



# APPENDIX H

## Conceptual Design for Future Surface Water Treatment

The following conceptual design was prepared for consideration of future surface water treatment.

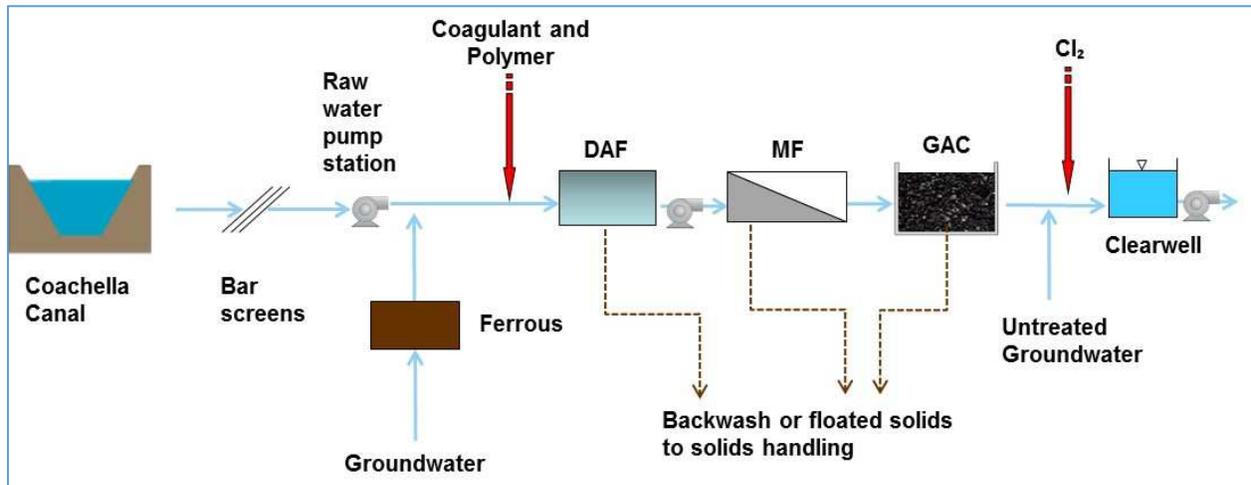


## APPENDIX H. CONCEPTUAL DESIGN OF TREATMENT

### Surface Water Treatment

#### H.1 Process Flow Diagram

The schematic below provides a process flow diagram for a surface water treatment plant. A surface water plant would blend groundwater and surface water to reduce TDS to an acceptable level. A portion of the groundwater stream would require treatment to remove Cr6 to keep the Cr6 level in the final blended water below the desired maximum.



Process Flow Diagram for Surface Water Treatment

Incoming groundwater flows would be separated into treated and non-treated streams. The non-treated stream would flow directly to the chlorine contact chamber where it would blend with the treated water product from the plant. The treated stream would enter a chemical dosing chamber where it will be dosed with ferrous iron to reduce the Cr6 to Cr3. From this chamber, water would flow to the rapid mixing chamber where it will blend with the incoming surface water.

Incoming surface water flows would be screened to remove large floating objects. In cases where there are algae or other undesirable biological material in the water, the incoming surface water can also be dosed with chlorine upstream of the screen (noting that the residual must be carefully controlled to avoid reoxidizing Cr3 to Cr6 once surface water blends with treated groundwater). The surface water would then flow to the rapid mixing chamber. Depending on site topography, this flow may either be by gravity or pumped.

In the rapid mixing chamber, the combined influent would be dosed with a coagulant chemical. The influent would then flow to the DAF unit. The DAF unit will separate coagulated materials from the flow. These coagulated materials would be removed in an overflow stream, which would flow to the floated solids tanks, and from there to the solids handling unit.



The treated flow from the DAF would enter an intake header for the membrane treatment unit. Flows from the header would be pumped through the membrane intake strainers and then through the membrane treatment units. Each membrane unit would have a dedicated feed pump. This arrangement is desirable to allow flows to be equalized between the different membrane units, which will have different pressure losses depending on fouling degree.

