bureau estimate (2018), the population grew to 1,110 or 38.00% in an 8-year period. This high growth rate can be attributed to residential growth in the area and annexation of portions of unincorporated Brown County. Areas annexed by the Town include Orchard Hills and Coffey Hills. Brown County grew only 0.17% in that same time frame, which may be a result of the annexation into Nashville. This high growth rate in Nashville and steady rate in Brown County is largely indicative of a slow and steady growth rate across the county.

The growth projections were developed along the same mind set, slow steady growth. The future projections for Brown County as a whole were compared to the historical performance of the townships and ultimately the Town. The only future projections available through the U.S. Census Bureau were for Brown County. This growth trend for Brown County resulted in a population reduction of approximately 3.37% every decennial. However, The Town disagrees with the projection of a population reduction for the next 30 years.

The Town has embarked on a number of economic development strategies in the last couple of years. This strategy has led to the construction of a number of moderately sized attractions, which bring a great deal of tourists to the area. This influx of tourists has revived an otherwise stagnant tourist based commercial center in downtown Nashville. The result of this revival is the renewed interest in economic development such as commercial shopping, restaurants, hotels, inns, bed & breakfast, and small to medium convention activities. The result of this is the development of the projected growth included in Table 2-5 – Projected Population Data Table 2-5 below:

Table 2-5 – Projected Population Data

Service Area	2010	2020	2030	2040	2050	Avg. Decennial Growth (%)
Brown County	15,242	15,475	16,217	16,994	17,809	2.37%
Town of Nashville	803	1,256	1,375	1,506	1,576	4.68%

2.5 COMMUNITY ENGAGEMENT

The Town held a Town Hall style public meeting on May 27, 2021. At this meeting, a presentation was made to the general public, which provided an overview of the water and sewer systems. This presentation also outlined the project scope as well as the need for the project, the operational service levels required, financing strategies and other considerations. A copy of pertinent public meeting documents is included in Appendix I of this document.

3.0 EXISTING FACILITIES

3.1 LOCATION

The WWTP is situated in the southwestern portion of the Town, adjacent to the North Fork of Salt Creek. The WWTP facility is located at 10 West State Road 46, Nashville, Indiana. The plant treats all wastewater produced from the planning area. Figure 3-1 below highlights the location of the existing WWTP relative to the Town. Figure 3-2 depicts the process flow schematic of the wastewater flow from the collection system through the WWTP, while Figure 3-3 shows the layout of the existing WWTP. There are photographs of each WWTP treatment process included in Appendix D.

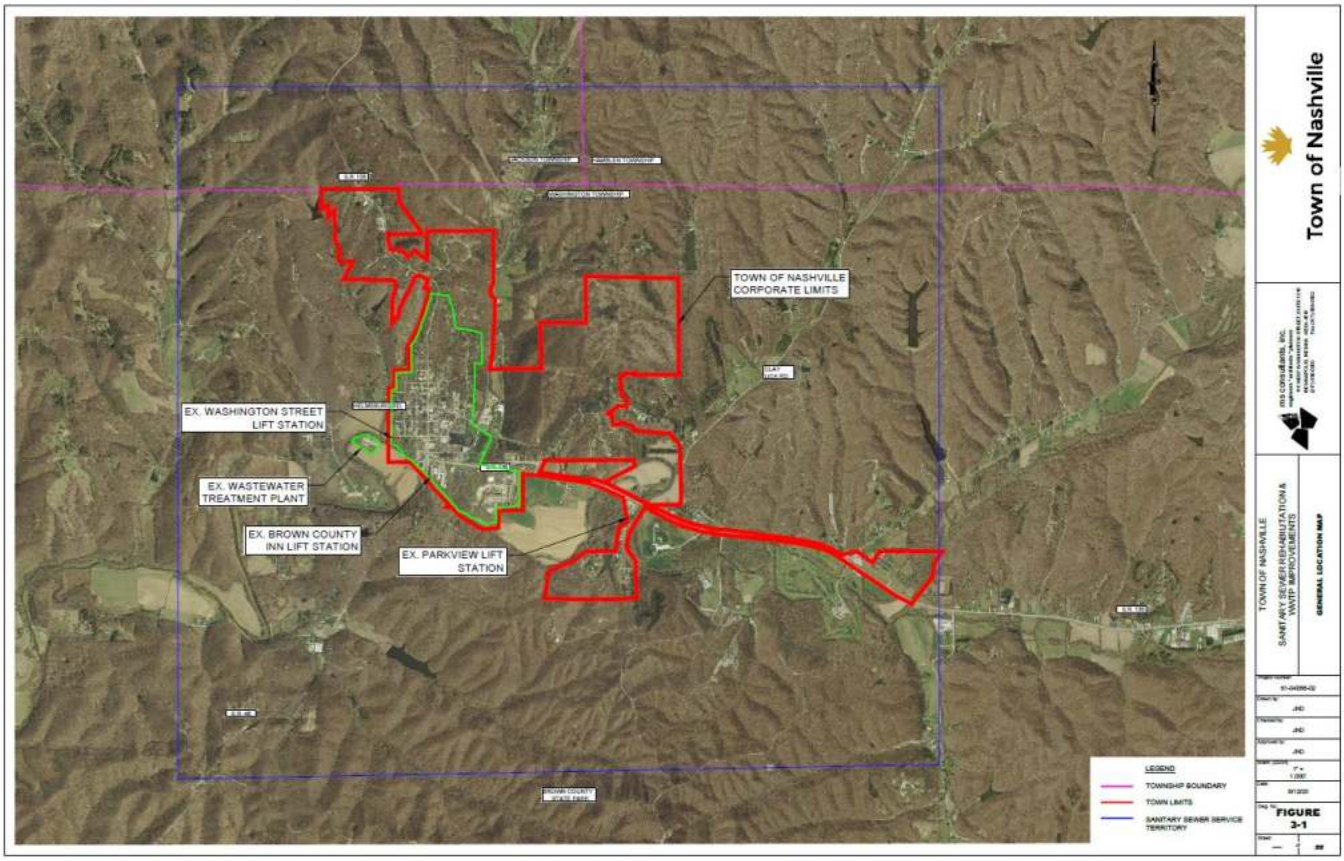


Figure 3-1 – Existing Facilities Location Map

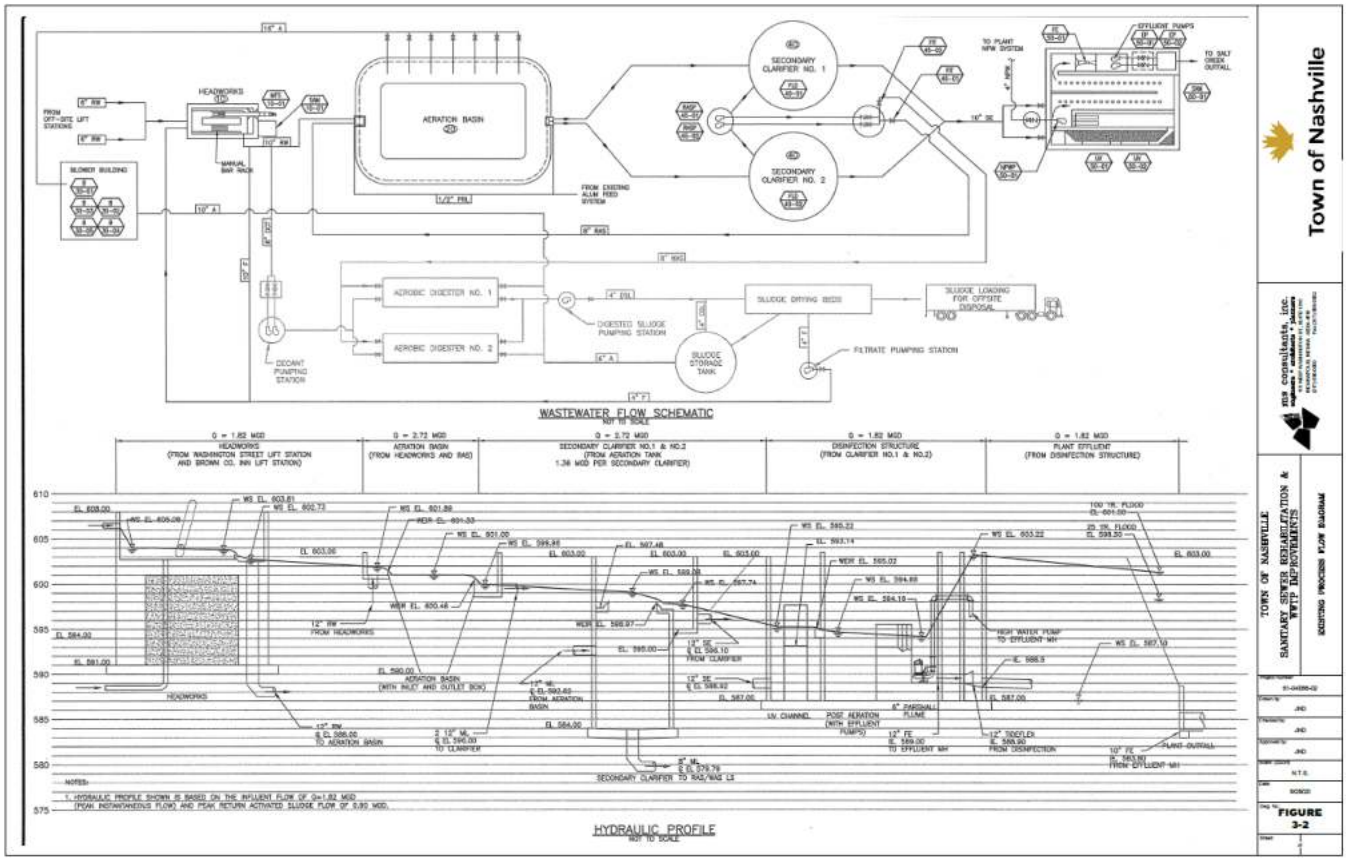


Figure 3-2 – WWTP Process Flow Schematic

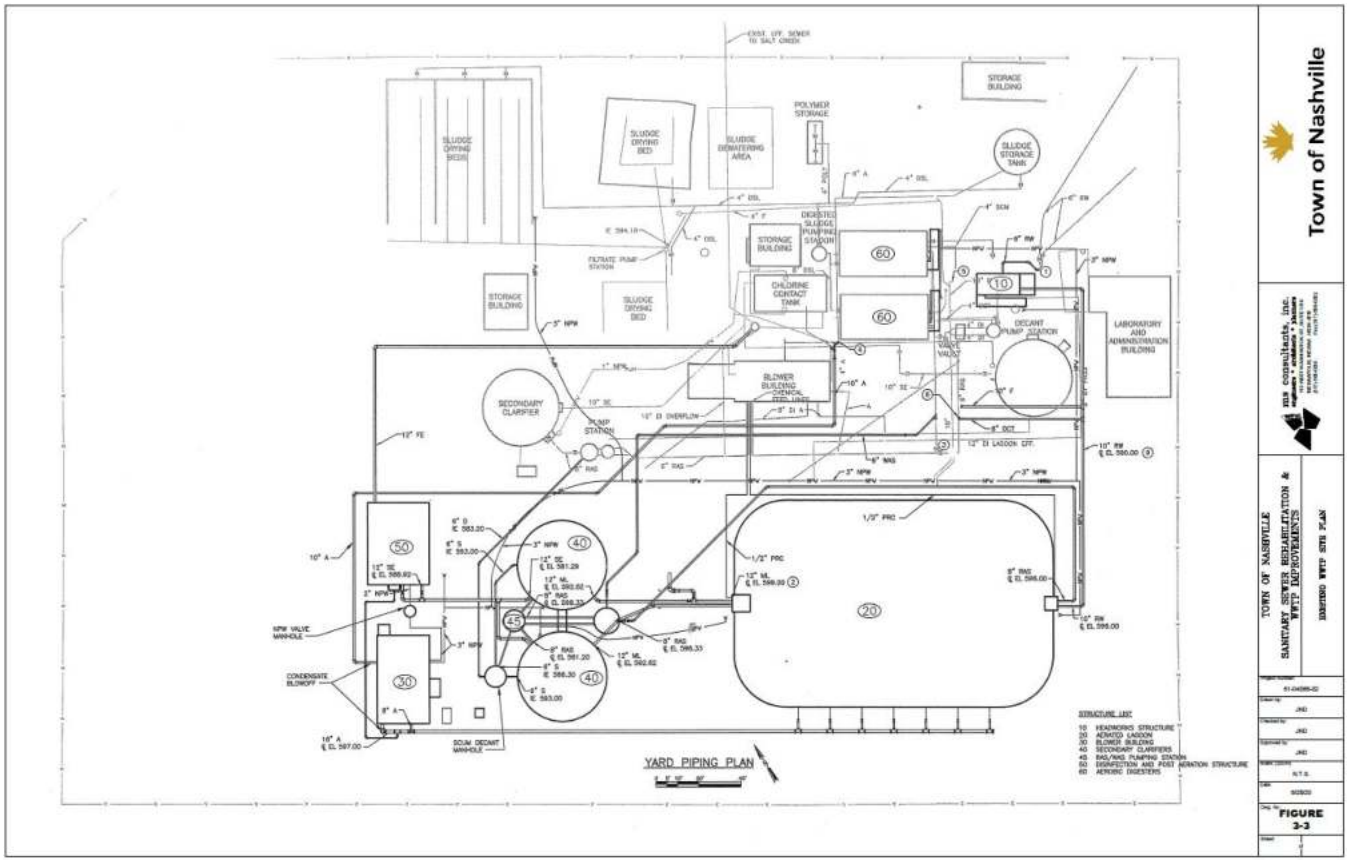


Figure 3-3 – Existing Facilities Layout

3.2 HISTORY

The original wastewater treatment plant and collection system was installed in or around 1961 and comprised the majority of the Town's corporate limits. The design conveyed all flows to one lift station, the Washington Street station, and constructed a wastewater treatment plant at the Town's current site. The project removed all sanitary sewer flows from the stormwater conveyance system to the North Fork of Salt Creek. This system appears to have been installed because of the Federal Water Pollution Control Act of 1948, and subsequent public outcry to clean and protect surface waters. This piece of legislation provided for some limited state and local government financing of projects and technical assistance.

The collection system was expanded in 1968 with the construction of the new State Road 46 alignment. This project installed a lift station at what is now the Creekside Retreat along Old State Road 46, and routed a forcemain back to the Town's gravity collection system. After completion of this project, the system remained relatively unchanged until 1981 when the Parkview and Brown County Inn lift stations were installed. It was also around this time period when small areas of unsewered development received low-pressure grinder pumps to replace failing septic tanks.

There were no significant additions or expansions to the collection system until 2010, after a significant flooding event occurred 2008. In the 2010 expansion, there were collection system and treatment plant components. The collection system component included expanding sewer service to the Coffeey Hill and Orchard Hill developments, and the Brown County Inn and Parkview lift stations were upgraded. The WWTP improvements expanded treatment capacity and raised some components above the floodplain.

The Town is currently engaged in an agreed order with the Indiana Department of Environmental Management (IDEM) dated December 1, 2019 as Case No. 2019-26278-W. A copy of this order is included in Appendix E. The violations noted in this order include sanitary sewer overflows during wet-weather rain events, the flooding of treatment processes at the WWTP and the washing out of the sludge drying beds during rain events. Within this agreement, the Town agreed to the following:

- The Town will cease use of the sludge drying beds and install a mechanized dewatering method.
- Clean, televise and rehabilitate the sewer collection system to remove the inflow and infiltration of clear water sources.
- Other remediation efforts not related to this Project.

3.3 CONDITION OF EXISTING FACILITIES

3.3.1 COLLECTION SYSTEM

As with many municipal sanitary systems, the Town's collection system is aging and in need of repair. The existing collection system is comprised of vitrified clay pipe in 2’ or 6’ lengths. This means that there are a high number of pipe joints in the system, which, as ground conditions shift and settle, become highly susceptible to groundwater infiltration. Additionally, as the ground shifts this type of pipe is highly prone to radial and longitudinal cracking. At this time, it is believed that the collection system is adequate for conveyance of sewer flows, provided it be lined to remove the infiltration.

