MEMO 23-22

TO: Mayor and City Council

FROM: James Kowalski, Director of Public Services

DATE: September 6, 2023

SUBJECT: Torrey Road Pump Station Generator

On April 17, 2023 the City applied for the Clean Water State Revolving Fund (CWSRF) program for improvements to Torrey Road Pump Station including a backup generator in the event of a power outage, which the City was denied. Due to the increasing storms in the area, I requested AEW to provide costs to move forward with installing a backup generator at Torrey Road Pump Station.

AEW provided the costs of construction and engineering to install the generator below.

Project Description	Total Cost	Construction	Construction Engineering	**Design Engineering**
Torrey Road Pump Station Generator	$2,080,000.00	$1,880,000.00	$90,000.00	**$110,000.00**

Pending Council's approval of this project, the estimated cost for design engineering would be $110,000.00 to facilitate timely construction schedules. This is not a budgeted item in the Fiscal Year 2023/2024 budget and would require a budget amendment and transfer from the water/sewer fund balance.

Please contact me if you have any questions regarding this matter.

Attachment

ANDERSON, ECKSTEIN & WESTRICK, INC.
CIVIL ENGINEERS - SURVEYORS - ARCHITECTS
Shelby Township - Roseville - Livonia
586.726.1234 | www.aewinc.com

September 1, 2023

Jim Kowalski, Director of Public Services
City of Grosse Pointe Woods
1200 Parkway Drive
Grosse Pointe Woods, MI 48236

Reference: **Design Engineering Fees**
Torrey Road Pump Station Generator

Dear Mr. Kowalski:

It is our understanding the City would like to install a generator at the Torrey Road Pump Station. A cost estimate as well as a letter from our subconsultant (Peter Basso Associates) detailing the proposed work is attached. Following is a breakdown of costs for this project.

Project Description	Total Cost	Construction	Const Eng	**Design Eng**
Torrey Road Pump Station Generator	$2,080,000	$1,880,000	$90,000	**$110,000**

In order to facilitate timely construction schedules for this project, we recommend authorization of the Design Engineering cost shown above. Please contact me with any questions or comments.

Sincerely,

Scott Lockwood, PE, Exec. Vice President

\\aew-actdata\active\0160\0160-0473\Project Mgmt\Correspondence\Drafts\DesignEngineeringAuthorization.docx

ANDERSON, ECKSTEIN & WESTRICK, INC.
51301 Schoenherr Road
Shelby Township, MI 48315
Phone: 586-726-1234
Fax No: 586-726-8780

PRELIMINARY ESTIMATE

AEW PROJECT NO. 0160-0473

PROJECT:	Torrey Road Pump Station Generator
OWNER:	City of Grosse Pointe Woods
PREPARED BY:	Scott Lockwood/PBA
DATE:	September 1, 2023
CHECKED BY:	Ross Wilberding
DATE:	September 1 ,2023

WORK ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Bonds, Insurance and Mobilization Expense - (Max. 3%)	1	LSUM	50,000.00	50,000.00
Generator, Switchgear and Transformer (PBA 6/30/23)	1	LSUM	1,300,000.00	1,300,000.00
DTE Allowance	1	LSUM	200,000.00	200,000.00
SCADA	1	LSUM	10,000.00	10,000.00
Site Work	1	LSUM	150,000.00	150,000.00
Contingency - 10%				170,000.00
			Construction Subtotal	**1,880,000.00**
Design Engineering Fee (6%)				110,000.00
Contract Administration & Construction Observation (5%)				90,000.00
			TOTAL PROJECT COST	**2,080,000.00**

General Notes

This estimate includes all work required to install a generator and switch gear as outlined in the PBA letter dated June 30, 2023. It is anticpated there will be future projects to address other improvements as identified in the Capital Improvement Plan

Peter Basso Associates
CONSULTING ENGINEERS

MEP Engineering
Lighting Design
Commissioning
Building Technology
Sustainable Design

February 24 , 2023
Revised June 30, 2023

Grosse Pointe Woods
Torrey Road Pump Station Electrical Upgrades
Concept Design Narrative

INTRODUCTION AND BACKGROUND

Peter Basso Associates, Inc. has been commissioned to engineer standby generation for the Torrey Road Pump Station.

