Hazen and Sawyer
4000 Hollywood Blvd., Suite 750N, North Tower • Hollywood, FL 33021

February 25, 2024

Wilhelmina Montero, P.E.
CITY OF HOLLYWOOD
Department of Public Utilities
Engineering and Construction Services Division
Post Office Box 229045
Hollywood, Florida 33022

City of Hollywood SRWWTP
Oxygen Generation System Replacement

Dear Ms. Montero:

As requested, Hazen and Sawyer, D.P.C. (Hazen) is pleased to offer engineering services for the replacement of the cryogenic oxygen generation system at the Southern Regional Wastewater Treatment Plant.

BACKGROUND

The Southern Regional Wastewater Treatment Plant (SRWWTP) uses a high purity oxygen (HPO) activated sludge process for the treatment and disposal of wastewater. The Oxygen Generation System is one of the key components of the SRWWTP and it has been in service for over 45 years. The system uses the cryogenic process to produce gaseous oxygen (GOX) and it has been experiencing frequent equipment failures. Advancements in oxygen generation technology has resulted in replacement equipment, parts, and contractors for legacy cryogenic systems to be increasingly scarce and costly. The City desires to replace the existing cryogenic oxygen generation process.

As a result, the City has requested Hazen to provide a scope of work for engineering services to evaluate alternatives for replacement of the existing cryogenic oxygen plant.

SCOPE OF SERVICES

Task 1 – Interim Level of Service Evaluation

The design and construction of a replacement HPO system is anticipated to take 4-5 years to complete. Increasingly frequent repairs to the existing cryogenic system have rendered its reliability suspect. Additionally, the liquid oxygen (LOX) storage which serves as backup to the GOX system is also in need of maintenance. Local demand for LOX has created recurrent shortages from the limited nearby vendors and the advent of its use for the treatment of COVID patients has resulted in the inability to receive LOX shipments on several occasions. Therefore, to provide reliable service prior to and after the new HPO system becomes operational, a sustainable pure oxygen supply strategy is needed. The purpose of this task is to evaluate the immediate needs of the existing oxygen generation and storage system with the goal of providing a reliable source of gaseous oxygen for the near term. Findings will be memorialized in a technical memorandum.

The technical memorandum will evaluate the existing system repair/replacement needs (cryogenic GOX and LOX storage system) to secure more reliable oxygen service for the SRWWTP until a

complete replacement to the existing HPO system can be placed into service. In addition, the evaluation will attempt to determine the potential interest for an interim operations and maintenance service contract (over-the-Fence arrangement for oxygen supply).

Hazen will review operations and maintenance records and consult recent maintenance vendors and/or conduct a site visit to investigate the existing cryogenic plant to establish the condition and remaining useful life of the major process components. The existing system review will be used to develop a determination of cryogenic system repair and/or replacement needs necessary to allow reliable cryogenic operations for the near term. DWG Associates will assist with the evaluation and in generating the required economic and technical information.

The Technical Memorandum will be developed in conjunction with Task 2 and will summarize the site visit, data review, evaluation, and recommendations for repair of the existing HPO system. A draft memorandum will be submitted to the City for review. Upon review, Hazen shall meet with the City to discuss the draft memorandum and receive comments for incorporation into the final draft.

Task 2 – Future Level of Service Evaluation

Based on the existing cryogenic system being beyond its useful life and the resultant increasingly frequent down-times being experienced for repairs, a complete replacement of the GOX system is necessary. Additionally, the liquid oxygen (LOX) storage which serves as backup to the GOX system is also in need of repairs. The purpose of this task is to evaluate the immediate needs of the existing oxygen generation and storage system with the goal of providing a reliable source of gaseous oxygen. Findings will be memorialized in a technical memorandum.

The technical memorandum will focus on the following HPO generation options for the SRWWTP:

- New cryogenic GOX for primary supply, LOX for redundancy
- VPSA for primary supply, LOX for redundancy
- VPSA for primary supply, additional VPSA for redundancy
- Public-Private Partnership (Over-the-Fence arrangement for oxygen supply)

For each arrangement, the evaluation will outline the advantages and disadvantages, the estimated capital cost for construction, estimated life cycle costs, and general layout considerations at the SRWWTP. A cursory analysis of SRWWTP influent data to determine current and future oxygen generation system capacity requirements will inform the proposed equipment sizing in the evaluation. DWG Associates will assist with the evaluation and in generating the required economic and technical information for each option.

