6.6.1 UV Disinfection Overview

The MBR effluent is disinfected in the UV building. Filtrate from the MBR process is pumped to the UV disinfection channels located in the UV Building. The UV effluent is discharged to the reuse contact basin, the reuse wet well or the effluent blend box where it mixes with the effluent from the CAS system and flows to the outfall in the Willamette River.

Process Overview

The UV disinfection system receives the MBR process flow from the filtrate pumps. The UV system consists of two channels, each with the capacity to meet the disinfection requirements for the MBR system. The UV system discharges to the UV effluent channel. Flow from this channel can go be directed to three places depending on the required use for the treated effluent.

- Effluent Blend Box – Flow that is not directed to reuse will overflow a weir in the UV channel effluent box into the Effluent Blend Box. The flow will be mixed with the treated effluent from the CAS system and will flow to the outfall for discharge to the river.
- Nonpotable Water Wet Well – Flow can be sent directly to the nonpotable water wet well for use within the treatment plant. This flow is used by the W3 water pumps and the MBR backpulse pumps. During periods of time when the effluent reuse system is not being operated, this will be the mode of operation. Only the volume of water used by in-plant uses will flow to the pumps with the remainin effluent overflowing to the Effluent Blend Box
- Reuse Chlorine Contact Basin – Flow can be sent to a small chlorine contact basin prior to the non-potable water wet well. Hypochlorite solution will be added to the flow as it enters the chlorine contact basin to provide additional disinfection prior to reuse. This mode will be used when the effluent reuse system is being operated to send flow outside of the plant boundaries.

The UV system is controlled by its own dedicated PLC located in the local control panel in the UV Building. Only monitoring of the system operation is provided through SCADA. The UV SCADA screen is shown on ***Figure 6.6.1-1***.

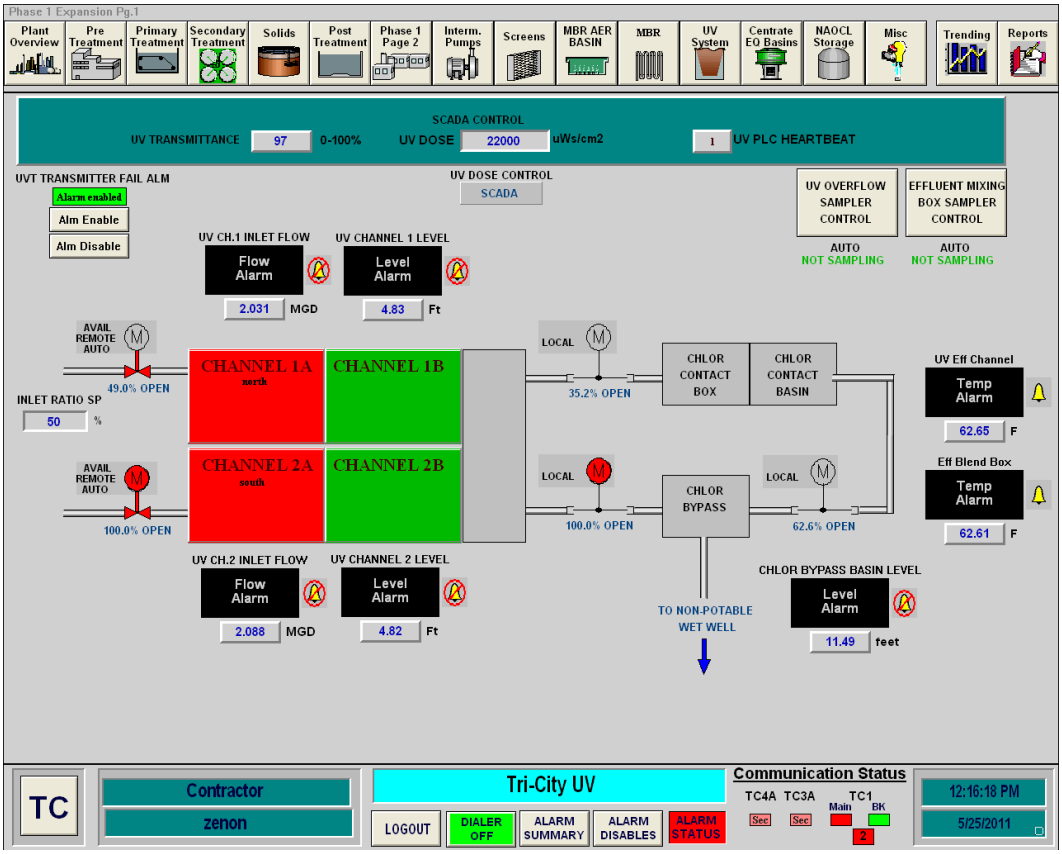

Figure 6.6.1-1 – UV Disinfection Main Screen

UV Disinfection Components

The UV disinfection system is made up of a number of components that operate interactively to provide automatic operation of the functions. These components are:

- UV Channel Flow Splitting
- MBR Effluent Flow Measurement
- UV System
- Channel Level Control Gates
- Effluent Flow Distribution Valves

UV Channel Flow Splitting

The effluent from the MBR system is pumped through the gallery system to the UV Building. As the pipeline approaches the UV building the line splits into two lines, one for feeding each UV channel. In each line, there is a control valve and a magnetic flow meter. When both channels are in operation, the control valves maintain an equal flow to both channels as measured by the flow meters.

