CITY OF CORCORAN

Council Work Session Agenda
October 28, 2021 - 5:30 pm

1. **Call to Order / Roll Call**
2. **Water Supply Planning***
3. **Unscheduled Items**
4. **Adjournment**

HYBRID MEETING OPTION AVAILABLE

The public is invited to attend the regular Council meetings at City Hall.

Meeting Via Telephone/Other Electronic Means
Call-in Instructions:
+1 312 626 6799 US
Enter Meeting ID: 867 9126 8323
Press *9 to speak during the Public Comment Sections in the meeting.

Video Link and Instructions:
https://us02web.zoom.us/j/86791268323
visit http://www.zoom.us and enter
Meeting ID: 867 9126 8323

Participants can utilize the Raise Hand function to be recognized to speak during the Public Comment sections in the meeting. Participant video feeds will be muted. In-person comments will be received first, with the hybrid electronic means option following.

For more information on options to provide public comment visit:
www.corcoranmn.gov

***Includes Materials -** *Materials relating to these agenda items can be found in the Council Chambers Agenda Packet book located by the entrance. The complete Council Agenda Packet is available electronically on the City website at www.corcoranmn.gov.*

Stantec

Memo

To:	Kevin Mattson, Public Works Director	From:	Kent Torve, PE, City Engineer
File:	227704426	Date:	October 21, 2021

Reference: Corcoran Water Supply, Treatment, & Storage Project
Work Session Discussion

COUNCIL ACTION REQUESTED

Staff would like to meet with the City Council at the work session ahead of the regular City Council Meeting to talk through several design components for the Northeast Water Project including water storage alternative and building architecture.

DISCUSSION TOPICS

The Stantec Water Project Design Team will be at the City Council Work Session to present and discuss with the city council key design topics for the Northeast Water Supply Project.

The first topic to discuss will be the preferred water storage system and a discussion on elevated storage vs ground storage. Attached is a memo prepared by Stantec with additional information on the potential alternatives which will be presented on and discussed with the Council.

Secondly, we would like to have a preliminary discussion on the building architecture for the water treatment facility which is planned to be located along County Road 116 just north of Hunters Ridge. A powerpoint slide deck is attached to this memo and the project architect and staff will be at the meeting to present on architectural considerations for the facility.

If there is not enough time during the work session to fully discuss all of the topics, we can return to a future work session or City Council Meeting to follow up.

Water Storage Options Evaluation

Northeast Water System

October 20, 2021

Prepared for:

City of Corcoran

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APPENDICES

1.0 INTRODUCTION

Stantec has begun work on the preliminary design of the Northeast Water System which includes the preliminary design of a municipal well, trunk conveyance, water treatment plant, and water tower. A park site has been identified in the 5th and 6th Bellwether Additions in northeast Corcoran as the location for the water tower. However, as discussed at the September council meeting, the City has requested additional information in evaluating storage options which include a water tower, above-ground ground storage tank (GST), and buried storage tank based on concerns related to the aesthetics and location of the infrastructure relative to neighboring homes.

The purpose of this document is to summarize the three water storage options, evaluate them in the context of the proposed water treatment plant and distribution system for northeast Corcoran, and provide an updated cost comparison that includes capital, operation, and maintenance expenses for each option. This document will be presented to the City for discussion during the October 28th Council Work Session. After the Work Session, we would ask that the council review the information provided and, if comfortable, provide guidance on the on their preferred storage option to be carried through preliminary design.

Portions of this document reference the NE Water Supply Feasibility Study Update submitted in July 2019, the 2020 Northeast Water System Feasibility Study finalized in February 2021, and Feasibility Report Supplements provided in June 2021.

2.0 STORAGE OPTIONS SUMMARY

2.1 WATER TOWER

The NE Water Supply Feasibility Study Update (July 2019) identified 650,000 gallons as the minimum water storage volume required for fire flow. This volume corresponds to a standard water tower size of 750,000 gallons. Available water tower configurations include composite, single pedestal, and multi-column.

Composite or single pedestal tower configurations have been discussed as options for an elevated storage system in the preliminary design for northeast Corcoran.

- Composite water towers consist of a concrete pedestal with a steel bowl (see Figure 1). This configuration typically, has a higher cost of construction but provides the benefit of reduced cost of maintenance on the concrete support as well as providing an area for storage at the bottom of the tower. A dripping ring around the bowl prevents unsightly mold and generally requires less interim maintenance.

- Single pedestal water towers consist of a steel pedestal and steel bowl (see Figure 2). This configuration has a smaller footprint at the base of the tower. In terms of maintenance, this configuration can be prone to condensation and mold growth on bottom half of the tower and the cost for reconditioning is typically more than that of composites.

