Appendix C – Water System Evaluations

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City of Airway Heights

Source

The City draws its drinking water through two interties with the City of Spokane water system and one groundwater well (Recovery Well No. 9) seasonally. (2021 WSP)

Based on water levels recorded from 2010 – 2014 (Appendix J) groundwater levels were generally declining when the City was using groundwater as its primary source of drinking water. (2021 WSP)

The City of Airway Heights owns **eight supply wells**. The City also has the two intertie agreements with the COS for its water needs. (2021 WSP)

- Well No.'s 1 and 4 are located together east of Lawson and north of McFarlane Road
- The City owns the Parkwest Well, previously an industrial well, located approximately 2.5 miles south of the City adjacent to Craig Road
    - Pump tests completed in 2000 indicated that the well would yield up to 1400 gpm of good quality water. During the first couple of years that the City used this well, issues were raised by adjacent well owners regarding declining water levels. To mitigate these issues the City reduced the pumping rate of the well to approximately 500 gpm.
    - In 2011 the City and Washington State Dept. of Ecology entered into an Agreed Order (Docket No 8703). This order stipulated that the City would reduce pumping from the Parkwest well each year until July of 2013 when pumping from the well was only permitted under emergency conditions. (2021 WSP)
- Well No. 8 (previously Well No. 2) is located east of Garfield Rd. and North of 21st Avenue. (2021 WSP)
- Well No. 9 or commonly referred to as the "Recovery Well" is located approximately 470 feet south of the intersection of 21st Avenue and Lundstrom Street. (2021 WSP)
- Well No. 3 is located near the City Maintenance Shop at 21st and Russell. This well is currently pumped for non-potable uses due to water quality problems. (2021 WSP)
- Well No. 5, located east of Garfield and just north of McFarlane Road. This well is no longer used due to water quality problems. (2021 WSP)
- Well No. 7 is located south of McFarlane Road at Russell Street. Well No. 7 is now considered an emergency water source. (2021 WSP)

Supply source 6 is identified as the COS intertie water main at Highway 2 and Hayford Road. (2021 WSP)

TABLE 1-1

CITY WATER SUPPLY SOURCE CAPACITIES

WELL	DESIGN PUMP CAPACITY (GPM)	DESIGN PUMP CAPACITY (1,000 GPD)*	"RELIABLE" SUSTAINED YIELD (GPM)	ACTUAL AVAILABLE CAPACITY (1,000 GPD)*
No. 1 and 4	448 (Taken Out of Service)	645	350	645
No. 8	150 (Taken Out of Service)	216	45	65
Park West	1,500 Reduced to 0	2,160 Emergency Only	0	0
COS Intertie #1	1,500	2,160	1,500	2,160
Recovery Well (9)	1,450 (Seasonal)	2,088 Seasonal Only	1,450	2,088
COS Intertie #2	1,400 (Not Pumped)	2,016	1,400	2,016
Total Daily System Capacity:	**2,900 4,350 Seasonal**	**4,176 6,264 Seasonal**	**2,900 4,100 Seasonal**	**4,176 6,264 Seasonal**

Source: (2021 WSP)

With the discontinued use of all of the City's wells with the exception of seasonal use of Well 9 the City relies on the two City of Spokane interties for is water sources. Future water source(s) for the City is uncertain at this time and will be determined through the Air Force EE/CA process and negotiations between the Air Force and the City. (2021 WSP)

Using the City of Spokane interties and Well #9 it can be seen that the City's present system production capacity of 5.616 MGD will provide the required production capacity into the year 2023 without added use of the Reclaimed Water System. The Reclamation Plant added source capacity will extend the City's supply to 2024. (2021 WSP)

The largest reliable source was determined to be Well # 9 since the City of Spokane interties provide reliable water through redundant pumps, bypasses and gravity feed from a much larger source. (2021 WSP)

Storage

Total storage capacity: 2,643,000 gallons (DOH)

There are four (4) water storage reservoirs within the water system service area. The City owns three of the reservoirs, and the fourth reservoir is owned by the State

Department of Corrections (DOC). (2021 WSP)

A 307,000-gallon City owned standpipe reservoir is located in the City Park north of Highway 2, between Lawson and King Streets. This welded steel reservoir was constructed in 1973 and is 20 feet in diameter and 140 feet tall. (2021 WSP)

In 1999, a one (1) million-gallon non-elevated reservoir (Russell Street Reservoir) was

constructed adjacent to Well No. 7 located south of McFarlane Road at Russell Street. (2021 WSP)

The Washington State Department of Correction (DOC) facility owns a 2.4-million-gallon welded steel storage tank located within the prison site, north of the 5th Street-Garfield gate. The City has an agreement with the DOC facility to use up to 500,000 gallons of the reservoir storage during periods of emergency. (2021 WSP)

In 2012 the City constructed the Deno Reservoir which is located northwest of the Kalispel Tribe Casino on West Deno Road. The reservoir's usable storage volume is 1,000,000 gallons at the operating level. There are three (3)-900-gpm booster pumps. (2021 WSP)

TABLE 1-2
STORAGE FACILITIES CAPACITIES

Tank Name & Location	Storage Capacity (gallons)	Useable Storage Capacity (gallons)
City Park Reservoir In the City Park, North of Hwy. 2 between Larson & King Streets.	307,000	143,000
Russell Street Reservoir South of McFarlane Rd. @ Russell Street	1,000,000	1,000,000
DOC Reservoir Department of corrections, North of the 5th St. Garfield gate	2,400,000	500,000
Deno Reservoir West Deno Road	1,000,000	1,000,000
TOTALS	**4,707,000**	**2,643,000**

Source: (2021 WSP)

Delivery

There are approximately 67.3 miles of distribution piping in the Airway Heights water system. This piping ranges in size from 6-inches to 12-inches in diameter of various pipe materials throughout the system. (2021 WSP)

The existing water distribution system is in fair to good condition. Some sections of the system date back to when the City formed in the 1950s. In the 1990s, the City began an effort to replace undersized water mains, and loop "dead end" water mains throughout the City, to provide better water quality and distribution. Since the previous Plan, the City has replaced several undersized lines including the water main in Lawson Road from 18th to 21st and the looping line from Wells 1 & 4 to directly connect the Russell Street Reservoir

TABLE 1-3
PIPE LENGTH SUMMARY

PIPE MATERIAL	LENGTH OF PIPE (ft)
Ductile Iron (D.I.)	4,100
Steel (ST.)	29,100
Polyvinyl Chloride (PVC)	310,732
Asbestos Cement (A.C.)	11,520
Total Distribution Pipe Length	**355,452**

Source: (2021 WSP)

Boosters/Pressure relief valves –

Water is boosted into the Airway Heights water system at a rate of 1,500 gpm from the intertie in SR-2. (2021 WSP)

The City of Airway Heights water service area is in only one pressure zone. Because there is a height restriction for all buildings within the City limits, the reservoirs cannot be taller than 35 feet above ground level. The City's need for booster pumps is due to obtaining the water pressure necessary to service the area with the existing ground-level reservoirs. (2021 WSP)

The two booster stations are located at the Russell Street Reservoir and the Deno Road Reservoir. These booster stations are summarized in the following table:

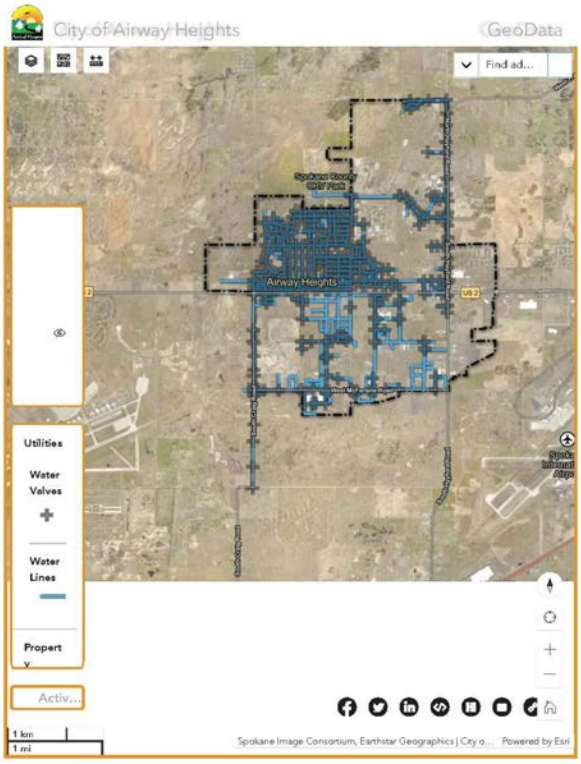
Reservoir	Number of Pumps	Pumps Capacities
Russell Street Reservoir	3	2 - 500 gpm and 1 - 1,500 gpm
Deno Road Reservoir	3	900 gpm each

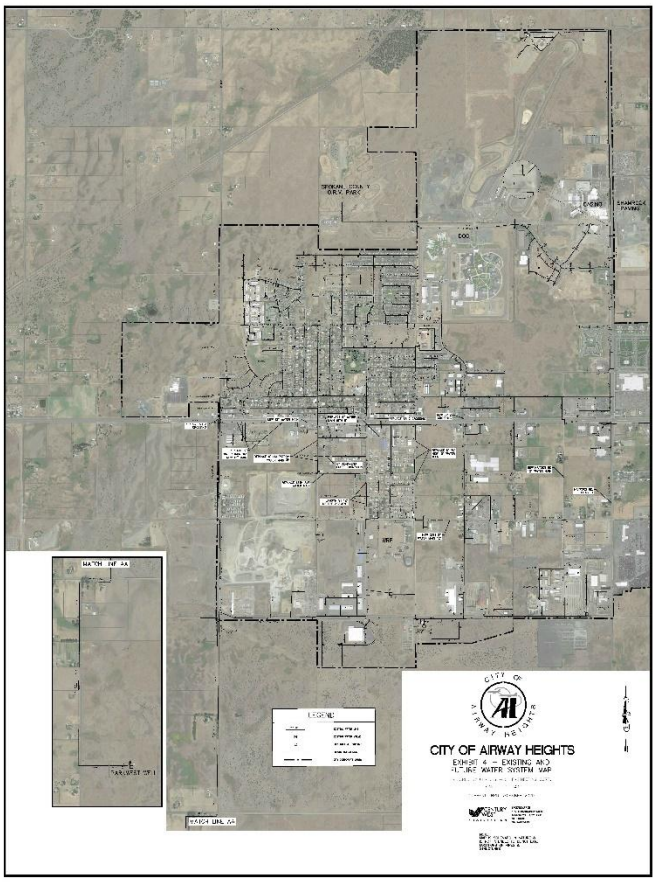
Source: (2021 WSP)

Transmission lines –

Schematic

The diagrams illustrate the City's system, showing generally where distribution mains and water valves are located. This illustration is intended as a schematic representation of the City's water system. The City has set up a GIS data sharing portal which includes water system inventory items, and is posted on its website (https://cawh.maps.arcgis.com/home/index.html) providing more detail on system design, capacity, and specifications.





Connections

The City provides water service to three categories of customers: commercial/industrial, institutional, and residential. There were 378 commercial/industrial, one (1) institutional customer and 1,300 residential connections in December 2019. (2021 WSP)

A list of capital deficiencies

Well #9 is treated for PFOS/PFOA using Granular Activated Carbon (GAC) filters. The filtration system are "skid mounted" units and are only operated during summer months due to risks of freezing in cold temperatures. The system was install by the United States Air Force as a temporary system and will be removed once a permanent solution for the groundwater contamination is in place and functional. (2021 WSP)

Testing completed by the Air Force has shown that treated water have non-detectible levels of PFOA and PFOS. (2021 WSP)

- Fire flow at 18th Avenue and Lundstrom Street is currently insufficient to meet the 1,500 gpm requirement. This issue is resolved by closing the loop between Lundstrom and Lawson on Seventeenth Avenue with an 8-inch main. (2021 WSP)

As described in Section C - System Description and Analysis of Chapter 3 of this plan, the City's distribution system is generally adequate to meet projected water demands through the 6-year planning period. The system will require upgrades to meet the demands through the 20-year planning period. Some system deficiencies were determined and are discussed in Chapter 7 of this plan. (2021 WSP)

A variety of system improvement projects are listed in Chapter 8 of the city's 2021 Water System Plan.

A list of projects (capital projects) to cure them

Chapter 8 of the city's 2021 Water System Plan outlines improvements, costs, and timing to address future water source uncertainties, inadequate Pressure and Flow, Overall System Hydraulic Improvements, level of service for fire flows, improved system operations and recent and future growth demands.

TABLE 8-1

WATER SYSTEM IMPROVEMENT SCHEDULE

Improvement Title	Type of Improvement	Description	Est. Cost (2020)	Funding Source	Year
New Water Source	Source	Construct new well in SVRP Aquifer and distribution main/booster station to City System	$22,000,000 $18,400,000 Secured	Federal/State Appropriations	2022-2023
17th Ave Loop closure	Distribution	Install a new 8" main from the dead end line on 17th to Lundstrom St.	$50,000	City Funds	2021
New 1 MG Reservoir	Storage	Construct a new 1 Million Gallon Storage Reservoir	1,800,000	Spokane Tribe	2023
Hayford Rd, Ph. II	Distribution	Construct 12" water line from 1,100 ft. mark to 21st & Loop	$403,500	Developer	Unknown
Dead End Looping	Distribution	Eliminate line dead ends (Including Seventeenth & Lundstrom to Lawson)	$431,300	City Funds	2021-2026
Lundstrom St. Waterline Replace	Distribution	Replace aged line on Lundstrom	$751,300	City Funds/CDBG Funds	2025

Hayden Ave Water line	Distribution	Construct new 12" Waterline, SR2 to 21st	$723,400	City Funds/ Developer/ CDBG	2024
Lawson St. Water line Replacement	Distribution	Replace Existing 10-inch AC line, Upgrade to 12- inch, 18th to 21st	$333,900	CDBG/City Funds	2023
Replace SR2 Crossings	Distribution	Replace Existing 6" SR2 crossing at Craig & 12" AC crossing at Lawson	$431,300	CDBG	2026
18th St. Water Main Replacement	Distribution	Replace existing 6" steel line on 18th from Lundstrom to Lawson	$333,900	CDBG/City Funds	2022
SR2 Water Main Replacement	Distribution	Construct 12-inch water main along SR2 from Ziegler to Craig Road	$584,300	CDBG/City Funds	Beyond Planning Period
21st Street Water Main	Distribution	Construct new 12" line on 21st from Russell to Garfield	$333,900	City Funds	2025
Construct New SR2 Crossing	Distribution	Construct new SR2 crossing at Garfield Rd	$216,800	City Funds	2026
6-inch water main Replacements, Ph.1	Distribution	Construct 10-inch water main in Russell Rd from 18th to SR2	$333,900	CDBG	2023
15th St. Water Main Replacement	Distribution	Replace existing 6" steel line on 15th from Campbell to Lundstrom	$556,500	CDBG/City Funds	2021
SR2 Water Main Replacement	Distribution	Construct 12-inch water main along SR2 from Lawson to Ziegler	$514,800	CDBG/City Funds	Beyond Planning Period
Reclaimed Water System	Distribution	Construct water lines to add multiple users to the reclaimed water system.	Funding and Cost Estimates are outlined in the City's Reclaimed Water System Plan 2013		2021-2026

Source: (2021 WSP)

Water rights deficiencies

- explanation of the area impacted and their thoughts about remedy

TABLE 4-7
FUTURE WATER RIGHTS STATUS USING CURRENT EXISTING WATER RIGHTS

Without Reclaimed Water		
	Forecasted Well Production	Excess in Water Rights
2026 (Instantaneous Use - gpm)*	3,325	-1,010
2026 (Annual Use - Acre-ft/yr)	919.9	1,408.1
2040 (Instantaneous Use - gpm)*	6,795	-4,480
2040 (Annual Use - Acre-ft/yr)	3,321.6	-993.6
With Reclaimed Water		

	Forecasted Well Production	Anticipated Reclaimed Water Use	Excess in Water Rights
2026 (Instantaneous Use - gpm)*	3,325	385.5	-624.5
2026 (Annual Use - Acre-ft/yr)	919.9	192.5	1,600.6
2040 (Instantaneous Use - gpm)*	6,795	459.8	-4,020.2
2040 (Annual Use - Acre-ft/yr)	3,321.6	218.7	-774.9

*Well Production is instantaneous "reliable" sustained yield with current well infrastructure. Also does not include intertie use.

With the approval of the application to integrate the City's water rights to allow pumping of all of the City's wells simultaneously, the existing water rights are sufficient to meet the projected annual water usage through the 2030 instantaneous pumping rates. (2021 WSP)

It is difficult at this time to compare future water right status until more is known regarding the final solution to the City's water sources as a result of the groundwater contamination. (2021 WSP)

The City has consolidated all of its seven water rights. The water right integration allows the City flexibility in the amount of water it draws from each source. This change also allows the City to address changing withdrawal rates of its water supply wells. The City through an Agreed Order with WSDOE has stopped pumping water from their Parkwest well. This well has been put on emergency status only. A number of locations have been identified as additional points of withdrawal for the Parkwest well water right/permit. (2021 WSP)

The recovery well is currently operating under this right/permit. Currently Well #9 is the only groundwater source being used for drinking water supply. The United States Air Force is developing an Engineering Evaluation and Cost Analysis (EE-CA) to determine the selected alternative for long term water supply for the City of Airway Heights. (2021 WSP)

When wells were shut down due to groundwater contamination water was supplied to the system through two interties with the City of Spokane. (2021 WSP)

Based on demand projections in this report, there is not enough water to meet the end of planning period (2040) demand projections for the assumed planning area. (2021 WSP)

Under current conditions the available water source will be exceeded in 2023. With the DOC reuse the sources will be extended to 2024. If all projected reclaimed water is put to beneficial use the City will have enough water for the estimated growth until 2026. (2021 WSP)

City of Cheney

Source

Cheney takes its groundwater from eight wells. However, well #4 is used solely for irrigation of city facilities, and is not included in capacity calculations.

2018 Cheney Water System Plan Update
City of Cheney

Table 3-1. City of Cheney Source of Supply Wells

Well No.	Year Drilled	Depth of Well (ft)	Depth of Pump (ft)	Diameter (inches)	Static Water Level (ft)	HP	Non-Irrg. Season Capacity[3] (gpm)	Irrg. Season Capacity[3] (gpm)
1	1946	559	480	14	304	125	600	375
2	1946	560	410	14	285	75	300	190
3R[1]	2019	747	438	20	292	250	1,450[4]	1,450[4]
4[2]	1993	2136		20	278	75	370	230
5	1979	2134	682	16	236	250	500	310
6	1994	710	480	8	215	125	550	340
7	1994	640	480	12	221	75	270	170
8	2008	430	300	20/16	169	125	400	250
						Total (Wells 1-8):	**4,440**	**3,315**
						Total (without Well 4):	**4,070**	**3,085**

1 Well 3R is a replacement well that was drilled in late 2018 and early 2019. The replacement pump house is still under construction in late 2019, but the well was utilized during the 2019 irrigation season in a temporary condition.

2 Well 4 is not connected to the drinking water system and is only used for irrigation due to water quality issues.

3 Irrigation (May to October) and non-irrigation (November to April) season pumping rates are based off design and historical pumping rates respectively.

4 Well 3R pumping rates are based off the pumping records for the 2019 irrigation season.

Storage

Total storage capacity: 4,420,000 gallons

The total available non-irrigation season source capacity at maximum design pumping rates for potable wells is approximately 4,070 GPM (including Well 3R) and the available potable source capacity during irrigation season is approximately 3,085 GPM (including Well 3R). (2018 WSP)

Delivery

The City also maintains an interlocal agreement with Eastern Washington University to share domestic water resources. They maintain an intertie at the intersection of North 11th and Cedar Streets in Cheney.

Boosters/Pressure relief valves –

The City has three booster stations: the first station was installed in 1970, the second in 1978, and the third in 1997. Booster Station 1 pumps water directly to the 200,000-gallon elevated Reservoir on Oakland Street and serves the High School Zone in the northern part of the City. One of the pumps in Booster Station 1 is offline due to mechanical issues and cannot provide flow. This Zone is connected via V bypass lines in three locations to the Main Zone. Booster Station 2 (also known as the Salnave Booster Station) boosts the water pressure directly into the Scenic Heights Zone. Booster Station 3 (also known as the Golden Hills Booster Station), constructed during the second phase of the Cheney Golden Hills subdivision, is connected to the High School Zone, providing additional capacity to this Zone. (2018 WSP)

Booster Stations 2 and 3 have standby generators and automatic transfer switches installed to provide emergency power. Booster Station 1 has the capability of being provided emergency power via a portable generator. (2018 WSP)

Transmission lines –

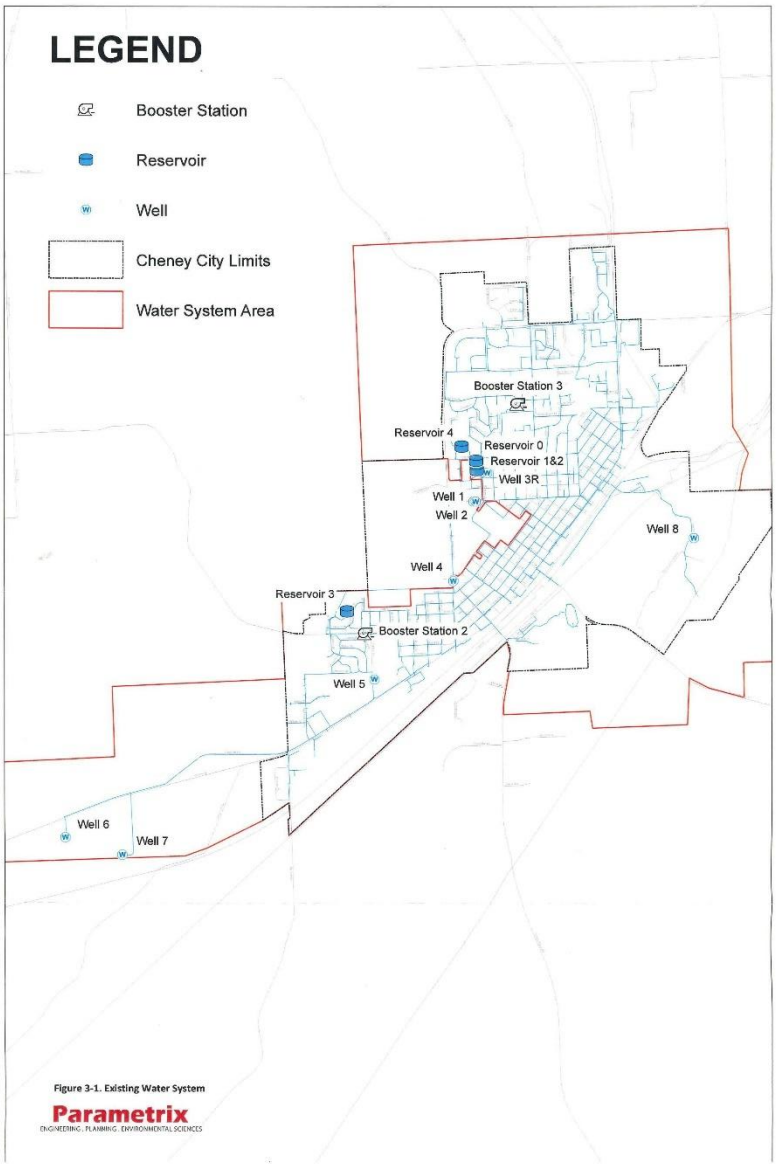
The city of Cheney's water system includes 46.3 miles of water line, ranging in size from 16" diameter for its major transmission lines to 4" for PFC lines serving smaller residential areas.

2018 Cheney Water System Plan Update
City of Cheney

Table 3-3. City of Cheney Summary of Distribution Mains

Size (Inches)	Length (Feet)	Material	Length (Feet)
4	13,240	PVC	156,668
6	75,703	Cast	11,906
8	70,646	Steel	69,001
12	75,840	KAL	6,592
16	8,738	–	
Total:	**244,167**		**244,167**

Schematic



Connections

Within the Retail Service Area there are approximately 2,300 service connections. Of those, there are approximately 1,700 single-family residential, 400 multi-family residential connections, and 200 commercial connections. (2019 WSP)

A list of capital deficiencies

Capital Improvement Program projects were selected based on their ability to remedy fire flow deficiencies, address undersized water distribution pipelines and booster station upgrades. From the results in the hydraulic model, all nodes that are not able to meet the 30 psi under PHD requirement are either immediately next to the storage reservoirs in the area just north of Eastern Washington University, along Washington Street near areas serviced by the Eastern Washington University Water System, and at the joint between the Main Zone and the Scenic Heights Zone at the intersection of Salnave Road and Holladay Drive. These nodes do not service the system directly or there are no cost-effective measures to eliminate the lower pressures in these areas; thus, the CIP Projects do not address these system deficiencies. (2018 WSP)

A list of projects (capital projects) to cure them

- Costs
- Timing

System improvements for the noted deficiencies were prioritized based on a hierarchy intended to protect public safety first and then address other noted deficiencies such as source capacity, storage capacity, and distribution system issues. This hierarchy is presented below as well as the anticipated planning period completion time frame. (2018 WSP)

CIP project descriptions from Chapter 8 of the city's 2018 Water System Plan are listed as:

Production

- Source Capacity Deficiencies (planning period 2018-2038)

- P-1: Well 3 Replacement (Completion in 2019). This project deals with increasing the City's available source capacity by replacing Well 3 and constructing a new pumphouse. This project is currently under construction as of November 2019.

Booster pumping

- B-1: Booster Station 1 (High School Zone) Upgrades (Estimated Completion in 2023). This project deals with replacing or repairing the existing pumps within Booster Station 1 that have either failed or no longer meet system demands

Storage

- Storage Capacity Deficiencies (planning period 2028-2038)

- S-1: New Reservoir 5 (Main Zone) (estimated 2028-2038). This project would install a new storage reservoir (size to be determined) in the Main Zone likely near the Cheney Industrial Park.

- S-2: Replacement Reservoir Zero (High School Zone) (estimated 2028-2038). This project would replace reservoir 0 (which is currently off-line) with a standpipe tank (size to be determined) to serve the High School Zone.

Distribution

- Distribution System Upgrades and Development (planning period 2018-2028)

- Fire Flow Deficiencies (planning period 2018-2028)

Note: Annual Water Meter Replacement is included in the City's Operations and Maintenance budget.

- D-l: Water Main Replacement (Concurrent work as needed). This project deals with replacing water mains that have less impact on available fire flow but are still undersized and/or are made from a less desirable or more fragile material than the City's standard pipe material, PVC. These pipes would be replaced based the City's criteria presented at the end of this list and will be funded through the City's depreciation fund.

- D-10 through 14: Main Zone Water Line Upgrades (Completion in 10-year time frame). These projects address system deficiencies within the Main Pressure Zone.
    - D-10: Replace Kalamine Pipe in N. 3rd St. from Elm St. to Oakland St. This project will replace an undersized pipe in N. 3rd St. with a new 8-inch PVC main. This addresses fire flow concerns in the area.
    - D-ll: Replace Kalamine Pipe in N. 4th St. from Elm St. to Oakland St. This project will replace an undersized pipe in N. 4th St. with a new 8-inch PVC main. This addresses fire flow concerns in the area.
    - D-12: Replace Kalamine Pipe in N. 5th St. from Elm St. to Oakland St. This project will replace an undersized pipe in N. 5th St. with a new 8-inch PVC main. This addresses fire flow concerns in the area.
    - D-13: Replace Kalamine Pipe in 4th St. from G St. to College Ave. This project will replace an undersized pipe in 4th St. with a new 8-inch PVC main. This addresses fire flow concerns in the area.

    - D-14: Replace Pipe in Front St. This project replaces the existing 2-inch galvanized steel main in Front St. and adds hydrants where there are none existing to address fire flow concerns. It is unlikely that this project will be completed in the 10-year planning period due to the prohibitive cost.

    - D-15: Loop Waterline from Alki St. to F St. This developer funded project wilt loop a long dead-end line in the southwest section of the city as new apartment complex is constructed. This will address any flushing and or fire flow concerns from the city.

- D-20: High School Zone Water Line Upgrades (Completion in 10-year time frame). This project addresses water distribution system deficiencies within the High School Pressure Zone.
    - D-20: Connect Reservoir 4 to Irene Pl./ Hillside Dr., and Summit Dr. This project adds a12-inch main from Reservoir 4 to Hillside Dr. and two pipes coming from Irene Pl. and Summit Dr. to address fire flows within the area described above and to the north.

Table 8-2. City of Cheney Capital Improvement Program – Budget and Schedule
2018 – 2028

Project Code	Project Description	Level of Service[1]	Estimated Project Cost (2017 dollars)	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029-2038
	Production														
P-1	Well 3 Re-Drilling (Planning, Design, Construction) (State Grant Funded) [2]	I	$727,500	$661,827	$65,673										
P-1	Well 3 Pump House (Planning, Design, Construction) (Debt Service 2020) [2]	I	$1,005,700			$121,500	$121,500	$121,500	$121,500	$121,500	$121,500	$121,500	$121,500	$121,500	$121,500 (per year until 2030
	Distribution Boosting														
	BPS No. 3 (High School Zone) Upgrade	I	$122,981	$122,981											
B-1	BPS No. 1 (High School Zone) Upgrade	I	$60,000						$60,000						
	Distribution Piping														
	System-Wide														
D-1	Water Main Replacement (20-year planning period)	II													$150,000/year
	Main Zone														
D-10	Replace Kalamine pipe in N. 3rd St. from Elm St. to Oakland St.	I	$474,573	$252,509	$220,933										
D-11	Replace Kalamine pipe in N. 4th St. from Elm St. to Oakland St.	I	$444,350				$222,175	$222,175							
D-12	Replace Kalamine pipe in N. 5th St. from Elm St. to Oakland St.	I	$446,834						$223,417	$223,417					
D-13	Replace Kalamine pipe in 4th St. from H St. to College St.	I	$330,226								$165,113	$165,113			
D-14	Replace Pipe in Front St.	I	$556,964										$278,482	$278,482	
D-15	Loop Water Line from Alki St. to F St. (Developer Funded)	I	$0			$0									
	High School Zone														
D-20	Connect Reservoir #4 to Irene PL, Hillside Dr., and Summit Dr.	I	$213,826											$213,826	
	System Management														
	SCADA System upgrade	II	$33,171	$33,171											
M-1	Water Conservation Program	II				$10,000	$15,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	Up to $20,000/year
M-2	Wells 1 and 2 – Back-up Generator	II	$60,000					$60,000							
M-3	Well 5 – Back-up Generator	II	$60,000						$60,000						
M-4	Water System Update (every 10 years)	II	$110,000										$110,000		
M-5	Utility Vehicle Replacement #306	II	$35,000				$35,000								
M-6	Utility Vehicle Replacement #307	II	$75,000					$75,000							
M-7	Emergency Reserve	II				$50,000	$50,000	$50,000	$50,000	$50,000	$40,000	$5,000	$5,000	$5,000	
	Total:		$4,758,125	$1,070,488	$286,606	$181,500	$443,675	$568,675	$534,917	$414,917	$346,613	$311,613	$534,982	$638,808	
	Total – LOS I:	I	$4,382,954	$1,037,317	$286,606	$121,500	$343,675	$343,675	$404,917	$344,917	$286,613	$286,613	$399,982	$613,808	
	Total – LOS II:	II	$373,171	$33,171	$0	$60,000	$100,000	$205,000	$130,000	$70,000	$60,000	$25,000	$135,000	$25,000	

Note: All cost estimates are project-level projections, including construction costs and other associated fees (e.g., engineering, permitting, and taxes). Project costs are based on year 2018 costs.

1 I = Deficiency (Project addresses a technical or regulatory deficiency or requirement.)
II = Preservation (Project preserves/upgrades existing facility or system component.)

2 Well 3 Replacement is partially funded via state grant funding. The drilling portion was mostly covered by the grant. Debt service from City funds will cover a portion of the pump and building, the remaining funding may come from an inter-department loan

Water rights deficiencies

- explanation of the area impacted and their thoughts about remedy

The Water System Plan suggests that under current growth and water use patterns the city's allocated water rights will remain sufficient to accommodate growth over the next 20 years from the plan's date of 2018.

Table 4-3. Water Right Self-Assessment Form for Water System Plan

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights: Qi= Instantaneous Flow Rate Allowed (GPM or CFS); Qa= Annual Volume Allowed (Acre-Feet/Year); This includes wholesale water sold				Current Source Production – Most Recent Calendar Year: Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS); Qa = Annual Volume Withdrawn (Acre-Feet/Year); This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP): This includes wholesale water sold				20-Year Forecasted Source Production (determined from WSP): This includes wholesale water sold			
		Primary Qi: Maximum Rate Allowed	Non-Additive Qi: Maximum Rate Allowed	Primary Qa: Maximum Volume Allowed	Non-Additive Qa: Maximum Volume Allowed	Total Qi: Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa: Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi: Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa: Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi: Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa: Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
1) 341-D	S01, S02, S03, S05, S08, S09 & S10	475		100													
2) 342-D	S01, S02, S03, S05, S08, S09 & S10	625		245													
3) 1418-A	S01, S02, S03, S05, S08, S09 & S10	900		550													
4) 3969-A	S01, S02, S03, S05, S08, S09 & S10	900		1,055*													
5) 5967-A	S01, S02, S03, S05, S08, S09 & S10	750		975													
6) G3-22439-C	S01, S02, S03, S05, S08, S09 & S10	500		804													
7) G3-25859-C	S01, S02, S03, S05, S08, S09 & S10	1,250		2,000													
	TOTALS =	5,400		5,729		1,921	3,479	1,870	3,859	2,584	2,816	2,241	3,488	2,952	2,448	2,560	3,169
Column Identifiers for Calculations:		A		B		C	=A-C	D	=B-D	E	= A-E	F	=B-F	G	=A-G	H	=B-H

ADDITIONAL COMMENTS:

* The annual volume allowed for groundwater certificate 3969-A was issued with a provision that "the total yearly withdrawal under all rights (previous to and including this one: i.e.; 341-D, 342-D & 1418-A) shall be limited to 1,950 acre-feet per year".
From DOH Publication No. 331-372 (1/13/2017)

Consolidated I.D. #19 System 1 (South System) and System 2 (North System)

Source

The North System has a total source capacity of 45,675 gpm (65.77 MGD); the largest source in the North System (Well 11A) has a capacity of 3,330 gpm. With the largest source out of service the North System has a total source capacity of 42,345 gpm (60.68 MOD). This exceeds the projected 20-year MDD for the North System. addition, source capacity in the North System exceeds projected 20-year PHD eliminating the need for equalizing storage in the 20-year time frame. (WSP 2016)

The South System has a total source capacity of 29,000 gpm (41.76 MOD); the largest source in the South System (Well 4A) has a capacity of 3,270 gpm. With the largest source out of service the South System has a total source capacity of 25,730 gpm (37.05 MGD). This exceeds the projected 20-year MDD for the South System. The Carder and Greenacres pressure zones have sufficient source capacity to meet projected 20-year PHD which eliminates the need for equalizing storage in those zones during the 20-year horizon. However, the Corbin pressure zone cannot meet projected 20-year PHD with existing source capacity; Corbin will either require additional source capacity or equalizing storage to meet projected PHD in the 20-year horizon. (WSP 2016)

Table 1-2 Summary of Groundwater Sources (wells)

System	Pressure Zone	Well Field	Well Name	Depth (ft)	Pump Setting Depth (ft)	Current Pumping Rate (gpm) (1)	Motor (HP)	Equipped with VFD	Automatic Backup Power	Location
South System	Carder	1	A	150	90	1,180	100	yes	yes	Mission & Evergreen SW¼, SW¼, S11 T25N R44E
			B	176	90	2,280	200	yes	yes	
			C	153	100	1,280	100	no	no	
	Corbin	2	A	230	120	1,525	150	yes	yes	Bow & Greenacres SE¼, SE¼, S18 T25N R45E
			B	230	120	3,035	300	no	no	
			C	197	120	2,255	250	yes	yes	
		3	A	232	120	2,325	250	no	no	Sprague & Hodges SE¼, SW¼, S17 T25N R45E
			B	216	120	1,525	150	yes		
			C	216	120	3,040	300	no		
	Greenacres	4	A	221	110	3,270	250	yes	yes	Mission ¼ mile east of Barker NW¼, NW¼, S17 T25N R45E
			B	217	110	2,050	150	yes	yes	
			C	217	110	2,050	150	yes	yes	
			D	231	110	3,185	250	no	no	
North System	West Farms	5	A	171	100	2,690	250	no	no	Euclid & Barker NE¼, NE¼, S7 T25N R45E
			B	171	100	1,510	125	no		
			C	172	100	1,520	125	yes		
	Otis Orchards	6	A	228	120	3,020	300	no	no	Wellesley & Kenney NE¼, NW¼, S4 T25N R45E
			B	198	120	1,700	150	yes		
			C	197	120	1,575	150	no		
		8	A	222	130	3,105	300	no	no	Lynden Rd. 1/3 mile south of Wellesley SE¼, NW¼, S3 T25N R45E
			B	222	125	1,670	150	yes		
			C	203	125	1,800	150	no		
		9	A	272	140	1,825	150	no	no	Garland & Simpson SW¼, NE¼, S2 T25N R45E
			B	244	140	1,825	150	yes		
			C	244	140	3,325	300	no		
	East Farms	7	A	202	140	1,715	150	yes	yes	Approximately N. 5500 Lynden Rd NE¼, SW¼, S34 T26N R45E
			B	240	140	3,130	300	yes	yes	
			C	214	140	1,710	150	no	no	
		10	A	235	150	1,620	150	no	no	Joseph & Malvern SE¼ ,NW¼, S35 T26N R45E
			B	226	150	1,620	150	yes		
			C	252	150	3,265	300	no		
		11	A	252	150	3,330	300	yes	yes	Rowan & Idaho NW¼, SE¼, S31 T26N R46E
			B	225	150	1,850	150	yes	yes	
			C	225	150	1,870	150	no	no	

(1) *Current approximate pumping rate reported by CID.*

Source: (WSP 2016)

In addition, the District has interties with neighboring systems (see Table 1-1) that provide a secondary level of redundancy should calamity befall CID supply facilities. The District has a total of six interties with neighboring water systems; two with Vera Water & Power, one with Modern Electric Water Company, one with Trentwood Irrigation District, one with Spokane Industrial Park, and one with Liberty Lake Sewer & Water. (WSP 2016)

The District has interties with several neighboring water systems. Ail District interties are for emergency use only. The table following contains intertie details. (WSP 2016)

Table 1-1 Interties with Neighboring Systems

Svstem	Location	Size	Valve Type	Purpose	Metered?
Vera Water & Power	Nora Ave & Mamer Rd	6'	Manually Operated	Emergency Only	No
Vera Water & Power	Mission Ave & Adams Rd	6'			
Modern Electric Water Co.	Mission Ave & Pines Rd	6'			
Trentwood Irrigation Dist.	Broad Ave & Boulder Rd	6'			
Spokane Industrial Park	Dalton Ave & Flora	6'			
LibertyLake Sewer & Water	Country Vista Dr & 1-90	12'			
Pioneer Water Company	Trent Ave. & Long Rd. (St. Joes Cemeterv entr.)	2·			

Storage

Total storage capacity: 2,200,000 gallons (System 1 / South System)
Total storage capacity: 2,750,000 gallons (System 2 / North System)

Table 1-3 Summary of Reservoirs

System	Pressure Zone	Reservoir Name	Volume (gal)	Overflow Elevation	Height (ft)	Type of Reservoir	Year Built	Date of Last Coating	
								Exterior	Interior
South System	Carder	1	50,000	2188.5	202	Elevated steel	1966	2009	1996
	Corbin	2	50,000	2245.5	210	Elevated steel	1966	2007	1997
	Corbin	3	50,000	2245.5	206	Elevated steel	1966	2006	2001
		Barker	2,000,000	2245.0	40	Ground level steel	1979	2012-top	1994
	Greenacres	4	50,000	2179.5	148	Elevated steel	1966	2007	1996
North System	West Farms	5	50,000	2198.5	181	Elevated steel	1966	2006	1996
	Otis Orchards	6	50,000	2223.5	169	Elevated steel	1966	2008	1997
		8	50,000	2223.5	176	Elevated steel	1966	2011	2001
		9	50,000	2223.5	161	Elevated steel	1966	2008	1999
	East Farms	7	50,000	2236.5	173	Elevated steel	1966	2010	1997
		10	50,000	2236.5	158	Elevated steel	1966	2005	1999
		11	50,000	2236.5	150	Elevated steel	1966	2005	2001
		Campbell	2,000,000	2239.0	40	Ground level steel	1979	2012-top	1995
	Granite	Granite	105,000	2460.0	20	Concrete	1994	N/A	N/A
	Chinook	Chinook	300,000	2250.0	30	Concrete	1995	N/A	N/A

Delivery

The District service area spans approximately 10 miles east to west and hundreds of vertical feet which necessitates multiple pressure zones. CID has a total of eight pressure zones; three zones are south of the Spokane River and five are north of the river. Both the north and south systems make extensive use of PRVs and altitude valves to intertie the pressure zones and increase overall system redundancy and reliability. (WSP 2016)

Boosters/Pressure relief valves –

Table 1-5 Summary of Booster Stations

Name	Pressure Zone		Pumps	Capacity (gpm)
	Upstream	Downstream		
Flora Booster	West Farms	Chinook	15 HP	600
			15 HP	600
			Combined (2)	950
Granite Booster	East Farms	Granite	25 HP	200
			40 HP	375
			Combined (2)	500
Campbell Booster	East Farms	Campbell (1)	10 HP	1,100

(1) *The Campbell booster operates in the summer months to prevent dead storage in the Campbell reservoir*
(2) *This row indicates the combined capacity of the pumps when operated in parallel.*

The District operates three booster stations all of which are in the North System. (WSP 2016)

Transmission lines –

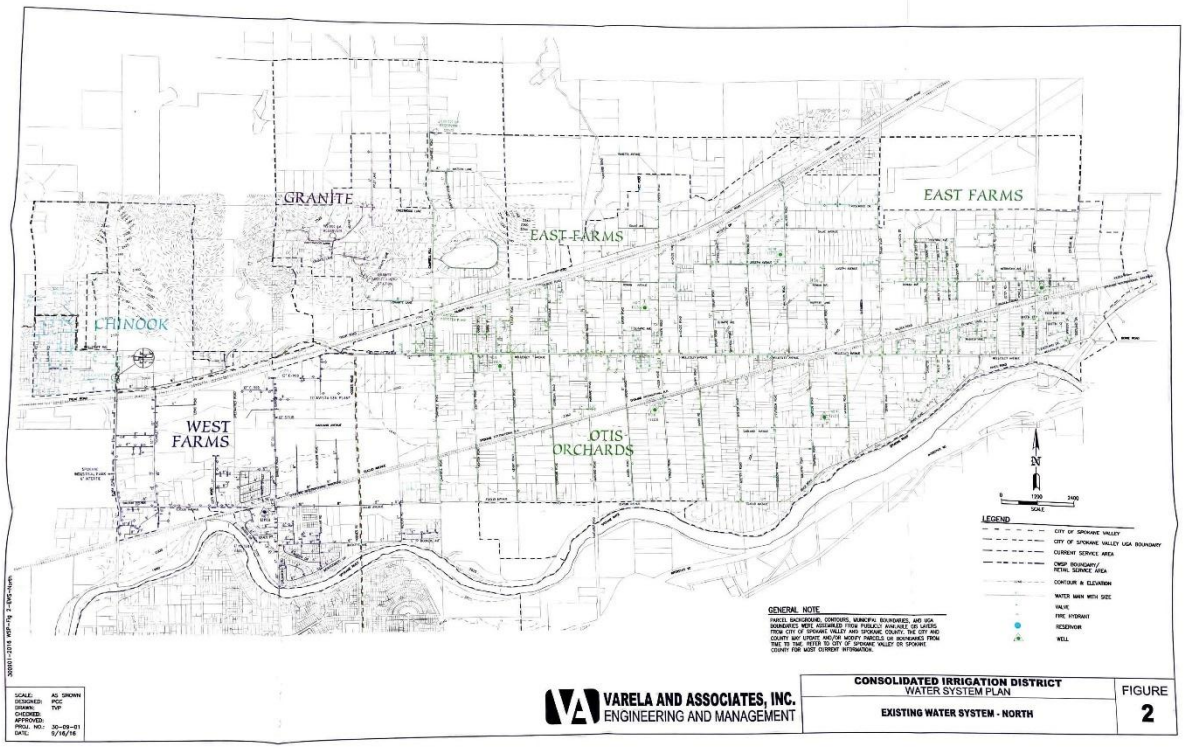
Table 1-4 Summary of Distribution System

	Length of Water Main of Diameter Shown (LF) (1)									
	4"	6"	8"	10"	12"	14"	16"	18"	21"	24"
North System	1,100	218,650	97,200	45,365	32,878	14,550	20,950	900	600	2,000
South System	900	196,050	176,022	28,280	71,621	2,200	20,263	8,302	3,900	1,350
Total	2,000	414,700	273,222	73,645	104,499	16,750	41,213	9,202	4,500	3,350

(1) *Lengths based on past information and updated piping provided by the District.*

The District has approximately 943,000 LF (179 miles) of water main. The majority of the District's mains (approximately 70%) are asbestos cement (AC) material that were installed prior to 1970. AC mains typically have a long service life provided they were installed with proper bedding and are not disturbed. Approximately 30% of the mains are PVC and DI material installed from the 1960s to the present. (WSP 2016)

Schematic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CHINOOK
WEST FARMS
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SCALE
LEGEND
CITY OF SPOKANE VALLEY
CITY OF SPOKANE VALLEY UGA BOUNDARY
CURRENT SERVICE AREA
CWSP BOUNDARY/ RETAIL SERVICE AREA
CONTOUR & ELEVATION
WATER MAIN WITH SIZE
VALVE
FIRE HYDRANT
RESERVOIR
WELL
GENERAL NOTE
PARCEL BACKGROUND, CONTOURS, MUNICIPAL BOUNDARIES, AND UGA BOUNDARIES WERE ASSEMBLED FROM PUBLICLY AVAILABLE GIS LAYERS FROM CITY OF SPOKANE VALLEY AND SPOKANE COUNTY. THE CITY AND COUNTY MAY UPDATE AND/OR MODIFY PARCELS OR BOUNDARIES FROM TIME TO TIME. REFER TO CITY OF SPOKANE VALLEY OR SPOKANE COUNTY FOR MOST CURRENT INFORMATION.
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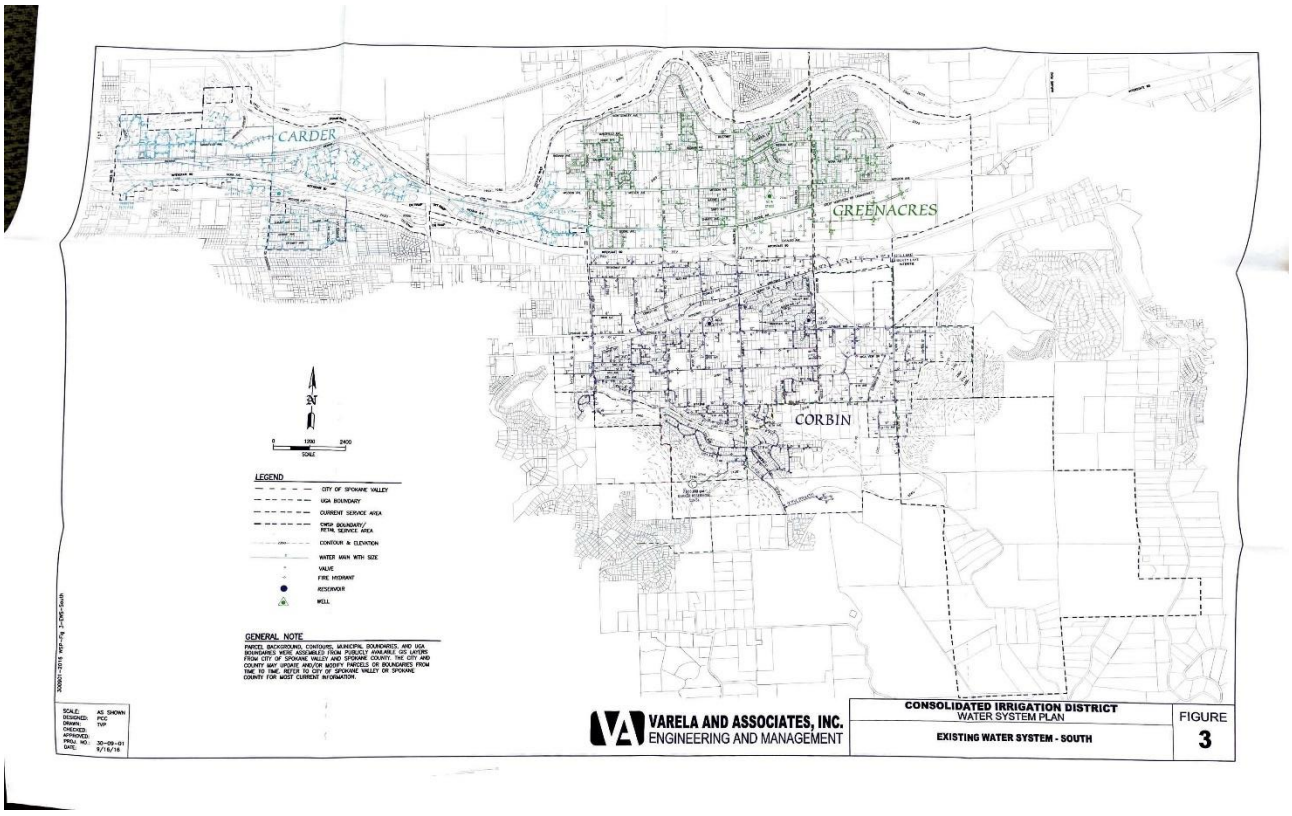
APPROVED:
PROJ. NO.: 30-09-01
DATE: 9/16/16
VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
CONSOLIDATED IRRIGATION DISTRICT
WATER SYSTEM PLAN
EXISTING WATER SYSTEM - NORTH
FIGURE
2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CURRENT SERVICE AREA
CWSP BOUNDARY/ RETAIL SERVICE AREA
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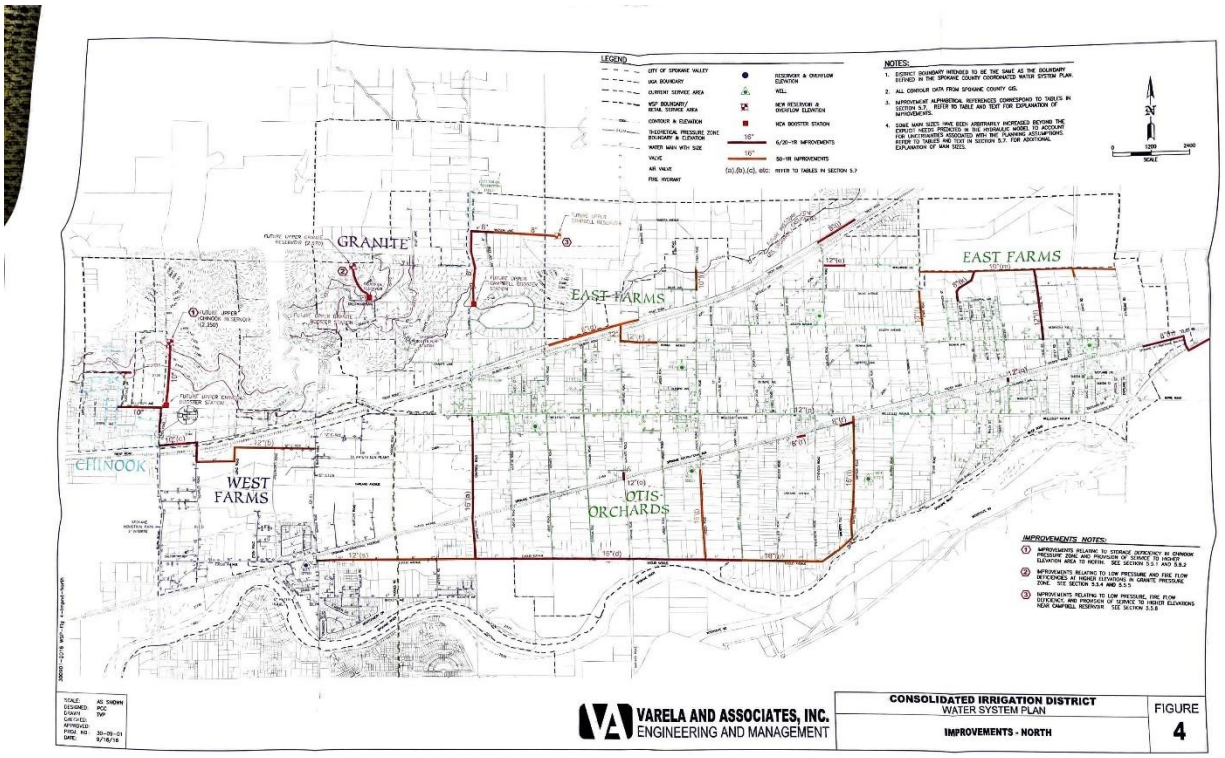
VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
CONSOLIDATED IRRIGATION DISTRICT
WATER SYSTEM PLAN
EXISTING WATER SYSTEM - SOUTH
FIGURE
3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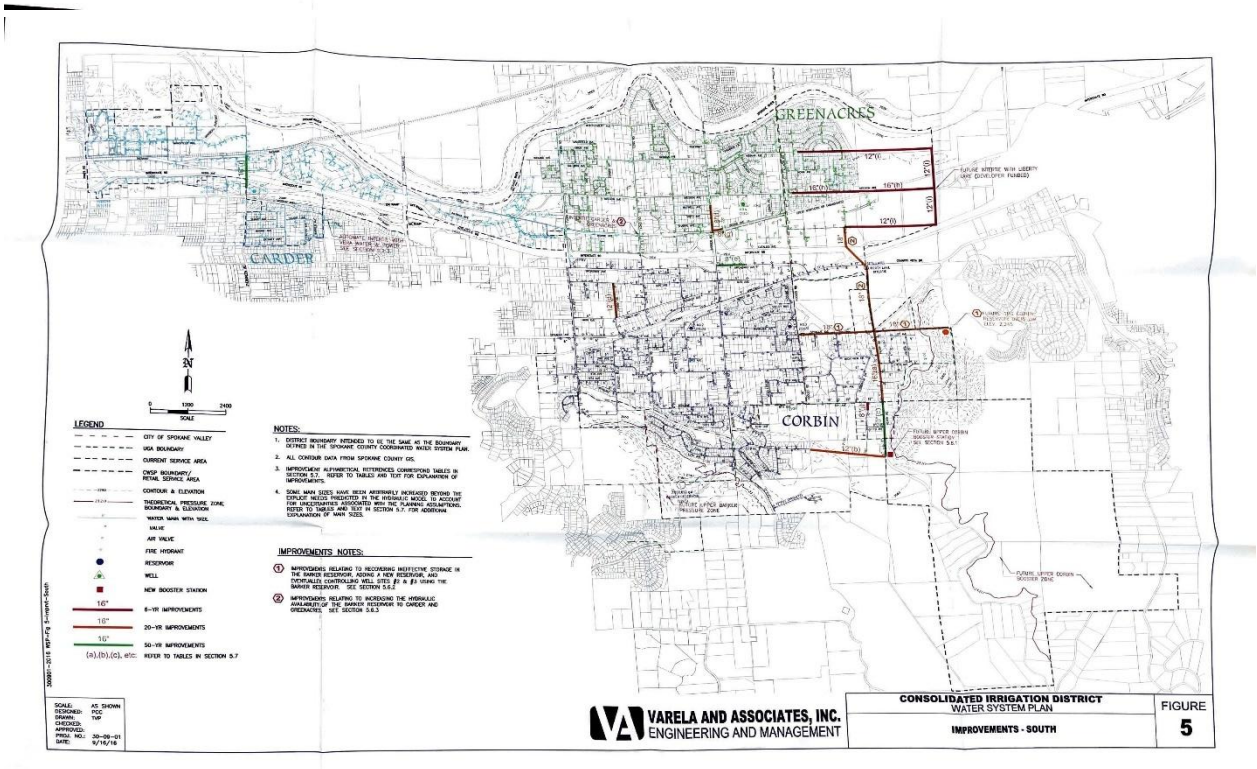
EAST FARMS
CHINOOK
WEST FARMS
OTIS ORCHARDS
IMPROVEMENTS NOTES:
VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
CONSOLIDATED IRRIGATION DISTRICT
WATER SYSTEM PLAN
IMPROVEMENTS - NORTH
FIGURE
4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IMPROVEMENTS NOTES:
VARELA AND ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
CONSOLIDATED IRRIGATION DISTRICT
WATER SYSTEM PLAN
IMPROVEMENTS - SOUTH
FIGURE
5

Connections

The District's 2015 WFI forms indicate the north and south systems have 3,438 and 6,314 existing service connections respectively; this includes all customer classes. (WSP 2016)

The District believes ERU ADD in both the North and South Systems will continue to decrease as large parcels become developed. (WSP 2016)

Table 2-1 Summary of System Connections and Dwelling Units (as of Spring 2015)

Type of Connection	Connections (meters)			Dwellina Units (DU)		
	North	South	Total	North	South	Total
Single Family Residential [1][2]	3,116	4,500	7,616	3,177	4,622	7,799
Mobile Homes	9	12	21	281	302	583
Multi-family Residential (Apts.)	0	80	80	0	1,468	1,468
Commercial	70	220	290	0	0	0
Commercial Irrigation	11	72	83	0	0	0
Total	3,206	4,884	8,090	3,458	6,392	9,850

[1] *The District seNes some customers on parcels with two residences owned by a single customer through a single meter; hence the number of single family residential connections does not match the number of single family dwelling units. Connections seNing more than one residence are designated D2 accounts.*

[2] *Some residential customers have separate irrigation connections.*

Source: WSP 2016

A list of capital deficiencies

The tables following summarize the deficiencies identified in Section 4.

• The severity of system deficiencies increases as system demands grow (i.e. time passes, the system grows, demands increase, and system deficiencies become more pronounced).

• Some items such as distribution system looping are not directly addressed by District criteria and do not adversely affect public health/welfare; therefore, these items will most likely be addressed in the 20-year planning period (as opposed to the 6-year planning period).

• Areas where District criteria exceed State criteria (e.g. an area which has or will have pressures of 30-40 psi does not meet District criteria, but satisfies the State minimum) may not be a high priority for the District to immediately address and will most likely be address in the 20-year planning period. (WSP 2016)

Table 4-20 Summary of North System Deficiencies

Area of Deficiency	Description of Deficiency
Supply	– None anticipated
Water Rights	– None anticipated
Booster Stations	– Insufficient fire suppression storage in Chinook booster zone (400,000 gal) – Insufficient fire flow at Skyview Elementary (Chinook booster zone) – Low pressure and fire flows for services above elevation 2,350 in Granite booster zone.
Storage	– No storage volume shortage anticipated (based on alternate design concept analysis)
Distribution System (1)	Low Pressure Areas (see **Table 4-15** for detailed description of deficiency) – Vicinity of Flora Rd and Tschirley Rd North of Euclid Ave and South of Trent Ave – Area south of Euclid Ave, east of Meyers and west of Barker Rd – Campbell Rd. north of Happy Trails Loop (above elev 2,110) – Campbell Rd between Wellesley Ave & Euclid Ave – Euclid Ave from Campbell Rd to Corrigan Rd – Starr Rd north of Dalke Ave and Rosewood Ave west of Starr Rd – Vicinity of Gilbert Ave & Harvard Rd – Lynden RD north of Trent Ave
	Fire Flow Not Meeting District Criteria (see **Table 4-16** for detailed description of deficiency) – Vicinity of Flora Rd and Tschirley Rd North of Euclid Ave and South of Trent Ave – Grace Ln and Buckeye Ave east of Meyers Rd and west of Barker Rd – Campbell Rd north of Happy Trails Loop (above elev 2,110) – Campbell Rd between Wellesley Ave & Euclid Ave – Euclid Ave from Campbell Rd to Garry Rd – North of Trent Rd east of Malvern Rd – Starr Rd north of Dalke Ave and Rosewood Ave west of Starr Rd – Cul de sac at north end of Blue Skies St – Chase Rd north of Rowan Ave (Mountain View Middle School) – North end of Stateline Rd – East end of Seltice Way
	Mains for Better Looping – RR crossing on either Harvard or Corrigan between Wellesley and Euclid – Tie mains on opposite sides of Wellesley together at Ormond – RR crossing in vicinity of Vincent Rd. – Connect mains along south side of railroad grade between Molter Rd, Stevenson Rd, and Simpson Rd.

(1) *Based on 2009 WSP hydraulic analysis results. Refer to* ***Section 4.7.1****.*

Table 4-21 Summary of South System Deficiencies

Area of Deficiency	Description of Deficiency
Supply	– Reliability – the District would like to increase supply redundancy in Carder by upgrading the intertie with Vera Water & Power near intersection of Mission Ave and Adams Rd
Water Rights	– None Anticipated
Booster Stations	– Booster zone needed to serve southeast portion of District service area – Transmission improvements will be needed to serve the future booster zone
Storage	– No storage volume shortage anticipated (based on alternate design concept analysis) – Approximately 550,000 gallons of ineffective storage in Barker reservoir – Hydraulic availability of storage to Carder and Greenacres
Distribution System	Low Pressure Areas (see **Table 4-17** for detailed description of deficiency) – Area between Cataldo Ave and Mission Ave from Evergreen Rd to Adams Rd – Area between Steen Rd and Tschirley Rd south of 6th Ave – Area east of Hodges Rd and south of Sprague Ave – East end of Mission Ave
	Fire Flow Not Meeting District Criteria (see **Table 4-18** for detailed description of deficiency) – Commercial area of west end of Indiana near Pines Rd – Greenacres Middle School: Cowley Ave and Corbin Rd – Commercial area on Broadway Ave between Barker Rd and Hodges Rd – Barker Rd between Mission Ave and Boone Ave – West end of Boone Ave between Barker Rd and Hodges Rd near Barker Rd – Future Commercial Area south of Mission Ave and east of Hodges Rd
	Long Dead End Mains – Glenbrook between 8th & 11th Ave – Main parallel to and south of Mission Ave east of Hodges Rd – 11th Ave. east of Barker Rd

Chinook Pressure Zone Storage

The Chinook pressure zone has insufficient fire storage to supply a 3,125 gpm 4-hour fire at Skyview Elementary School. The analysis indicates the pressure zone needs approximately 600,000 gallons of additional storage to meet District criteria. (WSP 2016)

The existing Chinook reservoir has an overflow elevation of 2,250. Assuming a minimum static pressure of approximately 50 psi with a full reservoir, the existing Chinook zone cannot provide service above elevation 2,135. Assuming the District does not wish to exceed a maximum pressure of 95 psl at the lowest service in the new pressure zone, the new reservoir should have a maximum HGL of 2,350. (WSP 2016)

Table 5-1 Estimated Cost of New Upper Chinook Pressure Zone Facilities

Item Description	Estimated Cost
Booster Station	
Site grading and access road	$14,000
Building (assume 15' x 15' stick frame)	36,000
Site and building piping (PRV & limit switch, required fittings)	48,000
Pumps, electrical, and controls	42,000
Property acquisition	24,000
Booster Station Subtotal	164,000
Reservoir	
Ground level steel 700,000 gal reservoir (1)	840,000
Telemetry system tied into District SCADA	24,000
Site piping	36,000
Property acquisition	36,000
Gravel access road (2)	18,000
Reservoir Subtotal	954,000
Transmission Improvements	
1,000 LF of 10" transmission main (3)	108,000
Subtotal (rounded to nearest $10,000)	1,230,000
Taxes (8.7%)	107,000
Engineering – design, inspection, construction admin (20%)	246,000
Contingencies (20%)	246,000
Total (rounded to nearest $10,000)	$1,830,000

(1) *Includes site work, excavation, foundation, and fencing.*
(2) *Assumes 1,000 LF, with 6" crushed rock, 12 ft wide, and $15/SY.*
(3) *Assumes $108/LF with asphalt replacement.*

Granite Pressure Zone Higher Elevation Area Service Plan

The existing Granite pressure zone HGL cannot meet District pressure and fire flow criteria for customers above elevation 2,350. DOH approved this pressure zone when initially constructed and the District feels no compulsion to modify the existing facilities unless growth pressures require expansion of the zone for new customers. This Section outlines the improvements necessary to meet District criteria and serve projected growth in the pressure zone. (WSP 2016)

Implementation of the upper Granite pressure zone discussed in the preceding Section will not fully address fire flow deficiencies in the Granite zone. The District will eventually need to replace most of the 6" mains with 8" in order to meet the 1,000 gpm residential fire flow rate criteria. This combined with the future reservoir for the Granite upper pressure zone described in preceding Sections will allow the District to meet the 1,000 gpm 1 hour residential fire flow criteria. Replacement of approximately 7,000 LF with 8" will cost approximately $700,000 (assume $99/LF with asphalt replacement) for construction and $280,000 (40%) for taxes, engineering, contingencies, estimated total cost is approximately $980,000.

Table 5-2 Estimated Cost of New Upper Granite Pressure Zone Facilities

Item Description	Estimated Cost
Booster Station	
Site grading and access road	$12,000
Building (assume 15' x 15' stick frame)	36,000
Site and building piping (PRV & limit switch, required fittings)	36,000
Pumps, electrical, and controls	30,000
Property acquisition	24,000
Booster Station Subtotal	138,000
Reservoir	
Ground level steel 80,000 gal reservoir (1)	144,000
Telemetry system tied into District SCADA	24,000
Site piping	24,000
Property acquisition	24,000
Gravel access road (2)	18,000
Reservoir Subtotal	234,000
Transmission Improvements	
≈ 3,000 LF of 8" main to reservoir and main replacements (3)	300,000
Subtotal	670,000
Taxes (8.7%)	58,000
Engineering – design, inspection, construction admin (20%)	134,000
Contingencies (20%)	134,000
Total (rounded to nearest $10,000)	$1,000,000

(1) *Includes site work, excavation, foundation, and fencing.*
(2) *Assumes 1,000 LF, with 6" crushed rock, 12 ft wide, and $15/SY.*
(3) *Assumes $99/LF with asphalt replacement.*

Campbell Higher Elevation Area Sen/ice Plan

The existing Campbell pressure zone HGL cannot meet District pressure and fire flow criteria for customers connected above elevation 2,120.

