

# TM-14: Needs Assessment for Booster Pump Stations and Reservoirs

## 1.0 Introduction

A series of meetings were held with DWSD staff and engineering consultants between August 2013 and September 2014 relative to renewal and replacement needs at booster pump stations and reservoirs. To facilitate these meetings, a list of major booster pumping and reservoir assets was created, and then discussion and documentation of needs proceed based on specific assets.

**Table 1-1** includes the list of existing major assets for high lift pumping, booster pumping and reservoirs along with identified capital improvement needs through the planning period.

The results of the needs assessment were incorporated in the cost estimating and 20-year capital improvement program in TM-17. Review comments on the draft version of this Water Master Plan Update have been directly incorporated into TM-17. Updates were not made to the original source data in TM-14.

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**Table 1-1: DWSD CS 1528 Water Master Plan Update Booster Pump Station and Reservoir CIP**

Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period
All Stations (or certain groups)					Add Power Monitors	2015-2019			
					Repair / replace HVAC Units	2015-2024	Almost all need inspection and probable replacement		
					Automate Facilities (prepared by others)		System costs for automation of facilities have been prepared by others in 10 yr. CIP		
					DWS-874 Booster Station Rehabilitation Contract	2015-2019	DWS-874 is a \$13.18 million 5-year program		
					Replace Roofing at Selected Booster Pump Stations	2015-2019	The budget includes cost estimates for WTPs and booster pump stations		
					Provide Pressure-Flow Control Improvements Evaluation at Electric, Ford, Michigan and West Chicago Stations	2015-2019			
					Facilities Needs Assessment at Adams, Eastside, Electric, Ford, Franklin, Joy, NW, Newburgh, Ypsilanti, WSC, and NSC	2015-2019			
					Evaluate Alternatives and Recommend Corrective Actions to Improve Power Factors at DWSD's Major Booster Pumping Stations	2015-2019			
					Provide condition assessment/possible replacement of Submersible pumps on underdrains of all underground reservoirs in 2015-2019.	2015-2019			
					Ongoing reservoir inspection and repair	post DWS-874	Assume \$ 1 million per year per 10 MG reservoir capacity		
				Provide Ovation Upgrade	2020-2024	Ovation will be 20 years old by this time			
				Repair / replace reservoir roof membranes		Need every ten years			



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Adams Road	109 MGD	HVAC System		(2) 4800V Emergency Generators	Replace VFD & add one VFD	2015-2020	Below Grade Pump Station with considerable condensation; reduces equipment life		
		Generators		(2) Nitrogen Tanks					
		Nitrogen Tanks							
		VFD Drive		4800V VFD for LP #1 (installed 1992, no longer supported)	Replace isolation valves	2020-2024	Additional pump no longer needed.		
		LP #1		(4) Line Pumps					
		LP #2							
		LP #3							
LP #4									
RP #1		(2) Reservoir Pumps							
RP #2							Reservoir scheduled for inspection in fall 2014		
Reservoir	10 MG	Prestressed Wire-Wound Concrete Reservoir			Repair Leaking Reservoir and replace valves and gates Update Switchgear for extra Pump	2015-2019	Leaking and needs to be repaired		
Chesterfield/Snover					New Pump Station - evaluate as part of Master Planning	2020-2024			
East Side (CANYON)	30 MGD	HVAC System			Rehab PS Building, particularly electrical system	2020-2024	No current needs for reservoir, based on inspection in 2014; potential for concern in future from MDEQ		
		Generators							
		RP #1		(3) Reservoir Pumps	Replace all 3 pumps and motors, including all station valves	2020-2024			
		RP #2			Add 4th reservoir pump & 1 VFD	2020-2024			
		RP #3							
Reservoir	10 MG	Underground Concrete Reservoir							



