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MEMORANDUM

Date: October 22, 2024

To: Bruce Reimers – New Prague Municipal Utilities

From: Mitchell Swanson, P.E.

Subject: Water System Modeling and Study - Summary
New Prague Municipal Utilities – New Prague, Minnesota
Project No.: 0M1.133584

The purpose of this memo is to summarize key points of the Water System Model and Study report which provides New Prague Municipal Utilities with relevant information regarding its water distribution system and recommendations for future improvements associated with the growing community. The report examined the existing 2024 water distribution system and the future 2044 water distribution system. Planned growth areas are based on the city's Comprehensive Plan. Population projections resulted in the following water demand projections.

Table 2.1 – Water Demands

Year	Population Projection	Projected Average Daily Demand (MGD)	Projected Maximum Daily Demand (MGD)
2024	8,768	0.833 (579 gpm)	1.749 (1,215 gpm)
2044	14,125	1.342 (932 gpm)	2.818 (1,957 gpm)

I. Design Criteria

Design requirements include the water supply wells' firm pumping capacity being equal to the maximum daily demand of the city. Firm pumping capacity is the total pumping capacity with the largest well out of service. Storage capacity requirements involve equalization storage for average daily demand and additional storage for fire protection. Pressure throughout the distribution system should stay above 35 psi during average daily demands and above 20 psi during maximum daily demands. Fire flow capacities should be 1,000 gpm for residential areas and 3,500 gpm is considered adequate for commercial and industrial areas; however, the fire marshal and ISO should be consulted to verify required capacities for insurance purposes. A water model of the existing and future system was developed to evaluate pressure and fire flow throughout the system.

II. Existing System Evaluation

The Public Utility operates the supply wells seen below in Table 3.1. The firm capacity of the wells is 2,410 gpm or 3.47 MGD. The existing distribution system's storage capacity was reviewed and determined to be deficient by 0.25 MG. Model results of the existing system show that pressures are within the recommended range and fire flows were above 1,000 gpm, except for the southwest pressure zone. Recommendations for the existing system are to add additional storage for fire flow capacity and improve fire flows to the southwest zone with larger pumps, a fire pump, or looping the southwest and southeast zones together. Looping is not anticipated to occur until the city has growth on the south side.

Table 3.1 – Supply Well Summary

Well No.	Feeds	Aquifer	Year Constructed	Capacity (gpm)
1	WTP No. 1	Tunnel City	1925	510
2	WTP No. 1	Tunnel City	1938	400
3	WTP No. 1	Tunnel City	1948	500
4	WTP No. 2	Mt. Simon	1988	500
5	WTP No. 3	Tunnel City	2002	500
6	WTP No. 3	Mt. Simon	2007	1,000
			Total Capacity:	**3,410 gpm (4.91 MGD)**
			Firm Capacity:	**2,410 gpm (3.47 MGD)**

III. Future System Evaluation

The future system assumes that Water Treatment Plant No. 2 is decommissioned. Well No. 4 is a Mt. Simon well, in 2021, the DNR limited the construction of new Mt. Simon wells; therefore it is recommended this well be maintained. It was not, however, used in the following evaluation. Topographic maps were used to delineate pressure zone boundaries.

Evaluating the storage capacity showed that the future system requires 1.0 MG of additional storage capacity. Based on the maximum daily demands shown above, the recommended firm pumping capacity is 1,957 gpm.

Treatment Plants No. 1 and No. 3 meet the capacity of future maximum daily demand; however, if the largest well is out of service, the capacity of Treatment Plant No. 3 drops to 500 gpm. This results in the treatment plants pumping 1,500 gpm, which is less than the maximum daily demand. It is therefore recommended that an additional well be installed near Water Treatment Plant No. 3 with a minimum capacity of at least 500 gpm.

While Water Treatment Plant No. 1 may be maintained, it is prudent to keep land north of Water Treatment Plant No. 3 for expansion purposes when Treatment Plant No. 1 is eventually decommissioned. When Treatment Plant No. 1 is decommissioned, additional wells need to be added to Treatment Plant No. 3 with a minimum combined capacity of 1,500 gpm to meet future maximum daily demands and replace the wells supplying Treatment Plant No. 1. The capacity of Treatment Plant No. 3 would also need to be expanded by an additional 1,000 gpm for a total capacity of 2,000 gpm.

The model of the future system showed pressures were in the desired range and all fire flow capacities were above 1,000 gpm.

IV. Opinion of Probable Cost

The cost estimates provided in this section are preliminary cost estimates using 2024 costs. Water supply, storage, and treatment improvement costs should be evaluated during the preliminary engineering of each item.

Table 5.1 shows probable costs for water supply and storage improvements. While maintaining Treatment Plant No. 1 would save capital costs compared to expanding Treatment Plant No. 3, there is additional risk when using a facility that is over 84 years old and supply wells that are over 76 to 99 years old. As improvements are made, the condition and capacity of Treatment Plant No. 1 and the associated wells should be evaluated to determine the long-term viability of the supply and treatment. The land north of Water Treatment Plant No. 3 should be kept for expansion purposes when Treatment Plant No. 1 is eventually decommissioned.

