CITY OF FLINT
FINANCE DEPARTMENT - DIVISION OF PURCHASES AND SUPPLIES

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Dr. Karen W. Weaver
Mayor

December 21, 2018

TO: All Proposers

FROM: Bryan D. Bond, Interim Purchasing Manager
Department of Purchases & Supplies

SUBJECT: Addendum #1 – Proposal #19000553 - "Engineering Services – Dort and Cedar Pumping Station Improvements" Due Thursday, January 24, 2019 @ 3:00 PM EST

A REVISED MANDATORY PRE-PROPOSAL MEETING HAS BEEN CHANGED AND WILL BE HELD AT THE WTP (4500 N. DORT HWY.), WEDNESDAY, JANUARY 9, 2019 @ 10:00 AM (EST)

The City of Flint (City), Department of Purchases & Supplies has issued Addendum #1 to the above referenced proposal. Please include this and any additional attached documents as part of the new scope of requirements in the RFP.

The purpose of this addendum is to provide a revision of the scope and approach of services within the original RFP documents. Additional attachments are provided for consideration of this addendum.

All other terms, conditions and requirements of the RFP remain. The due date has been unchanged and is Thursday, January 24, 2019 @ 3:00 PM (EST)

Bryan D. Bond
Finance Department - Division of Purchases and Supplies

Attachments

The estimated construction cost for this project is $8M.

Requested Services

The City of Flint is seeking to enter into a contract with one (1) prime consultant/contractor ("consultant") to provide design, permitting, bidding and construction administration services for the City of Flint – Dort and Cedar Street Pump Station and Storage Improvement project. At a minimum, this work assignment will include the following activities.

"This critique shall include an updated evaluation of renovation of the existing Pump Station #4 compared to construction of a new Dort Pumping Station. Previous analyses, performed by CDM Smith and AECOM, are attached. Since the scope of a renovated pumping station still requires definition, the Design/Permitting cost proposal shall be based on the construction of a new pumping station."

Design/Permitting (Phase 1 and 2 will be designed concurrently)

1. Preparation of a brief design concept critique to identify specific scope modifications which may result in a more cost-effective project, simplify construction and/or improve operating procedures.
2. Preparation and maintenance of a progress schedule through the Notice of Award of the selected construction contractor. The schedule shall compare actual to scheduled activities and be updated monthly. At a minimum, the schedule should include specific dates for the following milestones:
    - Each specific design review meeting (at least one week should be allotted for Water Department review of submitted information before each meeting)
    - Completion of applications for each specific permit and/or easement
    - Design phase completion
    - Receipt of specific permits
3. All survey work necessary to adequately complete the design, file permit and easement applications and provide reference points for use by the contractor.
4. All geotechnical investigations including soil borings, rock cores, and auger probing as necessary to adequately complete the design and allow for accurate estimating of construction earthwork.
5. For the Cedar Street Pumping Station, assess the presence of asbestos, lead paint or other environmental factors that could impact the project.
6. Interaction with all utility companies to design and specify proper service for the proposed improvements and to coordinate the relocation of existing facilities, as required.
7. Preparation and maintenance of a Design Memorandum.
8. Development of a list of all equipment that the City should consider for direct purchase to expedite completion of the project. This should include an assessment of the City risk compared to the estimated construction schedule time reduction.

PROJECT 2

DORT RESERVOIR PUMPING STATION AND CEDAR STREET PUMP REPLACEMENTS

1. BACKGROUND

The City of Flint currently receives their drinking water based on a long term contract with the Great Lakes Water Authority (GLWA). GLWA provides water up to a maximum of 15 mgd peak hour and 15 mgd peak day at a standard contract rate during GLWA's peak water usage months. Exceeding these flowrates causes the costs for water delivered to the City of Flint to be increased for the entire year. Therefore, maintaining a flow at or below these flows by maximizing the use of in-system storage is imperative to the financial health of the City of Flint. In addition, these improvements are needed to allow the City to meet their GLWA contract requirements.

