ENGINEERING FEASIBILITY STUDY

BOROUGH OF SHARPSVILLE
WATER TREATMENT FACILITY

FOR

BOROUGH OF SHARPSVILLE
MERCER COUNTY, PENNSYLVANIA

DECEMBER 14, 2005

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1.0 EXECUTIVE SUMMARY

The Sharpsville Borough Water Treatment facility was constructed in 1954. Through proper maintenance, the facility has historically served the system with only minor renovations and additions.

The facility is no longer capable of meeting the current and future proposed drinking water standards and it is currently in violation of the Stage I Disinfectant/Disinfection By-products Rule. As regulations become more stringent, the antiquated treatment process will need to be replaced with more advanced treatment technology to ensure continued compliance.

The facility's structural and mechanical components such as the tanks, piping, valves and controls have exceeded their useful life and must be replaced. As a result of this poor condition, the operation of the existing facility is very labor intensive.

The Borough is faced with a decision to construct significant renovations to the existing facility or replace it entirely. The Borough recently hired Gwin, Dobson & Foreman, Inc. (GDF) engineers to evaluate the existing facility and make recommendations for improvements.

GDF thoroughly evaluated the various treatment facility components and determined that due to the age and condition of the existing facility, a complete renovation or replacement of the facility would be necessary. GDF also identified the treatment components needed to provide a viable treatment system to meet the long-term needs of the system and to comply with future drinking water standards.

The cost to renovate the existing facility was estimated at $5,280,000 and the cost to construct a entirely new facility at the present location was $5,550,000. The estimated annual operation and maintenance cost was slightly less for the new facility, which based on a 20-year present worth analysis, resulted in a similar cost for either alternative.

The renovation of the existing facility will be extremely difficult since the Borough must maintain continued service during construction. This difficulty, along with the slightly higher O&M cost, makes the construction of a new facility as the recommended alternative.

Based on discussions with Pennvest representatives and the economic status of the service area, the Borough may be eligible for low interest loans to finance the project. Assuming Pennvest funding is secured, either project will result in an average residential user rate increase from the current rate of $25.64 per month to approximately $36.00 - $40.00 per month. The acquisition of grant funds should also be pursued to minimize the rate increase.

Interim operational changes should also be implemented in an attempt to remedy current violations. These measures may allow the Borough to stay in compliance during the design, permitting, funding and construction of a new treatment facility.

The following Implementation Schedule is proposed for the completion of the Borough's Water Treatment Facility Project.

	Project Element	**Date**
1.	Submit Feasibility Study to DEP	December 2005
2.	PennVEST Planning Consultation Meeting	January 2006
3.	Submit Pilot Study Proposal to DEP	January 2006
4.	Begin Pilot Study	March 2006
5.	Begin Preliminary Design	March 2006
6.	Complete Pilot Study	June 2006
7.	Submit Pilot Study Report	July 2006
8.	Complete Final Design	September 2006
9.	Submit PWS Permit to DEP	October 2006
10.	Submit PennVEST Application	December 2006
11.	PennVEST Board Meeting	February 2007
12.	Advertise for Construction Bids	March 2007
13.	Receive Construction Bids	April 2007
14.	PennVEST Closing	May 2007
15.	Begin Construction	June 2007
16.	Complete Construction	August 2008
17.	Receive Operating Permit	September 2008

2.0 INTRODUCTION

The Borough of Sharpsville retained the services of Gwin, Dobson & Foreman, Inc. (GD&F), to conduct a feasibility study relating to the rehabilitation or replacement of the existing water treatment facility.

The purpose of the study is to provide the Council with a clear and thorough evaluation of the existing conditions at the facility, review both current and future regulatory requirements, and evaluate the rehabilitation of the existing facility and the construction of a new facility. The study will provide recommendations that will address current deficiencies as well as the Borough's long-term water treatment needs.

Constructed in 1954, the existing treatment facility is no longer able to meet the long-term water treatment needs of the Borough. The facility is currently in violation of regulatory requirements relating to disinfection by-products. The facility is also labor intensive to operate and is suffering from excessive wear resulting from years of service. Therefore, based on sound engineering principals, this study did not evaluate any temporary or short-term improvements at the treatment facility.

Further, this study did not include any analysis of the existing water distribution system or storage facilities. These aspects of the water system will be evaluated at a later date once the water treatment facility has been addressed.

This report includes a brief history of the Borough's water treatment system, an evaluation of existing conditions and a review of current and proposed regulatory requirements. The study then evaluates the two alternatives and provides a cost estimates including a 20 year present-worth analysis of operation and maintenance costs. The report concludes with a financial analysis, final recommendations and an Implementation Schedule.

3.0 HISTORY AND BACKGROUND

Sharpsville's Water Works Plant was established in 1897 when two bond issues of $14,000 each were approved for its construction. A contract totaling $23,422 went to Standard Boiler and Bridge Company of Bellaire, Ohio.

The plant was completed in 1898 and water was first served to the public. In the beginning, the water was used principally for sprinkling and there was very little used in homes. The system initially served only 150 homes in the first year. Water was initially sold on a flat rate system but in 1911, a metering system was adopted.

The original system drew from one well but additional wells were drilled in 1920. The original wells were pumped by the airlift method and in 1939, electric pumps were installed.

In 1944, it appeared that recently drilled wells at camp Reynolds were draining the Sharpsville supply but, this was found not to be the case. In the fall of 1944 the Chester Engineering Company of Pittsburgh conducted a source and water quality evaluation.

In 1946, a new 220 foot well was drilled on the former Clair Furnace Property. This well was put into service that summer and the water problem was believed solved.

In 1951, the Council began working on the problem and started by interviewing a number of District Engineers. During that year they initiated discussions with Shenango Valley Water Company to see if they could buy water from them.

In January of 1952, a flood contaminated one well and dropped the water pressure so low that the Buhl Farm area was without water for nearly two days.

In 1952, council hired Morris Knowles, Inc., a Pittsburgh Engineering firm, to evaluate existing conditions and develop a report for system improvements. The study recommended the construction of a new treatment plant and the Borough decided to proceed since the cost of a new plant was similar to the cost of renovating the old one.

The engineers recommended that the plant be financed through a municipal authority, so in June of 1952, the Council created a Water Authority and named Thomas Lally, Jack Moore, Eben Lawrence, Charles KiMarco and Harold Stevenson as its members.

Plans and specifications for the new plant were developed and on August 11, 1953, bids were opened and shortly after, contracts were signed. The Water Authority borrowed $450,000 through a bond issue to pay for the new plant.

Construction began in November of 1953 and the plant opened in October 1954.

The new Treatment Plant provided water to approximately 1,680 metered customers who used 450,000 to 500,000 gallons of water daily. The plant had a rated capacity of 1,045,000 gallons per day providing reserve capacity for system growth.

At the time of the 1954 project, the distribution system in the Borough was comprised of approximately 21 miles of 8-inch pipe, 47,500 feet of 6-inch pipe and 35,000 feet of 4-inch pipe.