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period		
Electric Ave.	24 MGD	HVAC System			Replace 2 line pumps and 2 reservoir pumps, replace all station valves; provide a VFD for 1 line & 1 reservoir pump.	2015-2019	Design complete by Sigma but not implemented (Confirm scope)	Existing reservoirs are severely deteriorated and the poor condition of the concrete structure presents an unsafe condition. Therefore, replacement of one reservoir and demolition of the other reservoir are recommended within the next 2 years.  This project needs to be added to the 2016 CIP. This work would also include the pumps, motors and valves.			
		LP #1		(2) Line Pumps							
		LP #2									
		RP #3		(2) Reservoir Pumps							
		RP #4			Demolish one reservoir and replace one reservoir (per G&H).	2015-2019	Wayne County drain easement is delaying demolition work.  Tanks are leaking, and at least one needs to be replaced  Master plan hydraulic modeling should be used to confirm the need for only 1 tank				
		Reservoir #1	6.6 MG	3.3 MG Above Grade PWW Reservoir							
Reservoir #2		3.3 MG Above Grade PWW Reservoir									
Ford Road	90 MGD	HVAC System			Perform Condition Assessment for Electrical and Controls (hydraulic) replacement; update electrical system, new electrical control panels	2015-2019	Reservoir Leaks and needs to be repaired.	Need to verify that there are two independent power supplies to this station to negate the need for the addition of backup generators  Existing reservoir fill valve should be relocated because its current location is snug up to the ceiling of the station in a way that makes it nearly impossible to service.			
		LP #1		(5) Line Pumps							
		LP #2			Perform condition assessment for pump rehab / replacement (Last rehab in 1999)	2015-2019					
		LP #3			Repair Reservoir based on recent inspection; may be included in DWS - 874; Alkali or Silica accumulation noted.	2015-2019					
		LP #4									
		LP #5			(5) Reservoir Pumps	Add VFDs for 2 Line pumps and 2 Reservoir pumps				2015-2019	
		RP #6									
		RP #7									
		RP #8				Replace BF Control Valves with Cone Valves for all pumps, including the addition of associated controls for modulation				2020-2024	Need to improve access to isolation valves
		RP #9									
RP #10											
Reservoir	10 MG	Reservoir									





Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period
Franklin	164 MGD	HVAC System							
		VFD Drive		4800V VFD for line pump 3					
		VFD Drive		4800V VFD for line pump 4					
		Generators							
		LP #1		(4) Line Pumps					
		LP #2			Determine need to replace hydromatic control system	2015-2019	Currently difficult to take this station off line for service. Needs immediate upgrade		
		LP #3							
		LP #4		*Acts as Line pump and Reservoir pump #3					
Franklin		RP #1		(2) Reservoir Pumps	Replace Reservoir pumps R1 and R2 with motors and Control Panels, and replace reservoir fill valve.	2015-2019	Valve currently has no access and is blocked by the suction line when a pump was added.		
		RP #2							
		Reservoir	10 MG	Concrete semi-underground reservoir	Replace reservoir membrane this fall (DWS - 874)	2015-2019	Cost accounted for in DWS - 874 Contract above		
Haggerty Road	70 MGD	HVAC System							
		VFD Drive		4160V VFD for Line pump 1	Replace Fire Alarm System; poorly located, difficult to service	2020-2024	Station not used as much after closing of Ford Wixom plant.		
		VFD Drive		4160V VFD for Line pump 2					
		VFD Drive		4160V VFD for Line pump 3 & Reservoir pump 3					
		LP #1		(3) Line Pumps					
		LP #2							
		LP #3		*Acts as Line pump and Reservoir pump #3					
		RP #1		(2) Reservoir Pumps					
Haggerty Road		RP #2							
		Reservoir	10 MG	At Grade Reservoir			Inspect reservoir in fall 2015 under DWS-874 contract		