The Dort reservoir and pump station (Pumping Station No. 4) provides critical storage and the ability to manage pressure and flows through the Flint water supply system. The facilities are located at the City of Flint Water Treatment Plant and include a 20 MG ground storage reservoir constructed in 1966 that is used primarily for emergency water storage and for use during peak water demands. Pumping Station No. 4 includes a 4 MG suction well (Clearwell #4) and is equipped with two 20 mgd, one 15 mgd pump equipped with a variable frequency drive and one 6 mgd pump. The 6 mgd pump was installed in 1994 to induce turnover of the Dort Reservoir, and reportedly experiences some cavitation issues. Based on discussions with City staff, the 20 mgd pumps are oversized for their intended use and need to be replaced with smaller capacity pumps. There are additional low service pumps installed in this station that are considered inoperable. The total pumping capacity of this station is 61 mgd with a firm capacity of 41 mgd. This pump station was originally designed to withdraw water from Clearwell #4, and according to recent evaluations by others, the existing suction well does not conform to current Hydraulic Institute Standards. In addition, there are reportedly mold, lead paint and asbestos related issues inside the pump station, which need to be addressed. There are also structural issues in the Dort reservoir itself which require repair.

The Cedar Street Reservoir is a 20 MG ground storage facility that was constructed in 1948 and is primarily used as an emergency water supply and a pumping source during peak events. Due to the large capacity of the reservoir and its location on the opposite side of the system relative to the water supply, water quality in this reservoir has been problematic. The pumping station at the Cedar Street facility (Pump Station No. 3) has 3 pumps rated at 8 mgd, 12 mgd and 15 mgd, which provides a total pumping capacity of 35 mgd and firm pumping capacity of 20 mgd. The pumps at this facility are oversized for the current usage, and the City is no longer able to effectively utilize the 15 mgd pump. Based on discussions with City staff, only the 8 mgd pump at this facility is operated for approximately 12 hours per day. It should be noted that the switchgear in this facility was recently replaced and updated. In addition, sodium hypochlorite improvements will be constructed at this facility to allow for a permanent solution for disinfection by allowing the chemical deliveries to be filled directly from a truck and for City staff to inject the chlorine at all times, not only when the reservoir is being filled as is currently the case.

Regarding the 20 mg reservoir at the site, there are two-10 mg cells. Due to water age issues, it is recommended that during some time periods only 10 mg be utilized for storage. In order to implement this, the existing slide gates will need to be replaced.

See the attached Project 2 figure (or **Figure 2.1**) that shows the location of the above facilities. Also see Section 3.1.4 for further discussion of the project needs and benefits.

The City recently commissioned a hydraulic modeling study[1] to better understand the current operation of the Flint water system, and to evaluate potential changes for the purpose of system optimization. The results in this study indicated that there is excessive storage in the system and recommended decreasing system storage in order to avoid water quality issues. The study also recommended the continued usage of the Cedar Street reservoir and the water treatment plant elevated tank for system storage under normal system conditions as this presents the best results from the analyses.

Based on the storage analysis from the hydraulic modeling study, the recommended long-term operating strategy is to balance attenuating peak supply flow rates from GLWA while minimizing storage in the system for water quality purposes. It was recommended that the water treatment plant elevated tank, Dort reservoir and Cedar Street reservoir be operated during the winter months (with peak demands of 24 MGD due to main breaks); and for the plant elevated tank and Cedar Street Reservoir to be operated in the summer months when there are lower demands and higher reaction rates. Although not expected, if the City experiences significant demand growth in the future, the Dort reservoir can be returned to always-on operations.

2. APPROACH

Recent studies on the Flint water system indicate that there is excessive storage in the system and recommend decreasing system storage in order to avoid water quality issues. The hydraulic modeling results indicate that the Cedar Street reservoir and the plant elevated tank continue to operate under normal system conditions (12.4 mgd average day demand), and the Dort Reservoir be operated during the winter months only.

With the maximum supply from GCWA of 15 MGD, this would solely satisfy the City's average day demand condition of 12.4 mgd. Therefore, it is critical that sufficient pumping be provided at the Dort and Cedar Street facilities that allow the turnover of this water to avoid water age issues and also meet the City's maximum day and pear hour needs. The current pumps at these facilities are oversized for this intended use, and new smaller capacity pumps are needed to effectively operate these facilities under current and future conditions. In addition, the Dort pump station should have pumping capacity to meet the peak winter demand conditions of 24 mgd, which is 9 mgd based on the maximum supply from GCWA of 15 mgd.