Table 5-3 Estimated Cost of New Upper Campbell Pressure Zone Facilities

Item Description	Estimated Cost
Booster Station	
Site grading and access road	$12,000
Building (assume 15' x 15' stick frame)	36,000
Site and building piping (PRV & limit switch, required fittings)	36,000
Pumps, electrical, and controls	36,000
Property acquisition	24,000
Booster Station Subtotal	144,000
Reservoir	
Ground level steel 100,000 gal reservoir (1)	168,000
Telemetry system tied into District SCADA	24,000
Site piping	24,000
Property acquisition	24,000
Gravel access road (2)	18,000
Reservoir Subtotal	258,000
Transmission Improvements	
≈ 7,000 LF of 8" transmission & distribution main (3)	625,000
Subtotal	1,030,000
Taxes (8.7%)	90,000
Engineering – design, inspection, construction admin (20%)	206,000
Contingencies (20%)	206,000
Total (rounded to nearest $10,000)	$1,530,000

(1) *Includes site work, excavation, foundation, and fencing.*
(2) *Assumes 1,000 LF, with 6" crushed rock, 12 ft wide, and $15/SY.*
(3) *Assumes 3,500 LF at $79/LF with no asphalt replacement and 3,500 LF at $99/LF with asphalt replacement.*

Additional Interties

CID expects substantial growth in the eastern portion of Greenacres. Constructing a new intertie between Corbin and Greenacres near the intersection of 1-90 and Henry Rd would provide Greenacres increased access to Corbin storage and allow the District flexibility on serving some of the expected development from the Corbin pressure zone. The District could also automate the existing physical connection between Greenacres and Carder near the intersection of Boone Ave and Long Rd to provide increased reliability and redundancy for Greenacres and Carder.

Table 5-8 Alternative 2 Cost Estimate – Additional Interties

Item Description	Estimated Cost
Construct 18" I-90 crossing ≈ 200 LF directional drilling @ $200/LF (2)	$48,000
Construct ≈ 2,800 LF of 18" main on Henry from Sprague to I-90 (1) (3)	375,000
Construct ≈ 800 LF of 18" main on Henry from I-90 to Greenacres tie in (1) (2)	110,000
PRV station for intertie between Corbin & Greenacres	24,000
PRV station for intertie between Greenacres & Carder	24,000
Subtotal	$581,000
Taxes (8.7%)	51,000
Engineering – design, inspection, construction admin (20%)	116,000
Contingencies (15%)	87,000
Total (rounded to nearest $10,000)	$840,000

(1) *Assume $134/LF with no asphalt replacement necessary.*
(2) *The hydraulic model indicates that a 16" main would meet District criteria, but as a conservative measure for future flexibility the District wants to plan for an 18" main.*
(3) *The hydraulic model indicates that a 14" main would meet District criteria, but as a conservative measure for future flexibility the District wants to plan for an 18" main.*

A list of projects (capital projects) to cure them

Supply

The supply capacity analysis reveals that if growth occurs at the projected rate and in the projected locations, Corbin will have adequate supply capacity to meet 20-year MDD, but will no longer have sufficient supply capacity to meet 20-year PHD. The storage analysis (alternate design concept) indicates the Barker reservoir has surplus volume that can serve as equalizing storage if/when it becomes necessary. Hence, it appears the South System does not require additional supply capacity to meet projected needs. However, the District may consider adding capacity to existing wells when replacing pumps that wear out; the District has surplus water rights (Qi) that would make this possible. The District plans to evaluate pump replacement capacity on a case by case basis in light of most recent demand figures when replacements occur. The District chooses to set aside $125,000 for the cost of pump replacement. (WSP 2016)

Supply Reliability - Backup Power & Interties

The District may plan to install backup power at additional well sites to increase supply reliability throughout the system. The generators at Well Sites #4 and #11 cost approximately $200,000 each (includes generator, automatic transfer switch, weather/sound attenuation, miscellaneous site work, electrical engineering, electrical modifications, and installation). Adjusting for inflation and the potential for larger generators to be used, the District estimates each future generator setup will cost approximately $300,000. (WSP 2016)

The District desires additional supply redundancy in Carder. To this end, CID plans to upgrade the existing intertie with Vera Water & Power near the intersection of Mission Ave and Adams Rd. The upgrade will consist of replacing the existing manually operated valve with a two-way automatic valve. CID estimates the valve upgrade will cost approximately $25,000. (WSP 2016)

Table 6-1 Capital Improvements Plan

System	Category	Project	6-yr [1]	20-yr	Beyond 20-yr
North System	Booster Zones	Establish Upper Chinook pressure zone (booster station, reservoir, transmission main, etc.)		$1,830,000	
		Chinook distribution system upgrades near Skyview Elementary School		$360,000	
		Establish Upper Granite pressure zone (booster station, reservoir, transmission main, etc)		$1,000,000	
		Granite distribution system upgrades for residential fire flow		$980,000	
		Establish Upper Campbell pressure zone (booster station, reservoir, transmission main, etc)		$1,530,000	
	Distribution System	(a) Replace Campbell Rd from Euclid Ave to Wellesley Ave with 16"		$1,040,000	
		(b) Construct 12" loop parallel to south side of Trent Ave from Barker Rd to Tschirley Rd		$510,000	
		(c) Replace north side of Trent Ave from Tschirley Rd to Flora Rd with 10"			$280,000
		(d) Replace Euclid Ave from Campbell Rd to Garry Rd with 16"		$1,810,000	
		(e) Extend dead end main in Rosewood Ave to Malvern Rd with 8"	$80,000		
		(f) Replace Starr Rd from Joseph Ave to Dalke Ave with 10"			$190,000
		(g) Construct 12" crossing of Trent Ave at Harvard Rd and connect 8" mains east and west			$410,000
		(h) Replace Rowan Ave from Arden Rd to Harvard Rd with 12"			$200,000
		(i) Replace Lynden Rd north of Trent Ave with 10"			$180,000
		(j) Replace north side of Trent Ave east of Malvern Rd with 8"	$170,000		
		(k) Replace main in cul de sac at north end of Blue Skies St with 8"	$140,000		
		(l) Replace Chase Rd from Rowan to north end with 12"	$400,000		
		(m) Construct 10" main in Francis Ave from Stateline Rd to Starr Rd			$860,000
		(n) Replace 6" mains at east end of Ante Rd with 8"	$330,000		
		(o) 12" railroad crossing at Harvard		$50,000	
		(p) 12" main from north side of Wellesley Ave to south side at Ormond		$10,000	
		(q) 12" railroad crossing at Vincient		$20,000	
		(r) Connect existing mains between Molter Rd, Stevenson Rd, and Simpson Rd with 8"		$140,000	
		(s) Replace Euclid Ave between Barker Rd and Campbell Rd with 12"			$820,000
		(t) Replace Lynden Rd between Well Site #8 and Euclid Ave with 16"			$650,000
		(u) Replace Euclid Ave between Garry Rd and Simpson Rd with 16"			$570,000
		(v) Replace Simpson Rd between Euclid Ave and Wellesley Ave with 16"			$900,000
		North System Total	$1,120,000	$9,280,000	$5,060,000

(1) *The District plans to fund 6-yr improvements through reserves or by developer funding. See below for current and 6-yr Capital Reserve Fund balance.*

Table 6-1 Capital Improvements Plan (Cont'd)

System	Category	Project	6-yr [1]	20-yr	Beyond 20-yr
South System	Supply	Well pump capacity expansion with scheduled pump replacements	$125,000		
		Backup power for additional Well Site (well site to be determined)	$300,000		
		Upgrade intertie with Vera Water & Power to automatic valve (Mission Ave & Adams Rd)	$25,000		
	Storage	Transmission upgrades, well site control changes, and new 1MG reservoir		$3,640,000	
		New interties between Corbin, Greenacres, and Carder	$840,000		
	Distribution System	(a) Replace Henry Rd from Sprague to 8th Ave with 16"		$530,000	
		(b) Connect Barker Rd to Henry Rd at 11th Ave with 12"		$360,000	
		(c) Replace Henry Rd south of 8th Ave with 20"			$470,000
		(d) Replace Corbin Rd from Alki Ave to Cowley Ave with 12"	$210,000		
		(e) Replace Broadway Ave from Barker Rd to reducer with 8"		$150,000	
		(f) Replace Barker Rd from Maxwell Ave to I-90 with 8"		$130,000	
		(g) Replace west end of Boone Ave near Barker Rd with 8"		$60,000	
		(h) Replace Mission Ave from Hodges Rd to east CID boundary with 16"	$550,000		
		(i) Loop mains north and south of Mission Ave and east of Hodges Rd	$1,100,000		
		(j) Connect Glenbrook cul-de-sac dead end to 8th Ave with 8"	$30,000		
		(k) Replace from Well Site #1 north to Indiana Ave with 18"			$340,000
		South System Total	$3,180,000	$4,870,000	$810,000
		North and South System TOTAL	$4,300,000	$14,150,000	$5,870,000

(1) *The District plans to fund 6-yr improvements through reserves or by developer funding. See below for current and 6-yr Capital Reserve Fund balance.*

Table 6-2 Capital Reserve Fund Balance (6-yr)

	2016	2017	2018	2019	2020	2021
Beginning Capital Reserve Fund Balance	$3,000,000	$3,500,000	$820,000	$1,320,000	$1,820,000	$1,200,000
Transfer in from Operating Fund (Approx. $500,000 annually)	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000
Capital Expenditures [1]	-	$3,180,000	-	-	$1,120,000	-
Ending Capital Reserve Fund Balance	$3,500,000	$820,000	$1,320,000	$1,820,000	$1,200,000	$1,700,000

(1) *Assumes South System 6-yr improvements are constructed between 2017-2019 and North System 6-yr improvements are constructed between 2020-2021.*

Water rights deficiencies

The District has adequate water rights to meet existing and projected 20-year instantaneous (Qi) and annual (Qa) needs. The District plans no improvements to water rights at this time (WSP 2016).

From the figures below, demand may exceed water rights capacity within a 50 year time frame. However, The District believes that conservation and water use efficiency will play a key role in stretching existing water rights to meet future demands. (WSP 2016)

Table 4-2 Current Water Rights Status

Permit Certificate or Claim #	Name of Right Holder or Claimant	Priority Date	Source Name/ Number	Primary or Supplemental	Current Water Rights Q_i Instantaneous (gpm)	Current Water Rights Q_a Annual (ac-ft)	Current Use Q_i [1] Instantaneous (gpm)	Current Use Q_a [2] Annual (ac-ft)	Current Surplus or Deficiency Q_i Instantaneous (gpm)	Current Surplus or Deficiency Q_a Annual (ac-ft)
6927-A	CID		N/A	Primary	3,200	1,275				
6856-A	CID		N/A	Primary	580	280				
6855-A	CID		N/A	Primary	1,295	450				
6854-A	CID		N/A	Primary	1,760	580				
6853-A	CID		N/A	Primary	695	225				
6852-A	CID		N/A	Primary	3,280	650	74,675	14,544	6,875	7,866
5776-A	CID		N/A	Primary	18,800	5,000				
5775-A	CID		N/A	Primary	18,500	4,950				
5774-A	CID		N/A	Primary	5,560	1,500				
5773-A	CID		N/A	Primary	10,100	2,700				
5772-A	CID		N/A	Primary	13,200	3,550				
5771-A	CID		N/A	Primary	4,580	1,250				
				TOTAL	81,550	22,410	74,675	14,544	6,875	7,866

Intertie Name/Identifier	Name of Purveyor Providing Water	Current Limits on Intertie Use Q_i Instantaneous (gpm)	Current Limits on Intertie Use Q_a Annual (ac-ft)	Current Use through Intertie Q_i Instantaneous (gpm)	Current Use through Intertie Q_a Annual (ac-ft)	Current Intertie Surplus or Deficiency Q_i Instantaneous (gpm)	Current Intertie Surplus or Deficiency Q_a Annual (ac-ft)
Not Applicable [3]	-	-	-	-	-	-	-

Pending Water Right Application	Name on Permit	Date Submitted	Primary or Supplemental	Pending Water Rights Q_i Instantaneous (gpm)	Pending Water Rights Q_a Annual (ac-ft)
-	-	-	-	-	-

(1) *Combined pumping rate for all existing District wells. Refer to* ***Table 1-2****.*
(2) *4-year average annual use. Refer to* ***Table 2-2****.*
(3) *Existing interties are manually operated and for emergency use only; the District does not rely on them for continuous supply.*

Table 4-3 Forecasted Water Rights Status (6-year)

Permit Certificate or Claim #	Name of Right Holder or Claimant	Priority Date	Source Name/ Number	Primary or Supplemental	Forecasted 6-year Water Rights Q_i Instantaneous (gpm)	Forecasted 6-year Water Rights Q_a Annual (ac-ft)	Forecasted 6-year Use Q_i [1] Instantaneous (gpm)	Forecasted 6-year Use Q_a [2] Annual (ac-ft)	Forecasted 6-year Surplus or Deficiency Q_i Instantaneous (gpm)	Forecasted 6-year Surplus or Deficiency Q_a Annual (ac-ft)
6927-A	CID		N/A	Primary	3,200	1,275				
6856-A	CID		N/A	Primary	580	280				
6855-A	CID		N/A	Primary	1,295	450				
6854-A	CID		N/A	Primary	1,760	580				
6853-A	CID		N/A	Primary	695	225				
6852-A	CID		N/A	Primary	3,280	650	74,675	15,440	6,875	6,920
5776-A	CID		N/A	Primary	18,800	5,000				
5775-A	CID		N/A	Primary	18,500	4,950				
5774-A	CID		N/A	Primary	5,560	1,500				
5773-A	CID		N/A	Primary	10,100	2,700				
5772-A	CID		N/A	Primary	13,200	3,550				
5771-A	CID		N/A	Primary	4,580	1,250				
				TOTAL	81,550	22,410	74,675	15,440	6,875	6,920

Intertie Name/Identifier	Name of Purveyor Providing Water	Forecasted 6-year Limits on Intertie Use Q_i Instantaneous (gpm)	Forecasted 6-year Limits on Intertie Use Q_a Annual (ac-ft)	Forecasted 6-year Use through Intertie Q_i Instantaneous (gpm)	Forecasted 6-year Use through Intertie Q_a Annual (ac-ft)	Forecasted 6-year Intertie Surplus or Deficiency Q_i Instantaneous (gpm)	Forecasted 6-year Intertie Surplus or Deficiency Q_a Annual (ac-ft)
Not Applicable [3]	-	-	-	-	-	-	-

Pending Water Right Application	Name on Permit	Date Submitted	Primary or Supplemental	Pending Water Rights Q_i Instantaneous (gpm)	Pending Water Rights Q_a Annual (ac-ft)
-	-	-	-	-	-

(1) *Combined pumping rate for all existing District wells. Refer to* ***Table 1-2****.*
(2) *4-year average annual use. Refer to* ***Table 2-11****.*
(3) *Existing interties are manually operated and for emergency use only; the District does not rely on them for continuous supply.*

Table 4-4 Forecasted Water Rights Status (20-year)

Permit Certificate or Claim #	Name of Right Holder or Claimant	Priority Date	Source Name/ Number	Primary or Supplemental	Forecasted 20-year Water Rights		Forecasted 20-year Use		Forecasted 20-year Surplus or Deficiency	
					Q_i Instantaneous (gpm)	Q_a Annual (ac-ft)	Q_i [1] Instantaneous (gpm)	Q_a [2] Annual (ac-ft)	Q_i Instantaneous (gpm)	Q_a Annual (ac-ft)
6927-A	CID		N/A	Primary	3,200	1,275				
6856-A	CID		N/A	Primary	580	280				
6855-A	CID		N/A	Primary	1,295	450				
6854-A	CID		N/A	Primary	1,760	580				
6853-A	CID		N/A	Primary	695	225				
6852-A	CID		N/A	Primary	3,280	650	74,675	17,747	6,875	4,663
5776-A	CID		N/A	Primary	18,800	5,000				
5775-A	CID		N/A	Primary	18,500	4,950				
5774-A	CID		N/A	Primary	5,560	1,500				
5773-A	CID		N/A	Primary	10,100	2,700				
5772-A	CID		N/A	Primary	13,200	3,550				
5771-A	CID		N/A	Primary	4,580	1,250				
				TOTAL	81,550	22,410	74,675	17,747	6,875	4,663

Intertie Name/Identifier	Name of Purveyor Providing Water	Forecasted 20-year Limits on Intertie Use		Forecasted 20-year Use through Intertie		Forecasted 20-year Intertie Surplus or Deficiency	
		Q_i Instantaneous (gpm)	Q_a Annual (ac-ft)	Q_i Instantaneous (gpm)	Q_a Annual (ac-ft)	Q_i Instantaneous (gpm)	Q_a Annual (ac-ft)
Not Applicable [3]	-	-	-	-	-	-	-

Pending Water Right Application	Name on Permit	Date Submitted	Primary or Supplemental	Pending Water Rights	
				Q_i Instantaneous (gpm)	Q_a Annual (ac-ft)
-	-	-	-	-	-

(1) *Combined pumping rate for all existing District wells. Refer to* ***Table 1-2****.*
(2) *Projected 20-year use. Refer to* ***Table 2-11****.*
(3) *Existing interties are manually operated and for emergency use only; the District does not plan to rely on them for continuous supply.*

Figure C Projected Annual Water Demand VS Water Rights (Q_a)

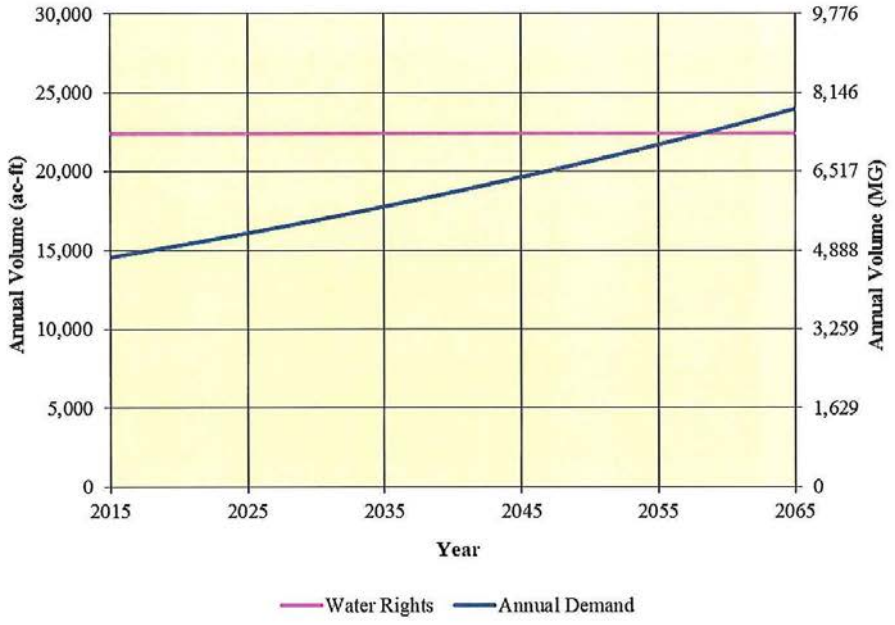
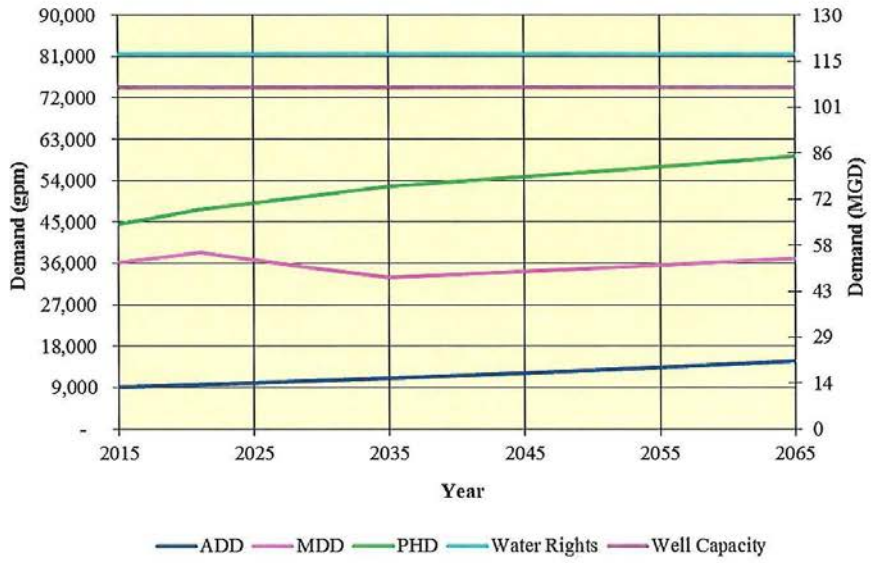


Figure D Projected Daily Demand VS Water Rights (Q_i) [1]



[1] *Refer to Section 2.2.4 for discussion of evolution of peaking factors over time.*

Consolidated Support Services

Source

All of the Eastern State Hospital facilities are served water from 2 wells located some 3.5 miles west of the hospital campus. Wells Nos. 1 and 2 pump water to the campus through a 12-inch and 14-inch transmission main. A booster pump is available in this transmission main to increase flows but is not necessary for normal operation. The booster pump reduces the pumping head on Well Nos. 1 and 2 and thereby increases their output. The booster is used infrequently and only during periods of high demand. (WSP 2011)

Water from the 2 wells is pumped directly into Reservoir No. 2 and levels are controlled by probes and telephone lines to the well sites. No. 2 reservoir (steel) then fills No. 1 (concrete), which is lower, and overflows are prevented with an altitude valve. From these two reservoirs water flows out into the ESH area, to the City of Medical Lake, and to Lakeland Village. Normally, the Eastern State Hospital campus and Lakeland Village receive water from Reservoir No. 2 and the City of Medical Lake receives water from the lower No. 1 reservoir. Normal operation is for reservoir No. 1 to flow to the City and provide emergency water to the ESH boilers facilities. A manual valve is normally closed such that reservoir No. I does not contribute to the ESH/Lakeland Village system.

There are no other pressure zones or booster pumps in the distribution systems for the two State facilities. Summer irrigation is provided in a separate system using reclaimed water from West Medical Lake. (WSP 2011)

Storage

Present storage capacity of the CSS system is 3,550,000 gallons. (WSP 2011)

The City of Medical Lake receives water through two separate pressure reducing stations necessary to prevent excess pressure in the City's system. The new City of Medical Lake reservoir is lower than the State's two reservoirs. Lakeland Village is also lower and water flows by gravity from Reservoir No. 2 to the Lakeland Village system and Reservoir No. 3. A control valve regulates water levels in the Lakeland Village Reservoir No. 3. (WSP 2011)

As Consolidated Support Services is connected through an intertie with the City of Medical Lake, the storage capacity of Medical Lake is also relevant. Medical Lake has a capacity of 1,500,000 gallons. (WSP 2011)

TABLE 3.3.2
Water Storage

Date	Tank Type	Capacity	Overflow Elevation	Dimensions
1930	No. 1 Concrete	550,000	2,611	12'x67'x127'
1969	No. 2 Steel	2,000,000	2,641	93' x 40'h
1970	No. 3 Steel	1,000,000	2,619	62'd x 45'h

Reservoir No. 1 and No. 2 are located in close proximity to each other on the Eastern State Hospital campus. The overflow elevation differential is controlled by an altitude valve. Water from the two wells flows directly to Reservoir No. 2 and this reservoir in turn fills No. 1 and the distribution system. Water from the wells can also be directed into the lower No. 1 reservoir. One of three mains serving the City of Medical Lake also initiates at this resivoir complex. Reservoir No. 3 is located at Lakeland Village and is filled via a control valve activated by probes in the reservoir. A second line serving the City of Medical Lake is connected to the State system between Eastern State Hospital and Lakeland Village with the third and manual intertie located on the City's 16-inch transmission main below reservoirs Nos. 1 & 2. (WSP 2011)

The effective storage for the CSS system is provided by reservoir No. 2 or 2,000,000 gallons. (WSP 2011)

Delivery

Boosters/Pressure relief valves –

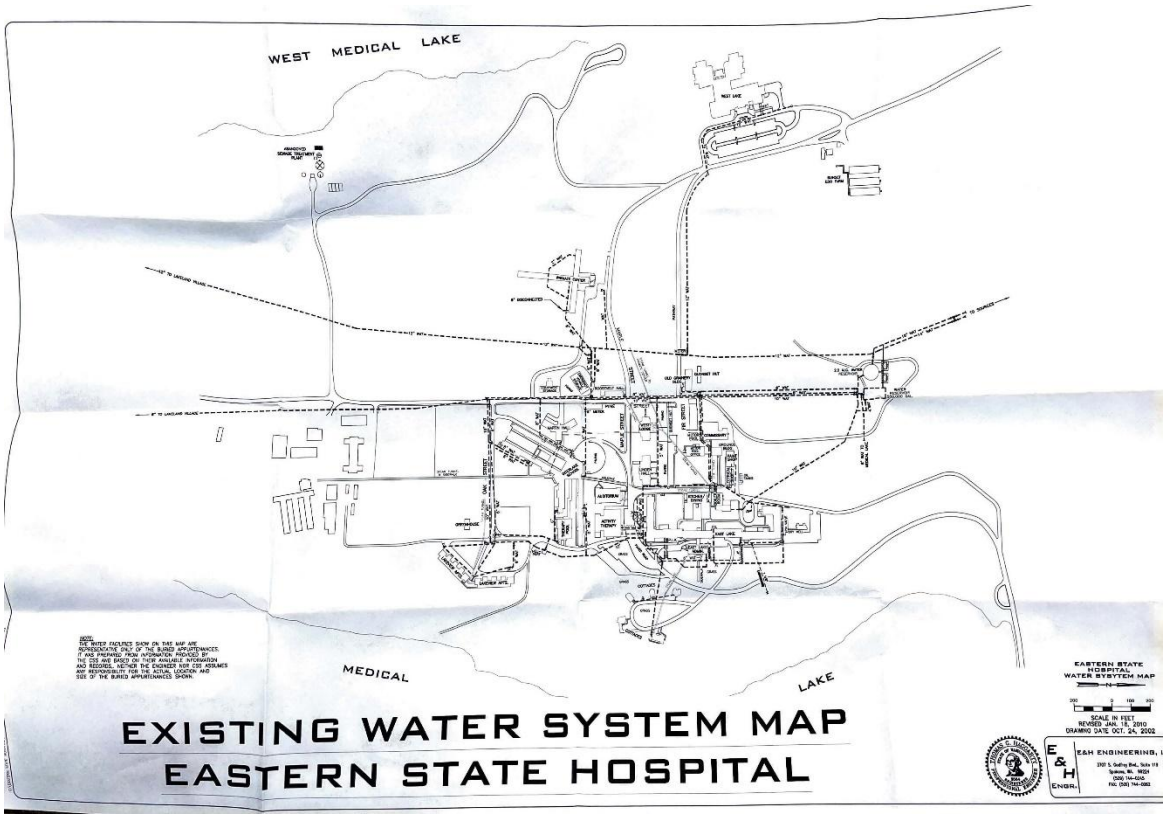
A booster pump is available for the primary transmission main (from wells 1 and 2) to increase flows but is not necessary for normal operation. The booster pump reduces the pumping head on Well Nos. 1 and 2 and thereby increases their output. The booster is used infrequently and only during periods of high demand.

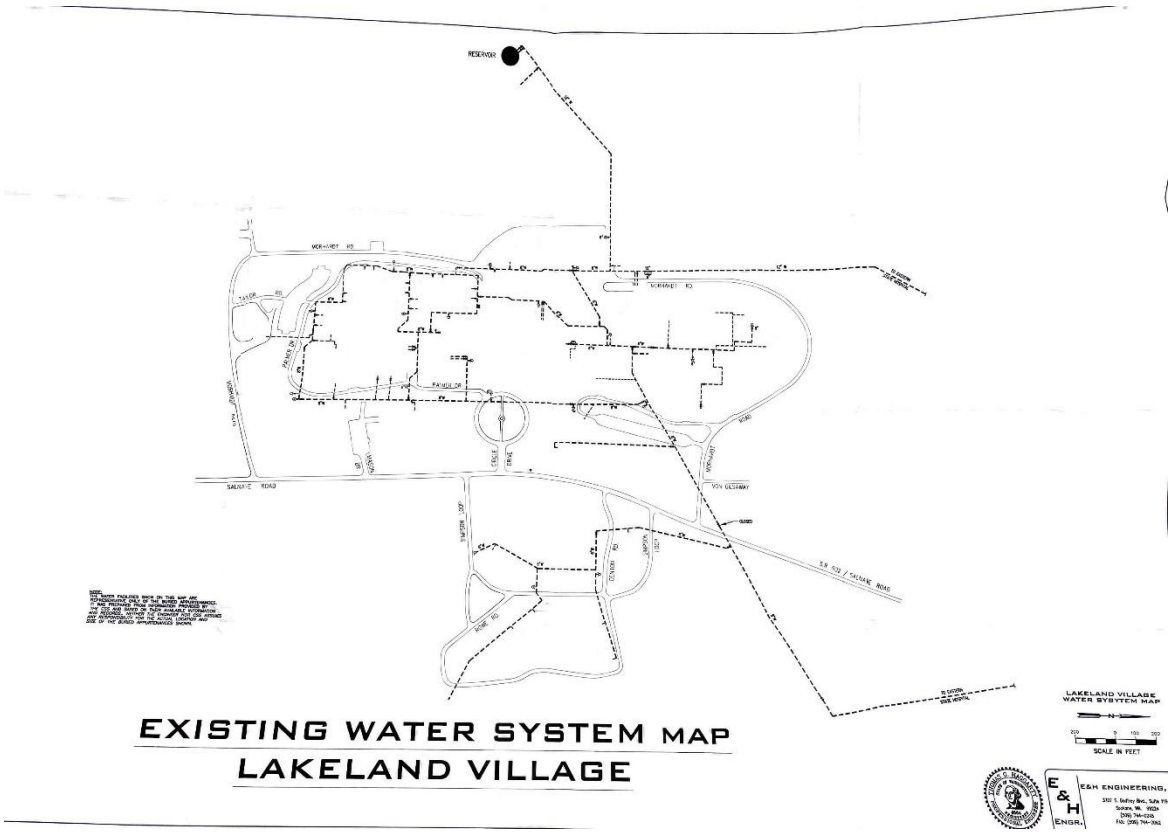
Transmission lines –

TABLE 3.3.3
Water Line Inventory – Eastern State Hospital and Lakeland Village

4" & Smaller	6"	8"	10"	12"	14"	16"
5,000	9,9670	21,530	5,110	26,400	7,510	220

Schematic





Connections

DOH approved connections = 99

A list of capital deficiencies

Storage

The existing storage facilities serving the CSS System are adequately sized to meet the projected needs of the system as determined herein. (WSP 2011)

Source

The existing source facilities cannot meet the projected maximum demand based on an 18-hour pumping program. By increasing the pump run time the deficiency can be eliminated in a given 24-hour cycle. The situation may not be emergent but it does give notice that corrective and/or improvement actions are essential.

Acquiring additional water rights and constructing a new third well pump station is not an appropriate action at this time. The aquifer serving the West Plains area continues to recede and the Department of Ecology is, and probably will continue, to reduce withdrawals and certainly not permit new withdrawals.

The City of Medical Lake and the City of Spokane are nearing an agreement for an intertie at Hwy. 902 and Craig Rd. The obvious solution to future CSS water needs is to purchase water from the City of Spokane. The City of Medical Lake has already indicated their intention to let CSS wheel water thru the City's system to a point where connection could be made to the CSS system. The water would then need to be pumped to the CSS reservoir. Details of this arrangement would be worked out when the CSS needs more water.

There are no immediate source improvements, but the following are pertinent to the existing conditions.

1. The CSS/Medical Lake shared water rights permit each well (S01 and S02)

to pump up to 1,000 gpm. As the existing pumps reach their useful life and are in need of replacement, larger pumps should be considered.
2. Increased efforts to meter water and reduce leakage is an overall improvement need of the system.
3. It is noted that both source meters were factory calibrated in 2010 and now read flow and totalizing. An improvement recommended in the first draft of this Plan. (WSP 2011)

Transmission/Distribution

The Hydraulic Analysis contained in the Appendix identifies areas where the existing system cannot provide 2,000 GPM. Chapter 8 discusses these in further detail and establishes an Improvement Plan to correct the deficiencies. The distribution system adequately provides service to all of the users and extensions to improve service are not needed. The Transmission mains from the well source are properly sized but leaks have occurred in the past. It is assumed that a replacement main will be necessary in the next twenty year period. The Capital Improvement Plan in Chapter 9 includes a program to investigate leakage and then make major repairs to the transmission main. The booster station on the transmission main is used infrequently as maximum theoretical demands have not occurred. As a result the station shows signs of neglect. Minor repairs and more frequent operation are in order. The Veterans Cemetery water use is for an Administration Bldg. (bathrooms, drinking fountain, and lunchroom) and a Maintenance Shop with the same uses plus a facility to wash equipment. The service has one fire hydrant on a fire line back into the property. The fire line and services are provided with an 8-inch meter. This would work for a fire but not for the day to day uses. The manufacturer's recommendation for an 8-inch meter is a minimum flow of 200 GPM and the day to day uses for the Admin. Bldg. and Maintenance Shop probably don't register in the meter. A replacement meter is included in the Improvement Plan. From time to time it is necessary because of lake levels or other reasons to add potable water to the irrigation reservoir. This arrangement is provided with a good air gap but the amount of water is not metered nor controlled by the potable water system manager. A meter is included in the Improvement Plan. (WSP 2011)

In the early preparation of this Plan water use data was incomplete and making determinations about leakage was difficult. The new Water Manager is making good strides to improve on this situation and he is encouraged to continue. Leakage does not appear to be a problem but more abundant and accurate data could change that condition. (WSP 2011)

A list of projects (capital projects) to cure them

To be received from DOH

Water rights deficiencies

- explanation of the area impacted and their thoughts about remedy

To be received from DOH

City of Deer Park

Source

A system of seven wells supplies the City Water. Each of the wells have a source meter. The source meters are connected to the City SCADA system collecting instantaneous flow data (gallons per minute). The City staff collects weekly flow totals at each source and keeps a handwritten log. The City replaces source meters as they become non-functional and provides periodic calibration.

Table 3-1 Existing Groundwater Wells

Name	City Number	DOH Source ID No.	Year Well Drilled	Facility Condition	Estimated Future Life Expectancy	Well Yield Max. Inst, (2) GPM	Well Yield Max, (1) MGD
West	DP-1	S01	1919	Fair	25 years	222	0.319
South	DP-2	S02	1946	Good	50 years	200	0.288
Swinyard	DP-3	S03	1981	Good	50 years	900	1.296
North	DP-4	S04	unknown	Good	50 years	300	0.432
North Dalton #1	DP-5	S05	1976	Fair	10 years	420	0.605
South Dalton #2	DP-6	S06	2000	Excellent	100 years	900	1.296
Perrins Field	SP-14	S07	2011	Excellent	100 years	400	.576
Total						**3342**	**4.812**

Prior to 1997, the City operated the water system as a single pressure zone. Following the installation of the 6th Street Booster Pump Station in 1997, The City's system was subsequently divided into two pressure zones. The second pressure zone was needed to provide adequate pressure to the higher land located in the Northeast portion of the City service area.

Pressure Zone Summary

Zone	Approx. Area Description	Supply	Storage
Lower zone	The majority of the City accept those services generally to the east of Forest Street.	Seven groundwater wells	Two lower zone reservoirs
Upper zone	Services generally to the east of Forest including the airport.	Booster stations (Wells indirectly)	Cedar Rd. Reservoir Constructed in 2009 500,000 gallons, 170' elevated tank

- The water system is comprised of the following components: 3 reservoirs, 7 wells (6 within City limits); 2 booster stations, and 1 PRV station.

A new Perrins Well was constructed in the summer of 2012

Storage

Total storage capacity:

An 800,000 gallon standpipe reservoir was erected in 1963.

600,000 gallon standpipe reservoir was constructed in 1981.

In 2009 the upper zone 500,000 gallon elevated reservoir was constructed.

The Cedar Road Reservoir was constructed providing an additional 500,000 gallon of 170' high elevated storage

Table 1-3 Reservoirs and Storage

Name	Size/Volume	Overflow Elevation	Type	Top of Roof Elevation	Tank Floor Elevation
Cedar Reservoir #20	500,000 Gallon @ 170' Tall, 50.5' Dia. X 39' with tapered bottom	2370	Welded Steel on Concrete Pedestal	2373	2331.86
6th Street Reservoir #10 - 1981	32' Dia x 100' Tall 600,000 gallons	2284.5	Welded Steel Standpipe	2288	2184.5
Crawford Avenue Reservoir #11 - 1963	38' Dia x 94' Tall 797,000 gallons	2284.5	Welded Steel Standpipe	2288	2190.5
Total	1,897,000				

Delivery

Boosters/Pressure relief valves –

Water is distributed to customers through many miles of a looped pipeline system consisting of pipes ranging in size from 2 to 12 inches in diameter. The majority of the distribution system consists of 6-inch and 8-inch diameter pipelines.

An upper pressure zone was created in 1996 to serve growth at higher elevation to the east of the original City core by constructing a booster pumping station and separating the distribution system into two zones, the upper (closed) and the lower with three reservoirs and all well sources.

Projects between 2007 and 2014

The 6th Street Booster Station was enhanced with variable speed drives. (3-10hp pumps and 1 50hp).

• The Mission Street Booster Station was added on Mission in 2010, just south of Crawford (5-10 HP Pumps)

Table 1-4A Mission Street Booster Station (Added 2010)

Primary Pumps	Flow/Head	Control
5 - 10 hp centrifugal	250 gpm/90 feet	VFD

Table 1-4B 6th Street Booster Pump Station (Added 1997)

Primary Pumps	Flow/Head	Control
3 - 10 hp centrifugal	250 gpm/90 feet	VFD
Fire Pump	Flow/Head	Control
1 - 50 hp centrifugal	1500 gpm/105 feet	Full speed soft start. Activated on low discharge pressure.

Transmission lines –

Projects between 2007 and 2014

- 3,700 lineal feet of 12-inch C-900 water main was installed on 12th Street and also between the new reservoir and Cedar Street.
- 640 lineal feet of 8-inch C-900 water main was installed on South Main Street just north of the "H" Street intersection
- 1, 125 lineal feet of 1-inch C-900 water main was installed on South Main centered near the railroad crossing, providing redundant supply flow to SW business area of City.
- 2,194 lineal feet of 12-inch diameter C-900 water main was installed on 6th Street west of Cedar Road.
- 1,966 lineal feet of 12-inch diameter C-900 water main was installed on Cedar Road to the south from 6th Street.
- 912 lineal feet of 8-inch diameter C-900 water main stubs were installed on both 6th Street and Cedar Road.

Schematic

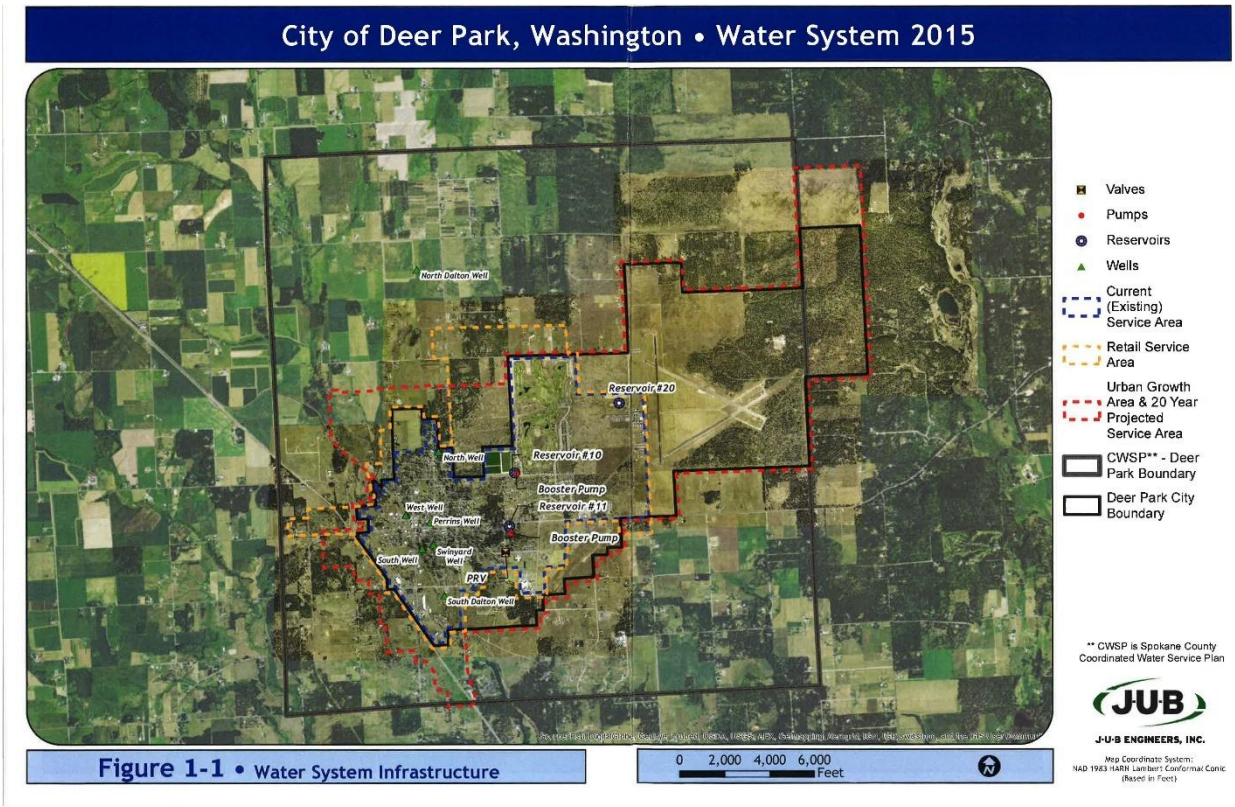


Figure 1-1 • Water System Infrastructure

Connections

The existing number of residences/businesses serviced is approximately 1,650 active connections. The connections are a mix of single family and multi-family residential, commercial, industrial and schools.

A list of capital deficiencies

Table 8-2 Existing Deficiencies and 6 Year and 20 Year Proposed Projected Projects

	Deficiency Type and Location	Planned Improvements	Comments
	Existing Deficiencies[1]		
1	4th street from North to Main; Park from 4th to 5th	1,060 LF of 8" Pipe	Replaces 3"
2	Larch from Crawford to 1st; 1st from Larch to Fir	1,140 LF of 8" Pipe	Replaces 4"
3	Park Ave from 1st to 2nd	400 LF of 8" Pipe	Complete loop in commercial district
4	3rd from Stevens to Colville; Colville from 2nd to 3rd	985 LF of 8" Pipe	Replaces 3"
5	Fir from 1st to 2nd; 2nd from Fir to Park Ave	985 LF of 8" Pipe	Replaces 4"
6	Hydrant on Southeast corner of "E" street and Colville	New Hydrant	Tie FH to 12" main on East side of Colville
7	Hydrant on Northeast corner of "B" Street and High Street	New Hydrant	Tie FH to 12" Main on North side of the street
8	Hydrant on Southeast corner of "C" Street and Colville	New Hydrant	Tie FH to 12" main on East side of Colville
	6 Year and 20 Year Proposed Projected Projects		
9	Reiper from Crawford to 2nd	500 Lf of 8" Pipe	Improve looping to increase fire flow (By 2020)
10	New Well in Dalton Well Zone	New Well	This well will add to an existing well (By 2020)
11	"H" street from Colville to Forest; Forest from "H" to "D"	3,400 LF of 12" Pipe	Upgrades distribution capacity to south growth area (By 2034) (City will require developer funding)
12	Crawford from Larch to Main	2,000 LF of 10" Pipe	Undersized for fire flow. Provides for expansion to west. (By 2034)
13	Colville from "B" to "C"	400 LF of 12" Pipe	Provides North/South connection (By 2034)
14	Replace 6th street storage reservoir	400,000 gal elevated tank	This tank will resolve storage deficit (By 2020)

(1) City crews will install 10" main on 8th Avenue from Main Street to North Street summer 2015. Hydraulic model completed for this plan already reflects this upsize project.

A list of projects (capital projects) to cure them

Table 8-3 Preliminary Estimate of Distribution System Improvement Costs

Number	Description	Quantity	Unit Cost	Cost
1	8" on 4th Street from North to Main; 8" on Park from 4th to 5th	1,060 LF	$99	$105,394.21
2	8" on Larch from Crawford to 1st; 8" on 1st from Larch to Fir	1,140 LF	$100	$113,702.44
3	8" on Fir from 1 to 2nd; 8" on 2nd from Fir to Park Ave	985 LF	$100	$98,592
4	8" on 3rd from Stevens to Colville; 8" on Colville from 2nd to 3rd	985 LF	$100	$98,592
5	8" on Park Ave from 1st to 2nd	400 LF	$106	$42,331
6	Connect hydrant on Southwest corner of "B" Street and High Street (8") to 12" Main	1	$12,266	$12,266
7	Connect hydrant on Southwest corner of "C" Street and Colville (8") to 12" Main	1	$12,266	$12,266
	Existing Deficiencies Subtotal			$483,142
8	New Well in Dalton Well Zone	1	$318,385	$318,385
	6-Year Subtotal			$318,385
9	8" on Reiper from Crawford to 2nd	500 LF	$105	$52,463
10	12" on 'H' Street from Colville to Forrest; 12" on Forrest from 'H' to 'D'	3,400 LF	$119	$403,533
11	10" on Crawford from Larch to Main	2,000 LF	$112	$223,489
12	12" on Colville from 'B' to 'C'	400 LF	$127	$50,895
13	Replace 6th Street Storage Reservoir	400,000 GAL	$5.60	$2,240,000
	20-Year Subtotal			$2,970,381
			Total	$3,771,908
			Tax & Cont. (23%)	$867,539
			Design, Inspection, Administration (23%)	$867,539
			GRAND TOTAL	**$5,506,986**

Table 8-4 Implementation of 6 and 20 year Improvement Capital Facilities Plan

	Improvement	Estimated Cost	Year Anticipated	Years Out	Add .02 Assumed Esc. Rate	Add 8.1% Sales Taxes	Add 10% Contingency	Add 10% Design Fees	Add 10% Construction Observation Fees	Add 3% Administration Fees	Proposed Payment Method comments	costs for table 9-2
Existing Deficiencies												
1	8" on 4th Street from North to Main; 8" on Park from 4th to 5th	$105,394	2018	3	$ 109,652	$ 118,534	$ 130,387	$ 143,426	$ 157,769	$ 162,502	future STP grant	0
2	8" on Larch from Crawford to 1st; 8" on 1st from Larch to Fir	$113,702	2019	4	$ 120,662	$ 130,436	$ 143,479	$ 157,827	$ 173,610	$ 178,818		$ 178,818
3	8" on Fir from 1 to 2nd; 8" on 2nd from Fir to Park Ave	$98,592	2016	1	$ -	$ 106,578	$ -	$ -	$ -	$ 106,578	city forces	$ 106,578
4	8" on 3rd from Stevens to Colville; 8" on Colville from 2nd to 3rd	$98,592	2017	2	$ 102,575	$ 110,883	$ 121,972	$ 134,169	$ 147,586	$ 152,013	street bond	$ -
5	8" on Park Ave from 1st to 2nd	$42,331	2020	5	$ 46,736	$ 50,522				$ 50,522	city forces	$ 50,522
6	Connect hydrant on Southwest corner of "B" Street and High Street (8") to 12" Main	$12,266	2016	1		$ 13,259				$ 13,259	city forces	$ 13,259
7	Connect hydrant on Southwest corner of "C" Street and Colville (8") to 12" Main	$12,266	2016	1		$ 13,259				$ 13,259	city forces	$ 13,259
	TOTAL	**$483,142**								**$ 676,951**		$ 367,436
Within 6 Year Planning Period												
8	New Well in Dalton Well Zone	$318,385	2018	3	$ 331,248	$ 358,079	$ 393,887	$ 433,275	$ 476,603	$ 490,901		$ 490,901
	TOTAL	**$318,385**								**$ 490,901**		$ 490,901
Within 20 Year Planning Period												
9	8" on Reiper from Crawford to 2nd	$52,463	2022	7	$ 60,264	$ 65,145	$ 71,660	$ 78,826	$ 86,708	$ 89,310		$ -
10	12" on 'H' Street from Colville to Forrest; 12" on Forrest from 'H' to 'D'	$403,533	2034	19	$ 587,872	$ 635,490	$ 699,038	$ 768,942	$ 845,837	$ 871,212		$ -
11	10" on Crawford from Larch to Main	$223,489	2035	20	$ 332,094	$ 358,993	$ 394,892	$ 434,382	$ 477,820	$ 492,154		$ -
12	12" on Colville from 'B' to 'C'	$50,895	2036	21	$ 75,627	$ 81,753	$ 89,929	$ 98,921	$ 108,814	$ 112,078		$ -
13	Replace 6th Street storage reservoir, being discussed only (1)	$2,240,000	2-3 years from now									
	TOTAL (2)	**$2,970,381**								**$ 1,564,753.73**		$ 853,337
Capitol improvement yearly total for projects in restructures 6 year cash flow												
3	8" on Fir from 1 to 2nd; 8" on 2nd from Fir to Park Ave	$98,592	2016	1	$ -	$ 106,578	$ -	$ -	$ -	$ 106,578	city forces	$ 106,578
6	Connect hydrant on Southwest corner of "B" Street and High Street (8") to 12" Main	$12,266	2016	1		$ 13,259				$ 13,259	city forces	$ 13,259
7	Connect hydrant on Southwest corner of "C" Street and Colville (8") to 12" Main	$12,266	2016	1		$ 13,259				$ 13,259	city forces	$ 13,259
	TOTAL	**$123,123**								**$ 133,096**		$ 133,096
4	8" on 3rd from Stevens to Colville; 8" on Colville from 2nd to 3rd	$98,592	2017	2	$ 102,575	$ 110,883	$ 121,972	$ 134,169	$ 147,586	$ 152,013	street bond	$ -
	TOTAL	**$98,592**								**$ 152,013**		$ -
1	8" on 4th Street from North to Main; 8" on Park from 4th to 5th	$105,394	2018	3	$ 109,652	$ 118,534	$ 130,387	$ 143,426	$ 157,769	$ 162,502	future STP grant	0
8	New Well in Dalton Well Zone	$318,385	2018	3	$ 331,248	$ 358,079	$ 393,887	$ 433,275	$ 476,603	$ 490,901		$ 490,901
	TOTAL	**$105,394**								**$ 162,502**		$ 490,901
2	8" on Larch from Crawford to 1st; 8" on 1st from Larch to Fir	$113,707	2019	4	$ 120,662	$ 130,436	$ 143,479	$ 157,827	$ 173,610	$ 178,818		$ 178,818
	TOTAL	**$113,702**								**$ 178,818**		
5	8" on Park Ave from 1st to 2nd	$42,331	2020	5	$ 46,736	$ 50,522				$ 50,522	city forces	$ 50,522
	TOTAL	**$42,331**								**$ 50,522**		

(1) $2,240,000 project being discussed and evaluated would construct new reservoir as the existing 6th Street storage reservoir currently requires interior recoating. "Standby Storage Capacity" limiting water system component could be resolved to more distant future with a new reservoir while recoating costs would only extend the reservoir life 10 - 15 years.

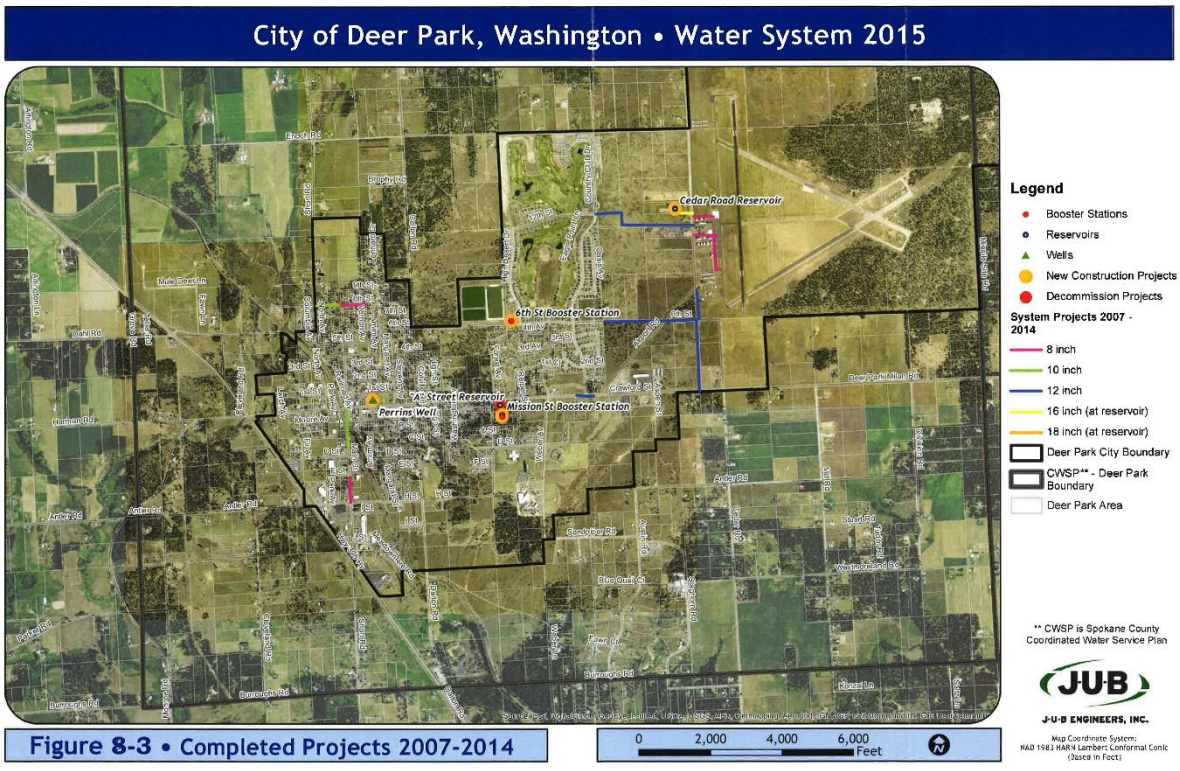


Figure 8-3 • Completed Projects 2007-2014

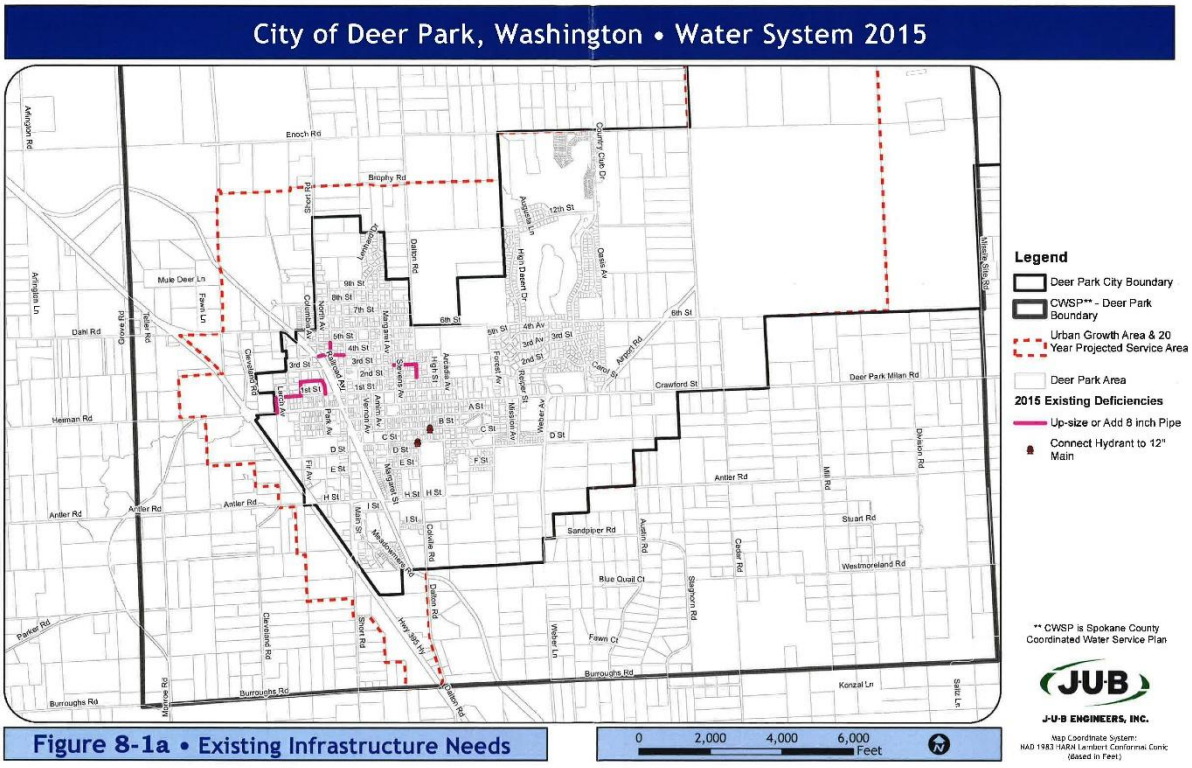


Figure 8-1a • Existing Infrastructure Needs

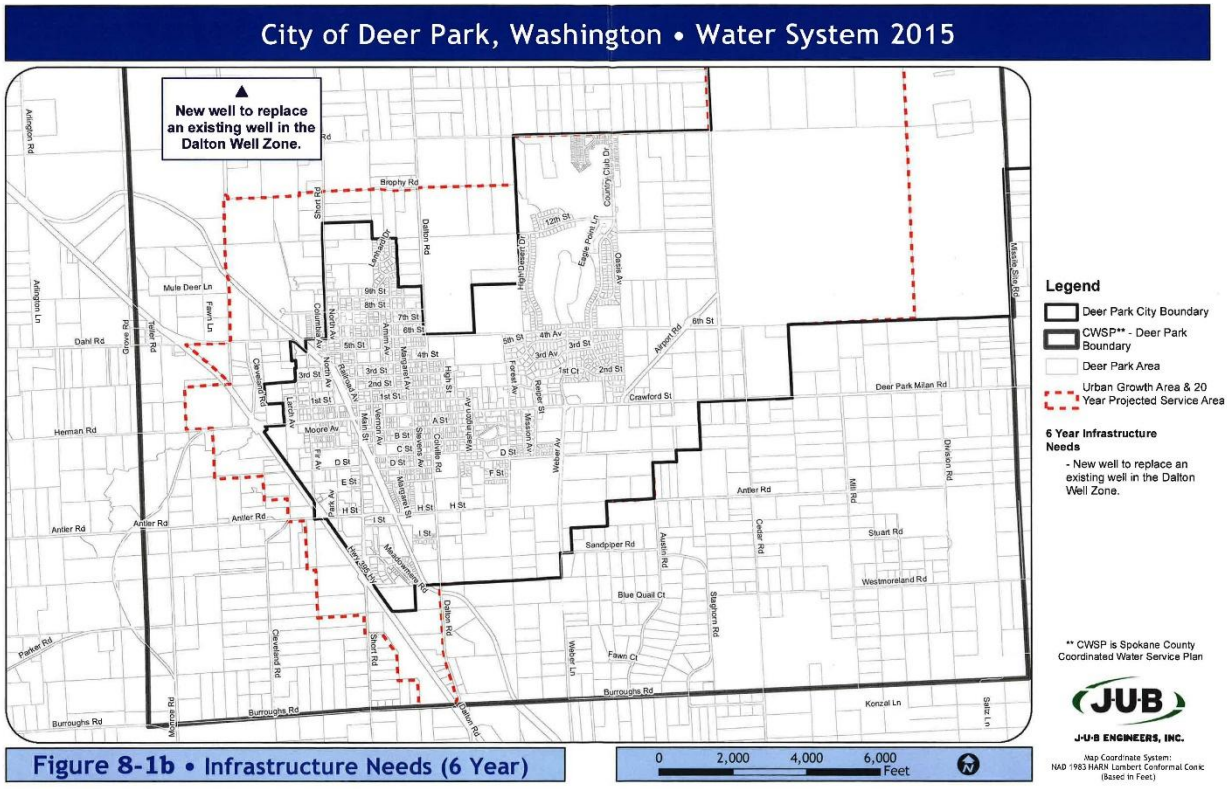
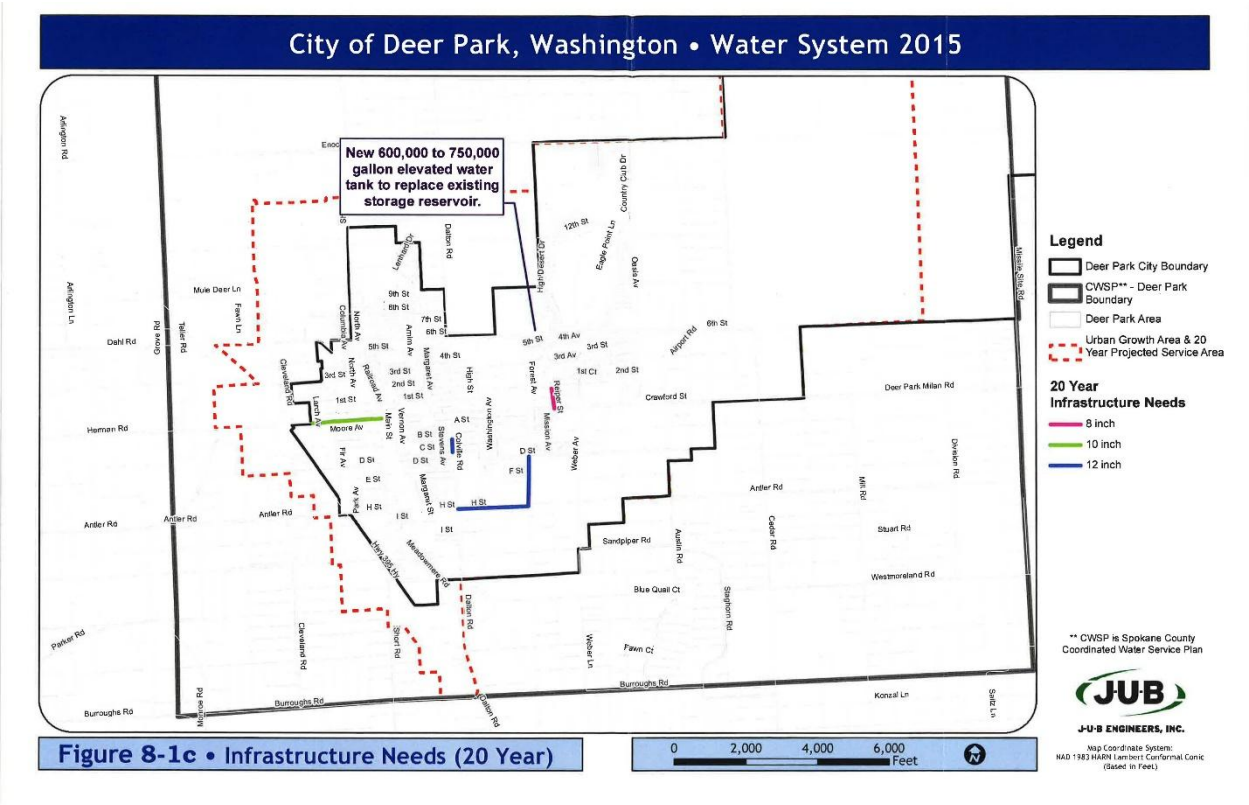


Figure 8-1b • Infrastructure Needs (6 Year)



Water rights deficiencies

As shown in **Tables 4-2** and **4-3,** the City's existing water rights are adequate to meet current demands as well as estimated future demands.

As evidenced in **Table 4.3,** the City has adequate water rights to meet its estimated future demand for the 20-year planning horizon. Therefore, a source of supply analysis is not warranted for this Plan.

E. Spokane

Source

The East Spokane Water District utilizes a total of seven wells for water sources and all pump water from the Spokane Valley Aquifer. Two of the wells are dug wells with two pumps per well, and the remainders are drilled. One well, purchased from the Dishman Water Company, has a sand problem when pumped regularly and is used for backup only. For the purposes of this Plan, it will be ignored in source calculations and the District then is served water from six wells with a total of eight pumps. All sources are metered. There are four separate pressure zones within the District. The lower zone is by far the largest and is served by a 1,000,000-gallon reservoir. The Beverly Hills area is served with a continuous running booster pump serving homes at a higher elevation. In 2004, the Morgan Murphy Estates, now named Broadmore Estates, water system became operational to serve a specific subdivision development and consists of a booster pump at the 1,000,000-gallon reservoir that serves the area with a 259,000-gallon reservoir. A second Broadmore continuous running booster pump serves a small number of lots on higher ground. The distribution / transmission

grid serves the entire developed service area of the District with normal sized water mains up to 16 . The system currently serves about 1,276 connections and all services are metered. The District has three emergency type interties, one with Spokane County Water District No. 3, and two with Hutchinson Irrigation District No. 16. A fourth intertie to supplement the District s water rights involves purchasing water from Modem Electric Water Company via Spokane County Water District No. 3. (WSP 2017)

The East Spokane Water District No. 1 is served by a total of seven wells and nine well pumps. One of the wells (purchased from Dishman Water Co.) is used for back up only and will not be considered in the analysis calculations. A 1.0 MG reservoir serves the base or low-Level system. Booster pumps create high-level systems, one on a 259,000-gallon reservoir. Two continuous running booster pumps create two higher-level systems above these two reservoirs. There are three emergency interties with other adjoining water systems (one with Spokane County Water Dist. No. 3 and two with Hutchinson Irrigation District No. 16). A fourth intertie moves water from Modern Electric Water Co., thru Spokane County Water District No. 3 to ESWD to resolve water right concerns. All sources and all connections (residential and commercial) are metered. The following provides a detailed discussion of the components of the system. (WSP 2017)

The East Spokane Water District No. 1 is served by six wells with a seventh well source used as a backup only. Two of the wells are hand dug and equipped with dual pumps. Table 3-1 lists the particulars using the District's identification numbering. (WSP 2017)

Table 3-1 Existing Groundwater Wells

Name	City Number	DOH Source ID No.	Year Well Drilled	Facility Condition	Estimated Future Life Expectancy	Well Yield Max. Inst. [2] GPM	Well Yield Max. [1] MGD
West	DP-1	S01	1919	Fair	25 years	222	0.319
South	DP-2	S02	1946	Good	50 years	200	0.288
Swinyard	DP-3	S03	1981	Good	50 years	900	1.296
North	DP-4	S04	unknown	Good	50 years	300	0.432
North Dalton #1	DP-5	S05	1976	Fair	10 years	420	0.605
South Dalton #2	DP-6	S06	2000	Excellent	100 years	900	1.296
Perrins Field	SP-14	S07	2011	Excellent	100 years	400	.576
Total						**3342**	**4.812**

Well No. 5 (S05) with pump #7 is identified as the old Dishman Water Company well and now serves as an emergency source only. It has a pumping capacity of about 500 gpm, but develops a sand problem with prolonged pumping. For the purposes of analyzing pumping capacities, it will be ignored, and is not shown in the above table. (WSP 2017)

All of the District's wells are located in the Spokane Aquifer and as such are dependable sources of water. This subject is discussed in other sections of this Plan. No treatment is provided at this time. (WSP 2017)

The total pumping capacity available to the District includes two pumps in Well No. 1 (480 gpm & 380 gpm), two pumps in Well No. 2 (650 gpm each), a 160 gpm pump in Well No. 3, a 225 gpm pump in Well No. 4, a 1,600 gpm pump in Well No. 6 and a 600 gpm pump in Well No. 7. As stated earlier. Well No. 5 provides an emergency backup

source only. The total pumping capacity of these eight pumps is 4,745 gpm. (WSP 2017)

All of the well pumping facilities are in good condition and no major improvements are proposed. Operation and maintenance provides for replacement of pumps and miscellaneous repairs as may be necessary. (WSP 2017)

An intertie moves water from Modern Electric Water Co. to ESWD, Current design capacity is for 500 gpm while allowing up to 1,500 gpm through an amended intertie agreement. This does not add to the pumping capacity, as the intertie will be used to provide water in lieu of an existing pump running. The intertie will be used only to make certain that the existing pumps do not exceed their permitted water rights. (WSP 2017)

The combined pumping capacity of the existing wells is adequate to meet the projected needs of the District, however, it may be necessary to pump in excess of 18 or 20 hours continuously to meet certain peak day demands and stay within water right limits. All facilities are in good condition and no capital improvements are proposed. Normal operation and maintenance must continue recognizing the replacement of worn out pumps can be expensive.

