Primary Clarifiers

Clarifier No. 1

The 45-foot diameter No. 1 primary clarifier is located in the southwest corner of the clarifier system, as shown in Figure 6.4, and is in fair condition with an estimated useful life of 5-years. This clarifier was installed and upgraded at the same time as clarifier No. 3, approximately 60 years and 26 years ago, respectively. The concrete structure has obvious cracks and surface deterioration, with the wall adjacent to the sludge pit in poor condition. The drive unit was replaced approximately two-years ago with a new Walker Process drive and is in good condition. The scraper and skimmer systems were inspected by Walker Process when the drive unit was replaced and reported to be in fair to poor condition. The metal walkway and handrails have been painted and are in fair condition, but will require some minor repairs and repainting in 2-3 years. The fiberglass weirs and baffles are approximately five years old and in good condition. The sludge pit telescoping valve does not seal properly and needs to be replaced.

Clarifier No. 2

Primary clarifier No. 2 is a 55-foot diameter EIMCO clarifier system shown in Figure 6.4 and was installed in 1963. The No. 2 and No. 4 clarifiers are identical units, installed during the same project. The No. 2 clarifier is located in the southeast corner of the clarifier system. It is in fair condition with an estimated useful life of 10 years. The concrete structure has surface cracks and deterioration. The 37-year old EIMCO drive, skimmer and sludge scraper systems are in fair condition. The fiberglass weirs and baffles are in good condition. Similar to clarifier No. 4, the painted metal walkway and handrail system is in poor condition, requiring significant repairs within the next two years. The sludge pit telescoping valve does not seal properly and needs to be replaced.

Clarifier No. 3

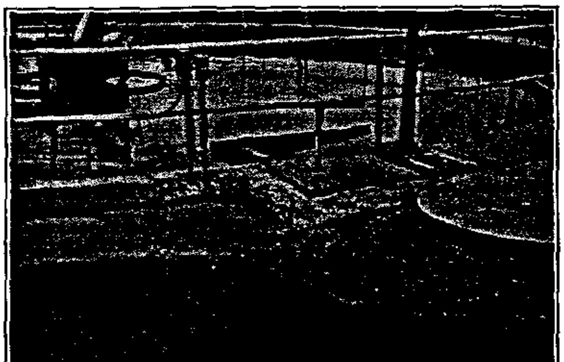

Figure 6.7 - Primary Clarifier

The 45-foot diameter No. 3 primary clarifier located in the northwest corner of the clarifier system as shown in Figure 6.4 is in fair to poor condition with an estimated useful life of five years. The clarifier is approximately 60 years old with an upgrade completed 26 years ago. The concrete structure has significant cracks and deterioration as shown in Figure 6.7, with the wall adjacent to the sludge pit in poor condition. The Walker Process drive unit has been in service for 26 years and is in poor condition. The fiberglass weirs and baffles are approximately five years old and in good condition. The metal walkway and handrails have been painted and are in fair condition with some minor repairs and repainting required in

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2-3 years. United Water staff advised Harding ESE during the site investigation that the sludge scrapers are in poor condition. The sludge pit telescoping valve does not seal properly and needs to be replaced.

Clarifier No. 4

The No. 4 primary clarifier, installed in 1963, is a 55-foot diameter EIMCO system. The clarifier is located in the northeast corner of the clarifier system, as shown in Figures 6.4, and is in fair condition with an estimated useful life of 10 years. The concrete structure has apparent cracks on the south side with some surface deterioration throughout the visible portion of the structure. The EIMCO drive has been in service for 37 years and is in fair condition. The skimmer system and sludge scraper system are reportedly in fair condition. The fiberglass weirs and baffles are in good condition, having been in service for five years. The painted metal walkway and handrail system is in poor condition, requiring some significant repairs within the next two years. Similar to the other three clarifiers, the sludge pit telescoping valve is in poor condition.

Sludge Piping

Sludge is pulled from the primary clarifiers and/or the sludge pit through a series of underground pipes to the basement of the control building where the sludge pumps are located. The clarifier isolation valves located in manholes adjacent to the primary clarifiers, are in poor condition making it difficult to isolate a single clarifier for sludge removal. The buried sludge piping is also in poor condition with several leaks being repaired in the last few years. The piping and isolation valves require replacement in the next 1-2 years.

Sludge Grinder

The sludge grinder, installed in the early 1990s is in good condition. United Water staff recently had the unit rebuilt after nearly 10 years of service.

Sludge Pump System

The air operated diaphragm pumps are also in good condition and should have over 15 years of useful life remaining. The pump system is a duplex system, so if one pump is out of service the other pump can handle the sludge pumping. The air solenoids require periodic rebuilding and the diaphragms will require replacement prior to the expected remaining 15 years of pump life.

Air Compressor No. 1, installed in the early 1990s has recently failed and is currently being replaced. Air Compressor No. 2, installed after No. 1 failed, is in good condition and should have a useful life of 10 or more years. With two air compressors operating as a duplex system, a 20-year useful life for the system could be expected.

6.5.3 Primarily Effluent Pumping

6.5.3.1 General Description

The primary effluent from the four clarifiers flows by gravity to two pump stations through a 30-inch line. The first pump station, shown in Figure 6.4 as Pump Station No. 1, contains three 20-horsepower submersible sewage pumps. The check valves and shut off valves for the three pumps are located in the basement of the control building. The second pump station shown as Pump Station No. 2, contains two 20-horsepower submersible sewage pumps identical to the three in Pump Station No. 1. A separate underground valve vault contains the check and shut off valves for the two pumps.

Pump station No. 1 and No. 2, with all pumps operational, are rated for a total of 12.4 MGD. The system with one pump out of service is rated for 9.5 MGD. A spare pump is available should a pump fail and need to be replaced.

6.5.3.2 Condition Evaluation

The primary pumping system was upgraded in the early 1990s with all the pumps, valves and controls being replaced. Since that time, the pumps have been rebuilt including replacement of the pump seals. The system should have 10-15 years of useful life remaining.

6.5.4 Secondary Treatment

6.5.4.1 General Description

The primary effluent is pumped by the effluent pumping system, described in Section 6.5.3, into a 24-inch RCP forcemain to a split flow chamber. The split flow chamber constructed in the late 1980s is equipped with slide gates that provide flow regulation to each of the three secondary treatment units. The chamber allows for operation of the secondary treatment system in either conventional or contact stabilization mode. During periods of dry weather and low flows, one secondary treatment unit is removed from service. All three secondary treatment units are required to be in service during periods of wet weather.

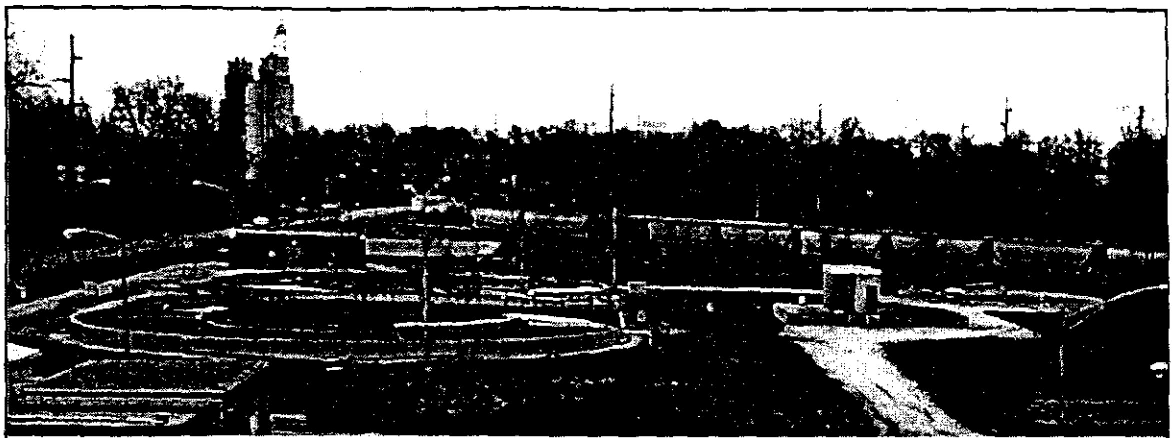

Figure 6.8 - Secondary Treatment

The existing secondary treatment facilities, shown in Figure 6.8, are comprised of three secondary treatment units. Two of the units, constructed in 1970, shown as the South Secondary Treatment Unit and the North Secondary Treatment Unit in Figure 6.4, are circular, multi-compartment tanks, 120 feet in diameter. The South Secondary Treatment Unit is divided into contact aeration, re-aeration, 70-foot diameter clarifier, chlorine contact, and a waste-activated sludge holding tank used for all three secondary treatment systems. The North Secondary Treatment Unit is divided into contact aeration, re-aeration, 70-foot diameter clarifier, chlorine contact and contact aeration and re-aeration for the third secondary treatment system. The third secondary treatment system, shown as Clarifier No. 3 in Figure 6.4, constructed in 1995 includes a 70-foot diameter clarifier, chlorine contact, and a return and waste activated sludge pumping building. Located north of the North Secondary Treatment Unit is the Blower Building that houses two engine-driven positive displacement blowers, one electrically-driven positive displacement blower, and the chlorination systems for all three secondary treatment units. Additional secondary treatment system equipment details are included in Appendix B.