Since its inception in 1898, the Borough's water system has seen several changes over the past 108 years. The Borough continues to rely on the water treatment plant constructed in 1954; however, several improvements have been made over the years. In 1976, the Borough constructed a wastewater holding tank and sludge lagoons. In addition, the Borough has made several equipment changes including pumps, valves, filter media, filter controls and instrumentation. Recently, the Borough made concrete repairs to the sedimentation basins and replaced their electrical distribution system.

The Borough currently serves water to a total of 1,982 domestic, commercial and industrial customers. Approximately 96% or 1,908 of these customers are residential customers. The Borough also provides an average of 180,000 gallons per day of water to a portion of South Pymatuning Township as a bulk water customer.

The Borough produces an average of 656,000 gallons of water per day (gpd) to meet customer demands and their peak day demand in 2004 was 1,013,000 gpd. The current average monthly residential water rate is $25.64 per 5,000 gallons.

4.0 EVALUATION OF EXISTING CONDITIONS

The Sharpsville Borough Water Treatment facility utilizes a conventional treatment process consisting of coagulation, flocculation, sedimentation, filtration and disinfection. The facility's permitted capacity is 1.045 MGD with a maximum flow rate of 726 gpm. The Borough's sole water source is an intake on the Shenango River. Their current allocation is limited to 1.0 MGD. A site plan of the existing facility is provided in Appendix A and a floor plan of the existing treatment building is provided in Appendix B. The following section provides a general description of each of the major components of the treatment facility. The deficiencies identified during the evaluation are also provided.

4.1 River Intake

The water treatment plant's raw water intake is located on the Shenango River immediately adjacent to the plant. Two points of intake were originally provided including a headwall on the river bank and a pipe extending out into the river. The river bank headwall is no longer used. The intake located approximately mid-stream is comprised of a pipe protruding up from the river bottom. The pipe has a tee with an elbow on each side of the tee facing downstream. Treatment plant personnel have added a diversion structure comprised of sheet plastic and fencing to reduce leaves and debris from entering the intake pipe. Water from the intake is piped to the intake chamber located on the river bank. The intake chamber is a two compartment concrete chamber with a mesh screen between the chambers. The screen is routinely cleaned of debris by plant personnel using a basket rake.

The primary operational issue with the existing intake is the maintenance labor required for routine cleaning. The diversion structure in the river is effective at keeping leaves and debris away from the intake pipe but requires frequent removal and repairs. The removal of debris from the mesh screen at the intake chamber is also labor intensive. During storm events or fall defoliation, the screen can require hourly attention during water production. Additionally, any debris that settles into the intake chamber must be removed with a bucket and rope.

Diversion Structure at Raw Water Intake

Intake Chamber (On Right)

4.2 Raw Water Pumping

River water is pumped from the intake chamber to the mixing chambers located within the treatment plant building. Two centrifugal, Fairbanks Morse pumps, rated at approximately 1 MGD each, are located in the lower level of the building. These pumps lift water from the intake chamber and they require a vacuum to prime. A vacuum pump is connected to each pump intake with a manual ball valve for applying vacuum to prime the pumps. Priming of these pumps takes approximately 30 minutes each time the plant is started.

The obvious concerns with these pumps are their age and the need to continuously prime them prior to use. The internal rotating assemblies and motors have been replaced but they are still operating in 50-year old housings. The isolation valves before and after the pumps will no longer seal which does not allow the operators to remove a pump from service for repairs without shutting down the entire treatment plant. The vacuum system is dependant on manual operation and is outdated. A leak in any of the piping or a problem with the vacuum pump prevents the operators from being able to prime the pumps and start the facility.

Raw Water Pumps and Piping

4.3 Mixing Chambers

The raw water pumps transfer water into the two (2) mixing chambers located within the treatment building. Despite the name, the detention time and single speed mixers of the mixing chambers are more characteristic of a flocculation basin. The purpose of the mixing chambers is to provide a means of mixing the coagulant chemicals and to form larger floc particles that can subsequently be removed via sedimentation and filtration. Each chamber is approximately 12' square and 14' deep with a volume of 15,080 gallons each. Combined, the chambers provide 42 minutes of flocculation time at the facility's permitted capacity of 1.0 MGD. The mixing chambers can be operated in a parallel or a series configuration. By changing valve position, operating personnel can select the desired operational mode. The Borough currently utilizes the chambers in a series configuration. Mixing is accomplished in these basins with a wooden paddle style mixer in each basin. The drive units for these mixers are located on the operating floor of the chemical feed room with shafts extending down through the floor to the actual mixer. Coagulant (polyaluminum sulfate) and powdered carbon are fed to the first mixing chamber. Chlorine is also injected into the pump discharge line prior to the mixing chambers.

The short duration, violent mixing needed for proper coagulant dispersion is not provided in the current treatment process. The mixing chambers should be preceded by either a mechanical mixer or a passive in-line static mixer. The existing mixer speed is also a constant, single speed and it does not allow variable speed control. The mixing basins do not provide redundancy or expansion capacity for Borough's projected future demands.

4.4 Coagulation (Sedimentation) Basin

Water from the mixing chambers is conveyed to a large sedimentation basin historically called the "coagulation basin". The purpose of the sedimentation basin is to provide sufficient detention time to allow the large, dense particles formed in the mixing chambers to settle out to the bottom of the tank. The sedimentation basin is a concrete structure located just outside of the filter plant measuring approximately 25' wide, 77.5' long and a water depth of 13'. The basin is divided in half in the long direction. Each basin contains approximately 94,200 gallons and together they provide approximately 4.3 hours of detention time at the plant's permitted capacity. Water enters the sedimentation tank on the end nearest the filter plant and flows through each side of the basin. Water exits at the far end of the basin and returns to the plant in a common interior channel that lies between each basin. The floor of the basin has a slight slope to the center of the basin in the long dimension. A drain pipe and valve are used to remove solids from the basin. The operating personnel drain the basin approximately four times a year and wash the accumulated solids out using a fire hose. The solids drain to the waste holding tank where they are pumped to the lagoons. Lime is added to the water leaving the sedimentation basin in the common effluent channel just prior to the pipe that conveys the water to the filters.

The primary concerns with this basin are the condition of the concrete structure and the labor required to remove the solids. A significant amount of concrete has peeled off of the surface of the structure. The Borough recently hired a contractor to repair the tanks but the repair work was unsuccessful. This basin would need significant repairs to make it a long-term viable structure and the longevity of the repairs would be questionable. Typical sedimentation basins have sloped floors and they are fitted with sludge removal devices such as chain and scraper mechanisms. The removal of solids from the existing basin is very labor intensive. The basins do not provide redundancy or expansion capacity for the Borough's projected future demands.