Figure 1: Composite Tower Example

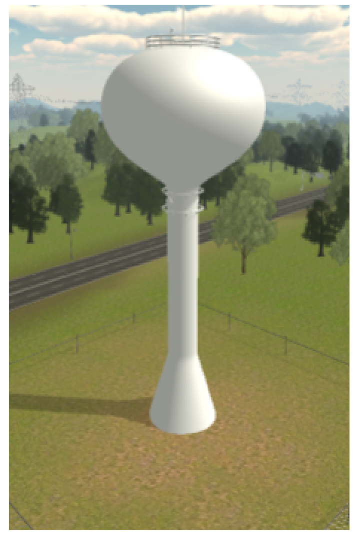


Figure 2: Pedestal Tower Example

2.2 GROUND STORAGE TANK

Ground storage tanks (GST) can be above ground, partially buried, or completely buried and are typically constructed of pre-stressed or poured-in-place concrete. GSTs are lower profile, making them less vulnerable to extreme weather events such as tornados. Various architectural finishes can be applied to the exterior of GSTs to achieve a desired aesthetic but can come at significant cost depending on the materials chosen and complexity. GSTs also require the construction of a booster station which consists of low and high demand pumps, a pressure tank, and a backup generator to provide pressure to the distribution system.

GSTs are typically constructed with domed roofs that are supported by the walls of the tank. It's also possible for the tanks to be partially or fully buried and have a flat roof that is supported by columns on the interior of the tank. Flat roofs can accommodate other uses above the tank and support the booster station infrastructure if site footprint is limited. Partially or fully buried tanks and flat roofs increase the overall construction cost due to additional excavation, requiring poured-in-place concrete, and additional costs associated with constructing internal columns to support the added roof loading. Figure 3 includes examples of above ground, partially buried, and buried GSTs.

Figure 3: Ground Storage Tank Examples

3.0 ALTERNATIVES EVALUATION

When considering which water storage option is best applied for the northeast Corcoran system, the following criteria have been identified as key decision drivers – aesthetics relative to surrounding community, functionality relative to other components in the system, and operability and serviceability.

3.1 AESTHETIC & SITE CONSIDERATIONS

The proposed water storage location will be in a City park located in the Bellwether 5th and 6th Additions and be surrounded primarily by single-family homes. The City wants to ensure that the water storage infrastructure will be aesthetically acceptable to the residents in the neighboring developments.

The proposed water tower option would be approximately 180-feet tall and 66-feet in diameter to accommodate the system pressure and total storage volume requirements. A shadow study for this option was completed in September 2021 to evaluate the shadowing impacts of a water tower on neighboring homes. Four figures were developed based on the time of year to project the shadow that would impact homes at various times of day and are included in Appendix A.

Water towers are the most common water storage option for communities in Minnesota due to the lack of vertical relief and operational advantages. As previously discussed, common tower configurations are composite and pedestal towers which can be painted in a variety of ways to display the City's name, logo, and instill a sense of community pride. Water towers typically have to be repainted every 20 years, which provides the opportunity for the City to update its logo and community branding.

Water towers can also accommodate telecommunications antennas, which can be a revenue source for the City, but may also be less aesthetically pleasing. Composite water towers could have maintenance storage space in the base of the tower which could be utilized by the City for park maintenance or other public works equipment.

A 750,000 gallon GST option would be approximately 40-feet tall and 66-feet in diameter if constructed at grade with a domed roof or 30-feet tall if constructed at grade with a flat roof. The GST would also require the construction of a booster station, which could be designed to look like a typical park building and would be constructed next to the GST or above it. Typical dimensions for a booster station would be approximately 30'x40'. A flat roofed tank could be designed for additional roof loading to accommodate additional park facilities and the booster station building, but at significantly greater cost compared to above ground options.

The exterior of the tank can be painted to display a City logo or finished with a specialized architectural treatment such as stone, brick, or columns. However, the cost of architectural treatments can escalate quickly and, given the tank's location in the City park, it may be a target for graffiti and vandalism. A fence around the GST would be recommended but would increase the footprint required and would have to be designed to fit into the context of the rest of the park.

A buried or partially buried tank would have to take into consideration the groundwater depth and buoyancy. At this time there is no ground water elevation data for the proposed site to determine if a buried or partially buried GST would be feasible or if it would require a drain and pumping system to maintain dry conditions under the tank. The depth of a buried tank would be limited by the suction lift of the pumps and would result in a larger diameter tank and footprint with dimensions of approximately 100-feet in diameter and 15-feet in depth.