Up to two VPSA system manufacturers and two cryogenic system manufacturers will be contacted to obtain proposals for new HPO systems including design, layout, and capital and O&M costs. At least one municipal utility that has converted from a cryogenic HPO system to a VPSA system will be contacted to obtain anecdotal experience. A brief review of at least one public-private oxygen generation partnership currently in effect and their experience will be documented.

The Technical Memorandum will summarize the site visit, data review, evaluation, and recommendation for replacement of the existing HPO system. A draft memorandum will be submitted to the City for review. Upon review, Hazen shall meet with the City to discuss the draft memorandum and receive comments for incorporation into the final draft.

Task 3 – Procurement Approach

Delivery of a HPO generation project involves specialized industrial vendors and contractors. To ensure that the City is able to receive the most qualified construction contractor for the best possible price, the City desires to review the relative risks and benefits of available project delivery methods. Hazen will review four project delivery methods available for the implementation of the recommended project. The review will include:

- Project objectives and priorities
- Advantages and disadvantages of the available project delivery methods with consideration of impacts on project implementation schedule as well as construction costs.
- Discuss, validate, and document the CITY's consensus for the project delivery method that best suits the City's project goals and objectives.

Delivery methods to be reviewed will include the following:

- Design-Bid-Build (DBB): The conventional project delivery approach used by the City wherein the City contracts separately with the Design Engineer and Contractor. The Engineer, with ongoing input from the City, progresses the design to 100% completion. A competitive bidding process is then carried out, and the award is given to a responsible Contractor submitting the lowest, most responsive bid.
- Fixed-Price Design-Build (FPDB): This is a version of design-build where the City would have a single contract with a design-build company consisting of an engineer and a contractor. In FPDB, the City prepares a design criteria package (DCP) with the help of a third party design consultant. The DCP is used as part of the RFP to procure the design-build firm.
- Progressive Design-Build (PDB): This is a version of design-build where the City would have a single contract with a design-build company consisting of an engineer and contractor. In PDB, the integrated team will develop a final scope of work and contract price proposal at the end of the preconstruction and design phase. Assuming the City and the PDB team agree on a contract price, the City has greater confidence in the upper limit of its project cost. However, if the contract price proposal does not meet the City's expectations, the City can discontinue the PDB process and proceed to deliver the project as a DBB.
- Construction Manager at Risk (CMAR): A delivery method where the City will have separate contracts with the engineer and contractor (CMAR) and engages the CMAR during both preconstruction and construction phases while the design firm advances the project design. The engineer and CMAR collaborate on constructability and design refinements, with City inputs and approval. Early engagements between engineer and CMAR are intended to promote collaboration among team members as well as enhance the quality of the design and delivery early cost and schedule estimates.

Hazen will present this information in a workshop setting with the City. Decisions made during this workshop will be documented in meeting minutes and provided to the City.

Task 4 – City Directed Services

This task is intended to provide for additional services, not currently defined, that may be requested and authorized by the City during the course of the project. Use of the associated budget is subject to specific authorization by the City.

KEY ASSUMPTIONS

Key assumptions concerning this scope are:

- City shall provide access to plans and data (electronic format), both public and private, that City has record of and provide copies of requested information/documents at no charge.
- This scope does not include any permitting services or negotiations with other agencies, jurisdictions, or parties relative to specific projects. Meetings with these parties may occur relative to general matters and/or conceptual solutions.
- City will provide access to all necessary facilities for execution of the work.
- Surveying services and underground utility locates are not envisioned.
- Preliminary construction cost estimate shall be unitized based on local, similar projects and quotes from contractors in accordance with AACE 56R-08 Estimate Class 4. The expected accuracy range is -30% to +50%. All costs will be provided in current dollars.

COMPENSATION

Engineering services performed under Tasks 1 through 3 of this Authorization will be performed for a Not-to-Exceed fee of $175,000 including other direct costs.

SCHEDULE

Projects of this type are heavily dependent upon communication with and data gathering from various vendors and manufacturers. Engineering services are estimated to be completed within six months from Notice-to-Proceed.

Engineering services for the project will be performed as part of our Professional Services Agreement for General Engineering Consultant Services (Agreement) dated October 2023. Services provided by Hazen and Sawyer, D.P.C. shall be limited to those services specifically identified in this work order.

We look forward to your reply. In the meantime, should you have any questions, please contact us.

Very truly yours,

HAZEN AND SAWYER, D.P.C.