Side View of Sedimentation Basin

Top of Sedimentation Basin

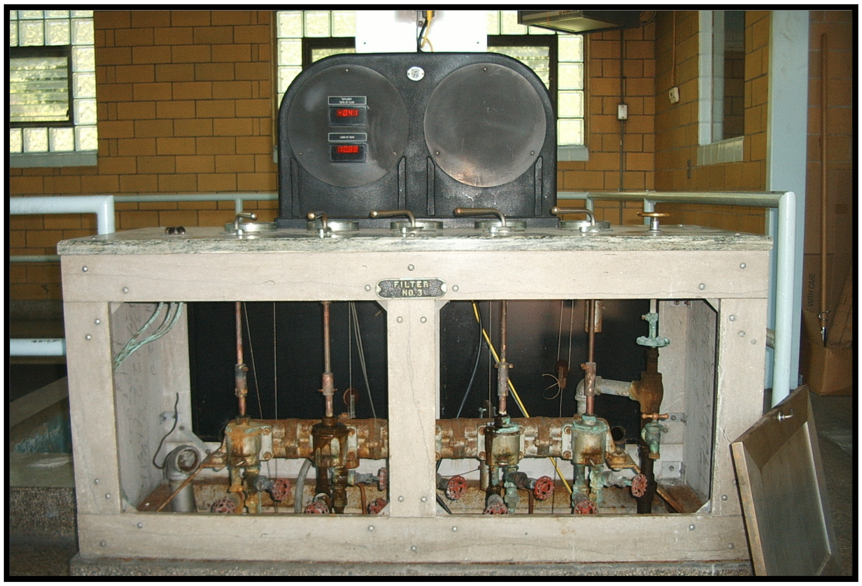
Deterioration of Sedimentation Basin Concrete

4.5 Filters

Effluent water leaving the sedimentation basin is conveyed to the filters through a pipe gallery located in the basement of the treatment building. The pipe gallery is comprised of numerous pipes, fittings and valves that direct the water to and from the filters. These valves control whether the filter is in or out of service, backwashing or filtering water to waste. There is also a rate controller that sets the flow rate to each filter to balance the water across the filters being used. There are three filters, each approximately 11' square. The hydraulic loading rate is 2.0 gpm/sq.ft. with all three filters in service at the plant's permitted capacity. The filters contain several layers of support gravel and approximately 34" of media including garnet, sand and anthracite. As the filters remove particles and accumulate headloss,, they require backwashing. Filter consoles located on the main operating floor allow operating personnel to control the filter valve positions. The backwashing is a manual operation which the operating personnel perform by switching valve positions, stopping flow through the filters and allowing water from the on-site 30,000 gallon backwash storage tank to flow up through the filters. The backwash flow dislodges trapped particles from the filter media and washes them to the waste holding tank.

With the exception of periodic filter media changes and operational maintenance, the filters have largely remained untouched since the original construction of the plant. The operating valves located in the control consoles require constant attention due to drifting from wear. The elevated steel backwash tank, located adjacent to the treatment plant, is in very poor condition. The backwash tank must also be manually filled and monitored. In order to fill the tank the operator must go to the basement, climb a step ladder and manually open a valve that allows a portion of the finished water to flow to the tank. The operator must also monitor the filling of the tank to avoid overflowing. Much of the piping and valves associated with the filtration process are in very poor condition. The filters do not provide redundancy or expansion capacity to meet the Borough's projected future demands. During batch operation, the filters are hydraulically surged beyond their permitted hydraulic loading capacity for the duration of each filter backwash and filter to waste cycle. This surge results in short duration particulate pass-through and diminished filtered water quality. During periods of proper coagulation chemistry, the filters are capable of meeting the current turbidity removal standards. However, the Borough will continue to have difficulty with compliance as source water quality changes and more stringent particulate removal standards are adopted.

Filters on Operating Floor



Filter Control Consoles

Backwash Storage Tank

Filter Flow Meter

Filter Control Valve

4.6 Chemical Feed Equipment

The treatment plant currently uses dry lime and soda ash for pH adjustment, liquid coagulant (aluminum sulfate), powdered carbon, sodium fluoride, and chlorine gas. All deliveries of chemicals, with the exception of chlorine cylinders, are stored on the second floor of the treatment plant. Dry chemicals are received in 50 or 100 pound bags on wooden pallets and hoisted to the second floor by means of an electrical hoist and beam. The bags are then manually unloaded and dumped into large hoppers, as needed. Chlorine gas is delivered in 150 pound cylinders to the operating floor and stored in a restricted room due to the associated safety risks. The only chemical currently purchased in bulk is liquid coagulant. The coagulant is delivered via bulk tanker truck and is pumped into two 500 gallon bulk storage tanks located on the second floor. Dry lime, carbon and fluoride are fed using dry chemical feeders that have been replaced in the last 20 years. Soda ash is manually fed in a batch mode to the mixing chamber through an access hatch. Coagulant is piped from the second floor to a converted day tank on the first floor and a liquid metering pump. Chlorine is fed using two gas chlorinators, carry water feed systems and dual tanks scales. One system is used for pre-chlorination prior to the mixing chambers and one is for post-chlorination after filtration.

The delivery and handling of chemicals is labor intensive and time consuming. The hoisting of large skids of chemicals to the second floor of the treatment plant poses a significant safety hazard. The hoist mechanism has a limited lifting capacity and the beam and trolley that carries the hoist often bind up creating a serious fall hazard. Each bag of dry chemical must be off-loaded and stacked as well as dumped into the hoppers. Loading the hoppers generates excessive chemical dust that creates a breathing hazard. The age of the feed equipment limits the accuracy of the desired feed rate and none of the feed systems are paced with treatment plant flow. The Borough does not have the ability to feed multiple coagulants nor does spare chemical feed equipment exist. The antiquated systems are difficult to repair since replacement parts are no longer available. The existing chemical feed systems seriously limit the operators ability to adjust to the changing water quality conditions of the Shenango River source.

Dry Chemical Hopper Loading Area

Bulk Coagulant Tanks

Dry Chemical Feeders

Chlorine Gas Feed System

4.7 Finished Water Clearwell

The filtered water leaving the filters is conveyed to a 60,000 gallon concrete clearwell located below the filters, pump room and pipe gallery. Fluoride and chlorine are added to the clearwell as post treatment chemicals. The clearwell serves to provide disinfection contact time to ensure proper disinfection prior to the treated water entering the distribution system. The water flows in a serpentine pattern around baffle/support walls before reaching the area of the high service pump suction piping.

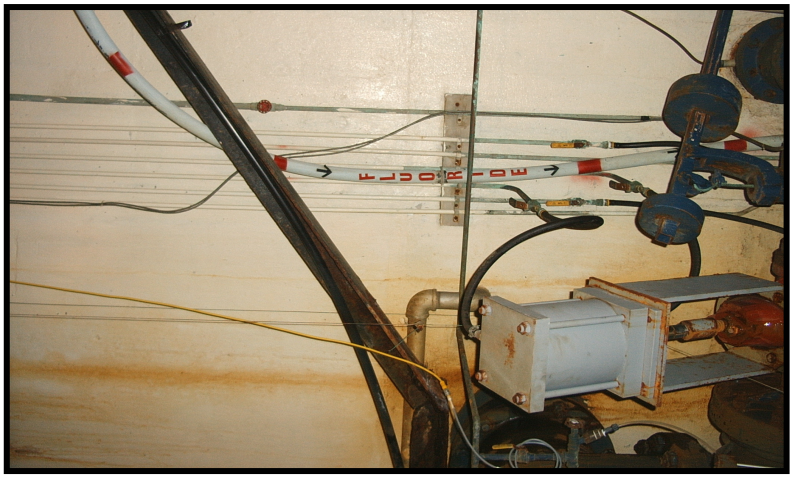
Several major concerns with the existing clearwell include a lack of disinfection contact time (CT) and the unknown structural condition of the 51 year old structure. Recent tracer studies conducted at 590 gpm determined that the clearwell provided only 37 minutes of detention time. Furthermore, the study showed significant short circuiting with a baffling factor of only 0.54. Assuming conservative water quality conditions (highest pH, lowest chlorine residual, lowest temperature) and a plant capacity of 726 gpm, the facility is not capable of providing adequate disinfection contact time in the existing clearwell. Additional clearwell detention time must be provided to meet the Borough's existing and future anticipated demands.