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period	
Imlay	575 MGD	HVAC System								
		VFD Drive		13,800V VFD for Pump 1				Addition: Replace drainage lift station equipment and related improvements	2015-2019	
		VFD Drive		13,800V VFD for Pump 6				Addition: Construct site drainage improvements to eliminate storm water entry into station	2015-2019	
		VFD Drive		13,800V VFD for Pump 7				Addition: Replace belt drainage system equipment and related improvements	2015-2019	
		VFD Drive		13,800V VFD for Pump 8		Add Freeze Protection Pump (rebuild vault?)	2015-2019	This is first portion of the \$3.3 million project from the 10-yr CIP	Addition: Construct improvements to the chiller system used to cool the VFDs	2015-2019
		VFD Drive		13,800V VFD for Pump 3		Inspect and Provide protection for Chiller system	2015-2019		Comment: Five VFDs with three on soft starters.	
		LP #3		(6) Line Pumps					Addition: improve HVAC system	2020-2024
		LP #4				Replace existing VFDs with new. Confirm number of new VFDs needed based on projected demand with the departure of Flint & GCDC. Note: the existing VFDs are 20 years old.	2020-2024	Need to revise operating plan now that Flint is no longer taking water, as well as GCDC will not be buying water from DWSD effective July 1, 2016		
		LP #5								
		LP #6								
		LP #7								
		LP #8								
		RP #1		(2) Reservoir Pumps						
		RP #2								
Fill System				8 electric motor operated cone valves with associated isolation BFVs, 4 manually-operated gates, with the system being on Ovation for control						
South Bypass				2 - 54" check valves in parallel and associated isolation BFVs with Ovation connected for remote monitoring						
West Bypass				24" pressure sustaining valve with associated isolation gates (2)						
Storm Lift Sta. Reservoir			20 MG	Storm drainage lift station Reservoir (actual capacity is about 17 MG)				Operationally, the reservoir at Imlay really acts as a surge tank.		



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period
Joy Road	94 MGD	HVAC System Generators		(2) 4800V Emergency Generators					
		VFD Drive LP #1 LP #2 LP #3		(3) Line Pumps	Replace L3 and all reservoir pumps, replace existing and add one VFD	2015-2019	Original Reservoir Pumps and L3 pump. Motors replaces in 2005~	Addition: replace soft starters for L2 & L3	2015-2019
		RP #1 RP #2 RP #3		(3) Reservoir Pumps					
		Reservoir #1	10 MG	5 MG Reservoir	Repair both reservoirs (membranes) (DWS - 874)?	2015-2019	JR1 planned for inspection in spring 2015 DWS-874		
		Reservoir #2		5 MG Reservoir	Replace Electrical System (CS 1226)	2015-2019			
Michigan Ave	29 MGD	HVAC System					1 reservoir was demolished; one 10 MG reservoir remains, needs inspection		
		LP #1 LP #2 LP #3		(3) Line Pumps	Replace L3 and reservoir pumps, replace all station and control valves, add 2 VFDs (1 reservoir, 1 line)	2015-2019	Coordinate with Phase 3 Glenwood water main improvements  Line pumps were replaced in 2004	Addition: Replace all station valves associated with the pumps, i.e., suction and discharge valves.	2015-2019
		RP #4 RP #5		(2) Reservoir Pumps			Master Plan Hydraulic Modeling should determine future need for PS and reservoir.	Major Comment: master plan needs to seriously evaluate if this entire station should be replaced with a brand new station due to the age, condition and poor layout of this existing station. Additional investment in this station needs to be evaluated.	
		Reservoir	3.5 MG	Steel Reservoir				Comment: the original 1940s tanks were demolished; and one new steel tank was installed.	