The existing collection system, in the Washington St. Lift Station sewershed, is primarily comprised of 8-inch sanitary sewer. This sewer system varies in capacity with the slope of the pipe; however, on average the system can convey 850 gpm (1.22 MGD). The existing collection system, in the Brown County Inn Lift Station Sewershed, is comprised entirely of 8-inch sanitary sewer. This system also varies in capacity by slope of the pipe(s), but on average has a capacity of 850 gpm (1.22 MGD). A computer based hydraulic analysis of these two sewersheds resulted in four areas where manholes surcharge during wet-weather flows. These areas all matched with historical records of sanitary sewer overflows, as shown in Figure 3-4 below:

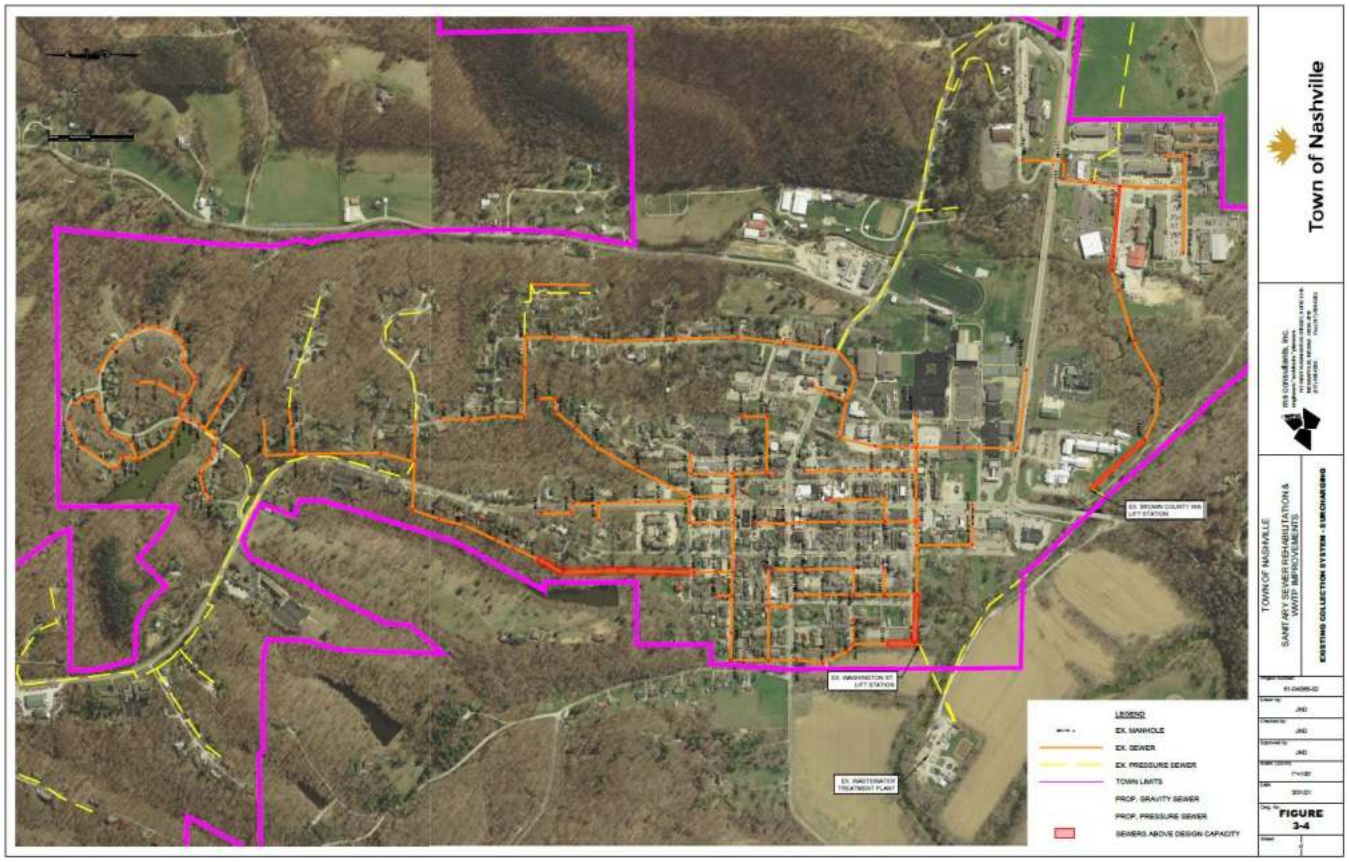


Figure 3-4 - Existing Collection System Surcharging

3.3.2 WASTEWATER TREATMENT PLANT (WWTP)

An analysis of the influent flows and loadings was conducted for the prior three (3) years of available data. The results of this analysis are shown in Table 3-1 below:

Table 3-1 : 3-Year Average Influent Characteristics

Influent Characteristics	Design	Avg	Min	Max
Flow Rate (MGD)	0.60	0.31	0.05	1.43
$CBOD_5$ (mg/L)	250.00	150	18	1,220
TSS (mg/L)	260.00	130	19	713
NH3 (mg/L)	45.00	15.6	0.3	89.0
P (mg/L)	9.00	3.86	0.70	29.00
pH (SU)		7.48	5.60	8.90

As noted above, the WWTP is operating at approximately 51% of its design hydraulic loading. Since we know there are inflow and infiltration concerns in the collection system, an analysis of the wet-weather and dry-weather flows was conducted. The maximum daily flow through the plant was determined to be 1.43 MGD, while the average daily dry-weather flow is 0.29, resulting in a wet-weather peaking factor of approximately 4.93.

Since the WWTP receives flow from collection system influenced by seasonal tourism, a seasonal analysis was conducted to evaluation the effect of tourism on the flows and loadings. Upon completion of this analysis it became clear that flows increased during the January – June months. This time frame does not correspond with increased tourism in the Town, rather it corresponds with the winter snow melt and onset of the spring rains. The conclusion of this analysis is that inflow & infiltration into the collection system has a greater impact on flows to the WWTP then the influx of tourists in the fall. Table 3-2 below summarizes these results:

Table 3-2 - Seasonal Influent Flow Characteristics

Year	Season	Flow (MGD)	Flow Variation from 3-Year ADF
2018	January - March	0.43	138.00%
	April - June	0.36	117.35%
	July - September	0.29	94.45%
	October - December	0.30	98.06%
2019	January - March	0.38	121.74%
	April - June	0.35	112.67%
	July - September	0.20	63.48%
	October - December	0.30	96.38%
2020	January - March	0.37	120.97%
	April - June	0.27	86.97%
	July - September	0.21	68.04%
	October - December	0.26	83.60%
3-Yr Average	January - March	0.39	126.90%
	April - June	0.33	105.66%
	July - September	0.23	75.32%
	October - December	0.29	92.68%

Table 3-3 - Maximum Month Flows & Loadings Summary

Month	Max Month Flow (MGD)			Max Month Loading - lbs		
	2018	2019	2020	2018	2019	2020
January	0.81	0.53	1.43	1,062.83	2,919.00	2,473.17
February	1.40	0.80	0.59	1,107.12	653.02	993.28
March	1.10	0.73	0.97	766.34	869.93	1,003.94
April	1.27	0.87	0.41	658.19	924.33	282.88
May	0.38	0.56	0.80	706.55	476.53	3,576.18
June	0.97	0.73	0.55	882.02	0.00	623.82
July	0.36	0.32	0.65	974.51	425.07	482.62
August	0.56	0.28	0.60	303.33	529.54	375.28
September	0.90	0.32	0.29	295.48	694.62	411.30
October	0.43	0.44	0.52	1,214.70	1,647.95	700.55
November	0.83	0.72	0.95	668.27	1,745.04	928.89
December	0.73	0.92	0.38	326.83	1,153.12	1,434.30

The significant wastewater contributors to the collection system consist of the Brown County State Park, Quaff On Brewing Company, and Hard Truth Distilling.

Overall, the WWTP is in good operating condition with the exception of the sludge treatment systems. Flow first enters the plant through two (2) forcemains, which both discharge, to the Headworks Structure. This structure is an elevated concrete structure that houses the mechanical bar screen, wash/compactor and sampling equipment. The structure is constructed of cast-in-place concrete and is elevated above the floodplain. This treatment component was built in the 2010 WWTP expansion and is in good condition.

Figure 3-5 – Headworks Structure

Flow leaves the Headworks Structure and flows by gravity to the influent structure to the Aerated Lagoon. This treatment process is comprised of an earthen lagoon, which is line with a synthetic waterproof liner. Medium bubble diffusers are suspended by steel cables across the lagoon to provide aeration for biological treatment. The average daily treatment capacity of this process is approximately 0.60 MGD @ 250 mg/l $cBOD_5$. This treatment process was added during the 2010 WWTP Expansion project and is in good condition.

Figure 3-6- Aerated Lagoon

The treated flow leaves the Aerated Lagoon through a splitter structure, which diverts flow to two (2) clarifiers evenly. These clarifiers are cast-in-place circular concrete structures, which utilize a plough style clarifier. Flow enters the center of each clarifier and dissipates solids out in a radial pattern. Sludge settles to the bottom and is ploughed to a hopper at the center, where it is returned to the Aerated Lagoons or wasted to the digesters. Clarified effluent overflows a series of v-notch weirs, which surround the outer perimeter of the clarifier, and is conveyed to disinfection. These units have a combined peak treatment capacity of 1.80 MGD. The existing clarifiers were also constructed with the 2010 WWTP Expansion and are in good condition.

Figure 3-7 - Secondary Clarifiers

Flow from the Secondary Clarifiers is recombined and conveyed by gravity to the Disinfection & Post Aeration Structure. This structure houses the UV Disinfection units, which are rated for 1.80 MGD. Additionally, there are diffuser grids included in this structure to provide reaeration to final effluent prior to discharge. This structure and treatment units were constructed with the 2010 WWTP Expansion and are in good condition.

Figure 3-8 - Disinfection & Post Aeration Structure

The Blower Building is located adjacent to the Disinfection & Post-Aeration Structure. This building houses the aeration blowers utilized in the Aerated Lagoons, Aerobic Digesters and Post-Aeration treatment processes. This structure is a slab on grade, CMU block building, with an asphalt shingle roof. This building also houses the non-potable water system for the plant and the main electrical gear for components of the plant built in the 2010 WWTP Expansion. The Blower Building is in good condition.

Figure 3-9 - Blower Building

The Chemical Storage Building is constructed of standard wood framing on a concrete slab on grade. This structure formerly housed the blowers, pre 2010 WWTP Expansion. It is also located in the floodplain and existing equipment inside this structure shows signs of flood damage. While the chemical storage tanks have not leaked during a flood event, they do get partially submerged. This has required the raising of pumps and electrical systems inside the structure and a series of elevated walkways to gain access to the equipment. This is not an appropriate structure and location for storage of chemicals and therefore is recommended for relocation to higher ground.

Figure 3-10 - Chemical Storage Building

Activated sludge is periodically sent from the clarifiers to the Aerobic Digesters for further treatment. The digesters are constructed of cast-in-place concrete and extend approximately 16' above ground. Both tanks are located in the floodplain, which explains why the walls of each tank extend so high above natural ground. The existing condition of these structures is average for their age, believed to be built in 1968 with the original plant and rehabilitated in the 2010 WWTP Expansion.

The total volume of tankage available between these structures is approximately 161,500 gallons. At the currently permitted design flow and loading conditions the plant is estimated to generate 17,000 gal./day of sludge. This sludge generation is estimated to all for approximately 9.5 days of solids retention time. Since the EPA Part 503 requirement for Class B sludge is a minimum of 60 days, this treatment process is undersized for its intended use.

Figure 3-11- Aerobic Digester Tankage

Digested sludge is pumped to a series of sludge drying beds for final dewatering. These drying beds are shallow, parallel, concrete basins intended to allow for natural evaporation. After drying is complete, the material is loaded into roll-off dumpsters and hauled to a landfill. However, a temporary measure has been put in place to provide an alternative to using the sludge drying beds. This alternative consists of installing geosynthetic filter bags inside roll-off dumpsters. These bags allow for sludge to be pumped in a liquid form into the bags and water to be filtered back to the head of the plant, while retaining the solids inside the bag and dumpster. When the bags are full they are trucked to a landfill for final disposal. The plant has temporarily installed two 20-yd^3 roll-off dumpsters to contain the geobags.

The facility does have a permit to land apply biosolids in lieu of landfilling. However, with the lack of adequate solids retention time the facility has not land applied in an unknown period of time. These drying beds are located within the floodplain of the adjacent creek, and there are document cases of sludge washout during flooding. For this reason, these drying beds are no longer utilized.

Figure 3-12- Sludge Dewatering Beds

Energy Consumption at the facility can largely be traced to a small number of components. At the WWTP, the largest user of electricity is the aeration system blowers. These units run all day, every day, to keep up with oxygen demands in the Aerated Lagoons. The total kilowatts of energy used at the WWTP ranges between 64,000 – 70,000 kW-Hrs. The below table indicates a total of 74,400 kW-Hrs. The discrepancy between these values can be related to the use of variable frequency drives on the blowers and RAS/WAS pumps. Below is a summary table of the electrical demands of the WWTP.

Table 3-4 - Summary Energy Consumption

Component	Total Qty.	Operating Qty.	Hp Rating	kW Rating (per unit)	Monthly Usage (Hrs.)	Total Energy Use (kW-Hr)
Aerated Lagoon / Digester Blowers	3	1	125	93.2	720	67,000
RAS/WAS Pumps	2	1	7.5	5.6	720	4,000
Final Effluent Pumps[1]	2	1	7.5	5.6	0	0
UV Disinfection System[2]	2	2	---	2.5	720	1,800
Sludge Transfer Pumps	1	1	5	3.7	180	667
NPW Pumps	1	1	9	6.7	60	400
Clarifier Drives	2	2	0.5	0.37	720	533
Blower Building Heater(s)[2]	2	2	---	13.0	0	0

Notes:

1 – The final effluent pumps are only required when the North Fork of Salt Creek is in flood stage. Due to the infrequency of this event, they have been ignored in this evaluation.

2 – This summary assumes a typical month during disinfection season, which would typically not require the use of the Blower Building Heater(s).

4.0 NEED FOR PROJECT

4.1 HEALTH & SANITATION

The Town of Nashville operates a separate sanitary sewer system contributing flow to its WWTP. However, there have been instances where the sanitary system surcharges and overflows into adjacent creeks and streams. These overflows leave the sanitary system through the manhole lids and are conveyed to the surrounding creeks and waterways by surface sheet flow. Similarly, it is believed that manholes along these waterways are allowing storm flows into the sanitary system, overwhelming the system. This interaction between the normally separate systems is especially hazardous to the public to raw sewage.

The Town's WWTP and collection system were both inspected by staff from the Indiana Department of Environmental Quality on February 24, 2019. The results of this inspection were a number of violations of the Town's NPDES permit, ultimately leading to the issuance of Agreed Order Case No. 2019-26278-W. This agreed order is included in Appendix E.

4.2 AGING INFRASTRUCTURE

In a separated sanitary sewer system, flow increase due to rain or snowmelt should theoretically be minimal. However, this may not be the case due to I&I of clean water sources. Primary sources of I&I typically include:

- Private storm connections (roof drains and floor drains) connected to the sanitary sewer
- Faults within the collection system (cracked pipes, joint separation, and leaking manholes) that allow storm water and/or ground water to enter the sewer
- Manholes and/or pump stations located in areas that are subject to flooding

Sewers that cross or run adjacent to bodies of water, similar to that of Leslie Run, are commonly susceptible to I&I. The Town is an older community where early construction practices may have included connecting downspouts and roof drains directly into the sanitary collection system. This contributes to clean water entering the sewage system. Additionally, the Town is geographically located in an area that has a high ground water table, making any fault in the system a potential source of I&I. As the collection system ages, sewers become prone to deterioration leading to infiltration. Combine high ground water with an aging collection system and the results can be a high volume of clean water entering the collection system.

4.3 REASONABLE GROWTH

4.3.1 POPULATION & ECONOMIC GROWTH

Population projections for the Nashville sewer service area are based primarily on expected development and secondarily based on historical growth projections. Table 5-1 summarizes the Town's population projections for the 20-year planning period.

Table 4-1 - Town of Nashville Population Projections

Service Area	2010	2020	2030	2040
Brown County	15,242	14,954	14,494	13,540
Town of Nashville	803	1,256	1,375	1,509

Over the first 10-year period (2020-2030), the town population growth is anticipated to increase by 4.63%. For the second 10-year period (2030 to 2040), the town population is anticipated to increase by another 4.63%. In total, over the 20-year planning period (2020-2040), the town population is anticipated to grow approximately 38.0%. These population figures are based on current growth patterns and depend upon several factors. These factors include the rate of economic growth and ability of the Town to sustain this growth by adequately serving these developments.

The Town's existing treatment facility is sized for an average daily flow of 0.600 MGD. After analyzing the past 3-years of monthly operating reports, the facility is currently treating 0.327 MGD of flow. If we take the current average daily flow and divide it by the number of residents, we arrive at an average usage of 260 gallons per day (gpd) per person (327,000 gpd / 1,256 persons). This water usage is high when you compare the industry average of 124 gpd/person (310 gpd/dwelling divided by 2.5 persons per dwelling). If you apply the 124 gpd/person to the 2020-estimated population, you arrive at a flow of 0.136 MGD with the remainder being inflow and infiltration (I&I). Assuming that the I&I is removed the population projection of 1,330 could easily be served by the existing WWTP design capacity.

The future population for year 2040 is estimated to be 1,509 people. Using the calculated flow per person (260 gpd/person) we anticipate the existing 0.60 MGD treatment plant to be sufficient through the planning period of 20-years.