Storage

Total storage capacity: 1,277,000 gallons

Storage for most of the District (lowest pressure zone) is provided by a 1,000,000-gallon reinforced concrete reservoir. This reservoir was constructed in 1964 and the overflow elevation is 2,197.08', Spokane County Datum. A second 259,000-gallon steel reservoir serves as a separate pressure level built specifically for the Broadmoor Estates subdivision, and has an overflow elevation of 2,747.00'. (WSP 2017)

The District's two existing reservoirs (1.0 and 0.875 MG) provide adequate storage for the District's projected needs. In 2009 the interior and exterior of Reservoir No. 1 was re-coated along with other improvements and repairs. Reservoir No. 2 (0.875), being relatively new, is in a good state of repair and no specific work is proposed for it. Maintenance on both reservoirs is a continuing task. (WSP 2017)

Delivery

Boosters/Pressure relief valves –

Transmission lines –

Total approximate footage of buried water mains = 135,194 feet

The District's transmission/distribution system consists of water mains from 2 inch to 20 inch. Generally, transmission capabilities are good and no improvements are proposed. As, or if, growth occurs, transmission mains will be required to serve the vacant land. The distribution system is well looped and all users receive good service. There are several runs of 4-inch mains that are targeted for replacement in the Improvement Plan. It is also noted that the District's Construction Specifications establish 8-inch as the minimum pipe size to help provide the required 1000-gpm fire

flow. The following Table 3-2 provides an inventory of the existing buried piping and approximate total footage of each. (WSP 2017)

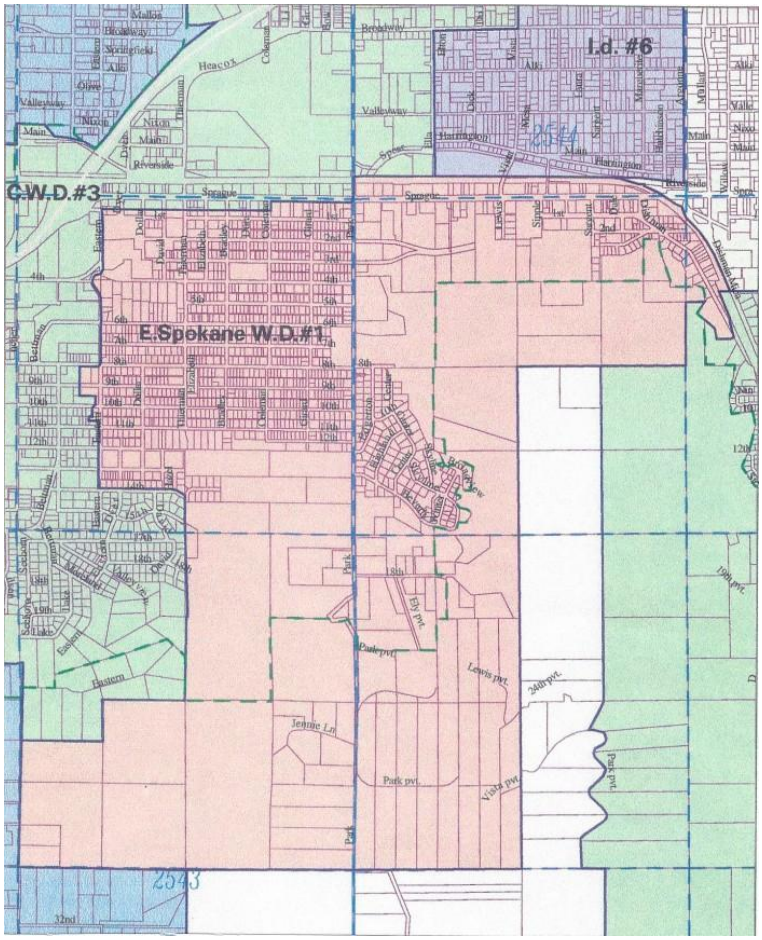
Table 3-2
Water Main Inventory

2"	4"	6"	8"	10"	12"	16"	20"
3,240′	26,293′	24,767	37,646’	14,268’	26,115’	2,515′	355’
2.4%	19.4%	18.3%	27.8%	10.6%	19.3%	1.9%	0.3%

Source: WSP 2017

The distribution system is well looped with adequate transmission support and provides adequate water service to all developed areas within the service area of the District. Developing entities are required to extend transmission/distribution mains into developing vacant areas and make improvements to the existing system, should such be necessary to meet their development needs. The District maintains the existing system and capital improvements are almost always main replacement projects. Several replacement projects are proposed during the next 6-year period and are discussed further in Chapter 8. (WSP 2017)

Schematic



Connections

At the present time the East Spokane Water District No. 1 has 1,276 metered customers.

A list of capital deficiencies

Section 3.4 of this Plan has identified that the existing source and storage facilities can adequately meet the District's needs at least through the next 6-yar planning period. The existing source and pumping capacities are sufficient to meet the 20-year needs however water rights will become a limiting factor. Without additional quantitative rights it will be necessary to increase utilization of the MEW Co. intertie. This does resolve the water rights issues and the District will continue to search for additional water rights to lessen the dependency on the intertie. The existing 1.0 MG reservoir can provide adequate storage for the next 20-year projections. Two new higher reservoirs are planned for future construction. A proposed 0.15 MG middle reservoir no. 2 would serve the Beverly Hills area to the east. This area is currently served by the new continuous running Beverly Hills Booster and this configuration will probably remain as is until some sort of catalyst (road construction, growth, etc.) increase the priority for a reservoir. The proposed 0.3 MG middle reservoir no. 1 is now poised for construction to meet the needs of the Taylor Cottages subdivision. This reservoir would be at the same elevation as the aforementioned no. 2 reservoir and serve the area to the south. The topography map in Chapter 1 illustrates these two reservoirs and the new pressure zone (Tier 2) that would be created. It should be noted that one reservoir to serve both areas was considered. The Tier 2 pressure zone extends around a

hillside for about a mile. The area is mostly undeveloped with no roads and relatively steel hillsides. One transmission main to serve the entire area would be very costly at this point in time. Middle Reservoir No. 1 is a priority for construction due to the Taylor Cottages subdivision which will have homes in the Tier 2 pressure zone. Hook-up charges from the subdivision will be used to fund construction of the reservoir.

The distribution/transmission system adequately meets the system's demands but with a substantial amount of older 4-inch mains. The current fire flow requirement of 1,000 gpm cannot be met in some areas due to these 4-inch mains. The district has been and will continue to upsize these mains in relatively small annual projects. The District has been successful in receiving Community Development Block Grants (CDBG) funds to assist in this endeavor but apparently the District is no long eligible for these funds. Replacement of 4-inch mains will continue on a pay-as-you-go status.

No other major improvements are proposed at this time. Since approval of the last Water System Plan the District s capital improvements included the Beverly Hills Booster Station and construction of a new office building.

The district is currently replacing service meters from budgeted funds and using the District's personnel. When completed the service meters will be on an AMR system. This will continue for several more years.

A list of projects (capital projects) to cure them

- **0.3 MG Middle Reservoir No. 1 / Pump Station / Transmission Main**

9.1.1 0.3 MG Middle Reservoir No. 1 / Pump Station / Transmission Main

Item	Description	Unit Price	Total Cost
1	300,000 Gal. Reservoir, Complete	Lump Sum	250,000.00
2	Booster Pump Station, Complete	Lump Sum	175,000.00
3	12-Inch PVC Pipe, In Place	1,700 L.F. @ $50.00	$85,000.00
4	Valves & Appurtenances	Lump Sum	$27,000.00
5	Retrofit Existing Booster Pumps	Lump Sum	$15,000.00
6	Stand-By Power	Lump Sum	$32,000.00
		Subtotal:	**$584,000.00**
		Plus 15% Construction Contingency	$87,600.00
		Subtotal:	$671,600.00
		Plus 8.4% Sales Tax:	$56,500.00
		Total Estimated Construction Cost:	$728,100.00
		Plus 24% Engr. Insp. Legal. Admin.:	$174,800.00
		Total Estimated Project Cost:	**$902,900.00**

Source: WSP 2017

- **Four (4) - Inch Main Replacement**

  Replacement of smaller water mains will continue on a pay-as-you-go basis and projects are usually one or two blocks at a time. Priorities vary dependent upon leakage encountered or a secondary catalyst such as street improvements. Should a grant program develop the District would be most interested in such funding. (WSP 2017)

- **AMR Meter Replacement**

  The District is replacing all service meters with AMR meters. The meters were purchased as shown in the following Capital Budget and in 2016 the balance of meters required was purchased. Installations are accomplished by existing personnel on a time available basis. There will be no further direct AMR expenses in the District's budget. To date approximately 640 new meters have been installed. (WSP 2017)

  The District began to evaluate seasonal or inclining rate structures, but immediately determined that no action until all of the meters are installed is the only appropriate avenue at this time. Once all AMR meters are installed, usage can be more accurately determined and used as guidance for a system-wide rate study and evaluation to help curb demands. (WSP 2017)

Water rights deficiencies

According the 2017 WSP, no expected water rights / capacity issues are envisioned.

Table 3-4.3
Capacity Analysis

Period	N	Max Day	Annual Gallons	Water Rights Q_a (gal/year)	Q_a > Annual Gal.?	Annual Gallons Pumped Less 2%	MDD (gpd/ERU)	ADD (gpd/ERU)	C	F	PHD (gpm)	Q_s (gpm)	Water Rights Q_i (gpm)	Q_i > Q_s?
Existing	2,156	3,848,460	374,127,100	*337,728,210*	No	0	1,785.0	475	1.6	225	4,573	*4,745*	*2,505*	No
6-Year	2,288	4,084,080	396,934,495	337,728,210	No	388,995,805	1,785.0	466	1.6	225	4,835	*4,745*	2,505	No
20-year	2,529	4,514,265	438,726,632	337,728,210	No	429,952,099	1,785.0	466	1.6	225	5,313	*4,745*	2,505	No
MEWCO Intertie				*340,859,384*									*1,500*	

*Italics = Entered Data

Source: WSP 2017

Liberty Lake Sewer & W.D.

Source

Liberty Lake Sewer and Water District owns five supply wells. Four of these wells are presently operating and providing water for the District. A fifth well is reserved for emergency purposes and does not operate on a daily basis. (WSP 2021)

The "Kenney Well" is located south of the east bound Liberty Lake off ramp of 1-90 west of Liberty Lake Road. This well was originally dug as an irrigation well and was reconditioned in October of

1980 for domestic use. It is 153 feet deep with a static water level approximately 124 feet below the surface. In 2016 a new pump and motor was installed in the Kenney Well the pump in this well is a 11-1/2-inch, 4 stage Flowserve vertical turbine pump (15EHM/15H277) with a capacity of approximately 3,100 gpm. It is accompanied by a 350-horsepower motor with a soft start. (WSP 2021)

The "Frontier" or "Mission Well" is located on Maxwell Avenue, south of Mission Avenue at the District office site. This well was reconditioned for domestic use in March of 1980. It is 198 feet deep with a static water level approximately 136 feet below the surface. In 2017 a new pump, motor and soft start was installed in the Mission well. The pump in this well is the same size and make as the pump in the Kenney Well. The Mission well has a pumping capacity of approximately 3,200 gpm. (WSP 2021)

The "Valleyway Well" is located on Valleyway east of Molter. The District made some improvements prior to the 2008 Water Plan update to the well house including installing a concrete floor and overhead door, and removing old electrical equipment. In 2012, improvements were made to this well so it could be used for daily consumption. Improvements included rehabilitation of casing and screen, a new pump and a new soft-start motor. It is 190 feet deep with a static water level approximately 165 feet below the surface. In 2021 a new pump and motor was installed in the Valleyway well. The pump in this well is a vertical turbine Flowserve 9 stage pump (12 EQH) with a 400-horsepower VFD motor and has a capacity of 2,600 gpm and is set at a depth of 185 feet. (WSP 2021)

The "Sprague Well" is located on Sprague Ave. between Garry Dr. and Wright Blvd. It was refurbished and brought on line in 1992. The well-developed silting problems and was taken off- line in September of 1996. A reconditioning project to clean the well was completed in 1997. In 2012, the well was switched from daily consumption to a backup well and is reserved for emergency use only. It is 155 feet deep, with a static water level of approximately 110 feet below the surface. The pumping capacity of the Sprague Well is approximately 650 gpm. (WSP 2021)

The "Schultz" well is located on Boone Avenue east of Molter. The well was reconditioned for domestic use in early 1997. Reconditioning work included videotaping the casing, pumping the well, chemical cleaning of the screen, running a pump test, sampling and testing the water quality. It is 235 feet deep with a static water level approximately 191 feet below the surface. The pump in this well is a 5 stage Peerless submersible pump. It is accompanied by a 400 horsepower VFD motor. The pump was set at a depth of 208 feet. The pumping capacity of the Schultz Well is approximately 2,950 gpm.

Table 1-1

Yield of District Wells and Pump Capacities

WELL	*SUSTAINED YIELD (GPM)	**PUMPING CAPACITY - 1,000 GPD
Kenney Well (*SO2*)	2,200	4,464
Mission Well (*SO3*)	Unknown	4,608
Sprague Well (*SO1*)	2,000	936
Valleyway Well (*SO4*)	Unknown	3,744
Schultz Well (SO5)	3,108	4,248
Eastside Well Field (#1&#2)	Unknown	0
*Based on well pump test. **Based on 24 hr. pumping.	**Total Daily Pumping Capacity:**	**18,000,000 gallons**

Storage

Total storage capacity: 4,616,200 gallons

There are nine water storage reservoirs within the District's boundary. The District owns all of the reservoirs. The Estates reservoir is located south of Inlet Drive, west of Liberty Lake Road. It is a steel tank that was constructed in 1980. The tank is non-elevated, with a wall height of 40 feet and a 98-foot diameter. The base elevation of this tank is 2251. The high water level is at elevation 2289.50 with an overflow elevation of 2290. The capacity of the tank is 2 million gallons, with capacity available to the entire system.

The second reservoir is located south of Dreamwood Circle above Liberty Creek Drive. It is a steel tank that was constructed in 1992. The tank is non-elevated, with a wall height of 24 feet and a 30 foot diameter. The base elevation of this tank is 2266. The high water level is at elevation 2289 with an overflow elevation of 2289.5. Capacity of the tank is 130,000 gallons. This storage is only available to services connected to the system south of the Lilac booster station. This includes a total of 68 ERUs.

The third reservoir is located near the Garry Booster Station. The Garry Reservoir is a welded steel reservoir that was constructed in 2000 along with a booster station upgrade and new transmission lines. The tank has a wall height of 24 feet and a diameter of approximately 42.79 feet. The base tank elevation is 2388.5 with an overflow elevation of 2412. The tank has a 250,000-gallon capacity.

The fourth and fifth reservoirs were primarily developed to serve the Legacy Ridge development on the western edge of the District. The first of these reservoirs is 78 feet in diameter with a wall height of 20 feet. The floor elevation of the tank is 2459 with a high water elevation of 2478. The capacity

of the tank is approximately 715,000 gallons. The second of these tanks is a 52-foot diameter tank with a high water elevation of 2679 and a floor elevation of 2660. The capacity of the second reservoir is approximately 314,000 gallons.

The sixth Water District reservoir is the Meadowood reservoir located off of Mission Ave. in the eastern section of the Water District. The tank is a precast concrete tank 60 feet in diameter with a bottom elevation of 2241.27 and an overflow elevation of 2289.5. The capacity of this reservoir is approximately 1,000,000 gallons.

The seventh and eighth reservoirs *(Kramer Hill Reservoirs 1 & 2)* are located just east of the Liberty Lake and Meadowwood Golf Courses above the Bella Lago development. These tanks serve an upper pressure zone and were constructed to serve new developments in the area with a total of 147 ERUs and 20,000 gpd (MDD) for Liberty Lake County Park irrigation needs. The new developments that are currently served by the reservoir include Bella Lago, The Lake Ridge development, and MacKinzie Bay. Each of the concrete tanks are 30 feet in diameter with a bottom elevation of 2416 and an overflow elevation of 2435.2. They each have a 93,600 gallon storage capacity with a total capacity of 187,200 gallons.

The ninth reservoir was constructed in 2020 and serves the Greenridge area. The reservoir has a total storage volume of 141,000 gallons and 135,500 gallons of operating storage. It is 20 feet in diameter and is 60 feet tall. It is a cast-in-place reservoir with a bottom elevation of approximately 2788 and an overflow elevation of 2846.5. This reservoir serves the 35 lots within Greenridge Estates as well as 15 lots in the Grande Vista Estates development. Due to elevations of some residents near the reservoir the Greenridge area is served by a booster station that draws water from the new reservoir. Grande Vista Estates is served by gravity through a pressure reducing valve. The reservoir is filled through a booster pump in the Ridgeview Estates Booster Station. The booster station was upgraded with new pumps at the same time as the reservoir was constructed in 2020.

Table 1-2 Storage Facilities

Tank Name & Location	Storage Capacity (*gallons*)
Estates Reservoir *South of Inlet Dr. West of Liberty Lake Rd.*	2,000,000 gallons
Dreamwood Reservoir *South of Dreamwood Circle above Liberty Creek Dr.*	130,000 gallons
Garry Reservoir *Near the Garry Booster Station*	250,000 gallons
Legacy Ridge 1 & 2 *Legacy Ridge Development*	1- 715,000 gallons 2- 314,000 gallons
Meadowwood Reservoir *Off of Mission Ave.*	1,000,000 gallons
Kramer Hill Reservoir 1 & 2 *Above Bella Lago*	187,200 gallons
Greenridge Reservoir *Greenridge Drive*	135,500 gallons
Total	**4,731,700 gallons**

Storage is an essential feature in a public water supply system. It is the most economical way to provide water during peak or emergency flow conditions. Water storage must be designed to fit daily fluctuations in demand (equalization storage, standby (emergency) storage, and fire protection). The projected storage requirements are shown on Table 3-2. It can be seen from this table, that the District's present storage capacity is adequate to provide the required storage volume until sometime in 2034.

Equalization storage is usually determined graphically from the area under the peak day demand curve and above the average peak day flow rate. This specific information is not available for the District, therefor equation 4-6 of the WSDOH Design Manual was used to determine required equalization storage.

Standby or emergency storage is required to provide water in case of source interruptions or distribution system failures. Examples would be power outages, pipeline breaks or well failures. A reasonable design emergency situation for the District is a pump failure at the Mission Well (the largest producing well) during a peak flow period in July or August. It was assumed that by public notification, consumption could be lowered almost immediately to an average day, peak month flow rate (1,526.1 gpd/ERU). Pulling the pump, locating the problem, and replacing the damaged pump was assumed to take two days. Standby storage should equal the difference between the system capacity without the Mission Well and the consumption requirements based on the flow rate for the

average day, maximum month, times two days. If the recommended minimum value of 200 gpd/ERU is higher than the evaluation above, this higher value should be used. For the planning period the 200 gpd/ERU is the higher value through 2029 and was used in Table 3-2.2030 through 2042 the 2-day scenario described above controls and was used in the table for those years.

Fire storage is the amount of stored water recommended by the Insurance Service office and the State of Washington Survey and Rating Bureau to extinguish fires of the duration and intensity that would occur in an existing structure. In the past the District used an estimated maximum estimated fire flow-rating requirement of 4,000 gpm over 4 hours. This estimate was based on a fire at Huntwood Industries. From discussions with Spokane Valley Fire District they explained that due to sprinkler requirements in buildings and improved firefighting procedures and equipment that fire suppression water requirements have lessened. They suggested that 3,000 gpm for 2 hours should cover any fire event that might occur in the District. The required fire storage volume has therefore been lowered to 0.36 million gallons. For system modeling purposes 2,500 gpm was used

based on the Fire District's email provided in Appendix X.

Since the recommended storage exceeds the storage available additional storage is recommended at this time. It should be noted that the pumping rate of all sources is only slightly below the PHD of the system so using Equation 7-1 of the DOH Design Manual results in a minimum equalizing storage of 185,500 gallons:

ES= (PHD-Qs)(150)

ES= (13,086.4-11,850)(150) = 185,460 Gallons

Although the system can provide minimum equalization storage, this reduced required volume is not recommended for the following reasons:

- Increasing pumping rates to accommodate equalization storage is not economical.
- Meeting peak demand periods with storage is more reliable than with increased pumping capacity.
- Due to limitations on instantaneous water rights additional pumping capacity may not be available or a viable option.

The calculations used to determine required storage volumes are shown below:

Basis for Storage Requirement Computation

Equalizing Storage= WSDOH Equation 4-6 = 1.970.9 gpd per ERU

Standby Storage= 2 x Avg Day/Max Month - 2 x pump capacity, or 200 gal/ERU Avg Day/Max. Month= 1,526.1 gpd per ERU

Pump Capacity= 10.38 MGD (without Mission Well and 20 hours pumping) Pump Capacity= 11.85 MGD (with Mission Well and 20 hours pumping) Fire Storage= 3,000 gpm x 60 x 2 = 0.36 MG

The pumping capacity above does not include the use of the Sprague Well.

Delivery

Boosters/Pressure relief valves –

The District has a total of Eight (*8)* water booster stations in their system. A description of each booster station is

provided below:

Lilac Lane Booster Station

This booster station is located near the intersection of Lilac Lane and Liberty Drive. It serves the residents along Liberty Drive as well as Dreamwood Bay and Pine Terrace along the west shore of the lake. The booster station is used to fill the Dreamwood Reservoir. The booster station is equipped with two 5 horsepower submersible Goulds Model 150H pumps inside 8- inch spools that pump to a manifold connected to an 8-inch main in Lakeside Road. The service area of this booster is still in Pressure Zone 1 with the booster used to overcome system losses in the distribution system south along the west shore.

Meadowwood Estates Booster Station

The Meadowwood Estates Booster Station is located on North Dunbarton Oaks Lane northeast of King James Lane. This booster station is an "off-line" booster that only operates during high demand and fire flow conditions. It operates off the main line pressure and serves the higher portions of North Dunbarton Oaks Lane and North Lancaster Lane. It has two *(2)* PACO model 1070-5 pumps with three (3) horsepower motors capable of pumping 65 gpm at 93 feet of head and is housed in a below-grade vault.

Legacy Ridge Booster Station #1

This booster station is west of North Legacy Ridge Drive between East Country Vista Drive and East Mullan Lane. It is a "Can" style booster station with five (5) Grundfos CR-90 pumps run by 50 horsepower motors. The booster station serves Pressure Zones 3, 4, 5, and 6 of the development through a network of distribution mains and PRV's. The booster fills the Legacy Ridge #l reservoir. The pumps are in parallel and have capacities of 553 gpm with one pump running up to 1,950 gpm with all five running.

Legacy Ridge Booster Station #2

This booster station is located next to the Legacy Ridge Reservoir #1. The booster station serves Pressure Zones 6 and 7 of the development. It is also a "Can" style booster station with three
(3) Grundfos CR-90 pumps run by 40 horsepower motors. The booster station fills the Legacy Ridge #2 reservoir. The three pumps run in parallel with capacities of 525 gpm with one pump running and 1,486 gpm with all three running.

Ridgeview Estates and Greenridge Booster Stations

The Ridgeview Estates booster stations are located north of North Timberfield Lane. The station is composed of a pump house with three booster pumps. Prior to the construction of the Kramer Hill reservoirs this booster served a closed loop system. With the construction of the reservoirs two of the booster pumps along with the electrical and telemetry were upgraded to allow the station to fill the new reservoirs. The two new pumps are Grundfos

20 pumps. Each pump is capable of pumping 100 gpm at 192 feet of head. They are run with 10 horsepower motors.

This booster station building also houses two booster pumps for the residents on Greenridge. With the consolidation of the Greenridge system into the District improvements to the booster station included installing two new Grundfos CR 32-10 booster pumps. Each pump is capable of pumping 129 gpm at 705 feet of head. They are run with 40 HP motors. These pumps pump into the Greenridge Reservoir.

Greenridge System Booster Station

The Greenridge System Booster Station is located on the top of Greenridge. It was installed as part of the improvements during consolidation. The booster station is located in a portion of the old Greenridge reservoir which was decommissioned when the new Greenridge Reservoir was constructed in 2019. The booster station is composed of two system pumps for supplying normal system demands and one fire pump to meet fire demands. The two system pumps are Grundfos CRE 15-1 N-B-A-E-HQQE pumps that provide 60 gpm at 35 feet of head. These pumps run with 2 HP motors. The fire pump is a Grundfos VL 80123 pump that provides 1,500 gpm at 50 feet of head. The pump runs on a 25 HP motor. These pumps pump water out of the Greenridge Reservoir.

Garry Road Booster Station

Prior to 2001 the Garry Road booster station provided water to a "closed looped" system. The station generally served South Garry Road, South Molter Road, and South McKinzie Road. In 2001 the booster station was upgraded and a new water storage reservoir was constructed off of Molter Road along with a distribution main connecting the two. The booster station is equipped with two *(2)* 30 horsepower pumps capable of pumping 480 gpm at 192 feet of head. The booster station is used to fill the Garry Road Reservoir.

Booster Station	Number of Current Connections	Number of Reserved Connections	Total Number of Connections Possible
Garry Street	39	N/A	39
Meadowwood Estates	11	N/A	11
Lilac	68	N/A	68
Ridgeview Lower	76	72	148
Legacy Ridge 1 & 2	436	96	532
Greenridge Lower	50	2	52
Greenridge Upper	35	2	37

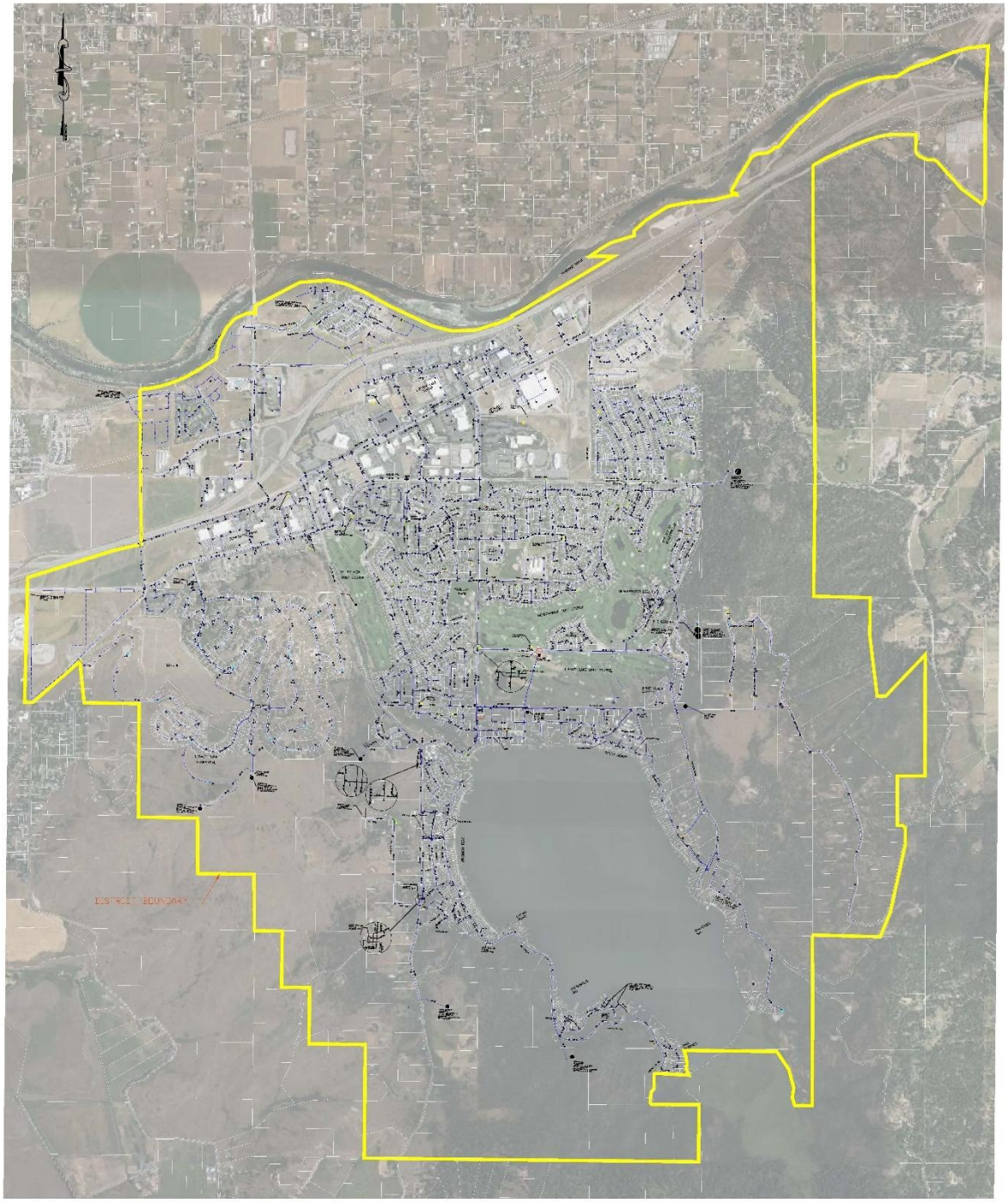
Transmission lines –

There are approximately eighty (*80*) miles of distribution piping in the system at present. This piping ranges in size from 2-inches to 18-inches in diameter. There is a variety of pipe material throughout the system. Below is a summary of the total footage of each pipe material in the District:

Pipe Material	Total Footage
Ductile Iron (*D.I.*)	353,741
Steel (*ST.*)	10,544
Polyvinyl Chloride (*PVC*)	19,456
C-900 Polyvinyl Chloride	141
Asbestos Cement (*A.C.*)	14,515
Cast Iron (*C.I.*)	8,331
Permistran (*Perm.*)	12,036
HDPE	205
Galvanized Iron (*G.I.*)	4,029
TOTAL	**422,998**

The existing water distribution system within the District is in relatively good condition. Most of the system in the north part of the District is less than 20 years old. The old McHenry system, which serves the west side of the lake, is partially comprised of considerably older pipe and is not in as good a condition. Portions of the old McHenry system were replaced or upgraded in 1989, 1990, 1992, 1993, 1997, 2005, and 2013. There are also areas in this older portion of the system that have under-sized water distribution mains. Examples are the 2-inch lines on Edgewood and Tum Tum Drive. These are discussed in greater detail in Chapter 8, Improvement Program, of this plan. One of these older water mains along South Liberty Drive was replaced in 2019. This project replaced approximately 3,700 feet of old 4" water main with 8" ductile iron pipe from Lilac Lane (extended) to 500 feet south of Tum Tum Drive. With the consolidation of the Eastside and Greenridge systems the District took ownership of the water mains that serve the areas. These were older mains in very poor condition. All the mains within the Greenridge area were replaced with 10" and 8" ductile iron pipe. Much of the Eastside system has been replaced with 8" ductile iron pipe. There are still a few sections within this area that need to be replaced.

Schematic



NOTE:
MAP IS SCHEMATIC IN NATURE & IS NOT INTENDED TO DEPICT EXACT LOCATIONS OF PIPES & STRUCTURES

CENTURY WEST ENGINEERING

PREPARED BY CENTURY WEST ENGINEERING CORP.
SCALE – 1"=750'
CURRENT T-RU DECEMBER 2020

LIBERTY LAKE SEWER AND WATER DISTRICT

WATER SYSTEM MAP

ABBREVIATIONS

B.O.	BLOW OFF
AVRS	AIR/VAC RELEASE STATION
D.I.	DUCTILE IRON
STL	STEEL
GALV	GALVANIZED
PERM	PERMASTRAN
PRV	PRESSURE RELIEF VALVE

LEGEND

FUTURE WATER MAIN	
EXISTING WATER MAIN	
RESERVOIR	●
VALVE	⋈
HYDRANT	✱
AVRS	▲
BLOW OFF	⊖
PRV	⊡

Connections

The Liberty Lake Sewer and Water District provides water service to three classes of customers: commercial/industrial/irrigation, multi-family residential and single-family residential. 3,676 water customers and 250 irrigation customers at the end of 2020. The total number of ERUs connected to the system in 2020 was approximately 5,999.

A list of capital deficiencies

1.) Inadequate Pressure and Flow

Through hydraulic system modeling and historical information one area within the District's water system is identified as experiencing low pressures during fire demands and inadequate fire flow capability. This area is listed below:

a. Edgewood and Tum Tum Drive.

The reason for this inadequacy is the undersized (2-inch) water main.

The District plans to improve the water system in areas that experience inadequate fire flow. The only feasible alternative is to replace the current 2-inch mains with a new 8-inch main, and add fire hydrants at appropriate locations. The 2-inch main line is located in a heavily bedrocked and enclosed area which will be difficult to access for improvement. Planning and construction will be costly for the District.

2.) Overall System Hydraulic Improvements

The hydraulic efficiency of large portions of the District can be improved by increasing line sizes along certain sections of the distribution system or linking portions with new sections and improving the "looping" character of the network. The hydraulic model does not show a deficiency in this area, however, efficiency for water usage is an important aspect of the Districts overall goals. These improvements are identified below:

A 2-inch water main in Wright Street between Clark and Melkapsi serves several residents along Wright. The line will be replaced with an 8-inch line to provide better flow and pressure to the residences. This work will be completed at the same time the Clark and

Melkapsi mains are replaced.

3.) Less than Standard Level of Service

Some areas within the District are receiving less than what the Sewer and Water District feels is a "standard level of service". Although these areas within the distribution system can provide sufficient pressure and flow, there are system restrictions that impact the delivery of water to the customers. These areas include:

b. Undersized distribution lines in Edgewood and Tum Tum Drive.

There are customers in the Tum-Tum/ Edgewood area, which the District believes, receives less than standard level of service because of undersized distribution lines.

4.) Recent or Future Growth Demands

The current water system requires additional storage to meet standards. The District plans to install a new 2 million gallon reservoir on a site the currently own or one that they will trade land for. The storage requirement may be delayed with the construction of a new well, the final timing for additional storage will be dependent upon the final capacity of the new well.

The Greenstone development north of the freeway will require the addition of distribution piping. This development is in the planning stages, and the developer will be required to install the water system upgrades necessary to meet the needs of the development.

5.) Required Routine Maintenance

Inspection of reservoir coatings are currently done annually for deterioration and damage. These inspections will identify any issues with the coatings before the damage is unrepairable, reducing future maintenance costs.

From previous inspections staff believes the Dreamwood reservoir will require repainting both inside and out 12 to 14 years.

6.) Improved System Operations

The list of improvements below, were developed to improve the reliability of the water distribution system and to reduce operator time and cost:

c. Lakeridge Booster Improvements will be completed to reduce pump operation and maintenance time.

d. Radio read meter replacements.

e. Kramer Way Water Main.

f. Meadowood Pressure Zone Improvements.

g. Auto Main Line Flushing Stations.

The Lakeridge booster station is an on-line booster that feeds into the main distribution main but only serves a limited number of residences. Due to increased demands on this portion of the system the booster station runs almost continuously. Separating the homes that need to be on the station and installing new electrical equipment will reduce wear and tear on the equipment and the staff time to operate and maintain the equipment.

Some of the District's current service meters are still on manual read. These require significant manpower to get service use data for billing purposes. Replacing the existing meters with radio read will reduce the staff effort and allow the District to bill residential customers on a monthly basis.

The Kramer Way water main includes extension of the water system from East Valley Vista Drive to Country Vista Drive. This line will tie into the distribution system at both ends and will improve the hydraulics of the system and eliminate two dead end mains. The project will be completed in the summer of 2022 and will be paid for by the developer of Legacy Ridge.

A small portion of the Meadowwood development is on a booster station to provide adequate system pressure for a small number of houses. Connecting the upper pressure zone from the Bella Lago development along with pressure reducing valves on either side of the connection would eliminate the need for this booster station.

There are several locations within the water system that are dead ends. These dead ends currently have blow off assemblies that need to be manually operated. Placing timed flushing valve at these stations will reduce the need for staff time and provide better water quality control.

7.) Replace Deteriorated Infrastructure

Some of the District's infrastructure has served beyond its design life and needs to be replaced. This infrastructure often represents a risk of failure and at times requires significant operation and maintenance funds to keep it functional. Improvements that fit into this category are listed below:

a. Melkapsi, Clark, and Liberty Dr. Water Main Replacement

These water mains are part of the old "McHenry" system and are in need of replacement. The old 6-inch cast iron line will be replaced with a new 8-inch ductile iron pipe to meet District Standards.

b. The booster pumps in the Garry Road Booster Station have reached their design life. They are experiencing operational issues and parts are difficult to find. The pumps and motors need to

be replaced. The booster station building is also in need of repair, including exterior siding, roofing, and decommissioning of the exterior storage tank.

c. Dreamwood Circle water main replacements. The water mains within Dreamwood Circle are over 40 years old and need to be replaced. The old steel lines will be replaced with new 8" ductile iron pipe.
d. Legacy Ridge Booster Station Building Rehabilitation. This booster station building needs new siding and a new roofing.
e. Alpine Shore Water System Replacements. These lines are also over 40 years old and need to be replaced.
f. 3rd Avenue Water Main Replacement. This line is part of the old Eastside Liberty Lake Improvement Club system and does not meet district standards and will need to be replaced.
g. Windsong Water Main Replacement: This old line needs to be replaced between the two previous system improvements on Star Lane and Neyland Ave.
h. The backup generator at the District's Mission Well is old and beyond its design life. To improve reliability the generator needs to be replaced.
i. The Lilac Lane Booster station which provides water the southwest side of the lake and to the Dreamwood reservoir was constructed in the 1980's and the pumps and controls are outdated and in need of replacement.

8.) Source

The District will need to add an additional well in the future. Water right changes that are currently being processed by WSDOE will allow the District to develop a portion of the need long term source capacity. The Water rights the District currently owns are adequate for their annual needs but additional instantaneous rights will be needed to address future demands. The new well is expected to be needed before 2029. The District has purchased additional property at their Kenney Well site to accommodate a second well in that location.

When all of the identified improvements were placed in the system model the results show that all of the deficiencies with the system are removed.

A list of projects (capital projects) to cure them

Table 8-1

Water System Improvement Schedule

Improvement Title	Type of Improvement	Description	Est. Cost	Funding Source	Year	Priority
Kramer Way Water Main Extension	Distribution Improvement	Install new 12" water main between East Valley Vista Dr. & Country Vista Dr.	Unknown	Developer	2022	1
Radio Read Meter Replacements	Distribution Improvement	Replace all existing meters with Radio Read.	220K, 231K, 242.6K, 254.7K,267.4K	District Funds	2022-2027	2
Eastside Phase 4 Lee, 3rd Extended, 2nd Ave Completion, Sandy Beach (Neyland to 3rd), Clubhouse, Valleyway connection, 2- Sprague fire hydrants, and service on 2nd.	Distribution Improvement	Replace mains and services.	$843,000	WSDOH-SRF	2023	3
Wright St., Melkapsi, Liberty Drive Water Main Replacements	Distribution Improvements	Wright – Clark to Melkapsi, Clark – Garry to Liberty, Liberty – Clark to Melkapsi	$1,129,000	PWTF/WSDOH SRF	2023	4
New Source well	Source	Install New Drinking Water Well	$2,600,000	PWTF/WSDOH SRF	2027	5
Mission Well Generator	Source	Install new backup generator at Mission Well.	$230,000	District Funds	2024	6
Garry Road Booster Pumps & Building Rehabilitation	Distribution Improvement	Replace existing pumps and motors and rehab building	$150,000	District Funds	2026	7
Lakeridge Booster Generator	Distribution Improvement	Replace existing generator at booster station	$144,300	District Funds	2026	8
Lilac Lane Booster Station Upgrades	Distribution Improvement	Replace Booster Pumps & Controls	$160,000	District Funds	2026	9
Edgewood/Tum Tum Line Replacements	Distribution Improvements	Upgrade 2-inch Mains to 8-inch	$545,000	District Funds	2027	10
2 Million Gallon Reservoir May be delayed with new well	Storage	Construct new storage	$3,500,000	PWTF/WSDOH SRF	2028	11

Meadowwood pressure Zone Improvements	Distribution Improvements	Connect upper pressure zone to Meadowwood	$400,000	District Funds	2029	12

Improvement Title	Type of Improvement	Description	Est. Cost	Funding Source	Year	Priority
Dreamwood Circle Water Main Replacements	Distribution Improvements	Replace water mains in Dreamwood Circle	$550,000	PWTF/WSDOH- SRF	2030	13
Legacy Ridge Booster Station #1 & #2 Building rehabilitations	Distribution Improvements	Rehabilitate building with new siding and roofing	$80,000	District Funds	2031	14
Alpine Shores Water Main Replacements	Distribution Improvements	Replace water mains within Alpine Shores	$1,600,000	District Funds	2034	15
3rd Ave Water Main Replacement	Distribution Improvements	Replace water main in 3rd Ave.	$333,000	District Funds	2035	16
Dreamwood Reservoir Rehabilitation	Storage	Repaint and repair as-needed reservoir structure	$260,000	District Funds	2036	17
Windsong Water Main Replacement	Distribution Improvements	Replace water main across Windsong bay Star Lane to Neyland	$400,000	District Funds	2038	18
Install flushing stations	Distribution Improvements	Install auto flushing stations in various locations in the system	$100,000	District Funds	2040	19

Table 9-1

Liberty Lake Sewer & Water
District Completed Water
System Improvements

Recommended in the 2015 Comprehensive Water System Plan

Improvement Title	Type of Improvement	Description	Funding Source	Year

Upgrade Electrical Gear, Pump & Starter – Mission Well	Source Improvement	Mission – Installed Soft Start	District Funds	2017
Coating Inspections	Reservoir Maintenance	Coating Inspections Due for Reservoirs	District Funds	2022
Liberty Drive Main Replacement	Distribution Improvements	Replaced 6" Steel Main from Lilac Lane to Dreamwood (3,693')	District Funds	2020
Radio Read Meter Replacements	Distribution Improvements	Replaced 2,142 Meters with New Radio Read Meters	District Funds	2018-2020
Sprague / Molter Loop	Distribution Improvements	Constructed as part of Phase 1 Eastside	WSDOH - SRF	2019
Kenny Well Flushing Improvements	Source Improvement	Constructed flushing abilities at the well.	District Funds	2018

Water rights deficiencies

planning period. It is anticipated that the current water rights will meet the District's needs The District's water rights are currently adequate to meet projected demands for the 20-year beyond the year 2042. A copy of the capacity table analyzing water rights adequacy is included in AppendixG.

The District's application for integrating their water rights to allow for a total withdrawal rate for the combination of the 5 withdrawal points has been approved. The District submitted proof of appropriations for water rights G3-27708P and 1953-A and these were approved. Water right applications have been submitted to WSDOE to change the ownership and points of withdrawal three water rights that were acquired through consolidation with Eastside Liberty Lake Improvement Club and Greenridge Homeowners Association. These rights are G3-21382 C and 2290-A from ESLLIC and G3-27809 from Greenridge. These changes are described in more detail in Section C. Water right documents and approvals are included in Appendix G.

The total existing water rights for the district exceed both the annual and instantaneous production requirements with current *(2020)* water consumption. The water rights are adequate to meet instantaneous and annual demands through the planning period *(2042).* The water rights are summarized in Table 4-1.

The Schultz Well was refurbished in 1997 for domestic use and has a capacity of approximately 3,108 gpm. The water right for this well was relinquished to the County by agreement. The Schultz Well was integrated into the 4 other Liberty Lake Sewer and Water District's water rights as an additional point of withdrawal, on April 30, 1999. This allows the District to withdraw water from the Schultz Well under the water rights for the District's 4 other wells. Copies of the District's water rights are included in Appendix G of this Plan.

Although the total existing water rights for the system are presently adequate, the individual water right for the Mission Well was not enough for the capacity of the pump in that well. To remedy this situation, the District's water rights were integrated to allow a total withdrawal rate from the combination of the 5 withdrawal points rather than an individual withdrawal rate from an individual well source. The integration of the District's water rights has accommodated a higher withdrawal rate at the Mission Well to meet the higher pumping capacity of the pump in that well.

Water rights G3-20130C and 1953-A were acquired for an additional 1,150 gpm instantaneous and 457.1 acre-feet of water which was originally intended for irrigation purposes but has been changed to a domestic use water right. Proof of appropriations were filed with DOE for these water rights and were approved.

The District acquired a water permit from Consolidated Irrigation District under Ground Water Permit No. G3-27708P. This assignment of rights increases the water rights of the District by 3600 acre-feet per year and 4500 gpm instantaneous withdrawal. Proof of appropriation is required by October 1, 2037 for this permit.

The District acquired additional water rights from the consolidation of the Eastside Improvement Club and the Greenridge water systems.

The water rights acquired from Eastside included Certificate G3-21382 C. G3-21382 C is currently for 562 gpm and 166.75 Ac. Ft./Yr. for continuous domestic supply and 250 gpm and 69 Ac. Ft./Yr for Irrigation; Fire Protection from April 1 through September 30. The District has an application into WSDOE to change the points of withdrawal on the water right to the District's 5 wells, change the place of use to the District's service area and change the purpose to continuous municipal supply. This application is still pending.

The second water right acquired from Eastside is under Certificate 2290-A. 2290-A is currently for

350 gpm and 135 Ac. Ft./Yr. for continuous domestic supply for community. The District has an application into WSDOE to change the points of withdrawal on the water right to the District's 5 wells, change the place of use to the District's service area and change the purpose to continuous municipal supply. This application is still pending.

The District also acquired the water right from Greenridge Estates under Certificate G3-27809. G3-27809 is currently for 150 gpm and 26 Ac. Ft./Yr. continuous municipal supply. The District has an application into WSDOE to change the points of withdrawal on the water right to the District's 5 wells and to change the place of use to the District's water service area. This application is still pending.

An application for an additional 1500 gpm and 924 acre-feet per year has been applied for (*application no. G3-29362*) and is pending DOE approval. WSDOE denied this application in May 2018 along with most other applications for new water rights in the SVRP Aquifer. The determination of denial is included in Appendix G.

City of Medical Lake

Source

1.3 Inventory of Existing Facilities

The City of Medical Lake currently operates and maintains two well sources; Lehn Rd. Well #3, (SO3) and Craig Rd. Well #4, (SO4), a 1.5 MG Reservoir, and their transmission/distribution system. There are two metered interties with the State system such that the City can purchase additional water from the State.

The State distribution system operates on a higher head than the City's and pressure reducing valves are necessary for the interties. The City's distribution system is then independent of the State's system and is owned and operated solely by the City. Pipe sizes vary from 18-inch down to 4-inch and smaller. All connections are metered. There are no booster stations or higher level systems. Normal system pressures vary from 85 to 60 psi and are generally quite acceptable. Lower pressures are normally due to high usage and small lines rather than the static head. The City currently has about 1,632 water connections. The City has one wholesale water agreement with the Strathview Water District No. 16, and an emergency intertie with the Four Lakes Water District No. 10.

3.3.1 Source

As discussed above, the City receives water from two City wells and two intertie stations with the State Institution's system. The Lehn Rd. Well (SO3) is located some 3.5 miles west of town on Lehn Rd. and the Craig Rd. Well (SO4) is located some three miles east of town at the intersection of SR 902 and Craig Rd. The Lehn

Rd. Well was installed in 1978and has been a dependable producer of about 550 GPM. There is seasonal fluctuation of the groundwater level (145′ to 215′ static level), but to date the well has not been adversely affected. The Craig Rd. Well was installed in 1995 and was test pumped to be a production well of 1,200 GPM. At that time the static water level was 53 feet. In the past several years the water table has been dropping, causing an extremely critical condition for the City. In 2006 the static water level high was at 146 feet with a low of 194 feet in August.

The Craig Rd. well was drilled to a depth of 1,404 feet with 16-inch casing to 324 feet and 12- inch casing installed from 316 feet to the bottom of the well at 1,404 feet. The 12-inch casing was then perforated at three different levels or water bearing zones. The pump test records show 171 feet of draw down at 1,000 GPM and 233 feet of drawdown at 1,400 GPM. Initially a 200 HP submersible pump was installed with the bottom of the bowls at about 300 feet and pumped about 1,200 GPM at the prescribed Total Dynamic Head (TDH). This worked fine until the water table began to drop and a host of problems arose. As the pump output fell due to the increased TDH, the City elected to install a new 300 HP vertical turbine pump with a variable frequency drive (VFD)to a lower depth (520+/- feet). When the submersible pump was pulled, an inordinate amount of rust colored material was discovered on the pump and submersed column pipe. Experts were called in, the material was determined to be a type of algae and not iron bacteria. Believing the material was clogging the well casing perforations, the well and pump piping were chemically treated. A television scan of the treated well indicated the material was essentially gone and the well looked normal and in good condition. The new well pump was installed, but at about 320 feet, or so, the new pump refused to move any deeper apparently at the point where the casing goes from 16″ to 12″. It should be noted that the new pump design was to develop 1,200 GPM at a TDH of 610 feet. This required 10″ bowls with 19 stages, an abnormally large pump configuration. With the pump setting at about 320 feet, the output was about 900 GPM. As the water table continued to drop, the output was reduced to about 550 GPM in 2006 and not enough water to meet peak demands without relying heavily on the interties. The original well driller and the pump installer were called in to re-think the problem. It was concluded that the 10″ pump bowls should fit inside the 12″ casing as originally designed. In January 2007, the pump installer made another attempt to lower the pump. This time he was successful and the pump and 20-foot tailpiece intake were lowered to about 500 feet. In a two hour pump test the pump produced 1,200 GPM with the drawdown or pumping level at approximately 341 feet from the surface. The City previously operated the pump at 700 gpm; however, since then the aquifer has regained some height and Airway Heights has stopped using their well, the City can operate the pump at about 1,100 gpm. With the VFD function, the City can quickly and easily increase the output to 1,200 gpm or lower the flow if so desired.

The Dept. of Ecology admits that there is very little technical information available on the groundwater in this area. They do recognize that the water has been "mined" in the past and has exceeded the rate of recharge. While this trend has somewhat

reversed, it is difficult to predict what water levels may be in the future. While the City has solved their immediate problem, it is apparent that other solutions (alternate sources, conservation, reclaimed water, etc.) must be implemented along with a City of Spokane Intertie, without undo delay. For the purposes of this plan, a Craig Rd. well pumping rate of 1,100 GPM will be used.

The two intertie stations remain operable and available for peak demands, but subject to the demands of the State system. As previously stated, there is no hard and fast agreement on the amount of water each entity is entitled to use. The two systems must be operated to the mutual benefit of both parties. The following Table 3.3.1 provides particulars of the City's two wells.

Table 3-3.1.1

Description	(S03) Well No. 3	(S04) City Well No. 1
Location	4 miles West of Town	Craig Rd & SR 902
Installation Date	1/12/78	3/28/95
Well Diameter	16" to 836' - 12" to 964'	16" to 324' - 12" to 1,404'
Well Depth	964'	1,404
Static Water Level	+/- 110'	194′ – Aug. 2006
Pump HP	125	350
Pump Capacity	650 GPM	1,100 GPM
Water Right No.	G3-25319 P	G3-28914P

All of the well sources for the City and the State Institutions are chlorinated at the various pumphouses. The Craig Road well is equipped with an auxiliary electrical generator to operate the pump during power outages. The City wholesales water to the Strathview Water District No. 16 under a maximum allotment of 200 GPM or 288,000 gpd.

Below is a table containing the above wells along with the North, South, and Strathview Interties. The wells and N/S interties are going into the system, the Strathview Intertie is going out of the system; when summed this presents a Total Effective Pumping into the ML Zone.

Well & Intertie Attributes, Table 3-3.1.2

Well Station / Intertie		
Zone	**Well #:**	**Flow (gpm).**
CSS	**North Intertie**	540
CSS	**South Intertie**	600
ML	**SO3-Lehn Rd.**	650
ML	**SO4-Craig Rd.**	1,100
SV	**Strathview-Out**	(200)
	Total Effective Pumping into Zone (gpm):	**2,690**

3.3.4 Source Analysis

Table 3.3.4
SOURCE ANALYSIS

	Planning Period		
	Existing	**6-Year**	**20-Year**
Maximum Day Consumption (gal.)	2,431,044	2,562,594	3,082,217
Required 24 Hr. Pumping Rate (gpm)	1,688	1,780	2,140
Required 18 Hr. Pumping Rate (gpm)	2,251	2,373	2,854
Existing Pump Capacity (gpm)-*Effective Pumping*	2,690	2,690	2,690
Indicated Excess or (Deficiency)	**439**	**317**	**(164)**

*City of Spokane Intertie will add 200 gpm for continuous use and up to 600 gpm for emergency use. The facilities are designed for up to 3,000 gpm with the changing out of the pumps.

Storage

Total storage capacity:

3.3.2 Storage

The City of Medical Lake completed construction of a 1.5 MG reservoir with an overflow elevation of 2,617′ in the spring of 1998. The reservoir is located on high ground northeast of the City and provides the static head for the system. A pressure sensing transducer provides the level control function, starting and stopping the City's Lehn Rd. and Craig Road well pumping stations. Water from the State's system augments this source through two automatic pressure regulated interties. The amount of water coming from the State can be regulated by manually adjusting one or both of the intertie pressure valves. This can be made to vary from zero flow to the total flow required. Water levels in the reservoir are then controlled by the setting on the intertie valves when the wells are not being pumped. The State system includes a 2.0 MG and 0.55 MG reservoir at Eastern State Hospital and a 1.0 MG reservoir at Lakeland Village. All three of these reservoirs are higher than the City's reservoir and all can provide water to the City. There are no other pressure levels in the City's system.

3.3.5 Storage Analysis

Table 3.3.5
STORAGE ANALYSIS

	Planning Period		
	Existing**	**6-Year**	**20-Year**
SB-Initial Calculation	-851,856	-820,808.0	-649,500
If SB<0, SB =200x N SB-Standby Storage	369,600	389,600	468,600
If ES<0, ES =0 ES-Equalizing Storage	35,250	57,150	143,700
FSS-Fire Suppression Storage	*240,000*	240,000	240,000
OS-Operational Storage	*99,460*	*99,460*	*99,460*
Total Storage Required:	744,310	786,210	951,760
Total Storage Available:	*1,500,000*	1,500,000	1,500,000
Indicated Excess or (Deficiency)	**755,690**	**713,790**	**548,240**
OS & ES Depleted:	134,710	156,610	243,160
OS & ES Elevation:	*2,614.29*	*2,613.85*	*2,612.11*
OS, ES, & FSS Depleted:	374,710	396,610	483,160
OS, ES, & FSS Elevation:	*2,609.47*	*2,609.02*	*2,607.28*

From the above calculations the existing 1.5 MG reservoir is adequate to serve the City's existing 6-year and 20-year water needs. It should be noted that as the source capacity increases, the Equalizing Storage requirement decreases. The existing reservoir should provide adequate storage for the City well into the future.

Delivery

Boosters/Pressure relief valves –

A C.S.S. pressure station is located between the well field, near Espanola, and the reservoirs at Eastern State Hospital. The booster pump is required during high demand periods only, for the C.S.S. system.

Transmission lines –

3.3.3 Transmission/Distribution

Pipe sizes in the City's distribution system range from a relatively minor amount of 2-inch and smaller up to 20-inch. The following Table 3.3.3 provides an inventory of the existing buried pipe and approximate footage of each.

Table 3.3.3.1
Water Main Inventory

2" & Smaller	4"	6"	8"	10"	12"	16"	18"	20"	Total
4,981	2,950	57,420	26,100	6,970	13,120	19,800	16,190	3,920	151,451
3.3%	1.9%	37.9%	17.2%	4.6%	8.7%	13.1%	10.7%	2.6%	100%

Total footage of pipe is approximately 151,451 feet or some 28.7 miles.

It should be noted in the above inventory that the 18-inch main is the transmission main from the Craig Road well back into the City along SR 902 and the 20-inch main runs from SR 902 up to the reservoir. A 16″ transmission main serves the Lehn Rd. well. The existing distribution system is well looped and service is extended to all sectors of the City providing adequate water service to all of the users. During the past several years the City has made substantial improvements to the transmission capabilities within the system and further improvements are planned for the future on a small scale from budgeted funds.

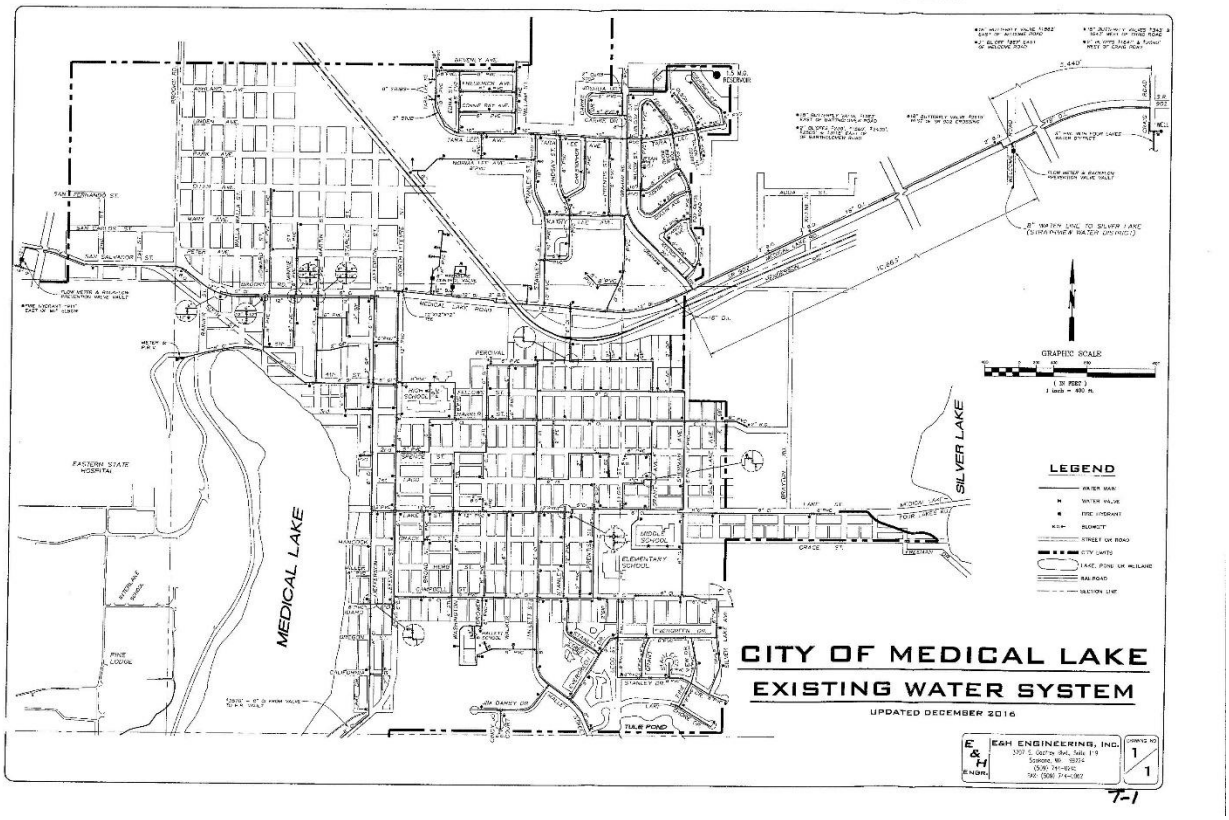
The below table summarizes the various information above and in Chapter 2 to produce the following Source and Storage Analyses.

Table 3.3.3.2
Analysis Parameters

Planning Period	Number of ERU's (N)	MDD (gpd/ERU)	Maximum Day Consumption	Annual Gallons Used	Annual Gallons Used Less 1%/2yrs.	ADD (gpd/ERU)	C	F	PHD (gpm)	Q_S (gpm)	Q_L (gpm)
Existing	1,848	1,315.5	2,431,044	262,671,000	0	389	1.6	225	2,925	*2,690*	*1,100*
6-Year	1,948	1,315.5	2,562,594	276,727,036	268,294,845	377	1.6	225	3,071	*2,690*	*1,100*
20-year	2,343	1,315.5	3,082,217	332,823,591	299,410,096	350	1.6	225	3,648	*2,690*	*1,100*

**Inches = Entered Data*

Schematic



Connections

Population served and number of service connections - People: 4,982, Connections: 1,527

A list of capital deficiencies

3.4 Summary of System Deficiencies and Proposed Improvements

Source

As stated, the City faces a critical situation and an additional water source must be developed. Chapter 8 discusses possible alternatives for the City.

Storage

The City's 1.5 MG reservoir provides adequate storage capacity through the projected 20-year needs of the City. No deficiencies are noted for the next 6-year planning period.

Transmission/Distribution

The transmission/distribution capabilities of the water system are adequate, but several older water mains are in need of replacement. Also, as street reconstruction projects proceed, improvements are made to existing water mains; this program will continue. The City also performs minor annual improvements with their own personnel and annually budgeted maintenance funds; this program will continue.

This includes conversion to an AMR system for all service meters. To date, all meters have been replaced and the City is proceeding with the installation of the radio component.

A list of projects (capital projects) to cure them

CHAPTER 8 IMPROVEMENT PROGRAM

Chapter 3 of this Plan identified that the existing source facilities can meet the existing demands, but that additional source(s) and/or other alternatives must be implemented in order to meet the projected 6-year needs. The existing 1.5 MG reservoir should be adequate to meet the City's 20-year projected needs. The Hydraulic Analysis determined that the distribution system has adequate capacity for fire flow needs throughout the system; however, it is noted that the furthest westerly hydrant on Lake St. is fed by a 6″ C.I. pipe that has borderline capacity for serving that hydrant. Model flow for this hydrant is approximately 996 gpm.

Other minor improvements to the distribution system will be done by city personnel from budgeted funds. This includes the continuing effort to complete an AMR program on all services. It is noted that all water mains to benefit or serve new development are installed by the developers at no cost to the City. This has been the practice in the past and will continue into the future. The City's Improvement Plan consists of the following elements. Three water main projects are proposed that would upgrade existing conditions. Cost estimates are provided in Chapter 9.

The City's first priority is to complete the proposed intertie with the City of Spokane. A cost estimate is provided in Chapter 9 for this project. To date an Intertie Agreement has not been signed such that significant criteria is not available. It is the City's current intent to construct this facility in 2017 and a Project Report will be prepared. No other capital improvements are proposed at this time.

The City's water system Capital Improvement Plan is as follows:

Name	Proposed Year of Construction
1. Spokane Intertie	2017
2. Staples/James St. (Water Main)	2019
3. Lake St./Hallett to Grant (Water Main)	2020
4. Lefevre St./Campbell to 4th (Water Main)	2022

9.1 Project Cost Estimates for 6-Year Plan

Separate cost estimates are provided for three proposed distribution system improvement projects. These relate more to operation and maintenance than capital improvements as they are essentially repairs of the existing system by replacing older water mains. They are included in this WSP so that their significance is not lost and are not specifically scheduled for completion at this time. This will occur when annual budgets are prepared.

Construction of an intertie with the City of Spokane is the primary capital improvement proposed for the 6-year planning period. A cost estimate for this project is included. It is the City's intent to implement this project in 2017 using funds from their operating budget as shown in the following section.

City of Medical Lake
8" Water Main Extension - Staples - James St. to 4th

Item No.	Description	Estimated Qty.	Unit Price	Total Amount
1	Mobilization	Lump Sum	$ L.S.	$10,000.00
2	Clearing and Grubbing	Lump Sum	$ L.S.	$2,000.00
3	8" PVC C-900 Pipe, In Place	500 L.F.	$35.00	$17,500.00
4	8" R.S. Gate Valve & Box, In Place	2 Ea.	$1,500.00	$3,000.00
5	New Fire Hydrant Assembly	1 Ea.	$4,000.00	$4,000.00
6	Six-inch Hydrant Pipe	15 L.F.	$50.00	$750.00
7	Exist. System Connection	Lump Sum	$ L.S.	$3,000.00
8	1" Service Connection	6 Ea.	$400.00	$2,400.00
9	1" Poly. Service Line (Trenched)	100 L.F.	$15.00	$1,500.00
10	1" Water Meter and Meter Box	6 Ea.	$700.00	$4,200.00
13	Trench Excavation Safety	Lump Sum	$ L.S.	$1,000.00
15	Fence, Landscape, & Surface Repair	Lump Sum	$ L.S.	$2,000.00
16	Crushed Surfacing Top Course	73 C.Y.	$35.00	$2,555.00
17	Hot Mix Asphalt (4")	560 S.Y.	$35.00	$19,600.00
18	Hydroseed	Lump Sum	$ L.S.	$1,000.00
			Subtotal: $	**$74,505.00**
			Plus 8.7% WA State Sales Tax: $	**$6,500.00**
			TOTAL CONSTRUCTION AMOUNT: $	**$81,005.00**
			10% Construction Contingency: $	**$8,200.00**
			22% Eng., Inspection, Surveying, Easements, Admin: $	**$17,900.00**
			TOTAL PROJECT BUDGET AMOUNT: $	**$107,105.00**

City of Medical Lake

12" Water Main Extension - Lake St. / Hallett to Grant

Item No.	Description	Estimated Qty.	Unit Price	Total Amount
1	Mobilization	Lump Sum	$ L.S.	$10,000.00
2	Clearing and Grubbing	Lump Sum	$ L.S.	$2,000.00
3	12" PVC C-900 Pipe, In Place	1,400 L.F.	$38.00	$53,200.00
4	12" R.S. Gate Valve & Box, In Place	2 Ea.	$2,000.00	$4,000.00
5	New Fire Hydrant Assembly	2 Ea.	$4,000.00	$8,000.00
10	Traffic Control	Lump Sum	$ L.S.	$1,500.00
11	Trench Excavation Safety	Lump Sum	$ L.S.	$1,000.00
13	Fence, Landscape, & Surface Repair	Lump Sum	$ L.S.	$2,000.00
14	Crushed Surfacing Top Course	170 C.Y.	$35.00	$5,950.00
15	Hot Mix Asphalt (4")	1,560 S.Y.	$30.00	$46,800.00
16	Hydroseed	Lump Sum	$ L.S.	$500.00
			Subtotal: $	**$134,950.00**
			Plus 8.7% WA State Sales Tax: $	**$11,800.00**
			TOTAL CONSTRUCTION AMOUNT: $	**$146,750.00**
			10% Construction Contingency: $	**$14,700.00**
			22% Eng., Inspection, Surveying, Admin: $	**$32,300.00**
			TOTAL PROJECT BUDGET AMOUNT: $	**$193,750.00**

City of Medical Lake

12" Water Main Extension - Lefevre St. / Campbell to 4th St.