Site figures have been prepared for both options that display the dimensions of the infrastructure relative to the preliminary park layout and are included in Appendix B.

3.2 SYSTEM CONSIDERATIONS

The main difference between water tower and GST options is how each interacts hydraulically with the overall water system. Water towers are at the highest elevation in the overall system which allows for them to passively provide water pressure to the entire distribution system without pumping. GSTs require water to first be pumped from the water treatment plant to the storage tank, and then again to the distribution system. In the event of a power outage, a GST requires backup generation to maintain pressure and deliver water. In contrast, during a power outage, a water tower can provide hours or days of supply to the system without backup power. Having available storage volume and system pressure from a water tower reduces stress on the operators in emergency situations.

Given that the northeast system will be a first for the City, maintaining a high level of system resiliency in emergency situations is recommended. The elevation of the proposed water tower would be designed so that it is similar to the hydraulic grade ine of Maple Grove. This would allow for a system interconnect in which case either the Corcoran water tower or the Maple Grove water tower could provide temporary supply to both systems in an emergency. Corcoran currently has this type of connection with Medina along Hackamore Road. This type of built-in redundancy would be more complicated with a GST using service pumps to supply Maple Grove, but for Corcoran during pump downtime the Maple Grove source would supply northeast Corcoran users.

3.3 OPERABILITY & SERVICEABILITY

The booster station for a GST includes one or two low-demand (daily use) pumps and two high-demand pumps (fire flow) in addition to a hydro-pneumatic tank and compressed air system that is used at very low demand. The two systems are similar for system pressure for the tower the wells pump to the treatment plant and then water is pumped from the treatment plant to the holding tank or tower. The GST has well pumps to the treatment plant, but additional pumps for fire flow. The daily use pumps are more complicated since demand is variable during the day and night. In contrast, a water tower's pumps are somewhat simpler in that water from the treatment plant can be pumped at a steady rate to fill the tower. The GST will require its own generator which will be in addition to the generator at the WTP.

The two options vary in terms of the maintenance time and cost for pumps and equipment. Typically a 10-year pump maintenance program can be followed for well pumps, etc. and more frequent maintenance may be needed for the GST. The relative challenges of operating a GST and booster pump system compared to a water tower should be considered for a City that will be operating and maintaining its own system for the first time.

4.0 COST SUMMARY & FINAL CONSIDERATIONS

Capital cost components for water towers include the foundation requirements, piping and appurtenances, composite pedestal and bowl, painting, and utility connections. Annual operating costs are associated with inspections, cleaning, equipment maintenance and replacement, and aesthetic rehabilitation. Table 1 presents budgetary capital costs for a 750,000 gallon, 180-foot tall composite tower with a shallow foundation system. If deep foundations are required, additional costs may approach $300,000.

Table 1: Water Tower Capital Cost Summary

Component	Cost
Water Tower (Composite Pedestal, Bowl)	$3,250,000
Piping & Appurtenances	$100,000
Site Improvements, Landscaping	$75,000
Paint w/ Logo	$350,000
Utility Connections (Gas, Electric)	$20,000
TOTAL	**$3,795,000**

The major capital cost components for a GST include the tank, tank piping and connection to the watermains, foundation requirements, earthwork, architectural treatments, the booster station with backup power generation, and connections to gas and electrical utilities. Annual operating costs are associated with inspections, tank cleaning, equipment maintenance and replacement, additional operations staffing requirements, and aesthetic rehabilitation. Table 2 presents budgetary capital costs for a 750,000 gallon, above ground storage tank with a shallow foundation system. If deep foundations are required, additional costs may approach $300,000.

Fully buried or partially buried tanks increase the capital costs significantly beyond the base option presented in Table 2 due to different structural needs, methods of construction, and additional excavation costs. If an at-grade GST is not desirable, the City should consider a partially or fully buried tank to be the most expensive of the three options with respect to both capital and O&M costs.

Table 2: Ground Storage Tank Capital Cost Summary

Component	Cost
Tank (above ground, tank only)	$1,035,000
Piping & Appurtenances	$100,000
Site Improvements, Landscaping	$100,000
Basic Architectural Treatment or Paint w/ Logo	$300,000
Booster Station & Backup Power	$1,200,000
Utility Connections (Gas, Electric)	$75,000
TOTAL	**$2,810,000**