IEPA design criteria for an aeration system requires a design loading rate of 50 lbs. BOD per day per 1000 CF of tank volume (contact and re-aeration combined), 1500 CF of air per lb. of BOD, return sludge pumps capable of 15% - 100% of peak flow, waste sludge pumps capable of at least 25% of peak flow, and air piping sized for 200% of the normal requirements. The blower capacity must be adequate to maintain 2.0 PPM minimum dissolved oxygen level with the largest blower out of service. Design criteria for secondary settling facilities requires a design surface loading rate of not more than 1000 gallons per square foot per day. Solids loading cannot exceed 50 lbs. per day per square foot at peak flow. Based on these criteria, the secondary treatment system has the theoretical capability of treating well over the 4.5 MGD design average flow and 8.7 MGD peak hourly flow.

6.5.4.2 Condition Evaluation

The secondary treatment system is comprised of components constructed at various times. As a result, the condition of certain parts of the system are good with others being in fair to poor condition. A summary of the components condition is listed in Table 6.5.3 and a more thorough description is included below.

Table 6.5.3
Secondary Treatment System
Condition Summary

Item Description	Condition	Useful Life Remaining (years)	Comments
Split Flow Chamber	Good	15	Sealing and repainting required
South Secondary Treatment Unit	Fair	5	▪ Significant concrete deterioration ▪ Traveling bridge near the end of useful life
North Secondary Treatment Unit	Fair	5	▪ Significant concrete deterioration ▪ Traveling bridge near the end of useful life
FCI Secondary Treatment Unit No. 3	Good	20	▪ Most components in good condition ▪ Aeration tanks have significant concrete deterioration
Blower System	Fair	2	▪ Blowers are 30-years old ▪ G342 engine's are obsolete
Chlorination System	Good	5	W-T equipment is outdated

Split Flow Chamber

The split flow chamber, constructed in the late 1980s is in good condition with some minor repairs required in the near future. The exterior concrete walls have some significant cracks. The sandblast procedure used to remove the original paint has exposed the aggregate in the concrete making it susceptible to freeze and thaw damage. The painted steel walkway, handrails, slide gate operators, and structural supports are beginning to show signs of surface rust.

South Secondary Treatment Unit

The 120-foot diameter tank perimeter walls are in poor condition. They have numerous cracks and areas of deteriorated concrete. The area on top of the wall where the traveling bridge drive wheels track, shown in Figure 6.9, was resurfaced approximately 8-10 years ago. This material has cracked and is now separating from the concrete.

The contact aeration and re-aeration tanks are in fair condition. The fine bubble air diffusers, vertical air piping, and valves were replaced in 1988. More recent improvements include replacement of the fine bubble air diffusers in 1999. The six inch air lift sludge pump is also in fair condition.

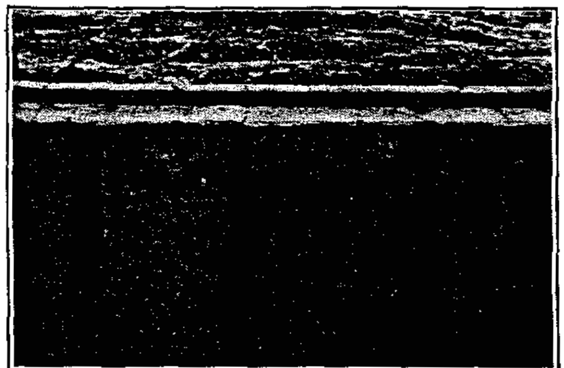

Figure 6.9 - Secondary Treatment - Top of Wall

The 70-foot diameter clarifier is in fair condition. The traveling bridge collector mechanism is original equipment and has been in service for nearly 30 years. Maintenance and repairs has kept the system operational, but it is reaching the end of its useful life. The 12-inch air lift sludge pump is in fair condition and is also original equipment. The return sludge suction tubes and scraper mechanisms were replaced in the early 1990s and appear to be functioning adequately. The weirs and baffles appear to be in good condition.

The chlorine contact zone, including the air diffuser piping, chlorine dispersion piping and baffle system is in good condition. The chlorine contact zone components were rebuilt in the early 1990s.

If major concrete structure improvements are made in the next year, the South Secondary Treatment Unit has an estimated useful life of five years.

North Secondary Treatment Unit

The North Unit shown in Figure 6.10, is in nearly the same condition as the South Unit described above. The main exception is the contact aeration and re-aeration tanks for secondary treatment system No. 3. These tanks are part of the original 1970 construction, but were renovated in 1995. The fine bubble air diffusers, vertical air piping, and valves were installed as part of that renovation and are in good condition. The fine bubble diffusers will most likely require replacement in the next two years.

Figure 6.10 - North Secondary Treatment Unit

The North Secondary Treatment Unit has an estimated useful life of five years, assuming major concrete structure improvements are made within the next year.

Secondary Treatment Unit No. 3

The contact aeration and re-aeration tanks are a portion of the North Secondary Treatment unit and are discussed in that report section. Clarifier No. 3, constructed in 1995, is in good condition and has remaining estimated useful life of 20 years.

Blower System

The three existing blowers, installed in 1970, are rated at 3,500 CFM each. Caterpillar G342-NA-6 cylinder natural gas engines drive two of the blowers. Caterpillar has rebuilt the engines, but no longer manufacture the G342. The third blower is driven by a 200 HP, 480VAC electric motor which was replaced in 1990. The blowers are in fair to poor condition and exhibit significant bearing noise. The blowers have been in service for 30 years. They should be replaced in the next 1-2 years or sooner.

Figure 6.11 - Blower Building

The Blower Building shown in Figure 6.11, was also constructed in 1970 and is in fair condition. United Water and the City of Pekin have developed a list of required building improvements, included in Appendix C for reference.

6.5.5 Effluent Disinfection

The chlorination system, housed in the Blower Building, is in good condition. The automatic chlorinators for the North and South Secondary Treatment Units, shown in Figure 6.12, were replaced in the early 1990s. The Secondary Treatment Unit No. 3 automatic chlorinator was installed in 1995. The manual chlorinators used to control filamentous bacteria in the aeration system are also in good condition. The chlorination system has approximately five years of useful life remaining.

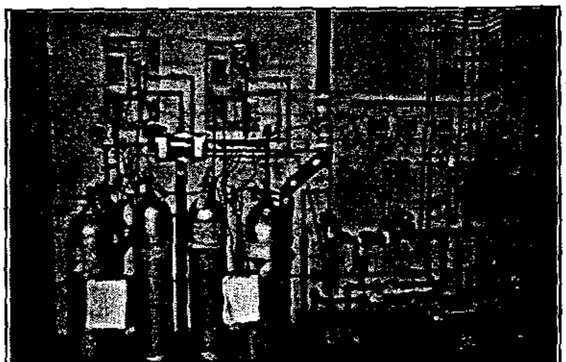

Figure 6.12 - Chlorination System

6.5.6 Sludge Handling/Processing

6.5.6.1 General Description

Historically, the sludge handling facilities at STP #1 have consisted of liquid sludge storage lagoons. In 1989, a gravity belt thickener, vacuum sludge drying beds, sludge storage pad, and associated piping, controls and metering equipment were added for sludge handling.

Currently, United Water operates the gravity belt thickener, shown in Figure 6.13, for thickening both primary and waste activated sludge prior to digesting the sludge in the anaerobic digesters. The vacuum sludge drying beds and the sludge storage pad are currently not in use. The liquid sludge is stored in the sludge storage lagoons and then land applied.

A general sludge handling/processing component description follows, with specific details listed in Appendix B. The liquid sludge storage lagoons are estimated to hold approximately 272,600 cubic feet of sludge (2,039,000 gallons). Sludge can be gravity drained from Digester No. 1, 2, and 3 to the lagoons.

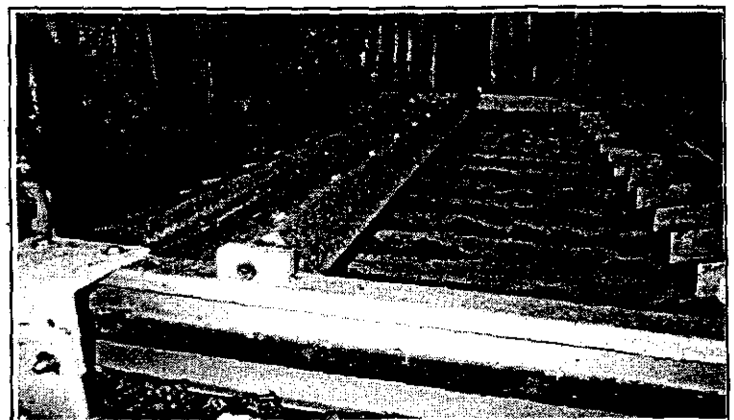

Figure 6.13 - Gravity Belt Thickener

The gravity belt thickener (GBT) system consists of a 2.5 meter wide gravity belt sludge thickener installed in 1989. Associated components include a 2 GPH variable rate polymer feed system, a 60 GPM rotary lobe thickened sludge pump, waste activated sludge flow meter, and a PLC-based control system. The GBT system is capable of thickening sludge at the rate of approximately 250 GPM. The GBT capacity is limited by the thickened sludge discharge pump.