Item No.	Description	Estimated Qty.	Unit Price	Total Amount
1	Mobilization	Lump Sum	$ L.S.	$20,000.00
2	Clearing and Grubbing	Lump Sum	$ L.S.	$2,000.00
3	12" PVC C-900 Pipe, In Place	2,500 L.F.	$38.00	$95,000.00
4	12" R.S. Gate Valve & Box, In Place	5 Ea.	$2,000.00	$10,000.00
5	New Fire Hydrant Assembly	3 Ea.	$4,000.00	$12,000.00
6	Six-inch Hydrant Pipe	30 L.F.	$50.00	$1,500.00
7	Exist. System Connection	Lump Sum	$ L.S.	$3,000.00
8	1" Service Connection	30 Ea.	$400.00	$12,000.00
9	1" Poly. Service Line (Trenched)	750 L.F.	$15.00	$11,250.00
10	1" Water Meter and Meter Box	30 Ea.	$700.00	$21,000.00
13	Trench Excavation Safety	Lump Sum	$ L.S.	$2,000.00
15	Fence, Landscape, & Surface Repair	Lump Sum	$ L.S.	$1,500.00
16	Crushed Surfacing Top Course	340 C.Y.	$35.00	$11,900.00
17	Hot Mix Asphalt (4")	2,800 S.Y.	$35.00	$98,000.00
18	Hydroseed	Lump Sum	$ L.S.	$500.00
			Subtotal: $	**$301,650.00**
			Plus 8.7% WA State Sales Tax: $	**$26,300.00**
			TOTAL CONSTRUCTION AMOUNT: $	**$327,950.00**
			10% Construction Contingency: $	**$32,800.00**
			22% Eng., Inspection, Surveying, Easements, Admin: $	**$72,200.00**
			TOTAL PROJECT BUDGET AMOUNT: $	**$432,950.00**

City of Medical Lake
City of Spokane Intertie & Booster Station

Item No.	Description	Estimated Qty.	Unit Price	Total Amount
1	Mobilization	Lump Sum	$ L.S.	$15,000.00
3	16" Ductile Iron Pipe, In Place	850 L.F.	$70.00	$59,500.00
4	State Route 902 Boring in 24" Steel Casing	Lump Sum	$ L.S.	$100,000.00
5	Pumphouse	Lump Sum	$ L.S.	$90,000.00
10	Pumps, Piping, & Elec.	Lump Sum	$ L.S.	$110,000.00
11	Site Work	Lump Sum	$ L.S.	$15,000.00
			Subtotal: $	**$389,500.00**
			Plus 8.7% WA State Sales Tax: $	**$33,900.00**
			TOTAL CONSTRUCTION AMOUNT: $	**$423,400.00**
			10% Construction Contingency: $	**$42,400.00**
			22% Eng., Inspection, Surveying, Admin: $	**$93,200.00**
			TOTAL PROJECT BUDGET AMOUNT: $	**$559,000.00**

Water rights deficiencies

4.5 Source of Supply Analysis

The City of Medical Lake does not currently plan to seek additional water rights during the next 20-year planning period. This is supported by several considerations. The aquifer in the area has already shown that it cannot withstand additional pumping. Drilling a new well in the area is not seen as a solution. It appears that the City and CSS currently have sufficient water rights for their projected needs. Perhaps more importantly there are other alternatives. The City's wastewater treatment plant serving both the City and the state facilities discharges reclaimed water. While there are currently numerous users this potential remains available. As growth proceeds, more reclaimed water will be available and construction of a reclaimed water system may very well become feasible. The City of Medical Lake will be in a position to construct an intertie with the City of Spokane perhaps as early as next year (2017). This has always been the selected

alternatives to solve the City's undulating water problems. The following Table

Table 4.5
Capacity Analysis

Period	N	Max Day	Annual Gallons	Water Rights Q_a (gal/year)	Q_a > Annual Gal.?	Annual Gallons Pumped Less 1%/2yrs.	MDD (gpd/ERU)	ADD (gpd/ERU)	C	F	PHD (gpm)	$Q_{S'}$ (gpm)	Water Rights Q_i (gpm)	$Q_i > Q_s$?
Existing	1,848	2,431,044	262,671,000	*1,199,000,000*	Yes	0	1,315.5	389	1.6	225	2,925	*2,690*	*2,690*	Yes
6-Year	1,948	2,562,594	276,727,036	1,199,000,000	Yes	268,294,845	1,315.5	377	1.6	225	3,071	*2,690*	2,690	Yes
20-year	2,343	3,082,217	332,823,591	1,199,000,000	Yes	299,410,096	1,315.5	350	1.6	225	3,648	*2,690*	2,690	Yes

*Italics = Entered Data

4.6 Water Rights Self-Assessment

The City of Medical Lake is served water from three wells (SO1, SO2 and SO3) West of town and one well (SO4) East of town. Certificates and a permit for these four wells is provided in the appendix. All water rights are for municipal supply

and the place of use for SO1, 2 and 3 is the City of Medical Lake and the state facilities at Eastern State Hospital and Lakeland Village. The place of use for SO4 is for the area served by Medical Lake. It is noted that the water system for Eastern State Hospital and Lakeland Village is operated and maintained by the Consolidated Support Services (CSS) and that nomenclature will be used herein representing the separate state-owned water system. The following Table 4.6 provides tabulation of the water rights data for the four wells serving the City of Medical Lake and the CSS.

Table 4.6
City of Medical Lake Water Rights

Source No.	Name	Cert./Permit	Max. GPM	Max Acre-Ft.	Priority Date
SO1	State of WA. Dept. of Institutions	3300-A	1,000	1,600	9/3/57
SO2	Town of Medical Lake	4404-A	1,000	1,600	5/27/59
SO3	Medical Lake & DSHS	G3-25319C	550	(800 Suppl.)	4/12/77
SO4	City of Medical Lake	G3-28914P	1,500	2,400	11/16/90
		TOTAL	**4,050 GPM**	**5,600 AC-FT.**	

As stated, the place of use for SO1, 2 and 3 is the City of Medical Lake and CSS. These rights are shared for the mutual benefit of both systems. The water right certificates do not stipulate a specific amount of water for either of the systems. In the current operation, the CSS operates and maintains SO1 and 2 and sells some of this water to the City thru interties. The City operates and maintains SO3 (Lehn Rd.) and all of this water goes directly to the City. SO4 (Craig Rd.) is the City's well and is used exclusively by the City. The following Table 4.5.1 tabulates the annual water usage for the City and the CSS since 2010 for SO1, 2 and 3 only. Water from SO4 is not included nor is intertie usage.

Table 4.6.1
Water Pumped from SO1, SO2, & SO3

Year	Medical Lake (SO3) (gal.)	CSS (SO1&2) (gal.)	Total Gallons (SO1,2,&3) (gal.)	Total Acre-Ft. (SO1,2,&3)
2010	66,092,000	160,893,900	226,985,900	696.5
2011	75,656,000	174,509,100	250,165,100	767.7
2012	70,480,000	192,460,200	262,940,200	806.9
2013	58,513,000	203,483,500	261,996,500	804.0
2014	72,639,000	196,324,600	268,963,600	825.4
2015	74,107,000	181,796,100	255,903,100	785.3
2016	68,772,000	203,652,300	272,424,300	836.0
2017	67,903,000	189,517,800	257,420,800	789.9

Model I.D.

Source

6 wells

The District currently operates six wells. All of the wells are located within the District's service area. Several of the District wells are not needed year round and are used seasonally during the summer months. The District has plans underway with a developer to construct new Well #8 in 2021.

Table 4-1 Well Capacities

Name	Location	Year Developed	Horsepower	Supplying Power Utility	Current Yield (gpm)
Well #1	15th Ave & Pierce Rd	1911	75	Avista	1,000
Well #3 (1)	30th Ave & Pierce Rd	1965	150	Inland Power & Light	1,500
Well #4	10th Ave & Skipworth Rd	1969	150	Avista	1,500
Well #5	26th Ave & Pierce Rd	1974	200	Inland Power & Light	2,000
Well #6	15th Ave & Pierce Rd	1979	200	Avista	2,000
Well #7	33rd Ave & Wilbur Rd	1979	150	Inland Power & Light	1,700
				Total	**9,700**
New Well #8 (2)	32nd Ave & Clinton Rd	2021	TBD	Inland Power & Light	2,000
				TOTAL	**11,000**

(1) *Shown as Well #8 on the DOH WFI form, however still referred to as Well #3 by the District. DOH attempted to change the designation back to Well #3, but were unsuccessful*

(2) *The District has plans underway with a developer to construct new Well #8 in 2021.*

WFI	Well Name	Metered	Legal Description
S0-1	1	Yes	$SW_{1/4}$ $SW_{1/4}$ of Section 21, T 25 N R 44 E.W.M.
S0-8 (1)	3	Yes	$SE_{1/4}$ $SW_{1/4}$ of Section 28, T 25 N R 44 E.W.M.
S0-4	4	Yes	$NE_{1/4}$ $SW_{1/4}$ of Section 21, T 25 N R 44 E.W.M.
S0-5	5	Yes	$NW_{1/4}$ $SW_{1/4}$ of Section 28, T 25 N, R 44 E.W.M.
S0-6	6	Yes	$SW_{1/4}$ $SW_{1/4}$ of Section 21, T 25 N, R 44 E.W.M.
S0-7	7	Yes	$NE_{1/4}$ $NE_{1/4}$ of Section 33, T 25 N, R 44 E.W.M.

Table 1-1 Water System Component Inventory

System	Component	Description	
		Log available:	Yes, see Appendix
		Depth:	183'

Supply	Well #1	Diameter:	7’
		Casing:	6’ Steel
		Screen:	0.75” holes from 166’ to 183’
		Date Constructed:	1911
		SWL:	1,910 to 1,918
		Approx. wellhead elev.:	2,082
		Present pumping rate:	1,000 gpm
		Pump/motor:	Line shaft turbine, 75 HP
		Backup Generator:	Yes
		Supplying Power Utility	Avista
		Discharge pressure:	48 psi (approximate)
		Enclosure:	Pump house (concrete block)
		Location:	$SW_{1/4}$, $SW_{1/4}$, S21, T25, R44 (15th Ave & Pierce Rd)

System	Component	Description	
Supply (Cont’d)	Well #3 (shown as S08 on DOH WFI form)	Log available:	Yes, see Appendix
		Depth:	167’
		Diameter:	16”
		Casing:	152’ to screen
		Screen:	152’ – 167’
		Date Constructed:	Oct 1965
		SWL:	1,916
		Approx. wellhead elev.:	2,030
		Present pumping rate:	1,500 gpm
		Pump/motor:	Line shaft turbine, 150 HP
		Backup Generator:	No
		Supplying Power Utility	Inland Power & Light
		Discharge pressure:	68 psi (approximate)
		Enclosure:	Pump house (concrete block)
		Location:	$SE_{1/4}$, $SW_{1/4}$, S28, T25, R44 (30th Ave & Pierce Rd)
		Log available:	Yes, see Appendix
		Depth:	177’
		Diameter:	16”
		Casing:	Full depth
		Screen:	Perforations 140’ – 175’

	Well #4	Date Constructed:	Feb 1969
		SWL:	1,917
		Approx. wellhead elev.:	2,042
		Present pumping rate:	1,500 gpm
		Pump/motor:	Line shaft turbine, 150 HP
		Backup Generator:	No
		Supplying Power Utility	Avista
		Discharge pressure:	67 psi (approximate)
		Enclosure:	Pump house (concrete block)
		Location:	$SE_{1/4}$, $NE_{1/4}$, S21, T25, R44 (10^{th} Ave & Skipworth Rd)

System	Component	Description	
Supply (Cont'd)	Well #5	Log available:	Yes, see Appendix
		Depth:	160'
		Diameter:	16"
		Casing:	154..5' to screen
		Screen:	154.5' – 160'
		Date Constructed:	March 1974
		SWL:	1,915
		Approx. wellhead elev.:	2,009
		Present pumping rate:	2,000 gpm
		Pump/motor:	Line shaft turbine, 200 HP
		Backup Generator:	No
		Supplying Power Utility	Inland Power & Light
		Discharge pressure:	65 psi (approximate)
		Enclosure:	Pump house (concrete block)
		Location:	$NW_{1/4}$, $SW_{1/4}$, S28, T25, R44 (26^{th} Ave & Pierce)
		Log available:	Yes, see Appendix
		Depth:	240'
		Diameter:	16"
		Casing:	210' to screen
		Screen:	210' – 240'
		Date Constructed:	Apr 1979

	Well #6	SWL:	1,910
		Approx. wellhead elev.:	2,082
		Present pumping rate:	2,000 gpm
		Pump/motor:	Line shaft turbine, 200 HP
		Backup Generator:	Yes
		Supplying Power Utility	Avista
		Discharge pressure:	48 psi (approximate)
		Enclosure:	Pump house (wood frame & steel siding)
		Location:	$SW_{1/4}$, $SW_{1/4}$, S21, T25, R44 (15^{th} Ave & Pierce Rd)

System	Component	Description	
Supply (Cont'd)	Well #7	Log available:	Yes, see Appendix
		Depth:	185'
		Diameter:	16"
		Casing:	155'
		Screen:	155' – 185'
		Date Constructed:	Jul 1979
		SWL:	1,920
		Approx. wellhead elev.:	2,030
		Present pumping rate:	1,700 gpm
		Pump/motor:	Line shaft turbine, 150 HP
		Backup Generator:	Yes
		Supplying Power Utility	Inland Power & Light
		Discharge pressure:	70 psi (approximate)
		Enclosure:	Pump house (concrete block)
		Location:	$NE_{1/4}$, $NE_{1/4}$, S33, T25, R44 (34^{th} Ave & Diane Ct)

Storage

Total storage capacity: 550,000 gallons

2 Reservoirs , 1 booster station,

The following storage analysis is based on the District's existing storage capacity and demand figures developed in **Section 2**. The following table summarizes the District's minimum required storage volumes

based on existing demands and projected demands associated with the SR-27 Development and infill identified in the 2018 land capacity analysis (refer to **Section 2.2**).

Table 4-11 Storage Capacity Summary

Component	Current			Projected 10-Year			Projected 20-Year		
	Total (gal)	Rsvr 1 (gal)	Rsvr 2 (gal)	Total (gal)	Rsvr 1 (gal)	Rsvr 2 (gal)	Total (gal)	Rsvr 1 (gal)	Rsvr 2 (gal)
Operational Storage (1)	77,000	37,000	40,000	77,000	37,000	40,000	77,000	37,000	40,000
Equalizing Storage (2)	0	0	0	265,200	127,500	137,700	307,000	147,600	159,400
Standby Storage (3)	378,000	171,800	206,200	489,500	222,500	267,000	503,900	229,000	274,900
Fire Suppression Storage (4)	540,000	245,500	294,500	540,000	245,500	294,500	540,000	245,500	294,500
Dead Storage (5)	0	0	0	0	0	0	0	0	0
Total (6)	**617,000**	282,500	334,500	**882,200**	403,000	479,200	**924,000**	422,000	502,000
Existing	550,000	250,000	300,000	550,000	250,000	300,000	550,000	250,000	300,000
Balance (excess/ deficit)	**(67,000)**	(32,500)	(34,500)	**(332,200)**	(153,000)	(179,200)	**(374,000)**	(172,000)	(202,000)

(1) *OS = Top 4 ft of storage in reservoirs.*

(2) *ES = (PHD – [QS – QL])(150 min.); QS = sum of all wells ; QL = largest well.*

(3) *Based on District minimum SB storage criteria = 150 gallons/ERU. Refer to Section 3.3.4.*

(4) *Assumes basic fire flow of 3,000 gpm for 3 hours remains constant for the 20-year*

(5) *DS = 0. The District has no service connections less than 70 feet below the bottom of their reservoirs. Hence, service pressure cannot drop below the DOH WSDM recommended minimum of 30 psi.*

(6) *This total "nests" fire flow and standby storage volumes as allowed by the DOH Water System Design Manual; the larger of the two volume contributes to the sum. See **Appendix** for local fire authority approval of "nesting".*

System	Component	Description	
Storage	Reservoir #1 250,000 Gal	Construction type:	Welded steel, elevated (110' to top of tank)
		Approx. dimensions:	40' dia. x 27' tall
		Date constructed:	1961
		Recoating:	1985
		Approx. max. WSE:	2,191
		Approx ground elev:	2,081
		Volume:	250,000 gallons
		Pressure zones served:	Main
		Location:	On same parcel as Well #1 (15th Ave and Pierce Rd)
		Construction type:	Welded steel, elevated (64' to top of tank)
		Approx. dimensions:	41' dia. x 30' tall
		Date constructed:	1983
		Recoating:	2004

	Reservoir #2 300,000 Gal	Approx. max. WSE:	2,191
		Approx ground elev:	2,127
		Volume:	300,000 gal
		Pressure zones served:	Main
		Location:	E. of district boundaries – E. of Highway 27, N. of Belle Terre Ave

Storage Capacity with New Well #8

MID has negotiated with a developer to install a new well (Well #8) in conjunction with a development that is moving forward in the southeast portion of the District. The following storage analysis takes into consideration the addition of new Well #8 which will be equipped with a Variable Frequency Drive (eliminating operational storage). The additional pumping capacity of new Well #8 also eliminates equalizing storage.

Table 4-12 Storage Capacity Summary (New Well #8 w/VFD, Automatic Backup Power)

Component	Current			Projected 10-Year			Projected 20-Year		
	Total (gal)	Rsvr 1 (gal)	Rsvr 2 (gal)	Total (gal)	Rsvr 1 (gal)	Rsvr 2 (gal)	Total (gal)	Rsvr 1 (gal)	Rsvr 2 (gal)
Operational Storage (1)	0	0	0	0	0	0	0	0	0
Equalizing Storage (2)	0	0	0	0	0	0	0	0	0
Standby Storage (3)	378,000	171,800	206,200	489,500	222,500	267,000	503,900	229,000	274,900
Fire Suppression Storage (4)	540,000	245,500	294,500	540,000	245,500	294,500	540,000	245,500	294,500
Dead Storage (5)	0	0	0	0	0	0	0	0	0
Total (6)	**540,000**	245,500	294,500	**540,000**	245,500	294,500	**540,000**	245,500	294,500
Existing	550,000	250,000	300,000	550,000	250,000	300,000	550,000	250,000	300,000
Balance (excess/ deficit)	**10,000**	4,500	5,500	**10,000**	4,500	5,500	**10,000**	4,500	5,500

(1) *Assumes installation of VFD at new Well #8 to increase operational flexibility and eliminate operational storage by keeping reservoirs full.*

(2) *Assumes construction of new Well #8 (2,000 gpm). ES = (PHD – [QS – QL])(150 min.); Qs = sum of all wells ; Ql = largest well.*

(3) *Based on District minimum SB storage criteria = 150 gallons/ERU. Refer to Section 3.3.4.*

(4) *Assumes basic fire flow of 3,000 gpm for 3 hours remains constant for the 20-year*

(5) *DS = 0. The District has no service connections less than 70 feet below the bottom of their reservoirs. Hence, service pressure cannot drop below the DOH WSDM recommended minimum of 30 psi.*

(6) *This total "nests" fire flow and standby storage volumes as allowed by the DOH Water System Design Manual; the larger of the two volume contributes to the sum. See* ***Appendix*** *for local fire authority approval of "nesting".*

Delivery

Boosters/Pressure relief valves –

The existing booster zone area is shown on **Figure 2**. The hydraulic model indicates the District can supply current demands to the entire system (when the booster station is not in operation) without service pressures dropping below 30 psi (DOH minimum service pressure). A number of residences at higher elevations complained that their sprinkler systems would not operate properly at the pressures they were being served. The District operates the booster station year round to supply the residences at higher elevations with greater service pressures. There is no dedicated reservoir for the pressure zone served by the booster pump; the zone operates as a closed system. A check valve bypasses the booster pumps to increase available fire flow to the booster zone; the check valve only opens when a very large demand (e.g. fire flow) exists in the booster zone.

The booster currently serves approximately 67 homes and the capacity of the booster is 350 gpm. This capacity exceeds the PHD of the booster zone. The booster station has an 8-inch bypass check valve that opens automatically if the booster zone pressure drops below the main zone hydraulic grade. The hydraulic model estimates that the system can maintain well above minimum required pressures while supplying a fire flow event in the main zone. The model also estimates the booster well exceeds minimum service pressure while supplying the PHD of the booster zone.

Pressures in the booster station service area range approximately between 80 and 90 psi with the booster station running. Pressures during peak demand periods decline 5-10 psi, with some areas seeing greater pressure drops depending on the area and which wells are in operation.

The booster station was rehabilitated in 2009 replacing the single pump with two smaller 175 gpm pumps. The following table describes the existing booster station and booster zone.

Table 4-13 Booster Station and Booster Zone Description

Element	Description
Booster station	Two pumps (175 gpm) 8' x 14' vault outside the 16th Ave. right of way, VFD matches demand of the system
Controls	Automatic VFD, booster pump operates year round
Accessibility	Vault hatch is approximately 3' x 3', provides good access and working space around the pump.
Fireflow	All areas have >1,000 gpm when the booster station is bypassed and the reservoirs are depleted 60,000 gallons (1,000 gpm for 60 mins) (1)
Bypass	The station is currently equipped with an 8-inch bypass and check valve that will open in the event the pressures in the booster zone drop below the pressures in the main zone; this will theoretically only occur during a fire.
Area served	Generally between Bowdish, Union, 16th Ave & 20th Ave – approximately 60 parcels
Elevation range of booster zone	2,075-2,088
Pressures in booster zone	80-90 psi

(1) *According to the hydraulic model. Refer to boundary conditions in the* ***Appendix***.

Pressures in the booster zone (when the booster is not operating and all connections are served from the main zone) are above the DOH required minimum (30 psi) but are less than typically desired. The District received complaints over the years regarding summer service pressures in this area (before the booster was installed). All service pressure complaints have ceased since the booster station was rehabilitated.

Generally speaking, customers consider pressures in the 45-50 psi range to be lower than desirable. Such pressures mean that simultaneous water uses (irrigation and interior use, for example) cannot occur nor can watering large areas. These low pressures barely support sprinkler system operation. For this reason the booster station runs year round keeping the pressures in the upper zone in the 80-90 psi.

Fire flow is met in all areas of the booster zone when the booster station is bypassed and the reservoirs are depleted 60,000 gallons (1,000 gpm for 60 minutes).

The District's current arrangement of using the booster station to provide higher pressure year round satisfies DOH service pressure criteria and 1,000 gpm fire flows are provided everywhere in the booster zone.

Transmission lines –

45 miles of transmission and distribution mains

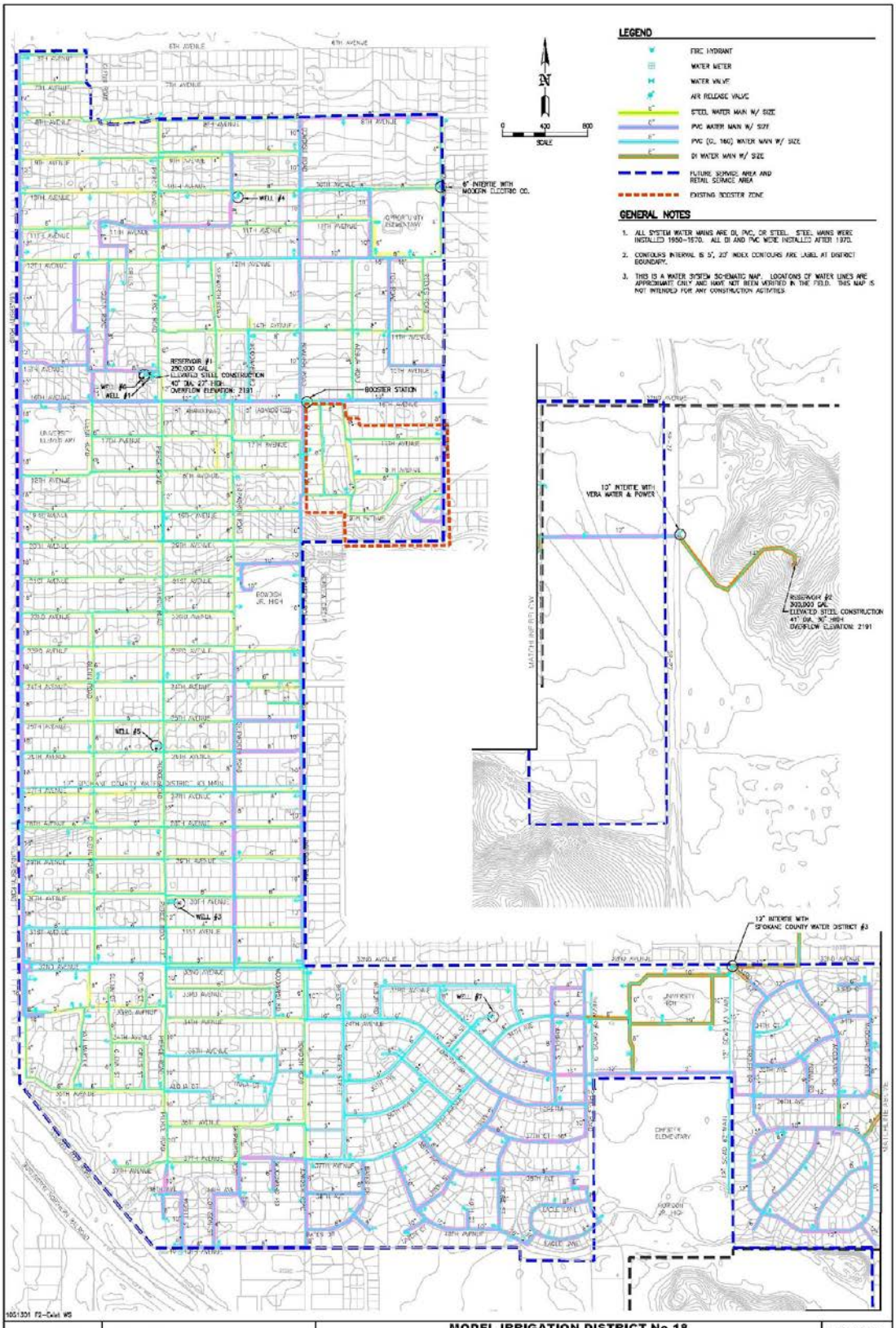
The District has several sections of 4" steel mains, some of them providing service to fire hydrants. These mains appear to be adequate for normal system demands (PHD); however, the hydraulic model estimates that during fire flow events the 4" mains experience high velocities that restrict flow rate. The locations in the preceding table do not meet flow rate criteria.

The majority of water mains in the system are steel, PVC, and ductile iron. The dipped & wrapped steel mains are relatively old and may be nearing the end of their service life. However, the District

Superintendent reports the steel mains he has seen to be in decent condition; no accelerated deterioration has been noted, soils in the area are free draining and are not especially harmful to the steel mains. Most PVC and ductile iron mains are reported to be in good shape.

All services are connected to the main with saddles. The District has approximately 1,000 galvanized iron services installed primarily on older pipes in the system. Services on more recently installed pipe are either copper or HDPE. Most services have either curb stops or shutoffs on the meter setter/yoke. All services are metered. Service lines are generally in good condition except approximately 1,000 galvanized services nearing the end of their service lives.

Schematic



SCALE: AS SHOWN DESIGNED: PCC DRAWN: TVP CHECKED: APPROVED: PROJ. NO.: 165-13-01 DATE: 3/11/21	VARELA Engineering & Management	**MODEL IRRIGATION DISTRICT No.18** WATER SYSTEM PLAN EXISTING WATER SYSTEM	FIGURE **2**

Connections

There are 2,481 existing service connections according to the District's 2020 Water Facilities Inventory (WFI) form; this includes residential and non-residential connections. The DOH WFI form indicates MID is approved for 2616 service connections.

A list of capital deficiencies

District has roughly 19 miles of dipped & wrapped steel water mains most of which are approximately 40 years old. These may be nearing the end of their service lives and could have problems in the next 20 years. Most valves were upgraded as Spokane County sewer projects went through the area.

For ease of reference, the following table summarizes the deficiencies described in this section. Several notes regarding the following table:

- The table below indicates the time frame in which the problem/deficiency must be corrected to meet state minimum standards of service. Some items are not directly related to state standards; some are shown as needing replacement within the 20-year planning period (as opposed to the 10-year period).
- Similarly, deficiencies revealed in this section (for example an area that does not currently meet the 1,000 gpm residential fire flow criteria) may not be a high priority in the District's opinion. These improvements may not show up in the 10-yr improvements.
- The capital improvements plan in **Section 6** corresponds with the following table.

Table 4-16 Summary of Water System Deficiencies

Area of Improvement	Problem Requires Correction in 10-year Planning Period?	Problem Requires Correction in 20-year Planning Period?
Supply		
• New Well #8 equipped with VFD (developer funded—Start construction 2021)	**Yes**	No
Storage (1)		
• Reservoir #2 may not fill completely depending on demand levels and well call to run sequencing	No	No (2)
Distribution		
• Steel mains (especially 4") may need replacement during the 20-year planning period if they begin to have problems • Thin Wall PVC mains may need replacement during the 20-year planning period if they begin to have problems	**Probably** (3)	**Probably** (3)
Booster Station		
• None	No	No
Control System		

• Installation of an altitude valve on Reservoir 1 that could be linked to the SCADA system and transmission main improvements from Reservoir 1 to help correct problem of differing filling rates for Reservoirs 1 & 2	No	**Yes**

(1) *Storage capacity is adequate provided new Well #8 is constructed and equipped with a VFD.*

(2) *The District plans to upsize existing mains as steel and C160 PVC mains are replaced. A portion of the transmission main will be installed during the 20-year timeframe but some of it will not.*

(3) *Some of the steel and thin wall PVC mains may begin failing in the 10-year and 20-year planning periods. Regulations do not require MID to address the deterioration of these mains, but the time required to maintain these aging mains will eventually become a losing proposition.*

A list of projects (capital projects) to cure them

Table 5-2 Preliminary Estimate of Costs for Reservoir Operational Revisions

Element	Estimated Cost ($) (2)
Electrical modifications (level detector, radio transmitter, control system modifications) (1)	20,000
Altitude valve at Reservoir #1 (alt. & isolation valves, bypass, vault, installation)	25,000
Transmission main improvements (3)	1,700,000
Construction Subtotal (rounded to nearest $1,000)	1,745,000
Taxes (8.9%)	155,000
Contingencies (20%)	349,000
Subtotal	2,249,000
Engineering – design, inspection, construction admin. (25%)	562,000
Total	**2,811,000**

(1) *Electrical cost estimates are dependent on what exists and what options the District would like. For systems with greater control flexibility or which significantly upgraded the existing control system, the actual cost could be significantly higher.*

(2) *The figures above assume the District would self perform little to none of the work. These amounts could be reduced if the District self performed some of the work or by other measures. Rounded to the nearest $1,000.*

(3) *Assume approximately 10,000 LF of 18" transmission main at 170$/LF*

Estimated Unit Costs of Distribution System Improvements

The Table following lists the estimated cost of construction for water mains with and without the cost of asphalt replacement. The table does not include tax, contingencies, and engineering; subsequent tables for specific improvement projects include these items.

Table 5-4 Estimated Distribution System Unit Costs

	Cost per LF

Diam. (in)	($)						
	Main & Install (1)	Valves, Fittings, Restraints (2)	Fire Hydrants (3)	Service Connections (4)	Asphalt Replacement (5)	Total for Construction	
						w/ out asphalt	w/ asphalt
8	41	8	10	36	20	95	115
10	48	10	10	36	20	104	124
12	52	10	10	36	20	108	128
14	64	13	10	36	20	123	143
16	77	15	10	36	20	138	158
18	87	17	10	36	20	150	170
20	100	20	10	36	20	166	186
24	126	25	10	36	20	197	217

(1) *Based on recent bid tabulations and pipe material costs – assumes PVC C900/905 mains.*

(2) *Assume 20% of cost of main and install*

(3) *Assume one hydrant every 500 ft*

(4) *Assume one service every 50 ft*

(5) *Assume 8' wide restoration*

Table 5-5 Estimated Steel Main Replacement Costs by Area

Area (1)	Main Size (2) (5) (in)	Total Length in System (ft)	Unit Cost (3) (per LF)	Replacement Cost
6th Ave. to 15th Ave. (1950-1960)	4	11,450	$115	$1,316,750
	6	7,000	$115	$805,000
	8	5,500	$115	$632,500
	10	0	$124	$0
	12	400	$128	$51,200
	Subtotal	24,350	-	**$2,805,000** (4)
16th Ave. to 22nd Ave. (1955-1960)	4	13,700	$115	$1,575,500
	6	10,300	$115	$1,184,500
	8	1,200	$115	$138,000
	10	0	$124	$0
	12	2,300	$128	$294,400
	Subtotal	27,500	-	**$3,192,000** (4)
23rd Ave. to 30th Ave. (w/ portion between	4	5,000	$115	$575,000
	6	19,300	$115	$2,219,500
	8	2,600	$115	$299,000
	10	0	$124	$0

32nd and 35th) (1965-1970)	12	2,600	$128	$332,800
	Subtotal	29,500	-	**$3,426,000** (4)
31st Ave. to 40th Ave. (1970s)	4	1,300	$115	$149,500
	6	6,900	$115	$793,500
	8	0	$115	$0
	10	1,900	$124	$235,600
	12	400	$128	$51,200
	Subtotal	10,500	-	**$1,230,000** (4)
TOTAL SYSTEM (All Steel Main Replacement) (4)				**$10,653,000**
Taxes (8.9%)				$948,000
Contingencies (20%)				$2,131,000
Subtotal				$13,732,000
Engineering – design, inspection, construction admin. (25%)				$3,433,000
Total (4)				**$17,165,000**

(1) *See Figure 3 for area locations*

(2) *All 4" and 6" steel mains to be replaced with minimum 8" per District criteria*

(3) *Assumes all main replacements will require pavement restoration, see Table 5-4. If the District coordinates main replacements with City of Spokane Valley paving projects the cost of main replacements could potentially be reduced.*

(4) *Rounded to nearest $1,000*

Table 5-6 Estimated Thin Wall PVC (Class 160) Main Replacement Costs

Main Size (in)	Total Length in System (ft)	Unit Cost (1) (per LF)	Replacement Cost
4 (2)	1,600	$115	$184,000
6 (2)	11,600	$115	$1,334,000
8	4,400	$115	$506,000
10	3,800	$124	$3471,000
12	1,000	$128	$128,000
Construction Subtotal (rounded to nearest $1,000)			$2,623,000
Taxes (8.9%)			$233,000
Contingencies (20%)			$525,000
Subtotal			$3,381,000
Engineering – design, inspection, construction admin. (25%)			$845,000
Total			**$4,226,000**

(1) *Assumed all main replacements will require pavement restoration. If the District coordinates main replacements with City of Spokane Valley paving projects the cost of main replacements could be substantially reduced.*

(2) *All 4" and 6" steel mains to be replaced with minimum 8" per District criteria*

Table 5-7 Estimated Total System Replacement Value

Facility	Replacement Value ($)	Useful Life (yr)	Annual Reinvestment ($) [6]
Mains [1]	40,340,000 [1]	80	504,000
Reservoirs [2]	2,000,000	60	33,000
Wells [3]	600,000	100	7,000
Well Pumps [4]	540,000	30	19,000
Pump House [5]	900,000	100	9,000
Total [7]	44,380,000	**Total** [7]	572,000

(1) *Estimated using main totals in Table 1-2 and replacement costs from Table 5-4 plus taxes (8.9%), Contingencies (20%) and Engineering (25%). Assumes 8" main replacement costs for existing mains 8" and smaller.*

(2) *Assume $1,000,000 per reservoir*

(3) *Assume $100,000 per well*

(4) *Assume $90,000 per well pump*

(5) *Assume $150,000 per pump house*

(6) *Rounded to nearest $1,000*

(7) *Rounded to nearest $10,000*

Period	Improvement	Purpose	Estimated Cost	Potential Funding Sources
10-YEAR PLANNING PERIOD	**Supply:** ● New Well 8	● Supply in lieu of operational and equalizing storage	[1]	Developer Funded
	Interties: No improvements planned	-	-	-
	Water Rights: ● No improvements planned	-	-	-
	Water Quality: ● No improvements planned	-	-	-
	Storage: ● Inspect steel reservoir coatings as needed (both tanks, min every 5 years)	● Routine inspection helps extend the life of a steel reservoir coating	$30,000	Reserve Funds
	Booster Station: ● No improvements planned	-	-	-
	Distribution System: ● Replacement of steel mains and C160 PVC mains throughout the District [2]	● Replace sections of mains that have maintenance issues	$2,887,000 [3]	Bank Loans, DWSRF, PWTF Revenu

				e Bonds, Reserv e Funds
	Control System: ● No improvements planned	-	-	-
		Total Estimated 10-Year Cost:	**$2,917,000** (4)	

(1) *MID has an arrangement with a developer to construct and donate the new well in lieu of paying System Development Charges.*

(2) *See Figure 3 for location of specific steel mains to be replaced during 10-year planning period. See also Table 6-2 for Water Main Replacement Plan. Existing 4" and 6"*

(3) *mains will be replaced with 8" mains at $115/LF.*

(4) *The District has budgeted to replace approximately 25,000 LF of steel main within the 10-year planning period.*

(5) *Assumes an annual capital improvement budget of $187.7K for 6 years and $447.7K for 4-years. The District currently allocates $260K per year toward the University T-main bond loan (refer to Table 7-1) which will be paid off in 6 years. Once the loan is paid off the $260K will be put toward additional capital improvements.*

Table 6-1 Capital Improvements Plan (Cont'd)

Period	Improvement	Purpose	Estimated Cost	Potential Funding Sources
10-YEAR PLANNING PERIOD	See Previous Table	See Previous Table	$2,917,000	See Previous Table
20-YEAR PLANNING PERIOD	**Supply:** • No improvements planned	-	-	-
	Interties: • No improvements planned	-	-	-
	Water Rights: • No improvements planned	-	-	-
	Water Quality: • No improvements planned	-	-	-
	Storage: • Inspect steel reservoir coatings as needed (both tanks, min every five years)	• Routine inspection helps extend the life of a steel reservoir coating	$30,000	Reserve Funds
	Booster Station: • No improvements planned	-	-	-
	Distribution System: • Transmission Main for Reservoir #1 and install altitude valve for Reservoir #1 • Continue replacement of steel mains and C160 PVC mains throughout the District [1]	• Allow Reservoir #2 to fill completely • Aging pipe will become a liability as it begins to leak and break	$2,811,000 $1,636,000 [3]	RD, Bank Loans, DWSRF, PWTF Revenue Bonds, Reserves
	Control System: • Update SCADA system as needed	• Stay up to date with SCADA software, obsolete parts etc.	- [2]	Reserve Funds
		Total Estimated 10-Year Cost: Total Estimated	**$2,917,000** **$4,477,000** [4]	

	20-Year Cost:		
	10-Year and 20-Year TOTAL:	**$7,394,000**	

(1) *See Figure 3 for location of steel mains and C160 PVC sections to be replaced during 10-yr and 20-yr planning period. See also Table 6-2 for Water Main Replacement Plan. Existing 4" and 6" mains will be replaced with 8" mains at $115/LF.*

(2) *Cost will be minimal and gradual. The District will use reserves for SCADA improvements as they arise.*

(3) *The District has budgeted to replace approximately 15,000 LF of steel main within the 20-year planning period.*

(4) *Assumes annual capital improvement budget of $447.7K for 10 years. See Table 7-1.*

Table 6-1 Capital Improvements Plan (Cont'd)

Period	Improvement	Purpose	Estimated Cost	Potential Funding Sources
Beyond 20 YEAR PLANNING PERIOD	**Distribution System:** ● Complete replacement of all remaining steel and C160 PVC mains throughout the District (1)	● Aging pipe will become a liability as it begins to leak and break	**$14,130,000** (2)	RD, Bank Loans, DWSRF, PWTF Revenue Bonds, Reserves

(1) *See Figure 3 for location of remaining steel mains and C160 PVC sections to be replaced during the Beyond 20-yr planning period. See also Table 6-2 for Water Main Replacement Plan. Existing 4" and 6" mains will be replaced with 8" mains at $115/LF.*

(2) *Includes replacement of all remaining steel and C 160 PVC mains not replaced during 10-year and 20-year planning periods.*

The following table shows the theoretical end of service life and the associated dollar cost of replacing mains at that point. However, MID currently plans to rely on a longer service life than the conventional 50-year in its main replacement.

Table 6-2 Water Main Replacement Plan

Area [1]	Priority	Main Size (in)	Total Length in System (ft)	Unit Cost (per LF) [1]	Replacement Cost [2]	Construction Cost	Total Cost [3]	End of Service Life Year
6th Ave. to 15th Ave. (1950-1960) Steel Main	1	4	11,450	$115	$1,316,750	$2,805,000	$4,520,000	2030
		6	7,000	$115	$805,000			
		8	5,500	$115	$632,500			
		10	0	$124	$0			
		12	400	$128	$51,200			
16th Ave. to 22nd Ave. (1955-1960) Steel Main	2	4	13,700	$115	$1,575,500	$3,192,000	$5,143,000	2035
		6	10,300	$115	$1,184,500			
		8	1,000	$115	$138,000			
		10	0	$124	$0			
		12	2,300	$128	$294,400			
23rd Ave. to 30th Ave. (w/ portion between 32nd and 35th) (1965-1970) Steel Main	3	4	5,000	$115	$575,000	$3,426,000	$5,520,000	2045
		6	19,300	$115	$2,219,500			
		8	2,600	$115	$299,000			
		10	0	$124	$0			
		12	2,600	$128	$332,800			
31st Ave. to 40th Ave. (1970s) Steel Main	4	4	1,300	$115	$149,500	$1,230,000	$1,981,000	2050
		6	6,900	$115	$793,500			
		8	0	$115	$0			
		10	1,900	$124	$235,600			
		12	400	$128	$51,200			
Throughout System (1970) PVC-160	5	4	1,600	$115	$184,000	$2,623,000	$4,226,000	2050
		6	11,600	$115	$1,334,000			
		8	4,400	$115	$506,000			
		10	3,800	$124	$3471,000			
		12	1,000	$128	$128,000			
					TOTAL	**$13,276,000**	**$21,390,000**	

(1) *See Figure 3 for map of areas. Existing 4" and 6" mains will be replaced with 8" mains estimated at $115/LF.*

(2) *See Table 5-9 for estimated total system replacement value.*

Includes taxes (8.9%), contingencies (20%) and engineering (25%). Rounded

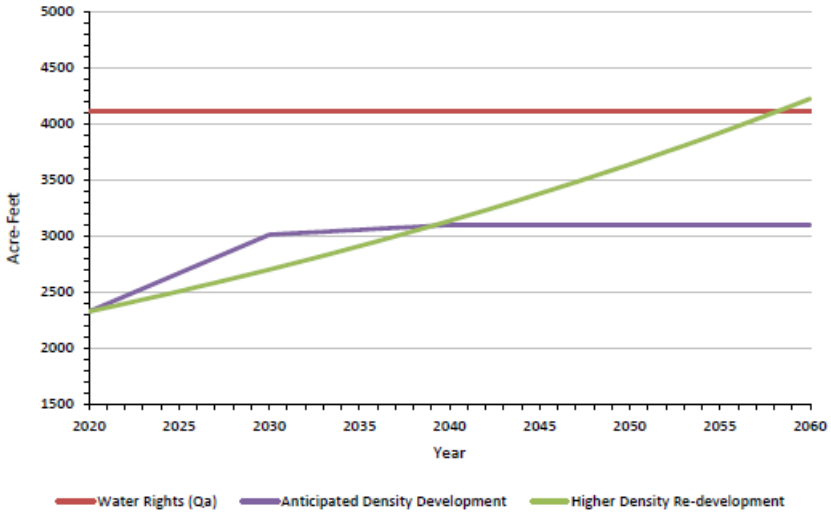
Water rights deficiencies

It does not appear the District requires any modifications to its annual water rights. The District will reevaluate the need for additional annual water rights as development in the system progresses.

The District's total water right is 9,780 gpm and 4,115 ac-ft per year. The District currently pumps 9,700 gpm during peak demand times; this is the combined capacity of all the system's current wells. The District's current water use is below their annual right.

Based on the City of Spokane Valley's 20-yr growth projections for the District and anticipated changes in current land use densities it does not appear the District will exceed its annual right (Qa).

Figure 4-1 Annual Water Use VS Water Rights Allotment (Q_a)



Growth projections for the District show that all land available for development will likely be developed by the end of the 20-year planning period. Once fully developed, annual water demand should only fluctuate with larger seasonal variations (hot summer Vs. cooler summer), unless the City elects to reevaluate land use and zoning to allow higher density redevelopment (see preceding discussion). Even under denser redevelopment scenarios, the District is not estimated to exceed its annual water rights until the year 2059.

MID will reevaluate the need for additional annual water rights as development in the system progresses and during the routine updates to its Water System Plan.

MID has plans underway for construction of new Well #8 (2,000 gpm). Construction of Well #8 is anticipated to begin in 2021. While the added capacity of Well #8 will bring total well capacity of the system above the District's existing instantaneous water rights, the purpose of this well is not to provide additional capacity to meet systems demands, but to provide additional redundancy in the system. If demands reach a point where in addition to the existing wells, Well #8 is required to meet demands, the District will pursue additional instantaneous water rights at that time.

Table 4-4 Existing Ground Water Rights Status

Permit Certificate and/ or Claim #	Name of Rightholder or Claimant	Priority Date	Source Name/ Number	Primary or Supplemental	Existing Water Rights		Existing Consumption		Current Water Right Status (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate - Q_i (gpm)	Maximum Annual Volume - Q_a (ac-ft)	Maximum Instantaneous Flow Rate - Q_i (gpm)	Maximum Annual Volume - Q_a (ac-ft)	Maximum Instantaneous Flow Rate - Q_i (gpm)	Maximum Annual Volume - Q_a (ac-ft)
689-D	Model Irr.	1912	All wells	Primary	4,200	779				
119-A	Model Irr.	9/24/1946	All wells	Supplemental	80	670 Max				
3211-A	Model Irr.	9/24/1946	All wells	Supplemental	375	670 Max				
4109-A	Model Irr.	9/7/1961	All wells	Supplemental	525	670 Max				
5558-A	Model Irr.	11/24/1965	All wells	Supplemental	1,000	670 Max				
G3-00342C	Model Irr.	8/17/1970	All wells	Primary	1,000	526	9,700 (1)	2,329 (2)	80	1,786
G3-20159C	Model Irr.	5/5/1972	All wells	Primary	600	540				
G3-21962C (3)	Model Irr.	10/17/1973	All wells	(3)	200	0				
G3-26072C	Model Irr.	10/3/1978	All wells	Primary	1,000	1600				
G3-26369C	Model Irr.	10/5/1979	All wells	Supplemental	800	Less 72C (3)				
TOTAL					9,780	4,115	9,700	2,329	80	1,786

(1) *The Qi consumption stated in this table is the combined capacity of all the District's well pumps. MID reports that some years the total combined pumping capacity of all wells is utilized to meet peak demands and other years some well pumps will sit inactive all summer depending on the weather. The total capacity of the District's well pumps accurately reflects the actual Qi used by MID.*

(2) *All system water rights are integrated and can be drawn from any of the system's wells. This table shows existing (2017-2019 average) Qa consumption taken from the system's well pumping records (759 MG/yr = 2,329 ac-ft), see Table 4-2.*

(3) *This certificate does not add annual volume, it only adds instantaneous flow rate to the Districts water rights. Annual withdrawal is limited to the same 1,600 ac-ft under certificate G3-26072C. The combined annual withdrawal of these two certificates is not to exceed 1,600 ac-ft.*

N. Spokane Irrigation District #8

Source

The Main Zone has 2,000,000 gallons of storage. The table following contains current and projected storage volume requirements for the Main Zone

NSID has the 2 MG steel reservoir inspected periodically to assess the condition of the steel coating. The at last inspection the coating was in good condition.

Table 1-1 Water System Components

System	Component	Description	
Supply	Pump#1	Type:	Line shaft vertical turbine Uncertain - see Appendix
		Log available:	258'
		Depth:	7' dug well (Pump #3 draws from same well)
		Diameter:	1906
		Date constructed:	190'
		SWL(1):	2031.5'
		Approx. wellhead elev.:	600gpm
		Present pumping rate:	Line shaft turbine, 100 HP 65 psi
		Pump/motor:	Pump control valve (discharges to drywell)
		Discharge pressure:	6' (pumping alone)
		Surge handling:	Concrete building (also houses Pump #3)
		Drawdown:	East of Regal midway between Francis & Lincoln S27, T26N, R 43E
		Enclosure:	
		Location:	
	Pump#2	Type:	Line shaft vertical turbine Yes- see Appendix
		Log available:	255'
		Depth:	8' dug well
		Diameter:	1923
		Date constructed:	188'
		SWL(1):	2031.5'
		Approx. wellhead elev.:	1,400 gpm
		Present pumping rate:	Line shaft turbine, 150 HP 65 psi
		Pump/motor:	None
		Discharge pressure:	13' (pumping alone)
		Surge handling:	Metalbuilding (also houses Pump #4)
		Drawdown:	West of Regal midway between Francis & Lincoln S28, T26N, R 43E, within20' of Pump #2
		Enclosure:	
		Location:	

)

System	Component	Description	
	Pump#3	Type:	Submersible
		Log available:	Uncertain - see Appendix
		Depth:	257'
		Diameter:	7' dug well (Pump #1 draws from same well)
		Date constructed:	1906
		SWU[1]:	190'
		Approx. wellhead elev.:	2031.5'
		Present pumping rate:	850gpm
		Pump/motor:	Line shaft turbine, 100 HP
		Discharge pressure:	65 psi
		Surge handling:	Pump control valve (discharges to drywell)
		Drawdown:	6' (pumping alone)
		Enclosure:	Concrete building (also houses Pump #1)
		Location:	East of Regal midway between Francis & Lincoln S27, T26N, R 43E
	Pump#4	Type:	Line shaft vertical turbine
		Log available:	Yes- see Appendix
		Depth:	275'
		Diameter:	16'
		Date constructed:	1969
		SWL[1]:	190'
		Approx. wellhead elev.:	2031.5'
		Present pumping rate:	1,200 gpm
		Pump/motor:	Line shaft turbine, 150 HP
		Discharge pressure:	65 psi
		Surge handling:	Pump control valve (discharges to drywell)
		Drawdown:	10' (pumping alone)
		Enclosure:	Metal building (also houses Pump #2)
		Location:	West of Regal midway between Francis & Lincoln S28, T26N, R 43E, within 20' of Pump #2

Storage

Total storage capacity: 2,000,000 gallons

System	Component	Description

Storage	2MG Reservoir	Construction type:	Welded steel standpipe
		Approx. dim:	86' dia x 48' high
		Date constructed:	1982
		Overflow Elevation:	2,186
		Volume:	2,000,000 gallons
		Location:	Gerlach & Freya
		Controls:	Pressure transducer & line of site radio
	Old Reservoir (not in service)	Construction type:	Welded steel elevated reservoir
		Height above ground:	88'
		Date constructed	1923
		Approx max WSE	2,121.5
		Volume:	100,000 gallons
		Location:	West of Regal between Francis & Lincoln, adjacent to office

Delivery

Boosters/Pressure relief valves –

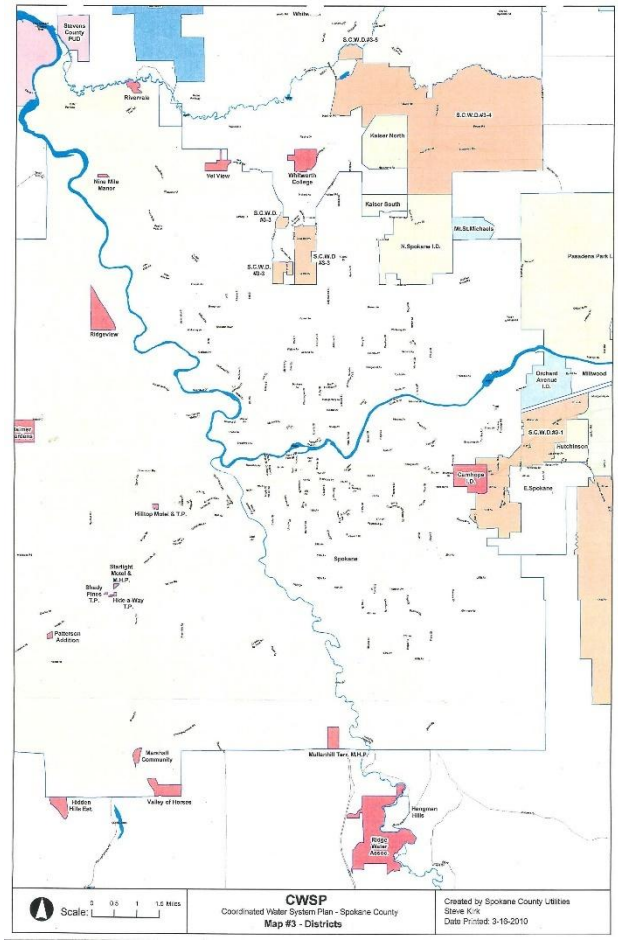
Transmission lines –

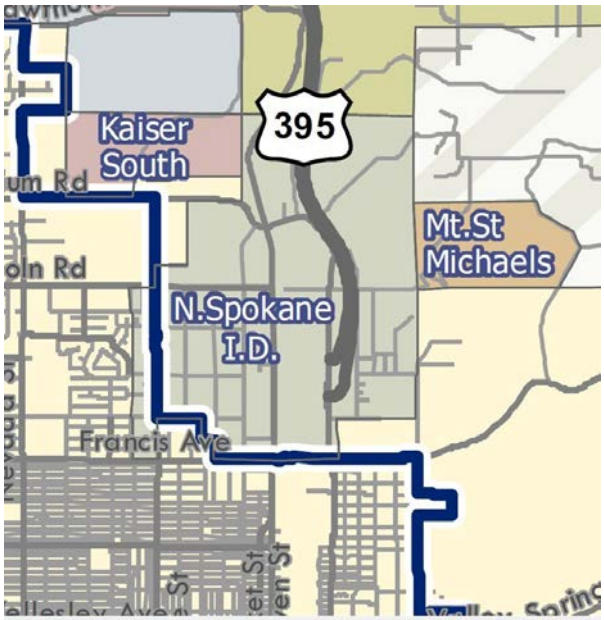
System	Component	Description					
		Construction type:		Welded steel standpipe			
			Steel	PVC	DI	CI	Total
Distribution	16' mains	Approximate			8,000		8,000
	14'	LF	6,300	1,000			7,300
	12'		800	5,400		2,200	10,400
	10'		6,300	12,800	300	-	19,400
	8'		1,600	8.400	9,200	-	17,100
	6'		15,000	3,000	5,000	-	20,800
	4'			1,600			5,500
	2' or smaller						3800
			30,000	32,200	22,500	2,200	92,300

Schematic

The District's contracted engineer maintains an online GIS system of the water systems schematics, including fire hydrants, water mains, service pipes, valves, meters, and manholes. The system can viewed at https://varela.maps.arcgis.com/apps/webappviewer/index.html?id=63cfe2c7687b451a94adc1bbc0e0e69c


MAGNESIUM RD.
CENTRAL PRE-MIX
AVISTA TRAINING CENTER
2 M.G. TANK
FREYA ST.
NORTH-SOUTH FREEWAY
UNITY CHURCH
BROOKLYN RD.
LINCOLN RD.
HOUGHTON AVE.
WILDING AVE.
0.1 M.G. TANK (EMERGENCY BACKUP)
PUMP HOUSE
HAVEN ST.
MARKET ST.
REGAL ST.
SMITH ST.
ALTAMONT ST.
CRESTLINE ST.
BURLINGTON NORTHERN
NAPA ST.
CALKINS DR.
TRAILER COURT
MEILE AVE.
DEVOE AVE.
VANETTA AVE.
BRUCE AVE.
HOUSTON AVE.
FRANCIS AVE.
LYONS
MAPLE ST.
BRAZEON AVE.
JULIA ST.
YALE ST.
REBECCA ST.
HAMMA ST.
CORLEN
JEAN
CONOCO INC.
CITY INTERTIE
CITY LINE
LEGEND
NORTH SOUTH FREEWAY RIGHT OF WAY
ROAD RIGHT OF WAY
WATER MAIN
FIRE HYDRANT
WATER VALVE
WATER METER
BLOW-OFF VALVE
AIR VACUUM RELEASE VALVE
PRESSURE RELIEF VALVE
WATER LINE STUD
CITY WATER VALVE
BY-PASS VALVE
SITE PLAN
NORTH SPOKANE IRRIGATION DISTRICT #8
PLAN
SERVICE AREA MAP
BELSBY ENGINEERING


Stevens County PUD
Riverside
Nine Mile Manor
Yet View
Whitworth College
S.C.W.D. #3-4
Kaiser North
Kaiser South
S.C.W.D. #2-3
S.C.W.D. #3-3
S.C.W.D. #3-2
N.Spokane I.D.
Mt.St.Michaels
Pasadena Park I.
Ridgeview
Orchard Avenue I.D.
Millwood
S.C.W.D. #3-1
Hutchinson
Carnahan
E.Spokane
Hilltop Motel & T.P.
Spokane
Starlight Road & M.H.P.
Shady Pines T.P.
Hide a Way T.P.
Patterson Addition
Marshall Community
Mullen Hill Terr. M.H.P.
Hidden Hills Est.
Valley of Horses
Hangmen Hills
Ridge Water Assoc.
Scale:
CWSP
Coordinated Water System Plan - Spokane County
Map #3 - Districts
Created by Spokane County Utilities
Steve Kirk
Date Printed: 3-16-2010


Kaiser South
395
Mt.St Michaels
N.Spokane I.D.
Francis Ave

Connections

The District's 2011 WFI forms indicate NSID has 703 existing service connections; this includes all customer classes. The WFI indicates the approved number of service connections for the District is unspecified.

Table 4-2 Comparison of Water Rights with Existing and Projected Demands

Permit, Certificate or Claim#	Name of Rightholder or Claimant	Priority Date	Source Number	Primary or Suoolemental	Water Right Max. Instant. Flow Rate (nnm)	Water Right Max. Annual Volume (ac-ft/vr)	Consumption Max. Instant. Flow Rate (nnm)	Consumption Max. Annual Volume (ac-ft/yr)	Water Right Status (Excess/Deficiency) Max. Instant. Flow Rate (aom)	Water Right Status (Excess/Deficiency) Max. Annual Volume <ac-ft/vr)
5381-A	NSID	1965	#1 &#3	Primary	1,200	483				
677-D	NSID	1909	#2 &#4	SUQQlemental	1,000	2,114	2,050 (3)	732.0 (4)	2,450	2,950.0
676-D	NSID	1909	#1 &#3	Prima!)'.	1,000	2,114				
G3-00556	NSID	1971	all4wells	Primarv	2,300	1,085				
Total (1)					4,500	3,682 (2)				
Projected Future <20-Year\					4,500	3,682 (2)	4,050 (3)	985.9 [4]	450	2,696.1

1 *Totals taken from Report of Exam (ROE) for the most recent water right, G3-00556.*

2 *According to ROE for G3-00556, annual withdrawal for community domestic and industrial is limited to 1,792 ac-fVyr and for irrigation is limited to 1,890 ac-fVyr.*

3 *The first draft of this Water System Plan listed current and 20-year Qi consumption as the combined capacity of NSID"s existing well pumps (4,050 gpm). Department of Ecology* indicated Qi consumption should only be the well pumping rate required to meet PHO. NSID can meet current PHO by using Pumps #1, #2, *and #3; they can keep Pump #4 in* reserve under current PHO. Hence, current Qi consumption has been revised to 2,050 gpm. NSID will need all four well pumps to meet 20-year PHO; hence, 20-year Qi consumption is 4,050 gpm.

4 *Refer to Section 3 for demand methodology.*

A list of capital deficiencies

Steel Main Replacements

As the District's approximately 20,000 LF of steel mains begin to reach the end of their useful life the mains will require replacement. The steel mains range in age from 30-50 years old. Assuming the mains do not have significant useful life beyond 50 years, NSID has approximately 20 years to replace the newest steel mains. NSID plans to replace approximately 4,500 LF of the oldest steel mains during the 6-year planning period; this is 6" main on Smith St from Lincoln Rd to midway between Francis Ave and Bruce Ave. The District will address the remainder of the steel mains as finances allow during the 20-year planning period.

Whenever possible, NSID replaces steel mains using District personnel with minimal outside assistance; this reduces the cost of main replacements. NSID estimates it can replace the 4,500 LF of 6"main for $150,000. The cost of replacing the remaining 13,500 LF of steel main will vary depending on the diameter of the main; NSID

estimates the cost of replacing the 13,500 LF will be approximately $600,000.

Fire Flow to Brooklyn Iron Works

NSID will need to complete a distribution system loop in Brooklyn Ave to provide the required 6,000 gpm fire flow rate to Brooklyn Iron Works. This will involve installing approximately 1,000 LF of 12" main in Brooklyn Ave from Altamont St to Crestline St. This portion of Brooklyn Ave is not paved which lowers the cost of installing the new main. NSID estimates the cost of installing the 1,000 LF of 12" will be approximately $60,000.

Serving Northeast Portion of District

The HGL of the existing pressure zone cannot provide adequate service pressure to connections above elevation 2,090. The northeast portion of the District has elevation exceeding 2,090 and will therefore require establishment of a new pressure zone in order to provide water service to this area. The growth projections for this area estimate that by the end of the 20-year planning period the new pressure zone will serve approximately 246 ERUs. Due to the eventual size of the new pressure zone, NSID wants the zone to have a reservoir and operate as an open system. NSID may allow the establishment of a closed pressure zone (no reservoir) on an interim basis if the number of connections initially proposed for the new zone does not justify the cost of constructing the reservoir. However, for the purposes of this Water System Plan, NSID assumes the booster station, reservoir, and connecting transmission main will all be constructed at the same time.

HGL of New Pressure Zone

The new pressure zone will serve customers above elevation 2,090. Assuming NSID limits maximum pressure in the new zone to I 00 psi and minimum pressure to 45 psi (static demand and full reservoir), the new zone could serve customers in the elevation range of 2,090-2,220; customers at the lower end of this elevation range with service pressure greater than 80 psi will likely desire individual PRVs. These service pressure and elevation parameters will require the new reservoir to provide an HGL of approximately 2,320.

Booster Station Capacity

The growth projections in **Section 3** predict a 20-year MOD for the new pressure zone of 388 gpm. The DOH WSDM requires open system booster stations to have sufficient capacity to meet MOD; they must also have sufficient capacity to meet ADD with the largest pump out of service; this assumes the pressure zone meets PHO (908 gpm) through the use of equalizing storage. NSID assumes the booster will utilize two 200 gpm pumps; this will allow the booster to meet projected 20- year ADD (110 gpm) with the largest pump out of service and meet projected MOD (388 gpm) using both pumps. Pumping from the main zone HGL to the new reservoir HGL will require static head of approximately 135 ft plus an allowance of 25 ft for friction and minor losses. This approximately results in two 15 HP pumps.

Storage Volume Needed

The required volume of the reservoir depends on the needs of the new pressure zone. The following calculations estimate the required volume for the new reservoir:

Operational Storage= 5,000 gal (allowance)
Equalizing Storage= (908 gpm-388 gpm) x (150 min)= 78,000 gal
Standby Storage= (200 gpd/ERU) x (246 ERUs) = 49,200 gal (DOH minimum) Fire Storage= (1,000 gpm) x (60 min)= 60,000 gal
Assume nesting of fire and standby storage
Required Storage= 5,000 gal+ 78,000 gal+ 60,000 gal= 143,000 gal"" 150,000 gal

The District would equip the proposed booster station with a bypass PRY and limit switch to lockout pump operation and make the upper zone storage available to the main zone if suction pressure drops below the set point.

In addition to the booster station and reservoir, the upper pressure zone will need a transmission main to connect the booster to the reservoir. The main zone may also require improvements depending on the location of the new booster station and residual capacity available at that point in the main zone.

A list of projects (capital projects) to cure them

- Costs
- Timing

Table 5-1 Estimated Cost of Upper Pressure Zone Facilities

tem Descriotion	Estimated Cost
Site grading and access road	$ 10,000
Site and building JJiJ)I!I_g (PRV & limit switch, required fittings)	25,000
PumRs, electrical, and controls	20,000
Booster Station Subtotal	
Reservoir	$225,000
Ground level steel 150,000galreservoir (1	
Site, Ring P_roperty acquisition Gravel	20,000
Reservoir Subtotal	
Transmission Imprrovements	$112,500
1,500 LF of 8" main to reservoir (3	
Construction Subtotal	$527,500
Contingencies (20%)	45,000
	106,000

<1> *Includes site work, excavation, foundation, and fencing*

<2> *Assume 1,000 LF, with 6" crushed rock, 12 ft wide, and $10/SY*

<3> *Assumes $75/LF*

The following table summarizes planned improvements for the 6-year and 20-year planning periods.

Table 5-2 Capital Improvement Plan

Improvement	Reason Needed	Estimated Cost	Funding Source
6 Year Plannina Period			
Replacement of approx. 4,500 LF of water main on Smith St. between Lincoln and midway between Bruce & Franciswith 6' DI	Old6' steel main, part of on-going replacements (partially complete as of last year)	$150,000 (1)	Local reserves
Install approx.1,000LF of water main on Brooklyn Ave between Creestline St and Altamont St	Loopdistribution system to increase available fire flow to Brooklyn Iron Works	$60,000	Local reserves
Ongoing meter replacement with Radio Read Meters	Reliability, replacing old meters	$10,000 per year	Local reserves
Inspect **2 MG** reservoircoatina	20 vears old	-	-
20 Year Plannina Period			
Repaint 2 MG reservoircoating	At some point in the 20 year planning period the 2MG reservoir coatina will reauire replacement.	$75,000 (1)	Local reserves
New booster station, transmissionmain and reservoir to serve northeast portion of District.	The existing reservoir doesnot have a high enough HGL toserve the northeast portion of the District.	$780,000	Developer funded

1

<1> *Costs estimated by District and assumes, where possible, utilizing District personnel for construction and minimal outside assistance.*

Water rights deficiencies

The District has four water rights Certificates which apply to all four wells. Two certificates exist as Declaration of Claim (Grandfather rights), issued in 1948 with their rights dating back to 1909, for the two lots on which the pump houses sit. The other two Certificates were issued under the State permit process after 1948. The combined Certificates allow for annual withdrawal of 3,682 acre-feet (1,200 MG) at a maximum instantaneous rate of 4,500 gpm, for community domestic, industrial, and irrigation purposes. The Certificates limit combined production of Pump #2 and #4 (the west pumps) to 3,199 acre-feet (1,042 MG) annually, and a maximum instantaneous rate of 3,300 gpm. The Certificates exempt withdrawals for fire protection purposes from instantaneous limits (refer to Appendix C for copies of the District's Water Rights Certificates).