Chlorine Injection Point at Clearwell

4.8 High Service Pumps

Treated water from the clearwell is pumped to the distribution system by two centrifugal high service pumps rated at 1.0 MGD each with 100 horsepower motors. These pumps lift water out of the clearwell and require priming by applying a vacuum to the pump suction. This is accomplished manually by opening a ball valve to apply the vacuum to the pump. This priming procedure is required every day when the plant is started. Water being pumped from the plant is either delivered to the Sharpsville System or to the South Pymatuning System. Based on off-site tank levels, which are transmitted to the plant via a telemetry system, operators direct water to the desired system by operating electric valves. As discussed previously, a manual valve on this pump discharge piping is also operated to refill the backwash tank at the end of a filter backwash.

The major concerns with this portion of the treatment plant include the age of the pumps. The pumps have been rebuilt and the motors have been replaced periodically but the pumps and discharge piping and valves have outlived their useful life. Priming the high service pumps is labor intensive and problematic due to poor piping conditions and leaks.



Fluoride Injection at Clearwell

4.9 Wastewater Holding Tank

All backwash water, filter-to-waste, water drained from the mixing tanks and solids drained from the sedimentation basin are conveyed to a concrete wastewater holding tank located just upstream of the sedimentation basin adjacent to the river. This tank, constructed in 1976, has two vertical turbine pumps that pump all the wastewater and solids to the lagoons. These pumps operate automatically based upon water level within the pumping station.

The wastewater holding tank pumps have been troublesome since they are not designed to pump dirty water and solids. One of pumps have been replaced and the bearing lubrication system on both pumps does not function.

Wastewater Holding Tank (Background)

Vertical Turbine Pump

4.10 Lagoons

All treatment process wastewater and solids are pumped from the wastewater holding tank to two lagoons located just upstream of the sedimentation basin. The lagoons consist of earthen embankments that allow the sludge and solids to settle out as the water slowly drains away. A diversion chamber allows the operators to divert wastewater to the desired lagoon. An effluent riser pipe carries the supernatant off the top of each lagoon to a discharge into the Shenango River through an NPDES permit. Plant personnel clean the lagoons on a by-annual basis once the sludge has dried into a semi-solid form. The lagoons have been an effective means of drying and disposing of solids generated by the water plant. Additional lagoon capacity may be needed if the system continues to expand.

Existing Lagoons

4.11 Plant Electrical/Control System

The treatment plant is served with 480 volt, 3 phase electrical service. The main service distribution center/motor control center was replaced recently and is good condition. Plant instrumentation and controls are limited to influent turbidity, individual filter effluent turbidity and plant effluent chlorine residual. The three filter effluent turbidity signals are connected to a computer for monitoring, logging and trending. Chlorine residual and influent turbidity are recorded on chart recorders.

Electric Service Distribution

Instrumentation/Chart Recorders

5.0 FUTURE REGULATORY IMPACTS

The Federal regulation of water systems began in 1974 with the enactment of the Safe Drinking Water Act (SDWA). Since then, the Environmental Protection Agency (EPA) and the Pennsylvania Department of Environmental Protection (PADEP) has enacted fifteen major drinking water regulations. They include the following:

- National Interim Primary Drinking Water Standards (1975)
- Total Trihalomethanes Rule (1979)
- Fluoride Rule (1986)
- Phase I Volatile Organic Compound Rule (1987)
- Surface Water Treatment Rule (1989)
- Total Coliform Rule (1991)
- Phase II Rule (1991)
- Lead and Copper Rule (1991)
- Phase V Rule (1992)
- Stage I Dinsinfectant/Dinsinfection By-products Rule (1998)
- Interim Enhanced Surface Water Treatment Rule (1998)
- Radionuclides Rule (2000)
- Arsenic Rule (2000)
- Filter Backwash Recycling Rule (2001)
- Long-Term 1 Enhanced Surface Water Treatment Rule (2002)

These regulations have established Maximum Contaminant Levels (MCLs) for various contaminants. The MCL list has expanded from the original 22 contaminants to more than 91 over the last thirty years.

The Sharpsville Borough Water system has historically complied with these regulations with the exception of a recent violation of the Stage I Disinfectant/Disinfection By-products Rule. Based on sampling conducted in 2004 and 2005, the Borough's running annual average of quarterly samples has exceeded the MCL for Total Organic Carbon (TOC), Specific UV absorbance (SUVA), Total Trihalomethans (TTHMs) and Haloacetic Acids (HAAs). This violation requires the Borough to issue public notification on a quarterly basis until the violation is corrected.

Future regulations are proposed that will make the existing regulations more stringent as well as expand the current list of regulated contaminants. The proposed Long Term 2 Enhanced Surface Water Treatment Rule will have a direct impact on the Borough's existing facility as the turbidity and particle removal standards become more stringent. The proposed Stage II Disinfectant/ Disinfection By-products Rule will also affect the Borough's system by lowering the current MCLs for organic precursors and their by-products and by changing the sampling requirements within the distribution system. These regulations are in the final stages of review and should become effective within the next year.

As these and other drinking water regulations become more stringent, water systems will be required to provide the best available treatment technology. The Borough will need to employ more advanced treatment technology to ensure compliance with these future regulations and the proper selection and design of this equipment will minimize the need for future treatment process changes.

6.0 EVALUATION OF ALTERNATIVES

The Borough has two options to provide a viable, long-term treatment system to meet the Borough's future water demands. They include a complete renovation of the existing facility or the construction of a new facility. Due to the poor condition of the existing facility and its ability to meet the current and proposed drinking water standards, this study did not evaluate any temporary or short-term improvements. The two alternatives evaluated will both result in a treatment system that is capable of meeting the system's need for a 20 to 30 year period. The projected 20-year demand for the system is 1.5 MGD and both alternatives were evaluated based on this future demand.

The following sections describe each alternative, the associated construction and project cost estimates and a present worth analysis to allow their comparison.

6.1 Renovation of Existing Facility

The renovation of the existing facility would be significant with major renovations and additions to the existing treatment system components. In order to meet the future drinking water standards and the long-term needs of the system, the facility will need extensive renovations.

