

5.3.3 Backwash Supply Water System

The existing Backwash Supply (BWS) Pump Station will be used to provide backwash supply water to the new filters in TB1. The BWS Pump Station receives water from the existing clearwell outlet prior to pumping to the filters. The pump station is equipped with two constant speed vertical turbine pumps suspended into a wet well connected by piping to the clearwell. The design operating point for the existing pumps is 8,600 gpm at 60 feet of total dynamic head (TDH). However, the new filters will require a maximum design pumping rate of 11,016 gpm at a TDH of 28 - 36 feet (depending on the water level in the BWS Pump Station wet well) for a maximum backwash rate of 18 gpm/sf. The backwash rate for the new filters is higher because the surface area of the new filters is significantly greater than the existing filters. The design operating TDH for the new filters is lower because there will be less headloss with the new piping. The new design operating point will be achieved by either running one of the existing pumps further out on its pump curve, or by running two pumps in parallel and throttling a valve to reduce the additional head that is not required. Installing a larger (i.e. higher RPM) motor on the existing pumps is not an option as the existing discharge head is too small to accommodate the additional weight. HDR is currently coordinating with the pump manufacturer and the City to determine the final pump operational strategy for the Project. However, no improvements are anticipated inside the BWS Pump Station for this Project. Table 5-5 summarizes the design criteria for the backwash supply system.

Table 5-5. Backwash Supply System Design Criteria

Parameter	Unit	Design Value ⁽¹⁾	CDPHE Design Criteria
No. of Pumps	qty	2	
Existing Design Pump Capacity	gpm	8,600	
Existing Design Pump Operating TDH	feet	60	
New Design Pump Capacity	gpm	10,800	
New Design Pump Operating TDH	feet	28 - 36	
Drive Type	-	Constant Speed	
Minimum Wet Well Volume	gal	36,125	
Maximum Wet Well Volume	gal	72,250	

New 30-inch backwash supply (BWS) piping will be connected to the existing 24-inch BWS pipe on the south of the Maintenance Building using a 24-inch tee and 24-inch x 30-inch increaser. Sheet 21C402 shows the new site piping.

5.3.4 Backwash Waste Water System

Backwash waste from the new filters will be conveyed to the existing Backwash Recovery (BWR) Pump Station. Four constant speed vertical turbine pumps are installed in the BWS Pump Station. Two of the pumps are larger duty pumps with variable frequency drives (VFD's) and the other two pumps are small jockey pumps with constant speed drives. To accommodate the backwash waste flows from the new filters, two of the large pumps will be run in parallel to transfer the flow from the BWR Pump Station wet well to the Equalization Basin. No improvements are anticipated inside the BWS Pump Station for this Project. Table 5-6 summarizes the design criteria for the backwash waste system.

Table 5-6. Backwash Waste System Design Criteria

Parameter	Unit	Design Value ⁽¹⁾	CDPHE Design Criteria
Existing Pump Design Capacity (Duty/Jockey)	gpm	8,600/600	
No. Backwash Recovery Pumps (Duty/Jockey)	qty	2/2	
Minimum Wet Well Volume	gal	58,625	
Maximum Wet Well Volume	gal	42,340	

New 36-inch backwash waste water (BWW) piping will be connected to the existing manhole on the east side of the BWR Pump Station. From the manhole, BWW will flow into the wet well of the BWR Pump Station via the existing pipe. Sheet 21C402 shows the new site piping.

5.3.5 Filter-to-Waste System

The filter-to-waste (FTW) system for the new filters has not been well defined for the 30 percent design. FTW will be recycled back to Pond 1, in lieu of processing FTW through the plant's residuals handling system. The transfer of FTW from the new filters to Pond 1 requires pumping due to the hydraulic grade line.

The original design concept for the pumping was to construct a stand-alone FTW Pump Station on the west side of TB1. This pump station would be equipped with two submersible pumps, one duty and one standby, that would serve both TB1 and future TB2. The pumps would have a dual function as they would also be used for rapidly draining a floc/sed basin for maintenance. The preliminary size of the pump station was 10-foot diameter and 25-feet deep. The depth of the pump station is driven by the need for adequate pipe bury depth, providing a 2 foot air gap from the pipe discharge to the maximum water surface elevation inside the pump station, and providing adequate working depth and volume for the submersible pumps. The project team is concerned about constructing the pump station due to the overall depth and the dewatering challenges given the shallow groundwater table. Sheet 21C402 shows the proposed FTW pump station on the site plan along with the associated FTW piping to Pond 1.