Table 4-2 Comparison of Water Rights with Existing and Projected Demands

Permit, Certificate or Claim #	Name of Rightholder or Claimant	Priority Date	Source Number	Primary or Supplemental	Water Rights		Consumption		Water Right Status (Excess/Deficiency)	
					Max. Instant. Flow Rate (gpm)	Max. Annual Volume (ac-ft/yr)	Max. Instant. Flow Rate (gpm)	Max. Annual Volume (ac-ft/yr)	Max. Instant. Flow Rate (gpm)	Max. Annual Volume (ac-ft/yr)
5381-A	NSID	1965	#1 & #3	Primary	1,200	483				
677-D	NSID	1909	#2 & #4	Supplemental	1,000	2,114				
676-D	NSID	1909	#1 & #3	Primary	1,000	2,114	2,050 [3]	732.0 [4]	2,450	2,950.0
G3-00556	NSID	1971	all 4 wells	Primary	2,300	1,085				
Total [1]					4,500	3,682 [2]				
Projected Future (20-Year)					4,500	3,682 [2]	4,050 [3]	985.9 [4]	450	2,696.1

(1) *Totals taken from Report of Exam (ROE) for the most recent water right, G3-00556.*
(2) *According to ROE for G3-00556, annual withdrawal for community domestic and industrial is limited to 1,792 ac-ft/yr and for irrigation is limited to 1,890 ac-ft/yr.*
(3) *The first draft of this Water System Plan listed current and 20-year Qi consumption as the combined capacity of NSID's existing well pumps (4,050 gpm). Department of Ecology indicated Qi consumption should only be the well pumping rate required to meet PHD. NSID can meet current PHD by using Pumps #1, #2, and #3; they can keep Pump #4 in reserve under current PHD. Hence, current Qi consumption has been revised to 2,050 gpm. NSID will need all four well pumps to meet 20-year PHD; hence, 20-year Qi consumption is 4,050 gpm.*
(4) *Refer to **Section 3** for demand methodology.*

Pasadena Park I.D.

Source

The District has five wells located as shown on the water system map in the Appendix. All water pumped is metered at the wells.

Well No. 1
Well No. 1 is located at the NE comer of Upriver Drive and Marguerite Road in a wood frame building. The well was hand dug in 1932. The depth from pumphouse floor to the bottom of the well is 104 feet. The perforated casing below 88 feet is three feet in diameter.
The 50 HP pump was removed from the well, and the District no longer pumps water for domestic use. The District has turned the well into an educational facility so that the public can observe and learn about the aquifer. The District remodeled the building, and constructed a 4 foot high safety wall and plexi-glass cover around and over the well opening. A 1 horsepower pump was installed in the well which pumps about 10 gpm. The pump supplies water through a 2 inch waterline to an outdoor pond at West Valley School District's Outdoor Learning Center at 8706 E.Upriver Drive.

Well No. 2
Well No. 2 is located at E. 9800 Garland Avenue in a concrete block building. The well was drilled in 1960 to a depth of 234 feet. A 100 HP pump rated at 1,000 GPM has been installed in the well.

Well No. 3
Well No. 3 is located at N. 4601 Willow Road in a concrete block building. The well was drilled in 1966 to a depth of 202 feet. The 200 HP pump is rated at 1,727 gpm @ 305 TDH.

Well No. 4
Well No. 4 is located just north of Well No. I in concrete block building. The well was drilled in 1974 with screen at 139 feet. The 200 HP pump is rated at 2,000 gpm @ 316 TDH. Well No. 4 is set up for chlorination.

Well No. 5
Well No. 5 is located about 600 feet south and 300 feet east of the intersection ofUpriver Drive and Maringo Drive. The well was drilled in 1993 to a depth of 180 feet. A 150 HP pump rated at 1,500 GPM @ 305 TDH was pulled from well no. 2 and installed in well No. 5 in 1995.

Chlorination facilities are installed in the concrete block pumphouse.

Storage

Total storage capacity: 3,938,672 gallons

TABLE 4-3
Pasadena Park Irrigation District No. 17
Storage Facilities

Reservoir Location	Material	Date Constructed	Floor Elevation (ft)	Overflow Elevation (ft)	Dimensions Height (ft)	Dimensions Diameter (ft)	Unit Storage (gal/ft)	Total Volume (gallons)	Altitude Control Valve
Tier 1			Datum	NAVD 29					
Reservoir No. 2 SE ¼ of Sec. 31, T 26 N, R 44 E WM	Concrete	1956	2152.77	2169.7	16.93	60	21,138.48	337,874	Yes
Reservoir No. 2A SW 1/4 of Sec. 31, T 26 N, R 44 E WM	Steel	1981	2151	2169.7	18.7	55	17,762.20	332,153	No
Tier 2									
Reservoir No. 3 NW ¼ of Sec. 31, T 26 N, R 44 E WM	Steel	1977	2317.54	2340.20	22.66	48	13,528.63	306,558	No
Reservoir No. 3A NW ¼ of Sec. 31, T 26 N, R 44 E WM	Concrete	2001	2317.50	2340.20	22.7	70	28,771.82	653,120	No
Tier 3									
Reservoir No. 4 SW ¼ of Sec. 31, T 26 N, R 44 E WM	Steel	1983	2516.5	2535	18.5	70	28,771.82	532,278	No
Tier 4									
Reservoir No. 5 NE ¼ of Sec. 36, T 26 N, R 43 E WM	Concrete	2008/2009	2560	2605	45	82	39,481.98	1,776,689	No
							Total Storage (gallons)	3,938,672	

The District presently has six Reservoirs; No. 2, No. 2A, No. 3, No. 3A, No.4 and No. 5.

Reservoir No. 1 the original district reservoir was abandoned years ago. The total District storage capacity is approximately 3,910,000 gallons. The water system map, Figure-5, in the appendix indicates the reservoir locations.

Reservoir 2
Reservoir 2 is located in the SE IA ofSE ',4 of Section 31, west ofArgonne Road. The reservoir was constructed underground with reinforced concrete with a capacity of 337,000 gallons, the reservoir has a diameter of 60* with a floor elevation of 2152.77 and an overflow of 2169.7. The reservoir was constructed in 1956 to serve the lower pressure tier from elevation 1940 to 2075 . The reservoir works in parallel with Reservoir 2A.

Reservoir 2A
Reservoir 2A is located in the SE1/4 ofSWl/4 of Section 31 just south ofMulvaney Court and north of the corner ofElton and Northwood Drive. The reservoir was constructed above ground of steel with a capacity of 332,000 gallons. The reservoir has a diameter of 55' with a floor elevation of 2151 and an overflow elevation of 2169.7. The reservoir was constructed in 1981 to serve the lower pressure tier along with Reservoir 2 from elevation 1940 to an elevation 2075. Reservoirs 2 and 2A provide 628,000 gallons of storage for the lower tier (Tier 1).

Reservoir 3
Reservoir 3 is located near the center of section 3 1, east ofNorthwood Drive. The reservoir was constructed above ground of steel with a capacity of 306,000 gallons. The reservoir has a

diameter of 48' with a floor elevation of 2317.54 and an overflow elevation of 2340.20 . The reservoir was constructed in 1977 and serves the middle pressure tier (Tier 2) between 2075 and 2240.

Reservoir 3A
Reservoir 3A is located near the center of section 31, east ofNorthwood Drive. The reservoir was constructed underground with reinforced concrete with a capacity of 653,000 gallons. The reservoir has a diameter of 70' with a floor elevation of 2317.54 and an overflow elevation of 2340.20 . The reservoir was constructed in 2001 and serves the middle pressure tier (Tier 2) between 2075 and 2240.

Reservoir 4
Reservoir 4 is located in the SW1/4 ofSWl/4 of Section 31, west of Ella Street. The reservoir was constructed of steel with a capacity of 532,000 gallons. The reservoir has a diameter of 70 feet with a shell height of 18.5 feet and an overflow elevation of 2535. The reservoir was constructed in 1983 and serves the upper pressure tier (Tier 3) between 2240 and 2440.

Reservoir 5
Reservoir 5 is located in the NE 1/4 of Section 36, T. 26 N, R. 43 E. W.M., west of Sunflower Drive. The reservoir is constructed of concrete with a capacity of approximately 1,750,000 gallons. The reservoir has an inside diameter of 82 feet and a height of 45 feet. The floor elevation is 2560, and the overflow elevation is 2605. The reservoir serves the high pressure tier (Tier 4) above elevation 2440.

Delivery

Boosters/Pressure relief valves –

The District has eight booster pump stations. Four of the stations pump water from the lower tier (Tier 1) to the middle pressure tier (Tier 2), two booster stations pump water from the middle tier (Tier 2) to the upper tier (Tier 3). Two booster pump stations pump water from the upper tier (Tier 3) to the highest tier (Tier 4).

Original Booster Station 2-3
The original booster station 2-3 is located at Reservoir 2, in the SE1/4 of SE1/4 of Section 31. The booster station is in a concrete vault and consists of two 20 HP motors that each pump 250 GPM. The pumps are controlled by water level in Reservoir No 3.

New Booster Station 2-3
The new booster station 2-3 is also located at Reservoir 2 in the SE1/4 of SE1/4 of Section 31. The booster station is in a concrete and wood framed semi-vault and consists of a 30 HP motor/pump and a 40 HP motor/pump that pump 300 GPM and 400 GPM respectively. The pumps are controlled by the water level in Reservoir No. 3.

Booster Station 2-3 (Karrer)
The 2-3 (Karrer) booster station was originally located in SW1/4 of SW1/4 of Section 32 just north of Argonne Road in a precast concrete below ground vault. This station had not operated in over 10 years, and was removed in year 2010. The District constructed a new station south of Argonne Road in year 2010. The station has three 40 HP pumps that pump 500 gpm each.

Booster station 2A"3
Booster station 2A-3 is located in an above ground concrete masonry unit building at Reservoir 2A in the SE1/4 of SW1/4 of Section 31 , Just south of Mulvaney Court. The booster station, has 2 - 25 HP pumps each rated at 300 gpm.
These four booster pump stations at present are capable of pumping 3,300 GPM from the lower

tier (Tier 1) to the middle tier (Tier 2).

Booster Station 3-4

Booster station 3-4 is located at Reservoir 3 and 3A in the SE1/4 of SW1/4 of Section 31 just north of the center of Section 31. The booster station is in an above ground wood frame building with a concrete floor and consists of three pumps. A 30 HP motor pumps 250 GPM, one 40 HP pumps 400 GPM, and another 40 HP pumps 500 GPM. The pumps are controlled by the water level in Reservoir 4. This pump station pumps water from the middle tier (Tier 2) to the upper tier (Tier 3) at the maximum rate of 1,150 GPM.

Booster Station 3A-4

Booster station 3A-4 was constructed in the year 2001 as an addition to Booster Station 3-4. The booster station is in an above ground wood frame building with a concrete floor and consists of three 40 HP motors. Each motor pumps 500 GPM. The pumps are controlled by the water level in Reservoir 4. This pump station pumps water from the middle tier (Tier 2) to the upper tier (Tier 3) at the maximum rate of 1,500 GPM.

Booster Station 4-5

This booster station supplies the highest tier (Tier 4) with water pumped from Tier 3 and from Reservoir No.4 which has the capacity of 532,000 gallons. The booster station is located on the south side of Reservoir No. 4. This booster pump station has three pumps. A 5HP electric motor operates a 100 GPM pump. The 10 HP electric motor operates a 250 GPM pump. The natural gas driven pump supplies 1,250 GPM. This pump station supplies a maximum of 1,600 GPM to the highest tier (Tier 4).

Booster Station 4A-5

This booster station supplies the highest tier (Tier 4) with water pumped from Tier 3 and from Reservoir No.4. The booster station is located at N. 5800 Jensen Road. This booster pump station has three pumps. A 3HP electric motor operates a 50 GPM pump. The 7.5 HP electric motor operates a 150 GPM pump. The 50 HP natural gas driven motor operates a 1,500 GPM pump. This pump station supplies a maximum of 1,700 GPM to the highest tier (Tier 4).

Booster Station 4B

Currently, there are no pumps in this booster station. A 12 foot by 15 foot building was constructed along Vista Park Drive by the developer of the Vista Ridge subdivision. 8 inch diameter pipes are stubbed into and out of the building. The booster station was constructed so that additional pumps could be installed in the future if water demands increase in the highest tier (Tier 4). The District installed piping and a slip valve/ pressure reducing valve through the building in year 2009. The slip valve will open automatically and allow water in Tier 4 to flow back into Tier 3 if a high demand such as fire flow occurs in Tier 3.

PRESSURE REDUCING STATIONS

Pressure Reducing Valve Stations

The District has six pressure reducing valve stations.

Two stations are located on Lehman Road, and reduce the water pressure from the upper tier (Tier 3) to the middle pressure tier (Tier 2), and from the middle tier to the lower tier (Tier 1).

One pressure reducing station serves the Hazelwood subdivision south of Reservoir No. 2. The subdivision is served water from the middle tier (Tier 2), and the station reduces the pressure.

The pressure is approximately 128 psi on the incoming side of the PRV, and the PRV is set to deliver 70 psi on the outgoing side.

One pressure reducing station serves the upper part of the Sandy Ridge subdivision south of Columbia Drive and Emerald Lane. This part of the subdivision is served water from the upper

tier (Tier 3), and the station reduces the pressure. The pressure is approximately 120 psi on the incoming side of the PRV, and the PRV is set to deliver 70 psi on the outgoing side.

One pressure reducing station serves Parkside Lane east of Vista Park Drive. It was constructed in year 2010. This subdivision is served water from the upper tier (Tier 3), and the station reduces the pressure. The pressure is approximately 135 psi on the incoming side of the PRV, and the PRV is set to deliver 70 psi on the outgoing side.

One pressure reducing station currently serves the upper part of the Valley Springs subdivision north ofFairmont Lane. The subdivision is served water from the high tier (Tier 4), and the station reduces the pressure. The pressure is approximately 100 psi on the incoming side of the PRV, and the PRV is set to deliver 56 psi on the outgoing side.

Transmission lines –

The layout of transmission and distribution mains in the District is shown on the attached map. The District has approximately 260,730 lineal feet or 49 miles of watermains in the four tiers.

TABLE 4-2 - WATERMAIN DATA

TIER No. 1

Size	Type of Watermain					Total	Percentage
	Steel	PVC	CI	DI	AC		
4" diameter	750		1,400			2,150 L.F	2.2%
6" diameter	12,600	3,370	6,930	1,230	2,900	27,030 L.F.	28.4%
8" diameter	1,700	15,100	300	700	9,200	27,000 L.F.	28.4%
10" diameter		4,580		1,950	3,370	9,900 L.F.	10.4%
12" diameter	4,010	19,320		2,470	3,300	29,100 L.F.	30.6%
	19,060	42,370	8,630	6,350	18,770	95,180 L.F.	100.0%
	20.0%	44.5%	9.1%	6.7%	19.7%	100.0%	

TIER No. 2

Size	Type of Watermain					Total	Percentage
	Steel	PVC	CI	DI	AC		
4" diameter		770				770 L.F	2.4%
6" diameter		5,810		380		6,190 L.F.	19.6%
8" diameter		12,960		1,120		14,080 L.F.	44.6%
10" diameter		6,460		230		6.690 L.F.	21.2%
12" diameter		3,850				3,850 L.F.	12.2%
		29,850		1,730		31,580 L.F.	100.0%
		94.5%		5.5%		100.0%	

TABLE 4-2 - WATERMAIN DATA (continued)

TIER No. 3

Size	Type of Watermain					Total	Percentage
	Steel	PVC	CI	DI	AC		
4" diameter		210		260		470 L.F	0.9%
6" diameter	1,480	8,510		2,890	390	13,270 L.F.	26.5%
8" diameter		11,780		160		11,940 L.F.	23.8%
10" diameter		5,930		1,900		7,830 L.F.	15.6%
12" diameter		16,290		340		16,630 L.F.	33.2%
	1,480	42,720		5,550	390	50,140 L.F.	100.0%
	3.0%	85.2%		11.1%	0.7%	100.0%	

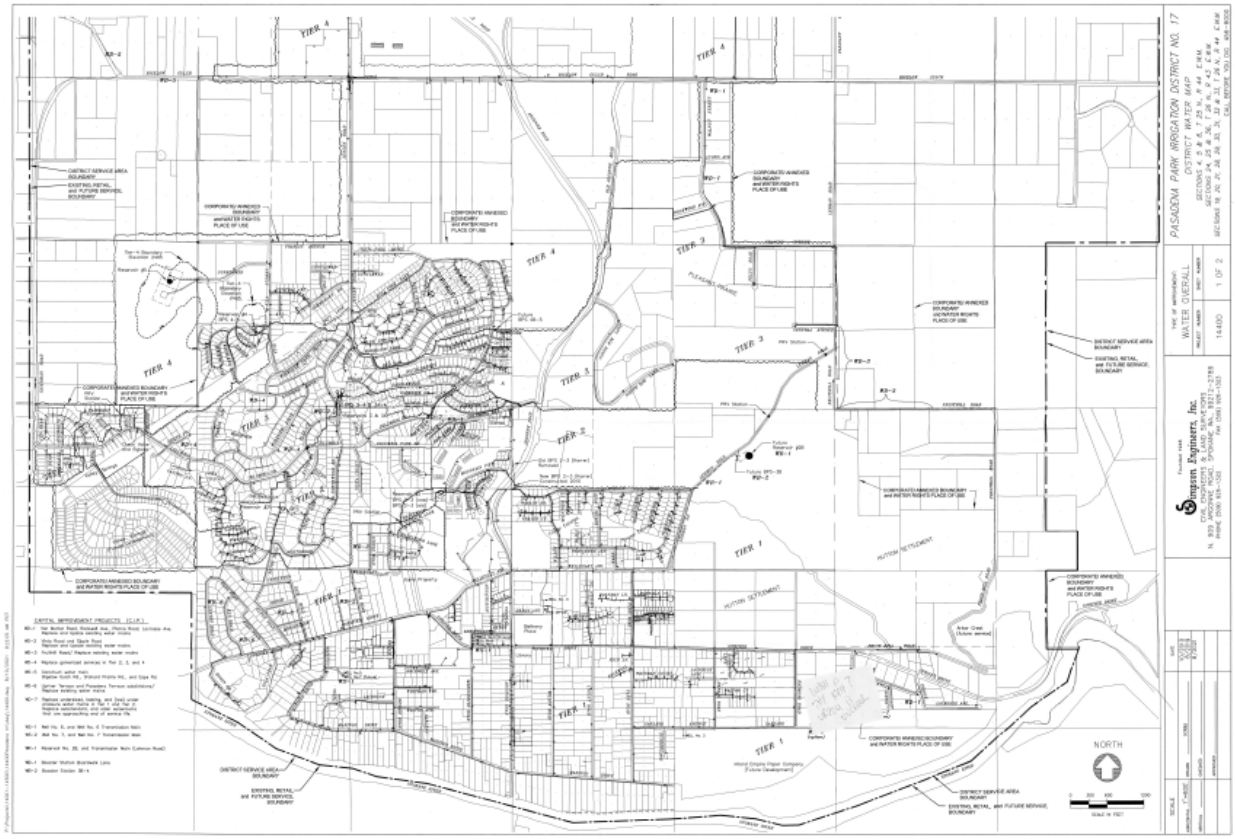
TIER No. 4

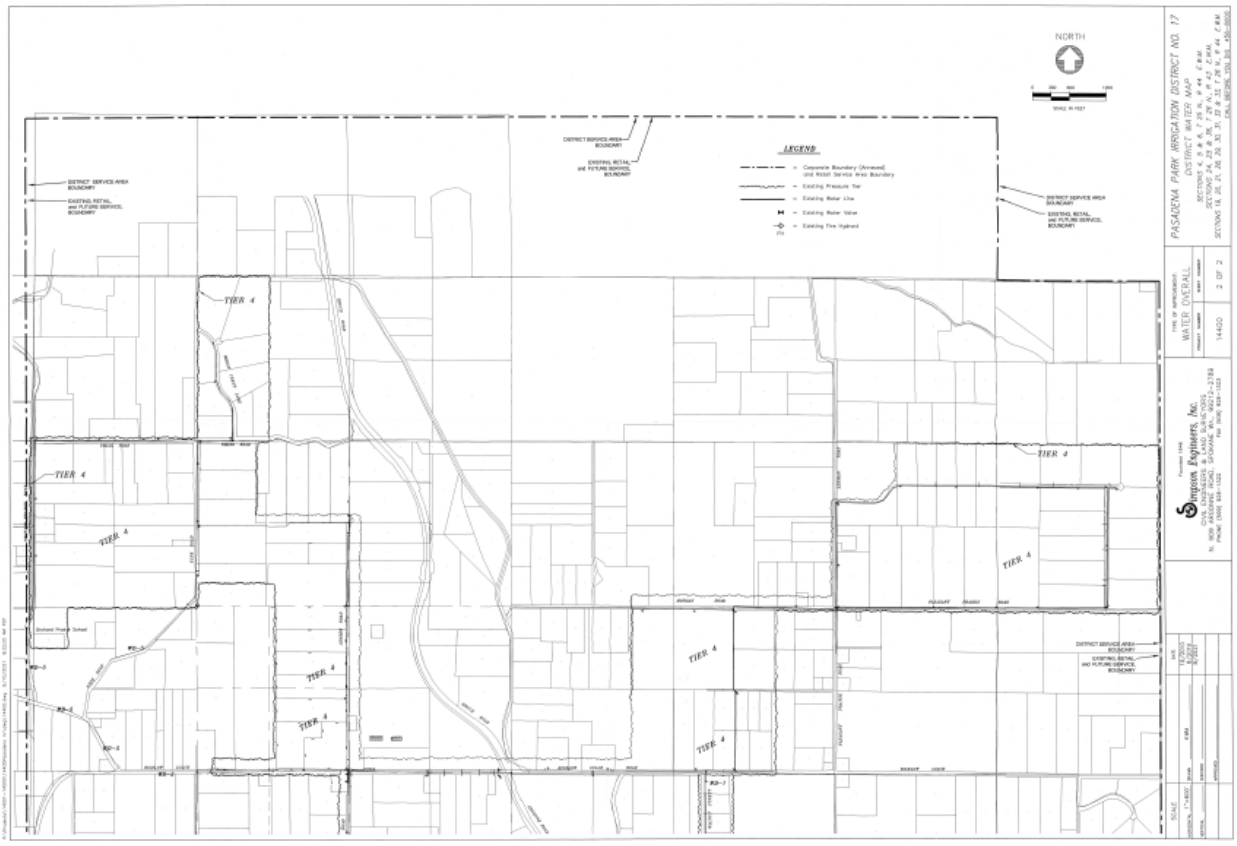
Size	Type of Watermain					Total	Percentage
	Steel	PVC	CI	DI	AC		
6" diameter		2,280		250		2,530 L.F.	3.0%
8" diameter		12,880		100		12,980 L.F.	15.5%
10" diameter		8,740		390		9,130 L.F.	10.9%
12" diameter		57,430				57,430 L.F.	68.5%
16" diameter		1,760				1,760 L.F.	2.1%
		83,090		740		83,830 L.F.	100.0%
		99.1%		0.9%		100.0%	

ALL TIERS

Size	Type of Watermain					Total	Percentage
	Steel	PVC	CI	DI	AC		
4" diameter	750	980	1,400	260		3,390 L.F	1.3%
6" diameter	14,080	19,970	6,930	4,750	3,290	49,020 L.F.	18.8%
8" diameter	1,700	52,720	300	2,080	9,200	66,000 L.F.	25.3%
10" diameter		25,710		4,470	3,370	33,550 L.F.	12.9%
12" diameter	4,010	96,890		2,810	3,300	107,010 L.F.	41.0%
16" diameter		1,760				1,760 L.F.	0.7%
	20,540	198,030	8,630	14,370	19,160	260,730 L.F.	100.0%
	7.9%	76.0%	3.3%	5.5%	7.3%	100.0%	

Schematic


PASADENA PARK IRRIGATION DISTRICT NO. 17
DISTRICT WATER MAP
NORTH



Connections

In year 2018, there were 2,628 domestic water service connections in Pasadena's water service area. 2.5 persons per household multiplied by 2,628 households equates to approximately 6,570 persons served by Pasadena Park Irrigation District in year 2018.

A list of capital deficiencies

1. Construct wells no. 6 and 7.
2. Construct reservoir no. 2B in Tier I.
3. Replace undersized and leaking watermains in Tier 1 and Tier 2.
4. Replace leaking galvanized iron pipe water services in Tier 2 and 3.
5. Increase capacity of booster pump stations as needed.

The system analysis indicates the following:
The District has adequate source pumping capacity and reservoir storage to meet the current average day demands, and peak hourly demands.
Fire flows and fire suppression storage are generally adequate with the existing pumping facilities, standby generators, and reservoir storage.
However, the storage and hydraulic analyses indicate that additional pumping and reservoir storage in Tier No. 1 will be needed for equalizing storage, standby storage, and fire suppression storage.
This would involve constructing a new Tank 2B in Tier 1. The new Tank 2B would be located off of Lehman Road on Hutton Settlement property, and would be 1 .5 million gallons or larger.
This would also involve constructing new wells in Tier 1 . A new well No. 6 shall be constructed at Marguerite Road and Longfellow Ave. next to existing well no. 4, and would be 1,500 gpm or larger.

A new well No. 7 shall be constructed at Maringo Road next to existing well no. 5, and would be 1,500 gpm or larger. One or both of these wells could also be constructed on property next to existing well no. 3 and the district office.

The storage and hydraulic analysis indicate that additional storage will be needed for Tier 2 and 3 between years 2029 and 2039 to meet estimated maximum day demands and provide equalizing storage, standby storage, and fire suppression storage. This would involve constructing a new Tank 3B in Tier 2, and new tank 4A in Tier 3. The District will need to obtain vacant land for these tanks.

The District has flowmcters and telemetry panels in all well houses and booster stations, and had updated Us SCADA system, so that instantaneous pumping rates can be monitored at all pumping stations.

Unfortunately, the District SCADA computer stopped working, and this data was lost for years 2012 through 2014 (see footnote in Table 3-1). The District now backs up the computer data. However, after the computer failure, the computers did not get reprogrammed to record flows at the booster pump stations, so How data has not been recorded by the computers. The District has contacted its SCADA system programmer to correct this.

In section 4.2.3, the storage analysis included a calculation for proposed equalizing storage. The equalizing storage was calculated using theoretical calculations for peak hourly demand.

The calculated peak hourly demands are likely higher than expected. Since, peak hourly demands were determined by theoretical calculations rather than actual readings, the peak hourly demands should be verified.

Hopefully in the future, the District will be able to record and retain the instantaneous pumping rates, so that actual peak hourly demands can be determined rather than theoretical PHD s. After a few years of recording instantaneous flow rates, the peak hourly demand and storage analysis could then be revaluated to verify the need for additional storage.

A list of projects (capital projects) to cure them

The District will continue to maintain and upgrade the water system, including replacement of water mains and service meters over the next six years. See Chapter 9.

The majority of the fire hydrants in the water system can provide at least 1,000 gpm of fire flow and maintain 20 psi pressure throughout the system. In areas where available fire flow is less than 1,000 gpm, the District will replace undersized watermains to increase fire flow capacity and pressure as part of its annual watermain replacement budget.

Improvements could be made at the locations where the pressure was less than 30 psi during peak hourly demand in the hydraulic analysis.

For example^ at Elde Ct. and Northwood Drive, where the pressure was less than 30 psi during peak hourly demand, the water services were disconnected from Tier 2 watermain and reconnected to nearby Tier 3 watermain.

At Vista Road and Sipple Road north of Upriver Drive, larger 8" diameter watermains shall be constructed to provide fire flows of 1,000 gpm and maintain 20 psi during maximum day demand.

At Van Marter Road, Pierce Road, Rockwell Ave. and Lacrosse Ave. larger 8" diameter watermains shall be constructed to provide fire flows of 1,000 gpm and maintain 20 psi during maximum day demand.

These projects shall be funded from the District's yearly budget for watermain replacement. See Table 9-1.

At Boardwalk Lane, a small booster pump station could be installed at the north end of the road, so that customers on Boardwalk Lane would receive pressures above 30 psi. The booster station would supply domestic flows only. The fire hydrant on Boardwalk Lane would need to be relocated upstream of the booster station.

The storage and hydraulic analyses indicate that additional pumping and reservoir storage in Tier No. I will be needed for equalizing storage, standby storage, and fire suppression storage.

The District has had discussions with Hutton Settlement about obtaining an easement for the Tank 2B site. A preliminary site plan/ topography map was prepared by the District's engineer, and the site plan

was submitted to Hutton Settlement in 2007 for discussion. In year 2017, the District obtained an easement from Hutton Settlement for the Tank 2B site. A new tank 2B shall be constructed at this site. A new well No. 6 shall be constructed at Marguerite Road and Longfellow Ave. next to existing well no. 4, and would be 1,500 gpm or larger. A new well No. 7 shall be constructed at Maringo Road next to existing well no. 5, and would be 1,500 gpm or larger. One or both of these wells could also be constructed on property next to existing well no. 3 and the district office.
The District will need to review its pumping records over the next 6 years to see if it is using the forecasted water demands, and evaluate the need for these improvements.
The District should seek to acquire properties or easements over the next six years on which to construct these improvements, and should also be looking for properties to construct future reservoirs and booster stations in Tier 2 and Tier 3, since suitable sites will become harder to find as land is developed in the Northwood area.

Table 9-1 lists proposed projects in Pasadena Park Irrigation District No. 17 for next 10 years along with the year of construction, and the cost. The cost of these projects are also included in the 10 year projected budget, Table 10-1. The projects will be financed by District funds collected through water rates, hookup fees, and equalization fees.
Proposed capital improvements to the District's system in the next 10-years are listed as follows:
• Construct Wells No. 6 and 7 (year 2022)
Projects would include the cost of drilling wells, pumps, pumphouses, and watermains.
• Construct Reservoir #2B for Tier No. 1 (year 2023)
• Replace undersized» leaking, and (low) under pressure watermains in Tier 1 and Tier 2.
Vista Road and Sipple Road north ofUpriver Drive
Van Marter Road, Rockwell Ave. Pierce Rod, and Lacrosse Ave
• Construct Booster Pump Station to serve Boardwalk Lane.
• Replace galvanized iron pipe water services in Tier 2, 3 and 4 (corroded and leaking)
• Upsize watermains in conjunction with private developments.
Proposed maintenance projects in the next 10-vears are listed as follows:
• Install and maintain fire hydrants throughout the District for better fire protection.
• Leak detection program
• Service meter replacement program. Source meter cahbration.
Costs for leak detection program, and costs for meter replacement and calibration of meters are included in yearly budget for capital improvements.
These improvements will be evaluated by the Board on a year to year basis. The decisions will be made considering the monies available and the system needs at that time.
Proposed improvements to the District's system in the next 20-years are listed as follows:
• The District shall acquire properties or easements to construct future reservoirs and booster stations in Tier 2 and Tier 3.
Construct reservoir #3B for Tier No. 2, and reservoir #4A for Tier No. 3

Distribution Mains and Transmission Mains
The age of the existing cast iron, and steel watermains is not known, but many could be as old as the system. There are several water mains in Tier 1 which are over 40 years old. Newer mains in Tier 1 are in good condition. The District has replaced some old watermains in Tier 1, and would like to replace more in the next 6 to 10 years. Consequently, the condition of the District's mains is continuing to improve. The District's mains should be in good condition in Tiers 2, 3, and 4, since the development in these areas is less than 35 years old» and most of the mains were constructed ofPVC pipe.
Unfortunately, galvanized piping was installed for many of water services in Tier 2. The District has found that the galvanized services in Tiers 2, 3 and 4 have corroded and are leaking. These Tiers are located on the hillside composed of granite and decomposing granite rock, and forested by ponderosa pine trees. The combination of granite rock and pine trees creates a corrosive condition for iron pipes. The District has replaced some of the galvanized services with polyethylene pipe, but there are still several galvanized service pipes that need to be replaced.
By continuing to replace existing cast iron, and steel watermains, and galvanized iron services, the District hopes to reduce the amount of water loss through leaking watermains.
The following is a list of construction projects for watermains anticipated in next 6 to IQ-years. and additional projects in 10 to 20 years if money is available.

WD-1 Construct 8" watermain or larger in Van Marter Road, Rockwell Ave., Pierce Road, and Lacrosse Ave. approx. 3,200 LF (6 years)
(Option: Construct 12" watermain from Garland Ave./ Raymond Rd. to Van Marter Rd., Glenn Rd. and Pierce Rd. on Inland Empire Paper property, approx. 3,200 LF)
WD-2 Construct 8" watermain or larger in Vista Road and Sipple Road north ofUpriver Drive approx. 2,000 LF (6 years)
WD-3 Complete replacement of existing watermain along Fruithill Road with approximately 3,000 lineal feet of 12" watermain. (south of Central Ave. approx. 1,350 LF and east approx. 1,650 LF) (Phase 3 watermain replacement in the old Pleasant Prairie Water User Association water system) (10 to 20 years)
WD"4 Replace existing galvanized iron water services in Tier 2 (Northwood subdivision). (6 to 10 years)

WD-5 12" watermain construction along Orchard Prairie Road (1,500 LF) and Espe Road (2,600 LF) from existing watermains to Bigelow Gulch Road, and along Bigelow Gulch Road (3,600 LF) to end of existing watermain.
These projects may occur if Spokane County commences with reconstruction of Bigelow Gulch Road. (10 to 20 years)
WD-6 Replace existing 4" and 6" watermains in Upriver Terrace and Pasadena Terrace subdivisions with 8" watermain. (Center Rd., Ely Rd., Ella Rd., Elton Rd., Dick Rd., Longfellow Ave., Heroy Ave., and Princeton Ave.) (10 to 20 years)
WD"7 Watermain Replacement (See Table 9-1): (6 to 10 years)
Replace undersized, leaking, and (low) under pressure watermains in Tier 1 and Tier 2
Replace substandard, and older watermains that are approaching end of service life
WD"8 Pay for upsize of 8" watermain to 12" watermain at time of construction in private developments when necessary (See list of anticipated private development projects listed on page 9-5). (6 to 10 years)
Wells
To meet peak hourly demand, the District shall construct additional wells and pumps, and an additional reservoir 2B in Tier No. 1. Two additional wells would be needed for increase in PHD from year 2018 to 2025. Each well will need to provide from 1,500 gpm to 2,000 gpm. An additional reservoir 2B shall be constructed in Tier No. 1 to increase equalizing and fire suppression storage.
WS-1 When constructed, these wells will be numbered no. 6 and no. 7. Well no. 6 could be constructed on property adjacent to existing well no. 4. Well no. 7 could be constructed on district property adjacent to existing well no. 5. The District has purchased additional properties adjacent to well no. 3. This property could also be used as a location for future wells no. 6 and 7, or for a standby/ emergency well.
It is anticipated that well no. 6 and 7 would be drilled at the same time, and well no. 6 would be placed into service first. Well no. 7 would then be placed into service shortly after. Additional water rights were requested from the Department of Ecology in February 1995 to increase water rights from 5,250 gpm to 10,000 gpm, and to permit withdrawal of water from wells No. 6 and No. 7. These projects are included in the 20" year planning horizon as WS-1 and WS-2.
It is estimated that work at Well no.6 is projected to cost $300,000 to $400,000, and well no.7 at $300,000 to $400,000.

Reservoirs
WR-1 An additional reservoir will be needed to serve Tier No. 1 by Year 2025. Using Spokane County adopted fire flow standards, a total of 585,000 gallons of storage (3,250 gpm for 180 min.) is required for Tier No. 1. At present 670,027 gallons of storage serves Tier No. 1. Constructing of a reservoir would lessen the reliance on the existing bypass valve to open and allow water from Tier 2 to flow back into Tier 1, and would meet additional needs in the next 20 years. A new reservoir should be at least 1,500^000 gallons in size.
The reservoir required for Tier No. 1 would be constructed on a hillside. The District has had discussions with Hutton Settlement about constructing a reservoir on its property next

to Lehman Road. The District has acquired an easement from Mutton Settlement for the reservoir site. It is recommended that a poured in place reinforced concrete reservoir with precast concrete roof be buried into the hill side. This type of construction is very maintenance free and aesthetically pleasing in the neighborhood.
The estimated cost for the reservoir 2B in Tier No. 1 is $3,000,000 to $4,000,000
This project is included in the 6-year planning horizon as WR-1.

Booster Stations

The District has emergency standby generators at well no. 2, no. 3, and no. 5 in Tier No. 1, and emergency standby generators at booster station 2-3 (new) and 2-3 (Karrer) in Tier No. 2, and an emergency standby generator at booster pump station 3-4 which serves Tier No. 3.
There are two natural gas powered pumps for Tier No. 4; one at booster station 4-5, and one at booster station 4A-5. These emergency standby generator activate in the event of power outage.
WB-1 At Boardwalk Lane, a small booster pump station could be installed at the north end of the road, so that customers on Boardwalk Lane would receive pressures above 30 psi.
The booster station would supply domestic flows only. The fire hydrant on Boardwalk Lane would need to be relocated upstream of the booster station.
Year 2012 Estimated cost is $75,000 to $100,000
WB-2 The storage and hydraulic analysis indicate that additional pumping will be needed for Tier 3 after year 2039 to meet estimated maximum day demands and provide equalizing storage, standby storage, and fire suppression storage. This would involve constructing a new Booster Pump Station 3B. The new booster pump station 3B could be located along Lehman Road next to future Tank 2B. The booster station would include two to three 40 HP pumps which can supply 500 gpm each. Another possible location for this booster pump station would be in the Northwood subdivision on the east side of Vista Park Drive near Sandlewood Lane.
The estimated cost for booster pump station 3B is $200,000 to $300,000.
This project is included in the 6~year planning horizon as WB-1.

In addition to the District financed projects listed above and in Table 9-1, the following is a list of privately funded projects and developments which are anticipated in the next 6-to 10 years.
Private/ developer proiects:

- Expansion ofBethany Place retirement housing.
- Valley Springs subdivision in NE IA, Sec. 36, T. 26 N., R. 43 E. W.M.
- Arbor Crest Winery: Required infrastructure to be determined.
- Watermain extension along Thierman Road
- Water improvements to existing church at northwest corner of Bigelow Gulch Road and Argonne Road
- Water improvements to Smart Garden at southwest comer of Bigelow Gulch Road and Argonne Road
- Development of Inland Empire Paper Company property east of Maringo Drive, south of Garland Avenue, and north ofSpokane River, etc.
- Properties east ofArgonne Road to Lehman Road in Tier 2
- Properties north of intersection of Argonne Road and Columbia Drive
- Properties along Bigelow Gulch Road corridor. Orchard Prairie Road, Pleasant Prairie Road, etc. Watermain extension along Bigelow Gulch Road in conjunction with Spokane County road improvements.
- Properties adjacent to Urban Growth Area may develop ifUGA is expanded.
- In future, District may annex properties that are currently served by the District.

9.2 **COST BREAKDOWN**

TABLE 9-1
PASADENA PARK IRRIGATION DISTRICT NO. 17
CAPITAL IMPROVEMENT PLAN – Projected 10-Year Projects

	Year		2021	2022	2023	2024	2025	2026	2027	2028	2029	**
	CAPITAL PROJECTS											
WD-1	Van Marter Rd./ Rockwell Ave./ Pierce Road/ Lacrosse Ave. *** Replace and upsize watermains (3,200 LF)				$320,000							
WD-2	Vista Road/ Sipple Road Replace and upsize water mains (2,000 LF)					$200,000						
WD-3	Fruithill Road/ replace existing water mains (3,000 LF)							$300,000				
WD-4	Replace galvanized services in Tier 2, 3, and 4.								$500,000			
WD-5	Orchard Prairie Road, Espe Road, and along Bigelow Gulch Road to end of existing watermain, (7,700 LF)											$770,000
WD-6	Upriver Terrace and Pasadena Terrace, etc.											$500,000
WD-7	Replace undersized, leaking, and (low) under pressure watermains in Tier 1 and Tier 2 Replace substandard, and older watermains that are approaching end of service life		$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	
WD-8	Upsize mains in Private Developments		$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	$100,000 *	
WS-1	Well No. 6			$400,000								
	Well No. 6 Transmission main			$100,000								
WS-2	Well No. 7			$400,000								
	Well No. 7 Transmission main			$100,000								
WR-1	Reservoir #2B (Lehman Rd.)						$3,300,000	Loan, and District funds				
	Reservoir #2B Transmission main (Lehman Rd.)						$200,000	Loan, and District funds				
WB-2	Booster Station (Boardwalk Lane)										$100,000	
WB-1	Booster Station 3B-4											$250,000
	MAINTENANCE PROJECTS											
*	Fire Hydrant (Install/ replace/ repair)	$7,500/yr.										
*	Leak Detection	$5,000/yr.										
*	Service Meter Replacement/ Calibration	$25,000/yr.										
	Total Capital Improvements		$200,000	$1,200,000	$520,000	$400,000	$3,700,000	$500,000	$700,000	$200,000	$300,000	**

All costs are based on estimated prices for 2019, and will need to be increased in the future for inflation.
* Included in Table 10-1 – Capital Improvements miscellaneous
** Projects beyond year 2029
*** Option: Watermain may be constructed on Inland Empire Paper property in easement; Garland Ave./ Raymond Rd. to Van Marter Rd., Glenn Rd. and Pierce Rd.

Water rights deficiencies

The District has pursued additional water rights. In February 1995, the District submitted an application to Department of Ecology to increase its water rights to 10,000 GPM for instantaneous flow (Qi).

The District received a letter from Department of Ecology, dated January 28, 2016, regarding the status of the water right application. The letter included a form, "Statement of Intent for Pending Application for a Water Right Permit", that was to be completed by the District and returned to D.O.E. The District completed the form, notifying D.O.E. that the District wants to pursue the water rights application, and requested a formal decision of the application. In December 2016, the District's attorney had email correspondence with D.O.E. representatives. D.O.E. indicated that the District's request for additional instantaneous water rights should be okay, but a D.O.E. hydrogeologist would need to perform a computer analysis to determine the effects of withdrawl on the Spokane River. In May 2016, the District's attorney received an email from the D.O.E. hydrogeologist. Per his analysis, the hydrogeologist indicated that increasing the instantaneous flow from 5,430 gpm to 17,430 gpm would be acceptable, and that he would place a recommendation in the file. Official approval would come out later in the year.

The Department of Ecology approved the water right G3-29799 in letter dated May 15, 2018. The water right approves additional instantaneous Qi of 10,000 gpm, and annual quantity Qa of 0 acre-feet per year. Copy of letter is included in Appendix under Water Rights and Certificates.

Patterson Add.

Source

The Patterson Addition Waster System is a community water system serving a small population. The system contains one groundwater well located along West Hope Road. It serves a population of 22 people on the south side of I-90 south of the Spokane International Airport. No water system plan was available at the Department of Health.

Storage

Delivery

Schematic

City of Spokane

The City of Spokane is Spokane County's largest water purveyor, with a service area extending far beyond the City's current limits. The City serves unincorporated county areas within the urban growth area and has agreements with the City of Airway Heights to provide supplemental water service and with Fairchild Air Force Base.

The e water system has 7 well stations with 14 wells and 27 well pumps, 25 booster pump stations with 72 booster pumps, 22 pressure zones with 34 reservoirs, and more than 1,000 miles of water pipes. (WSP 2016)

Source

The City of Spokane draws its water from the Rathdrum Prairie Aquifer via four wells. The wells are located at XXX, XXX, XXX, and XXX, each with different capacities for water withdrawal.

TABLE 1.3.1
City of Spokane Well Stations Data

Hydraulic Zone	Pump Station (Note 1)	No. Of Wells @ Site	No. Of Pumps Serving Zone	Connected Horsepower (Hp)	Typical Outlet Pressure (psi)	Capacity (MGD)
Low	Well Electric (1996)	2	1	1,000	80	21.6
	Parkwater (1949)	4	6	3600	68	69.0
	Nevada (2-1958/2-2003)	1	4	2400	68	36.0
North Hill	Well Electric (1925)	2	2	1,800	140	24.2
	Grace Avenue (1950)	1	2	1,800	110	27.4
	Hoffman Avenue (1938)	2	2	1,200	55	15.7
	Central Avenue (1960)	2	4	1,800	55	24.2
Intermediate	Well Electric (1996)	2	1	900	180	10.8
	Parkwater (1-1949/1-2003)	4	2	1900	145	21.7
	Ray Street (1937, 1950)	2	3	2,700	157	31.0
Totals			**27**	**19,100**		**281.6**

Notes:

1) Year following pump station name indicates the date of newest pump installations.

Storage

Total storage capacity:

The City's water system serves multiple pressure zones, with 12 reservoirs located throughout the service area. The reservoirs vary in capacity from 20,000 gallons at XXX to 500,000 gallons at XXX.

Each Pressure Zone, with the exception of the Northwest Terrace Pressure Zone and the Hatch Road Pressure Zone, has one or more storage reservoir(s). The pressure within each Pressure Zone is determined by the elevation of the water within the reservoir. **Figure 1.3.3** illustrates the hydraulic relationship of the various reservoirs in the water system. **Table 1.3.4** lists the storage reservoirs found in the water system. The table indicates the volume of storage, the zone served, the type of material, and the overflow and floor elevations for each of the 34 reservoirs.

TABLE 1.3.4

City of Spokane—Reservoirs and Storage Data

Hydraulic Zone	Reservoir Name	Elevations			Type	Diameter (ft.)	Reservoir Storage (Mg)	Zone Storage (Mg)
		Over-Flow	Tank Bottom	Base				
Low	Shadle (1965)	2100.87	2031.34	2031.34	Steel Reservoir Underground	107'	4.80	
	Rockwood Vista	2099.64	2083.51	2083.51	Concrete Steel Reservoir	2-1/2 ac.	11.00	
		2100.64	2082.87	2082.87	Steel Reservoir	260'	7.20	

	(1948) 9th & Pine	2101.65	2066.37	2066.37	Steel Reservoir Concrete w/liner	72’	1.00	28.75
	(1964) West Drive	2101.87	2045.91	2045.91		104’	3.50	
	(1956) Thorpe Road (1983) Qualchan (1992)	2101.87	2057.87	2057.87		71’	1.25	
Intermediate	14th & Grand (2005)	2283.25	2206.12	2206.12	Steel Standpipe Concrete w/liner	34’	0.52	20.52
	Lincoln Heights # 1 (1995)	2279.87	2249.87	2249.87		240’	10.00	
	Lincoln Heights # 2 (1995)	2279.87	2249.87	2249.87	Concrete w/liner	240’	10.00	
High	Garden Park (1956)	2470.23	2396.92	2396.92	Steel Reservoir	65’	3.10	4.35
	33rd & Lamonte (1930)	2465.91	2431.24	2347.14	Elevated Riv. Steel Tank	78’	1.25	
Top	Browne? Park #1 (1958)	2546.21	2511.73	2511.72	Steel Reservoir	160’	5.00	10.00
	Browne? Park #2 (1990)	2545.87	2511.72	2511.72	Steel Reservoir	160’	5.00	
Glennaire	Glennaire #1 (1958)	2851.87	2841.85	2841.85	Concrete w/sealer	43.33’ x 47’	.15	1.15
	Glennaire #2 (1991)	2851.82	2821.87	2821.87	Concrete w/liner	75’	1.00	
North Hill	North Hill (1986)	2189.87	2144.37	2144.37	Steel Reservoir Steel Reservoir	200’	10.80	25.60
	Five Mile (1956)	2190.12	2159.65	2159.65		240’	10.20	
	Indian Trail (1996)	2189.87	2149.87	2149.87	Concrete w/liner	140’	4.60	
Midbank	Midbank (1960)	2292.87	2230.87	2230.87	Steel Standpipe	40’	0.58	0.58
Indian Hills	Indian Hills (1995)	2330.87	2300.87	2305.87	Steel Standpipe	14’	0.03	0.03

TABLE 1.3.4

City of Spokane—Reservoirs and Storage Data (continued)

Hydraulic Zone	Reservoir Name	Elevations			Type	Diameter (ft.)	Reservoir Storage (Mg)	Zone Storage (Mg)
		Over-Flow	Tank Bottom	Base				
Shawnee	Shawnee #1 (1978)	2275.50	2261.50	2261.50	Steel Reservoir	15’	0.02	0.074
	Shawnee #2 (1993)	2276.62	2261.87	2261.87	Steel Reservoir	25’	0.054	
Five Mile	Strong Road (1982)	2520.87	2396.30	2396.30	Steel Standpipe	55’	2.00	2.00
Kempe	Kempe (2010)	2567.46	2433.46	2433.46	Steel Reservoir		1.10	1.10
Highland	Highland (1966)	2385.81	2276.71	2276.71	Steel Standpipe	40’	1.00	1.00
Woodland Hts.	Sunset (1968)	2281.87	2258.23	2258.23	Steel Reservoir	50’	0.35	0.35
SIA	SIA #1 (1935)	2490.09	2452.67	2362.89	Elevated Riv. Steel Tank	48’	0.50	4.50
	SIA #2 (1984)	2489.28	2364.53	2364.53	Steel Standpipe	78’	4.00	
Southview	Southview (1996)	2998.87	2956.87	2956.87	Steel Standpipe	14’	0.048	0.048
Eagle Ridge	Eagle Ridge (1995)	2331.87	2309.37	2309.37	Steel Reservoir	62’	0.542	0.542
Cedar Hills	Cedar Hills (1999)	2259.77	2239.37	2239.37	Steel Reservoir	52’	0.30	0.30
Plains	Mallen Hill (1985)	2634.87	2580.22	2580.22	Steel Reservoir	110’	4.00	4.00

Hatch Road	No Reservoir*							
NW Terrace	No Reservoir *							
Eagle Ridge #2	Eagle Ridge 2	2466.14	2336.14	2336.14	Steel Reservoir	40’	1.22	1.22
Woodridge	Woodridge	2407.96	2385.29	2385.29	Steel Reservoir	42’	.228	.228
					TOTAL STORAGE			**106.342 mg**

* Pressure zone controlled by prv stations.
Note: Elevations shown in this table refer to NAV 88 DATUM

Delivery

The City of Spokane water system has 22 (hydraulic) Pressure Zones (WSP 2016)

Boosters/Pressure relief valves – Because of the variety of the system’s pressure zones, the water delivery network also includes a series of booster stations and pressure relief valves (PRVs) to assure water is delivered to system customers at appropriate pressure and volume. Overall, the system has 17 boosters and 15 PRVs, each with appurtenant power and access as appropriate for its function.

TABLE 1.3.2

City of Spokane—Booster Pump Station Data

Pressure Zone Served	Booster Station (Date Constructed)	No. Of Pumps	Connected Horsepower	Typical Inlet/Outlet Pressure (psi)	Nameplate Capacity (MGD)	Total Pumping Capacity (MGD)
Intermediate	9th & Pine (1966)	2	500	8 / 82	11.09	
	Bishop Court (1989)	2	400	50/122	9.22	20.31
High	Lincoln Heights (1931,53,63)	8	280	7 / 92	56.30	
	14th & Grand (1989)	2	0 400	27 / 112	9.90	
						66.20
Top	Division & Manito (1963)	3	90	43 / 80	4.35	
	Garden Park (1963)	4	300	31 / 65	17.70	
	35th & Ray (1986)(2005)	3	300	40 / 78	15.84	
						37.89
Glennaire	Glennaire (1971,95)	4	130	18 / 160	1.43	1.43
Midbank	Belt Street (1963)(2006)	4	110	40 / 86	1.93	1.93
Indian Hills	Indian Hills (1969)*	2	85	60 / 120	1.80	1.80
Shawnee	Shawnee (2004)	2	60	47 / 90	1.61	1.61

Five Mile	Five Mile (1976)(2006)	3	450	10 / 136	5.81	5.81
Kempe	Kempe (2010)	3	80		5.47	5.47
Highland	Milton (1972,80)	3	245	56 / 170	3.30	
	Sunset (1969)	3	18	6 / 52	0.72	
						4.02
Woodland Heights	9th & E (1929,32)**	2	90	41 / 128	1.66	
	West Drive (2008)	2	120		2.30	3.96
Southview	Southview (1995)	4	50		1.30	1.30
Eagle Ridge	Eagle Ridge (1997)	3	200	80 / 180	2.30	2.30
Cedar Hills	Cedar Hills (1999)	3	75	19 / 88	1.51	1.51
SIA	Thorpe Road (1976)	4	1000	17 / 185	10.48	
	West Drive (2008)	3	900		9.76	20.24
Plains	Spotted Road (1985)	2	170	39 / 108	4.90	4.90
Eagle Ridge II	Eagle Ridge II (2005)	2	500	8/130	7.20	7.20
Woodridge Low	Woodridge (2005)	2	40	40/62	1.93	1.93
	Latah (2004)	1	500	115/150	23.04	23.04
Total		76				212.85

Notes: *The Indian Hills System is currently fed by the Five Mile System through and altitude valve. The Indian Hills Booster Station is currently not in service but remains for redundancy.

**A portion of the new West Drive Booster Station replaced pumping duty to Woodland Heights. The 9th and E Booster Station is currently not in service but remains for redundancy.

The varied terrain found in the City can cause localized high pressures. To reduce and maintain acceptable pressures within the distribution system, pressure reducing valve ("PRV") stations have been installed in some locations within various pressure zones. The Northwest Terrace Pressure Zone and the Hatch Road Pressure Zone control pressures throughout the entire pressure zone with PRV stations. Table 1.3.3 lists the locations of PRV stations within the distribution piping system.

The Water Department requires property owners to install PRVs on individual water services when pressures are between 80 psi and 100 psi. In areas that exceed 100 psi, a PRV station within the distribution system, as described above, plus individual PRVs on services are required.

TABLE 1.3.3
Pressure Reducing Valve Stations Data

Location	Valve Sizes (inches)	Inlet (Psi)	Outlet (Psi)
Shoshone & Lincoln	6 & 1-1/2	120	65
Panorama & Walnut Court	6 & 2	100	56
Walnut St. & Cedar Rd.	6 & 2	80	66
Assembly & Dalke (Extd.) (South)	6 & 1-1/2	80	8
Assembly & Dalke (Extd.) (North) (Northwest Terrace - Low Zone)	8 & 3	80	8
Sundance Dr. & Acoma? Dr. Upper Intertie (Northwest Terrace #1 - Nh Zone)	10 & 4	115	26
BPA Transmission Easement Lower Intertie (Northwest Terrace #2 - Nh Zone)	10 & 4	150	110
Burchwood & 9 Mile Road	8 & 2	120	55
Moran View & Woodland Court (Eagle Ridge)	6 & 3	123	68
Hatch Road (6200 South) #1	10 & 4	110	35
Hatch Road & Tomacher Ln. #2	10 & 4	125	45
Latah Hills Ct & Shelby Ridge (Eagle Ridge)	6 & 3	95	55
Summerwood & Shelby Ridge (Eagle Ridge)	8 & 3	95	55
Prairie Dr & Fleetwood Ct	8 & 3	113	63
16th Ave & Milton	10 & 6 & 3	175	55
River Ridge & Sand Ridge	10 & 6 & 3	120	65
River Ridge & Government Way	10 & 6 & 3	110	55

Transmission lines – The city of Spokane's water system includes more than 1,000 miles of water line, ranging in size from 24" diameter for its major transmission lines to 4" for some of its older lines generally serving smaller residential areas. The City has been decommissioning its 4" lines over time, replacing them with minimum 6" lines to meet fire-flow requirements.

Standard pipe sizes for distribution and transmission water mains are: 4, 6, 8, 10, 12, 18, 24, 30, 36, 42, and 48 inches. Typically, only ductile iron pipe and ductile iron fittings are allowed. (WSP 2016)

The transmission and distribution pipelines vary from 6 inches to 48 inches in diameter. The water system has several different pipe materials in use, with the majority being cast iron or ductile iron. Before ductile iron was available, the Department typically specified the use of cast iron pipe for the smaller distribution piping and steel for the larger transmission mains. All new pipelines are ductile iron. (WSP 2016)

Areas of concern for the Water Department has been the condition of aging distribution infrastructure. This distribution piping includes lead and leadite joint cast iron pipe, kalamein steel pipe and asbestoes cement pipe. As of 2015, 95 % of Kalamein pipe has been replaced with ductile iron pipe. Any isolated segments of Kalamein are replaced as they are located. Asbestos cement pipe has been effectively removed from the water system and any remaining pipe discovered is replaced. A program to replace lead and leadite joint distribution pipe is detailed in Chapter 8 and is part of the Integrated Engineering program for cost benefit of replacement of streets and utilities in coordination. (WSP 2016)

Since 2007, the Water Department has made a concerted financial effort to upgrade its aging 70- to 100-year-old transmission pipeline infrastructure, which, as the ongoing water water may show, could be a factor in the City's Distribution System Loss ("DSL") rate of 17.8% in 2014. These are steel pipelines ranging in size from 18 inches to 48 inches in diameter. The type of steel pipeline being replaced is predominately riveted steel although some welded steel is being replaced as well. The result of this effort is the replacement of about 14 miles of pipelines to date. Over the next six years, the Department has a program to replace another 13.5 miles and within 20 years an additional 12.8 miles. (WSP 2016)

Water system schematic

The diagrams illustrate the City's system, showing generally where wells, reservoirs, and the distribution system is located. This illustration is intended as a schematic representation of the City's water system. The

City has its water system plan posted on its website (http://www.spokanecity.org/.....), providing more detail on system design, capacity, and specifications.

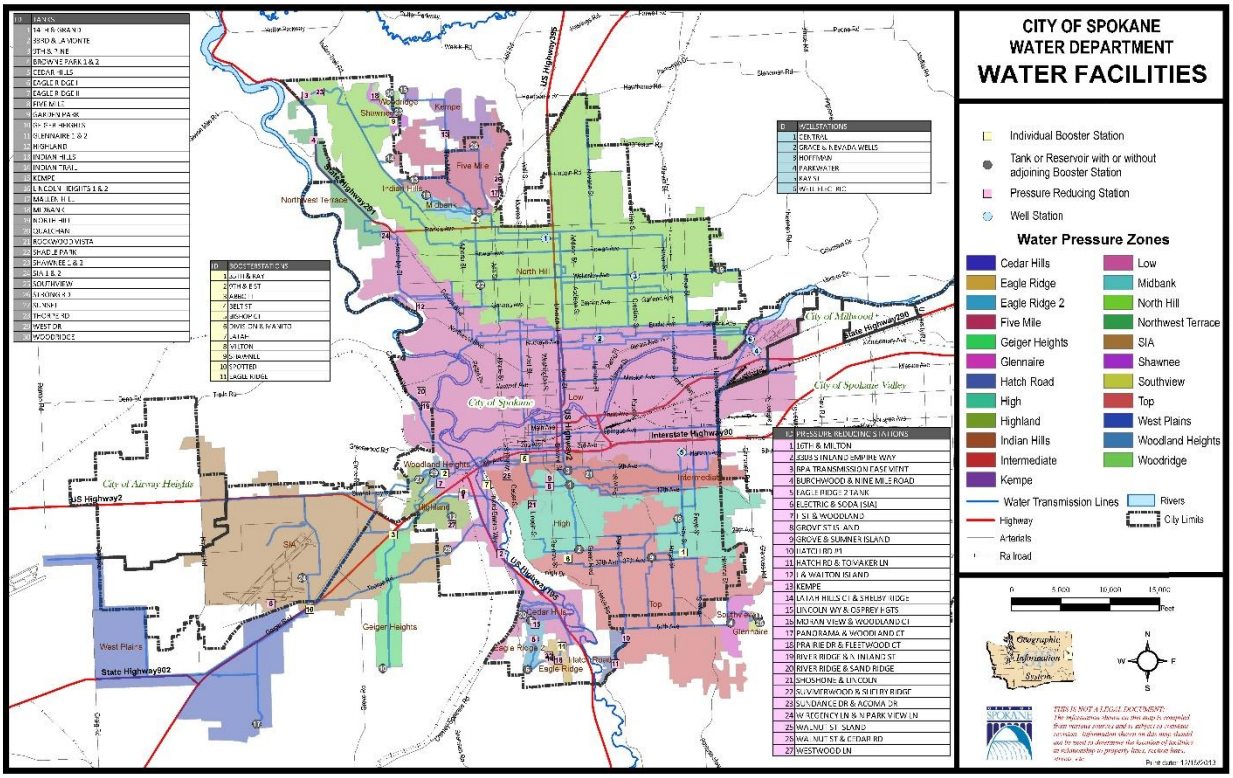


Figure 1.3.2

Connections

There are presently more than 76,250 service connection accounts to the City of Spokane water system. (WSP 2016)

A list of capital deficiencies

As part of the hydraulic model calibration a fire flow and Peak Hour Demand (PHD) analysis was completed. The analysis identified seven locations with potential deficiencies mainly due to undersized piping. In addition to the analysis option for resolving each deficiency is presented. The City is currently evaluating the results of this analysis and plans to utilize the hydraulic model further to identify future deficiencies. The Technical Memorandum with the analysis, results and recommendations is presented in **Appendix 3.10.1**. (WSP 2016)

As part of the hydraulic model calibration a fire flow and Peak Hour Demand (PHD) analysis was completed. The analysis identified seven locations with potential deficiencies mainly due to undersized piping. In addition to the analysis option for resolving each

deficiency is presented. The City is currently evaluating the results of this analysis and plans to utilize the hydraulic model further to identify future deficiencies. The Technical Memorandum with the analysis, results and recommendations is presented in **Appendix 3.10.1**. (WSP 2016)

See list of projects below.

A list of projects (capital projects) to cure them

Table 8.2.1

Source Improvements 6-Year

Project Name	Funding Source	To Date	2015	2016	2017	2018	2019	2020	Project Total
Central Avenue Station 1st Well Rehabilitation	Utility Rates	$75	$1,855	$0	$0	$0	$0	$0	$1,855
	Total	$75	$1,855	$0	$0	$0	$0	$0	$1,855
Central Avenue Station 2nd Well Rehabilitation	Utility Rates	$0	$0	$0	$75	$1,500	$0	$0	$1,575
	Total	$0	$0	$0	$75	$1,500	$0	$0	$1,575
Hoffman Well	Utility Rates	$0	$0	$0	$150	$1,350	$0	$0	$1,500
	Total	$0	$0	$0	$150	$1,350	$0	$0	$1,500
New West Central Well	Utility Rates	$0	$100	$700	$0	$0	$10,000	$0	$10,800
	Total	$0	$100	$700	$0	$0	$10,000	$0	$10,800
Parkwater Station Upgrade	Utility Rates	$0	$250	$0	$0	$0	$0	$0	$250
	Total	$0	$250	$0	$0	$0	$0	$0	$250
Category Total		**$75**	**$2,205**	**$700**	**$225**	**$2,850**	**$10,000**	**$0**	**$15,980**

Costs in Thousands of Dollars

Table 8.2.2

Source Improvement 7-20 Year

Project Name		Project Estimate (x1000)
Ray Street Well Station	Station Upgrade - ***Note 1***	$1,500
Hoffman Well Rehabilitation/Reconstruction	Station Upgrade - ***Notes 1, 2***	$2,000
Well Electric - North Hill Elements	Station Upgrade - ***Note 1***	$800
Parkwater - Low System Elements	Station Upgrade - ***Note 1***	$800

***Note 1*:** All of the well stations were constructed between1925 and 1960. Over the next 20 years, this program will undertake well station overhaul, rehabilitation, modernization, and upgrades which may include some increases in pumping capacity for increased system redundancy, reliability, and operational flexibility.

Note 2: One of the two well casings at this location has been compromised due to a shift in the earth. Reconstruction, or the construction of a new casing, may be required in order to regain full utilization of this well station.

Table 8.3.1

Booster Pump Stations 6-Year									
Project Name	Funding Source	To Date	2015	2016	2017	2018	2019	2020	Project Total
Booster Station Metering	Utility Rates	$0	$180	$180	$0	$0	$0	$0	$360
	Total	$0	$180	$180	$0	$0	$0	$0	$360
Five Mile Booster Replacement	Utility Rates	$0	$0	$0	$200	$1,800	$0	$0	$2,000
	Total	$0	$0	$0	$200	$1,800	$0	$0	$2,000
Plains System New Booster	Utility Rates	$0	$100	$0	$1,100	$0	$0	$0	$1,200
	Total	$0	$100	$0	$1,100	$0	$0	$0	$1,200
Upriver Headers	Utility Rates	$0	$0	$150	$1,850	$0	$0	$0	$2,000
	Total	$0	$0	$150	$1,850	$0	$0	$0	$2,000
Category Total		**$0**	**$280**	**$330**	**$3,150**	**$1,800**	**$0**	**$0**	**$5,560**

Costs in Thousands of Dollars

Table 8.3.2

Booster Pump Station Improvement 7-20 Year		
Project Name		**Project Estimate (x1000) (X1000)**
Milton	Station Upgrade - ***Note 1***	$250
Southview	Station Upgrade - ***Note 1***	$100
Sunset	Station Upgrade - ***Note 1***	$400
9th and Pine	Station Upgrade - ***Note 1***	$750
Shawnee	Station Upgrade - ***Note 1***	$1,200
Five Mile #2	Station Upgrade - ***Note 1***	$1,500
14th and Grand	Station Upgrade - ***Note 1***	$4,000
Cedar Hills	Station Upgrade - ***Note 1***	$300
Thorpe Road	Station Upgrade - ***Note 1***	$750

Bishop Court	Station Upgrade - ***Note 1***	$200
35th and Ray St.	Station Upgrade - ***Note 1***	$500

Note 1: This program will undertake booster station construction or reconstruction, overhaul, rehabilitation, modernization, facility upgrades and upsizing, as needed, over the next 20 years.

Table 8.4.1

Storage System Improvements
6-Year

Project Name	Funding Source	To Date	2015	2016	2017	2018	2019	2020	Project Total
High System Tank	Utility Rates	$0	$0	$0	$200	$2,800	$0	$0	$3,000
	Total	$0	$0	$0	$200	$2,800	$0	$0	$3,000
Lincoln Heights Tank #2	Utility Rates	$0	$700	$0	$0	$0	$0	$0	$700
	Total	$0	$700	$0	$0	$0	$0	$0	$700
Plains System Large Capacity Reservoir	PWTF	$300	$0	$0	$0	$0	$0	$0	$0
	Utility Rates	$360	$0	$0	$0	$0	$0	$0	$0
	Utility Rates	$0	$5,340	$0	$0	$0	$0	$0	$5,340
	Total	$660	$5,340	$0	$0	$0	$0	$0	$5,340
SIA System Additional Reservoir	Utility Rates	$0	$0	$150	$1,850	$0	$0	$0	$2,000
	Total	$0	$0	$150	$1,850	$0	$0	$0	$2,000
Tank Rehabilitation	Utility Rates	$0	$0	$500	$500	$500	$500	$500	$2,500
	Total	$0	$0	$500	$500	$500	$500	$500	$2,500
Thorpe Road Reservoir No. 2	Utility Rates	$0	$0	$0	$0	$0	$200	$3,000	$3,200
	Total	$0	$0	$0	$0	$0	$200	$3,000	$3,200
Category Total		**$660**	**$6,040**	**$650**	**$2,550**	**$3,300**	**$700**	**$3,500**	**$16,740**

Costs in Thousands of Dollars

Table 8.4.2

Storage System Improvement 7-20 Year

Project Name		Project Estimate (x1000)
Reservoir Rehabilitation Program	Storage Improvements - ***Note 1***	$1,000/year
Five Mile Reservoir #2	Storage Improvements - ***Note 2***	$4,000
Eagle Ridge #3	Storage Improvements - ***Note 2***	$3,000

Note 1: This program will undertake storage facility rehabilitation such as interior and exterior coatings, liners, sealing, and other work necessary to extend the useful life of the facility as needed over the next 20 years.