Table 4-2 : 20-Year Projected WWTP Flows

Service Area	Existing Avg. Daily Flow	Existing Max Daily Flow	Future Avg. Daily Flow	Future Max Daily Flow
Ex. Service Area – Existing Customers	0.252 MGD	1.159 MGD	0.280 MGD	1.288 MGD
Ex. Brown County State Park – North Park	0.057 MGD	0.262 MGD	0.057 MGD	0.262 MGD
Brown County State Park – South Park Addition	---	---	0.023 MGD	0.069 MGD
Future Service Area - Vacated Brown County RSD	---	---	0.025 MGD	0.115 MGD
Totals	0.309 MGD	1.421 MGD	0.385 MGD	1.734 MGD
Ex. WWTP Design Capacity	0.600 MGD	1.820 MGD	0.600 MGD	1.820 MGD
Surplus / Deficit	0.291 MGD	0.399 MGD	0.215 MGD	0.086 MGD

4.3.2 BROWN COUNTY STATE PARK

The Brown County State Park (BCSP) is located southeast of the Town in Brown County. Currently the park sends a portion of its sanitary sewer flow to the Town, in the amount of approximately 57,500 gpd. This flow is representative of areas on the north side of the park such as the Abe Martin Lodge, North Picnic Area, Saddle Barn and Swimming Facility. Below is a summary of the existing flows to the Brown County Inn Lift Station:

Table 4-3- Brown County Inn Lift Station Connection Summary

Development	Equivalent Dwelling Unit	Avg. Daily Flow (gal/d)	Peak Daily Flow (gal.d)
McDonalds	8	2,480	12,226
IGA Grocery	2	620	3,057
The People's State Bank	1	310	1,528
City Bank of Indiana	1	310	1,528
Laundry Mat	6	1,860	9,170
Quality Inn	17	5,270	25,981
Bear Hardware	1	310	1,528
Indiana BMV Office	1	310	1,528
Willow Manor Apartments	44	13,640	67,245
YMCA	10	3,100	15,283
Nashville Police Dept.	2	620	3,057
Brown County Healthy Living (Nursing Home)	34	10,540	51,962
Bloomington Hospital Office Building	6	1,860	9,170
Breeden Investment Group – Strip Mall	4	1,240	6,113
Salt Creek Medical Arts	2	620	3,057
Salt Creek Inn	20	6,200	30,566
The Seasons Lodge	30	9,300	45,849
Copper Creek Car Wash	3	930	4,85
Nashville Music Center	10	3,100	15,283
Brown County Sheriff & Jail	12	3,720	18,340
Creekside Lift Station	1	310	1,528
Brown County Lift Station (North)	178	55,180	272,037
Salt Creek Golf Course	48	14,880	73,358
Residence – Peggy Johnson	1	310	1,528
Residence – Jean Simmons	1	310	1,528
Brown County School Concession Stand	2	620	3,057
Campground of America	17	5,270	25,981
Eagle Park Wellness Center	2	620	3,057
Circle "K" Convenience Store	3	930	4,585
Brown County Tire	2	620	3,057
Parkview Nazarene Church	4	1,240	6,113
Parkview Lift Station	63	19,530	96,283
Total	536	166,160	821,387

The BCSP approached the Town and indicated that they wish to send the remaining, south, portion of the park to the Town's sanitary sewer system. This additional flow represents an additional 23,000 gpd of average daily flow from mostly campsites (69,000 PDF). These flows generally reflect that of single family residential waste strength volumes and organic loadings. The additional flow will require new infrastructure to be built by the BCSP and Town to support this flow.

5.0 ALTERNATIVES CONSIDERED

5.1 DESCRIPTIONS

ms consultants was retained by the Town in 2019 to study the sanitary sewer system and develop a master plan with two objectives. The first objective was to develop a plan for economic development within the Town and surrounding areas for the prescribed planning period. The second objective was to develop a plan to bring the Town's systems into compliance with the previously mentioned Agreed Order. The sanitary sewer master plan recommendations included removing I&I flow into the collection system and improvements to the WWTP to comply with the IDEM Agreed Order. Below are the alternatives considered to achieve these recommendations, as well as serve the BCSP additional sewer needs:

- Alternative No. 01 - No Action
- Alternative No. 02 – Collection System Rehabilitation
- Alternative No. 03 – Collection System Replacement
- Alternative No. 04 – Construct a New Wastewater Plant on a New Site
- Alternative No. 05 – Improve the Existing Wastewater Treatment Plant

The information presented below summarizes each alternative.

5.1.1 ALTERNATIVE NO. 01 - NO ACTION

The "No Action" alternative was considered to reduce the capital cost of improvements while weighing the financial impact of fines from SSO events in a typical year. However, tourism is arguably the top economic driver for the town and would certainly be impacted by SSO events. Additionally, the moral and ethical obligation to protect the health, safety and wellbeing of residents and the environment is inherently a top priority for the Town. This alternative became officially unfeasible when IDEM issued the Agreed Order on December 11, 2019 requiring the Town to take some form of action.

5.1.2 ALTERNATIVE NO. 02 – COLLECTION SYSTEM REHABILITATION, WASHINGTON ST & SALT CREEK LIFT STATIONS

5.1.2.1 DESCRIPTION

The rehabilitation of the Town's existing gravity sewer system was immediately identified as a top priority in the Town's sanitary sewer master plan. This project would remove clear water I&I from the collection system and eliminate the existing sanitary sewer overflows (SSOs) that the Town has experienced during rain events. A number of rehabilitation methods were considered, which could be categorized as open trench and trenchless. These two categories were evaluated for their particular application to the Town's needs.

The open trench method was immediately eliminated. This method would have involved long-term road/alley closures throughout downtown Nashville. Additionally, areas outside of downtown would be extremely hilly and congested with thick vegetation. Access to remote lines would include the removal of dense, old growth, forested areas. Access to downtown sewer lines would include navigating large excavators through narrow alleys filled with other utilities (broadband, storm, water, telecommunications, fiber optic networks, natural gas lines, etc.). Finally, these alleys and streets run in close proximity to historic structures with irreplaceable archaeological, historical and cultural value that cannot be replaced if damaged. As a result, the open trench method was eliminated as a

feasible rehabilitation method. The trenchless collection rehabilitation method was determined to be the most feasible course of action.

The Brown County Inn Lift Station lacks capacity to serve the new Brown County State Park flow, and the lift station is at the end of its expected service lift. The existing lift station has an influent 8" gravity sewer at a 0.40% slope. This sewer has a capacity of approximately 480,000 gal/day before experiencing surcharging. The existing 8" gravity line conveys approximately 166,000 gal/day, which including a standard peaking factor of 4 puts the flow at 664,000 gal/day. This indicates that the influent 8" gravity sewer is too small to convey the required flows.

The Washington Street Lift Station has also reached the end of its service life, as it was constructed circa 1961. In February 2023 the 10" influent gravity line collapsed approximately 20' from the wetwell. When the gravity pipe to the LS collapsed the wetwell filled with soil and gravel. This cause damage to the existing pumps and took the lift station completely offline. While the lift station was offline and being repaired a visual inspection of the wetwell (inside and out) was completed and determined that the station was beyond its useful life.

This alternative would decommission the Brown County Inn lift station in favor of constructing a new lift station closer to the Salt Creek Plaza development. This removes 1,800 linear feet of undersized gravity sewer along Greasy Creek, which is often submerged during rain events. Additionally, this would tie-in the Brown County State Park Lift Station directly to the wetwell and off the gravity sewer system. The new Salt Creek Lift Station would be sized to accommodate the future flows and include a new 8-inch forcemain directly to the wastewater treatment plant. The Washington Street Lift Station will also be decommissioned, and a new lift station will be installed next to the headworks at the WWTP. Along with the new station, a new gravity sewer conveying flow to the lift station will be installed under Salt Creek.

5.1.2.2 DESIGN CRITERIA

The trenchless rehabilitation technology chosen for this project is a cured-in-place pipe (CIPP) technology. This technology begins with a flexible felt tube, sized appropriately to the degraded host pipe. The felt material is then saturated with a corrosion resistant polyester or vinyl ester based resin. The uncured pipe liner, or bag, is kept cool during transport and storage until installed to prevent curing of the pipe. Installation of the bag is accomplished by inverting the bag through the host pipe using compressed air or steam. After the bag is installed, it is filled with high temperature water or steam, for a prescribed period of time, to cure or harden the bag. This method effectively creates a thin wall, continuous, seamless, joint less pipe inside the host pipe. This effectively eliminates I&I through longitudinal/radial cracks, joints, root intrusions, and other non-watertight areas of the host pipe. Below is a representative example of before and after photos of this rehabilitation method.

Figure 5-1- CIPP Lining Example Installation

The proposed Salt Creek Plaza Lift Station will be sized to accommodate the existing flows, plus the proposed flows from the Brown County State Park. The lift station will include a submersible style solids handling pump, wetwell, valve vault, and controls. A back-up generator will be included to provide power in the event of utility power loss. The preliminary capacity of the new lift station is approximately 500 gpm of peak pumping capacity. The new Washington Street Lift Station will be sized to accommodate existing and future flows. The station will be submersible style with wetwell, valve vault, and controls. The WWTP back-up generator will provide power in the event of utility power loss. The preliminary capacity of the new lift station is approximately 1,205 gpm.

5.1.2.3 MAP

The areas proposed to be rehabilitated are shown in Figure 5-2 below:

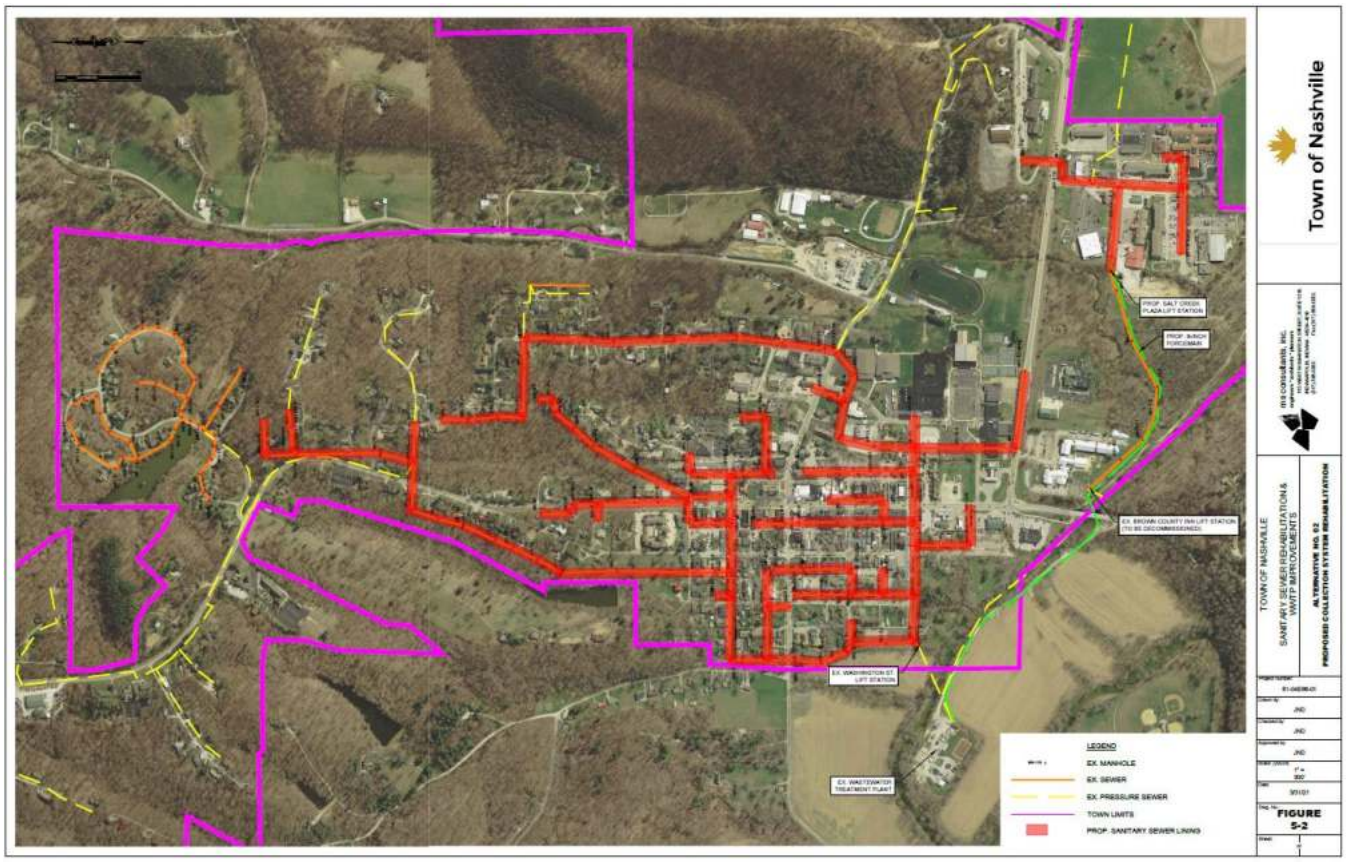


Figure 5-2- Proposed Collection System Rehabilitation

5.1.2.4 ENVIRONMENTAL IMPACTS

The trenchless method of rehabilitation is expected to have little impact to the environment. The areas in which this technology will be implemented will be both above and below existing floodplains, inside existing infrastructure. The anticipated impact to the environment is a positive improvement in removing raw sewage flows from entering streams, waterways and creeks. Any "waste" generated by installing the liner is expected to be removed and disposed of by the installation contractor, i.e. nothing is to be left above grade at the installation manholes.

This technology, being trenchless, is anticipated to have little to no impact to existing historical and/or archaeological sites. As long as the host pipe has not completely collapsed, which is believed to be the case, there will be no surface disturbance. If in the event there is a collapsed pipe, which requires excavation activities, appropriate measures will be implemented to protect the surrounding structures.

The new Salt Creek Lift Station will be installed above the 100-year flood plain on pre-disturbed ground, having no impact to the environment. The proposed 8-inch forcemain will be installed by open-trench method for which mitigation measures will be implemented to prevent negative effects on the environment during installation. The portion of 8-inch forcemain crossing Salt Creek will be directionally drilled or jack and bored to prevent any impacts to Salt Creek. The new Washington Street Lift Station will be installed with a top of slab elevation above the 100-year floodplain at the WWTP on pre-disturbed ground and mitigation measures will be implemented to

prevent negative effects. The gravity sewer main to the new lift station will be installed via open cut installation during dry weather months only.

5.1.2.5 LAND REQUIREMENTS

Land acquisition will be necessary to secure a location for the Salt Creek Lift Station. The Town has already begun the process of acquiring this property and will be complete prior to construction commencing. All other components of this Alternative will be located in pre-existing right-of-way or easement.

5.1.2.6 POTENTIAL CONSTRUCTION PROBLEMS

The most significant concern with this method of rehabilitation is the condition of the existing host pipe. To date the Town has conducted limited televising of the system, leaving areas of unknown condition. If an existing host pipe is found to be unsuitable for the CIPP liner, then it will require excavation to repair. This excavation could be anywhere in the system and for an indeterminate length, making estimating the scope of work difficult and uncertain.

5.1.2.7 SUSTAINABILITY CONSIDERATIONS

WATER & ENERGY CONSIDERATIONS

The rehabilitation of the gravity sewer system to remove I&I has a direct energy efficiency component through treatment costs of pumping flow and treating flow. Historically, the collection system and treatment plant see and average daily flow of 0.327 MGD, with a peak daily flow of 1.43 MGD. This results in a wet-weather peaking factor of 4.37. Assuming this rehabilitation lowers the peaking factor from 4.37 to a reasonable 2.37, this would result in a reduction of flow to be treated through the system.

GREEN INFRASTRUCTURE

None are proposed with this alternative.