The process improvements include a new river intake and pump station, the addition of a rapid mixing system for improved chemical coagulation, the addition of two stage flocculation basins, additional sedimentation tankage and sludge collectors, replacement of the existing multi-media filters with membrane filtration units, addition of UV disinfection, clearwell expansion for adequate disinfection contact time and complete replacement of the chemical feed systems. The existing treatment building and tankage would require significant interior and exterior renovations. All mechanical pumps, piping and valves would need to be replaced and the facility would need new instrumentation and control systems. An important consideration of this renovation alternative is that the existing facility must remain in production during all construction activities.

The following narrative provides a description of the major components of this alternative.

6.1.1 River Intake and Pumping Station

A new river intake and pumping station should be constructed just upstream of the existing intake. A new intake line will lead out into the river to a passive screen and diversion wall. The screen will be backflushed with periodic air bursts to prevent the accumulation of debris. The intake pumping station will include a wet well and vertical style pumps to transfer raw water to the treatment plant. All necessary electrical and controls will be provided.

6.1.2 Treatment Building Exterior Renovations

Renovations of the treatment building exterior would include the replacement of all doors and windows. Roof replacement and roof insulation should be considered to improve thermal efficiency. Structural and cosmetic repairs will be needed including re-pointing of brick exterior and repairs to the concrete foundation. The building renovations must address all building code standards including ingress/egress and handicap accessibility.

6.1.3 Treatment Building Interior Renovations

Renovations of the treatment building interior would include thermal efficiency improvements such wall insulation and the installation of a high efficiency heating system. Other elements include new ventilation systems, replacement of the spiral staircase, restroom and laboratory renovations, the replacement of interior doors and fixtures such as handrails and the painting of all interior surfaces. The interior renovations must also address the building code requirements.

6.1.4 Rapid Mixing

The existing facility does not have rapid mix facilities which is necessary for proper coagulant dispersion and coagulation. An in-line static mixer should be installed on the raw water line immediately after chemical addition and prior to the existing flocculation chambers. Improved chemical mixing, flocculation and sedimentation will be required if additional organic removal is needed via enhanced coagulation.

6.1.5 Flocculation

The existing flocculation chambers are not large enough to provide two stage flocculation at the desired plant capacity of 1.5 MGD. The construction of two additional concrete tanks similar in size to the existing tanks would be needed. Variable speed, hydrofoil style mixers should be installed in both the new and existing tanks to provide optimum flocculation.

6.1.6 Sedimentation Basin Modifications/Additions

The existing sedimentation basin is in need of significant repairs and due to the increase in plant capacity for future demands, an additional basin would be needed. Renovation of the existing basin would include the removal and replacement of all deteriorated concrete. A new concrete basin would be constructed adjacent to the existing basins to provide a combined detention time of 4 hours at the plant's design capacity of 1.5 MGD.

Currently, sludge is removed from the existing sedimentation basin by draining the tank and hosing out the solids. The existing basins should be retrofitted with new sludge scraper mechanisms. These scrapers will consist of a chain and scrapers connected and driven by an electric motor to move the sludge to one end of the basin for removal. This mechanism will allow the basin to remain in service while solids are being removed. The new sedimentation basin will also be fitted with a similar sludge collector.

6.1.7 Submerged Membrane Filtration System

The existing multi-media filters are capable of adequate turbidity and particulate removal when coagulation chemistry is optimized. The ability of these filters to meet the proposed regulations is questionable and the condition of the filter controls, piping and valves justify replacement. The filter bays are not large enough to provide the desired future capacity of 1.5 MGD using conventional filter media. The hydraulic loading rate will exceed 2 gpm/sq.ft. and particularly if one filter is designated as the required redundancy. In order to utilize the existing filter basins and eliminate the need for optimal coagulation, submerged membrane filtration units could be installed in the existing filter bays. The replacement would include the removal of all existing filter media, underdrains and appurtenances. The new submerged membranes would be installed into the existing filter cells including new piping, interconnections, pumps and other associated components. The new membrane filtration units would also require the installation of an automatic control system.

6.1.8 UV Disinfection

The existing treatment process does not provide a multiple barrier to possible contaminants. The existing filters are only effective if coagulation is optimized and the existing clearwell does not provide adequate disinfection contact time. Despite the proposed renovation of these treatment components, additional treatment barriers should be provided for a river intake source. One cost effective treatment barrier is UV disinfection. This treatment process is very applicable to the Borough's facility since it could be easily added within the existing facility. The UV process would provide an additional disinfection barrier and it would reduce post-filtration chlorine demand. The reduced chlorine usage will reduce the formation of disinfection by-products and improve the Borough's compliance with the upcoming Stage 2 D/DBP rule.

6.1.9 Clearwell Capacity

The existing clearwell does not provide adequate disinfection contact time prior to the first customer. In order to provide adequate contact time at the desired future plant capacity of 1.5 MGD, additional clearwell storage would be needed. A baffled concrete tank should be constructed adjacent to the treatment building and connected to the existing clearwell to utilize the existing tank capacity.

6.1.10 Chemical Feed Systems

The existing chemical feed systems are in extremely poor condition and they pose significant safety hazards. New chemical feed systems should be constructed included liquid feed systems, solution tanks, metering pumps, chemical storage areas and associated safety and handling equipment. Additional feed systems should be provided including an oxidant such as potassium permanganate to replace pre-chlorination and spare feed equipment for the possible addition of acid or alum/acid for additional organic removal via enhanced coagulation.

6.1.11 Treatment Building Mechanical/Piping/Pumps/Flow Meters

Due to the poor condition of the existing facility, all mechanical components, piping, pumps, flow meters and valves should be replaced. This equipment is primarily located on the lower level of the treatment building.

6.1.12 Wastewater Holding Tank Renovations

The existing wastewater tank was constructed in 1976 and the concrete structure is in good condition. The pumps need to be replaced with pumps designed specifically to pump solids. In addition, the associated valves and piping will also need to be replaced.

6.1.13 Lagoons

The existing lagoons are functional and can be retained with minor modifications. Any future design of system improvements should allow space for additional lagoon construction. Lagoon dewatering systems have a lower operation and maintenance cost in comparison to mechanical dewatering systems and they should be maintained if possible. The Borough's existing NPDES permit for supernatant discharge should be renewed as part of any facility upgrade or replacement.

6.1.14 Site Piping

New site piping will be required to connect the new and renovated process units together. Additional site drainage piping will also be required.

6.1.15 Fencing

The entire treatment facility site should be fenced with an 8' high chain-link fence with barbed wire top to provide security of the site. Adequate gates should be provided at the front and rear entrances and at the intake structure.

6.1.16 Paving

Due to the extensive renovation work including the construction of new process units and site piping, the entire site should be repaved upon completion of construction activities.

6.1.17 Electrical/Instrumentation

The renovation of the existing facility will require the installation of new electrical components including conduit, wire, receptacles, interior/exterior light fixtures and various other electrical components. The existing electrical distribution center/motor control center can be retained since it is relatively new. Some additional components will need to be added to the existing distribution center for any additional treatment equipment, such as the membrane filters and UV system. A complete instrumentation system will be installed throughout the treatment plant to automatically monitor and controls the various treatment processes.