Note 2: Construction of a new facility to augment storage, incease reduncancy and reliability, allow for operational flexibility, balance the system hydraulically, and allow for maintenance activities.

Table 8.5.1

Transmission Mains 6-Year

Project Name	Funding Source	To Date	2015	2016	2017	2018	2019	2020	Project Total
16th Ave Transmission Main, Chestnut to Milton Booster	Utility Rates	$0	$0	$0	$0	$0	$150	$2,000	$2,150
	Total	$0	$0	$0	$0	$0	$150	$2,000	$2,150
57th Transmission Main Rehabilitation/Replacement	DWSRF	$0	$0	$350	$3,778	$0	$0	$0	$4,128
	Total	$0	$0	$350	$3,778	$0	$0	$0	$4,128
Central Well to Indian Trail	Utility Rates	$0	$0	$0	$0	$0	$0	$400	$715,000
	Total	$0	$0	$0	$0	$0	$0	$400	$715,000
Cleveland Avenue from Buckeyeto Greene	DWSRF	$0	$0	$0	$0	$0	$0	$0	$0
	Utility Rates	$0	$0	$0	$60	$0	$0	$0	$60
	Total	$0	$0	$0	$60	$0	$0	$0	$60
Glenrose/57th/Havana/37th	DWSRF	$0	$4,049	$1,500	$0	$0	$0	$0	$5,549
	Total	$0	$4,049	$1,500	$0	$0	$0	$0	$5,549
Kempe to Woodridge Transmission Main	Utility Rates	$30	$270	$0	$0	$0	$0	$0	$270
	Total	$30	$270	$0	$0	$0	$0	$0	$270
Manito Boulevard from 14th to 33rd Avenue	DWSRF	$0	$200	$3,124	$0	$0	$0	$0	$3,324
	Total	$0	$200	$3,124	$0	$0	$0	$0	$3,324
Monroe-Lincoln, 8th Ave to Main Ave	Utility Rates	$0	$550	$0	$0	$0	$0	$0	$550
	Total	$0	$550	$0	$0	$0	$0	$0	$550
North/South Freeway Crossings	Utility Rates	$0	$300	$1,700	$0	$0	$0	$0	$2,000
	Total	$0	$300	$1,700	$0	$0	$0	$0	$2,000
Category Total		**$30**	**$5,369**	**$6,674**	**$3,838**	**$0**	**$150**	**$2,400**	**$18,431**

Costs in Thousands of Dollars

Table 8.5.2

Distribution Mains 6-Year

Project Name	Funding Source	To Date	2015	2016	2017	2018	2019	2020	Project Total
13th Avenue; Wall to Bernard	Utility Rates	$0	$300	$0	$0	$0	$0	$0	$300

	Total	$0	$300	$0	$0	$0	$0	$0	$300
Clarke Ave./Water Ave. Distribution Replacement	Utility Rates	$0	$25	$450	$0	$0	$0	$0	$475
	Total	$0	$25	$450	$0	$0	$0	$0	$475
Distribution Main Rehabilitation	Utility Rates	$0	$0	$0	$450	$450	$450	$450	$1,800
	Total	$0	$0	$0	$450	$450	$450	$450	$1,800
Long Service Elimination	Utility Rates	$0	$0	$400	$400	$400	$400	$400	$2,000
	Total	$0	$0	$400	$400	$400	$400	$400	$2,000
Category Total		**$0**	**$325**	**$850**	**$850**	**$850**	**$850**	**$850**	**$4,575**

Costs in Thousands of Dollars

Table 8.5.3

Transmission/Distribution Mains 7-20 Year

Project Name		Project Estimate (x1000)
Greene Street - Mission to Buckeye	30" – 4,150 l.f. - ***Note 1***	$1,100
Waterworks – Well Electric to 11th and Myrtle	48" – 14,724 l.f. - ***Note 1***	$4,700
Parkwater Yard Piping	48 & 36" - 3,850 l.f. - ***Note 1***	$1,900
33rd – Manito to Howard	24" – 3,293 l.f. - ***Note 1***	$900
Hatch – 9th to Rockwood Vista	30" – 132 l.f. - ***Note 1***	$60
Jefferson – 5th to 7th	18" – 700 l.f. - ***Note 1***	$100
Lincoln Heights to Lamonte – 29th/33rd	36" – 13,010 l.f. - ***Note 1***	$3,000
6th Ave – Jefferson to Hemlock	18" – 3,515 l.f. - ***Note 1***	$550
Fairview – Belt to Euclid - Atlantic	18" – 7,850 l.f. - ***Note 1***	$1,800
Latah Creek Crossing at 5th Ave	18" – 2,000 l.f. - ***Note 1***	$1,200
Central Well to Indian Trail	30" – 21,450 l.f. - ***Note 2***	$4,400
Melville Rd. –Thomas Mallen Rd. to Hayford Rd. Main	18" – 8,000 l.f. - ***Note 3***	$2,100
Spotted Road to Mallen Tank	36" – 15,150 l.f. - ***Note 4***	$3,250
Sunset Bridge Replacement	18" – 1,307 l.f. - ***Note 5***	$900
Distribution Main Rehabilitation	***Note 6***	$450/year
Downtown Main Replacements	***Note 7***	$8,000

Note 1: These are large diameter steel transmission water mains which have been in service from 65 years to over 100 years. The older mains have generally reached the end of their useful lives, and the remainder will have reached the end of their useful lives within the next 20 years. These mains are scheduled for replacement in order to properly maintain this infrastructure in a safe and reliable condition.

Note 2: This pipeline would increase the ability to fully utilize the well capacity at the Central Well Station in fulfilling the water demands in the Indian Trail area. Growth in this area is anticipated to exhaust existing piping capacity in the 20 year time frame.

Note 3: This water main will loop the system and eliminate a long dead end. However, for the project to move ahead, additional long range planning work needs to be done to confirm what size the line should be.

Note 4: This pipeline would run approximately parallel to the existing 24" main that connects this booster and tank. The new pipeline would increase capacity as well as reliability and redundancy.

Note 5: This project would replace the pipeline that crosses over Latah Creek on the Sunset Bridge. The existing pipeline has a poor repair record and replacement would save repair costs while increasing reliability.

Note 6: As reported, cast iron pipe with leadite joints poses a significant concern for leakage and devastating main breaks. This ongoing project replaces 8-inch and 12-inch leadite joint cast iron pipe prior to reconstruction of streets as part of projects undertaken by other department/utilities.

Note 7: The existing water system infrastructure in the City's downtown core area is predominantly cast iron pipe, some of which was installed in the late 1800s. The program will replace this old plumbing with ductile iron pipe to reduce maintenance costs as well as to enhance the reliability of the system. This project will be particularly difficult as businesses and traffic will be impacted during construction.

Table 8.6.1

Facilities and Operations 6-Year

Project Name	Funding Source	To Date	2015	2016	2017	2018	2019	2020	Project Total
Metering	Utility Rates	$0	$500	$500	$500	$500	$300	$300	$2,600
	Total	$0	$500	$500	$500	$500	$300	$300	$2,600
Rebuild Generator #2 in Powerhouse #2	Utility Rates	$0	$0	$30	$300	$0	$0	$0	$330
	Total	$0	$0	$30	$300	$0	$0	$0	$330
Rebuild Generator #1 in Powerhouse #1	Utility Rates	$0	$0	$0	$30	$300	$0	$0	$330
	Total	$0	$0	$0	$30	$300	$0	$0	$330
Rebuild Generator #1 in Powerhouse #2	Utility Rates	$0	$30	$300	$0	$0	$0	$0	$330
	Total	$0	$30	$300	$0	$0	$0	$0	$330
Rebuild Generator #2 in Powerhouse #1	Utility Rates	$0	$0	$0	$0	$30	$300	$0	$330
	Total	$0	$0	$0	$0	$30	$300	$0	$330
Rebuild Generator #3 in Powerhouse #1	Utility Rates	$0	$0	$0	$0	$0	$30	$300	$330
	Total	$0	$0	$0	$0	$0	$30	$300	$330
SCADA System	Utility Rates	$0	$60	$60	$60	$60	$60	$60	$360
	Total	$0	$60	$60	$60	$60	$60	$60	$360
Upriver Dam Spillway Rehabilitation	Utility Rates	$200	$1,000	$0	$0	$0	$0	$0	$1,000

	Total	$200	$1,000	$0	$0	$0	$0	$0	$1,000
Category Total		**$200**	**$1,590**	**$890**	**$890**	**$890**	**$690**	**$660**	**$5,610**

Costs in Thousands of Dollars

Table 8.7.1

6-Year Totals

Improvements	To Date	2015	2016	2017	2018	2019	2020	Project Total
Source Improvements	$75	$2,205	$700	$225	$2,850	$10,000	$0	$15,980
Booster Pump Stations	$0	$280	$330	$3,150	$1,800	$0	$0	$5,560
Storage System Improvements	$660	$6,040	$650	$2,550	$3,300	$700	$3,500	$16,740
Transmission Mains	$30	$5,369	$6,674	$3,838	$0	$150	$2,400	$18,431
Distribution Mains	$0	$325	$850	$850	$850	$850	$850	$4,575
Facilities and Operation	$200	$1,590	$890	$890	$890	$690	$660	$5,610
Totals	$965	$15,809	$10,094	$11,503	$9,690	$12,390	$7,410	$66,896

Costs in Thousands of Dollars

Water rights deficiencies

The existing water rights will allow the City to grow as planned within the 20 year planning horizon and beyond. While the City has ample water rights, being good stewards and conserving water is very much a high priority. (WSP 2016)

Table 4.5.4 lists the 20-year forecasted need. Currently, the City does not need to request additional water rights within the planning horizon of this water plan. (WSP 2016)

S.C.W.D #3, System 1

Source

SCWD #3's water supply is from groundwater. Thirteen "active" wells tap the groundwater aquifers that lie beneath the District's service areas. However, another nine wells are "inactive" due to various reasons, ranging from contamination, well casing failure or low yield. The depth, diameter, current pumping rate, and location of each well are summarized in Table 1-2. This information was obtained from several

sources including well logs, old pump tests, past studies, and discussions with District personnel. As a result, actual well pumping rates may vary slightly from those shown in the table. The current total pumping capacity is approximately 21,460 gpm from the District's 13 active wells. (WSP 2022)

Table 1-2 Well Data

WSA	Location	Motor (HP)	DOH Source Number	Approx. Depth (ft.)	Dia. (in)	Approx. Ground Elev. (ft.)	Approx. Depth to SWL (ft.)	Current Pump Capacity (gpm)	Model	Notes	Status	Date Pump Installed
1	Vista & Broadway [1]	--	S-20	108	12	1,985	74	0	No Pump	Not in use, capped	Emergency	
	Knox & Sargent	50	S-21	119	12	1,974	79	500	No Pump	Not in use	Emergency	
	Boone & Lily	30	S-22	104	12	1,948	56	**0**	No Pump	Not in use	Emergency	
	Sinto & Freeway [1]	--	S-23	102	10	1,952	--	0	No Pump	Not in use, capped	Emergency	
	Freeway & Vista	**150**	S-24	220	24	1,965	72	**2,000**	Ingersoll-Dresser 15EMM		Permanent	2000
	2nd & Koren	**150**	S-25	164	12	1,999	60	**2,000**	Flowserve 14ENLV29		Permanent	2008
	20th & Balfour	150	S-14,S-15	147	16 & 10	2,013	107	0	No Pump	Not in use, capped	Emergency	
	32nd & Pines [1]	--	S-09	131	10	2,007	112	0	No Pump	Not in use, capped	Emergency	
	20th & Balfour	300	S-13	156	18	2,020	107	2,750	Peerless 14HX13		Permanent	WWP
	26th & Vercler	350	S-10	180	18	2,014	95	3,300	Layne & Bowler		Permanent	WWP

	Vercler #2	400	S-17	200	20	2,014	91	2,900	Flowserve 15-HH		Permanent	2017
	Browns Park	400	S-11	173	18	2,028	109	0	No Pump	Not in use, capped	Emergency	
	Madison Road 1	**--**	**S-12**	**140**	**18**	**2,010**	**77**	**0**		**Not in use, sanded in**	**Emergency**	
							Total:	12,950				
3	Normandie & Lyons	250	S-06	293	16	2,055	230	1,430	12 ENH		Permanent	2018
	Steer Inn	125	S-07	252	12	2,053	210	**700**	8RJHC-6 stage submersible Goulds		Permanent	2018
							Total:	2,130				
4	Guy & Freya [1]	--	S-09	107	48	1,900	93	0	No Pump	Not in use, hand dug, capped	Emergency	
	Dakota 1	--	S-10	89	12	1,765	38	0		Not in use, to be capped	Emergency	
	Freya & Farwell	40	S-11	201	10	1,890	144	0	Peerless 15 bowls		Emergency	WWP
	Cherry & Farwell	125	S-12	180	18	1,860	116	1,200			Permanent	2000
	Freya & Guy [1]	--	S-13	116	16	1,900	92	0	No Pump	Not in Use, capped	Emergency	
	Helena	100	S-16	160	16	1,820	75	800			Permanent	1996
	Helena 2	400		356	20	1,820	91	3,000	TBD	Under Construction	Permanent	2022
	Hawthorne Well	400	S-17	283	30, 24, 18	1943	160	3,400	Flowserve -16ENL-5 stage		Permanent	2015
							Total:	5,400				
5	Pine River Park	50	S-32	204	12	1,610	17	330	Peerless 6MA		Permanent	2000
			S-33	206	6	1,610	17	0	No Pump	Monitoring Well		
							Total:	330				
6	Rivervie w Hills	25	S-01	124	12	1,750	91	450	Flowserve 10 EML		Permanent	2020
9	Waterview Terrace	25	S-02	136	10	1,546	12	200	Peerless 9LA		Permanent	1959

Storage

Total storage capacity: 4,250,000 gallons

A total of approximately 7.5 million gallons of storage is provided in the 13 reservoirs located throughout the District. Table 1-4 lists the size, approximate overflow elevation, and the type of each reservoir. Except where noted, base elevations and calculated overflow elevations are based on topographic maps. As a result, actual elevations may vary slightly. (WSP 2022)

Table 1-4 Reservoir Data

WSA	Location	Nominal Capacity (gallons)	Approx. Diameter (ft.)	Approx. Height (ft.)	Approx. Overflow Elevation	Type
1	16th & Bettman	1,000,000	86	24	2,100 [2]	Ground Level Steel
2	16th & Dishman	1,000,000	86	24	2,224 [2]	Ground Level Steel
	Horizon Hills	1,000,000	66	40	2,225 [2]	Ground Level Steel
	Ponderosa	1,000,000	86	24	2,338 [2]	Ground Level Steel
	Painted Hills	200,000	[3]	14	2,419 [2]	Ground Level Concrete
	Eagle Crest	50,000	23	16	2,601 [2]	Ground Level
3	5-Mile	600,000	65	24	2,250	Ground Level
		500,000	60	24	2,250	Ground Level
4	Mead	500,000	30	96	2,040	Stand Pipe
	Florida Lane	1,600,000	[3]	22	2,070	Ground Level Concrete
5	Pine River Park	50,000	17	30	1,820	Elevated Tank
6	Riverview Hills	50,000	15	40	1,830	Stand Pipe
9	Waterview Terrace	3,000			[1]	Hydro Pneumatic Tank

1. Not applicable for hydro pneumatic tanks.
2. Overflow elevations taken by surveyor with GPS unit.
3. Rectangular concrete reservoir

Delivery

Boosters/Pressure relief valves –

Eleven booster pump stations provide water to the higher elevations within the District. All pumping equipment is located inside structures for protection from the weather and heated for protection against freezing.

The size and estimated capacity for each booster station is shown in Table 1-3. The capacities shown were estimated on several sources of information. In some cases, actual pump curves were used to estimate capacity. In other cases, capacities were estimated based on pump reports from District telemetry, pressure chart recordings, old memorandums, or discussions with District personnel. As a result, actual capacities may vary slightly. Copies of the available pump curves are included in Appendix A. (WSP 2022)

Table 1-3 Booster Pump Station Data

WSA	Location	Capacity		Motor (HP)	Pump Model	Date Pump Installed
		Flow (gpm)	Head (feet)			
1	16th & Bettman [2]	339	249	30	Grundfos CR-64 5.59" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
	Mohawk (Lower Painted Hills)	115	250	20	Cornell 1 ¼Y, 9.25" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
	Horizon Hills [1]	450	250	60	Cornell 3HA, 15.22" impeller	2007
		450	250	60	Cornell 3HA, 15.22" impeller	2007
					Open Space for 7.5 HP, 7.75" impeller	
		50	200	15	Pioneer SC425C75, 7" impeller	2010
	Eagle Crest (Upper Painted Hills)	140	190	15	Cornell 1 VH-15-2	2017
		140	190	15	Cornell 1 VH-15-2	2018
		60	190	7.5	Berkeley B1WPS, 7.25" impeller	?
	44th & Bowdish	900	156	50	Cornell 4RB, 12.75" impeller	2019
		900	156	50	Cornell 4RB, 12.75" impeller	2019
	Schafer Road	900	156	50	Cornell 4RB, 12.75" impeller	2019
		500	130	30	Cornell 3RB 11.69"	2019
3	5-Mile	240	95	7.5	Cornell 2-1/2W, 5 ¼" impeller	Pre-1980
		175	75	5	Cornell 2-1/2W, 4 5/8" impeller	Pre-1980
4	Stoneman	240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
		240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
	Fairview	119	150	7.5	Berkeley B3TPM	2021
		119	150	7.5	Berkeley B1.5TPMS, 6" impeller	2015
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005

	Wandermere	100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
6	Riverview Hills	350	123	15	Berkeley B3TPM-3600	2021
		275	120	10	Cornell 2-1/2W, 5 7/8" impeller	1980s

1. Pumps from main zone to Painted Hills zone.
2. Variable speed pumps.

Transmission lines –

The District has an estimated total of 996,000 lineal feet of distribution piping across the 7 systems. The pipe ranges in size from 1" to 24" in diameter. The piping consists of various materials including, Cast Iron, Ductile Iron, Polyethylene, PVC, Steel and Asbestos Cement. (WSP 2022)

Intertie -

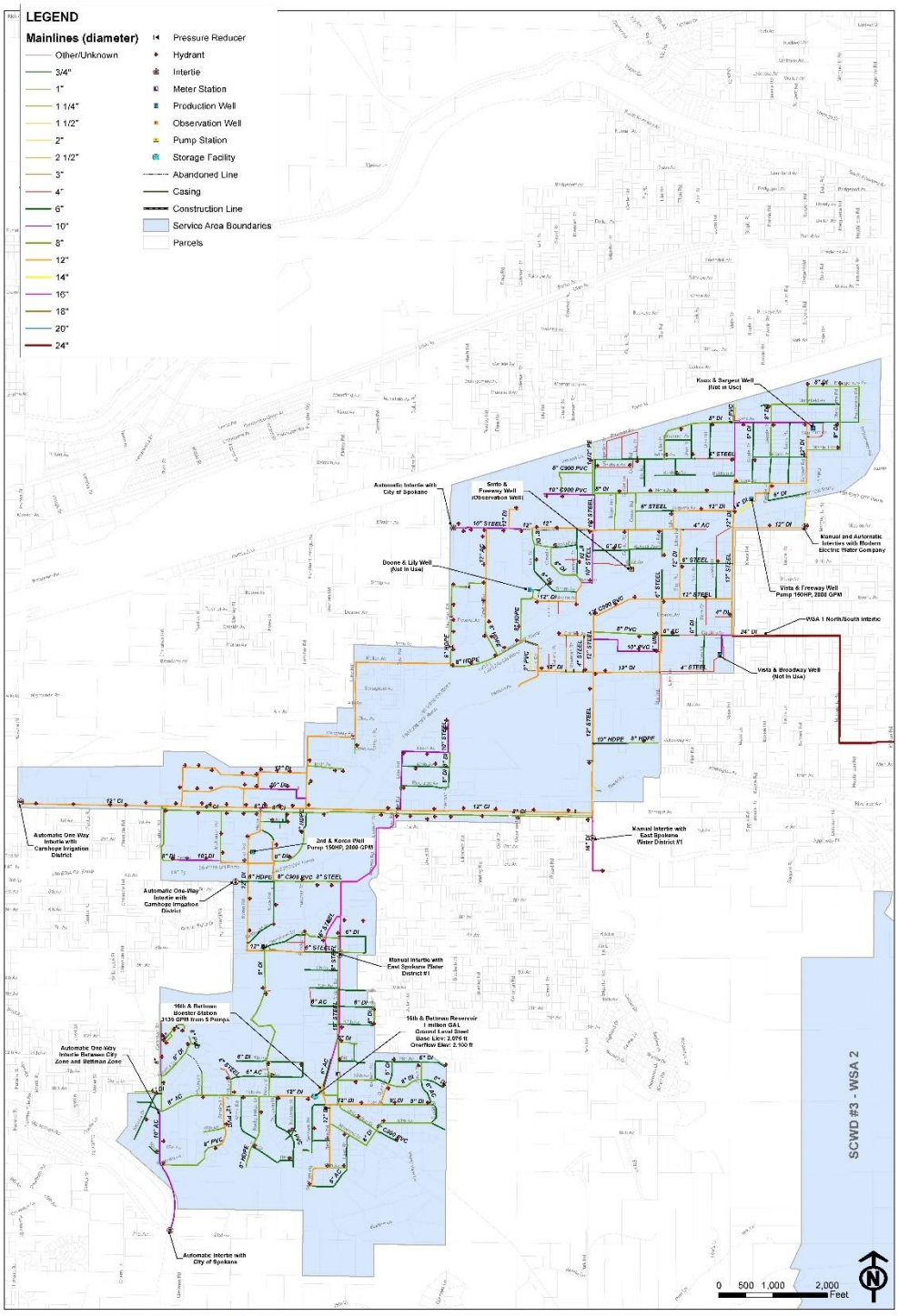
Table 1-5 Intertie Data

WSA	Intertie Name / Identifier	Purveyor Providing Water	Est. Capacity (gpm)[1]	Mode of Operation	Meter	Purpose	Agreement
1	Sprague & Park (2-way)	East Spokane Water District #1	2,000	manual	no	emergency	yes
	Mission & Thierman	City of Spokane	2,000	automatic	yes	emergency	yes
	Carnahan & Glenrose	City of Spokane	1,000	automatic	yes	continuous use	yes
	4th Avenue & Koren	SCWD #3 to Carnhope Irr.	Supply 1,000	automatic	yes	emergency	yes
	Havana & Sprague	Disabled					
	Mission & Sargent (2-way)	Modern Electric Water Co.	2,000	automatic	yes	emergency	no
	32nd Avenue & Collins	SCWD #3 to Model Irr. Dist.	Supply 3,000	manual	yes	emergency	yes
	20th Avenue & Pines (2-way)	Modern Electric Water Co. 2	3,000	manual	no	emergency	yes
	Highway 27 (2-way)	Vera Water & Power	Supply 1,500	manual	no	emergency	yes
	8th & Dickie	SCWD #3 to East Spokane	500	manual	yes	emergency	yes

3	N. Wall 8200 blk (2-way)	Whitworth Water District #2	Supply 1,500 / 1,000	manual	no	emergency	yes
	Francis & Wall	City of Spokane		manual	yes	emergency (not in use)	
4	N. Freya 12900 blk (2-way)	Whitworth Water District #2	Supply 500 / 500	manual	yes	emergency (not in use)	yes
	Mead St. & Perry	Whitworth Water District #2	1,500	automatic	yes	emergency	yes
	Lakeview & Wandermere Estates	Whitworth Water District #2	500	manual	yes	emergency	ues
6	Hilltop & Redowa	Whitworth Water District #2	500	automatic	yes	emergency	yes
8	Perry & 54th Avenue	City of Spokane		supply	yes	continuous use	yes

1. Capacity of interties based on SCWD #3 estimates; actual flow rates through intertie will vary with the head conditions of each system at time of operation of the intertie.

Schematic



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SCWD #3
WSA 1 (North) - Facility Map
Figure 0-1

Sources:
Spokane County GIS Dept
SCWD #3 Mapping Records

PROJECT NO. 51010.020
DRAWN BY DH
FILENAME WSA 1 North_Facility
DATE 10/20/21

Connections

	WSA1			WSA3			WSA4			WSA5		
	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's
Residential												
Single-family	9,979,024	5,192	5,192	1,622,218	1,118	1,118	2,858,712	1,532	1,532	342,961	198	198
Multi-family	1,677,906	343	873	290,200	50	200	794,916	56	426	-		
Nonresidential	-			-			-			-		
Industrial	-			-			-			-		
Commercial	1,260,832	267	656	383,064	72	264	362,004	68	194	15,993	1	9
Governmental	-			-			-			-		
Agricultural	-			-			-			-		
Recreational	-			-			-			-		
DSL	1,729,800		900	288,749		199	268,704		144	14,216		8
Other	-			-			-			-		
Irrigation	624,650	53	325	103,021	6	71	1,216,632	12	652	21,324	1	12
Wholesale	217,186	3	113	-			-			-		
Fire	24,986	94	13	2,902	26	2	26,124	28	14	-		
Total	15,514,384	5,952	8,072	2,690,154	1,272	1,854	5,527,092	1,696	2,962	394,494	195	222

A list of capital deficiencies

Network expansion outside of our current water infrastructure is developer driven and developer funded. If someone wants to develop a piece of property that doesn't have water main in the area, it will be up to them to extend the infrastructure to their development. Large developments will also trigger a water system impact study where we run flow modeling to guarantee our existing system will keep up with demands and fire flow to support the proposed growth before it goes online. The results of those studies will determine whether offsite improvements such as new sources, storage, or transmission main improvements are required.

We also monitor our existing system through flow modeling to determine and prioritize our own improvements to ensure we've got a reliable supply. Those improvements are listed out in our own version of a Capital Improvement Plan over a 20 year period. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

Main Zone (WSA 1 North)

The storage analysis indicates the main zone, served by the Bettman tank lacks sufficient storage to meet District criteria. Assuming nesting of fire flow and standby storage, the current deficit is estimated at approximately 480,000 gallons, with the deficit growing to approximately 554,000 gallons at buildout of the Main and Bettman zones. These deficits can be decreased by up to 300,000 gallons by altering the pump operating points to decrease operating storage. Once operating storage is decreased, the remaining deficit within this zone can be addressed through water sharing with the Dishman Zone and the excess storage capacity within the Dishman and Horizon Hills reservoirs.

The Ponderosa pressure zone has sufficient storage to meet District criteria in the present and 20-year planning period.
The future Upper Ponderosa pressure zone will require a reservoir prior to buildout. Refer to the September 2014 analysis in Appendix C. The anticipated volume to serve buildout of the Upper Ponderosa pressure zone is a minimum of 400,000 gallons (assuming nesting of fire suppression and standby storage).

The Painted Hills reservoir has sufficient storage to meet District criteria in the present and 20-year planning period. The Eagle Crest reservoir has an anticipated storage

deficit of 25,000 gallons due to fire flow requirements. The District does not have a plan in place for addressing this deficit at the current time. However, if additional growth occurs in the Eagle Crest pressure zone, the District will require developers/property owners to finance an evaluation to determine improvements necessary to support growth and meet fire flow requirements. (Refer to the discussion of the future Eagle Crest expansion in Section 3.3.3.)

Beyond the discussion provided above for the 20-year planning period, it was previously noted the southern portion of WSA 1 has a large amount of developable land. Pending actual growth rates, further evaluation of source and storage capacity to support each proposed development should be analyzed as requests are made to the District.

Recommended Improvements for Fire Flow- WSA 1 North
SCWD #3 proposes the following improvements to address the fire flow deficiencies identified above (see Figure 9 for layout of facilities):
• Increase fire flow to 4,000 gpm in Industrial area north of Sprague/Thierman:
o Install 24" main in Heacox from Thierman to Broadway Avenue (1,450 LF)
o Replace 10" steel main in Dyer between Sprague and Railroad Track with 24" main (350 LF)
• Increase fire flow to Residential area between Baldwin and Indiana and between Vista and Park:
o Replace 6" steel main in Baldwin between Vista and Ella with 12" ductile iron, create loop to Indiana (1,400 LF)
o Replace 4" steel main in Indiana between Vista and Ella with 8" ductile iron (1,200 LF)
The available fire flow after implementation shown in Table 3-12 assumes that all improvements listed above are complete. Partial implementation of improvements will result in a partial increase in available fire flow.
Other Distribution Concerns- WSA 1 North:
• Freeway Well/Intertie to Bettman Transmission:
There is limited hydraulic capacity to transport water between the Freeway Well and WSA 1 South intertie and the Bettman Reservoir. This creates large pressure swings within the NE portion of the system when the well is operating and makes it difficult to utilize the interties for filling the Bettman reservoir and serving daily demands within the main pressure zone of WSA 1 North. In order to address this, the District would like to install a 24" transmission main between the intersection of Cataldo and Vista and Bettman reservoir. This project will be completed through several projects that include:

• Cataldo Transmission (described below)
• Heacox Loop (described above)
• Dickey Transmission Alternative loop- New 24" transmission main paralleling existing 16" Dickey fill
The District is considering an alternate alignment to provide a redundant feed to the tank. The proposed alignment is Fancher from 8th to 13th avenue and then along

Dickey to the storage tank at 16th. When installed, the alternate alignment should be increased to 24-inch transmission to increase the hydraulic capacity between the northern portion of the system and the Bettman tank.

• Cataldo Transmission and Booster Station:

As previously mentioned, the District has completed an intertie between what were previously known as WSA 1 and WSA 2 allowing water to be shared from the Dishman Zone to the Main pressure zone via gravity. However, there is currently no way to transfer water from the north service area back to the south service area due to elevation difference. The District is planning on constructing a booster pump station near the north end of the intertie that would allow them to share water in each direction during emergency scenarios.

o Construct a booster pump station near the Broadway and Vista Well site capable of pumping water from the Main pressure zone to the Dishman pressure zone. The booster station should be sized to pump between 3,000-6,000 gpm at approximately 170 ft of head.

o Install approximately 1,300 ft of 24” transmission within Cataldo Ave from Ella to vista.

Recommended Improvements for Fire Flow- WSA 1 South

• Ponderosa

o Transfer existing high elevation service connections within Ponderosa zone to Upper Ponderosa zone upon completion of booster and reservoir construction.

o Future: Refer to discussion in Section 3.3.3 regarding improvements related to booster facility. (Not included in hydraulic model as part of the improvements impacting the above results.)

• Eagle Crest

o Future: Refer to discussion in Section 3.3.3 regarding improvements related to booster facility. (Not included in hydraulic model as part of the improvements impacting the above results.)

o Replace 6” PE main in Lochsa w/min 8” (main size subject to change based on location of additional storage to be built for this zone) from Zuni to Apache Pass (900 LF)

o Replace 6” PE main w/min 8” (main size subject to change based on location of additional storage for this zone) in Apache Pass from Lochsa to existing 8” PVC main (500 LF)

It should be noted that the District is currently is discussion with a developer of property on the ridge between Cree and Highway 27. A copy of the service evaluation memo for this development is included in Appendix C. If added to the system, the development would receive normal water service from the Eagle Crest zone. However, the Eagle Crest zone has a fire flow deficiency in its existing setup, so the Developer would be required to add a second booster pump station off Cree Rd to provide fire flow from the Painted Hills zone. If this improvement happens, the distribution improvements listed above for the Eagle Crest zone are no longer required to meet minimum fire flow throughout the zone.

Other Distribution Concerns- WSA 1 South:

WSA 1 is projected to need an additional source prior to system buildout and the District is considering available options for replacing the existing Dishman reservoir. Final site selection for each of these improvements needs to be completed prior to selecting which other transmission improvements are required within the southern portion of WSA 1.

Table 3-21 Summary of Deficiencies and Improvements

WSA	Area of Deficiency	Description of Deficiency	System Improvements [1] [2]
1	Distribution System Loss	– unaccounted for water in this water service area is 10.6% slightly exceeds 10% maximum	– Continue annual leak detection program – Continue to monitor and account for wheeled water from Modern to East Spokane. – Tighten accounting of unaccounted for water sources.
	Storage	– Bettman Reservoir has storage deficit for meeting current and projected growth demand	– Deficit can be eliminated through a combination of decreasing OS within the Bettman Reservoir and sharing water through the WSA 1-2 Intertie. No further improvements required.
		– Dishman Hills Tank is depreciating and will need replacement. The overflow/drain line for the existing tank has the potential to impact private property and should be addressed.	– Construct new reservoir of similar capacity south of existing, utilize existing tank feed as overflow/drain with disposal at the base of the hill (West of Dishman Mica Road).
		– Eagle Crest pressure zone has insufficient storage to provide fire suppression to current service area and insufficient storage to support any additional connections.	– Growth Funded: Construct new reservoir (approximately 100,000 gallons, based on providing 20,000 gallons of operational storage, 20,000 gallons of equalization storage and 60,000 gallons of fire suppression storage).
		– Future Upper Ponderosa pressure zone will require storage beyond initial 100 ERU's.	– Growth Funded: Construct new 400,000-gallon reservoir and transmission main to tie into existing system.
	Supply	– There is a projected source deficit at buildout of WSA 1 – The District desires additional supply redundancy	– Develop additional source within WSA 1.
	Boosted Zones	– Bettman zone booster station intertie with City of Spokane to satisfy supply redundancy requirements	– Continue to operate as closed zone until future developers fund construction of a reservoir for the Bettman pressure zone
		– Future Upper Ponderosa Booster Station	– Construct new booster station with 1,200 gpm capacity to serve projected buildout of the Upper Ponderosa zone.
	Transmission	– The hydraulic connectivity (due to insufficient main capacity) between the Freeway Well/Intertie and Bettman Tank is poor. As a result, there are large pressure swings when the Freeway Well turns on and it will be difficult to control the Bettman Reservoir level with the intertie.	– Install a 24" equivalent transmission main between the Intertie and Bettman Tank. (9,600 LF)
		– There is currently not a redundant transmission main between the Main pressure zone and Bettman Reservoir.	– Install a 24" watermain that parallels Dickie from 8th Ave to the Bettman Reservoir. (3,200 LF)

		– Water cannot be transported from the north service area to the south service area through the intertie.	– Construct a new booster station along Cataldo and upsize the transmission with Cataldo from Vista to Ella to 24". (1,300 LF)
		– Due to transmission improvements between the Vercler Well site and Dishman Reservoir, the District is having difficulty sending sufficient water to the Horizon Hills tank.	– Upsize transmission between Vercler Well and 32nd Ave to increase hydraulic capacity between the wells and Horizon Hills tank. (2,800 LF)

WSA	Area of Deficiency	Description of Deficiency	System Improvements [1] [2]
	Fire Flow	– Commercial and industrial areas north of Sprague & Thierman do not meet 4,000 gpm fire flow criteria	– Replace 10" steel main with 24" in Dyer from Sprague to Riverside and Railroad Crossing – Install 24" main in Heacox from Thierman to Broadway Avenue (1,900 LF)
		– Portions of Ponderosa Zone are not capable of meeting minimum fire flows while maintaining 20 psi at high elevation connections along Holman Rd and Schafer Branch Rd.	– Move high elevation connections to Upper Ponderosa Zone once booster station and reservoir are installed.
		– Portions of the Eagle Crest pressure zone do not meet 1,000 gpm residential fire flow criteria	– Replace 6" PE main in Lochsa w/min 8" (main size subject to change based on location of additional storage to be built for this zone) from Zuni to Apache Pass (900 LF) – Replace 6" PE main w/min 8" (main size subject to change based on location of additional storage for this zone) in Apache Pass from Lochsa to existing 8" PVC main (500 LF)
		– Fire hydrants served from 4" main in University do not meet 1,000 gpm residential fire flow criteria	– See transmission improvements related to East-West transmission below.
	Pressure	– Low Pressure	– The existing services on Holman Rd west of Woodruff Rd and along Schafer Branch Road do not meet minimum pressure criteria.
		– High Pressure	– Several services near the Lower Painted Hills Booster Station appear to have pressures exceeding 130 psi

A list of projects (capital projects) to cure them

	TABLE 8-1 (Update 12/7/2021)			20 YEAR										
				$3,862,022	$2,772,023	$2,352,024	$1,862,025	$1,612,026	$1,942,027	$1,972,028	$2,042,029	$2,012,030	$2,022,031	$1,972,032
WSA	PROJECT		Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
1	Replace depereciated waterlined in Buttercup and Wardsen (2,500 LF)	Depreciation	$610,000	$610,000										
	Phase 1: Upsize existing transmission along Cataldo and Broadway between Vista and Heacox to 24" (1,400 LF)	Reliability/Source/Storage	$630,000			$630,000								
	Phase 2: Install 24" main in Heacox from Broadway to Thierman (1,900 LF)	Depreciation/Fire Flow/Reliability/Operation	$790,000			$790,000								
	Phase 3: 24" Transmission Main 8th Avenue to Bettman Tank (3,200 LF)	Depreciation/Fire Flow/Reliability/Operation	$1,090,000						$200,000	$490,000	$400,000			
	Phase 4: Upsize existing transmission to 24" main Thierman to Sprague (2,700 LF)	Depreciation/Fire Flow/Reliability/Operation	$1,120,000								$900,000	$220,000		
	Phase 5: 24" Main from Sprague to 8th Ave (4,300 LF)	Depreciation/Fire Flow/Reliability/Operation	$1,790,000											
	Phase 6: Upsize existing transmission between Ella and Heacox to 24" (3,000 LF)	Depreciation/Fire Flow/Reliability/Operation	$1,340,000									$1,000,000	$340,000	
	New booster station for WSA 1 to WSA 2 Transfer	Reliability/Source/Storage	$770,000			$50,000	$720,000							
	Replace HDPE Main in Woodruff with minimum 8" (4000 LF)	Depreciation	$890,000						$890,000					
	Painted Hills Lower Booster Pump Replacement (pre-1980)	Depreciation	$60,000						$60,000					
	18" Vercler Well to 32nd (2,800 lf)	Operational Efficiency/Reliability/Capacity	$880,000										$880,000	
	New Well (3000 gpm)	Reliability/Source/Storage	$1,380,000											
	Dishman Reservoir Replacement 1.0 Million Gal Reservoir	Depreciation[7]	$4,500,000											
	Future Upper Zone Reservoir (assume 785,000 gal)	Growth	$3,300,000											
	Construct new booster station for Ponderosa Upper Zone	Growth	$710,000											
	Future Ponderosa Upper 400,000 gal Reservoir	Growth	$1,400,000											
	Future additional 100,000 gal Eagle Crest Reservoir	Growth	$360,000											
	Upsize 6" and 8" Main in 44th between Bowdish Booster and Woodruff (4,400 ft)	Growth	$1,120,000											
	Replace 6" Main in Lochsa and Apache Pass with minimum 8" (1400 LF)	Growth/Depreciation	$400,000											

Water rights deficiencies

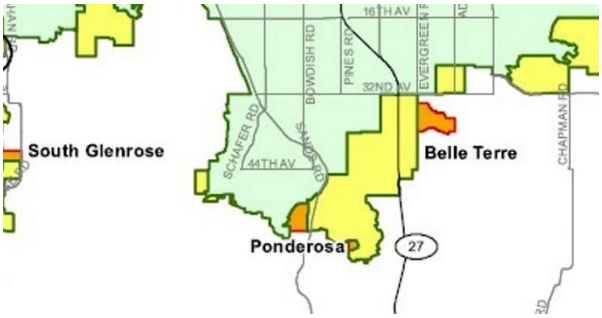
- explanation of the area impacted and their thoughts about remedy

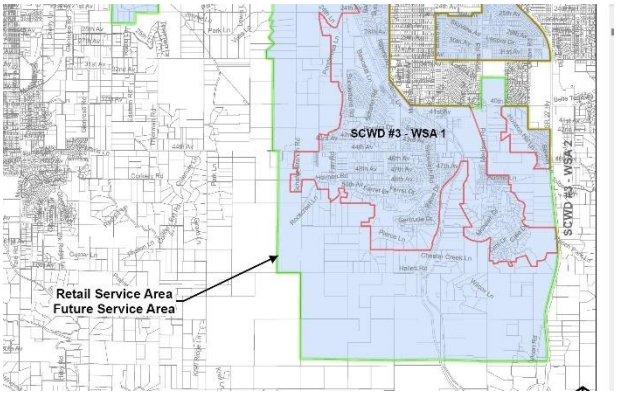
System 1 and 4 we have large undeveloped portions of land that are within our service boundaries. However, our large limiting factor is water rights. Last year we had to transfer some excess water rights from system 3 to system 4 to keep up with current growth. But we anticipate running out of water rights in both system 1 and 4 before we reach full buildout. Department of Ecology isn't issuing new rights in this State so once we run out of annual quantity allotted we'll either have to negotiate with other water districts to purchase some of their excess rights or just stop growth from happening. Here's a table showing what our limitations are in terms of water rights and how many additional ERU's we expect to supply before we run out. Just an example, we have the source capacity to serve up to 21,000 ERU's in system 1, but on paper can only support about 8,700, most of which are already spoken for. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

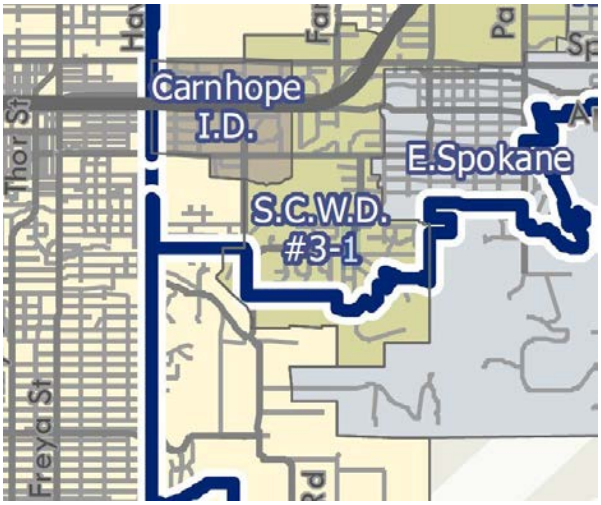
Capacity as ERU's	WSA1	WSA3	WSA4	WSA5	WSA6	WSA 8	WSA9
Limiting Capacity (ERU's)	**8,713**	**1,969**	**2,647**	**197**	**166**	**N/A**	**171**
Basis	WATER RIGHT QA	WATER RIGHT QA	WATER RIGHT QI	STORAGE	STORAGE	N/A	SOURCE (18/24) Hours
Current ERU's	8,072	1,854	2,962	222	152	183	42
ERU's Available	**641**	**115**	**(315)**	**(25)**	**14**	**n/a**	**129**
Notes			The District has applied for an additional 2,200 gpm instantaneous water right through DOE.	Storage deficit within WSA 5 can be supplemented by WSA 4 intertie once Helena Well 2 is online in summer 2022.			Because this system has only one source and no fire suppression requirement, we have evaluated source capacity based on max pumping 18/24 hours per day.

We operate on a first come-first serve basis for new connections to our system. Eventually, when we run out of water rights, there will be people who own property within the urban growth area and within our water service boundaries that will not be able to receive service from our water district. At that time, we'll either have to purchase water rights from other purveyors so we can support the new growth or allow people to begin drilling permit exempt wells within our borders again. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

Areas of current deficiency or cannot support full buildout:







The anticipated deficit for WSA 1 for the 20-year planning period is 462 afa, growing to approximately 1,099 afa at system buildout. It does not appear that the District will have sufficient water rights to serve projected buildout. As growth continues within WSA 1, the District may have to either require large developments to bring their own water rights with them or look into leasing excess water rights from another purveyor. (WSP 2022)

S.C.W.D #3, System 3

Source

SCWD #3's water supply is from groundwater. Thirteen "active" wells tap the groundwater aquifers that lie beneath the District's service areas. However, another nine wells are "inactive" due to various reasons, ranging from contamination, well casing failure or low yield. The depth, diameter, current pumping rate, and location of each well are summarized in Table 1-2. This information was obtained from several sources including well logs, old pump tests, past studies, and discussions with District personnel. As a result, actual well pumping rates may vary slightly from those shown in the table. The current total pumping capacity is approximately 21,460 gpm from the District's 13 active wells. (WSP 2022)

Table 1-2 Well Data

WSA	Location	Motor (HP)	DOH Source Number	Approx. Depth (ft.)	Dia. (in)	Approx. Ground Elev. (ft.)	Approx. Depth to SWL (ft.)	Current Pump Capacity (gpm)	Model	Notes	Status	Date Pump Installed
1	Vista & Broadway [1]	--	S-20	108	12	1,985	74	0	No Pump	Not in use, capped	Emergency	
	Knox & Sargent	50	S-21	119	12	1,974	79	500	No Pump	Not in use	Emergency	
	Boone & Lily	30	S-22	104	12	1,948	56	**0**	No Pump	Not in use	Emergency	
	Sinto & Freeway [1]	--	S-23	102	10	1,952	--	0	No Pump	Not in use, capped	Emergency	
	Freeway & Vista	**150**	S-24	220	24	1,965	72	**2,000**	Ingersoll-Dresser 15EMM		Permanent	2000
	2nd & Koren	**150**	S-25	164	12	1,999	60	**2,000**	Flowserve 14ENLV29		Permanent	2008
	20th & Balfour	150	S-14,S-15	147	16 & 10	2,013	107	0	No Pump	Not in use, capped	Emergency	
	32nd & Pines [1]	--	S-09	131	10	2,007	112	0	No Pump	Not in use, capped	Emergency	
	20th & Balfour	300	S-13	156	18	2,020	107	2,750	Peerless 14HX13		Permanent	WWP
	26th & Vercler	350	S-10	180	18	2,014	95	3,300	Layne & Bowler		Permanent	WWP
	Vercler #2	400	S-17	200	20	2,014	91	2,900	Flowserve 15-HH		Permanent	2017
	Browns Park	400	S-11	173	18	2,028	109	0	No Pump	Not in use, capped	Emergency	

	Madison Road 1	**--**	**S-12**	**140**	**18**	**2,010**	**77**	**0**		**Not in use, sanded in**	**Emergency**	
							Total:	12,950				
3	Normandie & Lyons	250	S-06	293	16	2,055	230	1,430	12 ENH		Permanent	2018
	Steer Inn	125	S-07	252	12	2,053	210	**700**	8RJHC-6 stage submersible Goulds		Permanent	2018
							Total:	2,130				
4	Guy & Freya [1]	--	S-09	107	48	1,900	93	0	No Pump	Not in use, hand dug, capped	Emergency	
	Dakota 1	--	S-10	89	12	1,765	38	0		Not in use, to be capped	Emergency	
	Freya & Farwell	40	S-11	201	10	1,890	144	0	Peerless 15 bowls		Emergency	WWP
	Cherry & Farwell	125	S-12	180	18	1,860	116	1,200			Permanent	2000
	Freya & Guy [1]	--	S-13	116	16	1,900	92	0	No Pump	Not in Use, capped	Emergency	
	Helena	100	S-16	160	16	1,820	75	800			Permanent	1996
	Helena 2	400		356	20	1,820	91	3,000	TBD	Under Construction	Permanent	2022
	Hawthorne Well	400	S-17	283	30, 24, 18	1943	160	3,400	Flowserve -16ENL-5 stage		Permanent	2015
							Total:	5,400				
5	Pine River Park	50	S-32	204	12	1,610	17	330	Peerless 6MA		Permanent	2000
			S-33	206	6	1,610	17	0	No Pump	Monitoring Well		
							Total:	330				
6	Rivervie w Hills	25	S-01	124	12	1,750	91	450	Flowserve 10 EML		Permanent	2020
9	Waterview Terrace	25	S-02	136	10	1,546	12	200	Peerless 9LA		Permanent	1959

Storage

Total storage capacity: 1,100,000 gallons

A total of approximately 7.5 million gallons of storage is provided in the 13 reservoirs located throughout the District. Table 1-4 lists the size, approximate overflow elevation, and the type of each reservoir. Except where noted, base elevations and calculated overflow elevations are based on topographic maps. As a result, actual elevations may vary slightly. (WSP 2022)

Table 1-4 Reservoir Data

WSA	Location	Nominal Capacity (gallons)	Approx. Diameter (ft.)	Approx. Height (ft.)	Approx. Overflow Elevation	Type
1	16th & Bettman	1,000,000	86	24	2,100 [2]	Ground Level Steel
2	16th & Dishman	1,000,000	86	24	2,224 [2]	Ground Level Steel
	Horizon Hills	1,000,000	66	40	2,225 [2]	Ground Level Steel
	Ponderosa	1,000,000	86	24	2,338 [2]	Ground Level Steel
	Painted Hills	200,000	[3]	14	2,419 [2]	Ground Level Concrete
	Eagle Crest	50,000	23	16	2,601 [2]	Ground Level
3	5-Mile	600,000	65	24	2,250	Ground Level
		500,000	60	24	2,250	Ground Level
4	Mead	500,000	30	96	2,040	Stand Pipe
	Florida Lane	1,600,000	[3]	22	2,070	Ground Level Concrete
5	Pine River Park	50,000	17	30	1,820	Elevated Tank
6	Riverview Hills	50,000	15	40	1,830	Stand Pipe
9	Waterview Terrace	3,000			[1]	Hydro Pneumatic Tank

1. Not applicable for hydro pneumatic tanks.
2. Overflow elevations taken by surveyor with GPS unit.
3. Rectangular concrete reservoir

Delivery

Boosters/Pressure relief valves –

Eleven booster pump stations provide water to the higher elevations within the District. All pumping equipment is located inside structures for protection from the weather and

heated for protection against freezing.
The size and estimated capacity for each booster station is shown in Table 1-3. The capacities shown were estimated on several sources of information. In some cases, actual pump curves were used to estimate capacity. In other cases, capacities were estimated based on pump reports from District telemetry, pressure chart recordings, old memorandums, or discussions with District personnel. As a result, actual capacities may vary slightly. Copies of the available pump curves are included in Appendix A. (WSP 2022)

Table 1-3 Booster Pump Station Data

WSA	Location	Capacity		Motor (HP)	Pump Model	Date Pump Installed
		Flow (gpm)	Head (feet)			
1	16th & Bettman [2]	339	249	30	Grundfos CR-64 5.59" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
	Mohawk (Lower Painted Hills)	115	250	20	Cornell 1 ¼Y, 9.25" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
	Horizon Hills [1]	450	250	60	Cornell 3HA, 15.22" impeller	2007
		450	250	60	Cornell 3HA, 15.22" impeller	2007
					Open Space for 7.5 HP, 7.75" impeller	
		50	200	15	Pioneer SC425C75, 7" impeller	2010
	Eagle Crest (Upper Painted Hills)	140	190	15	Cornell 1 VH-15-2	2017
		140	190	15	Cornell 1 VH-15-2	2018
		60	190	7.5	Berkeley B1WPS, 7.25" impeller	?
	44th & Bowdish	900	156	50	Cornell 4RB, 12.75" impeller	2019
		900	156	50	Cornell 4RB, 12.75" impeller	2019
	Schafer Road	900	156	50	Cornell 4RB, 12.75" impeller	2019
		500	130	30	Cornell 3RB 11.69"	2019
3	5-Mile	240	95	7.5	Cornell 2-1/2W, 5 ¼" impeller	Pre-1980
		175	75	5	Cornell 2-1/2W, 4 5/8" impeller	Pre-1980
	Stoneman	240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
		240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980

4	Fairview	119	150	7.5	Berkeley B3TPM	2021
		119	150	7.5	Berkeley B1.5TPMS, 6" impeller	2015
	Wandermere	100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
6	Riverview Hills	350	123	15	Berkeley B3TPM-3600	2021
		275	120	10	Cornell 2-1/2W, 5 7/8" impeller	1980s

1. Pumps from main zone to Painted Hills zone.
2. Variable speed pumps.

Transmission lines –

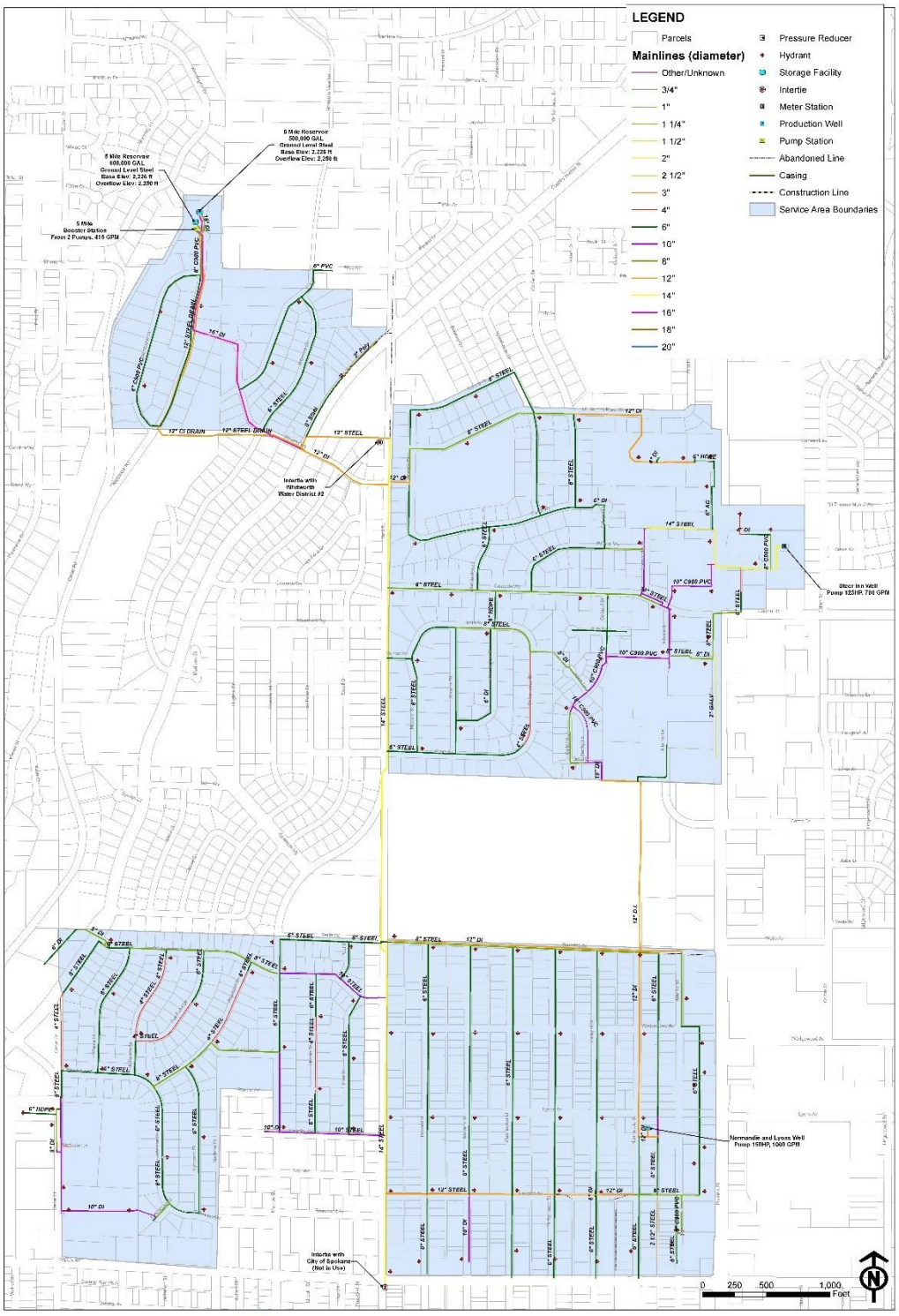
The District has an estimated total of 996,000 lineal feet of distribution piping across the 7 systems. The pipe ranges in size from 1" to 24" in diameter. The piping consists of various materials including, Cast Iron, Ductile Iron, Polyethylene, PVC, Steel and Asbestos Cement. (WSP 2022)

Intertie -

Table 1-5 Intertie Data

WSA	Intertie Name / Identifier	Purveyor Providing Water	Est. Capacity (gpm) [1]	Mode of Operation	Meter	Purpose	Agreement
1	Sprague & Park (2-way)	East Spokane Water District #1	2,000	manual	no	emergency	yes
	Mission & Thierman	City of Spokane	2,000	automatic	yes	emergency	yes
	Carnahan & Glenrose	City of Spokane	1,000	automatic	yes	continuous use	yes
	4th Avenue & Koren	SCWD #3 to Carnhope Irr.	Supply 1,000	automatic	yes	emergency	yes
	Havana & Sprague	Disabled					
	Mission & Sargent (2-way)	Modern Electric Water Co.	2,000	automatic	yes	emergency	no

Schematic



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SCWD #3

WSA 3 - Facility Map

Figure 0-3

Sources:
Spokane County GIS Dept
SCWD #3 Mapping Records

PROJECT NO.....51010.02
DRAWN BY.....DH
FILENAME.....WSA3_Facility
DATE.....10/27/2021

Connections

	WSA1			WSA3			WSA4			WSA5		
	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's
Residential												
Single-family	9,979,024	5,192	5,192	1,622,218	1,118	1,118	2,858,712	1,532	1,532	342,961	193	193
Multi-family	1,677,906	343	873	290,200	50	200	794,916	56	426	-		
Nonresidential	-			-			-			-		
Industrial	-			-			-			-		
Commercial	1,260,832	267	656	383,064	72	264	362,004	68	194	15,993	1	9
Governmental	-			-			-			-		
Agricultural	-			-			-			-		
Recreational	-			-			-			-		
DSL	1,729,800		900	288,749		199	268,704		144	14,216		8
Other	-			-			-			-		
Irrigation	624,650	53	325	103,021	6	71	1,216,632	12	652	21,324	1	12
Wholesale	217,186	3	113	-			-			-		
Fire	24,986	94	13	2,902	26	2	26,124	28	14	-		
Total	15,514,384	5,952	8,072	2,690,154	1,272	1,854	5,527,092	1,696	2,962	394,494	195	222

A list of capital deficiencies

NORTH SPOKANE (WSA 3)

The storage analysis indicates the main zone has sufficient storage volume to meet District criteria under present and future conditions. Based on nesting of fire suppression and standby storage, the main zone has an estimated excess storage volume of approximately 48,000 gallons to serve current demands. As previously mentioned, this zone is considered to be built out, so no future storage deficits are anticipated.

It must be noted that the age of the existing 600,000-gallon storage tank is unknown. The steel structure was erected in the 1950's, but it is believed to have been previously used. The District has worked to maintain the facility, but based on historic problems, the District does not believe the facility is a viable structure long-term. The District will seek to budget for the replacement of this facility.

As shown in the preceding table, some areas of WSA 3 do not meet the current fire flow criteria. In order to achieve the stated fire flow criteria, the following improvements would be necessary (see Figure 0-9 for layout of facilities, also refer to Note 1 of Table 3-15 regarding required funding of these improvements):
Recommended Improvements for Fire Flow
• Northview Court and 5-Mile Booster Station:
o The existing 5-mile booster station which serves Northview Court was not designed to provide fire flow. The District has concerns with the location of the existing booster station which is located below the older 5-mile storage facility. At such time as the District relocates the booster station, they intend to replace the booster pumps with higher capacity pumps to support fire flow and will add a generator for standby power.
• Southwest Commercial (Mini Storage and Future Church Expansion):
o Replace 8" steel main in Wedgewood with 12" from Monroe to Country Homes Blvd (1,800 LF)
o Replace 8" steel main in Beacon with 10" from Monroe to Argonaut

(600 LF),
Replace 8” steel main in Argonaut with 10” from Beacon to Jefferson
(600 LF),
Replace 6” steel main in Jefferson with 10” from Argonaut to Rosewood
(connect to existing 10” ductile iron main) (1,000 LF)
OR
o Install 10” ductile iron loop in Holyoke from Monroe to Lynwood.
• Francis and Division (south) Commercial:
o Replace 8” steel main in Houston with 12” from Normandie to Division
(500 LF)
o Replace 6” steel mains in Howard, Washington, Whitehouse, Calispel,
Normandie, and Atlantic with 10” (if not looped) between Houston and
Francis (4,000 LF)
o Install 12” ductile iron loop in Lyons from well to Division (400 LF) OR
o Replace 6” steel main in alley west of Division with 8” ductile iron
between Houston and Wedgewood (1,400 LF)
The available fire flow after implementation shown in the preceding table assumes that all improvements listed above are complete (unless otherwise noted). Partial implementation of improvements will result in a partial increase in available fire flow.

Other Distribution Concerns:
• Main feed from Steer Inn Well (This improvement is reflected in the hydraulic model analysis results shown in Table 3-15):
The existing 14” main well feed line between Division and Normandie from the Steer Inn well crosses a commercial parking lot and close to existing commercial structures. SCWD#3 intends to replace this main feed along an alternate route (parallel to Division from Rainier north to the 12 inch loop line that was installed in St. Thomas More Way-approximately 1,000 lineal feet). The 14 inch would be sliplined with a smaller diameter line to maintain the existing services located on this segment.

WSA	Area of Deficiency	Description of Deficiency	System Improvements [1] [2]
	Distribution System Loss	– System unaccounted for water of 10.7% slightly exceeds 10% maximum	– Continue annual leak detection program – Tighten accounting of unaccounted for water sources.
	Supply	– No projected source deficits for WSA 3	–
	Storage	– 500,000-gallon storage facility is depreciating and may need to be replaced in the near future.	– Replace with 500,000-gallon facility.

3	Booster Zone	– 5-Mile booster station has multiple deficiencies (based on current standards): – The pump station does not provide fire flow capacity. – The pump station does not have provisions for standby power. – The current pumps operate continuously, many times at very low flows, this operation is inefficient. – The pump station is located below the original 5-mile reservoir. This location is undesirable from an operational standpoint.	– Construct new booster station separate from the existing storage facility: – Provide sufficient pump capacity to provide MDD plus FF with the largest pump down. – Add standby power. – Provide variable frequency drive(s) and/or bladder tanks and size pumps to provide the full range of flows for this datum.

WSA	Area of Deficiency	Description of Deficiency	System Improvements [1] [2]
3	Fire Flow	– High pressure zone does not meet residential 1,000 gpm fire flow criteria	– Refer to 5-Mile booster improvements listed above.
		– Southwest Commercial area along Cedar near Francis does not meet 2,500 gpm fire flow criteria.	– Replace 8” steel main in Wedgewood with 12” from Monroe to Country Homes Blvd (1,800 LF) – Replace 8” steel main in Beacon w/10” from Monroe to Argonaut (600 LF), Replace 8” steel main in Argonaut w/10” from Beacon to Jefferson (600 LF), Replace 6” steel main in Jefferson w/10” from Argonaut to Rosewood (connect to existing 10” ductile iron main) (1,000 LF) OR – Create 10” loop from Monroe to Lynwood in Holyoke.
		– Commercial area along Francis & Division does not meet 2,500 gpm fire flow criteria	– Replace 8” steel main in Houston with 12” from Whitehouse to Division (1,200 LF) – Replace 6” steel mains in Howard, Washington, Whitehouse, Calispel, Normandie, and Atlantic with 10” (if not looped) between Houston and Francis (4,000 LF) – Install 12” ductile iron loop in Lyons from well to Division (400 LF) OR – Replace 6” steel main in alley west of Division with 8” ductile iron between Houston and Wedgewood (1,400 LF)
	Other	– Main feed from Steer Inn Well crosses a commercial parking lot, close to existing commercial structures.	– Slipline 14” steel main between Division and Normandie. Install new 12 inch ductile iron main parallel to Division from Rainier north approximately 1,000 LF.

A list of projects (capital projects) to cure them

Date Printed:2/21/2022

SCWD #3 WSP
Section 8

	TABLE 8-1 (Update 12/7/2021)			20 YEAR											
				$3,862,022	$2,772,023	$2,352,024	$1,862,025	$1,612,026	$1,942,027	$1,972,028	$2,042,029	$2,012,030	$2,022,031	$1,972,032
WSA	PROJECT		Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
3	Replace steel main in Jefferson and Mountain View Lane	Depreciation	$640,000	$640,000										
	5-Mile Booster Pump Station Replacement (Pre-1980)	Operational Efficiency/Reliability/Capacity	$640,000											
	Replace steel mains w/10" between Houston & Francis (4,000 LF)	Depreciation/Fire Flow	$1,080,000				$540,000	$540,000						
	Steer Inn Well Pump Replacement	Depreciation	$50,000									$50,000		
	Replace 600,000 gal Reservoir	Depreciation[3]	$1,990,000											

Water rights deficiencies

- explanation of the area impacted and their thoughts about remedy

Water systems 3,5,6,8, and 9 are almost at full buildout and they are landlocked by other water districts so we don't anticipate any future growth in those areas apart from infilling a few vacant lots here and there. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

We operate on a first come-first serve basis for new connections to our system. Eventually, when we run out of water rights, there will be people who own property within the urban growth area and within our water service boundaries that will not be able to receive service from our water district. At that time, we'll either have to purchase water rights from other purveyors so we can support the new growth or allow people to begin drilling permit exempt wells within our borders again. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

S.C.W.D #3, System 4

Source

SCWD #3's water supply is from groundwater. Thirteen "active" wells tap the groundwater aquifers that lie beneath the District's service areas. However, another nine wells are "inactive" due to various reasons, ranging from contamination, well casing failure or low yield. The depth, diameter, current pumping rate, and location of each well are summarized in Table 1-2. This information was obtained from several sources including well logs, old pump tests, past studies, and discussions with District personnel. As a result, actual well pumping rates may vary slightly from those shown in the table. The current total pumping capacity is approximately 21,460 gpm from the District's 13 active wells. (WSP 2022)

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	Ponderosa	1,000,000	86	24	2,338 [2]	Ground Level Steel
	Painted Hills	200,000	[3]	14	2,419 [2]	Ground Level Concrete
	Eagle Crest	50,000	23	16	2,601 [2]	Ground Level
3	5-Mile	600,000	65	24	2,250	Ground Level
		500,000	60	24	2,250	Ground Level
4	Mead	500,000	30	96	2,040	Stand Pipe
	Florida Lane	1,600,000	[3]	22	2,070	Ground Level Concrete
5	Pine River Park	50,000	17	30	1,820	Elevated Tank
6	Riverview Hills	50,000	15	40	1,830	Stand Pipe
9	Waterview Terrace	3,000			[1]	Hydro Pneumatic Tank

1. Not applicable for hydro pneumatic tanks.
2. Overflow elevations taken by surveyor with GPS unit.
3. Rectangular concrete reservoir

Delivery

Boosters/Pressure relief valves –

Eleven booster pump stations provide water to the higher elevations within the District. All pumping equipment is located inside structures for protection from the weather and heated for protection against freezing.
The size and estimated capacity for each booster station is shown in Table 1-3. The capacities shown were estimated on several sources of information. In some cases,

actual pump curves were used to estimate capacity. In other cases, capacities were estimated based on pump reports from District telemetry, pressure chart recordings, old memorandums, or discussions with District personnel. As a result, actual capacities may vary slightly. Copies of the available pump curves are included in Appendix A.

