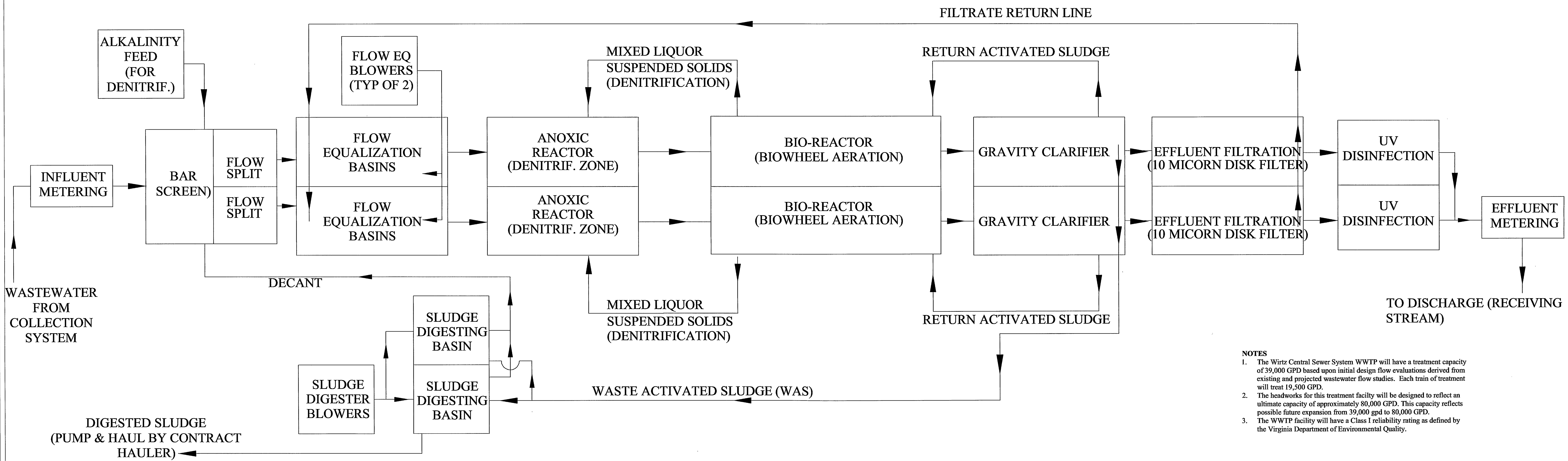
WWTP SCHEMATIC TREATMENT PROCESS DIAGRAM
(SHOWING TWO TRAINS RATED AT 19,500 GPD)



NOTES
1. The Wirtz Central Sewer System WWTP will have a treatment capacity of 39,000 GPD based upon initial design flow evaluations derived from existing and projected wastewater flow studies. Each train of treatment will treat 19,500 GPD.
2. The headworks for this treatment facilty will be designed to reflect an ultimate capacity of approximately 80,000 GPD. This capacity reflects possible future expansion from 39,000 gpd to 80,000 GPD.
3. The WWTP facility will have a Class I reliability rating as defined by the Virginia Department of Environmental Quality.

I. OVERVIEW AND GENERAL DESCRIPTION.

Raw wastewater is conveyed by way of the Wirtz Central Sewer System to the wastewater treatment plant (WWTP) facility located in close proximity to the existing warehouse facilities near Route 220 (refer to vicinity map). The facility consists of a treatment plant possessing Tertiary Treatment Capability as well as a functional laboratory building and emergency generator. The high quality effluent is discharged to an adjacent receiving stream.

The WWTP Facility will be rated at 39,000 GPD (Average Daily Flow or ADF) and will have a peaking factor of two such that it can treat 78,000 GPD during peak flows, should they ever occur. The treatment plant is designed to receive an inflow rated at 325 mg/l for Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) as well as 50 mg/l Total Nitrogen. It is designed to produce a high quality effluent with residual BOS, TSS, and Total N less than 10, 10, and 5 mg/l respectively.

The final design of the WWTP facility is such that two treatment trains have been designed, though only one train will be constructed initially. Provisions for two additional trains are provided in the final site plan and headworks design in the event that Wirtz Central Sewer growth exceeds the planned development projections established during 2007.

II. TREATMENT PROCESS DESCRIPTION

A. Headworks

Raw wastewater is received from the wastewater collection and conveyance system at the headworks. The headworks consists of an automatic mechanical screen rated at two times (or greater) average daily flow. A manual bar screen is provided as a bypass in the event that the automatic mechanical screen fails or is in need of repair or maintenance. Screening removes large inorganic and indigestible solids that cannot be treated through biological means. Screenings will be collected in a trash basket, doused with lime to neutralize odors and vectors, and disposed in a dumpster for delivery to an approved solid waste landfill.

Soda ash addition for alkalinity purposes is provided at the headworks. A flow switch installed in the headworks detects incoming wastewater flow and activates the soda ash chemical feed pumps located in the WWTP laboratory building. Soda ash feed rates will be determined by the operator and adjusted accordingly.

After screening, wastewater flows to a concrete splitter box whereby flows are split and delivered by gravity to one or more treatment trains. The splitter box controls flow through the use of V-notch weir flow gates. Screened wastewater gravity flows to the Flow Equalization Tank/Influent Pump Station within each treatment train.