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period
Newburgh	52 MGD	HVAC System  LP #1  LP #2 LP #3 LP #4 LP #5	NA	(5) Line Pumps	Replace All Station Valves, add bypass valve, provide electrical upgrades for pumps and one VFD	2015-2019	Station badly needs isolation/bypass piping and valve	Comment: existing cone valves will not make it until 2020. There are 5 pumps that are obsolete. Parts for these pumps have to be specially cast and are very expensive with long lead times. The electrical gear is very old Westinghouse and also needs to be replaced. Due to the criticality of this station, the time frame for these improvements needs to be moved to within the next 5 years.	
North Service Center	227 MGD	HVAC System  Generators  VFD Drive  VFD Drive VFD Drive VFD Drive LP #1		(4) 4800V Emergency Generators  4800V VFD Drive for Line pump 7  4800V VFD Drive for Line pump 8 4800V VFD Drive for Line pump 9 4800V VFD Drive for Line pump 10 Out of Service	Construct Hydraulic Surge Improvements at the North Service Center Pump Station  Complete Transient Improvements per TYJT study.	2015-2019  2015-2019	This is the first portion of the \$7 million project from the 10 Yr CIP	Addition: replace existing broken 96" BFV with new in order to facilitate water delivery from Imlay south of NSC. Schedule shall be coordinated with the master planner's schedule for the closure of treatment at Northeast.  Addition: install brand new division valves on the 96" transmission main when GCDC ceases buying water from DWSD.  Addition: make improvements to the yard valves at NSC to ensure their functionality	





Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period
North Service Center (cont'd)		LP #2		(9) Line Pumps are in service	Replace or recondition line pumps L2 - L6,; add VFDs	2020-2024	Examine cost of reconditioning. Could eliminate or consolidate some pumping units		2016-2020
		LP #3							
		LP #4							
		LP #5							
		LP #6							
		LP #7							
		LP #8							
		LP #9							
		LP #10							
		RP #1		(4) Reservoir Pumps	Replace Yard valves (BFVs) including those outside fence.	2020-2024	LP #7 - LP #10 are new and have VFDs		
	RP #2								
	RP #3								
	RP #4								
	Reservoir #1	20 MG	10 MG Reservoir			NSC1 inspection underway, no current needs anticipated			
	Reservoir #2		10 MG Reservoir	Provide needed rehab per recent inspection.	2015-2019	Reservoir Repairs assumed part of DWS 874; capital needs estimated at \$1M			
Northwest	50 MGD	HVAC System		(5) Reservoir Pumps	Replace pumps and valves, reduce from 5 to 4, and add 1 VFD, replace electrical switchgear, and replace station and control valves	2015-2019			
		RP #1							
		RP #2							
		RP #3							
		RP #4							
		RP #5							
Reservoir	10 MG	Underground Concrete Reservoir	No additional work needed.	2015-2019	NW1 advertised for repair under DWD 874; no additional needs known				



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period	
Orion	14 MGD	HVAC System	NA	(4) Line Pumps	Replace pumps and motors, replace station building to allow for new overhead crane	2015-2019	Station has been a "temporary" facility for decades			
		LP #1			Replace electrical switchgear	2015-2019				
		LP #2			Replace all Station Valves	2015-2019	Improve access or build new pumping station			
		LP #3								
LP #4										
Rochester	58 MGD	HVAC System	NA	4160V VFD Drive for Line pump 1	Upsize the suction pipe feeding this station	2015-2019		The need and really value for this project has to be confirmed after the new 42" parallel main along 24-mile road is placed into service		
		VFD Drive								4160V VFD Drive for Line pump 3
		VFD Drive								(5) Line Pumps
		LP #1								
		LP #2								
		LP #3								
LP #4										
LP #5										
Roseville	11 MGD	HVAC System	NA	(4) Line Pumps	Demolish Facility, not currently in use.	2015-2019				
		LP #1								
		LP #2								
		LP #3								
		LP #4								
Schoolcraft	80 MGD	HVAC System		(2) 4800V Emergency Generators	Replace LP #3/RP#2 and RP #1	2015-2019				
		Generators		(3) Line Pumps						
		LP #1		*Acts as Line pump and Reservoir pump #2						
		LP #2								
LP #3										
Schoolcraft (cont'd)		RP #1	10 MG	(1) Reservoir Pump Reservoir	Replace Reservoir Fill valves and vaults, replace cone valves, and control panels. Inspect belt drain system; replace duplex sump pumps.	2015-2019				
		Reservoir		Inspect submersible pumps and underdrains.	2015-2019	Advertised for rehabilitation on 8-4-14 under DWS 874				