5.1.2.8 COST ESTIMATES

Table 5-1- Alternative No. 2 Cost Estimate

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Construction Costs					
1	Mobilization, Demobilization, Bonds, & Insurance	1	LSUM	$305,000	$305,000
2	Construction Engineering	1	LSUM	$278,000	$278,000
3	Erosion & Sediment Control	1	LSUM	$56,000	$56,000
4	Maintenance of Traffic	1	LSUM	$41,000	$41,000
5	Final Cleanup & Restoration	1	LSUM	$84,000	$84,000
6	Cured-in-Place-Pipe for 8-inch pipe	36,000	LF	$73	$2,628,000
7	Cured-in-Place-Pipe for 10-inch pipe	25	LF	$120	$3,000
8	Point Repair, 8-inch Pipe (up to 15 LF)	14	LF	$27,000	$389,000
9	Lateral Remove & Replace (up to 15LF)	36	EACH	$4,700	$169,000
10	Replace manhole casting	5	EACH	$2,700	$14,000
11	Grout sealing of existing manhole	1,142	VLF	$257	$293,000
12	Epoxy sealing of existing manhole	476	VLF	$405	$193,000
13	Raise MH Casting (3" Increments)	26	EACH	$1,000	$26,000
14	Install 10-inch HDPE Forcemain (HDD)	4,125	LF	$85	$351,000

15	Install 10-inch HDPE Forcemain w/ 16" Steel Casing (Jack & Bore)	175	LF	$470	$82,000
16	New Packaged Lift Station (900 gpm Self Priming) w/ engine driven backup drive	1	EA	$275,000	$275,000
17	New Wetwell (8-ft Dia.)	1	LSUM	$95,400	$95,000
18	Electrical Modifications	1	LSUM	$76,000	$76,000
19	Protective coating for wetwell	1	LSUM	$27,000	$27,000
20	WWTP Yard Piping Modifications	1	LSUM	$23,000	$23,000
21	Decommission Ex. BCI Lift Station	1	LSUM	$52,000	$52,000
22	Brown County Jail Duplex Grinder Station	1	LSUM	$20,000	$20,000
23	Brown County Jail 2.5" Forcemain	1,300	LF	$30	$39,000
24	Natural Gas Line Extension (Indiana Gas Company)	800	LF	$68	$54,000
25	Raise ex. wetwell, valve vault & meter vault	1	LSUM	$17,000	$17,000
26	Raised Access Drive to Wetwell	1	LSUM	$15,500	$16,000
27	Install 10-inch DI Forcemain	50	LF	$240	$12,000
28	New 1,250 gpm Submersible Pumps	4	EA	$42,000	$168,000
29	New Wetwell (15-ft Square)	1	LSUM	$83,000	$83,000
30	New Valve Vault w/ Metering	1	LSUM	$25,000	$25,000
31	10-inch D.I. Pump & Discharge Piping	80	LF	$240	$19,000
32	10-inch D.I. Plug Valve(s)	4	EA	$5,200	$21,000
33	10-inch D.I. Check Valve(s)	2	EA	$7,250	$14,500
32	10-inch Mag Meter	1	EA	$17,000	$17,000
33	Electrical Modifications	1	LSUM	$71,000	$71,000
34	Protective coating for wetwell	1	LSUM	$30,000	$30,000
35	12" PVC Gravity Sewer in 24" Steel Casing	150	LF	$400	$60,000
36	12" PVC Gravity Sewer	450	LF	$270	$121,000
37	48" Concrete Manhole w/ boltdown lids	2	LSUM	$8,000	$16,000
38	Decommission Ex. Washington St. Lift Station	1	LSUM	$42,500	$42,500
			Construction Contingency (10%)		$630,600
				Construction Total	$6,936,600
Non-Construction Costs					
1	SRF Preliminary Engineering Report - ms consultants, inc.				$85,000
2	Engineering Design, Bid, & Construction Administration - ms consultants, inc.				$555,000
3	Construction Inspection - ms consultants, inc.				$416,000
4	Land/Easements (Washington St. Gravity Sewer Easement)				$10,000
5	Asset Management Plan (Wastewater) - ms consultants, inc.				$20,000
6	Asset Management Plan (Wastewater) - Krohn & Associates				$5,000
7	Financial Advisory Services - Krohn & Associates				$50,000
8	Bond Council				$26,000
9	Legal Council				$8,700
				Non-Construction Total	$1,175,700
				Total (Construction + Non-Construction)	$8,112,300
Annual Operation & Maintenance Costs					
1	Personnel (Salary, Benefits, Payroll Tax, Insurance, Training)				$163,000
2	Administrative Costs (Office Supplies, Printing, etc.)				$185,000
3	Waste Treatment Costs				$508,000

4	Insurance	$10,500
5	Energy Cost (Fuel/Electrical)	$75,000
6	Process Chemical	$30,000
7	Monitoring & Testing	$10,500
8	Short Lived Asset Maintenance/Replacement	-
9	Professional Services	$3,000
10	Residuals Disposal	$24,500
11	Miscellaneous	$286,000
	Total O&M Costs	$1,295,500

5.1.3 ALTERNATIVE NO. 03 – COLLECTION SYSTEM REPLACEMENT

5.1.3.1 DESCRIPTION

The removal of I&I into the collection system was highly recommended in the Town's Sanitary Sewer Master Plan. One alternative explored for achieving this removal was to abandon the existing infrastructure and replace it. This would likely be achieved through the installation of a parallel low-pressure sewer collection system. This option was a good fit for the Town because newer portions of the collection system are already low pressure sewer. This new system would likely consist of many individual grinder pump stations discharging to a single large pump station, and finally discharging to the WWTP.

5.1.3.2 DESIGN CRITERIA

Typical low-pressure sewer systems require that each customer have a small pump station installed to service their property. These stations are constructed of fiberglass or polymer, and are 2-3 feet in diameter x 8-10 feet deep. The station consists of a 1-2 Hp grinder pump, piping, valves and electrical controls. Power is supplied by the customer to the pump station. New forcemain piping would need to be installed at each pump station, along the alleys or roadways and under creeks and other waterways.

5.1.3.3 MAP

A preliminary layout of this alternative is included in Figure 5-3 below:

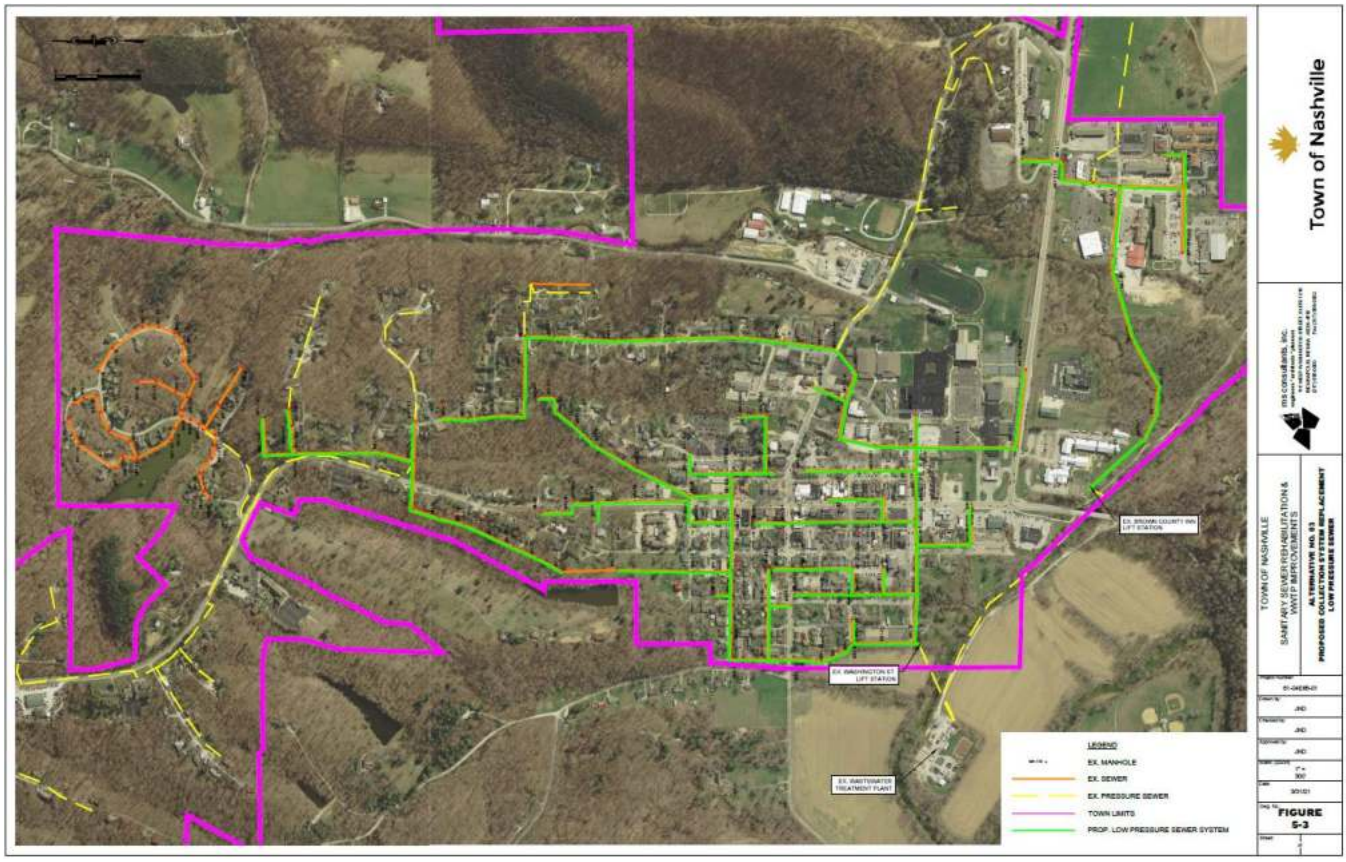


Figure 5-3 - Proposed Low Pressure Collection System

5.1.3.4 ENVIRONMENTAL IMPACTS

This alternative will have impacts on the existing floodplain and floodway. These impacts include excavation for installation of infrastructure in these areas, with temporary storage of excavation materials. Additionally, areas immediately adjacent to historic and archaeologically significant structures will require excavation, trenching and routing of new utilities. This could potentially harm the structures and foundations of these important buildings.

5.1.3.5 LAND REQUIREMENTS

All construction activities and new infrastructure is anticipated to be located in existing right-of-way and easement. No new easements, right-of-way or property acquisition is anticipated.

5.1.3.6 POTENTIAL CONSTRUCTION PROBLEMS

The routing of new forcemains is likely going to be the greatest problem with constructing this alternative. Although most of the forcemains are planned to be directionally drilled, it is likely that existing utilities will be impacted by this activity. Additionally, with the highly congested downtown it is likely that installing the individual grinder pump stations will present a challenge. These units will require a 5'x5' square area for installation, and located a position that lines up with existing sewer laterals and does not present a hazard to the general public will be a challenge.

5.1.3.7 SUSTAINABILITY CONSIDERATIONS

WATER & ENERGY EFFICIENCY

The energy savings associated with Alternative No. 02 are equally applicable to Alternative No. 03.

GREEN INFRASTRUCTURE

None.

5.1.3.8 COST ESTIMATES

Table 5-2- Alternative No. 3 Cost Estimate

Item	Description	Qty	Unit	Unit Cost	Total Cost
Construction Costs					
1	Mobilization, Demobilization, Bonds & Insurance	1	LSUM	$343,000	$343,000
2	Construction Engineering	1	LSUM	$240,000	$240,000
3	Erosion & Sedimentation Control	1	LSUM	$69,000	$69,000
4	Maintenance of Traffic	1	LSUM	$51,000	$51,000
5	Final Cleanup & Site Restoration	1	LSUM	$103,000	$103,000
6	2 Hp Low Pressure Grinder Station w/ Appurtenances	300	EACH	$10,500	$3,150,000
7	4” PVC Service Lateral	8,000	LF	$35	$280,000
8	2-½” HDPE Forcemain, Directional Drill	12,960	LF	$65	$842,000
9	3” HDPE Forcemain, Directional Drill	10,080	LF	$72	$726,000
10	4” HDPE Forcemain, Directional Drill	5,760	LF	$78	$449,000
11	Air/Vacuum Release Valve, 3” Forcemain	20	EACH	$5,500	$110,000
12	Air/Vacuum Release Valve, 4” Forcemain	15	EACH	$6,000	$90,000
13	Concrete Pavement Repair	3,500	LF	$112	$392,000
14	Asphalt Pavement Repair	8,500	LF	$95	$808,000
	Construction Contingency (10%)	1	LSUM	$765,300	$765,300
	Construction Total	1	LSUM	$8,418,300	$8,418,300
Non-Construction Costs					
1	SRF Preliminary Engineering Report	1	LSUM	$50,000	$50,000
2	Engineering Design, Bid, & Construction Administration	1	LSUM	$673,000	$673,000
3	Construction Inspection	1	LSUM	$505,000	$505,000
4	Asset Management Plan - ms consultants, inc.	1	LSUM	$20,000	$20,000
5	Asset Management Plan - Krohn & Associates	1	LSUM	$5,000	$5,000
6	Financial Advisory Services - Krohn & Associates	1	LSUM	$50,000	$50,000
7	Bond Council	1	LSUM	$26,000	$26,000
8	Legal Council	1	LSUM	$7,700	$7,700

	Non-Construction Total	1	LSUM	$1,336,700	$1,336,700
	Total (Construction + Non-Construction)				$9,755,000
Annual O&M Costs					
20	Personnel (Salary, Benefits, Payroll Tax, Insurance,	1	LSUM	$275,000	$275,000
21	Administrative Cost (Office Supplies, Printing, etc.)	1	LSUM	$277,500	$277,500
22	Waste Treatment Costs	1	LSUM	$508,000	$508,000
23	Insurance	1	LSUM	$12,600	$12,600
24	Energy Cost (Fuel/Electrical)	1	LSUM	$75,000	$75,000
25	Process Chemical	1	LSUM	$30,000	$30,000
26	Monitoring & Testing	1	LSUM	$10,000	$10,000
27	Short Lived Asset Maintenance/Replacement	1	LSUM	N/A	N/A
27	Grinder Pump Replacement	30	EACH	$1,000	$30,000
27	Grinder Pump Controls	10	EACH	$500	$5,000
28	Professional Services	1	LSUM	$3,000	$3,000
29	Residuals Disposal	1	LSUM	$24,500	$24,500
30	Miscellaneous	1	LSUM	$286,000	$286,000
	Total (O&M Costs)				$1,699,000

5.1.4 ALTERNATIVE NO. 04 – CONSTRUCT A NEW WASTEWATER TREATMENT PLANT

5.1.4.1 DESCRIPTION

The facilities included in Alternative No. 04 include the complete replacement and relocation of the existing WWTP. The new facility considered was sized for an ADF of 0.60 MGD, with provisions to easily be upgraded to 0.80 MGD. The new location for the proposed WWTP is on the north side of the North Fork of Salt creek, west of Jackson Branch. This location was considered most feasible as does not require relocating the NPDES discharge location, and requires the least work to relocate forcemain inflows.

The new WWTP was conceptualized as a sequencing batch reactor treatment process. This type of process offers the greatest flexibility to treat storm flows and adapt to future effluent limits. The treatment system would begin with a new Headworks Building, which includes a mechanical fine screen, washer/compactor and grit removal system. The flow would them be conveyed to the sequencing batch reactor consisting of three basins. Two basins would be alternated for biological treatment and the third would be an aerobic digester. This third basin could be converted to a biological treatment basin in the future. The final treatment process included a reaeration basin and UV disinfection.

Additional facilities in this alternative include a Blower / Electrical Building. This structure would house the aeration blowers and main electrical equipment for the facility. The emergency backup power supply would be located adjacent to this structure such that switchgear could also be housed here. A Sludge Dewatering Building would also be constructed to house a belt filter press and ancillary equipment.

5.1.4.2 DESIGN CRITERIA

The entirety of the plant's treatment processes would be sized to accommodate a 0.60 MGD average daily flow, and peak daily flow of 1.80 MGD. The methods and procedures utilized in preparing the design of the wastewater treatment plant improvements are based on the acceptable standards set forth by the Indiana Department of Environmental Management for wastewater collection and treatment. These guidelines are derived from the Recommended Standards for Wastewater Facilities (2014) ("Ten State Standards"). The design criteria applied shall be engineered to accommodate existing and estimated additional flows from possible future improvements.