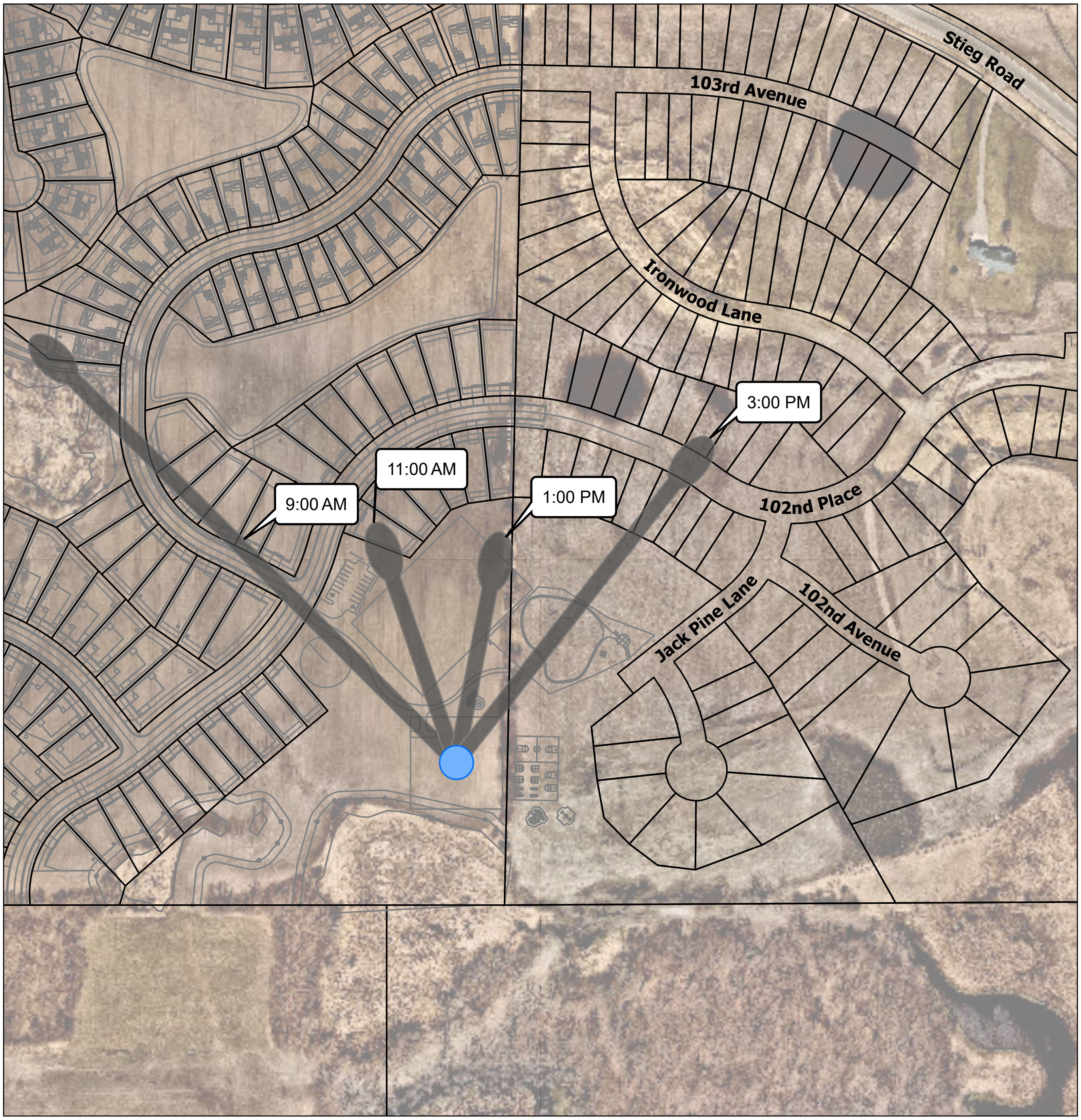
Table 3 summarizes the 30-year operating and maintenance expenses associated with the two options based on the expected annual recurrence of each expense. The main O&M cost differences are associated with pump and equipment replacement for the additional assets and additional operator hours to maintain the booster station facility on a daily basis and to complete annual maintenance activities. This comparison does not quantify electrical usage or revenue from hosting a cellular antenna, but both would favor the water tower option.

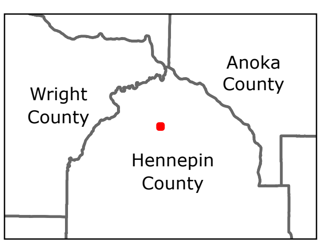
Table 3: 30-Year O&M Expense Summary

	Tower		GST	
Expense Category	**Recurrence**	**Cost**	**Recurrence**	**Cost**
Inspection, Cleaning	1	$ 7,500	1	$ 7,500
Pump, Equipment Replacement	5	$ 20,000	5	$ 50,000
Painting	20	$ 300,000	20	$ 200,000
Operator Hours	-	-	1	$ 31,200
30-year TOTAL	**$ 795,000**		**$ 1,761,000**	

Ground storage tanks and water towers are both in use throughout the metro area and have individual benefits and disadvantages. As discussed, there are specific considerations for the City to evaluate relative to the location of the infrastructure, effects on the overall water system, emergency response, and the City's relative experience in operating their own system. The costs presented in this evaluation represent the most cost-effective, base options for water tower and GST options.

