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MEMORANDUM

TO: Jarrod Cabral, Director of DPW, Town of Truro

FROM: Tom Lee, P.E.

COPY TO: Emily Beebe, Town of Truro
Cody Salisbury, Water Superintendent, Provincetown DPW – Water Division

DATE: April 12, 2023

RE: Truro - Potential Water Storage Tank Site

This memorandum summarizes Horsley Witten's analysis to-date of potential locations of a water storage tank in the Town of Truro.

The Town of Truro's drinking water is supplied by the Provincetown Department of Public Works (DPW) - Water Department. Based on the 2022 water supply data, the Town of Truro used 21,000,000 gallons. Currently, the water meter reading for Truro usage is taken once every six months. The 2022 summer consumption was approximately 16,000,000 gallons for six months, between April 15 and October 15. The average day demand (ADD) is averaged to be approximately 90,000 gallons per day (gpd). The historical max day demand (MDD) factor to the ADD is 2.54 while the peaking hour factor is 2.5 times MDD. The current WaterCAD model is provided by Environmental Partners Group, Inc. ("Environmental Partners") via Provincetown DPW – Water Department. Horsley Witten Group, Inc. ("HW") has used the same WaterCAD software to provide the additional modeling work for the Pond Road extension and water tank alternative site evaluation.

Water Demands:

Before HW used the WaterCAD model to work on the Pond Road extension, we noticed that there was no water demand assigned for the Clover Leaf Development in the existing model. Therefore, we added the water demand for the Clover Leaf Development and Pond Road extension to the WaterCAD model. The model result shows that the 8-inch watermain on the Pond Road extension will provide sufficient system pressure and meet the fire flow requirement. The design of the 8-inch watermain was completed.

In evaluating a suitable location and design for a tank, the Town requested the addition of the future water demand for the proposed Walsh property and the additional buildout of 250 homes

in Truro to the model. The Walsh property will consist of 260 two-bedroom homes. Based on the information, we estimated the ADD as 172,843 gallons per day (gpd) as show below:

- Summer demand (2022): 90,000 gpd
- Clover Leaf Development: 6,305 gpd
- Pond Road Extension: 10,238 gpd
- Future Walsh Property: 32,500 gpd
- Future Buildout: 33,800 gpd
- Total ADD: 172,843 gpd

Note: HW used the estimated population times 65 gallons per capita per day (gcpd) as the ADD. Sixty-five gcpd is an acceptable water demand according to Massachusetts Department of Environmental Protection and Massachusetts Department of Conservation and Recreation.

For the proposed Walsh Property, we added the water demand on one junction (J-999) in the WaterCAD model. As for the future buildout, we added 50% of the future demand to the south end of Truro (J-249) and 50% of the future demand to Pond Road (J-987).

Minimum Water Tank Volume:

The minimum water tank volume is estimated to include the MDD plus the allowable fire flow storage. The MDD is estimated at 439,021 gallons (=2.54 x 172,843 gallons) or 440,000 gallons while the fire flow storage is estimated at 240,000 gallons (=2,000 gpm x 120 minutes). The total volume is 680,000 gallons. Based on a typical elevated water storage tank configuration, the minimum tank volume is 750,000 gallons. Assuming a typical composite column tank, the expected tank diameter is 64 ft with an operating head of 40 ft.

System Pressure or Hydraulic Grade Line:

The existing operating hydraulic grade line (HGL) provided by the Provincetown DPW - Water Department is at 171.58 ft.

Table 1: Estimated Highest Elevation Served

Highest Elevation Served	Existing Pressure Zone	Proposed high pressure zone
HGL, ft	173.58	220
Min system pressure, psi	40	40
Min system pressure, ft	92.4	92.4
Estimated system headloss, ft	20	10
Highest elevation served	61.18	117.6

The Provincetown DPW – Water Department selected 40 psi as its minimum system pressure even though MassDEP recommends a minimum system pressure as 35 psi, which is a conservative minimum system pressure. The highest elevation served would be approximately

61ft. Truro has parcels with elevations between 100 and 120 ft. For the new water storage tank, we used the fire protection volume to set as the minimum water level, which is 220 ft. The bottom of the proposed tank would be at 212 ft.