5.1.4.3 MAP

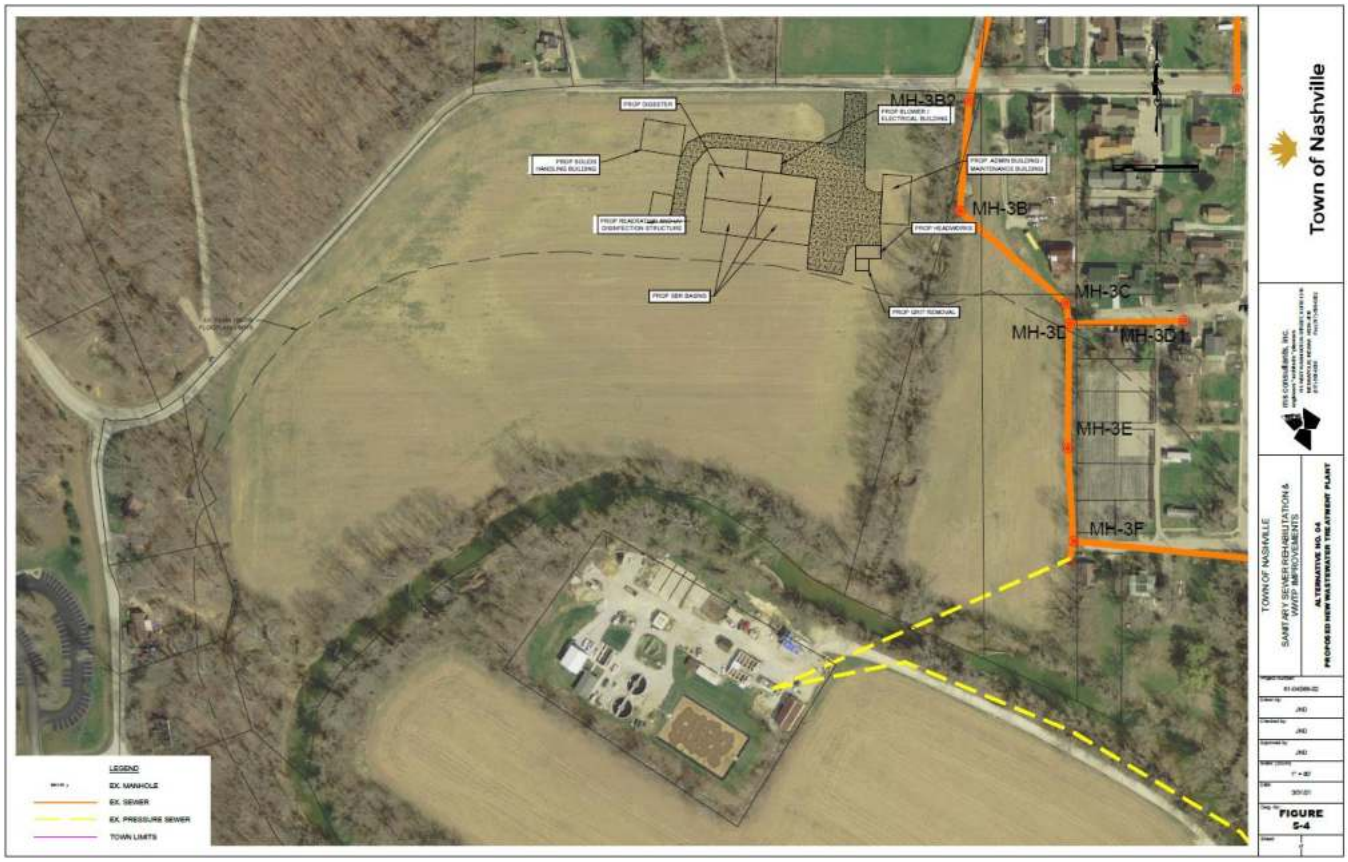


Figure 5-4 - New Wastewater Treatment Plant

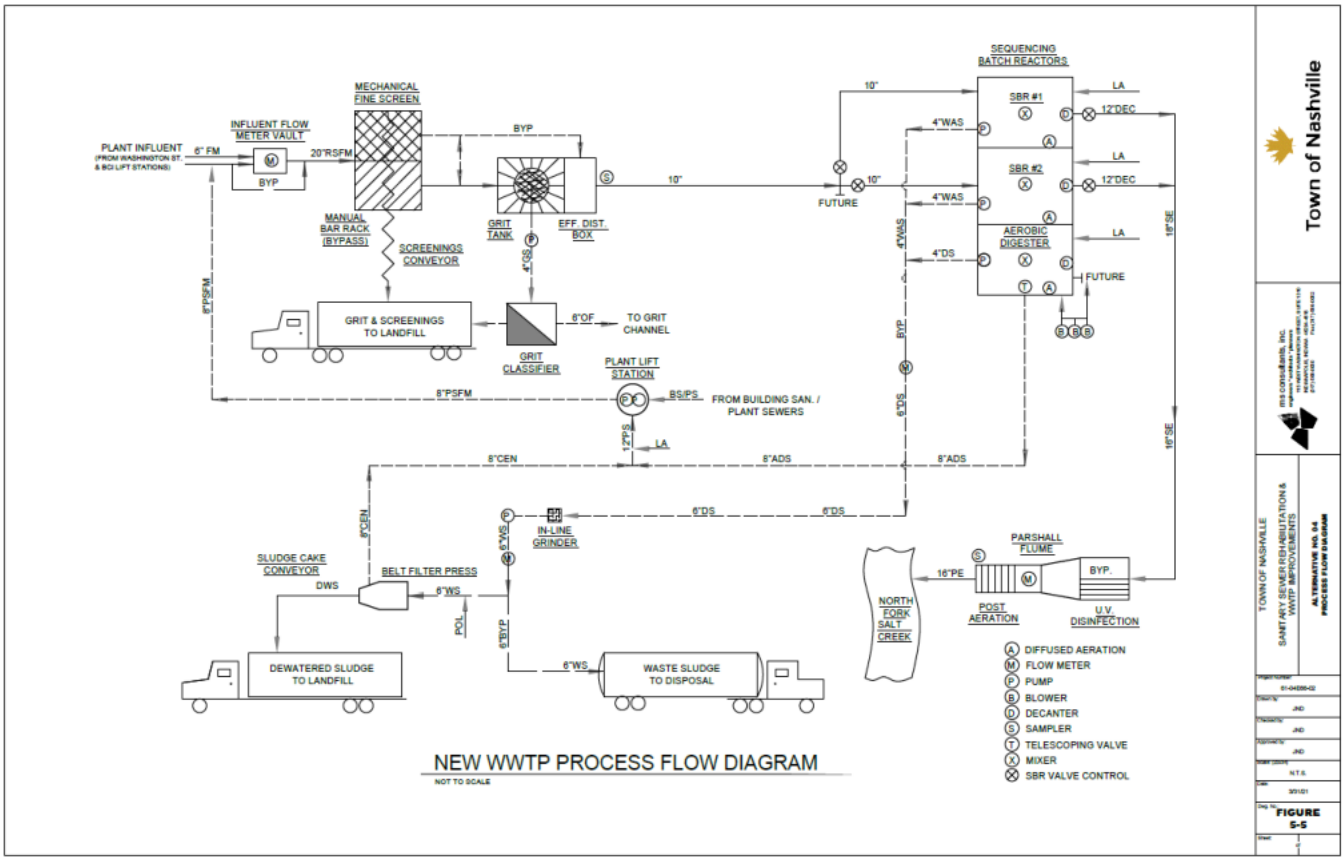


Figure 5-5 - New WWTP Process Flow Diagram

5.1.4.4 ENVIRONMENTAL IMPACTS

The implementation of this alternative is not expected to have any significant impacts to endangered species, or historical and archaeological properties. The existing site is an agricultural farm field, which has been in continuous use since at least 1960. There are no wetlands in or surrounding the proposed site. Additionally, all improvements are proposed to be implemented outside the 100-year FEMA floodplain. Construction activities associated with this alternative are expected to include the generation of excess fill material, resulting from the new tankage. This material is expected to be distributed outside the floodplain, on the proposed site.

5.1.4.5 LAND REQUIREMENTS

In order to facilitate the construction of this alternative an extensive search for property was conducted. This search evaluated criteria such as proximity to established floodway/floodplain, topography, distance from potential discharge points, and modifications to existing infrastructure. After completion of this evaluation, only one site appeared feasible for the relocated WWTP. This site is located along Helmsburg Road, west of Jackson Branch legal drain (State Parcel No.: 07-07-19-300-124.001-004). Figure 5-6 below indicates the proposed property in relation to the existing WWTP.

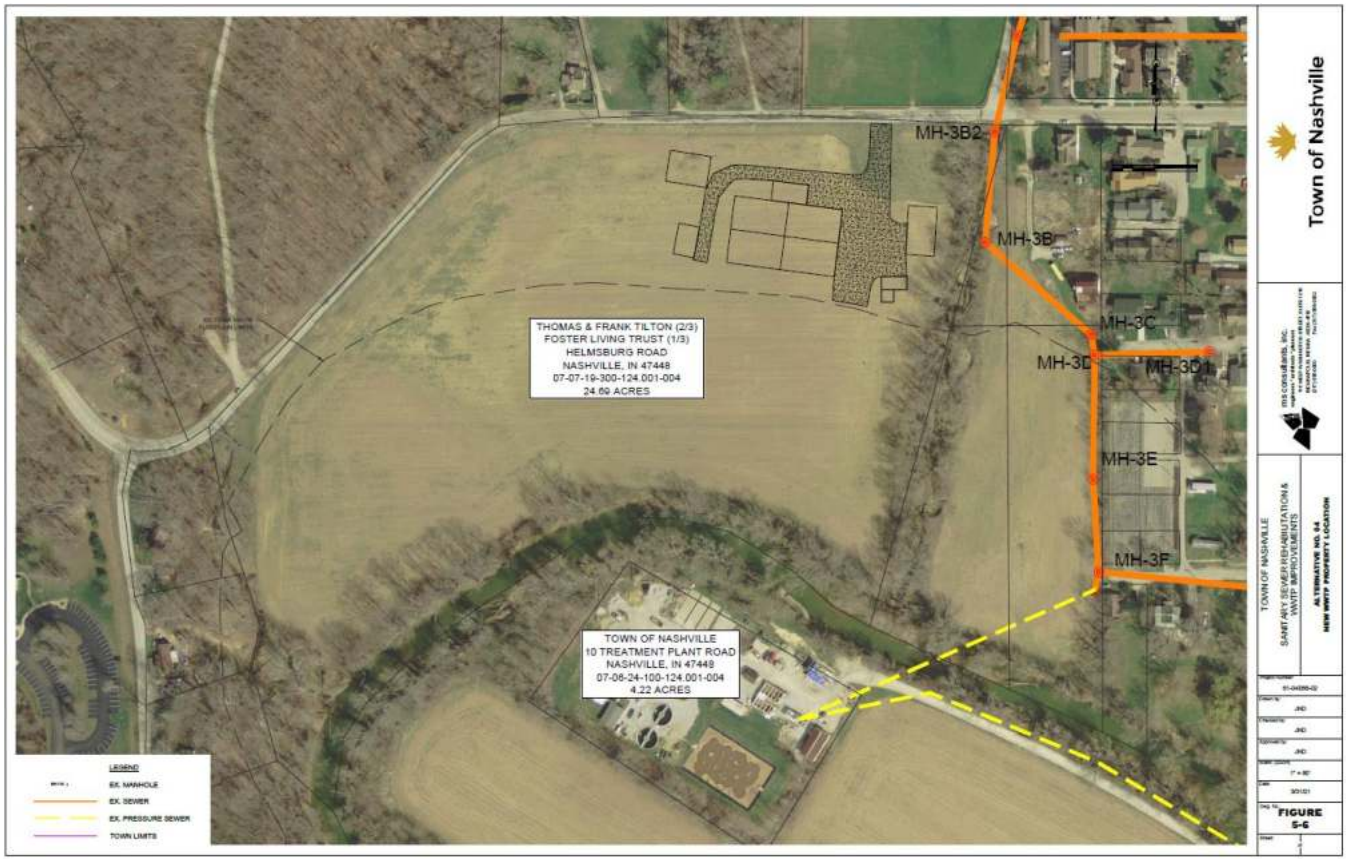


Figure 5-6 - New WWTP Property

This property currently consists of 24.69 acres of agricultural farm field, with a gently sloping topography draining to the North Fork of Salt Creek. Based up the existing FEMA floodplain mapping the northern 12.00 acres of this site are outside the 100-year floodplain. This site is also approximately 800 feet north of the existing WWTP, which would not require relocating the existing NPDES discharge permit location. This site would also require reasonably inexpensive rerouting of the forcemains from the Washington St and BCI lift stations.

The property is currently privately owned by Thomas & Frank Tilton, with a ⅓ interest owned by the Foster Living Trust. This creates a bit of an issue with acquiring this property should this alternative be pursued. During the construction of the original WWTP, back in the early 1960s, the Tilton family owned the property that the WWTP sits on today. After doing some historical research on the existing property, it was determined that this property was obtained through eminent domain. Through correspondence with the current owner's grandson, it appears that the family still holds animosity towards the Town. This would make acquiring the property a long, expensive, and labor-intensive legal battle and not a preferred alternative. Additionally, this option is not preferred as it would bring the proximity of the treatment facilities closer to downtown Nashville and have a negative impact to the quality of life of residents.

5.1.4.6 POTENTIAL CONSTRUCTION PROBLEMS

There are no construction concerns related to the proposed site.

5.1.4.7 SUSTAINABILITY CONSIDERATIONS

WATER & ENERGY EFFICIENCY

The improvements included in this alternative would include all new equipment for the processing of wastewater from the Town. This includes large electrical loads from pumps, blowers, mechanical processing units and ancillary equipment. All equipment, where practical, will include energy reduction measures. This includes high efficiency electric motors, variable frequency drive units, gear reduction appurtenances, etc. Additionally, a robust water reuse system was included in the design. This system would utilize treated effluent from the treatment process in lieu of potable drinking water.

The proposed treatment process includes the use of a sequencing batch reactor treatment process. This process reduced construction cost by combining the biological treatment process and final sedimentation basins into the same physical tankage. This reduces the carbon footprint of the treatment facility by reducing construction materials used and time for construction.

GREEN INFRASTRUCTURE

There are no green infrastructure components proposed for this alternative.

5.1.4.8 COST ESTIMATES

Table 5-3- Alternative No. 04 Cost Estimate

Item	Description	Qty	Unit	Unit Cost	Total Cost
Construction Costs					
1	Mobilization, Demobilization, Bonds & Insurance	1	LSUM	$537,000	$537,000
2	Construction Engineering	1	LSUM	$537,000	$537,000
3	Erosion & Sedimentation Control	1	LSUM	$108,000	$108,000
4	Maintenance of Traffic	1	LSUM	$80,000	$80,000
5	Final Cleanup & Site Restoration	1	LSUM	$129,000	$129,000
6	Headworks and Grit Structure	1	LSUM	$265,000	$265,000
7	Grit Removal System	1	LSUM	$84,000	$84,000
8	Mechanical Fine Screen	1	LSUM	$132,000	$132,000
9	Conveyor & Compactor	1	LSUM	$63,000	$63,000
10	SBR Tankage – Concrete Structures	1	LSUM	$1,703,000	$1,703,000
11	SBR Equipment	1	LSUM	$915,000	$915,000
12	Misc. Piping, Grouting, Coatings, Etc.	1	LSUM	$352,000	$352,000
13	UV, Post Aeration & Metering Structure	1	LSUM	$309,000	$309,000
14	UV Equipment	1	LSUM	$246,000	$246,000
15	Weir Gates	1	LSUM	$15,000	$15,000
16	Blowers	1	LSUM	$135,000	$135,000
17	Aeration Equipment	1	LSUM	$74,000	$74,000
18	Effluent Metering	1	LSUM	$40,000	$40,000

19	Sludge Processing Building	1	LSUM	$215,000	$215,000
20	Sludge Thickening Unit	1	LSUM	$130,000	$130,000
21	Mechanical Dewatering Unit	1	LSUM	$260,000	$260,000
22	Conveyors & Misc. Equipment	1	LSUM	$65,000	$65,000
23	Polymer Skid	1	LSUM	$24,000	$24,000
24	Sludge Transfer / Feed Pumps	1	LSUM	$42,000	$42,000
25	Office / Lab Building	1	LSUM	$510,000	$510,000
26	Furnishings	1	LSUM	$118,000	$118,000
27	Lab Casework	1	LSUM	$48,000	$48,000
28	Lab Equipment	1	LSUM	$100,000	$100,000
29	Electrical, SCADA Controls, HVAC	1	LSUM	$282,000	$282,000
30	Phosphorus Equipment & Level Sensors	1	LSUM	$107,000	$107,000
31	Chemical Dosing Equipment	1	LSUM	$106,000	$106,000
32	Building, Blower Pad, Generator Pad	1	LSUM	$620,000	$620,000
33	New Generator	1	LSUM	$300,000	$300,000
34	Electrical, Instrumentation & Controls	1	LSUM	$1,452,000	$1,452,000
35	Existing WWTP Demolition	1	LSUM	$500,000	$500,000
36	Electrical Service & Misc. Site Wiring	1	LSUM	$254,000	$254,000
37	Site Piping, Valves & Appurtenances	1	LSUM	$908,000	$908,000
38	Civil Site Work	1	LSUM	$363,000	$363,000
	Construction Contingency (10%)	1	LSUM	$1,212,800	$1,212,800
	Construction Total	1	LSUM	$13,340,800	$13,340,800
Non-Construction Costs					
1	SRF Preliminary Engineering Report	1	LSUM	$50,000	$50,000
2	Engineering Design, Bid, & Construction Administration	1	LSUM	$1,067,000	$1,067,000
3	Construction Inspection	1	LSUM	$800,000	$800,000
4	Land Acquisition (10 Acres for WWTP)	10	ACRE	$200,000	$200,000
5	Asset Management Plan - ms consultants, inc.	1	LSUM	$20,000	$20,000
6	Asset Management Plan - Krohn & Associates	1	LSUM	$5,000	$5,000
7	Financial Advisory Services - Krohn & Associates	1	LSUM	$50,000	$50,000
8	Bond Council	1	LSUM	$26,000	$26,000
9	Legal Council	1	LSUM	$8,000	$8,000
	Non-Construction Total	1	LSUM	$2,226,000	$2,226,000
	Total (Construction + Non-Construction)				$15,566,800
Annual O&M Costs					
46	Personnel (Salary, Benefits, Payroll Tax, Insurance,	1	LSUM	$330,000	$330,000

47	Administrative Cost (Office Supplies, Printing, etc.)	1	LSUM	$322,000	$322,000
48	Waste Treatment Costs	1	LSUM	$584,200	$584,200
49	Insurance	1	LSUM	$21,000	$21,000
50	Energy Cost (Fuel/Electrical)	1	LSUM	$90,000	$90,000
51	Process Chemical	1	LSUM	$36,000	$36,000
52	Monitoring & Testing	1	LSUM	$10,000	$10,000
53	Short Lived Asset Maintenance/Replacement				
53A	WAS Pumps/Motors	2	EACH	$35,000	$70,000
53B	Final Effluent Pumps/Motors	2	EACH	$40,000	$80,000
53C	Plant Lift Station Pump Replacement	2	EACH	$35,000	$35,000
53D	SBR Mixers	3	EACH	$75,000	$225,000
53E	SBR Decant Mechanisms	3	EACH	$80,000	$240,000
53F	SBR Diffuser Replacement	12	EACH	$15,000	$180,000
53G	Phosphorus Chemical Pump Replacement	12	EACH	$1,000	$12,000
53H	Instrumentation & Controls Replacement	1	LSUM	$250,000	$250,000
53I	UV Disinfection Bulbs & Ballasts	1	LSUM	$180,000	$180,000
53J	Mechanical Thickening & Dewatering Repairs	1	LSUM	$80,000	$80,000
53K	Conveyor Repair / Replacement	1	LSUM	$50,000	$50,000
53L	Emergency Generator Replacement	1	EACH	$275,000	$275,000
53M	SCADA System Maintenance & Repairs	1	LSUM	$60,000	$60,000
54	Professional Services	1	LSUM	$3,000	$3,000
55	Residuals Disposal	1	LSUM	$26,950	$26,950
56	Miscellaneous	1	LSUM	$286,000	$286,000
	Total (O&M Costs)				$3,810,000

5.1.5 ALTERNATIVE NO. 05 –EXISTING WASTEWATER TREATMENT PLANT IMPROVEMENTS

5.1.5.1 DESCRIPTION

The facilities included in Alternative No. 05 include improvements to the existing sludge treatment and phosphorus removal systems at the WWTP. At this time, the phosphorus treatment system includes chemical storage tanks and feed pumps. These facilities are located in the floodplain adjacent to the North Fork of Salt Creek. Additionally, the existing sludge drying beds and geosynthetic bag dewatering systems are also located in the floodplain. Lastly, the aerobic digester tankage is too small to meet state and federal requirements for a class B biosolid.