Appendix A SHADOW STUDY FIGURES





Legend
- Water Tower
- Projected Shadow (180' Tall, 66' Wide Tower)
- Proposed Layout
- County Parcels

0 150 300 Feet
(At original document size of 8.5x11)
1:3,600

N

Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County, Sathre Bergquist
3. Background: Hennepin County 2020 Aerial Photograph

Stantec

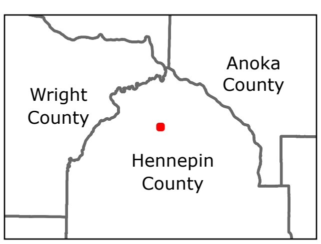
Project Location
T119N, R23W, S01
Corcoran, Hennepin Co., MN

Prepared by JCS on 2021-09-09
TR by XXX on 2020-XX-XX
IR by XXX on 2020-XX-XX

Client/Project
227704380
City of Corcoran
Water Tower Shadow Study

Figure No.
1

Title
Projected Shadow - January



Legend

- Water Tower (180' Tall, 66' Wide)
- Projected Shadow
- Proposed Layout
- County Parcels

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Stantec

Project Location
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TR by XXX on 2020-XX-XX
IR by XXX on 2020-XX-XX

Client/Project
227704380
City of Corcoran
Water Tower Shadow Study

Figure No.
2

Title
Projected Shadow - April

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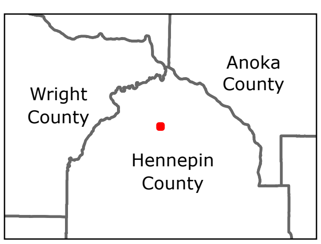

Legend
- Water Tower (180' Tall, 66' Wide)
- Projected Shadow
- Proposed Layout
- County Parcels

0 150 300 Feet
(At original document size of 8.5x11)
1:3,600

N

Stantec

Project Location
T119N, R23W, S01
Corcoran, Hennepin Co., MN

Prepared by JCS on 2021-09-09
TR by XXX on 2020-XX-XX
IR by XXX on 2020-XX-XX

Client/Project
City of Corcoran
Water Tower Shadow Study

227704380

Figure No.
3

Title
Projected Shadow - July

Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County, Sathre Bergquist
3. Background: Hennepin County 2020 Aerial Photograph