Based on a preliminary evaluation of new, smaller sized pumps at the Dort and Cedar Street facilities, if a total of three 4.5 mgd pumps are installed at each of these facilities, it would allow for the turnover of each corresponding 20 MG reservoir to occur in approximately 4.5 days with

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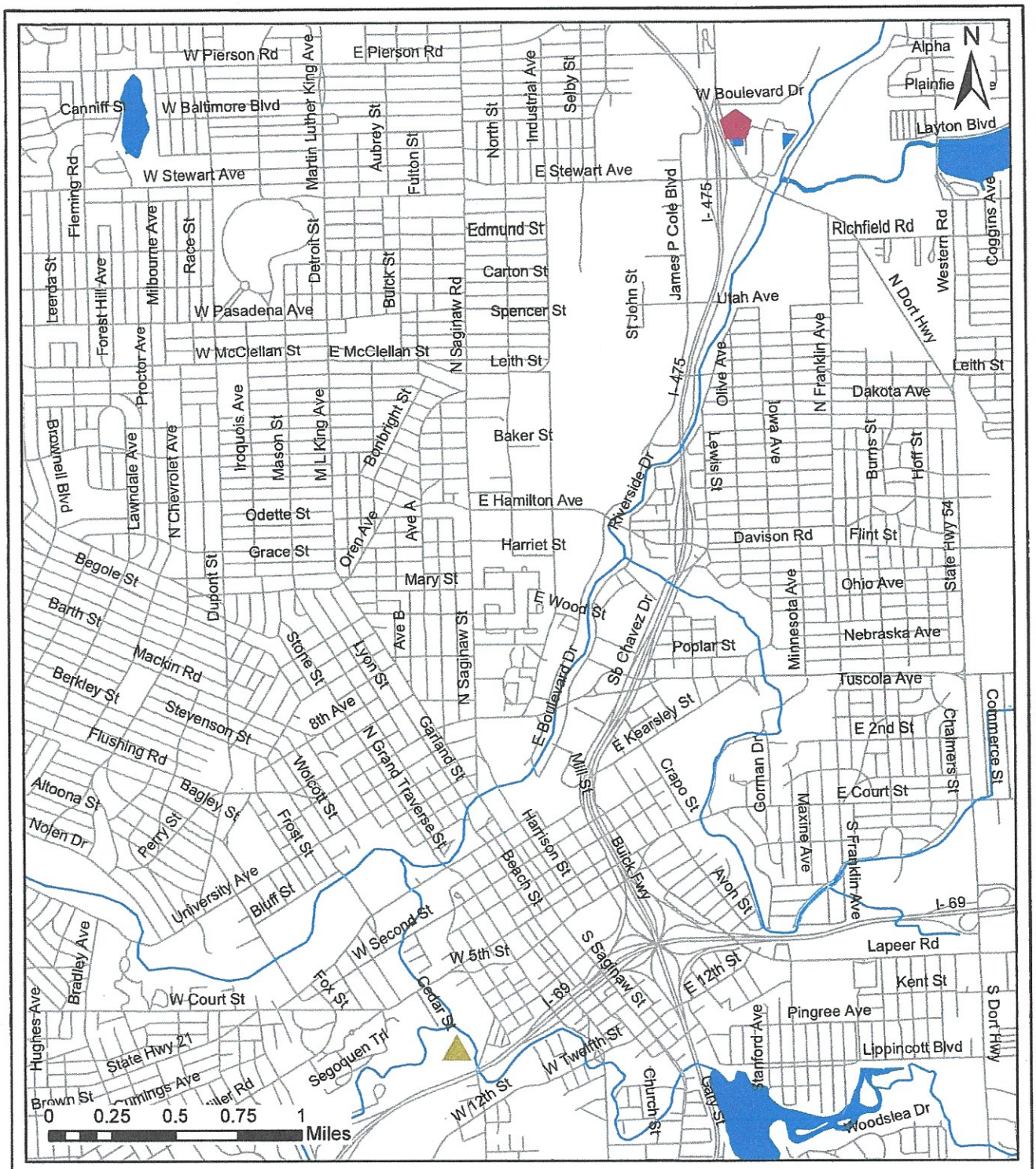
[1] *Hydraulic Modeling Technical Memorandum, Water Distribution System Optimization, Arcadis, January 2018*