In this study, there are two potential tank sites to be evaluated. They are shown in Figure 1 as location A and location B. Location A is located at the Police Station at an elevation of 115 ft while location B is located at the proposed Walsh Property Development at an elevation of 138 ft. We selected the location at the Walsh Property Development as the proposed water storage tank location in our WaterCAD model scenarios. The new tank would be 112 ft above the ground elevation.

Fire Flow:

Without the benefit of any fire flow requirements from the International Standards Organization (ISO) and the fire department, we have assumed a commercial fire flow requirement of 1,500 gpm and4 a residential fire flow requirement of 800 gpm. However, we used 2,000 gpm in the WaterCAD model for various scenarios. We will review the fire flow available to determine if the system conditions meet the fire flow requirements.

Model results:

We set up and conducted four WaterCAD model scenarios including ADD and MDD with fire flow for the proposed water storage tank on the Walsh Property.

With the projected water demand under the MDD and fire flow conditions, the result showed 15 model junctions that were below 40 psi. The lowest pressure was 32 psi. If 35 psi is acceptable, there would be only 7 model junctions that were below 35 psi. They are all located in the existing pressure zone. As for the fire flow, the results indicate six model junctions that had available fire flow less than 800 gpm. The six model junctions are J-770, J817, J-825, J-963, J-986 and J-987. Twenty-two model junctions showed less than 1,500 gpm. There were seven model junctions that were not assigned with fire flow (based on the original WaterCAD Model).

Potential Water Storage Tank Engineering and Construction Cost:

The minimum water storage tank volume of 750,000 gallons seems to be adequate. However, a small incremental cost would allow for a 1,000,000 gallons tank. The additional storage volume will allow for additional future water demand or water connections.

We prepared the following cost estimate for 750,000 gallons and 1,000,000 gallons tank as a comparison. If this project is to proceed, it may take up to four (4) years or more for the completion of the future water demand study, updating and confirmation of the WaterCAD model, detailed design, and construction.

Table 2: Potential Water Storage Tank Cost

Composite Elevated Tank	750,000 gallons	1,000,000 gallons
Water Storage Tank Cost	$3,250,000	$ 4,200,000
Interior Valve Room	$ 300,000	$ 300,000
Tideflex Mixing System	$ 150,000	$ 150,000

Subtotal	$3,700,000	$ 4,650,000
Foundation	$ 500,000	$ 750,000
Site Related Work	$ 500,000	$ 500,000
Detailed Design Engineering (15%)	$ 705,000	$ 885,000
Construction Observation (10%)	$ 470,000	$ 590,000
Contingency (50%)	$2,937,500	$ 3,687,500
Inflation (3% for 4 years)	$1,001,100	$ 1,256,700
Total Budget (2023$)	$9,343,600	$11,729,200

Note: Elevated water storage tanks have many style options, such as multi-column, pedesphere, and composite elevated tank. The storage tank costs vary between $2,340,000 and $3,250,000 for a 750,000 gallons tank and $2,900,000 and $4,200,000 for a 1,000,000 gallons tank.

Conclusion:

1. Without knowing the exact location of the future water demand, we assigned 50% of the demand to the south end of the Town (J-249) and 50% of the demand to Pond Road (J-987). If more information is available that would place the demands in different model junctions, the model results may be different regarding the system pressure and fire flow available.
2. The existing water system is primarily along Route 6A. There is not much pipe looping to the existing water system. Any future watermain extension should consider watermain looping.
3. If two pressure zones are likely scenario, a more detailed WaterCAD model should be conducted with possible pressure reducing valves.
4. Confirm the pump curves for booster pumps (BP-1, DP-1 and DP-2).
5. When the future water demand study is completed by Environmental Partners, the WaterCAD model should be confirmed and updated as needed.
6. The Town should consider whether there might be any other future water demands, such as PFAS affected private or public water supplies needing replacement within the Town of Truro.
7. The high point at elevation 138 on the Walsh property is a potential location for an elevated water storage tank site. The access to this potential location is important. However, we do not yet know if any housing layout is being considered.
8. The overflow and draining of the water storage tank should be part of the site consideration. A site visit to the area is highly recommended before any decision is made.
9. The Provincetown Public Work – Water Department should review the WaterCAD model and may consider other operating parameters to be part of the WaterCAD model.