While constructing a ground storage tank in the form of a clearwell would save capital costs, there are additional operation and maintenance costs associated with pumps required to pump the water into the distribution system and associated power consumption. The clearwell could be the site of the future Treatment Plant No. 3 expansion when Treatment Plant No. 1 is decommissioned. The storage tank costs utilized for this report should be re-evaluated at the time of design to ensure it is sized correctly and that the proper reservoir is constructed.

Table 5.1 – Opinion of Probable Cost – Water Supply and Storage

Item	Cost Estimate – Clearwell	Cost Estimate – Water Tower
Construct 1,000 gpm Well	$1,200,000	$1,200,000
0.5 MG Tower – South Zone	$3,750,000	$3,750,000
Alternative: 0.5 MG Clearwell [(1)] – Water Treatment Plant No. 3	$2,000,000	-
Alternative: 0.5 MG Tower – Water Treatment Plant No. 3	-	$4,250,000
Subtotal	**$6,950,000**	**$9,200,000**
25% Contingency	$1,750,000	$2,300,000
20% Admin/Engineering/Legal	$1,750,000	$2,300,000
TOTAL	**$9.5M – $11.5M**	**$12.5M – $15M**

[(1)] Ground storage tanks and clearwells have additional O&M costs associated with pump maintenance and power consumption compared to elevated storage tanks.

Table 5.2 provides probable cost opinions to install the future watermains and includes mobilization, street restoration, and other associated costs; however, they do not account for smaller diameter lateral watermains and service lines to homes and businesses associated with future developments.

Table 5.2 – Opinion of Probable Cost - Watermain		
Watermain Size	**Linear Feet**	**Cost Estimate**
6-inch	1,480	$140,000
8-inch	309,220	$29,380,000
10-inch	116,660	$11,670,000
12-inch	23,720	$2,500,000
16-inch	160	$30,000
	Subtotal	**$43,720,000**
25% Contingency		$10,000,000
20% Admin/Engineering/Legal		$10,000,000
	TOTAL	**$60M – $65M**

Table 5.3 provides cost opinions for the expansion of the 10th Ave. booster station improvements and additional PRV stations. The 10th Ave. booster station improvements involve replacing the existing pumps with slightly larger pumps, removing the pressure tank, adding fire pumps, replacing pipe and valves, and electrical improvements. The PRV station costs include the structure, pressure reducing valve, piping, and isolation valves.

Table 5.3 – Opinion of Probable Cost –Booster Station, and PRV	
Item	**Cost Estimate**
10th Ave. Booster Station Improvements	$500,000
PRV Structure and Valve (approx. $60,000 each)	$250,000
Subtotal	**$750,000**
25% Contingency	$200,000
20% Admin/Engineering/Legal	$200,000
TOTAL	**$1M – $1.5M**

If Water Treatment Plant No. 1 is decommissioned, then Treatment Plant No. 3 should be expanded to increase its capacity by 1,000 gpm. Table 5.4 provides cost opinions for the expansion of Water Treatment Plant No. 3. This includes additional building space, filter equipment, and electrical equipment.

Table 5.4 – Opinion of Probable Cost – Water Treatment Expansion	
Item	**Cost Estimate**
Water Treatment Plant No. 3 Expansion	$10,000,000
Subtotal	**$10,000,000**
25% Contingency	$2,500,000
20% Admin/Engineering/Legal	$2,500,000
TOTAL	**$13.5M – $16.5M**

V. Phase Implementation

Planning for significant infrastructure requires a robust capital improvements plan (CIP) to couple proper timing of new and replacement system components with the ability to absorb associated costs. A three-phase approach is recommended to balance financial preparedness with the needs described in this report. Note an updated rate study is often necessary to align income with proposed system improvement expenditures.

Phase I includes the construction of a supply well and clearwell at Water Treatment Plant No. 3 and the expansion of the water distribution system in the immediate five-year horizon. In the following 10 years, the city should plan to address Phase II, which includes additional storage needs and further expansion of the distribution system. This sequencing allows the funding source time to build adequate funds. Phase III includes any improvements to the distribution system that remain after 15 years. This phasing assumes Treatment Plant No. 1 is maintained and an expansion of Treatment Plant No. 3 is not required until after this phasing sequence.

Note that increasing pipe size in the network is a substantial part of the future need. It is typically most efficiently accomplished by incorporating it into future street reconstruction projects to the extent possible. Pipe sizing in growth areas can simply incorporate recommended diameters as part of the initial street and municipal infrastructure construction. Storage and pressure boost components may need to be accelerated to permit growth in certain areas.

Table 6.1 – Recommended Phasing of Water System Improvements	
Phase I - Supply Well, Clearwell, and Water Distribution Expansion	$25M
Phase II - Additional Tower and Further Distribution Expansion	$25M
Phase III - Remaining Improvements to Distribution System	$25M
Total Anticipated Probable Costs Over Next 20+/- Years	**$75M**