Hazen

J. Philip Cooke, P.E.
Senior Associate

c: File No. 4321-016/1.0

Attachments

CITY OF HOLLYWOOD
SOUTHERN REGIONAL WASTEWATER TREATMENT PLANT
High Purity Oxygen System Replacement Evaluation
Cost Breakdown

	Labor Hours										
Tasks	***Senior Officer***	***Senior Associate***	***Associate***	***Senior Principal Engineer***	***Principal Engineer***	***Engineer***	***Designer***	***Draftsman***	***Secretarial***	***Subtotal***	***Cost***
LABOR											
Task 1 - Interim Level of Service Evaluation	2	8	12	16	40	80	40	0	8	206	$ 34,369
Task 2 - Future Level of Service Evaluation	4	20	24	40	80	140	48	0	0	356	$ 62,570
Task 3 - Procurement Approach	2	4	8	16	36	40	0	0	8	114	$ 19,581
Task 4 - City Directed Services											$ 17,730
Subtotal	8	32	44	72	156	260	88	0	16	676	**$ 134,250**
DIRECT EXPENSES											
DWG & Associates (includes travel)											$ 40,550
Other Direct Costs (reproduction, UPS, etc.)											$ 200
Subtotal											**$ 40,750**
Total (Not-to-Exceed)											**$ 175,000**
Maximum Hourly Raw Labor Rate*	$108.15	$107.12	$94.76	$66.95	$53.41	$42.23	$51.50	$33.99	$28.84		

* Overall multiplier = 3.1

DWG ASSOCIATES, INC
DESIGN ENGINEERING FOR WASTEWATER & WATER SYSTEMS

P.O. Box 666
Cumming, GA 30028-0666
Phone: 770.592.5619
web: dwgassociates.com

23 February 2024

Mr. Phil Cooke, PE
Hazen and Sawyer
4000 Hollywood Blvd., Suite 750N
Hollywood, FL 33021

SUBJ: Hollywood Oxygen Generation System Replacement Evaluation

Dear Phil,

The Southern Regional Wastewater Treatment Plant (SRWWTP) in Hollywood, FL is a high purity oxygen (HPO) facility originally constructed in the late 1970s. The oxygen generation system at the plant is a single cryogenic oxygen generator originally designed to produce approximately 63 tons of gaseous oxygen per day (TPD) at a purity of approximately 98% oxygen. The cryo plant was originally designed and supplied by Union Carbide Corporation. Since installation, the plant has been refurbished and modified. The plant currently is functional, although there are ongoing technical issues with the unit. The City of Hollywood has a desire to investigate whether continued investment in the existing equipment is cost effective given newer oxygen generation technologies that are currently available in the marketplace. The intent of this effort is to investigate and determine the economics of four distinct long-term solutions for oxygen generation at the SRWWTP. Hazen and Sawyer has a contract to do this investigative work and establish economics. With this understanding, the purpose of this letter is to detail DWG ASSOCIATES' work activities and costs for assisting with Hazen's efforts.

This project will involve three distinct tasks. These tasks are (1) Interim Level of Service evaluation, (2) Future Level of Service Evaluation, and (3) Procurement Approach. The details of each of the three tasks are adequately described in Hazen's writeup of the project, a copy of which the City of Hollywood has. DWG ASSOCIATES has recently done a number of similar economic analyses evaluating the same long-term approaches to oxygen supply for other HPO facilities. As such, DWG ASSOCIATES has the background, expertise, and market presence necessary to expeditiously and accurately complete the work associated with the defined tasks. The table below indicates the costs DWG ASSOCIATES would anticipate for this project's tasks.

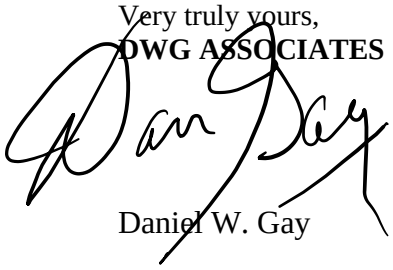
Table 1
Hollywood's SRWWTP Oxygen Generation System Replacement Evaluation

	Study Cost	Travel Cost
Task 1	$10,000	$6,050
Task 2	$20,300	--
Task 3	$4,200	--

Total project not to exceed cost would be $40,550, including a single trip to the SRWWTP for cryo plant evaluation services. Inherent in this figure is the assumption that the majority of the work conducted for the project will be performed in the home offices of DWG ASSOCIATES in Cumming, GA. It is also assumed that the majority of meetings (either internal or with the client) will be conducted via Microsoft Teams, or similar. DWG ASSOCIATES commits to performing the work outlined herein and in the Hazen writeup of the project according to Hazen's schedule.

If I can answer any questions on this proposal, or if we need to discuss the scope of work further, please contact me. I look forward to working with you, the entire Hazen team, and the SRWWTP operating staff on this project.

Very truly yours,
DWG ASSOCIATES



Daniel W. Gay