Council Study Session

February 1, 2021

Agenda Item	Request for Direction on Vendor Selection for Wastewater Treatment Plant UV System Upgrade	
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Item Type	Requested by Council ☐ Update ☐ Request for Direction ☒ Presentation ☐	

SUMMARY

Before Council is a request for direction with respect to vendor selection for a new Ultraviolet (UV) Disinfection System to be installed at the Wastewater Treatment Plant (WWTP). The WWTP currently operates with the original UV system installed in 2001. The need for replacement is a high priority due to failures, operational costs, lack of equipment upgrade ability and hydraulic bottlenecks. Staff in conjunction with the City's design engineering consultant firm through the preliminary design phase have evaluated four vendor options for replacement and upgrade to the current UV disinfection system.

POLICIES, PLANS & GOALS SUPPORTED

City Council Goals:
Maintain Essential Services – Wastewater Treatment
Continue to leverage resources to develop and/or enhance Value Services

- Emergency Preparedness
- Address Climate Change

CEAP Goals:

- Reduce Ashland's contribution to global carbon pollution by reducing greenhouse gas emissions associated with City, residential, commercial, and industrial activities
- Prepare the city's communities, systems, and resources to be more resilient to climate change impacts
- Strategic Initiatives:
  Maximize conservation of water and energy

Department Goals:

- Maintain existing infrastructure to meet regulatory requirements and minimize life-cycle costs
- Deliver timely life cycle capital improvement projects
- Maintain and improve infrastructure that enhances the economic vitality of the community
- Evaluate all city infrastructure regarding planning management and financial resources

BACKGROUND AND ADDITIONAL INFORMATION

In 2019, the City of Ashland contracted with Jacobs Engineering Group to perform a Wastewater Treatment Plant (WWTP) Facilities Assessment and Major Process Components Improvements planning effort (Staff Report). Included in the tasks was a full conditional assessment of the UV system with recommendations for improvement. The assessment was based upon the current equipment condition, projected future flows and loading, capacity and redundancy requirements, energy efficiency and anticipated regulatory changes.

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The final 2019 WWTP Facility Assessment report was accepted by Council on November 5, 2019 (Staff Report) and stated the UV system is in the greatest need of refurbishment and a top priority. Replacement of the system is needed because the main control and power system are obsolete, maintenance activities require custom fabrication of parts and the system represents a hydraulic bottleneck during high flows. The City does have emergency spare parts are on hand to ensure continued operation until a new system is procured and installed. Upgrading the technology will improve reliability and reduce operational costs. The report evaluated both medium pressure (in-conduit) and low pressure (channel) output systems for UV upgrades. The recommendation from the facility assessment was to replace the existing medium pressure UV system with a new medium pressure system due to capital costs.

In order to facilitate moving the UV project forward in the current biennium staff developed a public solicitation for professional engineering services for the UV upgrade project. Council approved a professional services contract with Carollo Engineers at the April 7, 2020 Business Meeting (Staff Report). The overall goal of the UV project is to upgrade the UV disinfection process to meet future demands while decreasing energy costs and maintenance needs.

As part of the preliminary design phase Carollo established the parameters for a vendor solicitation for UV equipment that would work within the current disinfection building (in-conduit system), meet future demands, produce lower energy costs/consumption and address maintenance needs. Low pressure in-conduit systems where not identified in the previous analysis but included in Carollo's preliminary engineering analysis as options that could work within the existing building.

This preliminary design phase evaluation of vendors and overall capital costs with Carollo Engineers has been completed and Carollo is waiting for the City to make a final vendor selection in order to complete final design and move into the construction phase. Four vendors submitted solicitation responses outlining their equipment and ability to meet the developed specification requirements. For below, L shaped and Flow through reactors are specifically labeled this to match their physical appearance in the images below as well as being used for operational reference when applying for incentives.