Backwash water from the membrane units will go to lamella clarifiers. The settled solids from the clarifiers will flow by gravity to the solids handling facility. The clarified overflow from the lamella separators will return to the influent chamber.

From the membrane units the treated water will flow to the GAC contact basins. GAC in the basins will remove organic compounds from the water eliminating unpleasant tastes and odors.

From the GAC water would flow by gravity to the chlorine contact basin/clearwell. At this point, treated water would mix with groundwater that has bypassed the treatment process. Water entering the contact basins will be dosed with sodium hypochlorite. Contact time in the clearwell will be a minimum of 47 minutes (at full plant throughout). From the clearwell, the water would enter the distribution pump station and be pumped to service. As the water is pumped to service, it will be dosed with sodium hydroxide to adjust the final pH (if necessary).

The solids handling units would include duty and standby centrifuges. Solids would be dosed with polymer prior to dewatering. Dewatered solids would be discharged into a truck or bin for removal from site. Details of the preferred method of removal off site would be further developed during the preliminary design stage based on the estimated qualities of solids generated and operator preference.

## H.2 Layout

An example layout has been developed for a surface water plant with a capacity of 20 MGD (Figure 1). Screening of the influent surface water would be provided at the canal intake, with no additional screening at the inlet of the plant. Influent groundwater would not be screened.

The DAF unit is shown in Figure 2. Three parallel trains would be used for the 20 MGD facility. Standby saturation equipment and pumps would be provided to allow units to remain in operation during equipment maintenance. A standby train was not included in the conceptual design.

The membrane filtration units would be housed inside a building (Figure 3). The building was sized to house 20 MGD of membranes. Redundancy would be provided in pumps and other equipment; no standby membrane units were included for cost estimating purposes but may be desired (to be determined in later preliminary design of surface water treatment). The building also includes ancillary functions including clean in place chemicals and electrical distribution and control rooms.

The granular activated carbon (GAC) would be sized for 20 MGD with some standby capacity to allow the units to operate at full capacity while the GAC was being changed out (Figure 4). The design of the GAC system should include a bypass to allow a portion of the flow to bypass the contactors. Use of the bypass would depend on the blend of surface water and groundwater and the TOC in the surface water. Ability to bypass some of the flow might vary seasonally.



The clearwell would be sized for 35 MGD. This included the 20 MGD product water from the treatment plant and 15 MGD of blended groundwater. The required contact time has been calculated at 47 min leading to an overall tank size of 1.2 million gallons.

The surface water plant was assumed to provide a baseload water supply to CVWD's customers for ease of SWTP operation and as such would be a critical component of the water supply. Sufficient standby generation capacity would be provided to allow the plant to continue in operation in the event of an interruption to the main power supply. A new electrical building would also be provided to house the motor control centers and other electrical control equipment.

A plant administration building would be provided to house the plant control room, showers and changing rooms for plant staff, a meeting/training room, and office space for the plant manager. Rooms for plant maintenance operations were also assumed to be provided in the administration building.

### **H.3 Hydraulic Profile**

Figure 5 shows the hydraulic profile for a surface water plant with a capacity of 20 MGD. Surface water would be pumped from the Coachella Canal to the Chemical Mixing Basin. On the conceptual layout, this pump station is shown as an onsite pump station. However, if the plant is not located adjacent to the canal, it may be necessary to locate this pump station at the canal. Groundwater has been assumed to be able to reach the chemical mixing basin without re-pumping.

Flow from the chemical mixing basin, through the DAF units to the membrane facility will be by gravity. The membrane feed pumps will boost the flow through the membrane units and maintain sufficient residual head to carry the flow to the inlet of the GAC. Flow through the GAC and the clearwell would be by gravity. The finished water pump station would boost flow to distribution system pressure.