The waste activated sludge (WAS) pump, housed in the "old dewatering building" pumps the WAS from the south tank of the South Secondary Treatment Unit to the GBT. The pump is rated at 300 GPM and is controlled by a variable speed drive.

The vacuum drying bed system is capable of dewatering up to 24,000 gallons of digested sludge in one cycle. The application and drying cycle time typically ranges from 24 to 48 hours. The system consists of four 20-foot by 40-foot rectangular vacuum drying beds, an 8 GPH variable rate polymer feed system, two vacuum pumps, digested sludge flow meter, and a PLC-based control system all housed in the Drying Bed Building shown in Figure 6.4.

To accommodate storage of the dried sludge, a sludge storage pad was constructed in 1989. The uncovered storage pad consists of one 60-foot by 100-foot rectangular concrete pad with curbs and drains. The pad can hold approximately 18,000 CF of dried sludge.

6.5.6.2 Condition Evaluation

The following paragraphs include a description of the sludge handling/processing components condition as noted during the STP#1 site investigations performed by Harding ESE personnel. Summaries of the conditions are listed in Table 6.5.4.

Table 6.5.4
Sludge Handling/Processing
Condition Summary

Item Description	Condition	Useful Life Remaining (years)	Comments
Sludge Lagoons	Fair	---	Routine Berm Repair Required
Gravity Belt Thickener	Good	10	Hydraulic system, belt and moving parts require periodic maintenance and replacement
Polymer Feed System	Good	10	Installed in 2000
Thickened Sludge Discharge Pump	Good	10	Pump replaced in 2000
Waste Activated Sludge Pump	Fair	10	Has been in service 11 years. Duplex system should be considered
Vacuum Bed System	---	---	Out of service
Sludge Storage Pad	---	---	Out of service

Liquid Sludge Storage Lagoons

The digested liquid sludge stored in the sludge lagoons, shown in Figure 6.14, is periodically removed by mechanical pumping. The lagoons have not been completely drained and cleaned for many years. Dried sludge deposits are dispersed throughout the lagoon area. The lagoon berms are in fair condition, requiring routine maintenance to eliminate rodents and vegetation control. There has historically been a question regarding groundwater intrusion into the lagoons, especially during periods of high river levels, indicating a lagoon floor with potentially minimal integrity.

Gravity Belt Thickener

The gravity belt thickener (GBT) was installed in 1989 and is used on a daily basis. The belt has been replaced several times and other system components have been repaired or replaced. The hydraulic drive unit and all moving parts are susceptible to wear and require periodic maintenance and replacement.

Based on the site investigation, it appears that the unit will require complete replacement within approximately 10 years. The vinyl curtain system is in fair condition and will need to be replaced in approximately five years. The concrete floor and curbing are in good condition.

The system control panel is discussed in Section 6.5.8.

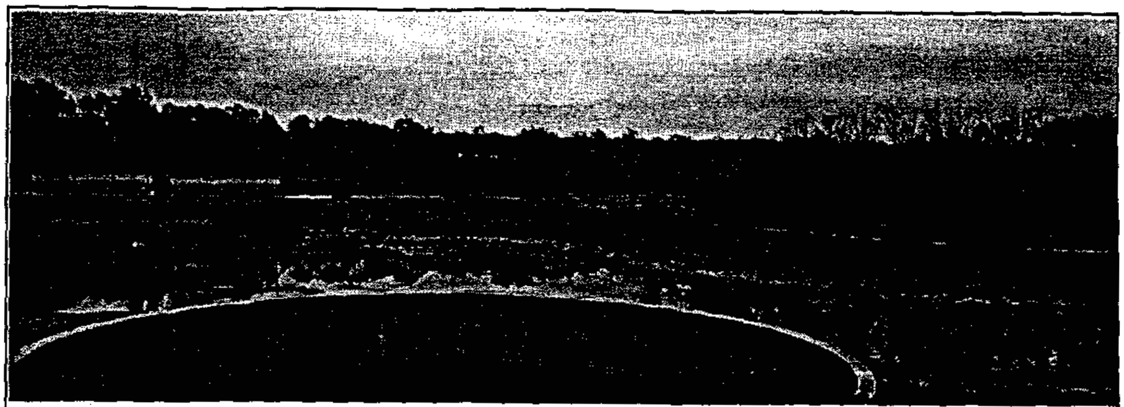

Figure 6.14 - Sludge Lagoons

Polymer Feed System

The GBT utilizes polymer to enhance the sludge dewatering process. The polymer-feed system has been in service for 11 years. Due to the importance of the GBT system for the sludge handling/processing procedure, the City has installed a second polymer feed unit to provide a duplex system. The original unit will need to be replaced within the next five years.

Thickened Sludge Discharge Pump

The 11-year-old pump is currently being replaced with a new unit. The existing motor is being reused. As noted in a early 1990 Harding ESE report, the sludge processed by the GBT system is restricted due to the capacity of the sludge discharge pump. The previous recommendation, which is still valid, is to replace the existing 60 GPM pump with a 75-100 GPM unit with a higher head capacity.

Waste Activated Sludge Pump

The 300 GPM waste activated sludge (WAS) pump has also been in service for eleven years. It appears to be in good condition. As with the other GBT support systems, addition of a duplex pump should be considered. The pump could be installed adjacent to the existing WAS pump in the "old dewatering building."

Vacuum Bed System

The vacuum bed system is not being used by United Water. It has been taken out of service due to the labor required to process the sludge, clean the beds prior to the next sludge application and the variations in sludge quality and cycle time. The system appears to be in good condition, although the vacuum plates are showing signs of wear.

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Sludge Storage Pad

The sludge storage pad is also not being used. The pad appears to be in good condition, but a roof should be installed if it is returned to service for dried sludge storage.

6.5.7 Anaerobic Digestion

6.5.7.1 General Description

The existing anaerobic digester system consists of two primary digesters, a secondary digester, an "old" out of service digester, gas recovery and conditioning equipment, and electrical controls.

The primary digesters, Digester No. 1 and No. 2, are complete mix digesters. Digester No. 1 constructed in 1989, consists of a 50-foot diameter digester tank, a dual-fuel sludge heat exchanger, a 300 GPM sludge recirculation pump, a complete mix digester gas system, gas collection, condensate recovery and conditioning system, gas volume and usage metering, and sludge level and floating cover level metering. Digester No. 2, built in 1963 and improved in 1996, consists of a 50-foot diameter digester tank, a dual-fuel sludge heat exchanger, sludge recirculation pump, a complete mix digester gas system, gas collection and condensate recovery system, gas volume metering, and sludge level metering. Total primary digester volume is 808,370 gallons.

Digester No. 3, built in 1939, was improved in 1996 and is currently used as a secondary digester. The digester is a 35-foot diameter tank with a fixed cover. There is no heating or mixing system associated with Digester No. 3. The total secondary digester volume is 244,222 gallons.

The "old" out of service digester, also built in 1939, was cleaned and the covered removed in 1996. It is currently being used as a digested sludge storage tank.

Thickened primary and waste activated sludge can be fed to either of the two primary digesters. Digester gas is collected in the three digesters and stored in Digester No. 1, under the floating cover. The floating cover has approximately 20,000 cubic feet of storage volume. The gas can be used for fuel for the engine-generator (G-1), Digester No. 1 and No. 2 dual-fuel sludge heat exchangers, or flared using the waste gas burner.

The organic treatment capability of the digestion system, based on the total primary digester volume of 108,070 CF, would be approximately 8,646 lbs. VTSS per day.

6.5.7.2 Condition Evaluation

The condition of the anaerobic digestion components is summarized in Table 6.5.5. A more complete description is included in the following paragraphs.

Table 6.5.5
Anaerobic Digestion
Condition Summary

Item Description	Condition	Useful Life Remaining (years)	Comments
Digester No. 1			
▪ Dual-fuel sludge heat exchanger	Good	15	Tubes require periodic replacement
▪ Recirculation pump	Poor	<1	Motor out, seals leaking
▪ Complete mix system	Poor	<1	Compressor out of service
▪ Gas collection system	Fair	10	Piping replacement < 5 years
▪ Building	Good	25	Exterior re-seal; interior re-paint
Digester No. 2			
▪ Dual-fuel sludge heat exchanger	Good	20	Installed in 1996
▪ Recirculation pump	Good	10	Installed in 1996
▪ Complete mix system	Good	15	Installed in 1996
▪ Gas collection system	Good	15	Installed in 1996
▪ Building	Good	25	

Anaerobic Digester No. 1

Digester No. 1, shown in Figure 6.15 was constructed in 1989 and is generally in good condition. The various components that comprise the complete mix digester system are in poor to good condition.