The pump station is served by two independent 4800V circuits from DTE Energy. The normal feed (PL191T) is routed to the pump station through underground ductbank. The alternate feed (PL36) is from an overhead line circuit.

Each feed terminates in a primary switchgear line-up to a load break switch. The load break switches are motor operated and controlled by an automatic transfer controller so that they will automatically switch from the normal feed to the alternate feed upon failure of the normal feed. The control components in this equipment appear to have been upgraded at some point – possibly 18-20 years ago. Given the age and style of this equipment, replacement is recommended.

The 4800V service provides power to the three main vertical axis turbine pumps and stepdown transformers that provide 240V service for the pump house general service.

- Pump P-1 is driven by a 200 HP, 4800V motor
- Pump P-2 is driven by a 400 HP, 4800V motor
- Pump P-3 is driven by a 400 HP, 4800V motor
- House power is provided by a 75 KVA transformer bank (3x25KVA single phase transformers)

Each of the main pump motors is fed by a medium voltage starter. Pump P-1 is a full voltage (across the line) starter, while P-2 and P-3 are wound rotor motors equipped with reduced voltage secondary resistance starters. The secondary resistors and the contactors that control them are housed in separate cabinets located across from (and oriented perpendicular to) the medium voltage starters.

The pump motors are late 1940's vintage. However, they have been regularly (and recently) tested and seem to remain in serviceable condition.

The starters are Westinghouse Amp Guard series, upgraded in the late 1980's. The cabinets appear to be in good condition and they have also been tested and determined to be in serviceable condition. However, they are the first generation of that design for that style of equipment and both the contactor mechanism and motor protective relays are obsolete. These can be retrofit in place with updated components and this is recommended.

Although we would typically consider equipment that old obsolete and past service life expectancy, the motors continue to operate and test out. There are factors that have likely contributed to the equipment lasting, including:

- It is likely that the total runtime of the pump motors is relatively low.

- The motors from that era were designed in a very robust fashion, meaning that the thermal stress placed on motor insulation is unlikely to approach the design conditions.
- Similarly, it expected that the number of starts imposed on each medium voltage motor starter is relatively low as well.

Given that the frequency of heavy storm events has been increasing over the past several years and the age of the equipment, it may be prudent to allocate capital improvement funds to either replace the motors or rewind the existing motors in the next 5-10 years. Replacement of the 3 main pump motors will require a cost/benefit analysis to determine if maintaining 4800V motors and controllers is the best option or if 480V motors and soft-start controllers (and associated transformation required) will provide a cost benefit.

In discussions with field service technicians that have years of experience with these style and age of motors, they have suggested that we strongly consider leaving the motors in service as long as they continue to function. They can be rewound as/when needed to remain serviceable at a fraction of the cost of a new motor.

Regardless of whether the motors and controllers remain 4800V or are switched to 480V, the standby generator and transformer proposed int this study will support either condition.

RECOMMENDATIONS

Incoming Primary Switchgear:

The existing primary switchgear, which consists of motor operator mechanical switching mechanisms, has been in service for quite some time. In general, load break switching mechanism are rated for a limited number of operations under load (10-15) and generally fail when attempting to re-close after being open. With automatic motor operated operation, this problem is exacerbated is a significant reliability concern. Since a significant investment is contemplated to improve reliability, it is prudent to replace this equipment with new switchgear to ensure that redundant utility services remain the first line of defense

New switchgear is recommended to be Metal Enclosed Vacuum Circuit Interrupter switchgear which is rated for thousands of operations and is considered much more robust and reliable. Furthermore, this switchgear with the addition of a Generator breaker will function as the automatic transfer switch that will allow the generator to start and be brought on-line in the event both utility sources are lost.