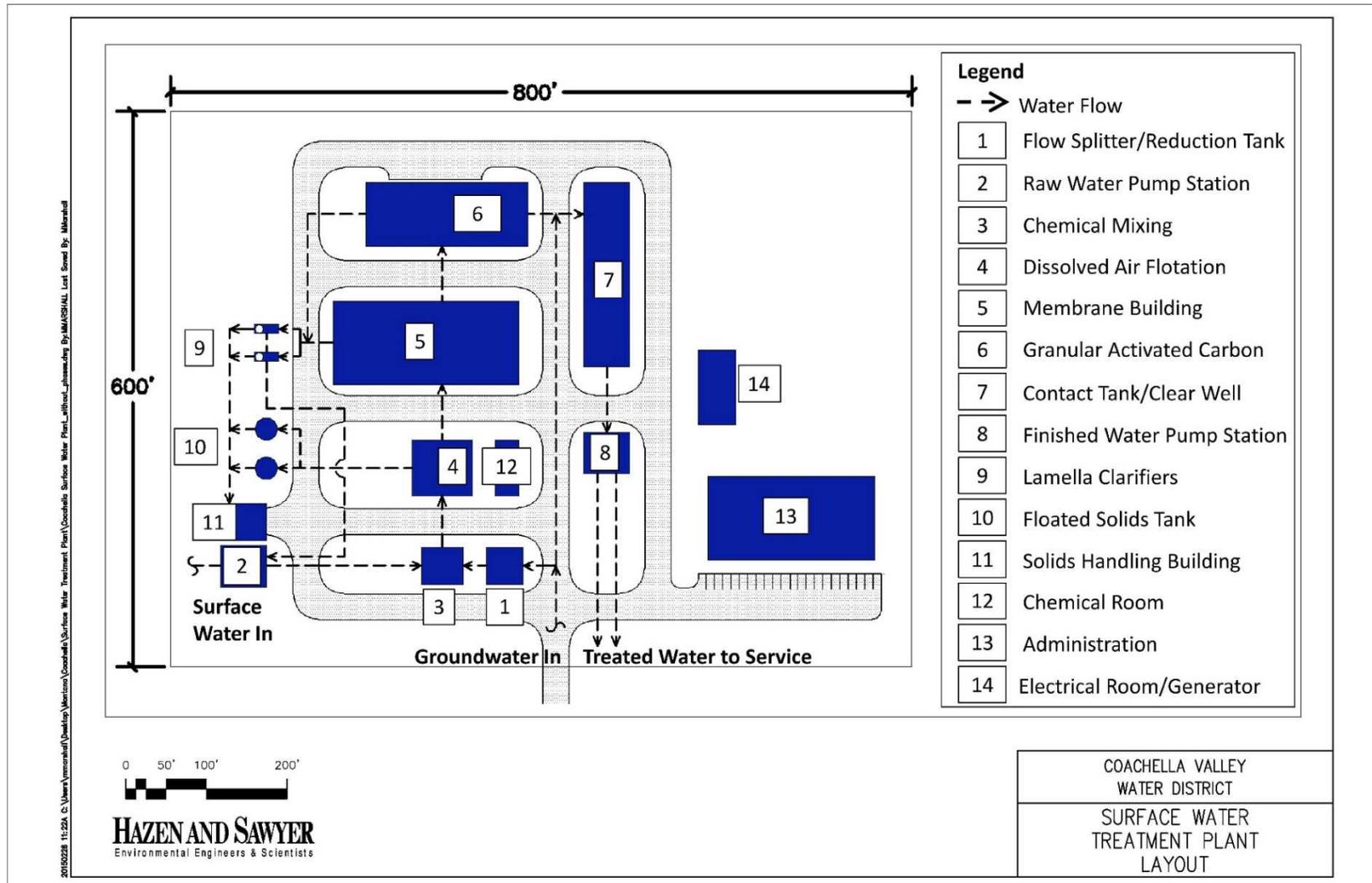


Figure 1. Example Layout for a 20 MGD Surface Water Treatment Plant