The dual fuel sludge heater boiler tubes have been replaced several times since installation. The digester gas is corrosive and has decreased the life of the tubes. United Water contracts out the maintenance and repairs to the sludge heater and heat exchanger and it is maintained in good condition. The anticipated remaining useful life of the heat exchanger is approximately 15 years, but system components will require replacement prior to that time.

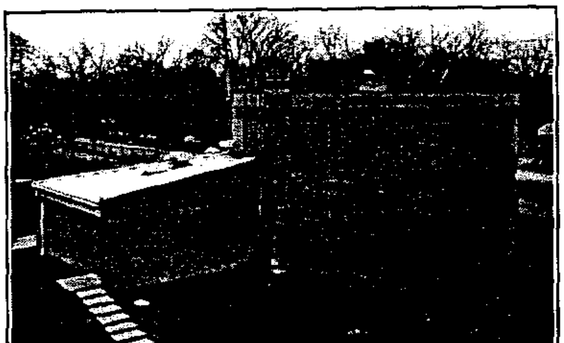

Figure 6.15 - Digester No. 1

A 5 HP, 300 GPM centrifugal pump re-circulates the sludge in the digester tank and through the sludge heater. The electric motor had failed and was being replaced during the site visit. On a prior visit, it was noted that significant seal water and/or sludge was leaking from the pump seal. Due to the importance of the pump, a stand-by unit should be considered.

The complete mix system is comprised of a belt drive gas compressor, gas piping, gas safety equipment, and three gas guns. During the site visit, the gas compressor was out of service due to a failed impeller. The piping that was accessible for inspection appeared to be in fair to poor condition on the interior, with a majority of the piping exterior painting in good condition. The piping will need to be completely replaced in the next five years (small sections of piping have already been replaced). The piping inside of the digester tank was coated on the inside of the pipe with an epoxy paint system prior to the initial installation. So, this piping is most likely in better condition than the piping in the digester gas room, but it would be prudent to replace the gas piping in the digester tank in five years also. Replacement of the piping will require the digester be taken out of service, drained and access made through the manways in the floating cover. The digester tank should be cleaned and inspected at that time. The system will have been in service for approximately 15 – 16 years in five years and other repairs may be required to the digester tank, floating cover or the mixing gun system.

The gas collection system consists of the floating cover, piping, and gas safety devices. The collection piping is primarily ductile iron pipe and appears to be in good condition. This entire system should be inspected when the digester is taken out of service in five years for gas mix system piping replacement. The waste gas burner, roof mounted on the south side of the building, should be inspected by a qualified technician and repairs made as required. The burner appears to be in fair condition, but the gas control panel enclosure is in poor condition. The pilot burner, fueled with natural gas, runs continuously. The original design for the system provided for ignition of the pilot burner only during periods of high digester gas pressure above a certain set point.

The digester building is in good general condition, but there are some maintenance and repairs that need to be completed. Appendix C contains the list of items related to the building identified by the City and United Water that need to be completed in the near future.

Anaerobic Digester No. 2

Digester No. 2, shown in Figure 6.16, was upgraded in 1996 and is in good general condition. All of the major system components were replaced in 1996, including the sludge heat exchanger, re-circulation pump, complete mix system, gas collection system, building heating and ventilation, and a majority of the sludge piping. These components are in good condition. The sludge piping that was not replaced is in fair condition, and needs to be repainted.

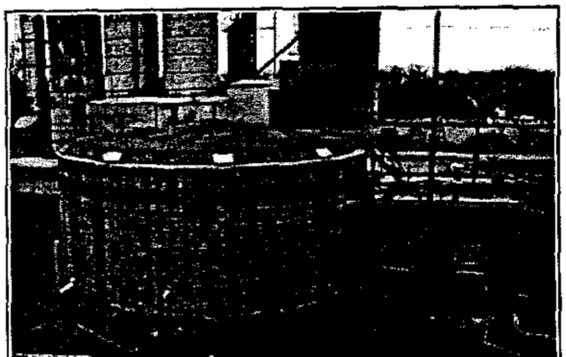

Figure 6.16 - Digester No. 2

The Digester No. 2 tank was rehabilitated on the exterior in 1996. The original bricks, installed in 1963, were removed, the tank height was increased by placing concrete walls on the top of the old tank, and split face CMU's were installed around the exterior of the tank. The CMUs need to be resealed with a waterproof coating. The digester building, constructed in 1963, has the original brick exterior and appears to be in good condition.

6.5.8 Metering/Instrumentation/Controls

6.5.8.1 General Description

Nearly all of the facility meters, instruments and control systems were replaced or upgraded during the 1989 plant improvements project, or more recently in some cases. Exceptions to this are the influent meters, which were installed previous to the 1989 improvement project. The facility contains seven Allen-Bradley PLCs, four significant HVAC control panels, two major motor control centers and numerous power panels.

The PLCs are linked to a central computer system located in the Control Building, second floor office area. Alarm system status and system controls are available from the central computer utilizing RSView Software. Alarms are telemetered by an Advotech system to an emergency telephone number during off hours. Table 6.5.6 includes a listing of the meters and PLCs, their location, function, and estimated years of service.

6.5.8.2 Condition Evaluation

The following paragraphs are condition reports for various control panels throughout STP #1.

Ventilation Control (Belt Thickener & Heat Exchanger Area)

- Overall, this panel is in relatively good condition but does show signs of hydrogen sulfide corrosion.
- All bare copper and brass fuses are black with corrosion.
- Wiring internal to the panel is coated copper wire and shows no signs of corrosion. Wiring brought into the panel is stranded copper and shows significant signs of corrosion and should be replaced.
- To prevent the migration of hydrogen sulfide gases, sealoffs should be installed on all conduits coming from or going to this panel.
- It is also recommended that Hoffman Corrosion inhibitors be maintained within the panel. Internal wiring is wire tagged with permanent plastic markers. External wiring (wire entering the control panel from a conduit) currently has paper wire tags that have started to deteriorate and fall off. It is recommended that these paper wire tags be replaced with plastic tags like those on wiring internal to the panel.
- Currently, front panel mounted switches, fuse blocks and other internal panel devices are inconsistently labeled. It is recommended that all internal panel devices be permanently labeled and that the panel be permanently labeled internally. It is recommended that a documentation rack be

installed in the panel and that the copy of the associated documentation be maintained within the panel.

- Remove debris and clean out the bottom of the cabinet

Table 6.5.6
Meters and Programmable Logic Controllers

Item	Location	Service	Years of Service
CP-PC-PLC	Control Building	Primary Pumps and Sludge Pumping	11
CP-PS-PLC	Digester No. 1 Bldg.	Engine/Generator	11
CP-BL-PLC	Digester No. 1 Bldg.	Digester No. 1 & No. 2 Heat Exchanger	11
CP-TH-PLC	Digester No. 1 Bldg.	Gravity Belt Thickener	11
CP-FP-PLC	Drying Bed Bldg.	Sludge Drying Bed System	11
CP-HG-PLC	Blower Building	Diversion Chamber Hydraulic Gates	12
CP-BM-PLC	Blower Building	Blower System, DO, FBOP Sludge Pumping	11
Influent Flow Meter	Control Building	East Effluent	18
Influent Flow Meter	Control Building	West Effluent	18
Effluent Flow Meter	Control Building	North Secondary Effluent	10
Effluent Flow Meter	Control Building	South Secondary Effluent	10
Effluent Flow Meter	Control Building	FBOP Effluent (East Secondary)	5
D.O. Meter	Blower Building	North Secondary	11
D.O. Meter	Blower Building	South Secondary	11
D.O. Meter	Blower Building	FBOP Secondary (East Secondary)	5
Turbidity Meter	Blower Building	North Secondary Effluent	5
Turbidity Meter	Blower Building	South Secondary Effluent	5
Turbidity Meter	Blower Building	FBOP Effluent (East Secondary)	5
Chlorine Residual	Blower Building	North Secondary Effluent	8
Chlorine Residual	Blower Building	South Secondary Effluent	8
Chlorine Residual	Blower Building	FBOP Effluent (East Secondary)	5
Sludge Meter	Digester No. 1 Bldg.	WAS & Primary Sludge	11
Sludge Meter	Drying Bed Building	Digested Sludge	11
Electric Meter	Digester No. 1 Bldg.	CILCO KWH	11
Electric Meter	Digester No. 1 Bldg.	G-1 KWH	11
Gas Meter	Digester No. 1 Bldg.	Digester No. 1 Digester Gas Production	11
Gas Meter	Digester No. 1 Bldg.	Digester No. 2 Digester Gas Production	11

Primary Effluent Pump Control Panel (CP-PC)

The following upgrades are recommended for this control panel.