6.1.18 Emergency Generator

The renovation of the existing facility should include the installation of an emergency generator to allow complete facility operation during power outages. This unit would be connected to the distribution system via an automatic transfer switch.

The following Table 1 presents the construction cost estimate for renovation of the existing facility. Cost estimates were derived from recently bid projects of similar scope.

Table 1 - Alternative No. 1
Renovation of Existing Water Treatment Facility

Construction Cost Estimate

	Project Element	**Estimated Cost**
1	Bonds/insurance/permits	$50,000
2	General conditions	$110,000
3	Mobilization/demobilization	$20,000
4	Site excavation/erosion control	$75,000
5	Treatment Building exterior renovations	$175,000
6	Treatment Building interior renovations	$275,000
7	Treatment Building submerged membrane filtration systems	$1,500,000
8	Treatment Building laboratory renovations	$30,000
9	Treatment Building UV system (alternate bid item)	$100,000
10	Treatment Building chemical feed system renovations	$125,000
11	Treatment Building mechanical/piping/pumps/flow meters	$250,000
12	Treatment Building additional clearwell capacity	$250,000
13	Sedimentation basin modifications/additions	$180,000
14	Sedimentation basin sludge collectors/weirs	$150,000
15	Flocculation Basin & Mixer	$50,000
16	River intake structure/building	$80,000
17	River intake screens/pumps	$70,000
18	Wastewater tank pump/piping replacement	$30,000
19	Site piping	$70,000
20	Fencing	$35,000
21	Paving	$50,000
22	Electrical/instrumentation	$270,000
23	Emergency generator	$80,000
24	Demolition	$25,000
	Total Estimated Construction Cost:	**$4,050,000**

Table 2 presents the total project cost estimate for the renovation alternative. This estimate is structured using the standard Pennvest project elements.

Table 2 - Alternative No. 1
Renovation of Existing Water Treatment Facility

Project Cost Estimate

	Project Element	**Estimated Cost**
1	Administration Costs	$10,000
2	Legal Fees	$30,000
3	Financial (Accounting) Costs	$5,000
4	Interest During Construction	$15,000
5	Engineering Fees	$800,000
6	Permits	$10,000
7	Land	$0
8	Construction Cost	$4,050,000
9	Contingency	$300,000
10	Other	$60,000
	Total Estimated Project Cost:	**$5,280,000**

6.2 Construction of New Facility

The second alternative considered during this study is the construction of a new treatment facility. A new facility would be designed to meet the current and proposed future drinking water standards and the long-term needs of the system. For the purpose of this study, the proposed treatment facility have a treatment capacity of 1.5 MGD.

Similar to the renovation alternative, the new treatment facility should also include the construction of a new river intake and pump station. The treatment facility should be a combination of proven conventional clarification and the latest technology to provide a complete multiple barrier treatment process. The new facility would include an in-line rapid mixing system, two stage flocculation, conventional sedimentation, membrane filtration units, UV and chlorine disinfection, clearwell storage and chemical feed systems. A proposed site plan for the new treatment facility is provided in Appendix C. A treatment process flow schematic is provided in Appendix D and a treatment building floor plan is provided as Appendix E.

A significant advantage of the new facility alternative is that it can be constructed, started and tested while the existing plant is used to meet the systems demands. Once constructed and placed on-line, the existing facility can be demolished.

The following narrative provides a description of the major components of this alternative.

6.2.1 River Intake/Pumping Station

A new river intake and pumping station is proposed to be constructed just upstream of the existing intake. A new intake line will lead out into the river to a passive screen and diversion wall. The screen will be backflushed with periodic air bursts to prevent the accumulation of debris. The intake pumping station will include a wet well and vertical style pumps to transfer raw water to the treatment plant. All necessary electrical and controls will be provided.

6.2.2 New Treatment Building

A new, low maintenance treatment building would be constructed to house the various process equipment, a laboratory, mechanical room, and emergency generator. The building should be of concrete and masonry construction. A possible location for the new building is the Borough's roadway material storage area immediately upstream of the existing lagoons.

6.2.3 Rapid Mixing

The new facility will provide an in-line static mixer on the raw water line immediately after chemical addition. The mixer will provide proper chemical dispersion prior to flocculation and sedimentation.

6.2.4 Flocculation

Flocculation would be provided through the use of two stage concrete basins with variable speed mechanical mixers. The flocculation basins should provide approximately 20 minutes of detention time for each stage at the desired future plant capacity of 1.5 MGD or 1050 gpm. The flocculation basins would be constructed adjacent to the sedimentation tanks.

6.2.5 Sedimentation

Sedimentation will be provided through the construction of a rectangular concrete basin with mechanical sludge collectors. These sludge collectors will consist of chain and scrapers connected and driven by an electric motor to move the sludge to one end of the basin for removal. This mechanism will allow the basin to remain in service while solids are being removed. The basin will have dual chambers with FRP weirs. The basins should be designed to provide four hours of detention time at the desired future plant capacity of 1.5 MGD or 1050 gpm.

6.2.6 Membrane Filtration

The new treatment facility should utilize membrane filtration in lieu of conventional filters. The Shenango River source is highly variable and membrane filtration will eliminate the need to maintain precise coagulation chemistry during water quality changes. The membrane filters provide excellent water quality by effectively removing particulate matter, pathogens and organic material. The proposed membrane system consists of three pressure membrane systems each having a capacity of 0.75 MGD each at a flux rate of 40 GFD. The three systems will allow continued production of the desired future plant capacity of 1.5 MGD with one unit out of service. The membrane systems have a small footprint, high recovery rate, low solids production, are easy to operate and are modular to allow future system expansion.

6.2.7 UV Disinfection

The proposed treatment process should provide UV disinfection as an additional treatment barrier. The UV process is cost effective, does not use chemicals and it reduces post-filtration chlorine demand. The reduced chlorine usage will reduce the formation of disinfection by-products and improve the Borough's compliance with the upcoming Stage 2 D/DBP rule.

6.2.8 Clearwell/Disinfection

A new concrete, baffled clearwell will be constructed beneath the new treatment building to provide disinfection contact time. The clearwell should be sized to provide adequate contact time at the desired future plant capacity of 1.5 MGD.

6.2.9 Chemical Feed Systems

The new treatment facility will have new chemical feed systems including solution tanks, metering pumps, chemical storage areas and associated safety and handling equipment. Systems will be provided for potassium permanganate as a pre-oxidant, coagulant, acid, and polymer for coagulation, caustic soda for pH adjustment, powdered carbon, chlorine, fluoride and corrosion inhibitor. Spare chemical feed equipment will be provided and the systems should be sized for additional organic removal via enhanced coagulation.

6.2.10 Wastewater Holding Tank Renovations

The existing wastewater tank was constructed in 1976 and the concrete structure is in good condition. This tank can be used for the new treatment facility. The pumps will need to be replaced with pumps designed specifically to pump solids. In addition, the associated valves and piping will also need to be replaced.

6.2.11 Lagoons

The existing lagoons are functional and can be retained with minor modifications. Any future design of system improvements should allow space for additional lagoon construction. Lagoon dewatering systems have a lower operation and maintenance cost in comparison to mechanical dewatering systems and the existing lagoons should be maintained if possible. The Borough's existing NPDES permit for supernatant discharge should be retained and renewed as part of any facility upgrade or replacement.