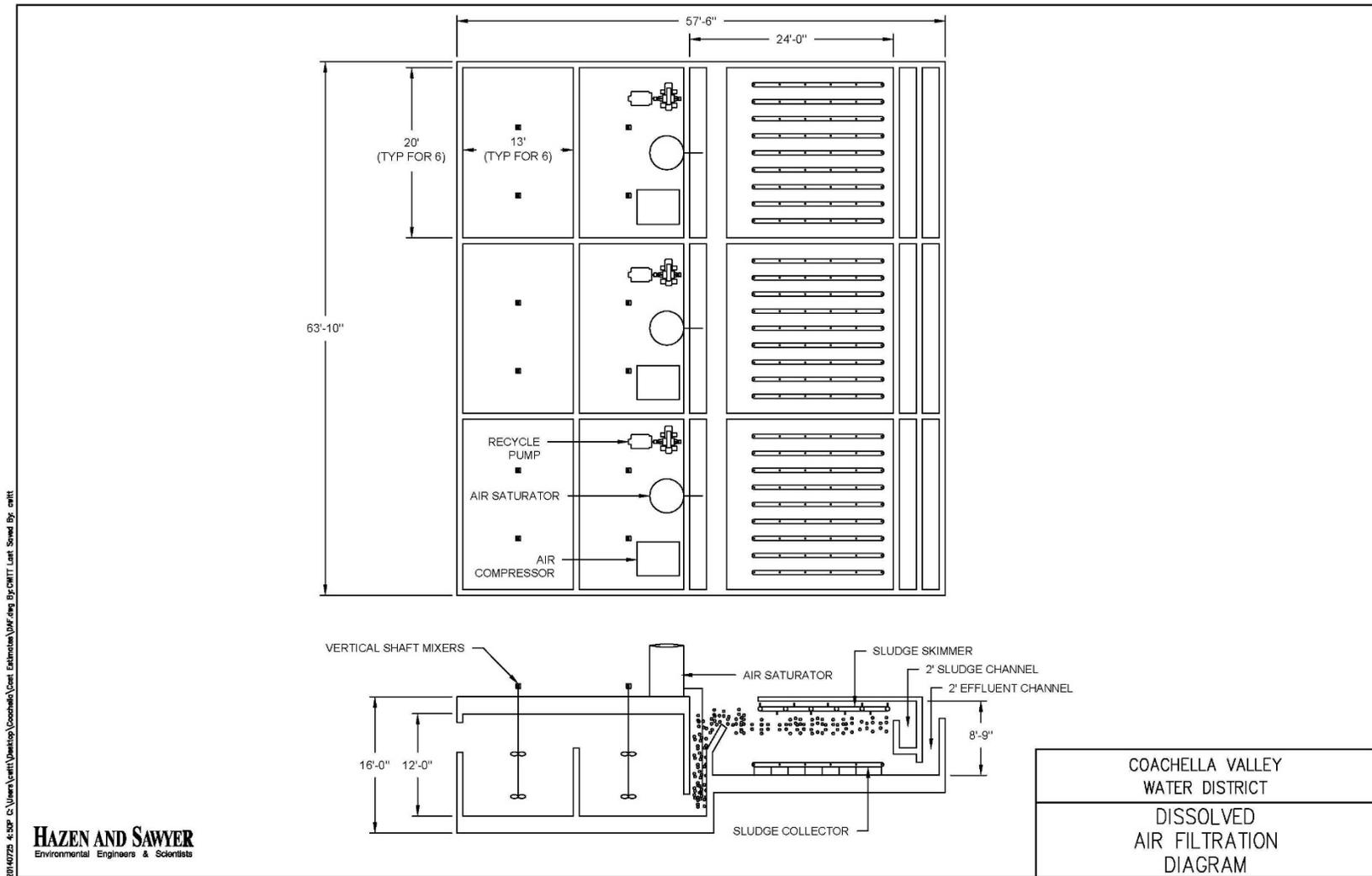


Figure 2. Example Arrangement for the DAF Process