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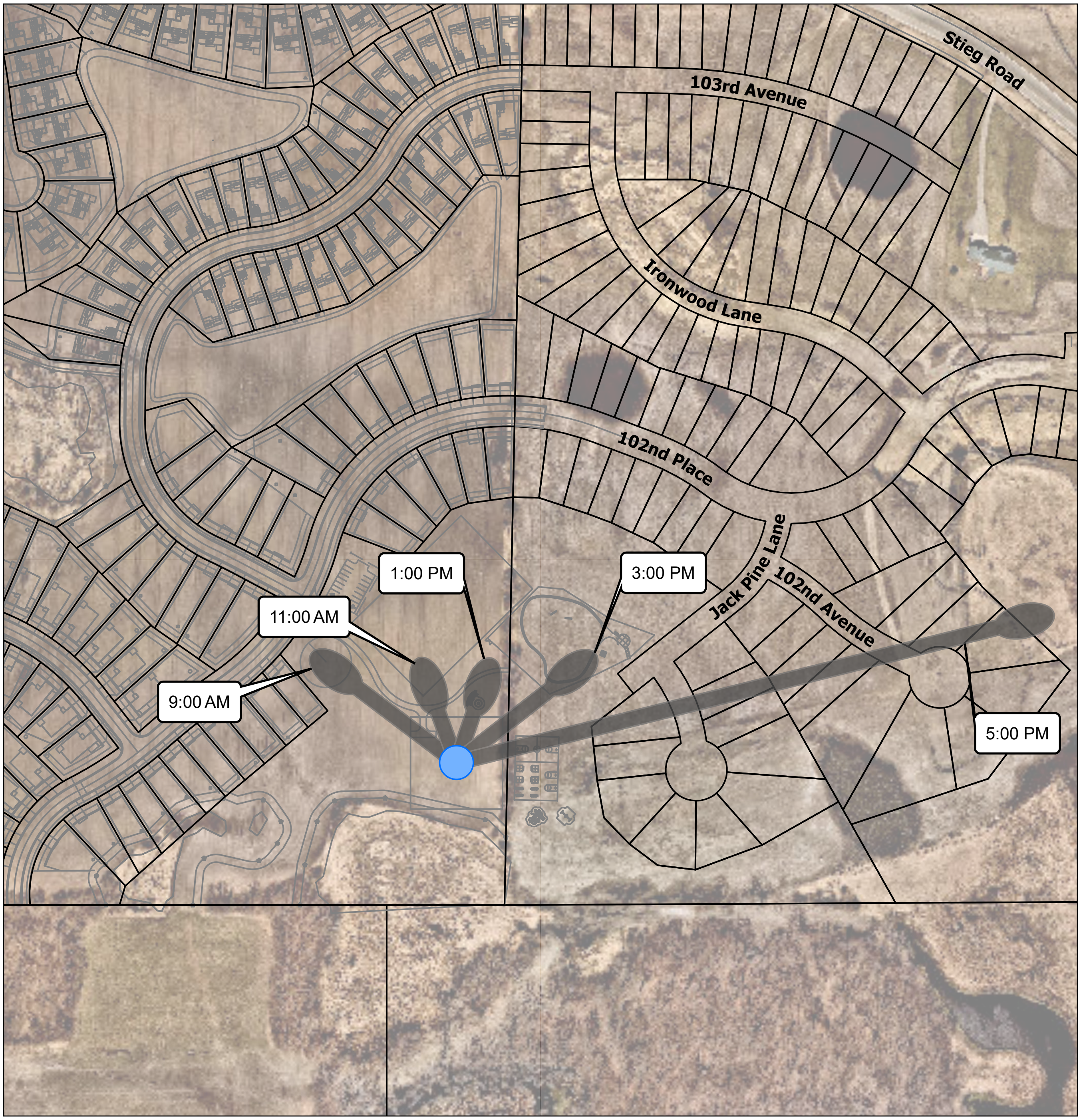

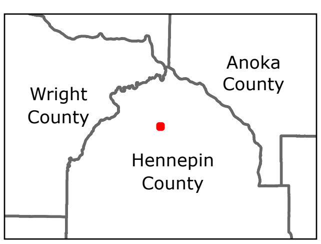

Legend

- Water Tower (180' Tall, 66' Wide)
- Projected Shadow
- Proposed Layout
- County Parcels

0 150 300 Feet
(At original document size of 8.5x11)
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N

Stantec

Project Location
T119N, R23W, S01
Corcoran, Hennepin Co., MN

Prepared by JCS on 2021-09-09
TR by XXX on 2020-XX-XX
IR by XXX on 2020-XX-XX

Client/Project
227704380
City of Corcoran
Water Tower Shadow Study

Figure No.
4

Title
Projected Shadow - October

Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County, Sathre Bergquist
3. Background: Hennepin County 2020 Aerial Photograph