Due to the physical limitations in the switchgear room, we are recommending the switchgear be installed outdoors in a weatherproof (NEMA 3R) structure.

Generator Capacity:

It is recommended to provide a generator sized to serve the capacity of the full pump station operation. The generator must support a running load of right around 900 KW (1125 KVA) with an alternator that will support the starting currents of the motor. Since the in-rush currents are limited by the secondary resistance, wound rotor starters, an oversized alternator is not necessary.

We recommend a 1250KW, standby rated generator. This will allow for continuous operation of all the pumps over a 24-hour period and provide adequate overhead for motor starting and potential spare capacity.

There are two options we have considered; generate at 4800V or generate at 480V and provide a transformer to step up to 4800V. Based on feedback from the manufacturer's representative, a 480V generator paired with a transformer will be the most cost effective and will have significant difference in lead time.

Another benefit to this approach is that if the motors are replaced with 480V equipment in the future, the transformer can be re-purposed to supply the motors and the generator can supply alternate power via a 480V transfer switch.

See the attached one-line diagram for the proposed configuration.

Generator Fuel:

Due to the size of the generator, a diesel engine generator is recommended. Diesel will be the most cost-effective option and is generally the choice for large generators.

If the City desires natural gas, the cost premium for the generator will be about $250,000 and extension of gas service to support the pressure and flow needed for this level of generation will need to be explored, including any cost from the utility company.

Transfer Switch:

The output of the generator/transformer will feed the alternate source side of a medium voltage transfer switch. The "normal source" will come from the utility service and the load of the transfer switch will be the existing 4800V distribution/motor starter line-up.

Since we are recommending new incoming switchgear, the automatic transfer operations associated with the generator will be integrated into this new switchgear.

Transformer:

The transformer recommended is an outdoor, FR3 liquid filled pad mounted, 65DegC rise, 1750 KVA, dual wound 13.2/4800V – 480V.

Grosse Pointe Woods
Torrey Road Pump Station Electrical Upgrades
Concept Design Narrative

PRELIMINARY BUDGETARY CONSIDERATIONS

Generator Installation:

The following estimate is based on leaving the existing motors and controllers The following material costs were solicited from manufacturer's representatives and the associate labor costs are high level estimates.
Actual costs for both material and labor are quite variable in the current bidding climate and these values should be considered budgetary only.

Item	Material	Labor/Incidentals
Generator (Diesel)	$450,000	$70,000
MV ATS/DTE Switchgear	$450,000	$40,000
Transformer	$125,000	$50,000
Switchgear Modifications	$15,000	$12,000
Conduit and Wire/cable	$35,000	$60,000
Subtotal	$1,075,000	$232,000

Total Budgetary Cost: $1,300,000, not including contingency
Increase budget by $450,000 for natural gas generator option.

Furthermore, there may likely be a DTE Cost component. We recommend carrying an allowance of $200,000 for DTE services to pull new cables to the facility and coordinate shutdowns.

Motor Replacement:

If the City is considering replacing the main pump motors, we received the following budget information for 480V motors (we were unable to find a source for 4800V motors as of the writing of this report). This cost would be in addition to the work indicated above (which would be modified slightly, but effectively the same budgetary impact.

Item	Material	Labor/Incidentals
400HP Motors	$45,000 each, $90,000 Total	$40,000
200HP Motor	$32,000	$15,000
400 HP Starter/Drive	$55,000 each, $110,000 Total	$50,000
200 HP Starter/Drive	$26,000	$15,000
New LV Switchboard	$35,000	$15,000
Conduit and Wire	$50,000	$60,000
Demolition		$25,000
Subtotal	$343,000	$220,000

Total Budgetary Cost: $563,000, not including contingency

Once the project is committed to, in general, we recommend issuing progress engineering drawings to a qualified CM for budgetary pricing, and we recommend carrying a significant project contingency due to the age of the pump station and the lack of existing as-built information.