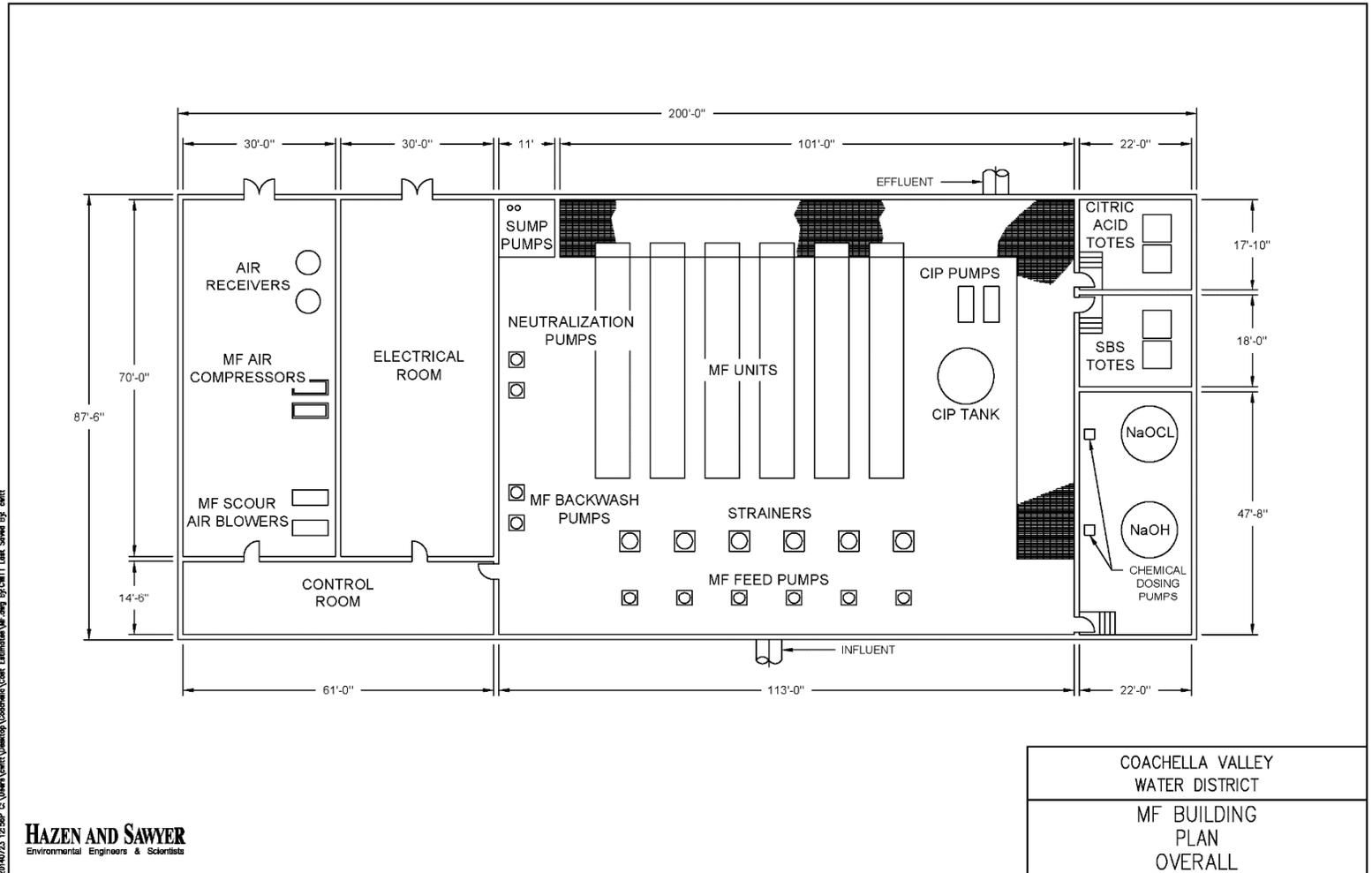


Figure 3. Example Arrangement for the Membrane Filtration Process