Legend

- Cedar Storage and Pump Station Improvements
- Dort Storage and Pump Station Improvements

AECOM
303 East Wacker, Suite 1400
Chicago, Illinois 60601
312-373-7700

City of Flint
Program Management Services

Project 2 - Dort and Cedar Street Storage and Pumping Station Improvements

DRAWN	CHECKED	DATE
APD	ELT	February 2018

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PROJECT NUMBER 60569664

one 4.5 mgd pump operating, and 2.25 days with two 4.5 mgd pumps operating. This turnover rate should be sufficient and provides the flexibility to increase the turnover as needed. In addition, this arrangement provides a standby pump resulting in a firm pump capacity of 9 mgd at each facility. A firm pumping rate of 9 mgd at both pumping stations allows the City to meet the peak winter demand of 24 mgd using either pumping station or a combination of the two, assuming a 15 mgd supply flow is maintained from GLWA. In addition, these pumps are expected to be equipped with variable speed drives (VFD's) in order to provide the City the necessary flexibility to adjust to the system water demand needs.

The following is a summary of alternatives considered for the Dort reservoir and pump station (Pumping Station No. 4) facility to address the oversized pumps and excessive storage within the Flint water system. Alternates # 2 and # 3 also include structural repairs to the Dort reservoir. Also, due to the water age issues, there may be times when the reservoir is operated half full in order to utilize only 10 mg of storage rather than 20 mg.

Dort Pump Station Alternate #1 – No Changes

This option is not viable since it does not address the issues that prevent this pump station from effectively operating under the current operating scheme and meeting the peak winter 24 mgd demand conditions.

Dort Pump Station Alternate #2 – Upgrade Existing Facility

This facility has several issues that would need to be addressed if the existing facility is utilized. The mold and asbestos concerns would require a survey of the building, abatement of asbestos containing materials, and treatment/removal of mold inside the facility. This would likely result in significant costs, and there also may be structural issues that need to be accounted for such as foundation cracking that has resulted in wet conditions for mold growth. The electrical, mechanical and architectural building components would likely need to be overhauled due to their age and poor condition in order to get this facility to current standards and code compliance. In addition, the suction well would need to be evaluated to determine what improvements are required for Pump Station No. 4 to conform to Hydraulic Institute Standards. These costs could be significant, and potentially require CFD modeling to evaluate the operation of new vertical turbine pumps, as well as substantial structural modifications that might be required for compliance. In addition, this facility is to be repurposed with smaller capacity pumps that would require significantly less space, which devalues any potential benefits for upgrading to this larger, outdated facility.

Based on the above, the upgrades required at the existing pump station building would be significant resulting in this alternate considered to be cost prohibitive for addressing the water age issues in the system. Our preliminary opinion of probable cost for this alternate is indicated in Table 2-1.

Dort Pump Station Alternate #3 – Construct New Pump Station

A new pump station building would require the identification of available space at the Flint Water Treatment Plant. However, it would allow for the placement to be potentially closer to the Dort

reservoir and sized properly to accommodate the smaller pumps and associated components. In addition, this option would allow for various types of pumps to be considered, including horizontal split-case type pumps, and not confined to drawing out of a wetwell with vertical turbine pumps as is currently the case. Also, once the new pump station is constructed and operational, the exiting Pump Station No. 4 would potentially be decommissioned, which would allow this space to be used for future use.

As a result of the above, this option provides the most desirable results and is also expected to be nearly the same cost, if not cheaper, than upgrading the existing pump station. Our preliminary opinion of probable cost for constructing a new pump station is indicated in Table 2-2.