- Permanently label all relays, switches, panel meters and internal devices.
- Label processor with associated rack, rung and slot designations.

- Provide documentation rack and associated panel documentation.
- Replace paper wire tags with permanent plastic tags.
- Reroute wiring within the panel through the provided raceway and reinstall the raceway covers.
- Provide permanent internal and external panel identification tag. (CP-PC)
- Permanently label all internal panel devices (i.e. power supplies, signal conditioners, etc.)
- All terminations should be retorqued.
- Label all spare wiring as to origination/destination etc.
- Remove debris and clean out bottom of control panel.

Primary Sludge Pumping System Control Panel (CP-SP)

Overall this panel is in good condition. The following modifications are recommended.

- Label switches, panel meters, transformer and relays permanently.
- Label the processor and associated rack rung and slot designations.
- Provide permanent internal and external panel identification tag. (CP-SP)
- Provide documentation rack and associated panel documentation.
- All terminations should be retorqued.
- Remove debris and clean out bottom of control cabinet.

Ventilation Control Panel-(Generator Room, Generator #1 & Generator #2)

This panel has corrosion consistent with exposure to hydrogen sulfide gas. The following improvements are recommended:

- To prevent the migration of hydrogen sulfide gases, sealoffs should be installed on all conduits terminated in the control panel.
- Provide permanent internal panel identification tag.
- Label all internal devices, fuses, switches, transformers, relays etc. with permanent labels.
- Hoffman Vapor Corrosion Inhibitors are recommended to be installed and maintained.
- Provide documentation rack and associated panel documentation.
- Significant corrosion is apparent on all bare copper wires and brass fuse ends. It is recommended that all external wiring be re-terminated or replaced to eliminate all corrosion.
- Replace paper based wire tags with permanent plastic tags.
- Remove debris and clean bottom of the cabinet.

Boiler System Control Panel (CP-BL)

Overall, this panel is showing signs of deterioration caused by hydrogen sulfide gas. The following upgrades are recommended:

- Remove debris and clean the cabinet
- Label processor with associated rack, rung and slot designations.
- Significant corrosion is apparent on all bare copper wire and brass fuse ends. It is recommended that all external wiring be re-terminated or replaced to eliminate apparent corrosion and that fuses be replaced. Internal panel wiring appears okay.
- Alarm buzzer needs to be re-terminated.
- Hoffman Vapor Corrosion Inhibitors are recommended to be reinstalled and maintained.
- In order to prevent the migration of hydrogen sulfide gases, sealoffs should be installed on all conduits terminated in the control panel.
- Provide permanent internal panel identification tag. (CP-BL)
- Label all internal devices, power supplies, fuse blocks, switches, breakers, panel meters, etc. with permanent labels.
- Provide documentation rack and associated panel documentation.
- Replace paper wire tags with permanent plastic tags.
- Replace door seal
- Remove all jumper wires
- Establish procedure for maintaining up-to-date panel documentation.

Auxiliary Boiler Control Panel (CP-BL Aux.)

Hydrogen sulfide gas corrosion is already apparent within this panel. The following improvements are recommended:

- Permanently label all starters associated with the auxiliary boiler system currently residing in the boiler room.
- To prevent the migration of hydrogen sulfide gases, sealoffs should be installed on all conduits terminated in the control panel.
- Provide permanent internal and external panel identification tags. (CP-Aux. BL).
- Corrosion is apparent on all bare copper wire. It is recommended that all corroded wiring be re-terminated or replaced as required to eliminate all corrosion.
- Hoffman Vapor Corrosion Inhibitors are recommended to be installed and maintained.
- All terminations should be retorqued.
- Permanently label all internal panel devices (i.e. switches, panel meters, etc.).
- Provide documentation associated with panel and documentation rack/holder.
- Provide permanent wire tags for all internal wiring.

Gas Compressor Control Panel (CP-GC)

This panel is showing signs of deterioration consistent with hydrogen sulfide gas exposure. The following improvements are recommended:

- To prevent the migration of hydrogen sulfide gases, sealoffs should be installed on all conduits terminated in the control panel.
- Provide permanent internal and external panel identification tag. (CP-GC)
- Significant corrosion is apparent on all bare copper wire and brass fuse ends. It is recommended that all external wiring be re-terminated or replaced to eliminate all corrosion and that fuses that are badly corroded be replaced.
- Provide documentation rack and associated panel documentation.
- Replace paper wire tags with permanent plastic tags similar to existing internal wire tags.
- Label processor with associated rack, rung and slot designations as required.
- Hoffman Vapor Corrosion Inhibitors are recommended to be installed and maintained.
- All terminations should be retorqued.
- Replace door seal.
- Remove debris and clean out bottom of the cabinet.

Generator Control Panel (CP-PS)

This panel is showing signs of deterioration associated with hydrogen sulfide gas exposure. The following improvements are recommended for this panel:

- To prevent the migration of hydrogen sulfide gases, sealoffs should be installed on all conduits terminated in the control panel.
- Significant corrosion is apparent on all bare copper wire and brass fuse ends. It is recommended that all external wiring be re-terminated or replaced to eliminate all corrosion and that fuses that are badly corroded be replaced.
- All terminations should be retorqued.
- Hoffman Vapor Corrosion Inhibitors are recommended to be installed and maintained.
- Label processor with associated rack, rung and slot designations as required.
- Provide permanent internal and external panel identification tag. (CP-PS)
- Replace paper wire tags with permanent plastic tags similar to existing internal wire tags.
- Waste heat system cooling water temperature panel meter is currently not working. Fix as required.
- Provide documentation rack and associated panel documentation.
- Permanently label all internal panel devices such as switches, panel meters, relays, breakers, fuse boxes, etc.
- Remove debris and clean out bottom of the control cabinet.

Boiler Control Panel (Mounted on Aux. Boiler)

- Label all internal devices permanently.
- Label all internal wiring permanently.
- Provide disconnecting means for power to control panel.
- Provide accurate wiring documentation and store in documentation rack/holder.

Gravity Belt Thickener (CP-TH)

This panel is showing signs of deterioration associated with hydrogen sulfide gas exposure. The following improvements are recommended:

- Provide permanent internal and external panel identification tag. (CP-.TH)
- Replace paper wire tags with permanent plastic tags similar to existing internal wire tags.
- Significant corrosion is apparent on all bare copper wire and brass fuse ends. It is recommended that all external wiring be re-terminated or replaced to eliminate all corrosion and that fuses that are badly corroded be replaced.
- Replace all corroded wiring associated with this panel.
- Label processor with associated rack, rung and slot designations as required.
- Permanently label all internal panel devices such as switches, panel meters, relays, breakers, fuse boxes, etc.
- Retorque all internal connections.
- Hoffman Vapor Corrosion Inhibitors are recommended to be installed and maintained.
- Clean interior of control panel.
- Label all unused wires as to origin/destination.
- Provide documentation rack and associated panel documentation.
- Establish procedure for maintaining accurate and up-to-date panel documentation.

Blower Control (CP-BM)

Overall, this panel is in relatively good condition and doesn't exhibit corrosion similar to other panels. The following improvements are recommended:

- Label incoming wiring permanently.
- Label power supply control relays, switches, breakers, etc. permanently.
- Label processor with rack, rung, and slot designations.
- Label all unused wires as to origin/destination.
- Permanently label interior and exterior of control panel (CP-BM).
- Provide documentation and associated documentation rack.

6.6 Sewage Treatment Plant No. 2 (STP#2)

STP#2, shown in Figure 6.17, is presently being used for wastewater storage during wet weather conditions when the CSOs are overflowing. The existing plant, built in 1971 and expanded in 1975, includes two activated sludge treatment units (north unit is shown in Figure 6.18), polishing pond, blower and office building, and sludge drying beds. The plant was removed from service in 1989, following completion of the north side interceptor sewer. The decision to discontinue the use of the 1MGD plant was based on the estimated cost to rehabilitate and operate the plant compare to the construction of a new interceptor sewer. It was determined that the annualized costs of improving, operating and maintaining