Vendors

- Aquionics – ProLine IL System
  - Flow through reactor with twelve (12) 6 kW medium pressure lamps per reactor. 20" ANSI inlet and outlet connections.
  - Existing Aquionics system consists of eight (8) 4 kW medium pressure lamps per reactor. 12" ANSI inlet and outlet connections.
- Trojan – UVFit System
  - L-shaped reactor, 240W, Seventy-two (72) low pressure high output lamps per reactor. 20" ANSI inlet and outlet connections.
- Wedeco – LBX System
  - L-shaped reactor, 300W, sixty (60) low pressure high output lamps per reactor. 20" ANSI inlet and outlet connections.
- Evoqua – UVLW System
  - L-shaped reactor, 800W, thirty (30) low pressure high output lamps per reactor. 20" ANSI inlet and outlet connections.

System Layouts

- Flow through reactor (Aquionics)
  - Minimal modifications to existing UV facility layout. Can reuse existing pipe and flowmeter

- L-shaped reactor (Trojan, Wedeco, Evoqua)
    - Requires multiple elbows to provide sufficient clearance within the existing UV facility footprint.
    - Trojan and Wedeco systems will require a gantry crane to pull out the entire UV lamp tray for maintenance. Evoqua system allows for individual lamp removal and servicing.
    - L-shaped reactors will need to be dropped in from the roof. Existing skylights are approximately 2 ft square. Roof modifications will be required to drop in the L-shaped reactors.

System Comparison

- Headloss
    - L-shaped reactor headlosses range from 12" to 26".
    - Flow through reactor headloss range from 9" to 10".
    - For comparison, existing Aquionics system headloss is 35" at the design flows of 5.7 MGD.
- Power consumption
    - L-shaped reactor power consumption range from 43.5 to 52 kW (peak load) and 11.5 to 14.6 (average load).
    - Flow through reactor power consumption is approximately 156.0 kW (peak load) and 37kW (average load).
- Equipment cost comparison
    - The master control panel (MCP) and programming costs were broken out for incentive funding, but Carollo does not recommend procuring the UV systems without their respective MCP and programming. The MCP and programming allows the UV systems to efficiently operate by automatically determining the appropriate lamp power to operate at based on UV Transmissivity.
    - Wedeco and Evoqua estimated annual O&M costs are approximately $33,000, while Trojan and Aquionics estimated annual O&M costs are approximately $50,000.

Table 1 below shows the cost comparisons between the four vendors considering both L-shaped reactors and flow through reactors.

1. Attachment #1 includes a total construction cost estimate for the project for two different style reactors. Reference figures 1 & 2 below for proposed conceptual layouts in the existing disinfection building.
    a. The first estimate is for the "flow through" reactor by Aquionics, total construction cost of approximately $948K.
    b. The second page is for an "L-shaped" reactor which is more efficient, total construction costs of approximately $1.41M.
    c. Difference between the two for construction: $460K.
    d. Reasons for the cost differences include:
        i. A tank located outside, adjacent to the building for cleaning solution. These reactors are larger and require more cleaning solution.
        ii. A required new access platform.
        iii. Demolish and repair of roof for installation of larger L-shaped reactors.

iv. Greater mechanical piping modifications required for the L-shaped reactors.