6.2.12 Site Piping

New site piping will be required to connect the new process units and treatment building as well as the interconnection of these facilities with the existing lagoon and wastewater holding tank.

6.2.13 Fencing

The new treatment facility site should be fenced with an 8' high chain-link fence with a barbed wire top to provide security of the site. Adequate gates should be provided at the front and rear entrances and at the intake structure.

6.2.14 Paving

New paving will be provided on all access roads and parking areas for the new treatment plant upon completion of construction activities.

6.2.15 Electrical/Instrumentation

The new treatment facility will have a complete electrical system including conduit, wire, receptacles, interior/exterior light fixtures and various other electrical components. A new electrical distribution center/motor control center will be installed for all new treatment equipment. A complete instrumentation system will be installed throughout the new treatment plant to automatically monitor and controls the various treatment processes.

6.2.16 Emergency Generator

The new treatment facility will include the installation of an emergency generator to allow complete facility operation during power outages. This unit would be connected to the distribution system via an automatic transfer switch.

The following Table 3 presents the construction cost estimate for the construction of a new treatment facility. Cost estimates were derived from recently bid projects of similar scope.

Table 3 - Alternative No. 2
Construction of New Treatment Facility

Construction Cost Estimate

	Project Element	**Estimated Cost**
1	Bonds/insurance/permits	$50,000
2	General conditions	$110,000
3	Mobilization/demobilization	$20,000
4	Site excavation/erosion control	$150,000
5	Treatment Building foundation/concrete walls/slab	$690,000
6	Treatment Building Masonry	$160,000
7	Treatment Building steel, aluminum, FRP	$80,000
8	Treatment Building roof/siding/insulation/flooring/painting	$260,000
9	Treatment Building laboratory	$40,000
10	Treatment Building chemical feed systems	$100,000
11	Treatment Building membrane filtration systems	$890,000
12	Treatment Building UV system (alternate bid item)	$100,000
13	Treatment Building mechanical/piping/pumps/flow meters	$430,000
14	Sedimentation basin foundation/concrete	$300,000
15	Sedimentation basin sludge collectors/weirs	$100,000
16	River intake structure/building	$80,000
17	River intake screens/pumps	$70,000
18	Wastewater tank pump/piping replacement	$30,000
19	Site piping	$220,000
20	Fencing	$60,000
21	Paving	$90,000
22	Electrical/instrumentation	$320,000
23	Emergency generator	$80,000
24	Demolition	$70,000
	Total Estimated Project Cost:	**$4,500,000**

Table 4 presents the total project cost estimate for the new treatment plant alternative. This estimate is structured using the standard Pennvest project elements

Table 4 - Alternative No. 2
Construction of New Treatment Facility

Project Cost Estimate

	Project Element	**Estimated Cost**
1	Administration Costs	$10,000
2	Legal Fees	$30,000
3	Financial (Accounting) Costs	$5,000
4	Interest During Construction	$15,000
5	Engineering Fees	$720,000
6	Permits	$10,000
7	Land	$0
8	Construction Cost	$4,500,000
9	Contingency	$200,000
10	Other	$60,000
	Total Estimated Project Cost:	**$5,550,000**

6.3 Present Worth Analysis

The following present worth analysis was prepared to allow comparison of the two alternatives.

Table 5 - Present Worth Analysis of Selected Alternatives

	Alternative 1 Renovate Existing Facility	Alternative 2 Construct New Facility
Construction Cost	$4,050,000	$4,500,000
Construction Contingency	$300,000	$200,000
Project Costs (Engineering, Legal, Admin., Acct.)	$930,000	$850,000
Total Project Cost	$5,280,000	$5,550,000
Annual O&M Cost	$820,000	$706,237
Present Worth O&M	$10,217,200	$8,799,713
Total Present Worth	$15,497,200	$14,349,713
No. Residential Customers	1908	1908
Present Worth per Customer	$8,122	$7,521

As shown by the table, the two alternatives have very similar project operational costs. The renovation of the existing facility has a slightly lower capital cost but a slightly higher O&M costs. The present worth analysis shows the construction of a new facility to have a lower present worth cost but for all intensive purposes, the two alternatives should be considered to be equal.

7.0 FINANCIAL ANALYSIS

The following section will provide a financial analysis of both the renovation of the existing facility and the construction of a new facility. The analysis will include a review of current median household incomes for the service area, affordable user rates, existing debt service, funding options and associated finance rates, and estimated resulting monthly user rates.

According to the U.S. Bureau of Census and the Pennsylvania Department of Community and Economic Development, the adjusted median household income for the Borough of Sharpsville is $37,142.00 per year. This factor is critical in determining project eligibility for various grants. Communities with low to moderate incomes may be eligible for certain grant programs such as Community Development Block Grants.

Based on the adjusted median household income, the PA DCED has calculated that the user affordable user rate for the Sharpsville Borough service area for residential water service is approximately $425.00 annually or $35.42 per month. This calculation is used in determining the grant/loan percentages and the term of a loan when PENNVEST funding is pursued for a project.

Based on a review of the 2004 and 2005 budget it appears that the Borough has no existing debt that is attributable to the water system.

Funding options that have been evaluated in association with this project include the Pennsylvania Infrastructure Investment Authority (PENNVEST) and the U. S. Department of Agriculture (USDA) Rural Utilities Services (RUS) funding program.

The PENNVEST program offers funding packages based on cap interest rates for the County. The Current cap interest rate for Mercer County is 1.387% for the first five years and 2.774% for the remaining years. PENNVEST also offers financing packages with a 20 or 30 year term. In certain cases, PENNVEST also subsidizes their funding offers with grant funds, if available, in an effort to keep the user rates within the target user rate for the service area.

The USDA RUS program offers a funding package based on an interest rate of 4.25% and a 40 year term. If the target user rate cannot be obtained, RUS will supplement the project budget with grant funds, if funds are available.

Based on the given projected project costs, finance rate, and term of financing, it that PENNVEST would be the preferred funding option for either of the proposed projects.