Table 2-1
Planning Level Costs for Upgrading Dort Pump Station

No.	Description	Quantity	Units	Unit Cost	Total Cost
1.	Abatement/removal of asbestos, lead materials and mold	1	LS	$500,000	$500,000
2.	Structural modifications	1	LS	$750,000	$750,000
3.	Mechanical/electrical/architectural upgrades	1	LS	$1,000,000	$1,000,000
4.	Removal of old pumps and installation of new vertical turbine pumps with VFD's	3	EA	$300,000	$900,000
5.	Modifications to piping and valves inside station	1	LS	$500,000	$500,000
6.	Structural Repairs to Reservoir	1	LS	$2,000,000	$2,000,000
				Subtotal:	**$5,650,000**

Note: the costs for items 1, 2 and 3 could fluctuate significantly; costs presented are derived from limited information and based on engineering judgment

Table 2-2
Planning Level Costs for Constructing New Pump Station

No.	Description	Quantity	Units	Unit Cost	Total Cost
1.	New horizontal centrifugal pumps and VFD's	3	EA	$275,000	$825,000
2.	Pump station building	1	LS	$1,000,000	$1,000,000
3.	Piping and valves inside station	1	LS	$525,000	$525,000
4.	Site piping and site modifications	1	LS	$500,000	$500,000
5.	Structural Repairs to Reservoir	1	LS	$2,000,000	$2,000,000
				Subtotal:	**$4,850,000**

6.4 Finished Water Pump Station

6.4.1 Alternative 1 – Rehabilitate Existing Finished Water Pump Station

The existing finished water pump station is located in Pump Station #4 (see **Figure 6.6**). This pump station was originally designed to withdraw water from Clearwell #4 into a suction chamber (see **Figure 6.7**). There are currently 4 available pump slots in this station. To accommodate the design flow rates, 4 new horizontal pumps (3 + 1 standby) at 8 MGD each would be required. Each pump would be variable speed drive. One of the pumps could be turned down to achieve a flow rate of 5 MGD. The HVAC system would have to be upgraded to provide cooling for the new variable speed drives and the existing electrical system would have to be evaluated. Given the age of the structure, there is a potential for lead paint abatement, so testing for lead would be required.

This pump station was originally designed in the late 1940s. The existing suction well design does not conform to current HI Standards design. Because of the poor geometry associated with the suction chamber, the construction of a physical model is recommended to determine how the

intake reacts to various flow conditions and to identify improvements required to meet HI Standards. This would impact project schedule.

Of greater significance is the relative elevation difference between the top slab of the finished water suction chamber and the elevations in the Dort Reservoir. As illustrated in **Figure 6.8**, the top slab of the suction chamber is at elevation 729 while the floor of the chamber is at elevation 704.

Table 6.2 – Comparison of Raw Water Pump Station – Tanks

Evaluation Criteria	VIP Can Pumps	HSC Pumps
Approximate Design Capacity	3 @ 14 MGD, 150 HP, 35 TDH	3 @ 14 MGD, 150 HP, 35 TDH
	2 @ 5 MGD, 40 HP, 25 TDH	2 @ 5 MGD, 40 HP, 25 TDH
	Comply with HI standards, AWWA E-103	Comply with HI standards, AWWA E-103
SCORE:	0	0
Operational Simplicity	VFDs all pumps	VFDs all pumps
		Better access to all pump components
SCORE:	3	4
Flexibility and Efficiency	1-14 MGD matches average flow	1-14 MGD matches average flow
	2-14 MGD provides 24 MGD	2-14 MGD provides 24 MGD
	5 MGD matches low flow	5 MGD matches low flow
SCORE:	4	4
System Reliability and Safety	1 standby for large pumps	1 standby for large pumps
	1 standby for small pumps	1 standby for small pumps
		More sensitive to NPSH conditions
SCORE:	4	3
Site Considerations	Smaller footprint, less depth for structure	Deeper structure required, larger footprint required
	Shorter lead time	Longer lead time
SCORE:	4	3
TECHNICAL RATED SCORE:	**3.75**	**3.5**