(WSP 2022)

Table 1-3 Booster Pump Station Data

WSA	Location	Capacity		Motor (HP)	Pump Model	Date Pump Installed
		Flow (gpm)	Head (feet)			
1	16th & Bettman [2]	339	249	30	Grundfos CR-64 5.59" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
		800	240	60	Berkeley B3ZPBHS 8.63" impeller	2020
	Mohawk (Lower Painted Hills)	115	250	20	Cornell 1 ¼Y, 9.25" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
	Horizon Hills [1]	450	250	60	Cornell 3HA, 15.22" impeller	2007
		450	250	60	Cornell 3HA, 15.22" impeller	2007
					Open Space for 7.5 HP, 7.75" impeller	
		50	200	15	Pioneer SC425C75, 7" impeller	2010
	Eagle Crest (Upper Painted Hills)	140	190	15	Cornell 1 VH-15-2	2017
		140	190	15	Cornell 1 VH-15-2	2018
		60	190	7.5	Berkeley B1WPS, 7.25" impeller	?
	44th & Bowdish	900	156	50	Cornell 4RB, 12.75" impeller	2019
		900	156	50	Cornell 4RB, 12.75" impeller	2019
	Schafer Road	900	156	50	Cornell 4RB, 12.75" impeller	2019
		500	130	30	Cornell 3RB 11.69"	2019
3	5-Mile	240	95	7.5	Cornell 2-1/2W, 5 ¼" impeller	Pre-1980
		175	75	5	Cornell 2-1/2W, 4 5/8" impeller	Pre-1980
	Stoneman	240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
		240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
		119	150	7.5	Berkeley B3TPM	2021

4	Fairview	119	150	7.5	Berkeley B1.5TPMS, 6" impeller	2015
	Wandermere	100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
6	Riverview Hills	350	123	15	Berkeley B3TPM-3600	2021
		275	120	10	Cornell 2-1/2W, 5 7/8" impeller	1980s

1. Pumps from main zone to Painted Hills zone.
2. Variable speed pumps.

Transmission lines –

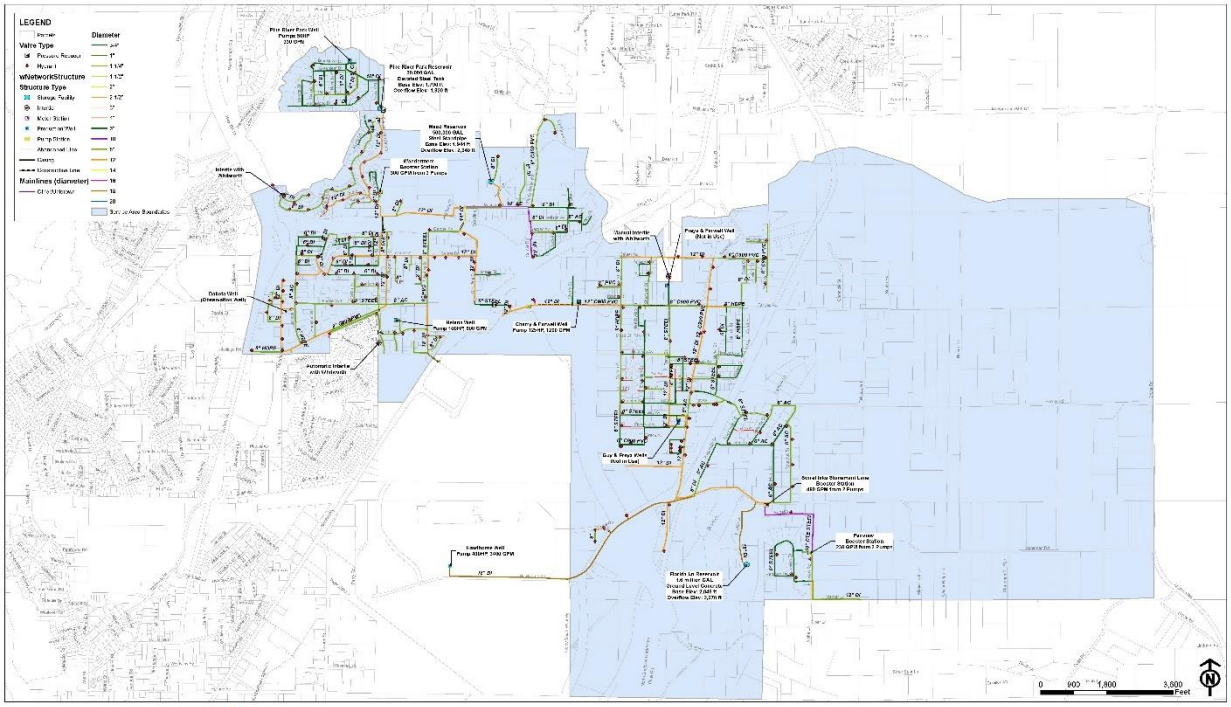
The District has an estimated total of 996,000 lineal feet of distribution piping across the 7 systems. The pipe ranges in size from 1" to 24" in diameter. The piping consists of various materials including, Cast Iron, Ductile Iron, Polyethylene, PVC, Steel and Asbestos Cement. (WSP 2022)

Intertie -

Table 1-5 Intertie Data

WSA	Intertie Name / Identifier	Purveyor Providing Water	Est. Capacity (gpm) [1]	Mode of Operation	Meter	Purpose	Agreement
1	Sprague & Park (2-way)	East Spokane Water District #1	2,000	manual	no	emergency	yes
	Mission & Thierman	City of Spokane	2,000	automatic	yes	emergency	yes
	Carnahan & Glenrose	City of Spokane	1,000	automatic	yes	continuous use	yes
	4th Avenue & Koren	SCWD #3 to Carnhope Irr.	Supply 1,000	automatic	yes	emergency	yes
	Havana & Sprague	Disabled					
	Mission & Sargent (2-way)	Modern Electric Water Co.	2,000	automatic	yes	emergency	no

Schematic



Connections

	WSA1			WSA3			WSA4			WSA5		
	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's
Residential												
Single-family	9,979,024	5,192	5,192	1,622,218	1,118	1,118	2,858,712	1,532	1,532	342,961	193	193
Multi-family	1,677,906	343	873	290,200	50	200	794,916	56	426	-		
Nonresidential	-			-			-			-		
Industrial	-			-			-			-		
Commercial	1,260,832	267	656	383,064	72	264	362,004	68	194	15,993	1	9
Governmental	-			-			-			-		
Agricultural	-			-			-			-		
Recreational	-			-			-			-		
DSL	1,729,800		900	288,749		199	268,704		144	14,216		8
Other	-			-			-			-		
Irrigation	624,650	53	325	103,021	6	71	1,216,632	12	652	21,324	1	12
Wholesale	217,186	3	113	-			-			-		
Fire	24,986	94	13	2,902	26	2	26,124	28	14	-		
Total	15,514,384	5,952	8,072	2,690,154	1,272	1,854	5,527,092	1,696	2,962	394,494	195	222

A list of capital deficiencies

MEAD (WSA 4)

In the current configuration WSA4 is essentially divided into two primary zones, East and West. On the west side of the system, the District relies upon the Helena well to provide source capacity. Helena well pumps to the Mead Reservoir. Within the East Zone, the District currently relies on the Hawthorne and Cherry well pumps for source capacity which pump to the Florida Lane Reservoir. The east side of the system operates at a higher hydraulic grade line than the west side.

The East Zone currently has a significant surplus in source capacity while the West Zone has a source deficit. A 6” PRV intertie exists between the east and west zones. This intertie is used to supplement the Helena Well capacity in the West Zone, but the intertie is undersized to meet projected future demands. The intertie is not metered, but it is estimated that the intertie has a maximum capacity of approximately 400 gpm during average daily demand which provides just enough capacity to support current MDD within the West Zone.

The Mead Reservoir currently has a 400,000-gallon deficit, which is projected to grow to 612,000 gallons at system buildout. Much of this deficit is due to the large fire suppression storage requirements allotted to the Wandermere Mall and Mead Middle School. The West Zone has limited sites suitable for additional storage and difficulties associated with increasing the capacity to share water from the East Zone to the West Zone, the District has elected to install a new 3,000 gpm well at the existing Helena site. The well is currently under construction and expected to be online prior to summer 2022.

Recommended Improvements for Fire Flow

- Construct a new 200,000-gallon (minimum) reservoir within the Fairview zone to gravity feed the Fairview and Sorrel services. The District has a reservoir site reserved. This improvement also includes the following items:
  - Replace existing Sorrel and Fairview booster stations with above ground pump facilities.
  - Replace existing 8" and 10” transmission within Sorrel and Fairview with 12” waterline.
- Installation of new 2,500 gpm source at the existing Helena Well Site (this improvement is expected to be online by summer 2022).
- Install 18” ductile iron main from Farwell and the Newport Highway to existing casing at Pittsburg and Newport Highway (2,300 LF); Include PRV set to maintain a minimum HGL of 2030 feet. It should be noted that once this piping is online, the District plans to abandon the existing 6-inch intertie that goes under the Newport Highway near Farwell. This transmission project shall be completed by developer at time of development of the Kaiser Property.
- Install 12” ductile iron loop between Dakota and the Ace Hardware Wandermere (to be installed by Developer in 2022).

Other Distribution Concerns

- Growth Related Improvements (These improvements are not reflected in the hydraulic model analysis results presented in Table 3-16.):

  - To manage discharge pressure at the second well at the Helena site, the District is planning to install a new 12” transmission main from the Helena well site to the intersection of Farwell Rd and Palomino Ln.
  - Associated with development of Kaiser North property, Developer to

install 18” ductile iron main from Hawthorne through property to existing crossing at Newport Highway. This improvement will maintain available emergency flows from the east zone to the west zone.[12]

- Replace/Upsize 12” AC main within Stoneman Rd between between Parksmith and Sorrel Ln to 18” ductile iron pipe.

The improvements listed correct all existing and projected deficiencies identified by the hydraulic model (unless otherwise noted). The pressure and fire flow available after implementation of proposed improvements shown in the preceding tables assumes that all improvements listed are complete. Partial implementation of improvements will result in a partial increase in system performance.

WSA	Area of Deficiency	Description of Deficiency	System Improvements [1] [2]
4	Source	– The West Zone has a significant deficiency with respect to meeting MDD plus Fire Flow	– Develop a new source within the West Zone (Helena Well 2)
	Boosted Zones	– Sorrel Lane and Fairview are inefficient, do not have standby power, and do not have sufficient capacity to provide MDD plus FF.	***Option 1*** – Replace Sorrel and Fairview Booster Stations-Abandon existing booster stations, install new booster station at Florida Lane Reservoir facility: – Install minimum pump capacity of 1200 gpm with the largest pump down – Install generator for standby power – Install 12” ductile iron main from booster facility to Red Roan and Overview Drive (~1,500 LF) ***Option 2*** – Construct new 200,000 gallon reservoir on District property off Mercer Ln. – Replace Sorrel and Fairview Booster Stations with an above ground pump facility that operate more efficiently. – Replace existing 8” and 10” distribution within Sorrel and Fairview Rd with 12” waterline. – Install generator for standby power.

4	Storage	– Mead Reservoir has a significant deficit for meeting current and projected demands.	– Helena Well 2 will be used to supplement storage during MDD plus FF scenario to eliminate storage deficit in the short term – Improve transmission capacity between the east and west pressure zones to allow Florida Ln Reservoir to supplement Mead Reservoir during emergency operation scenarios.
	Fire Flow	– Minimum fire flow criteria of 3,500 gpm is not met at the Wandermere Mall	– Install 16” ductile iron main from Farwell and the Newport Highway to existing casing at Pittsburg and Newport Highway (2,300 LF); Include PRV set to maintain a minimum HGL of 2030 feet. (developer funded) – Install 12” ductile iron loop between Dakota and the Wandermere Mall (developer funded) – Install 18” ductile iron main from Hawthorne Well site to Pittsburg and Newport Highway with PRV. Total length depends on route ● selected. (developer funded)
		– Residential fire flow requirements within Sorrel and Fairview zones cannot be met by current booster pump facilities	● – See Boosted Zone improvements for option for increasing fire flow.

A list of projects (capital projects) to cure them

Date Printed 2/21/2022

SCWD #3 WSP
Section 8

	TABLE 8-1 (Update 12/7/2021)			20 YEAR										
				$3,882,022	$2,772,023	$2,352,024	$1,962,025	$1,612,026	$1,942,027	$1,972,028	$2,042,029	$2,012,030	$2,022,031	$1,972,032
WSA	PROJECT		Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032

	Helena Well House and Pump	Capacity/Fire Flow	$700,000	$700,000									
	Sorrel Lane 200,000 gal reservoir	Operational Efficiency/Reliability/Capacity	$730,000	$730,000									
	Replace Sorrel and Fairview Pump Stations with Single Pump Station (Pre-1980)	Operational Efficiency/Reliability/Capacity	$740,000		$740,000								
	Upsize steel transmission in Fairview and Sorrel to 12" (3,500 LF)	Operational Efficiency/Reliability/Capacity	$1,030,000		$1,030,000								
4	12" Helena to Farwell, Automated Control Valve	Operational Efficiency/Reliability/Capacity	$240,000			$240,000							
	Replace AC main in Stoneman w/18" from Sorrel to Parksmith (1800 LF)	Fire Flow/Reliability	$640,000							$640,000			
	Replace AC main in Winger from Stone to Shady Slope (800 LF)	Depreciation	$230,000				$230,000						
	Backup generator for Wandermere booster station	Reliability	$50,000				$50,000						
	12" main from Farwell to Alumina 16" Waterline (2,600 LF)	Growth	$710,000										
	16" main from Hawthorne to SR 2 & Pittsburg (8,700 LF)	Growth	$2,440,000										

Water rights deficiencies

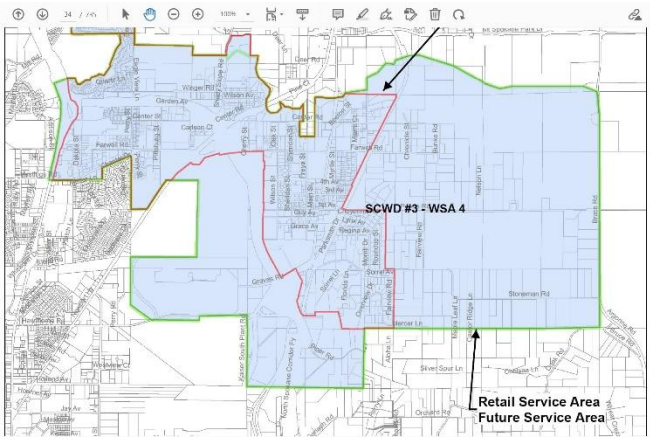
system 1 and 4 we have large undeveloped portions of land that are within our service boundaries. However, our large limiting factor is water rights. Last year we had to transfer some excess water rights from system 3 to system 4 to keep up with current growth. But we anticipate running out of water rights in both system 1 and 4 before we reach full buildout. Department of Ecology isn't issuing new rights in this State so once we run out of annual quantity allotted we'll either have to negotiate with other water districts to purchase some of their excess rights or just stop growth from happening. Here's a table showing what our limitations are in terms of water rights and how many additional ERU's we expect to supply before we run out. Just an example, we have the source capacity to serve up to 21,000 ERU's in system 1, but on paper can only support about 8,700, most of which are already spoken for. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

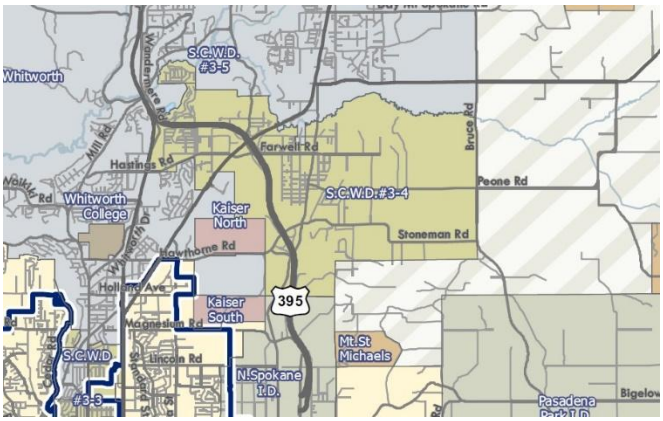
Capacity as ERU's	WSA1	WSA3	WSA4	WSA5	WSA6	WSA 8	WSA9
Limiting Capacity (ERU's)	**8,713**	**1,969**	**2,647**	**197**	**166**	**N/A**	**171**
Basis	WATER RIGHT QA	WATER RIGHT QA	WATER RIGHT QI	STORAGE	STORAGE	N/A	SOURCE (18/24) Hours
Current ERU's	8,072	1,854	2,962	222	152	183	42
ERU's Available	**641**	**115**	**(315)**	**(25)**	**14**	**n/a**	**129**
Notes			The District has applied for an additional 2,200 gpm instantaneous water right through DOE.	Storage deficit within WSA 5 can be supplemented by WSA 4 intertie once Helena Well 2 is online in summer 2022.			Because this system has only one source and no fire suppression requirement, we have evaluated source capacity based on max pumping 18/24 hours per day.

We operate on a first come-first serve basis for new connections to our system. Eventually, when we run out of water rights, there will be people who own property within the urban growth area and within our water service boundaries that will not be able to receive service from our water district. At that time, we'll either have to purchase water rights from other

purveyors so we can support the new growth or allow people to begin drilling permit exempt wells within our borders again. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

Areas of current deficiency or cannot support full buildout:





The District currently has an open application with the Washington Department of Ecology (DOE) to increase the instantaneous water rights within WSA4 by 2,200 gpm. Upon approval, the total instantaneous water right for WSA 4 will increase from 3,430 to 5,640 gpm. (WSP Amendment 2021)

The District will submit water right change applications to consolidate wells as needed with Department of Ecology. This consolidation will allow points of withdrawal to be utilized on the appropriate water rights to support corresponding water service areas in accordance with RCW 90.03.386(2). (WSP Amendment 2021)

Section 4.7.3 Water Rights, Current Water Usage and Projected Needs
The Tables in this section pertaining to WSA 1-4 have been updated to reflect appliable changes to the associated water rights. (WSP Amendment 2021)

Based on the above Table, the predicted water right deficits are as follows for the District:

1. Based on current demand and anticipated growth, we are estimating deficit in annual volume limit (Qa) to support buildout of WSA1. Based on this deficit of 181 AF, the District will need to evaluate the following:

a. Ability to reduce system losses and average daily demands.
b. Feasibility of transferring or acquiring water rights.
c. Reducing the service area.
2. Based on current demand and anticipated growth, we are estimating a deficit in the instantaneous diversion limit (Qi), to support maximum day demands for WSA3-4. This deficit will be eliminated if the District's application to increase the instantaneous flow rate by 2200 gpm is approved. (WSP Amendment 2021)

Additionally, it is important to note that in the original (2016) Comprehensive Plan, relative to WSA 4, a portion of the SCWD #3 future service area includes what is currently reflected as Kaiser North water system in the Coordinated Water System Plan (refer to Figure 1-7). In order to serve this area, it will still be necessary for SCWD #3 to acquire the associated rights with this property. Next to WSA 2, WSA 4 has the largest potential for growth. Transfer of water rights associated with the Kaiser North property will be vital to the District's ability to serve this piece of property and maintain the ability to serve the other areas within the District's current retail service area. If the Kaiser North water rights become non-transferrable, it may be necessary for the District to revise their retail service area. (WSP Amendment 2021)

The only other deficit depicted for WSA4 pertains to instantaneous diversion water

right prior to the 20-year growth projection. As shown, the predicted deficit is 867 gpm at the projected 20-year growth, growing to 1,800 gpm at projected system buildout. As shown in Table 4-14C, the District currently has a water right application in to increase their instantaneous diversion water right by 2,200 gpm, which would eliminate the projected deficit at buildout. The District has not received a final response from Department of Ecology at this time but anticipates the application will be approved. (WSP 2022)

S.C.W.D #3, System 5

Source

SCWD #3's water supply is from groundwater. Thirteen "active" wells tap the groundwater aquifers that lie beneath the District's service areas. However, another nine wells are "inactive" due to various reasons, ranging from contamination, well casing failure or low yield. The depth, diameter, current pumping rate, and location of each well are summarized in Table 1-2. This information was obtained from several sources including well logs, old pump tests, past studies, and discussions with District personnel. As a result, actual well pumping rates may vary slightly from those shown in the table. The current total pumping capacity is approximately 21,460 gpm from the District's 13 active wells. (WSP 2022)

Table 1-2 Well Data

WSA	Location	Motor (HP)	DOH Source Number	Approx. Depth (ft.)	Dia. (in)	Approx. Ground Elev. (ft.)	Approx. Depth to SWL (ft.)	Current Pump Capacity (gpm)	Model	Notes	Status	Date Pump Installed
	Vista & Broadway [1]	--	S-20	108	12	1,985	74	0	No Pump	Not in use, capped	Emergency	
	Knox & Sargent	50	S-21	119	12	1,974	79	500	No Pump	Not in use	Emergency	
	Boone & Lily	30	S-22	104	12	1,948	56	**0**	No Pump	Not in use	Emergency	
	Sinto & Freeway [1]	--	S-23	102	10	1,952	--	0	No Pump	Not in use, capped	Emergency	

1	Freeway & Vista	**150**	S-24	220	24	1,965	72	**2,000**	Ingersoll-Dresser 15EMM		Permanent	2000
	2nd & Koren	**150**	S-25	164	12	1,999	60	**2,000**	Flowserve 14ENLV29		Permanent	2008
	20th & Balfour	150	S-14,S-15	147	16 & 10	2,013	107	0	No Pump	Not in use, capped	Emergency	
	32nd & Pines [1]	--	S-09	131	10	2,007	112	0	No Pump	Not in use, capped	Emergency	
	20th & Balfour	300	S-13	156	18	2,020	107	2,750	Peerless 14HX13		Permanent	WWP
	26th & Vercler	350	S-10	180	18	2,014	95	3,300	Layne & Bowler		Permanent	WWP
	Vercler #2	400	S-17	200	20	2,014	91	2,900	Flowserve 15-HH		Permanent	2017
	Browns Park	400	S-11	173	18	2,028	109	0	No Pump	Not in use, capped	Emergency	
	Madison Road 1	**--**	**S-12**	**140**	**18**	**2,010**	**77**	**0**		**Not in use, sanded in**	**Emergency**	
							Total:	12,950				
3	Normandie & Lyons	250	S-06	293	16	2,055	230	1,430	12 ENH		Permanent	2018
	Steer Inn	125	S-07	252	12	2,053	210	**700**	8RJHC-6 stage submersible Goulds		Permanent	2018
							Total:	2,130				
	Guy & Freya [1]	--	S-09	107	48	1,900	93	0	No Pump	Not in use, hand dug, capped	Emergency	

4	Dakota 1	--	S-10	89	12	1,765	38	0		Not in use, to be capped	Emergency	
	Freya & Farwell	40	S-11	201	10	1,890	144	0	Peerless 15 bowls		Emergency	WWP
	Cherry & Farwell	125	S-12	180	18	1,860	116	1,200			Permanent	2000
	Freya & Guy [1]	--	S-13	116	16	1,900	92	0	No Pump	Not in Use, capped	Emergency	
	Helena	100	S-16	160	16	1,820	75	800			Permanent	1996
	Helena 2	400		356	20	1,820	91	3,000	TBD	Under Construction	Permanent	2022
	Hawthorne Well	400	S-17	283	30, 24, 18	1943	160	3,400	Flowserve -16ENL-5 stage		Permanent	2015
							Total:	5,400				
5	Pine River Park	50	S-32	204	12	1,610	17	330	Peerless 6MA		Permanent	2000
			S-33	206	6	1,610	17	0	No Pump	Monitoring Well		
							Total:	330				
6	Rivervie w Hills	25	S-01	124	12	1,750	91	450	Flowserv e 10 EML		Permanent	2020
9	Waterview Terrace	25	S-02	136	10	1,546	12	200	Peerless 9LA		Permanent	1959

Storage

Total storage capacity: 50,000 gallons

A total of approximately 7.5 million gallons of storage is provided in the 13 reservoirs located throughout the District. Table 1-4 lists the size, approximate overflow elevation, and the type of each reservoir. Except where noted, base elevations and calculated overflow elevations are based on topographic maps. As a result, actual elevations may vary slightly. (WSP 2022)

Table 1-4 Reservoir Data

WSA	Location	Nominal Capacity (gallons)	Approx. Diameter (ft.)	Approx. Height (ft.)	Approx. Overflow Elevation	Type

1	16th & Bettman	1,000,000	86	24	2,100 [2]	Ground Level Steel
2	16th & Dishman	1,000,000	86	24	2,224 [2]	Ground Level Steel
	Horizon Hills	1,000,000	66	40	2,225 [2]	Ground Level Steel
	Ponderosa	1,000,000	86	24	2,338 [2]	Ground Level Steel
	Painted Hills	200,000	[3]	14	2,419 [2]	Ground Level Concrete
	Eagle Crest	50,000	23	16	2,601 [2]	Ground Level
3	5-Mile	600,000	65	24	2,250	Ground Level
		500,000	60	24	2,250	Ground Level
4	Mead	500,000	30	96	2,040	Stand Pipe
	Florida Lane	1,600,000	[3]	22	2,070	Ground Level Concrete
5	Pine River Park	50,000	17	30	1,820	Elevated Tank
6	Riverview Hills	50,000	15	40	1,830	Stand Pipe
9	Waterview Terrace	3,000			[1]	Hydro Pneumatic Tank

1. Not applicable for hydro pneumatic tanks.
2. Overflow elevations taken by surveyor with GPS unit.
3. Rectangular concrete reservoir

Delivery

Boosters/Pressure relief valves –

Eleven booster pump stations provide water to the higher elevations within the District. All pumping equipment is located inside structures for protection from the weather and heated for protection against freezing.
The size and estimated capacity for each booster station is shown in Table 1-3. The capacities shown were estimated on several sources of information. In some cases, actual pump curves were used to estimate capacity. In other cases, capacities were estimated based on pump reports from District telemetry, pressure chart recordings, old memorandums, or discussions with District personnel. As a result, actual capacities may vary slightly. Copies of the available pump curves are included in Appendix A.

(WSP 2022)

Table 1-3 Booster Pump Station Data

WSA	Location	Capacity		Motor (HP)	Pump Model	Date Pump Installed
		Flow (gpm)	Head (feet)			
1	16th & Bettman [2]	339	249	30	Grundfos CR-64 5.59" impeller	2020
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		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
		115	250	20	Cornell 1 ¼Y, 8.75" impeller	?
	Horizon Hills [1]	450	250	60	Cornell 3HA, 15.22" impeller	2007
		450	250	60	Cornell 3HA, 15.22" impeller	2007
					Open Space for 7.5 HP, 7.75" impeller	
		50	200	15	Pioneer SC425C75, 7" impeller	2010
	Eagle Crest (Upper Painted Hills)	140	190	15	Cornell 1 VH-15-2	2017
		140	190	15	Cornell 1 VH-15-2	2018
		60	190	7.5	Berkeley B1WPS, 7.25" impeller	?
	44th & Bowdish	900	156	50	Cornell 4RB, 12.75" impeller	2019
		900	156	50	Cornell 4RB, 12.75" impeller	2019
	Schafer Road	900	156	50	Cornell 4RB, 12.75" impeller	2019
		500	130	30	Cornell 3RB 11.69"	2019
3	5-Mile	240	95	7.5	Cornell 2-1/2W, 5 ¼" impeller	Pre-1980
		175	75	5	Cornell 2-1/2W, 4 5/8" impeller	Pre-1980
4	Stoneman	240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
		240	125	10	Cornell 2-1/2W, 5 7/8" impeller	Pre-1980
	Fairview	119	150	7.5	Berkeley B3TPM	2021
		119	150	7.5	Berkeley B1.5TPMS, 6" impeller	2015
	Wandermere	100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
		100	125	7.5 [3]	Boosterpaq 3CRE 32-2	2005
6	Riverview Hills	350	123	15	Berkeley B3TPM-3600	2021
		275	120	10	Cornell 2-1/2W, 5 7/8" impeller	1980s

1. Pumps from main zone to Painted Hills zone.
2. Variable speed pumps.

Transmission lines –

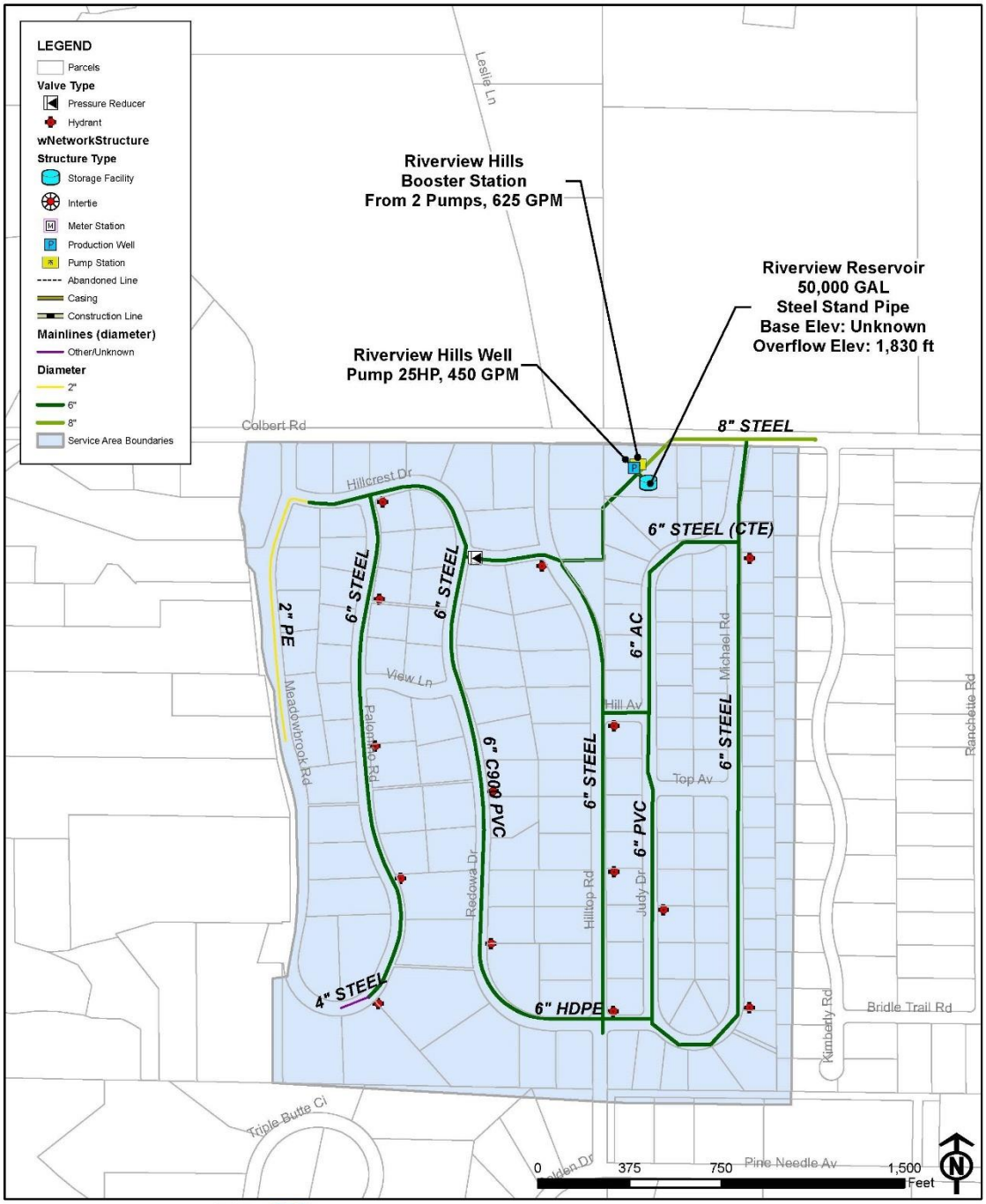
The District has an estimated total of 996,000 lineal feet of distribution piping across the 7 systems. The pipe ranges in size from 1" to 24" in diameter. The piping consists of various materials including, Cast Iron, Ductile Iron, Polyethylene, PVC, Steel and Asbestos Cement. (WSP 2022)

Intertie -

Table 1-5 Intertie Data

WSA	Intertie Name / Identifier	Purveyor Providing Water	Est. Capacity (gpm)[1]	Mode of Operation	Meter	Purpose	Agreement
1	Sprague & Park (2-way)	East Spokane Water District #1	2,000	manual	no	emergency	yes
	Mission & Thierman	City of Spokane	2,000	automatic	yes	emergency	yes
	Carnahan & Glenrose	City of Spokane	1,000	automatic	yes	continuous use	yes
	4th Avenue & Koren	SCWD #3 to Carnhope Irr.	Supply 1,000	automatic	yes	emergency	yes
	Havana & Sprague	Disabled					
	Mission & Sargent (2-way)	Modern Electric Water Co.	2,000	automatic	yes	emergency	no

Schematic



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SCWD #3
WSA 6 - Facility Map
Figure 0-5

Sources:
Spokane County GIS Dept.
SCWD #3 Mapping Records

PROJECT NO.....51010.020
DRAWN BY.....DH
FILENAME.....WSA6_Facility
DATE.....10/20/21

Connections

	WSA1			WSA3			WSA4			WSA5		
	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's	MDD (GPD)	Total Connections	ERU's
Residential												
Single-family	9,979,024	5,192	5,192	1,622,218	1,118	1,118	2,858,712	1,532	1,532	342,961	193	193
Multi-family	1,677,906	348	873	290,200	50	200	794,916	56	426	-		
Nonresidential	-			-			-			-		
Industrial	-			-			-			-		
Commercial	1,260,832	267	656	383,064	72	264	362,004	68	194	15,993	1	9
Governmental	-			-			-			-		
Agricultural	-			-			-			-		
Recreational	-			-			-			-		
DSL	1,729,800		900	288,749		199	268,704		144	14,216		8
Other	-			-			-			-		
Irrigation	624,650	53	325	103,021	6	71	1,216,632	12	652	21,324	1	12
Wholesale	217,186	3	113	-			-			-		
Fire	24,986	94	13	2,902	26	2	26,124	28	14	-		
Total	15,514,384	5,952	8,072	2,690,154	1,272	1,854	5,527,092	1,696	2,962	394,494	195	222

A list of capital deficiencies

PINE RIVER PARK (WSA 5)

WSA 5 contains an intertie with the WSA 4 West Zone via a 12” main line extension with a PRV. This intertie allows WSA 4 to serve as a backup supply/storage source for WSA 5. WSA 4 West Zone currently has a storage deficit, limiting its ability to share water in an emergency situation. However, once the Helena 2 well is online, the West Zone will have sufficient storage capacity to support WSA 5.

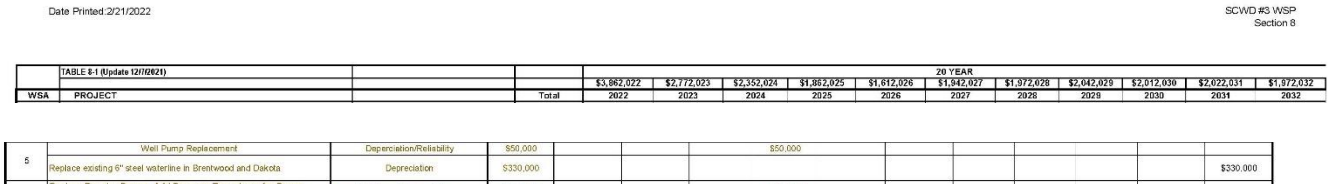
The District’s 2008 WSP considered the elimination of the existing WSA 5 storage tank. However, it was determined that elimination of this storage facility would not allow efficient operation of the existing WSA 5 well. Based on the available capacity and quality of this well and the associated water rights, it is recommended that the District maintain the WSA 5 well in its current configuration.

Recommended Improvements for Fire Flow
• Replace existing 6” steel mains in Hillcrest with 8” from standpipe to Palomino Rd (1,600 LF)
• Replace existing 6” steel main in Palomino Rd with 8” from Hillcrest to Meadowbrook (2,100 LF)
The available service pressure and fire flow after implementation shown in the preceding tables assumes that all improvements listed above are complete. Partial implementation of improvements will result in a partial increase in available service pressure and/or fire flow.

WSA	Area of Deficiency	Description of Deficiency	System Improvements [1] [2]
5	Storage	– The existing reservoir has a significant deficit for meeting current storage requirements	– The District has installed a PRV intertie between WSA 4 and 5 to allow WSA 4 to supplement WSA 5 during an emergency. However, there is not sufficient capacity within WSA 4 West Zone to share water in the current system configuration. The addition of the Helena Well 2 and Farwell/Pittsburg intertie will provide sufficient capacity within the West Zone to allow for water sharing to eliminate WSA 5 storage deficit.

	Distribution	– There are two short sections of steel pipe remaining in the southwest portion of the system.	– Replace the existing 6” steel pipe with ductile iron.

A list of projects (capital projects) to cure them



Date Printed:2/21/2022

SCWD #3 WSP
Section 8

	TABLE 8-1 (Update 12/7/2021)			20 YEAR										
				$3,862,022	$2,772,023	$2,352,024	$1,862,025	$1,612,026	$1,942,027	$1,972,028	$2,042,029	$2,012,030	$2,022,031	$1,972,032
WSA	PROJECT		Total	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
8	Well Pump Replacement	Depreciation/Reliability	$50,000			$50,000								
	Replace existing 6" steel waterline in Brentwood and Dakota	Depreciation	$330,000											$330,000

Water rights deficiencies

- explanation of the area impacted and their thoughts abou t remedy

Water systems 3,5,6,8, and 9 are almost at full buildout and they are landlocked by other water districts so we don’t anticipate any future growth in those areas apart from infilling a few vacant lots here and there. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

We operate on a first come-first serve basis for new connections to our system. Eventually, when we run out of water rights, there will be people who own property within the urban growth area and within our water service boundaries that will not be able to receive service from our water district. At that time, we’ll either have to purchase water rights from other purveyors so we can support the new growth or allow people to begin drilling permit exempt wells within our borders again. (email Aug. 2, 2022, Justin Van Dyke, Assistant Manager, Spokane County Water District #3)

Whitworth Water District 2

The XXXXXXXXXX water purveyor, with a service area covering the north metro area generally extending from the City of Spokane’s northern limits to XXX. The district has approximately 12,000 connections, the majority of which are single-family residential.

Source

The District draws its water from the Rathdrum Prairie Aquifer via seventeen wells. The wells are located at XXX, XXX, XXX, and XXX, each with different capacities for water withdrawal.

Facility	1-1-2006	12-31-2016	Increase
Mains	206.47 miles	284.08 miles	77.61 miles
Hydrants	1194	1631	178
Reservoirs	12	13	1
Booster Stations	11	16	5
Wells/Pump Stations	17	20	3

Storage

Total storage capacity: 2,100,000 gallons

Facility	1-1-2006	12-31-2016	Increase
Mains	206.47 miles	284.08 miles	77.61 miles
Hydrants	1194	1631	178
Reservoirs	12	13	1
Booster Stations	11	16	5
Wells/Pump Stations	17	20	3

The District's water system serves multiple pressure zones, with 12 reservoirs located throughout the service area. The reservoirs vary in capacity from 20,000 gallons at XXX to 500,000 gallons at XXX.

Delivery

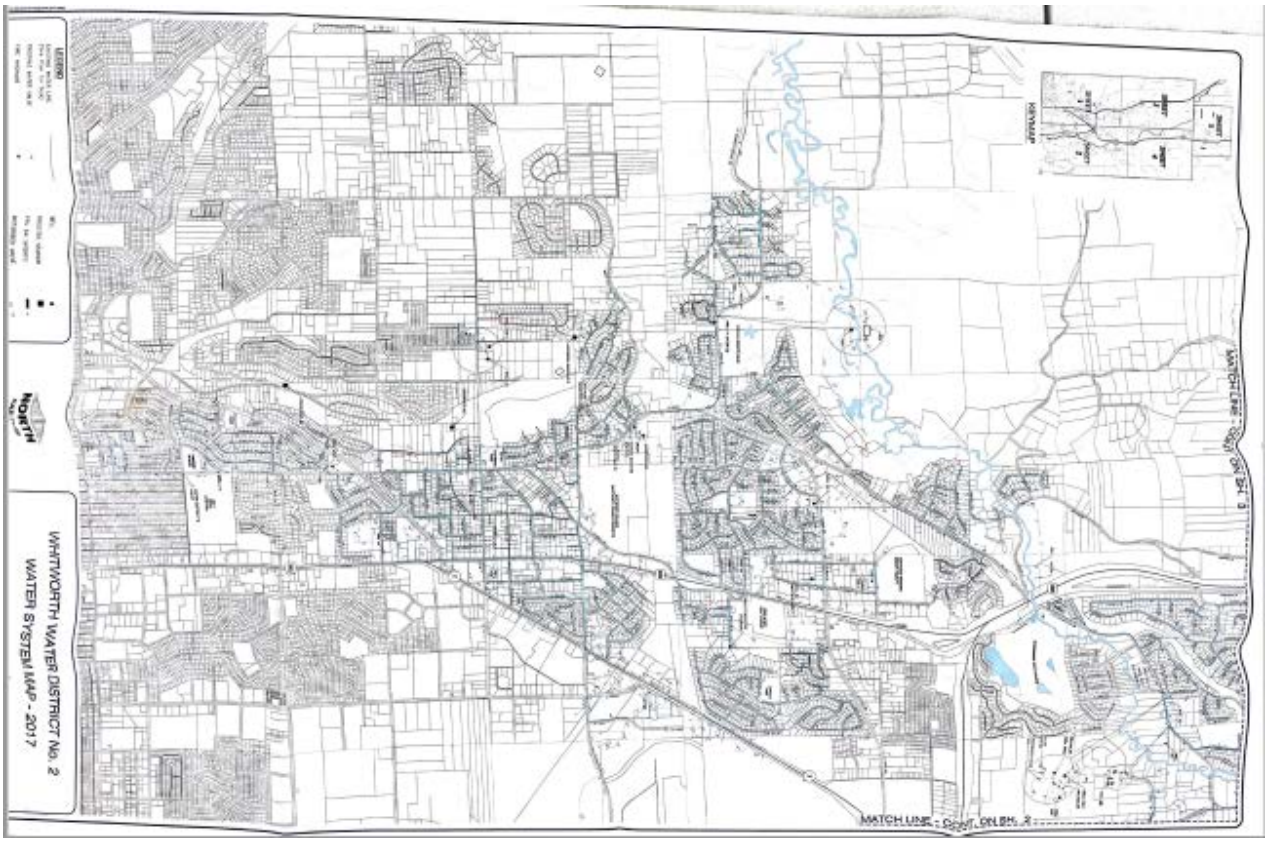
Boosters/Pressure relief valves – Because of the variety of the system's pressure zones, the water delivery network also includes a series of booster stations and pressure relief valves (PRVs) to assure water is delivered to system customers at appropriate pressure and volume. Overall, the system has 17 boosters and 15 PRVs, each with appurtenant power and access as appropriate for its function.

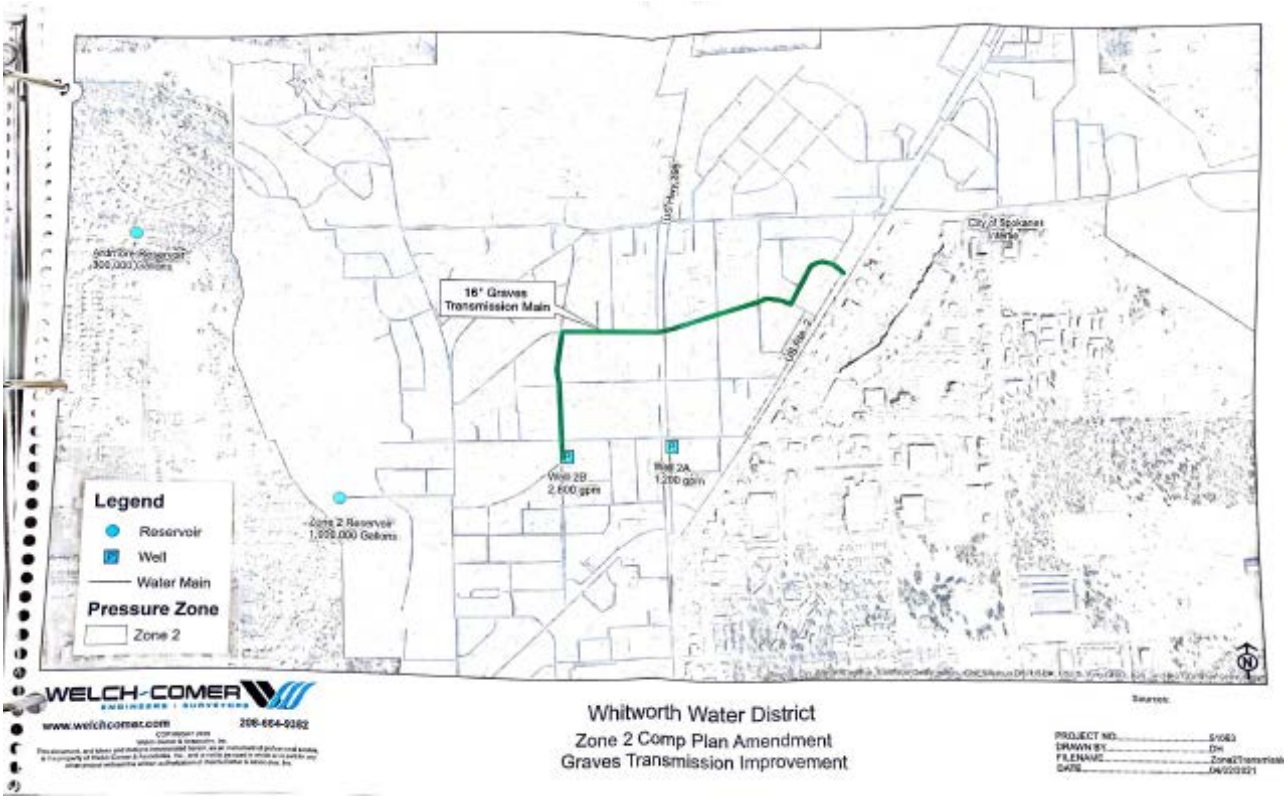
Transmission lines – The District's water system includes 284.08 miles of water line, ranging in size from 24" diameter for its major transmission lines to 4" for some of its older lines generally serving smaller residential areas.

Facility	1-1-2006	12-31-2016	Increase
Mains	206.47 miles	284.08 miles	77.61 miles
Hydrants	1194	1631	178
Reservoirs	12	13	1
Booster Stations	11	16	5
Wells/Pump Stations	17	20	3

Water system schematic

The diagrams illustrate the District's system, showing generally where wells, reservoirs, and the distribution system is located. This illustration is intended as a schematic representation of the District's water system.


WHITWORTH WATER DISTRICT No. 2
WATER SYSTEM MAP - 2017
LEGEND
North
MATCH LINE - SEE MAP SH. 3
MATCH LINE - SEE MAP SH. 2


16" Graves Transmission Main
Well 2B
2,600 gpm
Well 2A
1,200 gpm
Zone 2 Reservoir
1,000,000 Gallons
City of Spokane Valley
Legend
Reservoir
Well
Water Main
Pressure Zone
Zone 2
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208-664-9382
Whitworth Water District
Zone 2 Comp Plan Amendment
Graves Transmission Improvement
PROJECT NO. 51063
DRAWN BY DH
FILENAME Zone2Transmission
DATE 04/22/2021

Connections

TOTAL SERVICE CONNECTIONS = 11,834

A list of capital deficiencies

Issues with Zone 2, as there was forecasted deficiency of -436 ERU's by 2022 (table 3-3 pg.9). At the time of the amendment (2021) it appears that only 40 additional ERUs could be supported in Zone 2.

Zone2

The Whitworth Water District No. 2 (District) current 2018 Comprehensive Water System Plan (2018 Plan), indicated that Zone 2 had a significant surplus in storage and source capacity with minimal anticipated growth within the Zone. However, in recent years the district has observed declining storage levels in the Zone 2 Reservoir during periods of peak demand with longer recovery periods than the District would like to see. The District is also receiving increasing interest for development within the Zone, including a large development in the northeast portion of the Zone that was not reflected in previous growth projections. These factors prompted the district to authorize an updated evaluation of current Zone demands and the required improvements necessary to meet current demands. (WSP Amendment 2021)

The 2018 Plan included the Camelot pressure zone within the Zone 3 demand and capacity analyses. However, in recent years, the District has been primarily serving the Camelot Zone through a pressure reducing valve (PRV) intertie with Zone 2. Thus, the 2020 demands for Zone 2, evaluated herein reflect the Camelot zone. A copy of the presentation give to the District Board outlining the amendment to the 2018 Plan is available in Appendix A. (WSP Amendment 2021)

As indicated in the table above, the operational changes instituted by the District free up approximately 308,000 gallons of storage capacity and create a minor storage capacity within the Zone. Based on demands presented in this analysis, this storage surplus can support approximately 40 additional ERUs. While the operational changes mentioned above were implemented to address the current deficit, the District intends to make the changes permanent. (WSP Amendment 2021)

Storage capacity is the limiting factor within Zone 2. Based on this analysis, it appears the District can serve an **additional 40 ERU's** prior to completion of capacity improvements. Proposed improvements to serve growth beyond 40 ERU's are provided in the following section of this report. (WSP Amendment 2021)

Projected Growth Capacity Analysis

Table 3-3 and Table 3-4 provide a summary of the current source and storage capacity relative to future demands based on the projected growth presented in Section 2.2 of this addendum. (WSP Amendment 2021)

Table 3-3[1]: Summary of Available Source Capacity Compared to Projected Growth (Sources operating 20/24 hours)

Growth Phase	ERU's Served	Maximum Day Demand (gpm)	Available Source (gpm)	Excess/Deficit (gpm)	Remaining ERU's
Near-Term (1-3 years)	2930	3,157	3,333	176	164
Mid-Term (4-10 years)	3530	3,804	3,333	-470	-436
Long-Term (11-20 years)	3830	4,127	3,333	-793	-736

1. Replaces Zone 2 Table 3-5 "10-year" and "20-year" capacity from the 2018 Plan.

Table 3-4[1] Summary of Storage Capacity Compared to Project Growth (includes nesting)

Available Storage	Near-Term (1-3 years)	Mid-Term (4-10 years)	Long-Term (11-20 years)
Unused Volume	50,000	50,000	50,000
Operating Storage	100,000	100,000	100,000
Nested Standby and Fire Suppression Storage	560,000	680,000	740,000
Equalization Storage	305,594	499,650	596,678
Total Required Storage	1,015,594	1,329,650	1,486,678
Available Storage	1,000,000	1,000,000	1,000,000
Excess/Deficit	-15,594	-329,650	-486,678

1. Replaces Zone 2 Table 3-6 "10-year" and "20-year" capacity from the 2018 Plan.

(WSP Amendment 2021)

As indicated above, the Zone is expected to exceed available source capacity a~d storage capacity within the next several years. To address this capacity issue, the District plans to develop a new 4,000 gpm well (Well 2C) at their existing Well 28 site. It should be noted that the 2018 Plan listed the installation of a backup well within Zone 2 as a recommended capital improvement. This well would serve only as a backup and would not be capable of pumping to the system at the same time as Well 2B. However, it appears the new well will be required to operate in combination with the two existing wells to support current and projected future peak season demands rather than serving strictly as a backup source. (WSP Amendment 2021)

Summary of System Deficiencies

The Zone 2 water system does not currently have any deficiencies with respect to meeting existing system demands. However, the Zone appears to be approaching its maximum capacity, as significant growth is expected to occur over the next 20 years. Based on demand analysis, Zone 2 is projected to reach the following deficiencies at buildout if no capacity improvements are made:

- Source- 793 gpm deficit with respect to meeting MDD while operating all sources 20 out of 24 hours per day.

• Storage- 487,000 gallon[4] deficit.
• Distribution- The existing hydraulic capacity for Zone 2 is undersized to support another large capacity well and there does not appear to be sufficient distribution capacity to meet projected growth demands on the east side of the system. (WSP Amendment 2021)

A list of projects (capital projects) to cure them

CHAPTER 8 AMENDMENT

Section 8.1 10-year Improvement Plan

To address the projected source and storage deficiencies listed above, the District plans to install the following improvements within Zone 2. Cost estimates for each improvement are available in Appendix E.

1. Well 2C. The new well will be drilled at the existing Well 2B site and the pump will be sized to provide 4,000 gpm capacity. This source will be sufficient to eliminate source and storage deficits through the buildout of Zone 2 based on growth projections presented in Section 2.2 of this document. This project will also include the installation of a new standby power supply for Well 2C[5]
· The estimated construction costs associated with this improvement are approximately $1,745,000.

2. 16" Water Main- Graves Alignment. This transmission project will include the installation of approximately 6,000 ft of 16" pipe from the Well 2B/2C site to the intersection of Elm Rd and Highway 2. The proposed alignment will replace existing 6"-8" pipe in Ivanhoe Rd, Graves Rd, Andrew St, and Elm Rd and will allow the District to operate the 2B and 2C wells at the same time without over pressurizing the existing Zone 2 system. The estimated construction costs associated with this improvement are approximately $2,102,000.

3. Reservoir 2B- This project includes the installation of a new 2 MG reservoir within Zone 2. The new reservoir will be required if Zone 2 grows beyond the projections listed in the report or the existing Reservoir 2 must be taken offline. Reservoir 2 has been in service for over 50 years and may require replacement in the next 10-15 years. Detailed analysis on the location and cost of the new reservoir have not been completed at this time.
The above improvements are reflected in the District's current capital improvement

plan which is included in Figure 2 on the next page. (WSP Amendment 2021)

Priority Projects/Budget
DRAFT 19-May-21

WSP 5 Year

ID		Description	Total Project	2021	2022	2023	2024	2025	2026
1	Well 3D	Zone 8-9 Source Deficit (18/24 hours pumping)	$1,578,000	$31,995					
2	24" Main - Mill Rd & Mayfair Rd		$2,525,285						
5	Reservoir 9B	Add 1.5 MG to reduce reliance on booster pumps during peak hour. Reduces load on MacDonald.	$3,941,996	$1,375,746					
New	Hatch and Zone 9 South Boosters	Add ~1000 gpm to each Zone to get through 2024 (18/24 hours pumping)	$110,000	$100,000					
9	3 to 8 Transmission Main	Construct ahead of 3E Well. 3C Well can pump through Dartford in emergency.	$5,505,200	$286,000	$5,135,900	$83,300			
		Add Alternate ($810,000)	$810,000	NOT REFLECTED					
10	Well 3E	Zone 8-9 Source Deficit (18/24 hours pumping)	$2,411,000			$529,000	$1,882,000		
4	1.5 MG Hatch #2 Standpipe	Required by 2024 unless additional booster and transmission capacity is added to zone.	$4,181,000					$1,087,000	$3,094,000
3	Well 2C	Add 4000 gpm min. Includes Graves Transmission (16 inch)	$4,491,600	$836,000	$1,124,000			$253,160	$2,278,440
Other									
6	16" Golden Rd Main & Booster	Transmission Upsizing Associated with Hatch and Zone 9 Boosters	$1,800,000				$1,800,000		
12	16" Leslie Lane - Colbert Rd	Development/Future Looping	$890,000						
	Total Capital Projects		$28,244,081	$2,629,741	$6,259,900	$612,300	$3,682,000	$1,340,160	$5,372,440

(WSP Amendment 2021)

Whitworth Water District
Well 2C Drilling
ENGINEER's OPINION OF PRELIMINARY PROJECT COSTS

Prepared By:	Necia Maiani	Date:			
Project Manage	Necia Maiani	Date:			
Pay Item	**Description**	**Pay Unit**	**Estimated Quantity**	**Unit Price**	**Total Amount**
015050.01	MOBILIZATION	LS	1	$ 15,000.00	$ 15,000.00
332100.01	30-INCH WELL DRILLING	VF	90	$ 385.00	$ 34,650.00
332100.02	24-INCH WELL DRILLING	VF	130	$ 355.00	$ 46,150.00
332100.04	SURFACE SEAL	VF	90	$ 175.00	$ 15,750.00
332100.05	30-Inch Well Casing	VF	92	$ 120.00	$ 11,040.00
332100.06	24-INCH TEMPORARY WELL CASING	VF	40	$ 70.00	$ 2,800.00
332100.07	24-INCH WELL CASING	VF	182	$ 82.00	$ 14,924.00
332100.09	WELL VIDEO	LS	1	$ 2,500.00	$ 2,500.00
332100.10	WELL DEVELOPMENT	HR	48	$ 500.00	$ 24,000.00
332100.11	PLUMBNESS / ALIGNMENT TESTING	LS	1	$ 2,000.00	$ 2,000.00
332100.12	TEST PUMP SETUP	LS	1	$ 18,000.00	$ 18,000.00
332100.13	TEST PUMPING	HR	16	$ 800.00	$ 12,800.00
332100.14	24-INCH STAINLESS STEEL WELL SCREEN	VF	43	$ 500.00	$ 21,500.00
			SUBTOTAL		$ 221,114.00
		WA SALES TAX @ 8.9%			**$ 19,679.15**
		10% Contingency			**$ 24,079.31**
			Total		**$ 264,872.46**
ENGINEERING					
	Design Phase Services				$24,800.00
	Bidding Phase Services				$4,500.00
	Construction Phase Services				$32,800.00
ESTIMATED TOTAL PROJECT COST					**$ 327,000.00**

(WSP Amendment 2021)

Whitworth Water District
Well 2C Building
ENGINEER's OPINION OF PRELIMINARY PROJECT COSTS

Prepared By:	Necia Maiani	Date:			
Project Manage	Necia Maiani	Date:			
Pay Item	**Description**	**Pay Unit**	**Estimated Quantity**	**Unit Price**	**Total Amount**
015050.01	Mobilization	LS	1	$100,000.00	$ 100,000.00
061060.02	Well House	LS	1	$280,000.00	$ 280,000.00
221005.01	Mechanical Piping	LS	1	$240,000.00	$ 240,000.00
312200.01	Site Work	LS	1	$110,000.00	$ 110,000.00
31231613.01	Trench Safety System	LS	1	$ 4,000.00	$ 4,000.00
321216.06	Drive Approach	LS	1	$ 20,000.00	$ 20,000.00
331116.01	Site Piping	LS	1	$ 75,000.00	$ 75,000.00
332100.09	Pump/Motor Assembly	LS	1	$150,000.00	$ 150,000.00
332100.10	Certified Factory Test Pump	LS	1	$ 3,000.00	$ 3,000.00
			SUBTOTAL		$ 982,000.00
			WA SALES TAX @ 8.9%		**$ 87,398.00**
			10% Contingency		**$ 160,409.70**
			Total		**$ 1,229,807.70**
ENGINEERING					
	Design Phase Services				$72,000.00
	Bidding Phase Services				$6,000.00
	Construction Phase Services				$74,500.00
	Permitting				$3,000.00
ESTIMATED PROJECT COST					**$ 1,385,307.70**
	Electrical				$250,000.00
	ESTIMATED TOTAL PROJECT COST (Includes Electrical)				**$ 1,635,000.00**

(WSP Amendment 2021)

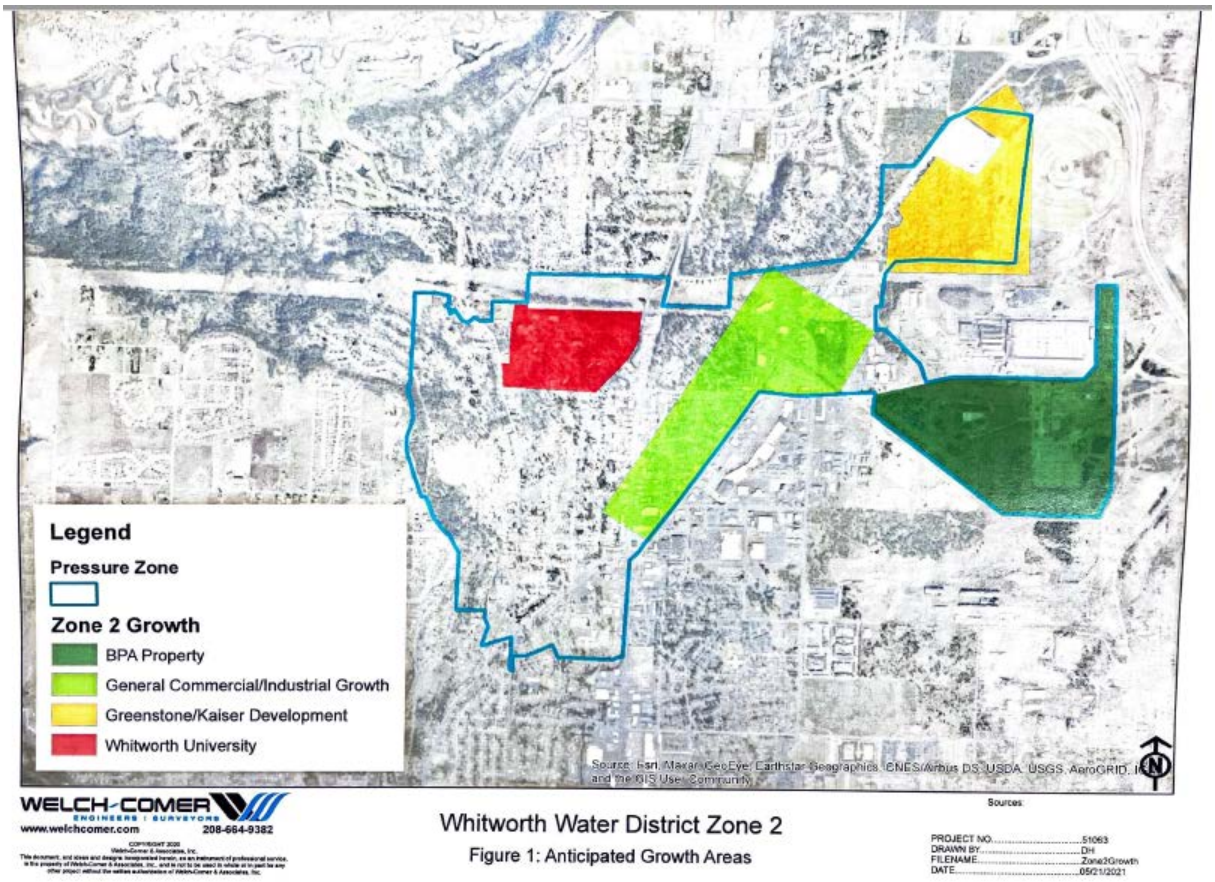
Whitworth Water District
GRAVES ALIGNMENT TRANSMISSION UPSIZE
ENGINEER's OPINION OF PRELIMINARY PROJECT COSTS

Prepared By:	Derek Huff	Date:	April 1, 2021		
Project Manager	Necia Maiani	Date:	April 2, 2021		
Item No.	Description	Unit	Quantity	Unit Price	Total
	Mobilization	LS	1	$152,600.00	$152,600.00
	Site Control	LS	1	$21,800.00	$21,800.00
	Traffic Control	LS	1	$50,000.00	$50,000.00
	HMA Pavement (4"/6")	SY	8400	$35.00	$294,000.00
	Saw Cutting	LF	5600	$3.00	$16,800.00
	Asphalt Removal	SY	8400	$6.00	$50,400.00
	Trench Safety System	EA	1	$5,000.00	$5,000.00
	16" Pipe Installation	LF	5400	$130.00	$702,000.00
	16" Butterfly Valve	EA	16	$5,000.00	$80,000.00
	Service Reconnection	EA	75	$3,000.00	$225,000.00
	Hydrant Reconnection	EA	10	$3,000.00	$30,000.00
	Tie-in to Existing 12"	EA	4	$3,500.00	$14,000.00
	Tie-in to Existing 6"	EA	13	$2,500.00	$32,500.00
	Tie-in to Existing 4"	EA	1	$2,500.00	$2,500.00
	Tie-in Existing 2"	EA	1	$2,000.00	$2,000.00
				Subtotal =	$ 1,678,600.00
				8.9% Tax	$149,000.00
			Total Estimated Construction =		**$ 1,827,600.00**
				15% Contingency =	$274,000.00
			Total Estimated Construction =		**$ 2,101,600.00**
ENGINEERING					
	Design Phase Services				$210,000.00
	Bidding Phase Services				$7,500.00
	Construction Phase Services				$210,000.00
ESTIMATED TOTAL PROJECT COST					**$ 2,529,000.00**
	Assumptions:				

(WSP Amendment 2021)

Water rights deficiencies

- explanation of the area impacted and their thoughts about remedy



(WSP Amendment 2021)

Vera

Source

Vera Water & Power's (Vera, the District) Water System consists of five pressure zones, ten wells at seven sites, five reservoirs and approximately 145 miles of water mains. (WSP 2022)

Vera has 9 wells, 6 booster stations (4 booster zones), and 5 reservoirs. There are five main pressure zones; two of these zones (Ridgemont/Morningside and Ball/Morrow Park) serve several sub-zones through pressure reducing valves (PRVs). Vera has approximately 145 miles of distribution system mains. Refer to Figure 2 for map of Vera's water system components. Refer to Table 1-1 for details and information on Vera's water system components. The majority of Vera's steel mains were installed during the 1957 project which included 95 miles of steel mains; some of these mains have since been replaced. (WSP 2022)

Table 1-1 Water System Component Inventory

System	Component	Description	
Supply	Well 1	Log available:	Yes, refer to **Appendix C**
		Depth:	170′
		Diameter:	6′ dug well – 4′ hand perforated casing (screen)
		Casing:	to 135′
		Screen:	unknown/unavailable
		Date Constructed:	1908
		Depth to SWL:	112′ – 134′ (historic high and low)
		Approx. wellhead elev.:	2,045
		Present pumping rate:	3,200 gpm
		Pump/motor:	Line shaft turbine, 350 HP
		Discharge pressure:	83 psi
		Enclosure:	Pump house (old system rock reservoir converted to pump house)
		Location:	NE ¼, SE ¼, S15, T25, R44 (Springfield Ave & Evergreen Rd)
	Well 2	Log available:	Yes, refer to **Appendix C** (two separate wells in same building)
		Depth:	265′ (both wells)
		Diameter:	20″ (both wells)
		Casing:	210′ to screen (both wells)
		Screen:	210′ – 265′ (both wells)
		Date Constructed:	1994 (both wells)
		Depth to SWL:	81′ – 110′ (historic high and low)
		Approx. wellhead elev.:	2,039
		Present pumping rate:	7,000 gpm (two wells – 4,600 gpm and 2,400 gpm)
		Pump/motor:	Line shaft turbines (2 pumps) 600 HP, 300 HP
		Discharge pressure:	≈ 86 psi
		Enclosure:	Pump house (brick)
		Location:	NE ¼, SE ¼, S14, T25, R44 (Springfield Ave & Murbach Rd)
	Well 3-1	Log available:	Yes, refer to **Appendix C**
		Depth:	175′
		Diameter:	8′ dug well – 6′ fabricated screen
		Casing:	Concrete to 165′ to screen
		Screen:	Approximately 4′ diameter perforated steel
		Date Constructed:	1909 (concrete liner installed in 1950s)
		Depth to SWL:	142′ – 168′ (historic high and low)
		Approx. wellhead elev.:	2,085
		Present pumping rate:	4,700 gpm (variable speed pump)
		Pumps/motors:	Line shaft turbine, 600 HP
		Discharge pressure:	≈ 68 psi
		Enclosure:	Pump house (brick)
		Location:	SE ¼, SE ¼, S22, T25, R44 (16th Ave & Evergreen Rd)