The following analyses have been developed based on the above factors:

Table 6 - Alternative No. 1
Renovation of Existing Water Treatment Facility
Potential Funding Options and User Fees

	PENNVEST (20 Year)	PENNVEST (30 Year)	Conventional Bond	PENNVEST (30 Year w/ Grant)
Interest Rate*	2.427	2.427	6	2.427
Term (Yrs.)	20	30	30	30
Total Estimated Capital Costs	$5,280,000	$5,280,000	$5,280,000	$5,280,000
Grant	$0	$0	$0	$1,000,000
Loan (Amount to be Financed)	**$5,280,000**	**$5,280,000**	**$5,280,000**	**$4,280,000**
Annual Debt Service	$336,366	$249,817	$383,586	$202,503
Annual Operation & Maintenance Exp.	$820,000	$820,000	$820,000	$820,000
Annual Total Expenditures	$1,156,366	$1,069,817	$1,203,586	$1,022,503
Current Annual Revenue	$680,676	$680,676	$680,676	$680,676
Required Additional Revenue	$475,690	$389,141	$522,910	$341,827
Percent Increase	69.88%	57.17%	76.82%	50.22%
Current Residential Rate**	$25.64	$25.64	$25.64	$25.64
Project Residential User Fee	**$43.56**	**$40.30**	**$45.34**	**$38.52**

**PENNVEST Interest Rate based on 1.387% for first five years and 2.774% for the remaining years*
***Based on average consumption of 5,000 gallons per month*

Table 7 - Alternative No. 2
Construct New Water Treatment Facility
Potential Funding Options and User Fees

	PENNVEST (20 Year)	**PENNVEST (30 Year)**	**Conventional Bond**	**PENNVEST (30 Year w/ Grant)**
Interest Rate*	2.427	2.427	6	2.427
Term (Yrs.)	20	30	30	30
Total Estimated Capital Costs	$5,550,000	$5,550,000	$5,550,000	$5,550,000
Grant	$0	$0	$0	$1,000,000
Loan (Amount to be Financed)	**$5,550,000**	**$5,550,000**	**$5,550,000**	**$4,550,000**
Annual Debt Service	$353,566	$262,592	$403,201	$215,278
Annual Operation & Maintenance Exp.	$706,237	$706,237	$706,237	$706,237
Annual Total Expenditures	$1,059,803	$968,829	$1,109,438	$921,515
Current Annual Revenue	$680,676	$680,676	$680,676	$680,676
Required Additional Revenue	$379,127	$288,153	$428,762	$240,839
Percent Increase	55.70%	42.33%	62.99%	35.38%
Current Residential Rate**	$25.64	$25.64	$25.64	$25.64
Project Residential User Fee	**$39.92**	**$36.49**	**$41.79**	**$34.71**

**PENNVEST Interest Rate based on 1.387% for first five years and 2.774% for the remaining years*
***Based on average consumption of 5,000 gallons per month*

Based on the above, it is anticipated that the renovation of the existing water treatment facility would cost the average residential customer an additional $3.81 per month over the construction of a new facility. Further, using a 30 year finance term, it appears that the project could be constructed within the affordable user rate of $36.00 (±) per month.

8.0 CONCLUSIONS

The Borough's existing water treatment facility has historically served borough well for more than 50 years with only minor renovations. The Borough employees have done an excellent job optimizing and maintaining the existing facility to meet the ever increasing demands for potable water.

While the existing treatment facility is very labor intensive, the facility has been effective in treating a varying water quality and can consistently produce good quality water when properly optimized. However, the facility is no longer capable of meeting current and future proposed drinking water standards and it is currently in violation of the Stage I Disinfectant/Disinfection Byproducts Rule.

With exception of the recently upgraded electrical equipment, the equipment in the existing water treatment facility is also suffering from extensive wear and is in poor condition. The controls and valving associated with filter flow rate require constant adjustment due to excessive wear. The existing river intake is labor intensive, requiring constant attention during storm events and fall defoliation. The raw water and high service pumps require daily priming and attention and are still operating in the original housings. All the existing mechanical piping and valves are in extremely poor condition. Many of the valves no longer operate properly or seal, thereby making routine maintenance and service an extreme inconvenience. The plant also lacks proper SCADA and instrumentation to optimize operation.

The plant also has numerous process deficiencies that will contribute to the inability to meet current and future proposed drinking water standards. Pretreatment in the existing facility only consists of single stage flocculation with single speed mixers. The facility lacks the ability to rapid mix coagulation chemicals to maximize polymer. The sedimentation basin is in poor structural condition, does not have sludge collecting capabilities. The basin cannot easily be increased to meet the need of a 1.5 MGD treatment plant. The conventional media filters require coagulation at all times and may not be capable of meeting the Long Term 2 Enhanced Surface Water Treatment Rule. The clearwell is not large enough to meet required chlorine contact demands of a 1.5 MGD treatment facility.

Based on the above findings, the Borough has two options to adequately meet the long term water supply needs of the service area and maintain compliance with current and proposed future regulatory requirements. The Borough is faced with either a complete renovation of the existing treatment facility including an update of the treatment process or the construction of a new facility on property adjacent to the existing treatment plant.

Based on detailed cost estimates it appears that the cost of each option is basically the same. However, the construction of a new facility may have several advantages. It appears that the new facility may have lower operation and maintenance costs due to improved layout and a reduction in manpower. The renovation of the existing facility may have a higher than anticipated construction costs due to the extensive coordination and temporary facilities that will be necessary to maintain water production during the renovation. The renovation option may also have a higher percentage of change orders during construction due to numerous unknown factors. The Borough could increase the capacity of a new facility easier than a renovated facility. It appears that based on information provided by Borough officials, adequate land exists adjacent to the current plant to construct a new facility. However, if a new plant is pursued, the Borough must conduct additional research to document the amount of property under the Borough's ownership.

When each option is compared using a present worth analysis, the construction of a new facility is less expensive. Additionally, if PENNVEST funding is pursued, and a 30 year financing package is secured, it appears that each option would result in a monthly residential user rate of approximately $36.00 - $40.00 per month. However, additional grant monies should be pursued to reduce that principal amount borrowed.

9.0 RECOMMENDATIONS

In order to address the long term water treatment needs of the Borough of Sharpsville, the following recommendations have been derived from the feasibility study. The Borough should consider:

1. Review the existing treatment processes to determine interim measures to correct outstanding violations.

2. Install a temporary chemical feed system for potassium permanganate to replace pre-chlorination oxidation.

3. Optimize coagulation for increased organic removal during periods of high source water TOC.

4. Reduce post-chlorination if possible to further minimize disinfection by-product formation.

5. Meet with Pennvest and DEP for a Planning Consultation to determine possible funding options for the construction of a new treatment facility.

6. If acceptable funding is feasible, pursue the design, permitting and construction of a new multiple barrier, membrane treatment facility.

7. Conduct distribution system study including hydraulic analysis and storage tank evaluation to determine short and long-term needs.

10.0 IMPLEMENTATION SCHEDULE

The following Implementation Schedule is proposed for the construction of a new Water Treatment Facility for the Borough of Sharpsville.

The schedule is obviously dependant upon receiving acceptable project funding.

	Project Element	Date
1.	Submit Feasibility Study to DEP	December 2005
2.	PennVEST Planning Consultation Meeting	January 2006
3.	Submit Pilot Study Proposal to DEP	January 2006
4.	Begin Pilot Study	March 2006
5.	Begin Preliminary Design	March 2006
6.	Complete Pilot Study	June 2006
7.	Submit Pilot Study Report	July 2006
8.	Complete Final Design	September 2006
9.	Submit PWS Permit to DEP	October 2006
10.	Submit PennVEST Application	December 2006
11.	PennVEST Board Meeting	February 2007
12.	Advertise for Construction Bids	March 2007
13.	Receive Construction Bids	April 2007
14.	PennVEST Closing	May 2007
15.	Begin Construction	June 2007
16.	Complete Construction	August 2008
17.	Receive Operating Permit	September 2008