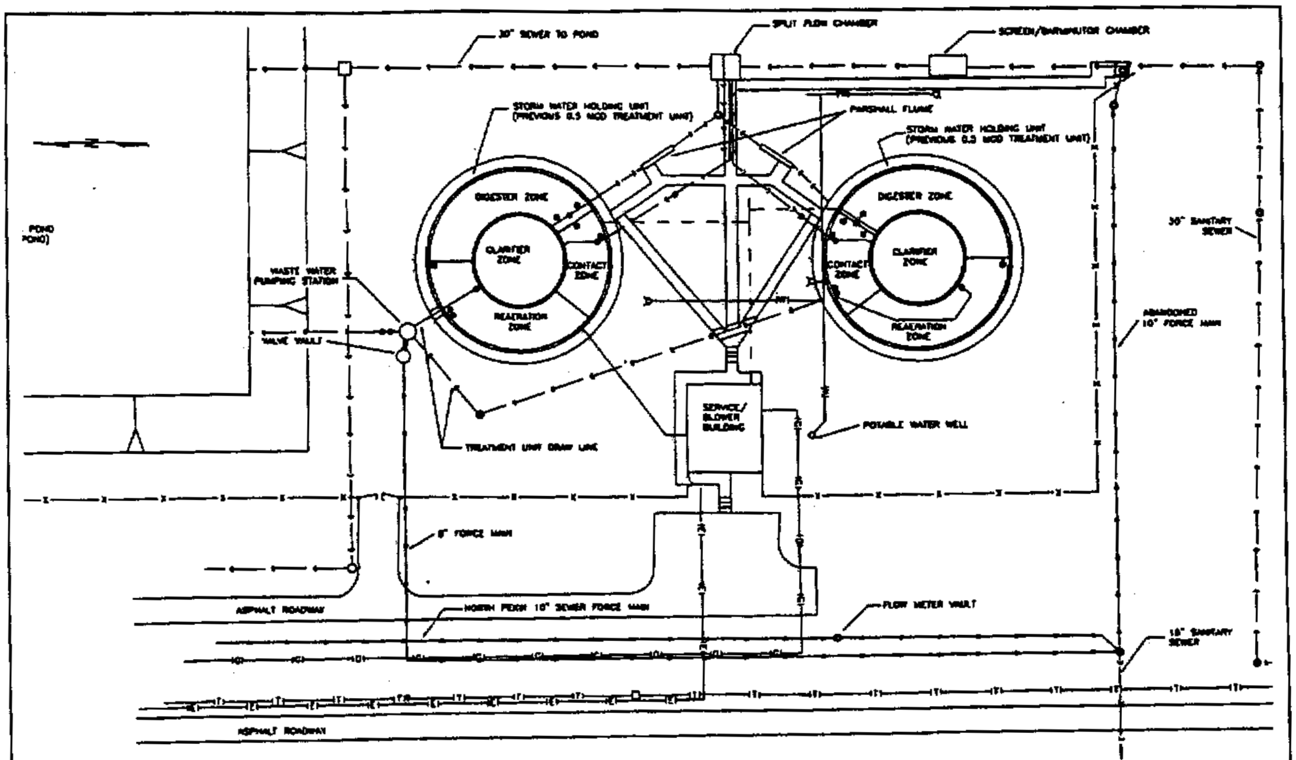

Figure 6.17 - STP No. 2

STP #2 would be in excess of the cost of constructing an interceptor sewer and transporting the wastewater to STP#1 for full treatment.

The condition of STP#2 is fair to poor. The components were all inspected and while some could be salvaged, many will require replacement if the treatment plant was returned to service. When in operation, the treatment systems were difficult to operate and compliance with the discharge permit was inconsistent. The design of the original system was less than ideal and restoring the existing plant is discouraged.

The north and south treatment unit structures are in fair condition, but the air piping, diffusers, clarifier system, sludge pumps, weirs and baffles, and scum box are in poor condition. The bar screen is in good condition, but the comminutor appears to be inoperable. The flow meters are inoperable and the control gates have been removed. The polishing pond as determined by a previous pond study, has apparent leaks in the pond floor and the chlorination system is inoperable.

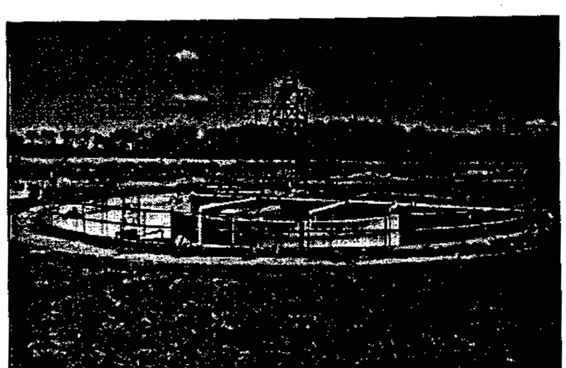

Figure 6.18 - STP No. 2 - North Unit

6.7 CSO Settling and Chlorine Contact Basin – STP #1

6.7.1 General Description

The CSO Settling and Chlorine Contact Basins are used to store excess flow from the incoming combined sewer system during wet weather conditions. If the flow exceeds the storage capacity of the CSO settling basin, the flow passes into the chlorine contact basin and ultimately out to the Illinois River. The combined storm water and wastewater retained in the basin after a storm event is pumped back into the interceptor sewer to STP #1 for full treatment.

Both basins have concrete walls and floors that were upgraded in the early 1990s.

6.7.2 Condition Evaluation

The basins are generally in good condition. United Water staff have indicated that they have had problems with the pumping system due to solids collecting in the sump. Operational experience has proven there is a tendency for significant volumes of solids to collect in the CSO settling basin and to some extent in the chlorine contact basin. Typically the plant operators clean the settling basin with a tractor loader. This is only somewhat successful due to the high water content of the solids. The chlorine contact basin must be cleaned manually by hand. These methods of cleaning have been time consuming and difficult, and cleaning of the basins is the primary issue to be resolved with this system. Improvement options evaluation is included in Section 7.4.

CA000052

7.0 Wastewater System Improvement Options

7.1 Combined Sewer Overflow Structures

7.1.1 Fayette Street Outfall

Problems associated with the Fayette Street regulator structure, flap gate, and outfall are two-fold. First, the manway to the regulator is in Fayette Street and difficult to access, resulting in the second issue which is maintenance. The slide gates require exercising and lubrication, at least annually. The flap gate needs to be inspected on a regular basis, preferably following each overflow occurrence.

The proposed improvement to the Fayette Street CSO includes replacement of the slide gates with stainless steel units. The estimated cost to replace the 15- and 18-inch slide gates is shown in Table 7.1.1.

Table 7.1.1
Fayette Street Outfall
Cost of Improvements

Item	Estimated Cost
Replace 15-inch slide gate with stainless steel unit	$ 7,500
Replace 18-inch slide gate with stainless steel units	$ 8,500
Structure sealing	$ 1,500
Subtotal	$17,500
Contingency	$ 1,750
Engineering & Administration	$ 2,900
Estimated Total	$22,150

7.1.2 *Court Street Outfall*

The recommended improvements at Court Street CSO include repair of the concrete structure, site improvements to reduce required maintenance including vegetation removal and installation of a bituminous surface from the structure to outside the fenced area, sealing of pipe penetrations, and replacement of the slide gates. The estimated cost of the improvements is listed in Table 7.1.2.

Table 7.1.2
Court Street Outfall
Cost of Improvements

Item	Estimated Cost
Repair concrete structure	$ 5,000
Site improvements	$ 2,500
Seal pipe penetrations	$ 1,500
Replace 15" sluice gate	$ 7,500
Replace 36" sluice gate	$18,000
Subtotal	$34,500
Contingency	$ 3,450
Engineering & Administration	$ 5,700
Estimated Total	$43,650

7.1.3 Caroline Street Outfall

The Model 30" TF-2 Tideflex Check Valve was reinstalled in the mid-1990s after becoming loose from the discharge pipe and allowing river water to enter the combined sewer system. The valve appears to be in good condition but requires periodic inspection to clean any debris that may be lodged in the valve. The 12-inch sluice gate and the 21-inch slide gate are inoperable and need to be replaced with similarly constructed units or stainless steel units, since the stainless steel units will perform better when minimal maintenance is performed on the gates. The estimated cost of improvements is listed in Table 7.1.3.

Table 7.1.3
Caroline Street Outfall
Cost of Improvements

Item	Estimated Cost
Replace 12" sluice gate	$ 6,000
Replace 21" slide gate	$10,000
Subtotal	$ 1,600
Contingency	$ 3,450
Engineering & Administration	$ 2,600
Estimated Total	$36,200

7.1.4 State Street Outfall

The State Street Outfall requires periodic maintenance which includes inspection and cleaning of the 60-inch and 72" x 48" flap gates. The structure is in fair condition.

7.2 State Street First Flush Basin

The following options have been identified to resolve the solids accumulation problem in the State Street Basin.

Aeration System

Under this option, an aeration system will be installed on the floor of the tank with adequate air supplied to keep the solids in suspension. This would require a system of diffusers mounted to the floor as well as a blower system to supply the necessary air. This system will not be pursued due to the high cost of a blower system and associated building, the noise problems associated with blowers in a residential area, and the difficulty of maintaining diffusers when only used on an intermittent basis.

Flushing System with Domestic Water

A series of high-pressure nozzles will be installed throughout the tank to flush the solids into the drain channel and back into the wet well where the waste will be pumped into the sewer system. This approach will require a separate wet well for water storage and a high-pressure pump to supply the nozzle system. The wet well will be filled from the City water main. This approach will require a water meter, a backflow preventer, and pressure relief valve to protect the pump. Water will be purchased from Illinois-American Water Company. This alternative will not be pursued due to the need for a high-pressure pump, the need for an additional underground structure to store the flushing water, and the added cost of purchasing water.