Figure 1: Flow Through Reactor

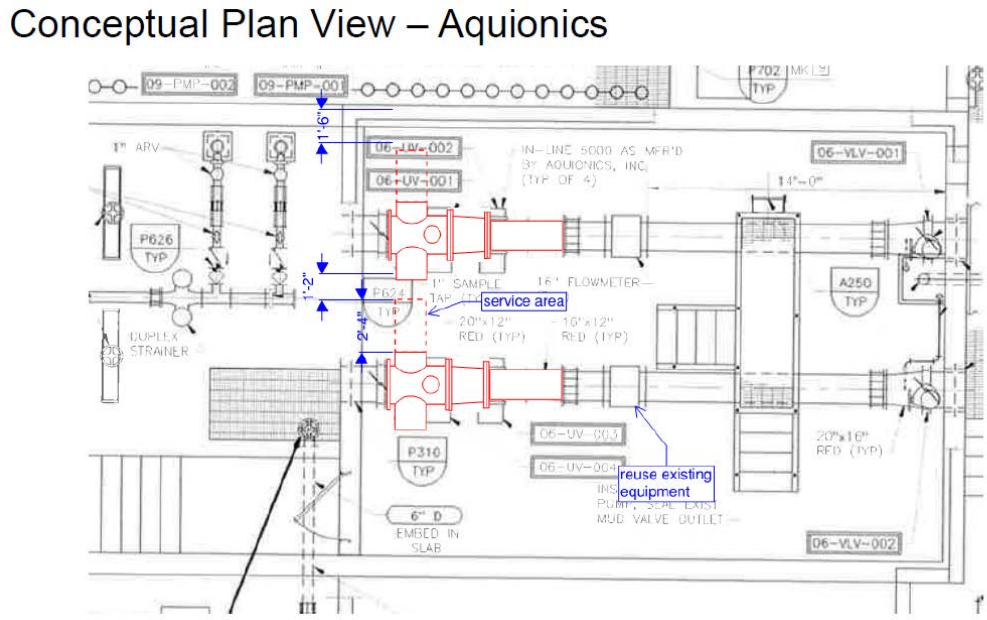
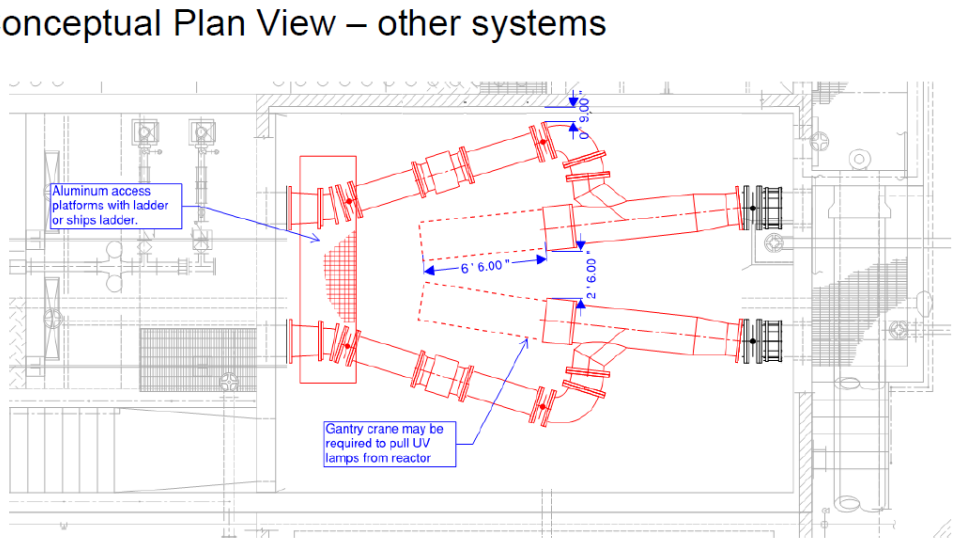


Figure 2: L-shaped reactor



2. Life cycle comparisons for the various UV reactors.

   Life cycle assumptions:

   a. Inflation Rate – 2%
   b. Discount Rate – 5%
   c. Time period – 20 years.
   d. Electricity Rate – $0.06/kWh
   e. Labor Rate - $55/hour

Table 1 Equipment Cost - Net Present Value Evaluation Summary							
Equipment	**Capital Cost**	**Parts and Replacement Cost**	**Labor Cost**	**Energy Consumption Annually**	**Energy Cost Annually**	**O&M Cost**	**Life Cycle Cost**
Trojan UVFIT	1,462,000	42,039	7,294	117,034	7,022	56,355	**$2,305,000**
WEDECO LBX	1,316,000	18,973	6,423	133,897	8,034	33,430	**$1,816,000**
Evoqua UVLW	1,410,500	19,212	5,956	144,277	8,657	33,825	**$1,916,000**
Aquionics ProLine	948,055	28,869	3,008	376,242	18,475	50,352	**$1,701,000**

Capital Cost=Construction Cost including equipment
Parts = Estimated 20-year parts and replacement cost
Labor = Estimated 20-year labor costs for equipment replacement
Energy = Annual estimated energy costs
O&M = Parts, labor and energy costs for 20-years

The existing system is an Aquionics medium pressure system with an estimated annual energy consumption range using the average and peak bounds, equates to approximately $22,706 - $34,143 per/year and per reactor depending on the required disinfection rate and there are two reactors in the system.