Table 6.3 – Comparison of Raw Water Pump Station – Impoundment

Evaluation Criteria	VIP Can Pumps	HSC Pumps
Approximate Design Capacity	3 @ 14 MGD, 175 HP, 45 TDH	3 @ 14 MGD, 175 HP, 45 TDH
	2 @ 5 MGD, 50 HP, 35 TDH	2 @ 5 MGD, 50 HP, 35 TDH
	Comply with HI standards, AWWA E-103	Comply with HI standards, AWWA E-103
SCORE:	0	0
Operational Simplicity	VFDs all pumps	VFDs all pumps
		Better access to all pump components
SCORE:	3	4
Flexibility and Efficiency	1-14 MGD matches average flow	1-14 MGD matches average flow
	2-14 MGD provides 24 MGD	2-14 MGD provides 24 MGD
	5 MGD matches low flow	5 MGD Matches low flow
SCORE:	4	4
	1 standby for large pumps	1 standby for large pumps

Evaluation Criteria	VIP Can Pumps	HSC Pumps
System Reliability and Safety	1 standby for small pumps	1 standby for small pumps
		More sensitive to NPSH conditions
SCORE:	4	3
Site Considerations	Smaller footprint, less depth for structure	Deeper structure required, larger footprint required
	Shorter lead time	Longer lead time
SCORE:	4	3
TECHNICAL RATED SCORE:	**3.75**	**3.5**