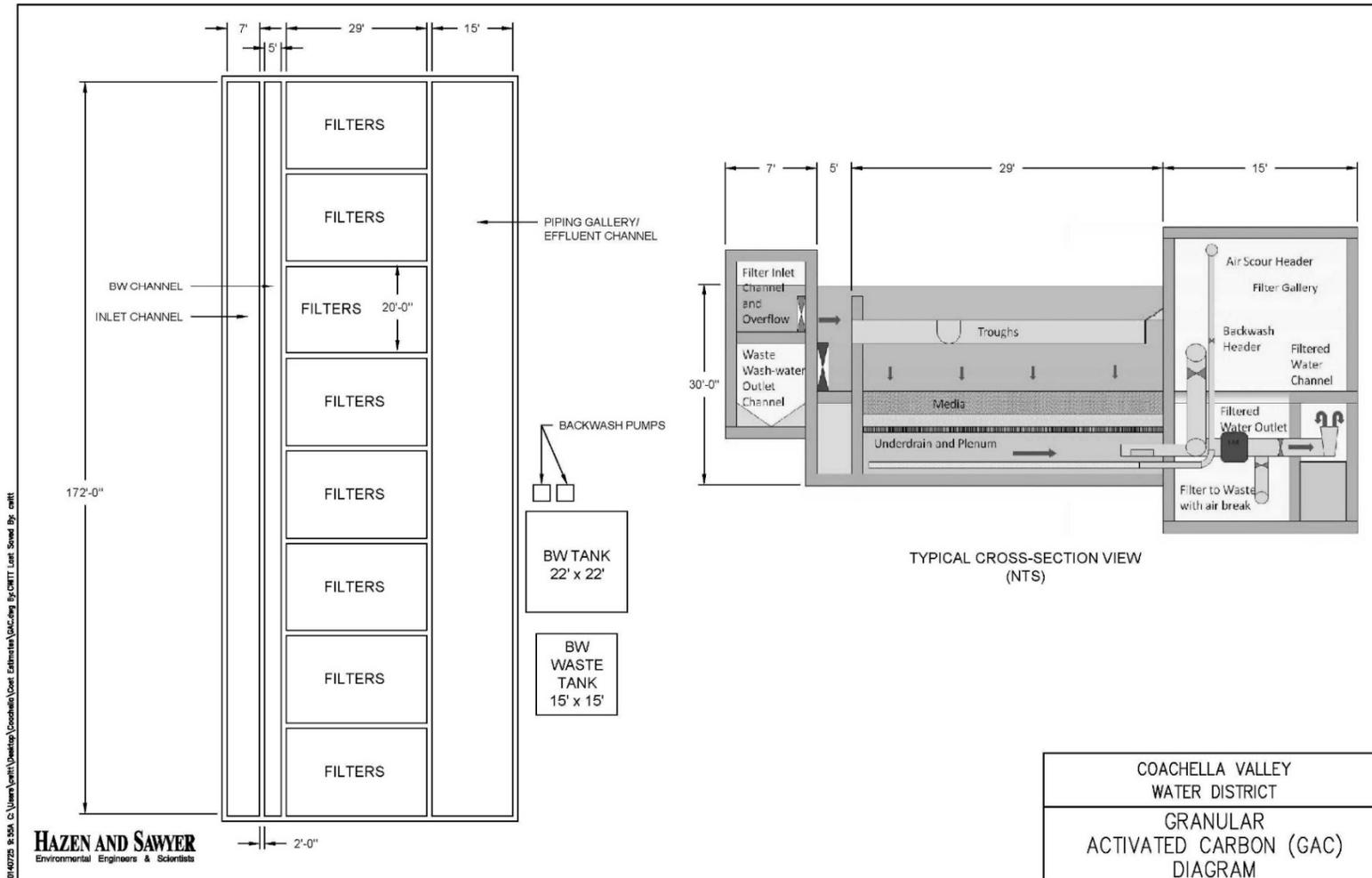


Figure 4. Example Arrangement for the GAC Process