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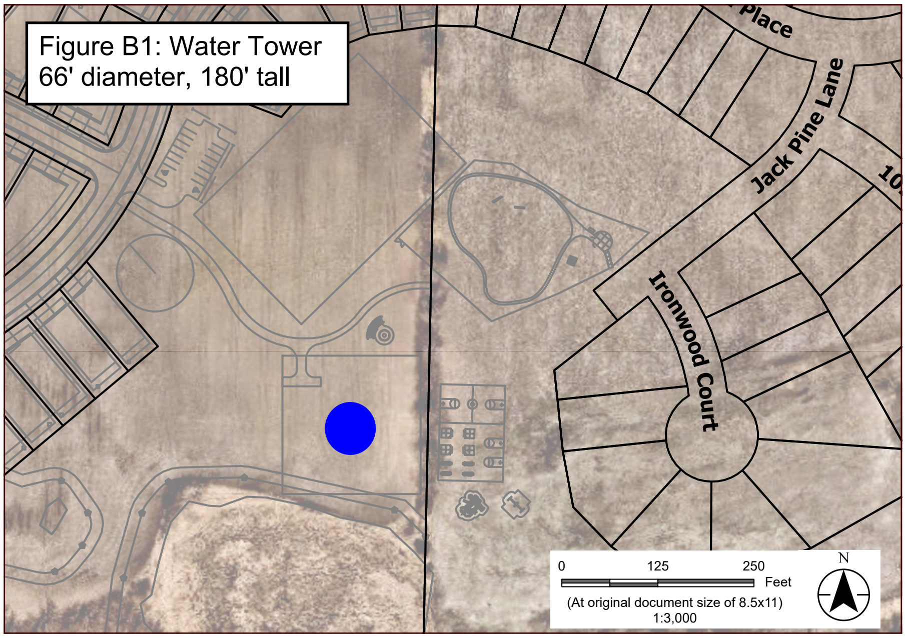
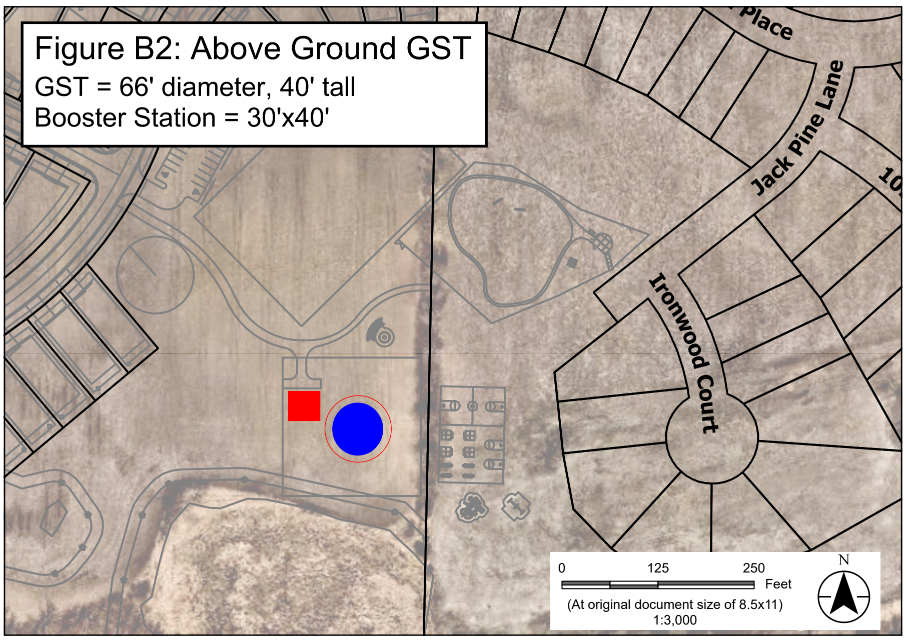
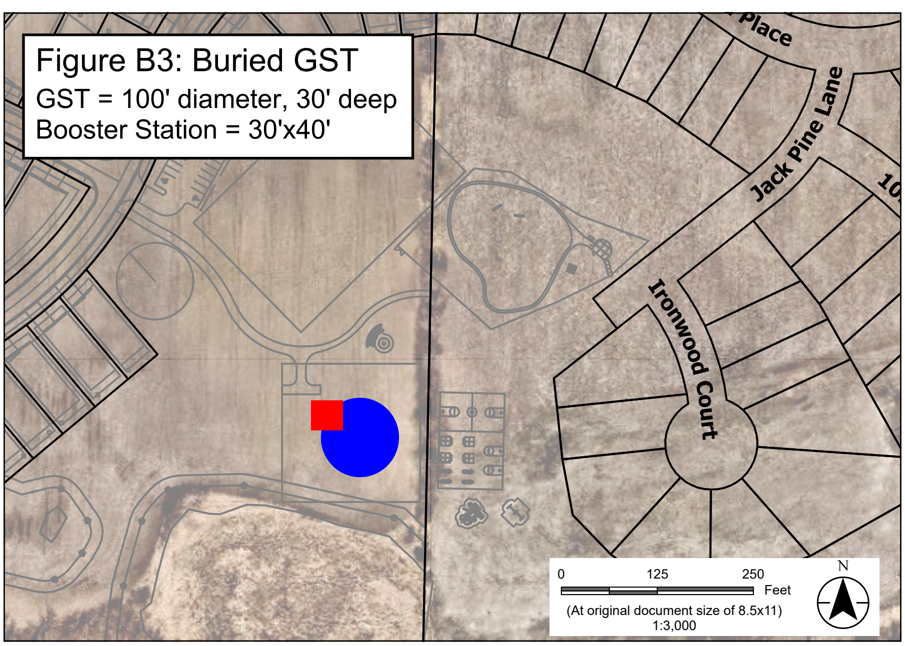
Appendix B WATER STORAGE COMPARISON FIGURES







Stantec

Project Location
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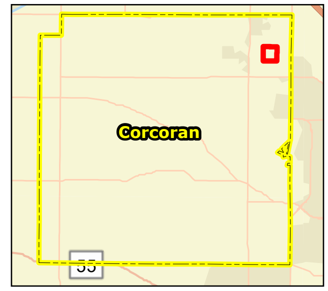
Corcoran, Hennepin Co., MN