Flushing System with Wastewater

This concept shown in Figure 7.2.1 will use one of the existing sewage pumps to supply wash water to the basin for flushing purposes. Electric valves in the pump house will control diversion of water to the basin. Under normal conditions when the basin is not being cleaned, the pump will be used in rotation with the other pumps to pump wastewater to the interceptor sewer. An inline grinder will be required in the main flushing line to prevent large solids from plugging the discharge ports on the flushing headers. With this approach a large volume of water (approximately 600 to 700 gpm) will be concentrated on a small area of the tank to move the solids to the drain channel and ultimately into the wet well. To accomplish this, the tank will be flushed in sequence via electric control valves. The timing of the valve sequence will be controlled by the PLC used for the pump system. If the solids buildup in the tank is heavy, it may be necessary to cycle through the flushing sequence two or three times. The electric valves for sequencing the headers will be located outside the tank in a separate building. The building will serve two purposes; 1) to facilitate maintenance of the valves, and 2) to allow the valves to be installed above the flood level of the Illinois River. The valves could be mounted in the tank, however, this would require explosion proof operators and maintenance would be extremely difficult due to limited access and the potentially harmful environment in the tank. The estimated cost for installation of this system is approximately $141,000. A cost breakdown is shown in Table 7.2.1.

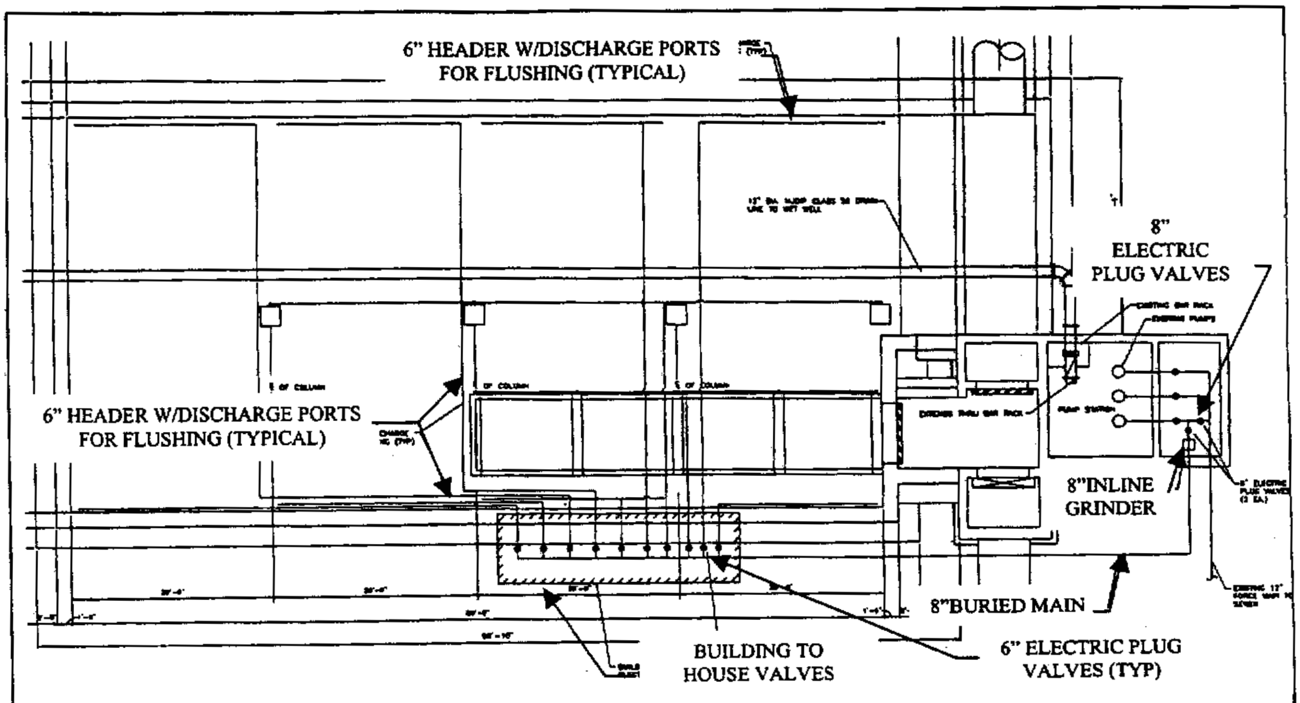

Figure 7.2.1 - State Street Basin Cleaning Concept

Table 7.2.1

State Street Basin
Cost of Flushing Improvements

No.	Item	Quantity	Units	Unit Price	Total Price
1	8" buried force main	100	LF	$ 50.00	$ 5,000.00
2	8" electric plug valves in pump house	2	EA	$ 2,500.00	$ 5,000.00
3	6" electric plug valve	10	EA	$ 4,500.00	$ 45,000.00
4	Core drill walls for pipes	10	EA	$ 100.00	$ 1,000.00
5	Interior piping	840	LF	$ 30.00	$ 25,200.00
6	Building to house valves	250	SF	$ 40.00	$ 10,000.00
7	Conduit & wiring	1	LS	$ 3,500.00	$ 3,500.00
8	PLC programming	1	EA	$ 2,000.00	$ 2,000.00
9	Grinder for flushing water	1	EA	$14,000.00	$ 14,000.00
10	Seeding	1	LS	$ 500.00	$ 500.00
				Subtotal	$111,200.00
				Contingency	$ 11,120.00
				Engineering & Administration	$ 18,348.00
				Estimated Total	$140,668.00

7.3 FCI Bar Screen

Proposed improvements at the bar screen facility include the following items:

- Rehab exterior lights
- Clean and repaint all exterior and interior metal surfaces
- Replace overhead door and install electric opener
- Re-insulate ceiling and cover wood components
- Seal exterior masonry walls
- Seal all wall penetrations from the bar screen room
- Install new HVAC systems

The estimated cost for the proposed improvements is listed in Table 7.3.1.

Table 7.3.1
FCI Bar Screen
Cost of Improvements

Item	Estimated Cost
Electrical/Mechanical Improvements, including lighting, HVAC, and door opener	$7,500
Overhead door replacement	$3,000
Painting, sealing, and insulation	$4,500
Subtotal	$15,000
Contingency	$1,500
Engineering & Administration	$2,500
Estimated Total	$19,000

7.4 CSO Settling and Chlorination Basin – STP #1

The following two options have been evaluated for solids removal from the CSO Settling and Chlorination Basins.

Option 1

Option 1 consists of the installation of a pumping station on the existing fill line, a buried main on the south and east sides of the basins, and a header system with electric valves and flushing ports in each basin. In both Option 1 and Option 2 it is still recommended that a loader tractor be used to remove the majority of solids from the settling basin. Flushing heavy loads of solids back into the sewer system could cause buildups in the sewer system, plugging of the discharge pump, and excessive loadings for the process treatment facilities. The flushing system will be used to clean the settling basin once the heavy solids have been removed. Since tractor access is not available in the chlorine contact basin, the flushing system will be used to flush the solids into the line that drains back into the settling basin. The floor of the chlorine contact basin must be sloped toward the north to facilitate proper draining, which could be accomplished by adding a few inches of concrete to the floor. Two small holes will be required in the baffle walls to allow the floor to drain toward the drain line. The pump station will be capable of pumping about 1000 gpm. To flush the floors of the basins it is anticipated that a large volume of water will be required on a relatively small area. This will require electric valves, in conjunction with a PLC controller, be used to sequence the flushing process. Three fire hydrants will also be included on the perimeter of the basins for supplemental hose flushing, if required. The electric valves may have to be elevated above the top of slope elevation to prevent damage during flooding conditions along the Illinois River. The estimated cost of this option is approximately $218,000. A cost breakdown is shown in Table 7.4.1.

<u>*Option 2*</u>

Option 2, as shown in Figure 7.4.1, consists of the installation of a pumping station on the existing fill line, a buried main on the south and east sides of the basins, drop legs on the slope of the chlorine contact basin for connection of a portable hose flushing unit, access ramp to the chlorination basin, revisions of baffle walls, and drop legs on the slope of the settling basin for connection of portable hose flushing unit. As mentioned under Option 1, it is recommended that a loader tractor still be used to remove the majority of solids from the settling basin. Once the heavy solids have been removed from the settling basin, a portable hose unit can be connected to the drop legs for manual clean up of the remaining solids. These solids will be flushed into the existing sump pit and pumped into the sewer for processing at the plant.