System	Component	Description	
Supply	Well 3-3	Log available:	Yes, refer to **Appendix C**
		Depth:	257′
		Diameter:	20″
		Casing:	210′ to screen
		Screen:	210′ – 257′
		Date Constructed:	1994
		Depth to SWL:	142′ – 168′ (historic high and low)
		Approx. wellhead elev.:	2,085
		Present pumping rate:	3,000 gpm
		Pump/motor:	Line shaft turbine, 300 HP
		Discharge pressure:	≈ 69 psi
		Enclosure:	Pump house (concrete block)
		Location:	SE ¼, SE ¼, S22, T25, R44 (16th Ave & Evergreen Rd)
	Well 4	Log available:	Yes, refer to **Appendix C**
		Depth:	215
		Diameter:	24″
		Casing:	145′ of welded steel
		Screen:	24″ telescoping size stainless from 143-195
		Date Constructed:	2012
		Depth to SWL:	123′ – 145′ (historic high and low)
		Approx. wellhead elev.:	2,060
		Present pumping rate:	3,000 gpm
		Pump/motor:	Line shaft turbine 350 HP
		Discharge pressure:	≈ 76 psi
		Enclosure:	Pump house (CMU)
		Location:	NE ¼, SW ¼, S26, T25, R44 (24th Ave & Adams Rd)
	Well 5 [1]	Log available:	Yes, refer to **Appendix C**
		Depth:	190′
		Diameter:	8′ Dug well – 6′ perforated casing
		Casing:	unknown/unavailable
		Screen:	unknown/unavailable
		Date Constructed:	1950
		Depth to SWL:	143′ – 167′ (historic high and low)
		Approx. wellhead elev.:	2,082
		Present pumping rate:	2,000 gpm
		Pump/motor:	Line shaft turbine 250 HP
		Discharge pressure:	≈ 68 psi
		Enclosure:	Pump house (concrete block)
		Location:	NW ¼, NW ¼, S26, T25, R44 (16th Ave & Bolivar Rd)
	Well 6	Log available:	Yes, refer to **Appendix C**
		Depth:	160′
		Diameter:	24″
		Casing:	135′ to screen
		Screen:	135′ – 159′
		Date Constructed:	1968
		Depth to SWL:	74′ – 95′ (historic high and low)
		Approx. wellhead elev.:	2,015
		Present pumping rate:	4,400 gpm
		Pump/motor:	Line shaft turbine 500 HP
		Discharge pressure:	≈ 99 psi
		Enclosure:	Pump house (concrete block)
		Location:	SE ¼, NE ¼, S22, T25, R44 (6th Ave & Evergreen Rd)

[1] *In the past Well 5 supported much higher pumping rates than currently utilized. At one point the well began producing sand and portions of the perforated screen were blocked to prevent sand from entering the well. The well was last videoed in 2001 and was deemed in decent condition. The current condition of the perforated casing is unknown*

System	Component	Description	
Supply	Well 7	Log available:	Unavailable
		Depth:	96′
		Diameter:	5′ dug well – 31″ casing
		Casing:	92′
		Screen:	Unknown
		Date Constructed:	Unknown
		Depth to SWL:	78′ – 96′ (historic high and low)
		Approx. wellhead elev.:	2,038
		Present pumping rate:	Inactive
		Pump/motor:	None
		Discharge pressure:	N/A
		Enclosure:	Pump house (wood frame)
		Location:	NE ¼, NW ¼, S23, T25, R44
	Well 8	Log available:	Yes, refer to **Appendix C**
		Depth:	210′
		Diameter:	20″
		Casing:	165′ to screen
		Screen:	165′ – 215′
		Date Constructed:	1988
		Depth to SWL:	98′ – 120′ (historic high and low)
		Approx. wellhead elev.:	2,038
		Present pumping rate:	3,000 gpm
		Pump/motor:	Line shaft turbine, 400 HP
		Discharge pressure:	≈ 87 psi
		Enclosure:	Pump house (concrete block)
		Location:	NE ¼, SE ¼, S23, T25, R44 (8th Ave & Charles St)
	Well 9	Log available:	Yes, refer to **Appendix C**
		Depth:	240′
		Diameter:	20″
		Casing:	190′ to screen
		Screen:	190′ – 240′
		Date Constructed:	1991
		Depth to SWL:	98′ – 120′ (historic high and low)
		Approx. wellhead elev.:	2,038
		Present pumping rate:	3,500 gpm
		Pump/motor:	Line shaft turbine, 400 HP
		Discharge pressure:	≈ 87 psi
		Enclosure:	Pump house (concrete block)
		Location:	NE ¼, SE ¼, S23, T25, R44 (8th Ave & Charles St)

Table 4-1 Well Pumping Capacities

Well Number	Location	Year Constructed / Drilled	Motor Horsepower	Current Pumping Rate (gpm) [4]	Status
1	Springfield Ave & Evergreen Rd	1908	350	3,200	Active
2-1	Springfield Ave & Murbach Rd	1994	600	4,600	Active
2-2	Springfield Ave & Murbach Rd	1994	300	2,400	Active
3-1	16th Ave & Evergreen Rd	1909	600	4,700 [1]	Active
3-3	16th Ave & Evergreen Rd	1994	300	3,000	Active
4	24th Ave & Adams Rd	2012 [2]	350	3,000	Active
5	16th Ave & Bolivar Rd	1950	250	2,000	Active
6	6th Ave & Evergreen Rd	1968	500	4,400	Active
7 [3]	2nd Ave & Best Rd	1967	-	-	Inactive
8	8th Ave & Charles St	1988	400	3,000	Active
9	8th Ave & Charles St	1991	400	3,500	Active
			Total	33,800	

[1] *The pump in Well 3-1 is equipped with a VFD which allows Vera to vary the flow rate pumped from the well.*
[2] *Vera abandoned the original hand-dug Well 4 (originally constructed in 1912) in 2012 and drilled a replacement well on the same site.*
[3] *Vera currently has no pump installed at Well 7. At present a wood frame enclosure protects the well head. The capacity of Well 7 is currently reserved until Vera determines the best way to incorporate it into the system.*
[4] *Provided by Vera's District Engineer, Brian Dilts.*

Storage

Total storage capacity: 1,100,000 gallons

The District has approximately 33,800 gpm of instantaneous well pumping capacity and 8,650,000 gal of total storage capacity. (WSP 2022)

Vera Water & Power's (Vera, the District) Water System consists of five pressure zones, ten wells at seven sites, five reservoirs and approximately 145 miles of water mains. (WSP 2022)

System	Component	Description	
Storage	1MG Reservoir	Construction type:	Welded steel (ground level)
		Approx. dimensions:	72' dia. x 32' high
		Date constructed:	1959
		Recoating:	1972
		Approx. Overflow Elev.	2,238
		Approx ground elev:	2,206
		Volume:	1,000,000 gallons
		Pressure zones served:	Main
		Location:	SW ¼, NE ¼, S25, T25, R44 (approximately half a mile east of the intersection of Sullivan Rd and 24th Ave)

System	Component	Description	
Storage	2MG Reservoir [2]	Construction type:	Welded steel (ground level)
		Approx. dimensions:	90' dia. x 42' high
		Date constructed:	1986
		Recoating:	2001
		Approx. Overflow Elev.	2,240
		Approx ground elev:	2,200
		Volume:	2,000,000 gal
		Pressure zones served:	Main
		Location:	NE ¼, SW ¼, S35, T25, R44 (approximately ¼ mile south of intersection of Belle Terre Ave and Suncrest Dr)
		Control Valve:	Pneumatic actuated valve controlled by SCADA system
	4MG Reservoir	Construction type:	Welded steel (ground level)
		Approx. dimensions:	145' dia. x 32' high
		Date constructed:	1972
		Recoating:	1972
		Approx. Overflow Elev.	2,242
		Approx ground elev:	2,210
		Volume:	4,000,000 gal
		Pressure zones served:	Main
		Location:	SE ¼, SE¼, S24, T25, R44 (approximately ¼ mile east of intersection of Shamrock St and 16th Ave)
		Control Valve	Pneumatic actuated valve controlled by SCADA system
	750KG Reservoir	Construction type:	Welded steel (ground level)
		Approx. dimensions:	64' dia. x 32' high
		Date constructed:	1986
		Recoating:	1986
		Approx. Overflow Elev.	2,747
		Approx ground elev:	2,715
		Volume:	750,000 gal
		Pressure zones served:	Ball/Morrow Park
		Location:	NW ¼, SE ¼, S02, T24, R44 (approximately at southern end of Morrow Park Rd)
		Control Valve:	Altitude valve (not currently functional)
	900KG Reservoir	Construction type:	Welded steel (standpipe)
		Approx. dimensions:	40' dia. x 104' high
		Date constructed:	1996
		Recoating:	1996
		Approx. Overflow Elev.	2,472
		Approx ground elev:	2,371
		Volume:	900,000 gal
		Pressure zones served:	Ridgemont/Morningside
		Location:	SE ¼, NE ¼, S25, T25, R44 (near intersection of Steen Rd and 23rd Ave)
		Control Valve:	Motor actuated valve controlled by SCADA system

2) *Vera reports that the 2MG reservoir was originally constructed 1948 at the Hanford nuclear project. Vera purchased the 2MG reservoir as a salvaged tank from the Hanford nuclear project and re-erected it in its current location. Hanford surplused three tanks, two of which went to Vera's neighbor Consolidated Irrigation District. Vera reports the steel panels of this reservoir are thicker gauge than those used for its other ground level steel reservoirs.*

Delivery

System	Component	Description
Pressure Zones	Main	Vera serves the majority of its customers from the main pressure zone. Services in the main zone range in elevation from approximately 2,000 to 2,100. Pressures in this zone range from 35 psi at high elevations to 100 psi at lower elevations. The District's 1MG, 2MG and 4MG reservoirs (max HGL 2,242) provide storage for this zone. All of Vera's wells are located in the main zone. This zone constitutes approximately 83% of system demand.
	Ridgemont / Morningside	Two booster stations (Ridgemont and Morningside) serve this pressure zone. The Ridgemont booster station is located adjacent to the District's 1MG reservoir and the Morningside booster station is located adjacent to the 4MG reservoir. The booster stations serve the Ridgemont development and several surrounding areas. Both booster stations pump from the main zone to the 900-KG standpipe reservoir (max HGL 2,472). Two lower elevation areas in this zone receive service through PRVs. Approximately 52 homes on the west side of the zone, served via PRV, are referred to as Ridgemont Zone 2. Approximately 47 homes in the Saltese Addition along the east side of the pressure zone, served via PRV, are referred to as Ridgemont Zone 3. The Ridgemont booster has four identical 75 HP pumps with a combined capacity of approximately 2,250 gpm. The Morningside Booster has six identical 60 HP pumps with a combined capacity of approximately 3,000 gpm
	Ball / Morrow Park	Located at the southern end of Vera's service area, this zone provides service to hilly areas that cannot be served from the main zone. The zone is served by two booster stations: the Ball booster and the Morrow Park booster. Both of these booster stations pump to Vera's 750KG reservoir (max HGL 2,746). Vera is in the process of upgrading the Ball booster station which will be capable of accommodating nine 75 HP, 350 gpm pumps with a total build out capacity of 3,150 gpm. Due to limitations related to the existing 10-inch discharge main to the high pressure zone, only five pumps will be installed initially. Morrow Park Booster has four 60 HP pumps and has room for additional pumps. The total pumping capacity of the Morrow Park booster is estimated at 800 gpm with four pumps. The booster has room for expansion to a total of six identical pumps that will be capable of delivering upwards of 1,000 gpm. This zone also serves three sub-zones through PRVs.
	Suncrest	Approximately 35 homes in the vicinity of the 2MG reservoir are located at elevations that prevent service from the Main Zone. Elevations of services in this zone are in the range of 2,200 – 2,250. The Suncrest zone operates as a closed system with no reservoir or pressure tank. This zone is boosted from an HGL of 2,242 (Main Zone max HGL) to approximate HGL of 2,475 (100 psi difference). Two identical 15 HP pumps provide normal and peak flow while a single 50 HP pump provides fire protection. Each 15 HP pump is capable of approximately 150 gpm individually and 250 gpm combined. The 50 HP pump is capable of approximately 500 gpm.
	The Crest	This pressure zone operates as a closed system (no reservoir open to atmospheric pressure). The booster pumps have variable speed controllers that adjust the speed of the pumps to match the demand of the system. The HGL of the zone is created by boosting from 2,715 (max HGL of the 750KG reservoir) to approximately 3,325 (260 psi difference). This pump station has a total of 4 pumps; two identical 30 gpm, 10 HP units and two identical 100 gpm, 25 HP units. Several customers served at the lower elevations of this pressure zone have individual PRVs installed on their services. At present this zone serves approximately 28 customers.

Boosters/Pressure relief valves –

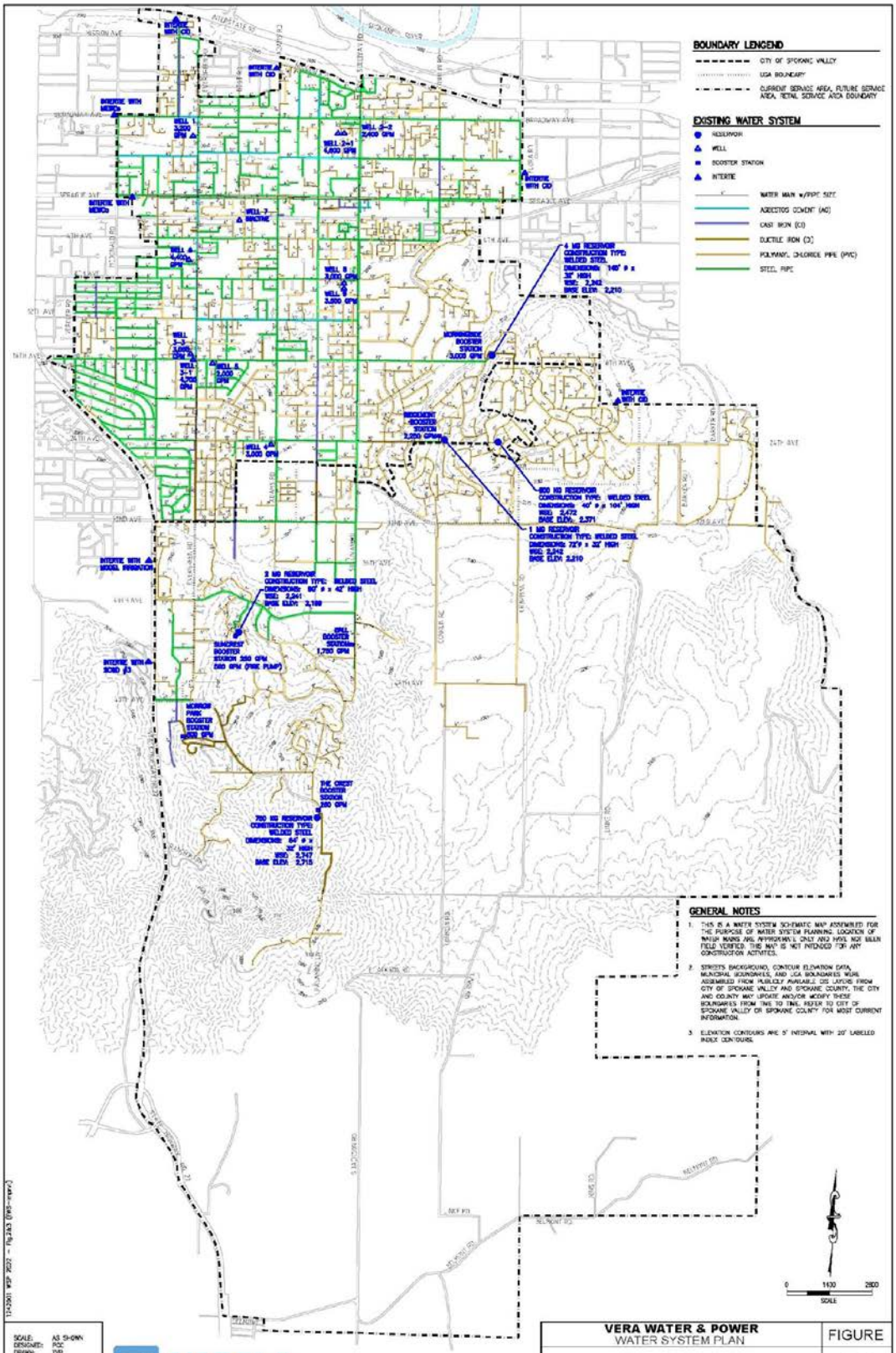
Transmission lines –

Vera Water & Power's (Vera, the District) Water System consists of five pressure zones, ten wells at seven sites, five reservoirs and approximately 145 miles of water mains. (WSP 2022)

Interties –

Vera has a total of eight interties with neighboring water systems; two are with Modern Electric Water Company, four are with Consolidated Irrigation District (CID), one is with Spokane County Water District #3, and one is with Model Irrigation District. Both interties with Modern are along the District's western border. Two of the interties with Consolidated are along the District's northern border near the freeway. One is along the eastern border of the Ridgemont/Morningside zone off Chapman Rd. and one is along the northeastern border on Flora Rd. The intertie with Spokane County Water District #3 is along the District's western border near Highway 27. The intertie with Model Irrigation District is along Vera's western border on Highway 27. Seven of the interties are manually operated "two-way". Most of the interties were installed for emergency purposes only with two exceptions: one intertie serves a CID development and one intertie returns the volume of water used by the CID development back to Vera (Refer to Section 2.1.5). At the time of construction the Districts chose not to install meters on the emergency-only interties. The intertie with Model Irrigation District operates automatically via a pressure reducing valve; this intertie is also equipped with a bypass for manual operation.

Schematic


BOUNDARY LENGEND
CITY OF SPOKANE VALLEY
UGA BOUNDARY
CURRENT SERVICE AREA, FUTURE SERVICE AREA, RETAIL SERVICE AREA BOUNDARY
EXISTING WATER SYSTEM
RESERVOIR
WELL
BOOSTER STATION
INTERTIE
WATER MAIN w/PIPE SIZE
ASBESTOS CEMENT (AC)
CAST IRON (CI)
DUCTILE IRON (D)
POLYVINYL CHLORIDE PIPE (PVC)
STEEL PIPE
GENERAL NOTES
1. THIS IS A WATER SYSTEM SCHEMATIC MAP ASSEMBLED FOR THE PURPOSE OF WATER SYSTEM PLANNING. LOCATION OF WATER MAINS ARE APPROXIMATE ONLY AND HAVE NOT BEEN FIELD VERIFIED. THIS MAP IS NOT INTENDED FOR ANY CONSTRUCTION ACTIVITIES.
2. STREETS BACKGROUND, CONTOUR ELEVATION DATA, MUNICIPAL BOUNDARIES, AND UGA BOUNDARIES WERE ASSEMBLED FROM PUBLICLY AVAILABLE GIS LAYERS FROM CITY OF SPOKANE VALLEY AND SPOKANE COUNTY. THE CITY AND COUNTY MAY UPDATE AND/OR MODIFY THESE BOUNDARIES FROM TIME TO TIME. REFER TO CITY OF SPOKANE VALLEY OR SPOKANE COUNTY FOR MOST CURRENT INFORMATION.
3. ELEVATION CONTOURS ARE 5' INTERVAL WITH 20' LABELLED INDEX CONTOURS.
0
1400
2800
SCALE
SCALE: AS SHOWN
DESIGNED: ROC
DRAWN: TYP
CHECKED:
APPROVED:
PROJ. NO.: 124-30-01
DATE: 8/5/22
VARELA
Engineering & Management
VERA WATER & POWER
WATER SYSTEM PLAN
EXISTING WATER SYSTEM
FIGURE
2A

Connections

Vera serves approximately 7,925 single family residential accounts, 473 multi-family accounts, and 492 commercial accounts. Vera serves approximately 10,825 single and multi-family dwelling units. (WSP 2022)

Vera's equivalent residential unit (ERU) consumes 813 gpd; Vera serves approximately 11,710 ERUs. (WSP 2022)

A list of capital deficiencies

 Projections estimate that growth in the Ridgemont/Morningside booster zone will result in a standby storage shortage as well as the need for utilizing part of the 900KG reservoir for equalizing storage. Projections estimate that growth in the Ball/Morrow Park pressure zone will eventually result in the need for utilizing part of the 750KG reservoir as equalizing storage. The main zone has adequate storage to meet projected demands.

 The 4MG, 1MG and 750KG welded steel reservoirs need recoated. The 1MG and 2MG reservoirs lack overflow protection. Vera also plans to check the plumbness of the 900KG standpipe on roughly a five-year cycle.

 The Crest booster zone cannot meet future peak demands with the largest pump out of service. The Crest is not currently required to provide fire flow. It is unknown if fire flow will be required at some point in the future. Vera intends to size improvements and plan for fire flow to eventually be required in The Crest.

 The Ridgemont booster is small and cramped which makes maintaining the booster pumps, piping, and electrical facilities difficult. Vera would like to eventually replace this booster station.

 Vera's distribution system performs well under peak hour demand (PHD). The hydraulic model estimates that services throughout the majority of the system receive the required 30 psi minimum service pressure under current and projected 20-year PHD. A number of services in the Ridgemont/Morningside pressure zone drop below 30 psi within the 10-year planning period but this drop can be mitigated by adding additional pumps to the Morningside booster to keep up with PHD to eliminate the use of equalizing storage.

 Several areas do not meet the District's fire flow criteria. Areas served by 4-inch mains have limited fire flow capability.

 Aging steel mains may become a maintenance nuisance as corrosion causes these mains to fail over time.

This Water System Plan will identify phased transmission main improvements necessary to meet projected water transmission needs to address deficiencies identified in the 20-year planning period and beyond. This Water System Plan will consider additional growth beyond the 20-year planning period especially in the southern portion of the system near the UGA boundary. Any distribution system deficiencies requiring installation or replacement of water mains will include additional capacity for potential growth in that region. In general, water main upgrades may include a 50% capacity allowance/upgrade (one or two pipe sizes depending on diameter increment) above those needed for 20-year growth to account for growth beyond the 20-year planning horizon. Pipe sizes will be finalized at the time of implementation.

Wells
Vera could utilize reservoirs to provide equalizing storage during peak demands however Vera prefers to meet peak demands with well pumping capacity.
Booster Stations
 The Suncrest booster station building is dilapidated and the foundation appears to have structural

issues. It appears the building will eventually need to be reconstructed.

Storage

- The 1MG and 2MG reservoirs currently have no overflow ponds. Overflowing these reservoirs may cause flooding onto private property and damage. Vera just finished constructing an overflow main to route overflows from the 4MG reservoir to a nearby stormwater pond Vera previously purchased.
- The 1MG reservoir needs the exterior recoated, a safety railing and access to vent.
- The existing pneumatically operated in a vault abutting the 4MG reservoir leaks and does not operate reliably. Vera would like to install a new 20" valve in 4MG reservoir vault—existing valve leaks 900 gpm through it when closed. Vera is currently working on running a 3" conduit from the vault to the Morningside Booster for possibly upgrading to an electric actuated butterfly valve.

Distribution System

- The following aging sections of water main likely need replacement within the next 20 years:
  - Burns Rd between Valley Way and Broadway Ave – 4" steel (invasion pipe).
  - Progress Rd between 12th Ave and 24th Ave – 4" CI (leaky bells).
- Some services installed by Vera during the 1970's appear to be an inferior type of poly material. These services have not lasted well. As sewer installation projects move through the Valley, Vera plans to replace the services made of inferior material as construction takes place.
- The pressure reducing valve manhole between Ball/Morrow Booster zones on E. Bella Vista Ct collects gases that are hazardous to maintenance personnel. These gases collect in sufficient concentrations to incapacitate a person if no ventilation is provided. The vault also collects groundwater.
- Vera would like to investigate installing two PRV vaults in E Bella Vista Dr and S Ball Dr at the two normally closed valves that separate the Ball/Morrow low zone from the Ball/Morrow intermediate zone. This would increase operational flexibility by enabling these zones to be looped together which may improve pressure in areas and eliminate two dead ends for better water quality.

Vera's criterion for supply quantity is to provide supply capacity at least equal to MDD; however, Vera generally runs all available wells to pump PHD rather than relying on equalizing storage. Vera has a total well pump capacity of 33,800 gpm. Vera's existing well pumping capacity exceeds current PHD (32,229 gpm) but does not exceed projected 10-year PHD (35,603 gpm). Vera's largest well pump (Well 3-1) has capacity to pump 4,700 gpm. With the largest well pump out of service Vera has a total well pump capacity of 29,100 gpm. Vera can supply current MDD (16,528 gpm) and projected 20-year MDD (20,168 gpm) with the largest well pump out of service. Vera has sufficient supply capacity to meet its minimum supply quantity criterion and 10-State Standards' recommendation to meet MDD with the largest producing source out of service. However, if Vera wants to continue to pump PHD, additional supply capacity will become necessary relatively soon.

Transmission Main Improvements

When all or most of Vera's existing wells operate during peak demands the discharge pressures at some wells elevate significantly above the static pressure (sometimes over 30 psi). Vera plans to add source capacity by drilling a new well (and/or increasing existing source capacity) to improve system redundancy and to continue to pump peak demands rather than utilize equalizing storage. Adding source capacity to the system will exacerbate the current issue of high discharge pressures at well sites. Transmission main improvements associated with current well capacity will be needed (and furthermore with increased well capacity in the future).

The following planned transmission improvements are generally sized around seeking to limit discharge pressure increase at well sites to 15 psi above static. Mains on Progress from Well 2 were sized to account for a new well at the existing Well 2-1/2-2 site. Refer to discussion regarding well site selection following improvements below. Some of the sizes of these transmission mains may need to be adjusted at the time of implementation depending on the final location and quantity of future source pumping

capacity (whether by increasing the pumping rate of existing wells or by drilling new wells).

24” main on 8th Ave from Evergreen Rd to Progress Rd

- Connects the east and west supply corridors along Evergreen Rd and Sullivan Rd
- Decreases discharge pressure at Wells 3-1, 3-3, 5, and 6

24” main on Progress Rd from Well 2 to 16th Ave

- Bolsters transmission capacity parallel to Sullivan Rd
- Decreases discharge pressure at Wells 2-1, 2-2, 8, and 9
- Makes it more feasible to add capacity to Well 2 site with either larger pump or additional well(s)

30” main on Progress Rd from 8th Ave to 16th Ave

- Bolsters transmission capacity parallel to Sullivan Rd
- Decreases discharge pressure at Wells 2-1, 2-2, 8, and 9
- Makes it more feasible to add capacity to Well 2 site with either larger pump or additional well(s)

30” main on 16th Ave from Progress Rd to Sullivan Rd

- Connects the future Progress Rd transmission main to Sullivan Rd transmission corridor and increases transmission capacity to 4MG reservoir
- Decreases discharge pressure at Wells 8 and 9

30” main on 16th Ave from Sullivan Rd to 4MG reservoir

- Increases transmission capacity to 4MG reservoir and Morningside booster station
- Decreases discharge pressures at Wells 2-1, 2-1, 8, and 9

16” main on 24th Ave from Evergreen Rd to Adams Rd

- Connects Well 4 to the Evergreen Rd transmission corridor
- Decreases discharge pressure at Well 4

Increasing existing well capacity or drilling a new well will trigger transmission main improvements. However, transmission main improvements are necessary to minimize current discharge pressures at well sites under existing conditions.

Vera plans to drill a new well at the existing Well 2-1/2-2 site. Vera considered a new well at three existing well sites: Well 6, Well 2-1/2-2, and Well 8/9. The Well 2-1/2-3 site was selected given the location and minimal added costs due to already necessary transmission main improvements under existing conditions. The added capacity of a new well at the Well 2-1/2-2 site requires an increase in one main size on a portion of the already planned transmission main improvements on Progress Rd. and 16th Ave, which is reflected in the transmission main improvements listed above and in Table 5-14.
Transmission main improvements also depend on Vera’s ability to maintain a constant hydraulic grade line (HGL) in the main zone reservoirs (i.e. prevent one reservoir from draining faster than the others). Improvements to the transmission mains on 24th Ave and Evergreen Rd and construction of the Morningside booster station and new Well 4 have allowed Vera to minimize differential reservoir levels. As system growth occurs, the mitigating measures currently employed by Vera to maintain parallel reservoir levels may no longer be sufficient.
Depending on the location of future development, future wells, and expansion of booster station capacities Vera will require some or eventually all the preceding transmission distribution system improvements. At this time Vera estimates some of these improvements will be necessary during the 10-year planning period when a new well is drilled.
Possible quantitative triggers for incremental implementation of the remaining transmission improvements could be when discharge pressure increase at a well exceeds 20 psi and/or when 30% of a reservoir becomes lost to differential levels. At that point the preceding transmission improvements could be analyzed to determine which portions yield the greatest benefit to the observed issue. When Vera decides to increase well capacity Vera will determine which transmission main improvements will be necessary. Vera will also monitor differential reservoir levels during high demand periods to determine if/when to implement the preceding transmission improvements.

Replacement of Aging Steel Mains

Vera has approximately 95 miles of aging dipped & wrapped steel, galvanized steel, and cast iron mains. The majority of these mains were installed around 1959. As these mains age, eventually they will begin to leak and fail. Typically steel mains have a service life of approximately 50 years; this varies substantially depending on a variety of factors such as soil type, average main velocities, ground water presence, etc. Spokane Valley soils are generally non-corrosive to metallic pipe. Vera staff feels that the majority of steel mains in the District have substantial service life remaining before leaks and failures will necessitate their replacement.

Some of Vera's small diameter steel mains (4-inch) provide service to fire hydrants. Vera plans to replace these small diameter mains with 8-inch mains in accordance with Vera standards (refer to Section 3). Although Vera's small diameter mains limit available fire flow, Vera staff reports the mains provide adequate service for typical non-emergency system operation; the customers served by 4-inch mains do not complain of large pressure drops during PHD. The majority of Vera's small diameter mains are dipped & wrapped steel and maybe nearing the end of service life; as these mains begin to leak and break they will need to be replaced.

Table 4-18 Summary of Water System Deficiencies

Area of Improvement	10-year Planning Period		20-year Planning Period	
	Required by Regulation	Elective	Required by Regulation	Elective
Supply				
• The majority of Vera's wells and pump stations are in good condition; Vera may choose to replace the remaining dug wells (1, 3-1, and 5) if problems occur with them. (1)	No	Possibly	No	Possibly
• Vera may need to expand source capacity to meet projected peak demands; and also to avoid equalizing storage if desired.	No	Yes	N/A	N/A
Disinfection				
• No improvements planned or required at this time.	N/A	N/A	N/A	N/A
Water Rights				
• Vera has adequate water rights (Q_i and Q_a) to meet projected demands. No improvements planned or required at this time	N/A	N/A	N/A	N/A
Storage				
• All reservoirs should be inspected every five years to evaluate condition of coating.	No	Yes	N/A	N/A
• 4MG and 1MG reservoirs need interior & exterior recoating.	No	Yes	N/A	N/A
• 2MG reservoir needs interior corrosion repairs.	No	Yes	N/A	N/A
• 750KG reservoir needs interior recoating.	No	Yes	N/A	N/A
• Miscellaneous reservoir maintenance/repairs (all reservoirs)	No	Yes	N/A	N/A
• 1MG and 2MG reservoirs need overflow protection. (2)	Yes	N/A	N/A	N/A
• Main zone begins to require equalizing storage.	No	Possibly	No	Possibly
• Ball/Morrow Park zone begins to require equalizing storage.	No	Possibly	No	Possibly
• Ridgemont/Morningside zone begins to require equalizing storage.	Yes	Yes	N/A	N/A
• Ridgemont/Morningside zone will have standby storage deficiency by the end of 10-year planning period.	Yes	N/A	N/A	N/A
• Check plumbness of 900KG standpipe reservoir.	No	Yes	N/A	N/A
Booster Stations				
• The Ball/Morrow Park zone meets supply quantity criteria. Vera may add pumps to the Morrow Park booster for redundancy and/or to eliminate use of equalizing storage in 750KG reservoir.	No	Possibly	No	Possibly
• The Crest booster station cannot meet future peak demands with largest pump out of service.	Yes	N/A	N/A	N/A
• Morningside and Morrow Park booster stations have provision for adding backup power generators to increase reliability.	No	Possibly	No	Possibly
• The Crest and Suncrest booster stations have no backup power generator or manual switch gear.	No	Possibly	No	Possibly
• The Suncrest booster station building/foundation is dilapidated. Vera may replace this facility.	No	Possibly	No	Possibly
• The Ridgemont booster station is small, cramped, and difficult to maintain. Vera may replace and upgrade this facility.	No	Yes	No	Possibly
Distribution				
• Several areas do not meet District fire flow criteria – refer to **Table 4-15**.	No	Possibly	No	Yes
• District has large quantity of steel mains that may be nearing the end of their service lives.	No	Possibly	No	Possibly
• PRV in Ball/Morrow Park zone has vault that is dangerous and valve not reliable (history of failure).	No	Yes	N/A	N/A
• High discharge pressures at wells sites	No	Yes	N/A	N/A
Control System				
• No improvements planned or required at this time.	N/A	N/A	N/A	N/A

(1) *In general, dug wells tend to have problems with structural integrity and capacity limitations due to poor aquifer penetration. If and when these problems become an issue with Vera's dug wells the necessary action will be taken to remedy the deficiency. At present it appears Vera's wells function adequately in their current condition.*

(2) *Vera desires overflow protection for the 1MG and 2MG reservoirs. No existing regulation requires overflow protection. Vera may coordinate eventual construction of overflow ponds with construction of a future main zone reservoir. Projections do not indicate an additional main zone reservoir will be necessary during the 20-year planning period. Vera may take elective, interim measures to ensure overflows do not occur and damage private property.*

Service Line Replacements

Vera has approximately 500 “purple tube” services that tend to deteriorate. As Spokane Valley implements pavement replacement projects in the areas and Vera implements main replacement projects the purple pipe services will be replaced. The cost of these service line replacements is included in the cost estimate for the distribution project with which they coincide.

Fire Hydrant Replacements & Additions

At present, all of Vera’s fire hydrants are in working condition. The preceding cost estimate of main replacements includes an allowance for fire hydrant replacements and additions. The oldest hydrants are on old steel mains; Vera will replace hydrants as needed as steel mains replacement projects occur.

Valve Replacements & Additions

All District valves are in working condition and are exercised annually by Vera staff. It does not appear any valve replacements or additions are necessary at this time. As Vera begins replacing aging steel mains, valves will also be replaced.

A list of projects (capital projects) to cure them

- Costs
- Timing

Table 6-1 Capital Improvements Plan

System	Improvement	Purpose	Potential Funding Sources	Estimated Cost [1]
Supply [3]	New well and pump station	Operational flexibility, eliminate equalizing storage	Revenue Bonds	$2,400,000
Storage	Inspect steel reservoir coatings (every 5-yrs)	Determine condition of steel coating	Reserve Funds	24,000
	Recoat 4MG reservoir (interior/exterior)	Protect steel reservoirs	Revenue Bonds	960,000
	Recoat 1MG reservoirs (interior/exterior)	Protect steel reservoirs		324,000
	Recoat 750KG reservoir (interior)	Protect steel reservoirs		276,000
	Well shut off controls	Reduce risk of reservoir overflow	Reserve Funds	55,000
	Check plumbness of 900KG reservoir (every 5-yrs)	Determine whether settlement has occurred	Reserve Funds	5,000
Booster Stations	Additional pumps at Morrow Park booster	Operational flexibility, eliminate equalizing storage	Reserve Funds	115,000
	Additional pumps at Morningside booster	Operational flexibility, eliminate equalizing storage	Reserve Funds	140,000
	Eventual replacement of Ridgemont booster	Modernize old booster, increase capacity	Revenue Bonds	2,300,000
	Expansion or replacement of The Crest booster	Meet future peak demands, supply fireflow	Booster Customers, LID	210,000
Distribution System	Refer to **Table 5-14** for breakdown of projects. Cost includes sections e, f, g, and h in table.	Address existing discharge pressure near well sites, and future discharge pressure with new well.	Revenue Bonds, Reserve Funds, DWSRF, PWTF	9,600,000
			Total Estimated Cost of 10-year Capital Improvements	≈ $16.4M
Supply	Eventual Replacement of dug Well 1 [2]	Remaining service life of these wells unknown	Revenue Bonds, DWSRF, PWB	$2,400,000
	Eventual Replacement of dug Well 3-1			2,400,000
	Eventual Replacement of dug Well 5			2,400,000
Storage	Inspect steel reservoir coatings (every 5-yrs)	Determine condition of steel coating	Reserve Funds	24,000
	Overflow containment for 1MG reservoir	Prevent property damage during overflow events	Revenue Bonds	325,000 – 1,120,000
	Overflow containment for 2MG reservoir	Prevent property damage during overflow events	Revenue Bonds	1.1M – 1.8M
	Check plumbness of 900KG reservoir (every 5-yrs)	Determine whether settlement has occurred	Reserve Funds	5,000
	New standpipe for Ridgemont/Morningside zone	Standby storage for Ridgemont/Morningside zone	Revenue Bonds	1.5M – 2M
Booster Stations	Backup power generator for Morningside booster	Standby supply for Ridgemont/Morningside zone	Revenue Bonds, Reserve Funds, Booster Customers, LID	260,000
	Backup power generator for Morrow Park booster	Standby supply for Ball/Morrow Park zone		260,000
	Backup power generator for Suncrest booster	Standby supply for Suncrest zone		150,000
	Backup power generator for The Crest booster	Standby supply for The Crest zone		150,000
Distribution System	Refer to **Table 5-14** for breakdown of projects. Cost includes sections a, b, c, d, and i in table.	Address fire flow deficiencies, discharge pressure near well sites, and replace aging steel mains	Revenue Bonds, Reserve Funds, DWSRF, PWTF	18,500,000
			Total Estimated Cost of 20-year Capital Improvements	≈ $29.5M – 31.5M
			Total Estimate Cost of 10-year and 20-year Capital Improvements	≈ $45.9M – 47.8M

[1] *Costs shown are planning level estimates that show approximate funding needs for improvements; a full cost evaluation should be completed prior to design and implementation.*
[2] *Vera's Well 1 is historic and will not be demolished even if it is eventually taken out of service; refer to discussion in* **Section 5.1.1**
[3] *Refer to 10-year Distribution System improvements for associated transmission main improvements.*

Vera may choose to replace its remaining dug wells (Wells 1, 3-1, and 5) due to uncertainty of remaining service life.

- Vera plans to increase supply capacity to increase redundancy by drilling a new well and/or increasing pumping capacity of (an) existing well(s).
- Vera plans to recoat the 4MG, 1MG and 750KG reservoirs. All reservoirs will be inspected on a routine basis to evaluate the conditions of the coatings.
- To provide a measure of overflow protection for the 1MG and 2MG reservoirs, Vera plans to eventually construct overflow conveyance/containment facilities.
- Vera may eventually construct another reservoir in the Ridgemont/Morningside pressure zone to address a projected standby storage shortage.
- Vera will add pumps to the Morningside and Morrow Park booster stations for operational flexibility and to eliminate the need for equalizing storage.
- The District may choose to add backup power to the Morningside, Morrow Park, Suncrest, and The Crest booster stations to increase reliability.
- Vera plans an eventual retrofit of the Crest booster station with additional capacity to meet fire flow rate and peak pumping redundancy requirements.
- Eventually Vera would like to replace the Ridgemont booster station to address maintenance difficulties and provide room for expanded pumping into the Ridgemont/Morningside pressure zone.
- Several main replacements are necessary to meet Vera's fire flow criteria.
- Several transmission improvements are necessary to alleviate high discharge pressures at Vera's wells and to reduce potential for differential reservoir levels in the main zone.
- Approximately 326,000 feet (almost 62 miles) of steel mains in Vera's distribution system

Table 5-1 Estimated Cost of Replacing Existing Dug Well

Description	Quantity	Unit	Unit Cost	Amount
Drill New Well				
Drill new 20-24" well	-	LS	-	$320,000
Pump Station				
Demolish existing pump house [1]	-	LS	-	30,000
Abandon old dug well [2]	-	LS	-	35,000
Site work [3]	-	LS	-	50,000
Construct new pump house [4]	-	LS	-	250,000
4,000 gpm line shaft vertical turbine pump and motor [5]	-	LS	-	200,000
Piping, plumbing and valves [6]	-	LS	-	150,000
Electrical and controls including soft start [7]	-	LS	-	265,000
Miscellaneous	-	LS	-	50,000
			Construction Subtotal	**$1,350,000**
			Contractor Mobilization and Administration (8%)	108,000
			Sales Tax (9.0%)	122,000
			Contingencies (15%)	203,000
			Construction Total	**1,783,000**
			Engineering, Design, Construction Management and Inspection (25%)	446,000
			Hydrogeological Investigation (if necessary)	26,000
			Environmental Review Process	7,000
			Water Rights (new point of withdrawal added to existing rights) [8]	6,000
			Site Purchase (assumed allowance if necessary) [8]	100,000
			Project Total (rounded to nearest $100K)	**$2,400,000**

[1] *Assume no asbestos or other hazardous material removal and disposal required.*
[2] *Assume approximately 150 CY of 5-sack concrete and 150 CY of pea gravel in alternating layers.*
[3] *Assume PCV piping and drywells will require reconstruction.*
[4] *Assume CMU construction and 20' x 32' dimensions.*
[5] *Assume TDH of 340 ft, 500 HP motor, and 200' of 12" column and shaft.*
[6] *Assume 16" piping*
[7] *Does not include electric utility modification costs as Vera will likely supply materials and self-perform these tasks.*
[8] *May not be necessary if replacement well on same site as existing well or is within same ¼ ¼ Section as existing well*

Table 5-5 Estimated Cost of Overflow Containment for Main Zone Reservoirs

Element	Estimated Cost
1MG Reservoir	
• Site excavation [1]	$130,000 – $530,000
• Pond liner [2]	70,000 – 220,000
• Drainage system [3]	30,000 – 50,000
2MG Reservoir	
• Land purchase & easement costs [4]	130,000
• Gravity conveyance to pond site [5]	400,000
• Site excavation [1]	130,000 – 530,000
• Pond liner [2]	70,000 – 220,000
• Drainage system [3]	30,000 – 50,000
Subtotal	990,000 – 2,130,000
Taxes, Engineering, Contingencies (40%)	400,000 – 850,000
Total (rounded to nearest $100K)	$1,400,000 – $3,000,000

Table 5-6 Estimated Cost of Adding Two Pumps to Morrow Park Booster Station

Description	Quantity	Unit	Unit Cost	Amount
Vertical multi-stage centrifugal pump [1]	2	EA	$20,000	$40,000
Piping modifications, fittings, pump pedestals	-	LS	-	4,000
Electrical and controls modifications	-	LS	-	25,000
Miscellaneous	-	LS	-	10,000
Construction Subtotal				**$79,000**
Contractor Mobilization and Administration (8%)				6,000
Sales Tax (8.7%)				7,000
Contingencies (10%)				8,000
Construction Total (rounded to nearest $1K)				**100,000**
Engineering, Design, Construction Management and Inspection (15%)				15,000
Project Total (rounded to nearest $10K)				**$115,000**

[1] *Assumes pumps identical to existing (200 gpm, 630 ft TDH, 3,600 RPM, 60 HP).*

Table 5-7 Estimated Cost of Adding Two Pumps to Morningside Booster Station

Description	Quantity	Unit	Unit Cost	Amount
End suction centrifugal pump [1]	2	EA	$25,000	$50,000
Piping modifications, fittings, pump pedestals	-	LS	-	5,000
Electrical and controls modifications	-	LS	-	30,000
Miscellaneous	-	LS	-	10,000
Construction Subtotal				**$95,000**
Contractor Mobilization and Administration (8%)				8,000
Sales Tax (8.7%)				9,000
Contingencies (10%)				10,000
Construction Total (rounded to nearest $1K)				**122,000**
Engineering, Design, Construction Management and Inspection (15%)				18,000
Project Total (rounded to nearest $10K)				**$140,000**

[1] *Assumes pumps identical to existing (500 gpm, 3,600 RPM, 60 HP).*

Table 5-8 Estimated Cost of The Crest Booster Station Improvements

Description	Cost
Package pump system [1]	$100,000
Installation, piping modifications, valves, fittings, pump pedestals	$15,000
Building modifications [2]	-
Electrical and controls modifications	$10,000
Miscellaneous	$7,000
Backup generator [3]	-
Estimated Construction Subtotal [3]	**$132,000**
Mobilization (8%)	$10,560
Sales Tax (9%)	$11,880
Contingency (15%)	$19,800
Estimated Construction Total [3]	$175,000
Engineering, Construction Management, Inspection (20%)	$35,000
Estimated Total [3]	**$210,000**

[1] *Assumes a variable speed pumping package combination consisting of three additional pumps to achieve a combined capacity meeting future PHD with largest pump out of service and combined pumping capacity of all pumps equal to MDD plus 1,000 gpm fire flow.*

[2] *Assumes new pumping system and piping fits within existing building.*

[3] *Assumes no backup generator included given reliable power supply status in The Crest. Refer to Backup Power Consideration section for additional details.*

[4] *Rounded.*

Table 5-9 Estimated Cost of Backup Generator for Morningside Booster Station

Description	Quantity	Unit	Unit Cost	Amount
Generator [1]	-	LS	-	$125,000
Automatic Transfer Switch [2]	-	LS	-	20,000
Building knockouts for exhaust & ventilation [3]	-	LS	-	10,000
Installation, electrical, and controls modifications	-	LS	-	10,000
Miscellaneous	-	LS	-	10,000
			Construction Subtotal	**$175,000**
			Contractor Mobilization and Administration (8%)	14,000
			Sales Tax (9.0%)	16,000
			Contingencies (10%)	18,000
			Construction Total	**223,000**
			Engineering, Design, Construction Management and Inspection (15%)	33,000
			Project Total (rounded to nearest $10K)	**$260,000**

[1] *Assumes Cummins 275KW diesel with integral 24 hour fuel storage tank. This generator would have sufficient capacity to power the four existing pumps, but not additional pumps that may be added to the Morningside booster station in the future.*

[2] *Assumes 600A NEMA 12 automatic transfer switch.*

[3] *Building design made structural provisions for knockouts.*

Table 5-10 Estimated Cost of Backup Generator for Suncrest Booster Station

Description	Quantity	Unit	Unit Cost	Amount
Generator [1]	-	LS	-	$70,000
Automatic Transfer Switch	-	LS	-	10,000
Installation, electrical, and controls modifications	-	LS	-	10,000
Miscellaneous	-	LS	-	10,000
Construction Subtotal				**$100,000**
Contractor Mobilization and Administration (8%)				8,000
Sales Tax (8.7%)				9,000
Contingencies (10%)				10,000
Construction Total (rounded to nearest $10K)				**130,000**
Engineering, Design, Construction Management and Inspection (15%)				20,000
Project Total (rounded to nearest $10K)				**$150,000**

[1] *Assumes generator with weatherproof enclosure.*

Table 5-11 Estimated Cost of Replacement of Ridgemont Booster Station

Description	Quantity	Unit	Unit Cost	Amount
Land Purchase [1]	-	LS	-	-
Site Work [2]	-	LS	-	400,000
Building [3]	-	LS	-	350,000
Booster pumps [4]	4	EA	$25,000	100,000
Piping	-	LS	-	150,000
Electrical	-	LS	-	240,000
Site Piping [5]	-	LS	-	40,000
Access road and asphalt parking area [6]	650	SY	$60	39,000
Miscellaneous	-	LS	-	100,000
Construction Subtotal (rounded)				**$1,420,000**
Contractor Mobilization and Administration (8%)				114,000
Sales Tax (9.0%)				128,000
Contingencies (10%)				142,000
Construction Total (rounded to nearest $10K)				**1,800,000**
Engineering, Design, Construction Management and Inspection (25%)				450,000
Project Total (rounded to nearest $100K)				**$2,300,000**

[1] *Assumes replacement constructed on existing site or on other land already owned by Vera.*

[2] *A geotechnical investigation was completed in 2022 which revealed the existing site soils either need to be replaced or will require fortification through a costly process known as cement modified soil (CMS).*

[3] *Assumes 1,700 SF block building with room for automatic backup power generator (similar to Morningside booster); also assumes generator would be purchased and installed at a later date.*

[4] *Assume four 60 HP pumps similar to Morningside booster.*

[5] *Connect to existing discharge main. Additional improvements may be needed to increase the transmission capacity between the Ridgemont booster and the 900KG reservoir. Some of the existing transmission main may need to be upsized/replaced depending on the future capacity desired by Vera for this booster.*

[6] *Assumes 250 LF access road 15 ft wide and approximately 70ft x 30ft parking area.*

Table 5-12 Improvements Related to Fire Flow

Zone	Location	Flow Rate Criteria [1] (gpm)	Estimated Flow Rate Without Improvements [1]		Improvement	Estimated Flow Rate With Improvements	
			Current (gpm)	20-year (gpm)		Current (gpm)	20-year (gpm)
Main	Broadway Ave & Flora Rd	2,500	2,100	2,000	Replace 6" steel main in Flora Rd between Broadway Ave & Valleyway Ave with 8" main	3,600	3,500
Main	Areas served by 4" steel mains	1,000	500-600	500-600	Replace 4" steel mains with minimum 8" [2]	1,000+	1,000+
Ball / Morrow	Terre Verde, Bella Vista, Shelly Ct, Ball Dr	1,000	1,000-2,000	1,000-2,000	Two new PRV stations: [7] ▪ Ball Rd between Bella Vista Dr and Shelly Ct ▪ One at Terra Verde Dr & Bella Vista Dr	2,000-3,000	2,000-3,000
Ball / Morrow	Hillcrest Ln	1,000	900	900	Loop 6" main from southwest Hillcrest Ln to Bella Vista Dr [3]	1,700	1,600
Suncrest	Entire booster zone	500 [4]	500	500	Replace 500 gpm fire pump with 1,000 gpm fire pump	1,000	1,000
The Crest	Entire booster zone	N/A [5]	- [6]	- [6]	Add fire protection pumping capacity to Crest booster station; refer to **Section 5.7.3** for details.	1,000	1,000

(1) *Refer to Section 3.4 for fire flow rate criteria and **Section 4.11.3** for fire flow analysis.*
(2) *The hydraulic analysis utilized a skeletonized distribution system which neglected the majority of 4" mains. The majority of Vera's 4" mains are located in the main pressure zone and are steel which will eventually need to be replaced. Refer to **Section 5.8.4** for additional discussion of steel main replacements.*
(3) *Vera will need to acquire an easement from existing homeowner to loop this main.*
(4) *Vera's "rural residential" fire flow rate criteria of 500 gpm was approved when this pressure zone was originally constructed; the Spokane County Coordinated Water System Plan recommends a flow rate of 1,000 gpm.*
(5) *Spokane County Fire District 8 does not currently require fire flow be provided in The Crest. Refer to **Section 4.10.5**.*
(6) *Fire flow rates in The Crest booster zone were not modeled in the hydraulic model. It is assumed that booster station design will also include analysis of capacity of distribution system to convey flow rate from the booster station to the location of hydrants.*
(7) *These improvements are not necessary to achieve fire flow but are voluntary aimed at increasing operational flexibility so that these PRV areas are not out of service if the Ball booster is offline for any reason. These PRVs also increase the available fire flow to those PRV zones since they will be fed from both directions.*

Estimated Cost of Planned Distribution System Improvements

The Table following lists the estimated cost of construction for water mains with and without the cost of asphalt replacement. The table does not include tax, contingencies, and engineering; subsequent tables for specific improvement projects include these items.

Table 5-13 Estimated Distribution System Unit Costs

Diam (in)	Cost per LF ($)						
	Main & Install [1]	Valves, Fittings, Restraints [2]	Fire Hydrants [3]	Service Connections [4]	Asphalt Replacement [5]	Total for Construction w/ out asphalt	Total for Construction w/ asphalt
8	58	12	16	50	$42	136	178
10	75	15	16	50	$42	156	198
12	95	19	16	50	$42	180	222
14	119	24	16	50	$42	209	251
16	140	28	16	50	$42	234	276
18	162	32	16	50	$42	260	302
20	185	37	16	50	$42	288	330
24	234	47	16	50	$42	347	389
30	294	59	16	50	$42	419	461

(1) *Vera uses both PVC and DI throughout the water system. Costs assume DI mains due to high cost of PVC driven by current supply chain disruption and high cost of oil. Unit cost based on actual material cost (HD Fowler, July 2022) plus 20% install cost.*
(2) *Assume 20% of cost of main and install.*
(3) *Assume one hydrant every 500 ft.*
(4) *Assume one service every 50 ft.*
(5) *Assume 10' wide restoration.*

The following table estimates the cost of main replacements and additions planned by Vera to address system deficiencies and issues outlined in the preceding analyses.

Table 5-14 Estimated Transmission / Distribution System Construction Costs

Section to be Constructed or Replaced	Priority (1)	Deficiency Addressed	Length Size Unit Cost (2)	Estimated Cost (rounded)
a. Replace 6" steel main in Flora Rd between Broadway Ave & Valleyway Ave with 8" main	Low	Fire Flow/ Aging Steel Mains	1,350 LF 8-inch $178/LF	$240,000
b. 4-inch steel mains throughout Vera's distribution system	Low	Fire Flow/ Aging Steel Mains	51,000 LF 8-inch $178/LF	9,080,000
c. Loop 6" main from southwest Hillcrest Ln to Bella Vista Dr	Low	Fire Flow	200 LF 8-inch $178/LF	40,000
d. 24" main on 8th Ave from Evergreen to Progress Rd	Medium	Discharge Pressure at Wells	4,010 LF 24-inch $389/LF	1,560,000
e. 24" main on Progress Rd from Well 2 to 8th Ave	Medium	Discharge Pressure at Wells	5,500 LF 24-inch $389/LF	1,560,000
f. 30" main on Progress Rd from 8th Ave to 16th Ave	Medium	Discharge Pressure at Wells	2,700 LF 30-inch $461/LF	2,140,000
g. 30" main on 16th Ave from Progress Rd to Sullivan Rd	Medium	Discharge Pressure at Wells	1,300 LF 30-inch $461/LF	600,000
h. 30" main on 16th Ave from Sullivan Rd to 4MG reservoir	Medium	Discharge Pressure at Wells	4,500 LF 30-inch $461/LF	2,070,000
i. 16" main on 24th Ave from Evergreen Rd to Adams Rd	Low	Discharge Pressure at Wells	2,700 LF 16-inch $276/LF	750,000
		Construction Subtotal	**73,260 LF**	**17,720,000**
		Contractor Mobilization and Administration (8%)		1,420,000
		Sales Tax (9.0%)		1,590,000
		Contingencies (10%)		1,770,000
		Construction Total (rounded to nearest $100K)		22,500,000
		Engineering, Design, Construction Management and Inspection (25%)		5,630,000
		Project Total (rounded to nearest $100K)		**$28,100,000**

(1) *Due to cost and feasibility issues, main replacements occur in phases rather than all at once. Vera has prioritized needed main replacements. High priority areas will be replaced first and low priority areas will be replaced later.*

(2) *It is assumed all main replacements will require pavement restoration. If Vera coordinates main replacements with City of Spokane Valley paving projects the cost of main replacements could be substantially reduced (refer to preceding table for distribution system unit cost assumptions).*

Table 4 Estimated Cost of Water Main Extension and Main Replacements—The Crest

Description	Main Diameter (in)	Quantity	Unit	Unit Cost	Cost
Mains [1]	8	8,765	LF	$52	$455,780
	12	7,035	LF	$94	$661,290
Valves [2]	8	13	EA	$1,000	$13,000
	12	10	EA	$2,200	$22,000
Fittings [3]	8	9	EA	$500	$4,500
	12	6	EA	$2,000	$23,250
Fire Hydrant w/ shut off valves [4]	6	26	EA	$5,500	$143,000
Water Meters [5]	1	26	EA	$1,700	$44,200
Estimated Construction Subtotal [6]					**$1,356,000**
Mobilization (8%)					$108,480
Sales Tax (9%)					$122,040
Contingency (15%)					$203,400
Permitting (2%)					$27,120
Estimated Construction Total [6]					$1,817,000
Engineering, Construction Management, Inspection (20%)					$363,400
Estimated Total [6]					**$2,200,000**

(1) *Lengths estimated using Google Earth based on routing shown on **Exhibit A**. All lengths are approximate. Unit cost includes material and install. Assumes main will be installed on side of roadway with no asphalt removal/replacement with no rock excavation required. Rock excavation could significantly affect total cost if encountered.*

(2) *Quantities estimated based on routing shown on **Exhibit A** and Vera's design standard of minimum one valve every 1,000 feet of main.*

(3) *Quantity estimated based on routing shown on **Exhibit A**.*

(4) *Quantity estimated based on providing one hydrant per new connection due to large lot sizes in area.*

(5) *Assumes 1" services for new connections.*

(6) *Rounded.*

Table 4 Estimated Cost of Water Main Extension and Main Replacements—The Crest

Description	Main Diameter (in)	Quantity	Unit	Unit Cost	Cost
Mains [1]	8	8,765	LF	$52	$455,780
	12	7,035	LF	$94	$661,290
Valves [2]	8	13	EA	$1,000	$13,000
	12	10	EA	$2,200	$22,000
Fittings [3]	8	9	EA	$500	$4,500
	12	6	EA	$2,000	$23,250
Fire Hydrant w/ shut off valves [4]	6	26	EA	$5,500	$143,000
Water Meters [5]	1	26	EA	$1,700	$44,200
				Estimated Construction Subtotal [6]	**$1,356,000**
				Mobilization (8%)	$108,480
				Sales Tax (9%)	$122,040
				Contingency (15%)	$203,400
				Permitting (2%)	$27,120
				Estimated Construction Total [6]	$1,817,000
				Engineering, Construction Management, Inspection (20%)	$363,400
				Estimated Total [6]	**$2,200,000**

(1) *Lengths estimated using Google Earth based on routing shown on **Exhibit A**. All lengths are approximate. Unit cost includes material and install. Assumes main will be installed on side of roadway with no asphalt removal/replacement with no rock excavation required. Rock excavation could significantly affect total cost if encountered.*

(2) *Quantities estimated based on routing shown on **Exhibit A** and Vera's design standard of minimum one valve every 1,000 feet of main.*

(3) *Quantity estimated based on routing shown on **Exhibit A**.*

(4) *Quantity estimated based on providing one hydrant per new connection due to large lot sizes in area.*

(5) *Assumes 1" services for new connections.*

(6) *Rounded.*

Table 5 Estimated Cost of Booster Station Upgrades—The Crest

Description	Cost
Package pump system [1]	$100,000
Installation, piping modifications, valves, fittings, pump pedestals	$15,000
Building modifications [2]	-
Electrical and controls modifications	$10,000
Miscellaneous	$7,000
Backup generator [3]	-
Estimated Construction Subtotal [3]	**$132,000**
Mobilization (8%)	$10,560
Sales Tax (9%)	$11,880
Contingency (15%)	$19,800
Estimated Construction Total [3]	$175,000
Engineering, Construction Management, Inspection (20%)	$35,000
Estimated Total [3]	**$210,000**

(1) *Assumes a variable speed pumping package combination consisting of three additional pumps to achieve a combined capacity meeting future PHD with largest pump out of service and combined pumping capacity of all pumps equal to MDD plus 1,000 gpm fire flow.*

(2) *Assumes new pumping system and piping fits within existing building.*

(3) *Assumes no backup generator included given reliable power supply status in The Crest. Refer to Backup Power Consideration section for additional details.*

(4) *Rounded.*

Summary and Conclusions

The preceding Sections developed improvement cost estimates for providing water service and fire flow to landowners in the area of The Crest that have expressed interest in Vera water. The following table summarizes the estimated overall cost to provide water service to these parcels.

Table 6 Summary of Booster Zone Improvements—The Crest

Description	Cost
Water main extension and main replacements	$2,200,000
Booster station upgrades	$210,000
Estimated Total	**$2,410,000**

Water rights deficiencies

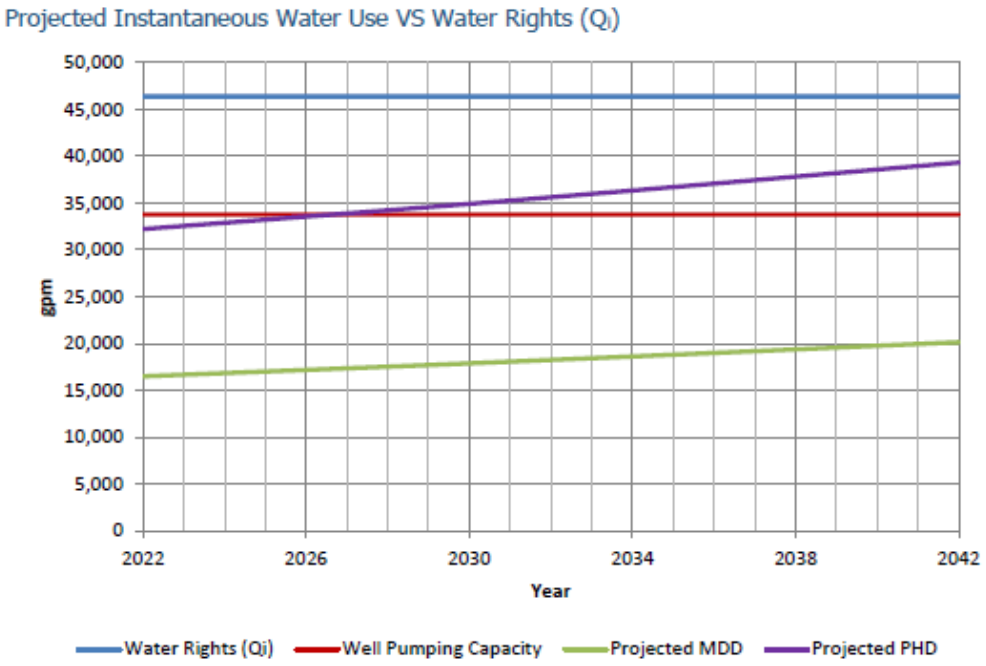
- explanation of the area impacted and their thoughts about remedy

Vera has adequate instantaneous water rights (Q_i) to meet current and projected 20-year needs. Existing wells utilize 33,800 gpm of Vera's available 46,400 gpm instantaneous withdrawal rate. This leaves 12,600 gpm of instantaneous withdrawal rights still available to Vera should it become beneficial to expand the pumping rate of existing wells or drill additional wells.
Water demand projections developed herein indicate Vera has adequate annual water rights (Q_a) to meet current and projected annual demands through the end of the 20-year planning period.
If at some point in the future additional water rights become necessary Vera can pursue applying for additional water rights from ECY, purchase or lease additional water rights from a third party or potentially conserve water to stay within current water rights.

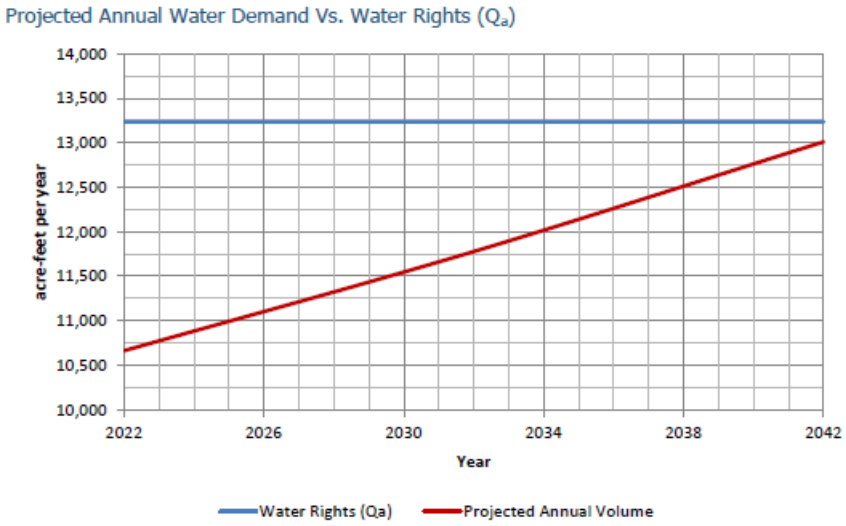
Vera has adequate annual water rights (Q_a) to meet current and projected annual demands throughout the 20-year planning period and Vera has adequate instantaneous water rights (Q_i) that exceed current well pumping capacity by 10,617 gpm. (WSP 2022)

Vera has an application pending with Ecology for a change/transfer of a small water right from Jay Rambo. Not including the Rambo water right, it appears that Ecology and Vera are in agreement that Vera has available 13,235 acre-feet of water; with priority dates as shown in Table 4-4 and 4-7.
It is believed that Ecology has confirmed Vera's instantaneous (Q_i) water right is 46,400 gpm. There does not appear to be any issue on the maximum instantaneous flow rate (Q_i) of 46,400 gpm.
Ecology has proposed a water rights adjudication for Spokane County; however, it has not funded the adjudication at this time.

Vera has instantaneous water rights (Q_i) totaling 46,400 gpm and existing well pumping capacity totaling 33,800 gpm. As shown in the figure following, Vera has adequate well pumping capacity to supply projected MDD and PHD throughout the next five years. At that point PHD may exceed current well pumping capacity and Vera may need to utilize equalizing storage to meet peak demands; or Vera could add well pumping capacity. Vera has sufficient water rights to permit addition of more wells to supply peak demands.



It is believed that through the Memorandum of Agreement with Ecology the questions regarding Vera's maximum annual volume rights (Q_a) available at this point has been resolved at 13,235 acre-feet, and that 13,235 acre-feet per year is deemed sufficient by Ecology for the 20-year projection. Refer to Appendix A for a copy of the Memorandum of Agreement with Ecology.



Vera has adequate annual (Q_a) water rights to meet current and projected annual demands for 20 years and it appears will not need to acquire additional water rights for that period.
Vera's instantaneous water rights exceed their current well pumping capacity by approximately 10,617 gpm. As growth occurs and PHD increases, Vera may elect to develop additional sources to meet peak demands. The logical point in time for such an expansion of District facilities is when existing wells can no longer meet peak demands and/or to increase redundancy; the PHD projections contained herein indicate Vera will need to expand source capacity to meet PHD within the 10-year planning period (in approximately five years). Vera possesses some instantaneous water rights to expand well capacity if

needed.

Inactive Systems

East Side Liberty Lake Improvement Club (ESLLIC)

According to the DOH, this system is inactive (the ESLLIC has been consolidated with Liberty Lake Sewer and Water District)

Fairview Heights T.C. (Group B System - No WSP @ DOH)

Group B System – Plan not available

Source

1 well

Storage

O storage capacity

Delivery

N/A

Schematic

N/A

Hide-a-Way T.P.

According to the DOH, this system is inactive (either consolidated, not reviewed by DOH, or now defunct)

Hutton Settlement

According to the DOH, this system is inactive (either consolidated, not reviewed by DOH, or now defunct)

Kaiser North

MEAD WORKS SOUTH PLANT

According to the DOH, this system is inactive (either consolidated, not reviewed by DOH, or now defunct)

Kaiser South

MEAD WORKS SOUTH PLANT

According to the DOH, this system is inactive (either consolidated, not reviewed by DOH, or now defunct)

Shady Pines T.P.

According to the DOH, this system is inactive (either consolidated, not reviewed by DOH, or now defunct)

Starlight Motel & M.H.P.

According to the DOH, this system is inactive (either consolidated, not reviewed by DOH, or now defunct)