

SUMMARY OF PROPOSED UPGRADES  
AT THE  
SOUTH MILWAUKEE WASTEWATER TREATMENT FACILITY  
April 15, 2012

The Wastewater Treatment Facility Site Study (Applied Technologies Inc., May 2006) defined a number of plant upgrade projects required in a state mandate. The majority of the original projects in the mandate have been completed. The two main remaining projects are the secondary clarifier and UV disinfection projects. The original stipulation called for the clarifier project to be completed in June 2010, and the UV disinfection project was to be completed in June 2014.

We have recently completed an evaluation of the two proposed projects in terms of:

- positive impact on plant reliability under peak loads
- constructability and interference with existing plant structures
- maintaining operations during construction

It was concluded that combining the two projects, and other related projects, into one coordinated construction effort will provide the most value and allow the City to achieve the above goals. The project will include the following:

- The current 9 mgd UV effluent disinfection will be replaced with a new system capable of treating a peak day flow of 17 mgd. This would be an expansion of what was proposed in the Site Study, with a current estimated cost of **\$2.2 million**.
- A recent study revealed that the two incoming utility power sources are not fully redundant and are vulnerable to a power outage. A new, 500kW diesel generator would be the standby power source. It should be located in a new room/building that is located close to the existing Operations Building. This location would enable easy re-fueling and minimize wiring and conduit to the lower level of the Operations Building. An evaluation of a year's worth of energy billing information shows that the highest peak demand charge was approximately 300kW. Therefore, a 500kW diesel generator should be sufficient to support all critical process loads. The "Backup" electrical service would no longer be required and would be removed. Current cost estimate, **\$400,000**.
- The main power distribution equipment in the Control Building is outdated (about 40 years old) and in poor condition. Since this equipment powers much of the plant process equipment, its replacement is vital to future plant reliability. It is recommended that the existing service equipment (the Main Distribution Panel and the Main Power Panel (MPP)) be replaced with a new 480-volt Power Panel and new automatic transfer switch located along the north wall of the lower level of the Operations Building. Use of the north wall enables equipment installation prior to de-activation of the old service equipment. Both of these new pieces of equipment (the new Power Panel and new ATS) are small enough to be wall mounted which offers the protection against any chance of seasonal flooding that this building has experienced. Current cost estimate, about **\$200,000**.

- The existing RAS and WAS pumping system is over 30 years old and has exceeded the original design life. The existing RAS pumps will be replaced with three vertically-mounted, end-suction centrifugal pumps, similar to the type of pump currently installed. The existing end-suction centrifugal pump has worked well and plant staff is familiar with this style of pump. Two of the pumps will normally operate continuously at a set rate, and variable speed drives will be installed on the pumps to provide the operational flexibility to meet a wide range of flow rates. Cross connections will be installed in the suction piping to allow the third pump to pull sludge from either clarifier. A magnetic flow meter located in the RAS piping in the Control Building will be used to monitor the RAS flow to the clarifiers, and for controlling the RAS pumping rate. Plant staff will be able to adjust the pumping rate at the main plant control panel. The proposed WAS pumps will be horizontally-mounted, end-suction centrifugals with a design flow of 150 gpm. Two pumps will be installed, with one pump operating normally and one pump provided as backup. The pump that is wasting sludge will operate at a pumping rate determined by plant staff, and automatically cycle on and off at preset intervals. Variable speed drives will be installed on each pumps to provide operational flexibility. A new magnetic flow meter located in the Control Building will monitor the pumping rate and quantity of waste activated sludge pumped to the Raw Sewage Pump Station. The pumping rate and wasting quantity will be adjustable at the main plant control panel. Valves and interconnecting piping between the RAS and WAS piping will allow the WAS pumps to waste if only one RAS pump is in operation. The existing 8-inch diameter gravity line will be replaced with a 4-inch diameter force main. Cost estimate, about **\$500,000**.
- We recommend that automated gates be installed in the aeration basins to allow for switching from plug flow to contact stabilization under high flow conditions. The plant staff currently performs this operation using manual stop plates. This addition will allow the plant to make the switch more efficiently and reliably. Current cost estimate of about **\$50,000**.
- The WWTF has two draft tube mixers currently installed on the Primary Digester. The mixers are not operational, and the plant has been mixing the digester using the sludge recirculation system. The mixers will be replaced in order to improve digester operation. Thorough mixing of the digester contents is required to optimize the performance of the digester. Ineffective mixing of the digester contents will result in unmixed or dead zones within the digester that reduce the active or effective volume of the digester. Proper mixing promotes contact between raw sludge and the active biomass, and evenly distributes any metabolic waste products produced during digestion. Toxic substances introduced with influent raw sludge will be diluted by the digester contents, thereby minimizing their inhibiting effect on microbial activity. Mixing also lessens temperature stratification, reduces grit settling, and prevents the formation of a surface scum layer. The estimated construction cost for installing the new mixers is **\$244,100**.
- The secondary anaerobic digester has several cracks in the tank walls that leak small amounts of sludge. The installation of a polyurea liner system is proposed for the interior walls and floor of the digester to seal any cracks and prevent