B. Flow Equalization and Influent Pumping

Wastewater Inflow is collected in a Flow Equalization basin/Influent Pumping station. Flow Equalization volume will be 25 percent of average daily flow or 4,875 GPD of storage capacity per train. Flow equalization will provide the ability to treat diurnal peaks, which typically occur during the morning and afternoon evenings; this provides the ability to feed the treatment plant with a consistent volume of wastewater, thereby enhancing overall treatment efficiency.

A series of submerged diffusers are provided to keep raw influent wastewater fresh. A pressure transducer controller senses water levels and provides intermittent aeration (provided by regenerative blowers) to mix raw wastewater and prevent the onset of septicity.

The pressure transducer pump controller will control influent pump station operation. A duplex alternating pumping arrangement is provided. Typical pump controls include Pump Off, Lead Pump On, Lag Pump On, Aeration On, and High Water Alarm On. Influent pumping will be equal to the Average Daily Flow design value or 13.5 Gallons Per Minute (GPM).

C. Biological Process Design

After Flow Equalization, wastewater is pumped to the biological treatment portion of the treatment plant facility. The first step of treatment will be the pre-anoxic zone. The pre-anoxic zone provides food source and low dissolved oxygen environments to foster the removal of nutrients (primarily nitrogen). Mixing of the Mixed Liquor Suspended Solids (MLSS) is accomplished through influent pumping, submerged mechanical mixing, and MLSS return pumping. The pre-anoxic zone is part of a continuous recycle arrangement designed and developed for advanced wastewater treatment and nutrient removal. After pre-anoxic mixing, wastewater gravity flows over a wall cut-out (weir) into the Bioreactor zone.

D. Bioreactor

The bioreactor zone provides the primary aeration and mixing component of the treatment process. This zone initiates the nitrification process that is required prior to denitrification. The primary equipment will consist of the BioWheel Aerator System; the BioWheel provides primary aeration as well as very efficient mixing. This type of installation is referred to as an Integrated Fixed Film-Activated Sludge (IFAS) treatment system, which combines the benefits of conventional activated sludge treatment with the nitrification benefits of a fixed film system.

BioWheel operation consists of an electric motor driving a simple gearbox, which provides very powerful, but slow rotation of the BioWheel rotating assembly. Rotation will vary from 0.5 Revolutions Per Minute (RPM) to 1.5 RPM. A simple chain drive arrangement is utilized for simplicity and ease of maintenance.

An MLSS pump station is provided as part of the biological treatment process. This station consists of a submerged simplex alternating pumping arrangement, which will provide MLSS recycle to the pre-anoxic zone. The pumps are VFD controlled and rated at approximately 54 GPM.

E. Clarification

The mixed liquor gravity flows from the bioreactor to a gravity clarification basin. This basin consists of an upside down trapezoidal shaped box with a return activated sludge pump located in the sump basin. The RAS pump is rated at 7.5 to 20.25 GPM and is adjustable such that the wastewater treatment plant operator can successfully adjust RAS rates to match biological process requirements. Sludge settles to the bottom of the clarifier basin and is returned by the RAS pump to the Pre-anoxic zone.

Sludge wasting is accomplished through the use of manual flow control valves located inline with the RAS forcemain. A valve will be closed on the RAS line and a valve opened on a Waste Activated Sludge forcemain; when this action takes place, waste sludge can be pumped to the sludge digester basins contained within each treatment train. RAS process is returned by reversing the valve settings.

F. Effluent Filtration

Filtration is the next step of biological treatment and begins the tertiary treatment component of the process. The effluent filter provides advanced wastewater filtering through the use of 10 micron drum filters located in each clarifier basin. Filtered water gravity flows through the drum filter head and then flows to the UV Disinfection System.

The drum filters are equipped with automatic cleaning systems that provide suction cleaning of the filter cloth faces. The filtrate water that is suctioned from the filter cloth face is returned by a filtrate pump to the flow equalization basin. In the event of filter clogging (or blinding), an emergency highwater overflow weir is provided in the drum filter assembly. A highwater mercury float switch also provides automatic filter suctioning.

G. Disinfection

Effluent disinfection is achieved through the use of simple UV light systems. The UV systems consist of simple gravity flow trough style units connected to the effluent filter piping outfall. Each UV unit provides maximum disinfection as rated for the peak flow, or 39,000 GPD. After disinfection, the effluent water gravity flows by gravity through an effluent flow meter and then to the receiving stream.

H. Sludge Digestion

Sludge digestion occurs in a sludge digester tank. A series of submerged air diffusers, powered by a regenerative blower, provide aeration and mixing as determined by the operator. Waste sludge is periodically pumped to the digester tank and properly aerated for a sufficient time. A decant pump station is provided such that the digester supernatant can be pumped from the digester tank and recycled back through the wastewater treatment process. Digested sludge will be pumped by a contract sludge pump and haul contractor who will then truck digested sludge to an approved sludge receiving facility for final treatment and disposal.

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WWTP PROCESS AND IMPLEMENTATION PLAN