The analysis indicates the Aquionics reactors are less efficient when compared to the other three vendors due to the high-power consumption to achieve the same disinfection rate but is the least expensive from both a capital and life cycle cost perspective. Carollo has investigated the potential for incentive funding for the project and funding is available for L-shaped reactors in an estimated amount of $60,000 to help offset capital cost differences. The proposed flow-through reactor does not qualify for incentives due to the system operation being the same as our existing system that's also a flow-through reactor.

FISCAL IMPACTS

The original project budget established in the 2019-21 biennium CIP budget included $600,000 for engineering and construction for the UV system upgrades. This estimate was put in the CIP document and associated budget as a placeholder prior to finalizing the Facility Assessment Report and gaining a better understanding of UV upgrade options and associated costs. At the November 5, 2019 Business Meeting, staff clarified the costs of the UV upgrades based on the recommendation from the final report would be approximately $900,000 and represent the change from the current medium pressure system to a new medium pressure system.

Staff is in the process of creating the 2021-23 biennium budget and Capital Improvement Plan documents and is looking for policy direction from Council on how to address capital costs versus on-going energy costs with respect to the potential UV system upgrade options.

DISCUSSION QUESTIONS

1) Does the Council have a policy direction for staff to follow with respect to project capital costs vs. energy consumption and associated costs relative to a 20-year life cycle for a new UV disinfection system?

SUGGESTED NEXT STEPS

Based on the equipment comparisons and Council direction on the balance of capital cost vs. energy consumption, Public Works recommends replacement with either the Aquionics system (medium pressure

and lowest net cost) or replacement with the Evoqua system (low pressure and least amount of lamps and ease of maintenance). Both systems represent an energy consumption reduction when compared to the existing system.

Based on direction received from Council, Public Works will continue to work with Carollo Engineers to finalize the vendor selection and associated documents required for moving into the construction phase. Public Works will update the proposed 2021-23 CIP document with new cost estimates and request the correct appropriation as part of the 2021-23 Budget Biennium.

REFERENCES & ATTACHMENTS

Attachment 1: Carollo Preliminary Cost Estimate Comparison

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UV Improvements Project
City of Ashland

PRELIMINARY CONSTRUCTION COST ESTIMATE

PROJECT :	UV Improvements Project	**LOCATION FACTOR :**	1.10
JOB # :	11940A.10	**ESTIMATED MIDPOINT OF CONSTRUCTION :**	1/1/2022
LOCATION :	Ashland, OR	**COST ESTIMATE PREPARATION DATE :**	10/28/2020
ELEMENT # :	1	**BY :**	DDC
ELEMENT :	Flow Through Reactor	**REVIEWED BY:**	DEL

DIVISION	DESCRIPTION	QUAN	UNIT	UNIT COST	LOCATION FACTOR	SUBTOTAL	TOTAL
11	**EQUIPMENT**						
	Demolish Existing UV Reactor and Piping	1	LS	$10,000	1.00	$10,000	
	Flow Through UV Reactor (Contingency and Contractor Markup)	1	LS	$296,805	1.00	$296,805	
	Master Control Panel and Programming (Contingency and Contractor Markup)	1	LS	$10,250	1.00	$10,250	
	Equipment Installation Allowance (% of Equipment)	20	%			$61,411	
	Total, Div. 11						$378,466
15	**MECHANICAL**						
	16" DIP	10	LF	$211	1.10	$2,324	
	16"x20" Reducer	2	EA	$7,516	1.10	$16,536	
	Chemical Cleaning System Allowance	1	LS	$12,500	1.00	$12,500	
	Support Allowance (% of Piping Cost)	20	%			$3,772	
	Total, Div. 15						$35,132
16	**ELECTRICAL**						
	Electrical Allowance	1	LS			$75,000	
	Total, Div. 16						$75,000
17	**INSTRUMENTATION**						
	Existing 16" Magnetic Flowmeter Relocation	2	EA	$1,000	1.00	$2,000	
	Instrumentation Allowance	1	LS			$50,000	
	Total, Div. 17						$52,000
	DIRECT COSTS SUBTOTAL						**$540,598**
	Estimating Contingency	30	%				$162,179
	SUBTOTAL						**$702,777**
	General Conditions, Contractor Overhead, and Profit	25	%				$175,694
	SUBTOTAL						**$878,471**
	Contractor's Risk and Payment Bond	3	%				$21,962
	SUBTOTAL						**$900,433**
	Rate of Annual Inflation	4	%				$42,581
	SUBTOTAL						**$943,014**
	Corporate Activity Tax on Direct Costs Plus Contingency	0.57	%				$5,375
	SUBTOTAL						**$948,389**
	ELEMENT CONSTRUCTION COST						**$948,000**