Potential Water Tank Locations

Town of Truro, MA

1 inch = 700 Feet

0 700 1400 2100

April 10, 2023

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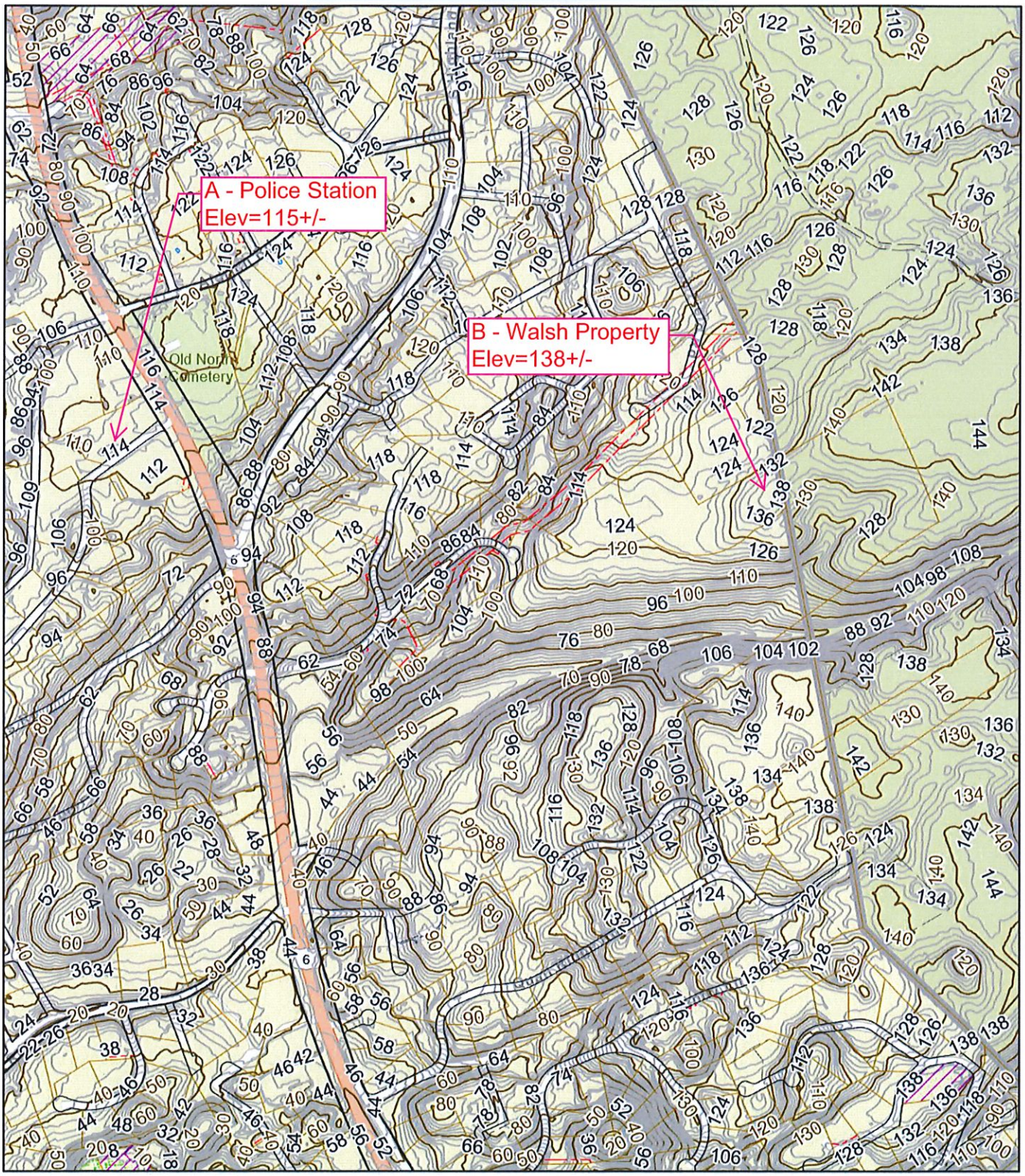

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Figure 1