The proposed alternative consists of building a sludge processing building on site, above the floodplain. This building would house new mechanical thickening and dewatering units, polymer systems, blowers, and electrical systems. Additionally, this alternative includes the construction of additional aerobic digester tankage. This would also include aeration diffusers, piping, valves and other ancillary equipment.

5.1.5.2 DESIGN CRITERIA

The entirety of the plant's treatment processes would be sized to accommodate a 0.60 MGD average daily flow, and peak daily flow of 1.80 MGD. The methods and procedures utilized in preparing the design of the wastewater treatment plant improvements are based on the acceptable standards set forth by the Indiana Department of Environmental Management for wastewater collection and treatment. These guidelines are derived from the Recommended Standards for Wastewater Facilities (2014) ("Ten State Standards"). The design criteria applied shall be engineered to accommodate existing and estimated additional flows from possible future improvements.

5.1.5.3 MAP

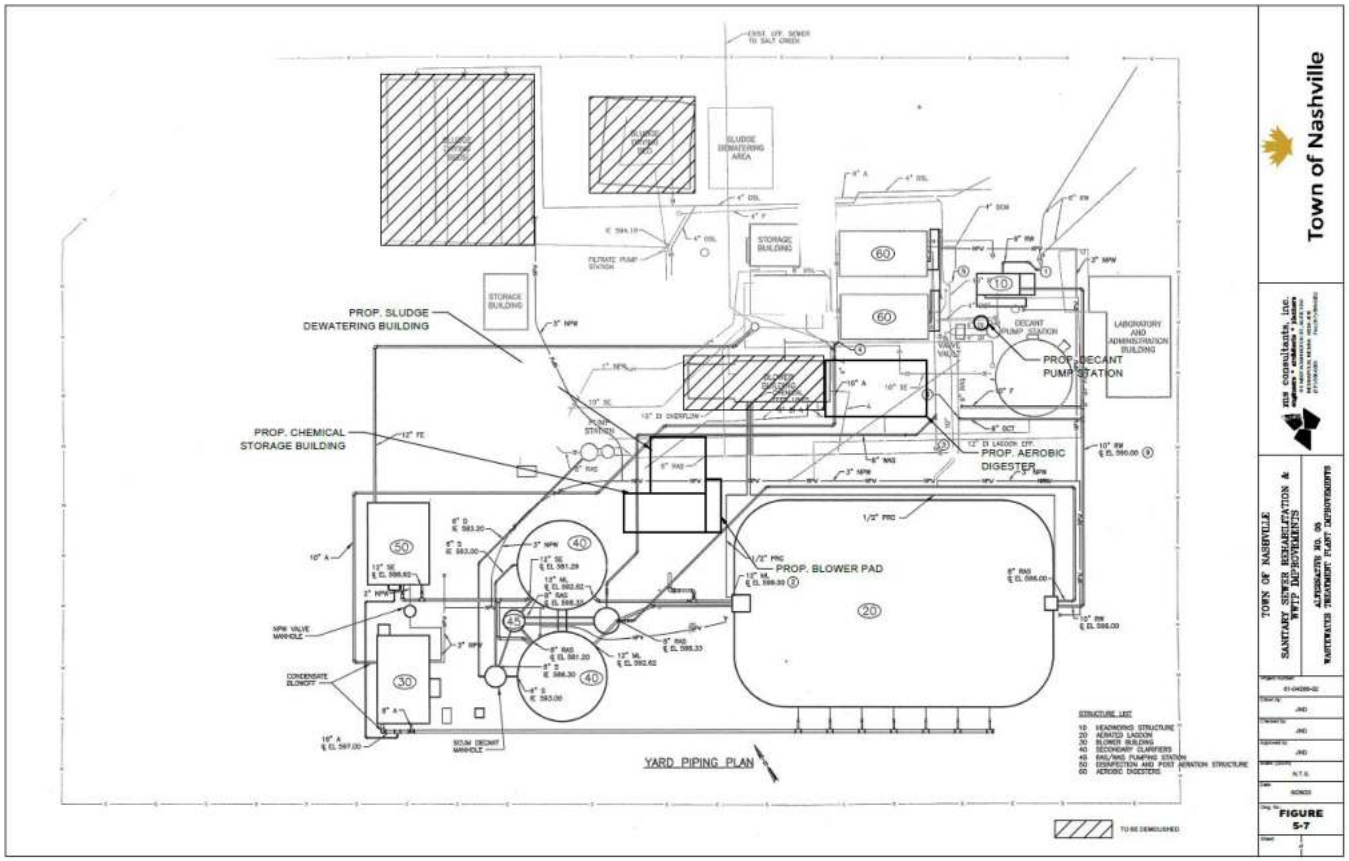


Figure 5-7 - WASTEWATER TREATMENT PLANT IMPROVEMENTS

5.1.5.4 ENVIRONMENTAL IMPACTS

The implementation of this alternative is not expected to have any significant impacts to endangered species, or historical and archaeological properties. The existing site is the WWTP, which has been in continuous use since at least 1967. There are no wetlands in or surrounding the site. Additionally, all improvements are proposed to be implemented in a raised fashion, outside the 100-year FEMA floodplain.

5.1.5.5 LAND REQUIREMENTS

The Town currently owns the property in which the WWTP sits on. This alternative would not require purchasing, leasing or otherwise obtaining any additional property.

5.1.5.6 POTENTIAL CONSTRUCTION PROBLEMS

The proposed improvements would be located inside the floodway, 100-year floodplain and 500-year flood plain. As a result certain mitigation are included in the project, such as setting the finished floor elevation of all structures 2'-0" above the 100-year flood elevation (matching other portions of the plant). Additionally, equipment pads will be located at this same finished floor elevation. Any manholes or valve vaults located below this floodplain will include bolt down / gasketed lids or flood tight access hatches to prevent damage to equipment.

5.1.5.7 SUSTAINABILITY CONSIDERATIONS

WATER & ENERGY EFFICIENCY

The proposed facilities would include new electrical loads to the WWTP. These loads consist of blowers, pumps and the mechanical thickening/dewatering units. These units will utilize high efficiency motors and variable speed drives. Additionally, the aerobic digesters will have a control system to regulate the level of dissolved oxygen in the basins. This will reduce the electrical usage of the blowers while digesting sludge.

GREEN INFRASTRUCTURE

There are no green infrastructure components proposed for this alternative.

5.1.5.8 COST ESTIMATES

Table 5-4 - Alternative No. 05 Cost Estimate

Item	Description	Qty	Unit	Unit Cost	Total Cost
Construction Costs					
1	Mobilization, Demobilization, Bonds & Insurance	1	LSUM	$209,000	$209,000
2	Construction Engineering	1	LSUM	$190,000	$190,000
3	Erosion & Sedimentation Control	1	LSUM	$38,000	$38,000
4	Maintenance of Traffic	1	LSUM	$28,000	$28,000
5	Final Cleanup & Site Restoration	1	LSUM	$57,000	$57,000
6	New Aerobic Digester Tankage	692	YD^3	$1,870	$1,294,000
7	New Aerobic Digester Blowers	3	EACH	$76,000	$228,000
9	New Chemical Storage/Sludge Dewatering Building	1	LSUM	$405,000	$405,000
10	Mechanical Dewatering Unit	1	LSUM	$351,000	$351,000
11	Mechanical Thickener	1	LSUM	$149,000	$149,000
12	New Sludge Pumps	1	LSUM	$68,000	$68,000
13	New Polymer Injection System	1	LSUM	$30,000	$30,000
14	New Digester Diffusers, Air Piping, Valves & Appurtenances	1	LSUM	$135,000	$135,000
15	New Decant Pump Station	1	LSUM	$203,000	$203,000
16	Electrical & SCADA Modifications	1	LSUM	$630,000	$630,000
17	Emergency Generator & ATS (500 Kw)	1	LSUM	$297,000	$297,000
	Construction Contingency (10%)	1	LSUM	$401,500	$401,500

	Construction Total	1	LSUM	$4,416,500	$4,416,500
Non-Construction Costs					
1	SRF Preliminary Engineering Report	1	LSUM	$50,000	$50,000
2	Engineering Design, Bid, & Construction Administration	1	LSUM	$179,000	$353,000
3	Construction Inspection	1	LSUM	$265,000	$265,000
4	Asset Management Plan - ms consultants, inc.	1	LSUM	$20,000	$20,000
5	Asset Management Plan - Krohn & Associates	1	LSUM	$5,000	$5,000
6	Financial Advisory Services - Krohn & Associates	1	LSUM	$50,000	$50,000
7	Bond Council	1	LSUM	$26,000	$26,000
8	Legal Council	1	LSUM	$8,000	$8,000
	Non-Construction Total	1	LSUM	$776,500	$776,500
	Total (Construction + Non-Construction)				$5,193,500
Annual O&M Costs					
24	Personnel (Salary, Benefits, Payroll Tax, Insurance, Training)	1	LSUM	$163,000	$163,000
25	Administrative Cost (Office Supplies, Printing, etc.)	1	LSUM	$185,000	$185,000
26	Waste Treatment Costs	1	LSUM	$558,800	$558,800
27	Insurance	1	LSUM	$10,500	$10,500
28	Energy Cost (Fuel/Electrical)	1	LSUM	$86,250	$86,250
29	Process Chemical	1	LSUM	$30,000	$30,000
30	Monitoring & Testing	1	LSUM	$10,000	$10,000
31	Short Lived Asset Maintenance/Replacement				
31A	Sludge Pump Replacement	1	EACH	$30,000	$30,000
31B	Digester Blower Replacement	2	EACH	$30,000	$60,000
31C	Digester Diffuser Replacement	2	EACH	$20,000	$40,000
31D	Instrumentation & Control	1	LSUM	$25,000	$25,000
31E	Mechanical Thickening/Dewatering Repairs	2	EACH	$30,000	$60,000
31F	Conveyor Repair/Replacement	1	EACH	$15,000	$15,000
31G	Emergency Generator Replacement	1	EACH	$200,000	$200,000
31H	SCADA System Maintenance & Repair	1	LSUM	$25,000	$25,000
32	Professional Services	1	LSUM	$3,000	$3,000
33	Residuals Disposal	1	LSUM	$22,050	$22,050
34	Miscellaneous	1	LSUM	$286,000	$286,000
	Total (O&M Costs)				$2,000,000

6.0 ALTERNATIVE SELECTION

6.1 SUMMARY

The selected alternative consists of rehabilitating the existing gravity sewer system by cured-in-place pipe method (Alternative No. 02, New Salt Creek & Washington Street Lift Stations and improvements to the WWTP (Alternative No. 05). Capital cost as well as schedule make the selected alternative the most feasible to meet the requirements set forth by the IDEM. The rehabilitation of the existing collection system offers the lowest impact to existing customers, and reduces the potential for loss of historic structures. The improvements to the WWTP make the fiscal sense and keep the facility isolated from public view, which is extremely important for the Town given the propensity for tourism.

The Town currently owns the property that would be required to construct the rehabilitation and improvements, and the Salt Creek Lift Station property acquisition is currently in progress. The combination of these alternatives also result in the lowest capital cost while allowing the Town to meet the requirements of the IDEM Agreed Order. Additionally, these improvements allow the Town to recoup lost capacity in the WWTP for new development. Extending the useful life of the existing facilities with minimal impact to the environment.

6.2 LIFE CYCLE COST

The life cycle cost analysis used a 20-year life span to bring the O&M cost to a present worth value. An annual interest rate of -0.5% is used in the present worth analysis. The present worth analysis of the various alternatives utilizes a straight-line depreciation of the durable infrastructure to establish a salvage value at the end of the 20-year project period. Table 6-1 summarizes the present worth analysis completed for the alternatives explored in this engineering report.

Table 6-1 –Present Worth Analysis

ALTERNATIVE	CAPITAL COST	ANNUAL O&M COST	SALVAGE VALUE	PRESENT WORTH
Alt No. 01 – No Action	-	-	-	-
Alt No. 02 – Collection System Rehabilitation	$8,112,300	$1,432,000	$3,488,000	$6,056,300
Alt No. 03 – Collection System Replacement	$9,755,000	$1,699,000	$2,220,000	$9,234,000
Alt No. 04 – New Wastewater Treatment Plant	$15,566,000	$3,810,000	$2,886,000	$16,490,000
Alt No. 05 – Wastewater Treatment Plant Improvements	$5,193,000	$1,371,000	$1,025,000	$5,839,000
Alt No. 02 & Alt No. 04	$18,335,000	$3,810,000	$4,851,000	$17,294,000
Alt No. 02 & Alt No. 05 (Selected Plan)	**$13,382,000**	**$2,000,000**	**$4,161,000**	**$11,221,000**
Alt No. 03 & Alt No. 04	$22,925,000	$3,848,000	$4,682,000	$22,091,900
Alt No. 03 & Alt No. 05	$15,195,000	$2,431,000	$2,804,000	$14,381,000

6.3 NON-MONETARY FACTORS

As previously mentioned, SSO mitigation was directly tied to the Town via an IDEM Agreed Order. The largest non-monetary factor in selecting alternatives revolved around a social aspect, specifically community objection. This community is heavily reliant on tourism for economic stability, specifically the natural setting of the Town. Alternative Nos. 03 & 04 would require the addition or relocation of collection and treatment facilities, at great detriment to the visual beauty of the natural landscape of the Town. Specifically, the new WWTP site selected in Alternative No. 04 would place the facility closer to downtown and adjacent to a heavily traveled east/west transportation corridor. This effectively eliminated this alternative as a feasible alternative. Finally, the construction of a new collection system (Alternative No. 03) would leave hundreds of grinder stations all over Town.