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UV Improvements Project
City of Ashland

PRELIMINARY CONSTRUCTION COST ESTIMATE

PROJECT :	UV Improvements Project	**LOCATION FACTOR :**	1.10
JOB # :	11940A.10	**ESTIMATED MIDPOINT OF CONSTRUCTION :**	1/1/2022
LOCATION :	Ashland, OR	**COST ESTIMATE PREPARATION DATE :**	10/28/2020
ELEMENT # :	2	**BY :**	DDC
ELEMENT :	LPHO UV Reactor	**REVIEWED BY:**	DEL

DIVISION	DESCRIPTION	QUAN	UNIT	UNIT COST	LOCATION FACTOR	SUBTOTAL	TOTAL
5	**METALS**						
	Access Platform	1	EA	$7,500	1.00	$7,500	
	Roof Modification	1	LS	$10,000	1.00	$10,000	
	Total, Div. 5						$17,500
11	**EQUIPMENT**						
	Demolish Existing UV Reactor and Piping	1	LS	$15,000	1.00	$15,000	
	LPHO UV Reactors (Contingency and Contractor Markup)	1	LS	$374,700	1.00	$374,700	
	Master Control Panel and Programming (Contingency and Contractor Markup)	1	LS	$68,800	1.00	$68,800	
	Equipment Installation Allowance	20	%			$88,700	
	Crane Rental Allowance	0.5	MO	$20,000	1.00	$10,000	
	Total, Div. 11						$557,200
15	**MECHANICAL**						
	16" DIP	20	LF	$211	1.10	$4,648	
	16"x20" Reducing Elbow	2	EA	$8,865	1.10	$19,503	
	20" 11.25 Deg Elbow	2	EA	$5,097	1.10	$11,213	
	20" Dismantling Joint	2	EA	$5,202	1.10	$11,445	
	Filler Flange	4	EA	$1,000	1.10	$4,400	
	16" Butterfly Valve	4	EA	$5,748	1.10	$25,293	
	Chemical Cleaning System Allowance	1	LS	$10,000	1.00	$10,000	
	Support Allowance (% of Piping Cost)	20	%			$15,300	
	Total, Div. 15						$101,801
16	**ELECTRICAL**						
	Electrical Allowance	1	LS			$75,000	
	Total, Div. 16						$75,000
17	**INSTRUMENTATION**						
	Existing 16" Magnetic Flowmeter Relocation	2	EA	$1,000	1.00	$2,000	
	Instrumentation Allowance	1	LS			$50,000	
	Total, Div. 17						$52,000
	DIRECT COSTS SUBTOTAL						**$803,501**
	Estimating Contingency	30	%				$241,050
	SUBTOTAL						**$1,044,552**
	General Conditions, Contractor Overhead, and Profit	25	%				$261,138
	SUBTOTAL						**$1,305,690**
	Contractor's Risk and Payment Bond	3	%				$32,642
	SUBTOTAL						**$1,338,332**
	Rate of Annual Inflation	4	%				$63,289
	SUBTOTAL						**$1,401,621**
	Corporate Activity Tax on Direct Costs Plus Contingency	0.57	%				$7,989
	SUBTOTAL						**$1,409,610**
	ELEMENT CONSTRUCTION COST						**$1,410,000**