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period	
West Service Center PS	148 MGD	HVAC System					This Station requires a needs assessment and alternatives evaluation to determine if it is in the Department's best interest to continue to investment/improve the existing facility; or if will be less costly in the long term to build a new station.			
		Generators		(2) 4800V Emergency Generators	Rehab Discharge Division 20" AND 36" Valves	2015-2019	Built in 1968			
					Replace Isolation Valves for Line Pumps (36" - 54")	2015-2019				
		LP #1		(6) Line Pumps	Replace all pumps, motors, drives, switchgear and valves; add 2 VFDs. May require one or two new PSs.	2015-2019	Discharge Isolation Gate Valves are needed on all of the pumps. All yard valves need to be either re-built or replaced with new.			
		LP #2					Major Facility in need of full upgrades of pumps and equipment			
		LP #3					RP1 and RP2 are horizontal pumps that need to be replaced with vertical pumps.			
		LP #4					Yard valves should be controlled and operated by WSC			
		LP #5						New Pump station with demolition of old facilities may prove to be best option		
		LP #6								
		RP #1 RP #2 RP #3 RP #4		(4) Reservoir Pumps						
Reservoir #1	20 MG	Water Storage Reservoir					WSC1 has cracks that are being repaired with a new repair technique. (DWS - 874)			
Reservoir #2		Water Storage Reservoir								



Station/Reservoir	Pumping Capacity	Asset (1)	Storage	Asset Description (1)	Project Description	Time Period	Notes and Additional Information to Prepare Cost Estimates	DWSD Comments and Additions	Time Period
West Chicago	36.5 MGD	(Asset Data not listed)	NA (Res. has been removed)	(Asset Data not listed)	Remove Reservoir Pumps, Replace 3 line pumps & motors; possibly salvage Res. Pumps & cone valves, and convert to Line pumps. Provide at least 1 VFD. Replace Switchgear	2015-2019	Assume \$500,000 funded from DWS 874/CIP 1230  All new RPs in the last 10 years. These pumps could be salvaged.	Consultant to advise on actual need.	
Wick Road	60 MGD	HVAC System  Generators  Nitrogen Tanks LP #1 LP #2 LP #3  RP #1 RS #2 VFDs Reservoir #1	10 MG	(2) 4160V Emergency Generators  (2) Nitrogen Tanks (3) Line Pumps  *Acts as Line pump and Reservoir pump #3  (2) Reservoir Pumps  L1, L2, L3/R3 Buried concrete Reservoir			Need 18" cone valve for L1 with controls. Consultant to verify size of valve.  Replace hydropneumatic system used to drive the valves  Reservoir in good condition. Replacement with above Grade Reservoir not necessary per G and H. Inspect and repair as needed.		
Ypsilanti	54 MGD	HVAC System Generator  Nitrogen Tanks  VSDs LP #1  LP #2 LP #3	NA	(1) Emergency Generator  (2) Nitrogen Tanks  3 VSDs on all three line pumps (3) Line Pumps	Replace pumps, motors and drives; provide 1 VFD. Reconnect generator. Generator should be housed.	2015-2019		Addition: demolish existing temporary building  Addition: installation of 2MW generator (needs to be done ASAP); capping and cutting yard pipes not used associated with the existing temporary building; installation of a true station bypass (needs to be done ASAP).	2014-2015  2015-2019

(1) Major Assets as listed in DWSD Asset Management Data Base "BOOSTER STATIONS AND SEWAGE STATIONS - ALL ASSETS (EXCLUDING DELETED AND INACTIVE) as of November 2013