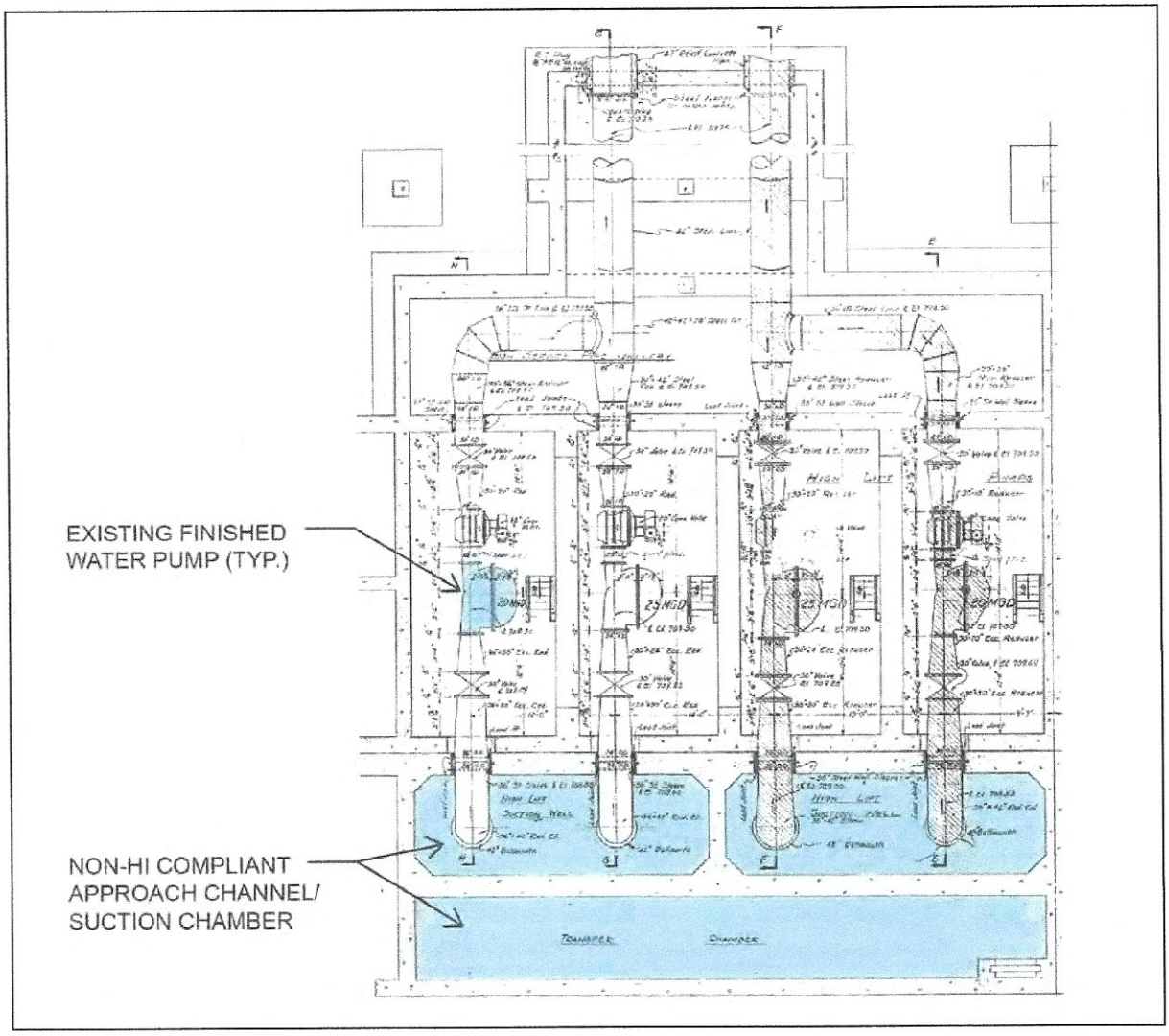

Figure 6.7 – Existing High Service Pump Station Plan View

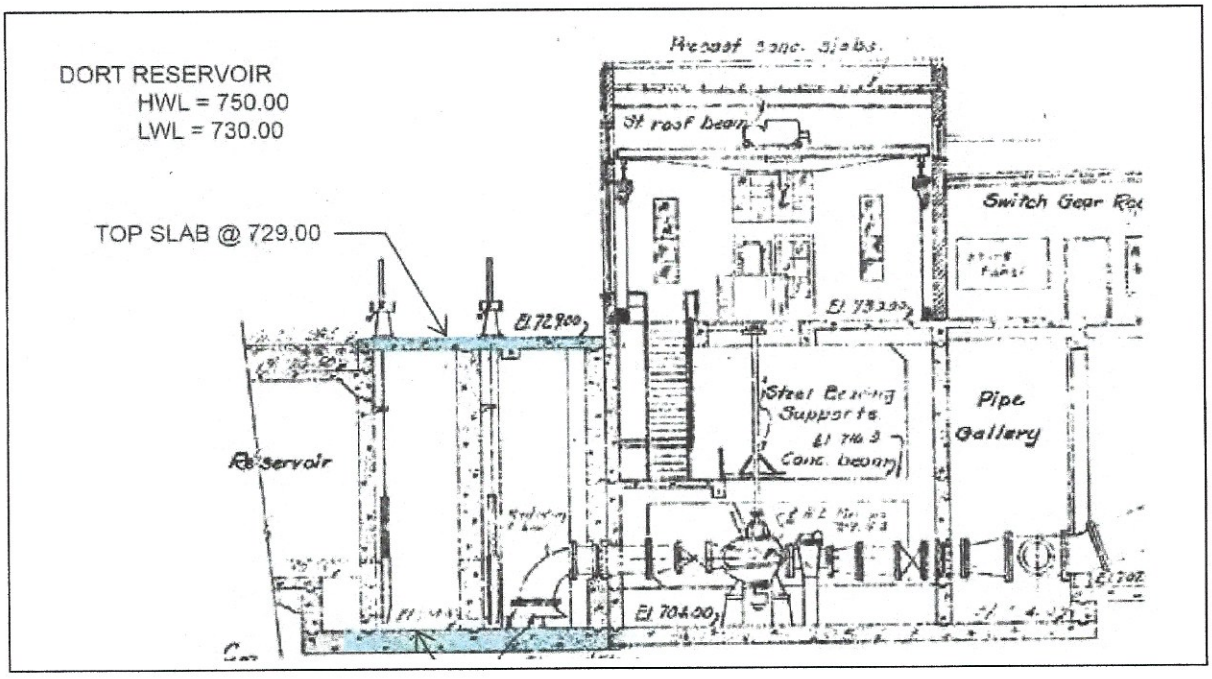

Figure 6.8 – Existing High Service Pump Station Section View

As indicated in Figure 6.8, the Dort Reservoir would have a high-water level of about 750 and a low water level of about 730, both of which are above the top slab of the suction chamber. The major elements of concern are:

- The need for a throttling valve/flow meter arrangement to direct flow to the pump station, which adds complexity to plant operations.
- Failure of the throttling valve may result in an uplift of the top slab of the suction chamber due to the elevation differences, with resulting structural damage caused by the uplift.
- Failure of the throttling valve could cause flooding, resulting in damage to the suction chamber/pump station and the need to drain the Dort Reservoir.