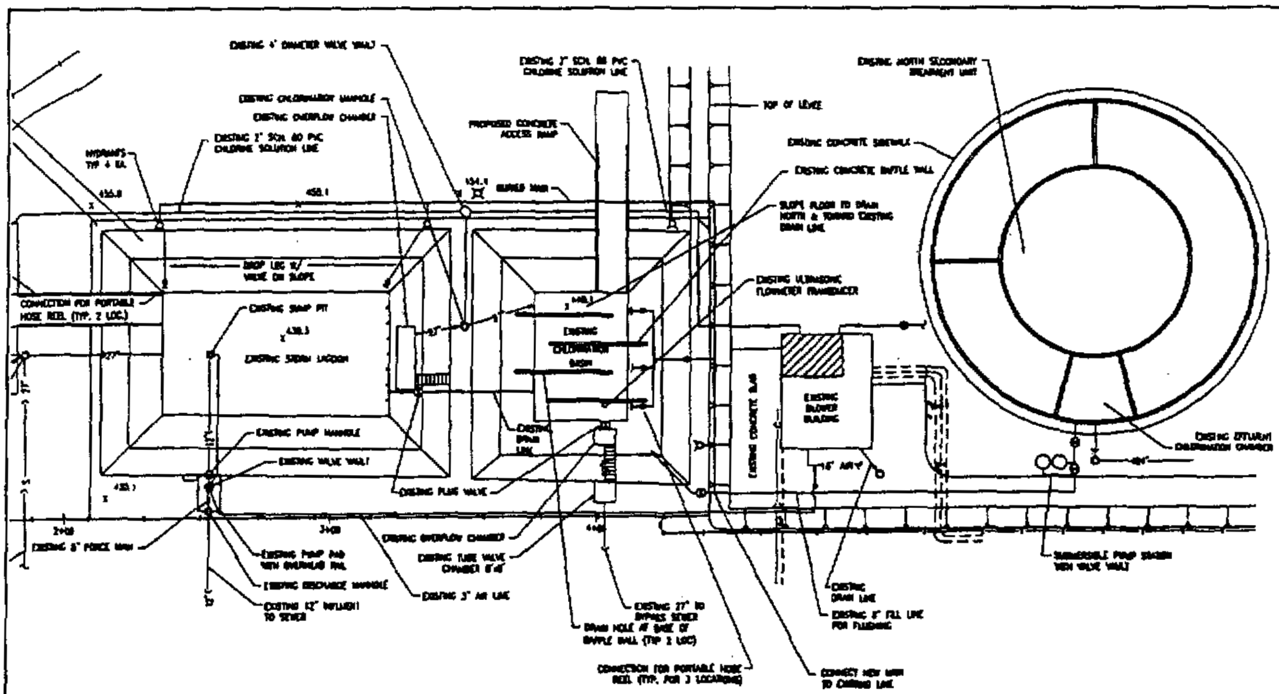

Figure 7.4.1 - Storm Basin - Option No. 2 Improvements

Tractor access will be made to the chlorine contact basin through the addition of a concrete access ramp. The existing concrete baffles will be modified to allow space for a small skid loader to move around the baffle ends. The flushing system will be used to flush the remaining solids into the line that drains back into the settling basin. The floor of the chlorine contact basin must be sloped toward the north to facilitate proper draining. This could be accomplished by adding a few inches of concrete to the floor. Two small holes will be required in the baffle walls to allow the floor to drain toward the drain line. Similar to the settling basin, drop legs will be installed in the chlorine contact basin for hose connection for final cleanup. The pump station will be capable of pumping about 1000 gpm. Electric valves will not be required with this option. Perimeter hydrants will also be available for additional hose cleanup, if necessary. The estimated cost of this option is approximately $175,000. A cost breakdown is shown in Table 7.4.2.

Table 7.4.1
Option 1
Wastewater Plant Basin
Cost of Flushing Improvements

No.	Item	Quantity	Units	Unit Price	Total Price
1	8" buried force main	225	LF	$ 50.00	$ 11,250.00
2	6" main at top of slope	340	LF	$ 50.00	$ 17,000.00
3	6" drop legs on slopes	305	LF	$ 50.00	$ 15,250.00
4	4" header pipes	300	LF	$ 30.00	$ 9,000.00
5	6" electric valves	11	EA	$ 3,000.00	$ 33,000.00
6	Fire Hydrants	3	EA	$ 2,000.00	$ 6,000.00
7	Nozzles	80	EA	$ 50.00	$ 4,000.00
8	Concrete for slope in chlorination chamber	1	LS	$ 2,500.00	$ 2,500.00
9	Pump Station	1	EA	$ 63,000.00	$ 63,000.00
10	Concrete slab repair	100	SF	$ 5.00	$ 500.00
11	Holes in chlorine baffles	2	EA	$ 500.00	$ 1,000.00
12	Electrical feed for pump station	1	LS	$ 5,000.00	$ 5,000.00
13	Seeding	1	LS	$ 1,000.00	$ 1,000.00
14	PLC Controller	1	LS	$ 4,000.00	$ 4,000.00
				Subtotal	$172,500.00
				Contingency	$ 17,250.00
				Engineering & Administration	$ 28,463.00
				Estimated Total	$218,213.00

Table 7.4.2
Option 2
Wastewater Plant Basin
Cost of Flushing Improvements

No.	Item	Quantity	Units	Unit Price	Total Price
1	8" buried force main	50	LF	$ 50.00	$ 2,500.00
2	6" buried force main	250	LF	$ 40.00	$ 10,000.00
3	3" drop legs on slopes	75	LF	$ 30.00	$ 2,250.00
4	3" header pipes in cl basin	235	LF	$ 30.00	$ 7,050.00
5	3" plug valves	3	EA	$ 3,000.00	$ 9,000.00
6	Fire Hydrants	4	EA	$ 2,000.00	$ 8,000.00
7	Nozzles	30	EA	$ 50.00	$ 1,500.00
8	Concrete for slope in chlorination chamber	1	LS	$ 2,500.00	$ 2,500.00
9	Pump Station	1	EA	$ 63,000.00	$ 63,000.00
10	Concrete slab repair	25	SF	$ 5.00	$ 125.00
11	Holes in chlorine baffles	2	EA	$ 500.00	$ 1,000.00
12	Electrical feed for pump station	1	LS	$ 5,000.00	$ 5,000.00
13	Seeding	1	LS	$ 1,000.00	$ 1,000.00
14	Hose reel & cart	1	EA	$ 2,000.00	$ 2,000.00
15	Access ramp to chlorination chamber	1	LS	$17,500.00	$17,500.00
16	Baffle wall revisions	4	EA	$1,500.00	$6,000.00
				Subtotal	$138,425.00
				Contingency	$ 13,842.50
				Engineering & Administration	$ 22,850.00
				Estimated Total	$175,117.50

7.5 Wastewater Treatment-STP #1

7.5.1 STP #1 Replacement-General

For comparison purposes, several different processes have been evaluated to provide primary and secondary treatment in addition to the conventional activated sludge process. At the request of the City and United Water, two processes were evaluated that do not require the primary treatment process.

The systems evaluated for the upgrade and expansion of STP #1 include:

1. Conventional activated sludge;
2. Counter Current aeration (Schreiber) without primary treatment;
3. Counter Current aeration (Schreiber) with primary treatment;
4. Sequence batch reactor (Aqua-Aerobics); and
5. Vertical loop reactor (Envirex) with primary treatment.

For construction cost comparisons, the unit costs listed in Table 7.5.1 were utilized as common to all systems.

Table 7.5.1
Construction Unit Costs

Item	Construction Cost
Concrete - Slab on grade	$300/yd^3
Concrete - Curved wall	$450/yd^3
Concrete - Straight wall	$400/yd^3
Concrete - Spiral formed	$650/yd^3
Excavation:	$7.00/yd^3

The proposed facilities are all designed to treat a DAF of 6.84 MGD with a peak hourly flow of 15.39 MGD. Design loading will be 11,219 lbs/day BOD_5, 15,910 lbs/day TSS and an ammonia concentration of 25 mg/l. Design effluent is 20 mg/l BOD_5 and 25 mg/l TSS.

In addition to the evaluation of the major treatment systems, the study includes an evaluation of other treatment components including:

- Primary clarifiers;
- Secondary clarifiers;
- Expansion of the chlorination facilities for disinfection or replace them with UV disinfection; and
- Re-use and expansion of the existing sludge thickening, dewatering and lagoon system or replace portions of the system.

The evaluation of options for these systems are included in the following paragraphs. Recommendations made for these treatment systems are included in the overall treatment plant capacity expansion options and final upgrade recommendation.

7.5.1.1 Primary Clarifiers

Two options were considered to improve and expand the capacity of the primary treatment system. The first option includes improving the existing four primary clarifiers and adding one additional clarifier. The second option considers replacement of all of the existing clarifiers with two new clarifers.

Option No. 1

The four existing primary clarifiers will require significant refurbishing to extend their useful life through the next 20 years. The required improvements include:

- Significant concrete removal and repair on all of the concrete structures;
- Clarifier mechanism replacement in all four clarifiers;
- Handrail, sidewalk, and site improvements around all four structures;
- Sludge piping and valve replacement; and