MBR Effluent Flow Measurement

The magnetic flow meters on the two lines entering the UV channels are the main meters for measuring the effluent flow from the MBR process. Some of the flow does not pass to the effluent as it is used for backpulsing the membranes and for W3 water in the treatment plant. The MBR effluent flow meter is calculated as follows:

MBR Effluent Flow = UV Influent Flow – W3 Water Flow – MBR Backpulse Flow

UV System

The UV disinfection system is the Ozonia Aquaray® 40 HO VLS 40-lamp high output vertical lamp system with low pressure/high output lamps, a vertical modular design, row-by-row flow pacing, and a fully automatic in-channel wiper cleaning system. The UV disinfection system has four UV disinfection modules containing 40 lamps each. The modules include an integral mechanical wiper for cleaning the quartz jackets. There is a UV intensity sensors to monitor the UV intensity on each module. The UV modules are automatically flow-paced based on the MBR process effluent flow rate in increments of 8 lamps (one row) per channel with minimum four rows on at all times. The design head loss per UV channel at 10 MGD is 3.61 inches.

Channel Level Control Gates

It is important to have a constant level in the UV channels to ensure that the lamps are properly submerged and the level does not rise above the level of the lamps allowing some flow to pass without proper disinfection. The channel level control gates maintain a level within a couple inches under varying flows to ensure proper submergence of the lamps.

Effluent Flow Distribution Valves

There are three gates on the UV effluent box that distribute flow to the non-potable water wet well. Depending on which gates are open, the flow can be sent directly to the non-potable water wet well or sent through the chlorine contact basin to receive additional disinfection.

UV System Controls

The UV system valves can be operated through SCADA. SCADA only provides monitoring of the UV disinfection equipment with all control being done locally at the UV local control panel located in the UV building.

UV Channel Flow Splitting

The plant PLC located in the UV building controls the UV system flow control valves. Placing the valves in REMOTE at the local operating station places the valves under automatic control. When under automatic control, the valves will maintain even flow split between the two UV trains. The valves can also be manually controlled through SCADA or at the local valve operator station. At least one of the valves must be open to pass flow to the UV system.

UV System Controls

The UV system has a dedicated control panel located in the UV room. The UV system will turn rows of lamps on and off as the flow and UV Transmittance changes to provide the set-point UV dosage to the waste stream. An analyzer measuring the UV transmittance of the UV effluent measures the UV Transmittance continuously. There is also an option to input a fixed UV transmittance, when necessary. The desired UV dosage is a set-point that can be entered at either the SCADA Screen or at the UV System control panel.

UV Disinfection Building Sustainable Features

The UV disinfection building has been designed with several sustainable features to provide for economic expansion of the system as well as minimize energy use.

Design for Low UV Dosage

The design criteria for a UV system are 30 mJ/cm2 for a secondary effluent with 30-mg/L BOD and 30-mg/L TSS. The MBR effluent is treated to a much higher standard than the typical secondary effluent. In addition, the MBR system filters out most of the bacteria and viruses the present a health hazard. For this reason, the UV system has been designed with additional turndown to minimize the power use of the system while still maintaining adequate disinfection.

Phased Expansion of UV System

The UV system structure was designed to handle peak flow under build-out conditions for the MBR system at an average day flow of 24-mgd and a peak flow of 60-mgd. Expansion of the system can be done in phases by adding additional UV modules. The UV control panel was sized to provide controls for the additional modules.

Reuse Disinfection and Wet Well Design

The UV building was designed with a reuse disinfection chlorine contact basin under the UV channels. This system will provide additional disinfection for bacteria, but was also designed to provide virus removal, when a new standard is required in the future.

Reuse Pump Station

The UV building was designed with a reuse wet well that can accommodate the W3 water pumps and backpulse pumps necessary for MBR system build-out. In addition, the reuse wet well, reuse pump room and electrical system was designed to install three reuse pumps in the future. The reuse pipeline (24-inch purple pipe) has been installed from the reuse pump room into Agnes Avenue for future connection of a reuse distribution system.

UV Building Master Plan

The UV Screen Building is designed for a peak firm capacity of 60-mgd with

The UV system was designed with two channels. The structure was designed to handle peak flow under build-out conditions for the MBR system at an average day flow of 24-mgd and a peak flow of 60-mgd. The current channels have a blockout in each channel that makes them have of their final width. The channels were also sized for three modules in series in each channel. The Phase I Expansion only has two modules in each channel and has 100% redundancy, which is not required in the future.