further leakage. Polyurea is an organic polymer that forms a thick, plastic-like coating, typically 80 – 100 mils. The thickness of the polyurea coating allows it to bridge cracks up to 1/16” in width. The coating is waterproof, temperature resistant, and chemical resistant. The entire liner system would include surface preparation, a primer coat, and a final polyurea coating. The estimated construction cost for this modification is **\$77,000**.

- The secondary digester gasholder cover must be removed from the tank to effectively apply the liner to the digester tank walls. While the cover is removed from the tank, it will be cleaned and repainted. Because the two digester covers were last painted 15 years ago, and the coatings are nearing the end of their effective lifespan, the primary digester cover will also be removed from the tank, cleaned and repainted. The tanks will also be cleaned while each digester is out of service. The estimated construction cost for removing, painting and replacing both digester covers is **\$231,000**.
- The secondary digester’s brick façade and insulation were removed several years ago due to moisture problems and spalling, and the concrete walls of the digester are now exposed to the elements. The temperature differences in winter between the interior and exterior wall surfaces are likely causing thermal stress in the walls and exacerbating the cracking. In addition, the exposed concrete has become stained and unsightly. An exterior insulation finishing system (EIFS) will be installed on the secondary digester to reduce the thermal stress in the walls, prevent additional cracking, and improve the structure’s appearance. The system will consist of rigid insulation mechanically affixed to the concrete, and a stucco-like finish applied to the exterior. The insulation will have channels along the back to allow for moisture drainage. The estimated construction costs for this modification is **\$38,000**.
- The two existing final clarifiers are square in shape and measure 62’-0” per side. One-sided fiberglass effluent troughs are installed on three sides of each clarifier, and discharge into a concrete effluent trough that runs along one side of each clarifier. The existing fiberglass troughs and weirs are in poor condition, and they are no longer plumb, causing the clarifiers receive the majority of flow on one side. The existing concrete trough is also in poor condition. The facility currently has issues with algae growth on the weirs and in the troughs and removing the algae requires significant amounts of maintenance. The proposed one-sided troughs do not meet the DNR or Ten State Standards design requirements for average and maximum weir overflow rates. However, installation of one-sided troughs would be a replacement in kind of the existing troughs, which the plant has effectively operated with for the past 10 years. In addition, concrete troughs are more accessible for maintenance; because the fiberglass troughs are set 1 – 2 feet from the wall of the clarifier they are extremely difficult to access and clean. Construction of concrete troughs is also more economical when compared to fiberglass troughs. The estimated construction cost for the concrete troughs is **\$54,600**, and the estimated construction cost for FRP troughs is \$108,200. For these reasons, the existing troughs in the two final clarifiers will be replaced by one-sided concrete effluent troughs. Fiberglass launder covers will be installed over the new troughs to prevent the growth of algae on the weirs and in the

troughs. The covers are hinged and lift up to allow for inspection of the weir and channel. The estimated construction cost for the launder covers is **\$114,300**.

- Construction of a splitter structure to divert high flows from the aeration system will prevent hydraulic overloading and biomass washout. The structure will have a series of manual and powered gates to give staff options for routing the flow during high flow events. Estimated cost: **\$130,000**
- The existing ballasted membrane roof on the Control Building is leaking in several locations, and the ballast makes the roof difficult to clean when the Primary Digester has foaming incidents and overflows onto the Control Building. The existing roof will be replaced with a fully adhered membrane roof, which does not require ballast. The estimated construction cost for removal and replacement of the existing roof is **\$64,500**.
- The elevated, concrete walkway on the outside of the Control Building is deteriorating and a section of concrete recently fell off into one of the final clarifiers, forcing an equipment shutdown. A concrete slab along the top of the Primary Digester is also deteriorating. The walkway and slab will be removed to improve plant safety and operation. The estimated construction cost for these removals is **\$18,000**.
- Sitework and plans, **\$300,000**
- Standard project allowances, **\$125,000**.

Total Estimated project cost: \$4,600,000 to \$4,800,000. The project is in the final stages of planning, so the estimated cost, as well as the actual final cost may vary a bit.