6.4.2 Alternative 2 – New Finished Water Pump Station

A new finished water pump station would convey water from the Dort Reservoir to the elevated tank/distribution system and would include new pumps for backwashing the existing gravity filters. An additional high service pump may be added in the new Finished Water Pump Station to allow the WTP to provide finished water to the Genesee County Drain Commissioner (GCDC) in the event of an emergency. The estimated pumping capacities are as follows:

- High Service Pumps:
  - Three (2 + 1 standby) at 14 MGD, 600 HP.
  - Two (1 + 1 standby) at 5 MGD, 200 HP.
- Backwash Pumps:

- Two (1 + 1 standby) at 22 MGD, 150 HP.

- All pumps variable speed.

The pump station would be located immediately south of the Dort Reservoir, requiring relocation of the existing CO_2 Storage Tank.

A non-economic comparison of alternatives is presented in **Table 6.4**. **Table 6.5** compares vertical turbine can pumps and horizontal split case pumps. A preliminary layout of the pump station utilizing vertical turbine can pumps is illustrated in **Figure 6.9**.

The estimated cost to rehabilitate the existing finished water pump station is $15 million exclusive of any improvements required by the results of the physical model. The estimated capital cost of a new finished water pump station is $17.4 million of which pumps and appurtenances account for approximately 70 percent of the cost. Approximately $1 million should be added for the new backwash water pumps.

Table 6.4 – Finished Water Pump Station

Rehabilitate Existing Pump Station	New Pump Station
▪ No new structures required	▪ New structure at grade with limited buried infrastructure
▪ Modifications to suction chambers required to meet HI standards	▪ Easier access for maintenance, including removal of pumps/motors
▪ Constrained access for installation and maintenance of equipment	▪ Design will conform to latest HI Standards
▪ Potential to over pressurize suction chamber and/or drain Dort Reservoir	▪ Pump bowl not visible within the can for inspection
▪ Requires complete replacement of existing piping and valves	
▪ Does not meet project goal of O&M simplicity	

Table 6.5 – Comparison of High Service and Backwash Pump Station

Evaluation Criteria	VIP Can Pumps	HSC Pumps
Approximate Design Capacity	3 @ 14 MGD, 600 HP, 183 TDH	3 @ 14 MGD, 600 HP, 183 TDH
	2 @ 5 MGD, 200 HP, 181 TDH	2 @ 5 MGD, 200 HP, 181 TDH
	2 @ 22.1 MGD, 150 HP, 20 TDH	2 @ 22.1 MGD, 150 HP, 25 TDH
	Comply with HI Standards, AWWA E-103	Comply with HI Standards, AWWA E-103
SCORE:	0	0
Operational Simplicity	VFDs all pumps	VFDs all pumps
		Better access to all pump components
SCORE:	3	4
Flexibility and Efficiency	1-14 MGD matches average flow	1-14 MGD matches average flow
	2-14 MGD provides 24 MGD	2-14 MGD provides 24 MGD
	5 MGD matches low flow	5 MGD matches low flow

Evaluation Criteria	VIP Can Pumps	HSC Pumps
	22.1 MGD for maximum backwash rate	22.1 MGD for maximum backwash rate
SCORE:	4	4
System Reliability and Safety	1 standby for large pumps	1 standby for large pump
	1 standby for small pumps	1 standby for small pumps
	1 standby for backwash pumps	1 standby for backwash pumps
		More sensitive to NPSH conditions
SCORE:	4	3
Site Considerations	Smaller footprint, less depth for structure	Deeper structure required, larger footprint required
	Shorter lead time	Longer lead time
SCORE:	4	4
TECHNICAL RATED SCORE:	**3.75**	**3.5**

6.4.3 Recommendation

A new high service pump station is recommended due to the elevation differences between the suction chamber and the Dort Reservoir. A new pump station would also be easier to operate and maintain. Additionally, a new high service pump station will allow a new high service pump to be installed that could also serve GCDC in the event of a disruption within their system.