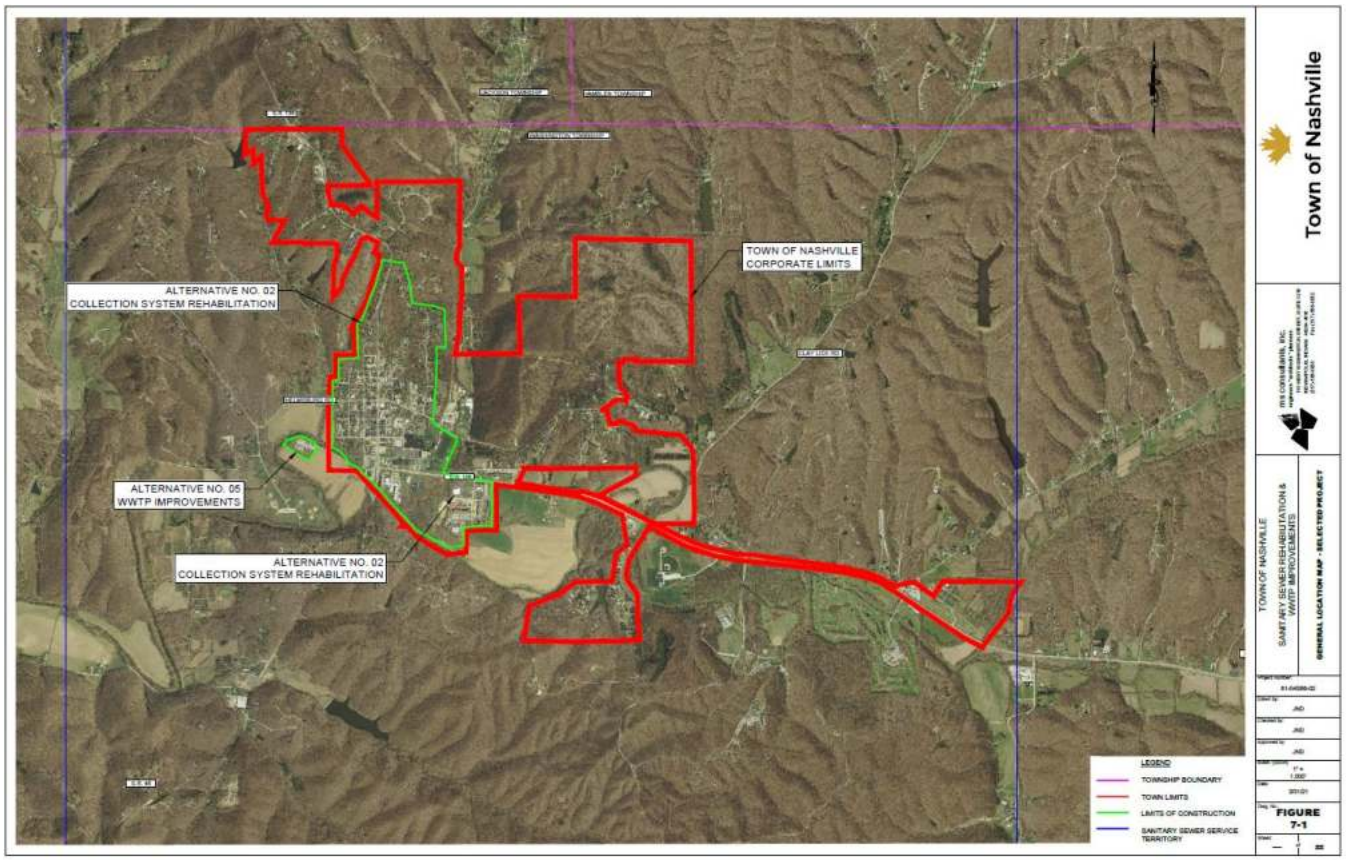
6.4 CONTRACT OPERATIONS

The Town employs staff to operate and maintain the treatment plant and collection system. The treatment plant has an onsite lab to process samples on-site for regulatory compliance. At this point in time the Town does not have the capability to land apply treated sludge. This service could be contracted out to a private entity and will likely be done in this manor should land application of sludge become appropriate. No expansion of the existing facilities is anticipated to support the Selected Project.

7.0 PROPOSED PROJECT

The selected project (recommended alternative) is a combination of Alternative Nos. 02 & 05. The collection system rehabilitation includes the lining of the existing gravity sewers with a cured-in-place pipe method. The Brown County Inn Lift Station would be decommissioned in favor of building a new Salt Creek Plaza Lift Station. This new lift station would eliminate gravity sewer in the floodplain and allow greater capacity to serve additional flow from the Brown County State Park. The Washington Street Lift station would be relocated to the WWTP and a gravity sewer will be put in place to convey flow to it. The WWTP improvements include new aerobic digester tankage, diffusers blowers, piping, valves and appurtenances. Additionally, it includes a new chemical storage building, new mechanical sludge thickening and dewatering facilities. Figure 7-1 below includes a general location map.

Figure 7-1 - Selected Project: General Location Map



7.1 PRELIMINARY PROJECT DESIGN - COLLECTION SYSTEM REHABILITATION

The portion of the collection system identified for cured-in-place-pipe lining includes those lines installed in the 1960s. These lines are generally located in the original corporate limits of the Town of Nashville. Additionally, these lines can be further classified as being constructed of vitrified clay pipe (VCP). When evaluating the scope of this rehabilitation, the total length and size of the line to receive lining was determined as shown in

Table 7-1 below:

Table 7-1- Summary of CIPP Lining

Pipe Size	Pipe Material		Total (ft.)	To Be CIPP Lined (ft.)
	POLYVINYL CHLORIDE (PVC)	Vitrified Clay Pipe (VCP)		
6-inch	0	180	180	0
8-inch	5,500	36,000	41,500	36,000[1]
10-inch	25	0	25	25
Total	5,525	36,180	41,705	36,025

Notes:

1. Approximately 1,800 linear feet of 8-inch VCP pipe will be abandoned with the decommissioning of the Brown County Inn Lift Station, and construction of the Salt Creek Plaza Lift Station. Additionally, the 5,500 linear feet of PVC pipe is in good condition and does not require CIPP lining.

The manholes within the collection system are advanced in their service life. As a result, they have become less water tight, allowing ground water and storm water to infiltrate through cracks in joints. These leaks will be repaired in one of two ways. A cementitious hydrophilic grout will be applied to those manholes showing signs of low to moderate leakage. The second method is for those manholes exhibiting larger cracks through observation of significant infiltration. These manholes will be sealed with a combination of cementitious grout and an epoxy top coat. The manholes identified for rehabilitation total 119 manholes, of which it is estimated that 80% of them will require the more stringent epoxy coating.

An additional component to rehabilitating the collection system is to remove manhole lids from the floodplain. The original collection system was installed in the mid to late 1960s. In the last 60 years, the floodplains have changed, shifting higher and lower with the environment. Today we have a better understanding of where the floodplain is in relation to the top of manhole elevations along the North Fork of Salt Creek. All manholes along waterways will be evaluated and castings raised above the floodplain. The sewer lines and manholes identified for rehabilitation are shown in the general location map below:

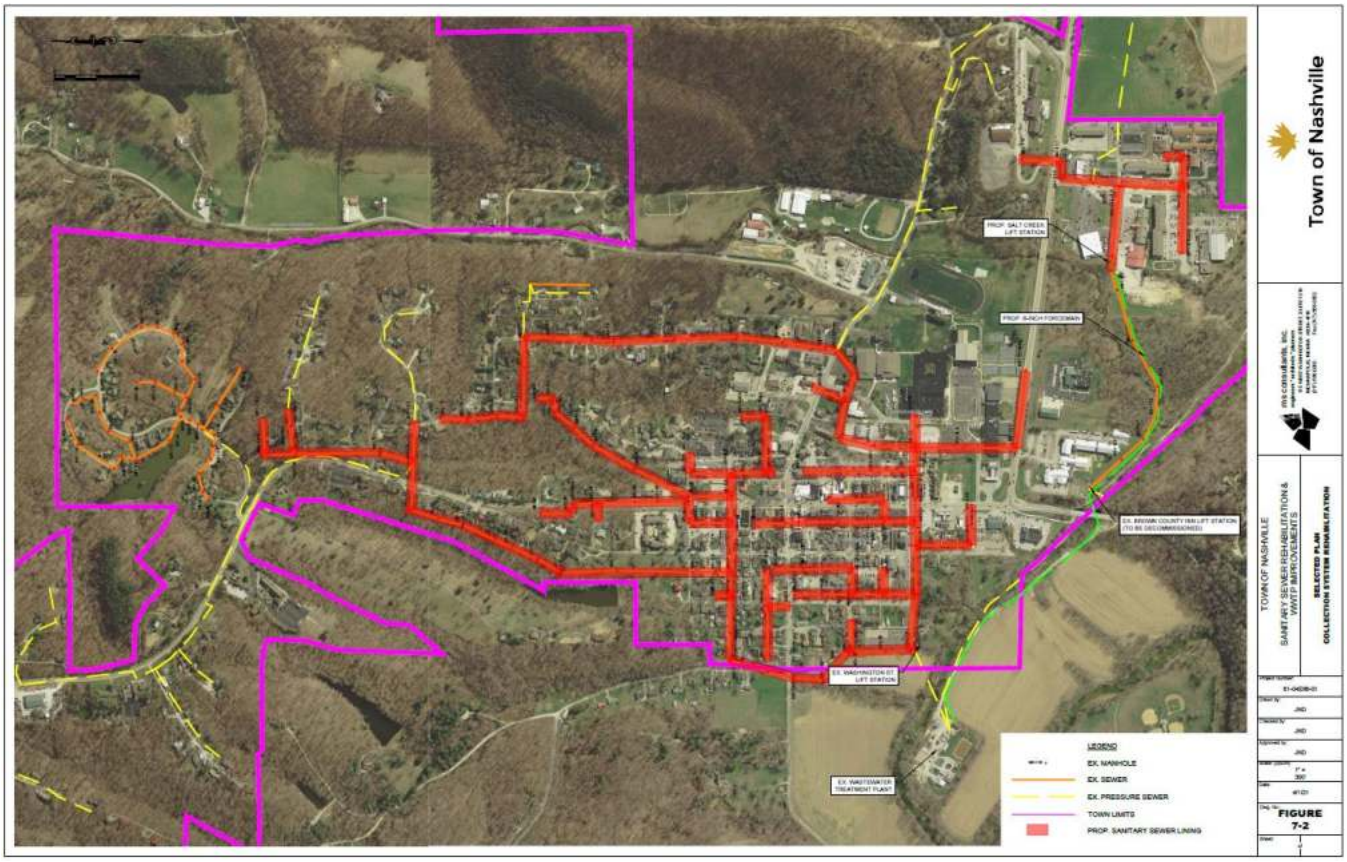


Figure 7-2 - Selected Plan: Collection System Rehabilitation

In addition to the rehabilitation of existing gravity sewer lines, new lift stations will be constructed to replace the Brown County Inn and Washington Street lift stations. The new Salt Creek Plaza Lift Station will be relocated closer to the Salt Creek Plaza development, removing approximately 1,800 LF of gravity main. This gravity main is in poor condition and would be abandoned with this alternative. The new lift station would also include a new, larger, 8-inch forcemain directly to the wastewater treatment plant. The new Washington Street Lift Station will bypass the old damaged one in favor of relocating the station to the WWTP. The combination of a new lift stations and forcemain would allow for additional flow from Brown County State Park to be conveyed to the Town for treatment.

7.2 PRELIMINARY PROJECT DESIGN - WWTP IMPROVEMENTS

The previous Alternative No. 04 resulted in a total project cost far and above what is financially feasible for the Town. Additionally, the acquisition of the property would come at a high financial and public relation cost for the Town. Lastly, the environmental impact to the proposed site would be detrimental for the Town's overall health. As a result, Alternative No. 05 proved more feasible to the Town and was selected.

7.2.1 AEROBIC DIGESTER TANKAGE

The existing aerobic digestion system, as previously discussed, is comprised of two (2) aerobic tanks, blowers, piping, and sludge drying beds. At present, the aerobic digesters have a capacity of 158,500 gallons of treatment capacity. Utilizing the EPA Part 503 regulations as a guide, this volume results in a solids retention time of

approximately 33 days. Since the minimum solids retention time, for design purposes, is 60 days, the tanks are too small. The proposed improvement includes additional aerobic digestion tankage to comply with the permitted average daily design flow. This additional tankage will also include properly sized blower units, diffusers, piping, valves and appurtenances.

7.2.2 SLUDGE HANDLING BUILDING

A new Sludge Handling Building will be constructed on the existing site, above the 100-year floodplain. This building will house a number of components related to the sludge treatment/dewatering process. Additionally, an electrical room will be included to service the new equipment. The equipment to be located in this building is listed as follows:

- Mechanical Sludge Thickening Unit
- Mechanical Sludge Dewatering Unit
- Sludge Transfer Pump(s)
- Polymer Injection Unit
- Digester Blower(s)
- Electrical Equipment

The mechanical sludge thickening unit will be designed to bring the typical 0.6% waste activated sludge and thicken it to approximately 2.5%. This process results in less volume of liquid sludge to be sent to the aerobic digesters, and thus a smaller tank volume required to meet the 60-day digestion period. Two pieces of equipment are being considered for use, a gravity belt thickener and a rotating drum thickener. A thickened sludge pump will be utilized to convey the 2.5% solids sludge to one of the three digesters.

New blowers will be required to provide dedicated aeration to the digesters. Currently the digesters siphon air off the activated sludge treatment process, making precision aeration control impossible. The new blowers will be configured in a triplex configuration, with two (2) duty blowers and one (1) standby unit. These blowers will be positive displacement type blowers, allowing for variable liquid levels in the digesters. The units will be enclosed in sound attenuation enclosures and located on a concrete pad adjacent to the building.

The sludge building will also house a mechanical dewatering unit for final sludge disposal. This unit will take the 2.5% solids, digested sludge, and thicken it to a target range of 15%-20%. There are two technologies being considered, a belt filter press and a screw press. The dried sludge will be deposited into a roll off dumpster and hauled to a local farm field for land application, or to a landfill. The centrate from the dewatering unit will be gravity conveyed to the new Decant Pump Station.

7.2.3 CHEMICAL STORAGE BUILDING

The Chemical Storage Building will be located adjacent to the Sludge Handling Building. This structure will house the bulk storage tanks, which provide for chemical phosphorus removal. This structure will also house the electrical feed equipment necessary to power the Sludge Dewatering Building. These will be a total of 3,500 gallons of bulk chemical stored in this building, along with pumps and piping.

7.2.4 DECANT PUMP STATION

The Decant Pump Station will be a new pump station to replace the old one, which is currently below the floodplain. This new station will be an elevated concrete wetwell, located adjacent to the Headworks Structure.

This is to allow for elevated access to the pumps/piping and to keep the top of the wetwell above the floodplain. This pump station will receive flow from the aerobic digesters (decant), centrate from the mechanical thickener and centrate from the mechanical dewatering unit.

7.2.5 DEMOLITION

A component of this selected plan will include compliance items with the IDEM Agreed Order. This includes the demolition of the existing sludge drying beds and existing blower building. These structures will be removed and disposed of in accordance with local, state and federal regulations. Additionally, there will be numerous small items demolished to allow for the construction of the proposed facilities.

A site layout of the proposed project is included in Figure 7-3 - Selected Plan: WWTP Sludge Improvements below:

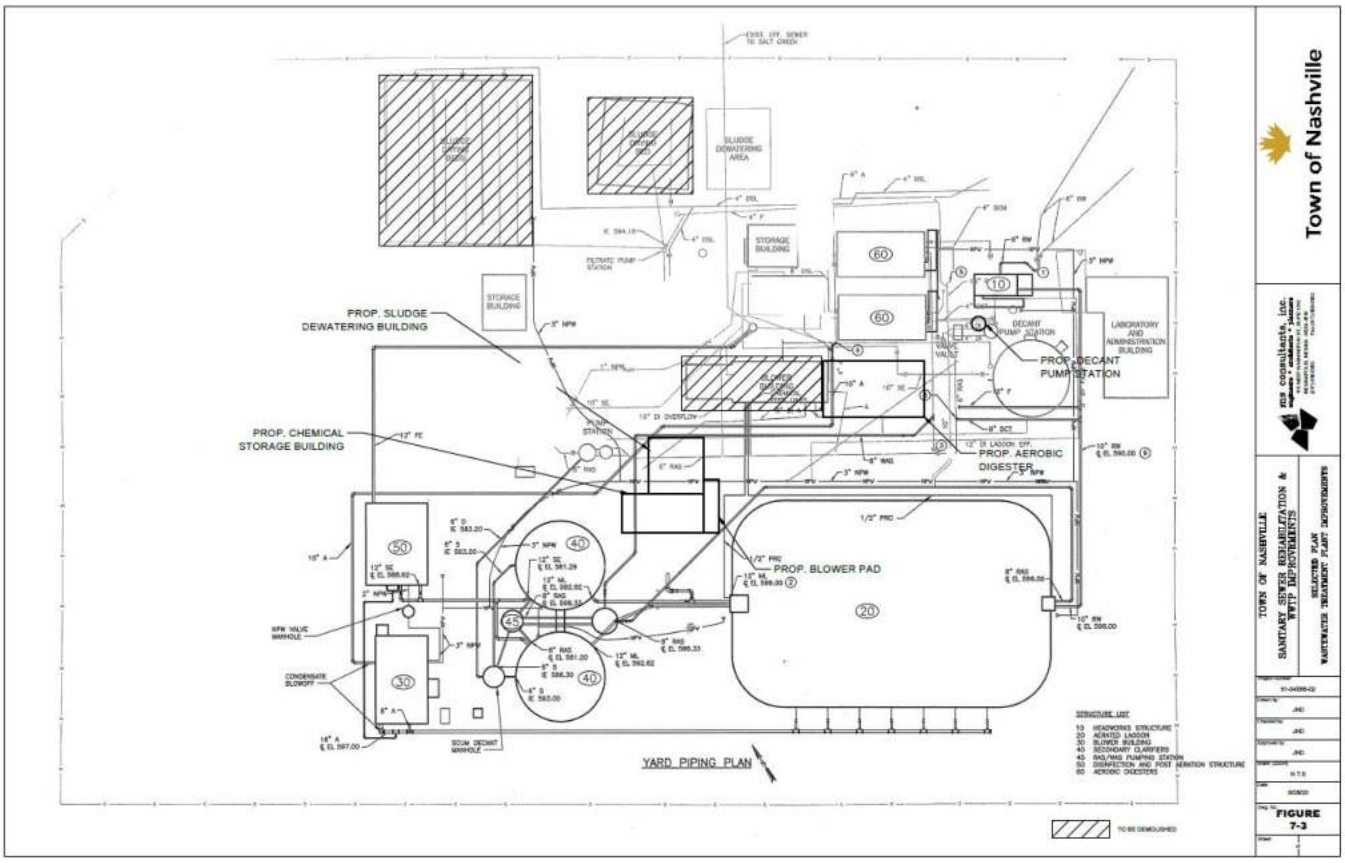


Figure 7-3 - Selected Plan: WWTP Sludge Improvements

Figure 7-4- Selected Plan: WWTP Sludge Improvements

Figure 7-5- Selected Plan: Brown County Inn Lift Station Demolition

Figure 7-6- Selected Plan: Salt Creek Lift Station

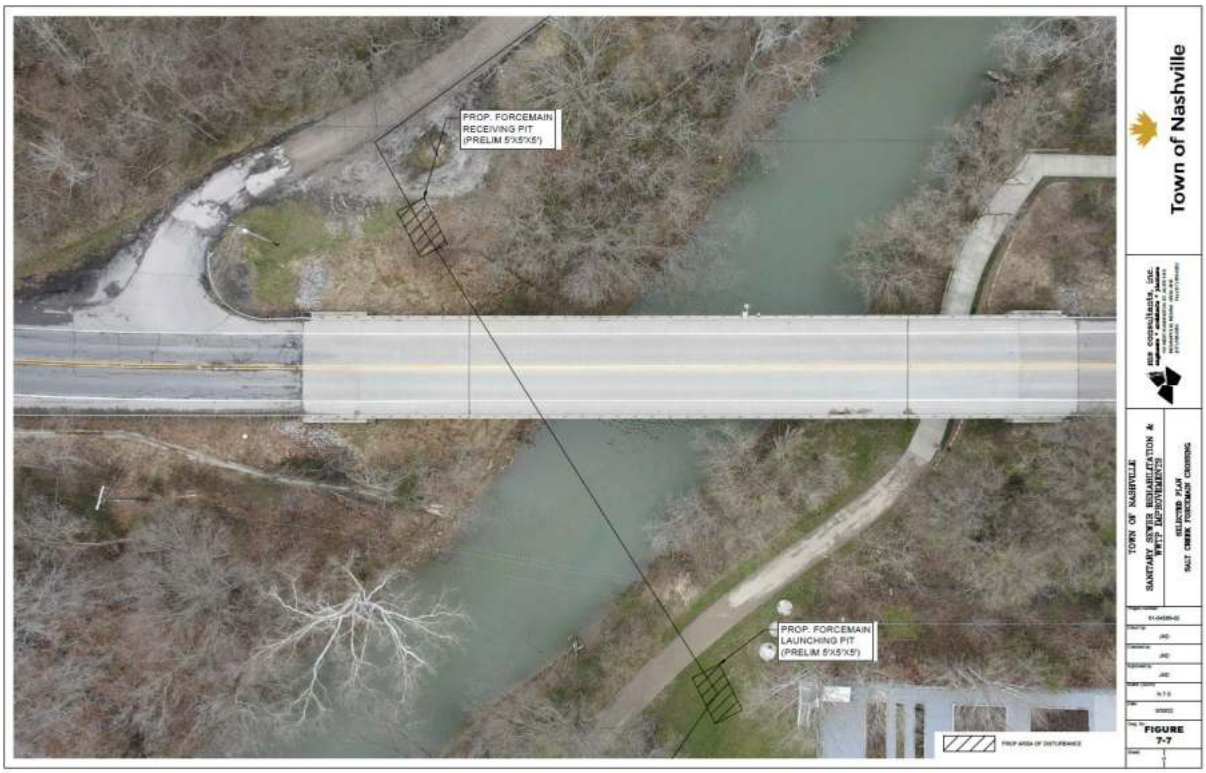


Figure 7-7- Selected Plan: Salt Creek Lift Station Forcemain Route

Figure 7-8 - Selected Plan: Washington St. Lift Station

7.3 PROJECT SCHEDULE

Table 7-2 – Project Schedule

DESCRIPTION	INITIATION	COMPLETION
Preliminary Engineering Report Submittal	4/21/2021	---
Land Acquisition	N/A	N/A
Preliminary Engineering Report Approval	---	3/31/2022
Engineering Design	2/01/2022	10/31/2023
Submit Approvable IDEM Construction Permit	11/01/2023	01/31/2024
Advertisement for Bid	2/1/2024	3/1/2024
IFA Revolving Fund Loan Closing	03/01/2024	05/31/2023
Proposed Start of Construction	06/01/2024	---
Substantial Completion	---	03/01/2026
Project Completion	---	04/01/2026

7.4 PERMIT REQUIREMENTS

The following list includes those known permits that will be required for the project:

- Indiana Department of Environmental Management – Wastewater Treatment Facility Construction Permit
- Indiana Department of Environmental Management – Sanitary Sewer Construction Permit
- Indiana Department of Environmental Management – Stormwater Pollution Prevention Plan (Rule 5) Permit
- Indiana Department of Environmental Management – 401 Water Quality Certification Permit
- U.S. Army Corp of Engineers – 404 Dredge & Fill Permit
- Indiana Department of Natural Resources – Construction in a Floodway Permit
- Brown County – Stormwater Pollution Prevention Plan (Rule 5) Permit

7.5 SUSTAINABILITY CONSIDERATIONS

7.5.1 WATER/ENERGY EFFICIENCY

There are no water efficiency components incorporated into the selected project. However, there are energy savings components to the selected WWTP Sludge Improvements component. This energy efficiency component includes the separation of the digester blowers from the existing combined blower system. Currently one blower unit provides for aeration of the biological treatment basin, post- disinfection re-aeration basin and the digesters. This single blower operates at 100% energy consumption regardless of the air demands in each of the three processes. Since each of the three processes have different aeration needs, this lends itself to excessive electrical demands.

The selected project will separate the digesters from this combined system. Digester basins are not always being aerated. If the basin is empty or being settled in preparation for decanting, the basin will not need air at all. Dedicated blowers for digestion would allow for stopping a blower entirely during these times. Additionally, the digester blowers will be put on variable speed drives. This allows the blower to be accelerated or deaccelerated based on the liquid level in the digester, saving energy.

7.5.2 GREEN INFRASTRUCTURE

There are no green infrastructure components included in the selected plan.

7.5.3 OTHER

There is a resiliency component included in the selected plan. This component is related to increased visible impacts of global climate change. It is becoming more apparent that climate change is causing weather patterns to shift. This shift is likely causing storm events previously thought to have a statistical chance of occurring every 100 years to occur more frequently. The result of this is the migration of previously delineated floodplains and floodways, generally higher than previously thought.

The resiliency component for the collection system component of the project includes the raising of manhole castings above the known 100-year floodplain. Castings which cannot be feasibly raised will be replaced with bolt down / gasketed metal castings. The Salt Creek Plaza Lift Station portion of the project must be located in proximity to the existing collection system for which it serves, and cannot be located outside the base flood.

However, provisions in the design of this component will include the finished floor elevation being 3'-0" above the 500-year base flood.

Regarding the treatment plant component, the existing sludge drying beds are being demolished and a new sludge building constructed 2'-0" above the 100-year floodplain. These improvements will prevent the escape of untreated sewage and sludge into the environment, making the WWTP more resilient to the effects of climate change. The Town of Nashville is aware of the hazards of locating structures in areas subject to the base flood. Location of the proposed project outside the 100-year flood plain is not deemed to be a feasible or reasonable alternative because the improvements are a component of a larger wastewater treatment facility currently located in the base flood. The improvements to the wastewater treatment facility impact non-critical infrastructure and appropriate design considerations have been made.

The Town will ensure, through local zoning laws or other means, will ensure that the SRF-funded facilities will be protected from the 500-year flood to two feet above the base flood elevation for non-critical infrastructure, or to three feet above the base flood elevation for critical infrastructure in accordance with Executive Order 13690. The Town will require new development and infrastructure projects to be constructed within the guidelines of the U.S. Fish and Wildlife Service, IDNR, IDEM, and other environmental review authorities.

7.6 ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST (OPCC)

A detailed total project cost estimate can be found in Appendix B to this report.

7.7 ANNUAL OPERATING BUDGET

7.7.1 INCOME

The Town's in-town sewer rate structure for the 2022 fiscal year is as follows:

Table 7-3 – Sewer Meter Service Charge

Water Service Meter Size (inch)	Monthly Charge
5/8	$33.29
1	$80.18
1-½	$164.72
2	$277.91
3	$562.00
4	$989.58
6	$2,008.41

Table 7-4- Sewer Use Charge

Sewer Usage (gallons)	Monthly Charge
0 – 2,000	$10.19
2,001 – 6,000	$10.56
6,001 – 15,000	$11.06
15,001 – 30,000	$11.68
30,001 +	$12.43
---	---
---	---

1 – Rates shown above are for in-town residential customers. Outside of town customers, pay a different rate.

Assuming the average customer with a 5/8" water service uses 4,000 gallons per month, a typical bill for in-town residents is $74.79. In 2019, the sanitary sewer utility collected revenue from metered ratepayers, unmetered ratepayers, charges for other services and interest/investments.

Table 7-5 below summarized the 2019 revenue sources for the Town's Utility.

Table 7-5 - Summary of Sewer Utility Revenue

Revenue Source	2019 Amount
Metered or Measured Sales & Services	$1,079,628.05
Unmetered Sales and Services	$6,000.00
Other Charges for Service – Wastewater Operation of Grinder Stations	$21,530.56
Total Sewer Utility Revenue	$1,107,158.61
Earnings on Investments & Deposits	$26,425.42
Misc. Revenue	$26,611.86
GRAND TOTAL SEWER UTILITY OPERATING	**$1,160,195.89**

A high-level operations and maintenance budget for 2019 is included in Table 7-6 below:

Table 7-6 - Summary of Sewer Utility Expenditures

Expenditure	2019 Amount
Salaries & Wages	$223,894.75
Insurance	$62,679.19
Rentals	$15,035.38
Improvements Other Than Buildings	$83,867.66
Machinery, Equipment & Vehicles	$34,902.81
Transfers to Other Funds	$286,395.00
Other Disbursements	$38,241.91
Chemicals	$29,731.25
Contractual Services	$109,019.09
Employee Pensions & Benefits	$30,655.25
Materials & Supplies	$60,486.23
Power Production & Purchased Power	$68,659.42
Purchased Water	$3,073.72
Sludge Removal	$24,562.81
Transportation	$4,884.24
Other Operating	$6,700.31
GRAND TOTAL SEWER UTILITY OPERATING	**$1,082,789.02**

In the above table, there is a line item for “Transfers to Other Funds”. A detailed review of these transfers confirmed that the amount was transferred due to contractual obligations. These obligations include debt service coverage for existing bonds/loans, sanitary sewer depreciation, and sanitary sewer asset management.

7.7.2 ANNUAL O&M COSTS

Table 7-7 summarizes the annual operations and maintenance costs experienced in 2019.

Table 7-7 - Annual O&M Costs for Selected Plan

Item	Description	Annual Cost
1	Personnel (Salary, Benefits, Payroll Tax, Insurance, Training)	$163,000
2	Administrative Costs (Office Supplies, Printing, etc.)	$185,000
3	Waste Treatment Costs	$558,800
4	Insurance	$10,500
5	Energy Cost (Fuel/Electrical)	$86,250
6	Process Chemical	$30,000
7	Monitoring & Testing	$10,000
8	Short Lived Asset Maintenance	$455,000
9	Professional Services	$3,000
10	Residuals Disposal	$22,050
11	Miscellaneous	$286,000
	Total Annual Cost	**$2,000,000**

7.7.3 DEBT REPAYMENTS

Table 7-8 summarizes the four (4) existing loans for past sewer utility projects the Town as completed. The selected plan is proposed to be funded, 100%, through IFA State Revolving Fund loans and grants.

Table 7-8 – Existing Debt Service

OWED	PURPOSE	TERM (YR.)	FIRST PAYMENT	ORIGINAL DEBT	ANNUAL PAYMENT	INTEREST RATE	MATURITY DATE
USDA	Wastewater Facility Expansion - A	40	2010	$2,545,000.00	$99,430.00	2.25%	2050
USDA	Wastewater Facility Expansion - B	40	2010	$1,060,000.00	$41,777.52	2.25%	2050
People's State Bank[1]	Utility Equipment – Track Hoe	---	2020	$60,133.08	---	1.50%	---
People's State Bank[1]	Utility Manager Truck	5	2018	$30,405.50	$5,930.08	2.75%	2023
Proposed Indiana SFR	Sanitary Sewer Rehabilitation & WWTP Improvements	20	---	---	---	---	---

1 – This debt is shared between the Water Utility, Sewer Utility & Street Department. As a result, the Sewer Utility is only responsible for ⅓ of the debt associated with this debt.

7.7.4 RESERVES

7.7.4.1 DEBT SERVICE RESERVES

The Town currently has a total debt service of

Table 7-9 - Debt Service Reserves

Owed	Purpose	Original Debt	CURRENT BALANCE (AS OF 12/31/2019	ANNUAL DEBT SERVICE RESERVE	Total Debt Service Reserve (As of 12/31/2019)
USDA	Wastewater Facility Expansion - A	$2,545,000.00	$2,209,000.00	None, Fully Funded	$99,430.00
USDA	Wastewater Facility Expansion - B	$1,060,000.00	$921,000.00	None, Fully Funded	$41,777.52
People's State Bank[1]	Utility Equipment – Track Hoe	$60,133.08	$60,133.08	None, Fully Funded	---
People's State Bank[1]	Utility Manager Truck	$30,405.50	$19,627.74	None, Fully Funded	$1,976.69
Proposed Indiana SRF	Sanitary Sewer Rehabilitation & WWTP Improvements	---	---	---	---
	Grand Total	$3,695,538.58	$3,209,760.82		$143,184.21
	Total (As of 12/31/2019)	---	$3,209,760.82		$143,184.21
				Unallocated Debt Service Reserve (As of 12/31/2019)	**$2,830.46**

7.7.4.2 SHORT LIVED ASSET RESERVE

Table 7-10- Short Lived Asset Reserve

Item	Description	REPLACEMENT COST	USEFUL LIKE (YRS.)	Annual Reserve
1	Previous Wastewater Bond(s)	---	---	$65,220.00
2	Sludge Pump Replacement	$30,000	11 - 15	$2,000.00
3	Digester Blower Replacement	$60,000	11 - 15	$4,000.00
4	Digester Diffuser Replacement	$40,000	5 – 10	$4,000.00
5	Instrumentation & Control Replacement	$25,000	5 – 10	$2,500.00
6	Mechanical Thickening/Dewatering Repairs	$60,000	16 – 20	$3,000.00
7	Conveyor Repair/Replacement	$15,000	11 – 15	$1,000.00
8	Emergency Generator Replacement	$200,000	16 – 20	$10,000.00
9	SCADA System Maintenance & Repairs	$25,000	5 - 10	$2,500.00
	Total	**$1,025,000**		**$94,220.00**

7.8 INFRASTRUCTURE OPERATIONS

The sanitary sewer infrastructure is currently operated by Town staff, of which the plant super intendent holds a Class III operator's license. The proposed project will not change the classification of the collection system or treatment facility. Therefore, the existing certified operator will remain unchanged.

7.9 REGIONALIZATION

See Appendix H for discussion on the regionalization considerations for this project.

7.10 FISCAL SUSTAINABILITY / ASSET MANAGEMENT PLAN

The Town will develop a Fiscal Sustainability Plan that meets the minimum requirements listed in the Federal Water Pollution Control Act Section 603(d)(1)(E)(i) and will submit a completed FSP Certification Form prior to request for final disbursement related to the primary project.

The Town will develop an Asset Management Program that meets the requirements defined by the State Revolving Fund's Asset Management Program Guidelines pursuant to Indiana Code 5-1.2-10-16 and will submit a completed AMP Certification Form prior to request for final disbursement related to the primary project.

8.0 RECOMMENDATIONS

It is essential that the selected project satisfy the IDEM Agreed Order requirements to both eliminate SSOs in the collection system, and remove treatment processes from the floodplain. This preliminary engineering report outlined a number of alternative approaches and technologies to satisfy these requirements. However, only the selected plan achieves these goals in a cost effective and having as little environmental impact as possible.

The rehabilitation of the collection system is critical to eliminating the existing sanitary sewer overflows. The most cost effective method, with the lowest impact on the community, to achieve this is through the use of a cured-in-place pipe method. This method will allow continuous lining of the existing gravity sewer lines without surface disturbance. Creating a monolithic and watertight liner to prevent groundwater from infiltrating into the system. Additionally, raising and sealing the existing manhole will prevent groundwater infiltration and submergence during rain events.

The new Salt Creek Plaza Lift Station is essential to providing capacity to serve the Brown County State Park. Along with this new lift station, an old lift station and trunk line will be removed from service. This old trunk line is routed through low-lying areas, which expose it to significant I&I. Abandoning this line and relocating the lift station remove a significant contributor of I&I from the collection system. The new Washington Street lift station is essential to replace the currently damaged lift station.

The WWTP improvements will increase the treatment capacity and quality of sludge that comes into the plant. These new facilities are critical in assuring that future processed and dried sludge does not reenter the environment during rain/flooding events. Additionally, the improvements are necessary to achieve compliance with an existing IDEM Agreed Order. It is recommended that the Town implement the improvements outlined in this preliminary engineering report.