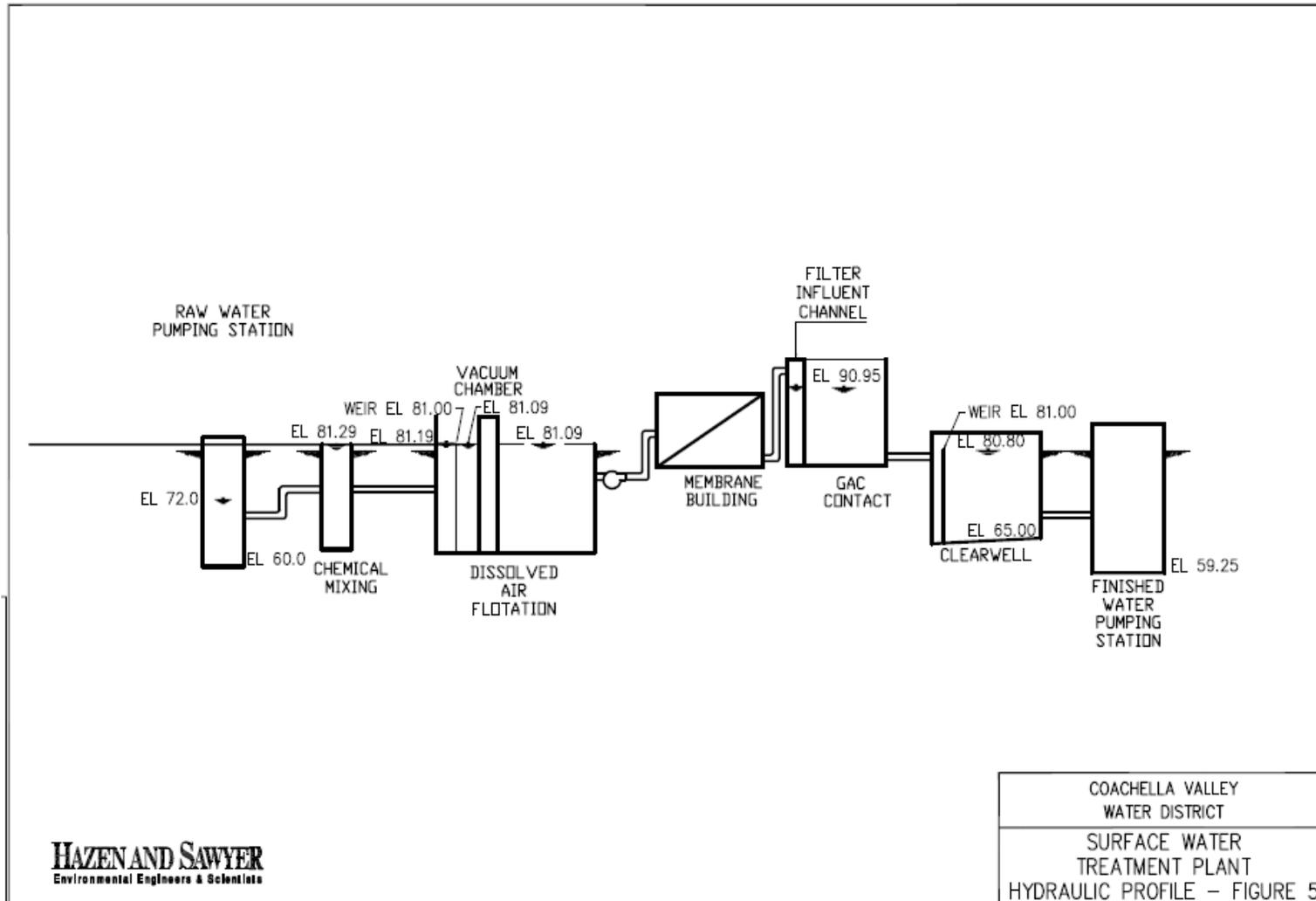


Figure 5. Example Hydraulic Profile of Surface Water Treatment