Prepared by XXX on 2021-10-20
TR by XXX on 2020-XX-XX
IR by XXX on 2020-XX-XX

Client/Project
City of Corcoran

227704380



Notes
1. Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet
2. Data Sources: Hennepin County, Sathre Bergquist
3. Background: Hennepin County 2020 Aerial Photograph

Chaska Water Treatment Facility

16 MGD capacity

- Six gravity-type filter cells
- Three backwash retention tanks
- 750,000-gallon clearwell
- 15,000 GPM high-lift pumping capacity

Chaska Water Treatment Facility

Face brick veneer with manufactured stone accent band
Prefinished metal wall panels
Prefinished metal coping at flat roofs
Prefinished metal standing seam roof panels at pitched roofs
Aluminum framed windows

Chaska Water Treatment Facility

Face brick veneer with manufactured stone accent bands
Prefinished metal wall panels
Prefinished metal coping at flat roofs
Prefinished metal standing seam roof panels at pitched roofs
Aluminum framed windows

Chaska Water Treatment Facility

Face brick veneer with manufactured stone accent bands
Prefinished metal wall panels
Prefinished metal coping at flat roofs
Prefinished metal standing seam roof panels at pitched roofs
Aluminum framed windows

Hastings Water Treatment Facility

3 MGD Capacity

- Engineered anionic exchange removal facility treats high nitrate well water to less than 5 PPM of nitrate

Hastings Water Treatment Facility

EIFS (Exterior Insulation and Finish System) at roof overhangs and walls
Manufactured stone wall veneer
Precast concrete window sills and column accents
Aluminum framed windows at grade
Translucent wall panels below high roof
Prefinished metal coping at flat roofs

Hastings Water Treatment Facility

EIFS (Exterior Insulation and Finish System) at roof overhangs and walls above brick
Manufactured stone wall veneer columns
Face brick veneer with arched tops
Precast concrete window sills and column accents
Translucent wall panels below high roof
Prefinished metal coping at flat roofs

Hastings Water Treatment Facility

EIFS (Exterior Insulation and Finish System) at roof overhangs and walls above face brick
Manufactured stone wall veneer
Face brick veneer with arched tops
Precast concrete window sills and column accents
Translucent wall panels below high roof
Prefinished metal coping at flat roofs

Apple Valley Water Treatment Facility Expansion

Increased capacity from 16.25 MGD to 24.4 MGD

- Added 4 new filter cells and pipe gallery
- Added new backwash tank

Apple Valley Water Treatment Facility Expansion

Face brick veneer – three color blends
Manufactured stone corner accent
Horizontal corrugated prefinished metal wall panels behind name
Multi-colored prefinished aluminum wall panels
Aluminum framed windows
Prefinished metal coping at flat roofs

Apple Valley Water Treatment Facility Expansion

Face brick veneer – three color blends
Manufactured stone corner accent
Multi-colored prefinished aluminum wall panels
Aluminum framed windows
Prefinished metal coping at flat roofs

Chaska Ground Water Storage Booster Station

Chaska Ground Water Storage Booster Station

Chaska Ground Water Storage Booster Station

Stacy Water Treatment Facility

0.6 MGD Capacity

- Gravity filtration to remove radium, manganese, and iron

Stacy Water Treatment Facility

Stacy Water Treatment Facility

Stacy Water Treatment Facility

Maple Plain Water Treatment Facility

1.0 MGD Capacity

- Gravity filtration to remove radium, manganese, and iron

Considerations

Exterior Wall Materials:

All of the water treatment facility examples shown above utilize a structural masonry or precast concrete panel backup system with a wall cavity for insulation and the visible materials are a veneer.

- Face brick – 100-year lifecycle with mortar pointing required at 50 years
- Precast Concrete Wall Panels – 100-year life cycle with caulking replacement every 10-20 years
- Manufactured Stone – 100-year lifecycle with mortar pointing required at 50 years
- Prefinished metal panels – 35-year warranty against peeling, checking or cracking
- EIFS – 50 years (no warranty against birds pecking holes through the synthetic plaster and removing the insulation to build nests)
- Windows – 50 years for frames; 10 years for glass panes
- Translucent wall panels – 50 years for frames; 30 years for translucent panels

Roof Options:

- Flat roof – 20- or 25-year warranties available
- Pitched roof with prefinished standing seam metal panels – 50-year lifecycle
- Pitched roof with asphalt shingles – 40+ year warranties available.

Victoria Water Treatment Facility & Firehouse

XX MGD Capacity

- Gravity filtration to remove iron and manganese

Victoria Water Treatment Facility & Firehouse

Victoria Pumphouse No. 3

Cottage Grove Fire Station

Cottage Grove Fire Station