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TRANSMITTAL LETTER FOR BOARD MEETING OF DECEMBER 1, 2016

COMMITTEE ON PROCUREMENT

Mr. David St. Pierre, Executive Director

Issue purchase order and enter into an agreement with the Iowa State University for professional engineering services for Contract 14-062-AP Evaluation of Revolving Algae Biofilm System for Recovery of Nutrients Phase 2, O'Brien Water Reclamation Plant, in an amount not to exceed $219,514.00, Account 201-50000-601170, Requisition 1444817

Dear Sir:

Authorization is requested to issue a purchase order and enter into an agreement with the Iowa State University (ISU) for professional engineering services for Contract 14-062-AP Evaluation of Revolving Algae Biofilm System for Recovery of Nutrients Phase 2, O'Brien Water Reclamation Plant (OWRP).

This project will be conducted under the auspices of the Master Agreement between ISU and the District, authorized by the Board of Commissioners at the Board Meeting of February 6, 2014. The purpose of the Master Agreement is to allow the District to directly take advantage of the expertise offered by the ISU in the field of algae cultivation and harvesting. This will be the second research project undertaken under this Master Agreement and will build upon the work developed in the first research project specification.

This research project will be accomplished in fulfillment of the special provisions of the OWRP'S NPDES permit and the District's long-term plan for control of phosphorus discharge in the OWRP effluent. The benefit of using algae to remove phosphorus from wastewater is that the algae can be harvested and used in a variety of sustainable means, such as bioplastics, aquaculture, bio-chemicals or fertilizers.

In September 2015, the District installed four patented revolving algae biofilm (RAB) units supplied by ISU at the O'Brien Algae Research Facility (OARF) to evaluate the performance of this technology in the removal of phosphorus and nitrogen from two side-stream wastewater sources from the District's plants. The District ran the four RAB units for over one year under various conditions, monitoring nutrient uptake, algae biomass production, algae harvesting and equipment robustness. The results of this one-year pilot study demonstrated that RAB system is capable of removing a significant percentage of nitrogen and phosphorus from these wastewater streams under natural sunlight conditions. Two of the RAB units are 3 ft. tall and two of the units are 6 ft. tall, to determine if height has an effect on nutrient uptake. Results concluded that the taller (6-ft.) RAB unit had a higher nutrient removal efficiency and algae biomass productivity than the 3-ft. unit, and has a phosphorus removal efficiency greater than raceway algal ponds, which are traditionally used for algae cultivation. The 6-ft RAB system was able to reduce the total phosphorus effluent concentrations consistently below 0.1 mg/L with a hydraulic residence time of 4.6 days. In addition, the algae biomass productivity per footprint of land area of the 6-ft RAB system was shown to require less than 20% of the land area required for a traditional raceway pond system. The algal biomass produced at the OARF was measured to have a nitrogen, phosphorus, potassium and micronutrient content that would make it suitable as a balanced fertilizer for high value crops.

Based on the demonstrated success of Phase 1 of this study and the promise of this technology to become a practical means for sustainable nutrient recovery, the Engineering Department desires to proceed to a second phase study. The goal of Phase 2 is to further reduce the overall footprint required of the technology by reducing the hydraulic retention time to less than one day. This can be accomplished by increasing the throughput of wastewater through the unit, which can be done by increasing the height of the RAB units. The existing RAB units will be modified to provide a heights of 8 ft. and 10 ft. The performance of the RAB units will be evaluated on low-nutrient concentration final effluent from the OWRP versus side-stream flows which were tested in Phase 1. High efficiency LED lights will be added in one experiment to determine if artificial light will appreciably enhance the algae productivity and nutrient removal capacity. In addition, an RAB unit will be tested in a small-scale configuration simulating immersion in an aeration reactor to evaluate the synergistic performance of algae in combination with mixed liquor bacteria. If successful, several process and economic benefits could be achieved by operating the RAB units in this manner.

The scope of work also includes evaluation in the ISU laboratory of the production of a pelletized product blended with additives such as corn stover, to create a saleable fertilizer product. ISU researchers will also evaluate the requirements to process the algae biomass to create a feedstock for bioplastic manufacturing. Finally, ISU will perform a techno-economic analysis to estimate the economic benefits of the theoretical full-scale application of the RAB technology at OWRP.

The time for completion of the research project is 12 months after award of the contract. There are no provisions in the agreement for the extension of time except for such reasonable period as may be agreed upon between parties. The deliverables to be provided under this agreement include:

- Supply and modification of pilot-scale rotating algae biofilm units to taller configurations
- Supply and installation of LED lights for one RAB system
- Supply and installation of one RAB/aeration reactor pilot simulation
- Overall monitoring of performance and technical support
- Quarterly progress reports
- Final report summarizing all data and removal efficiencies under varying operating parameters and a complete techno-economic analysis

The day-to-day operation of the research facility will be run by staff from the District's Monitoring and Research (M&R) Department. In addition, the District's M&R Department will perform all laboratory analysis, except for specialty analysis not normally conducted at District laboratories. ISU will provide equipment, supplies, material, start-up, monitoring, direction, documentation and technical support during the research project. Two key personnel plus a research assistant and 2,160 hours of university time are estimated for this work. The estimated average payroll rate is $27.22/hour.

The components of the total fee for the agreement are as follows:

1.	Direct Labor Costs	$58,795.00	
2.	Subcontractor Costs (fabrication of equipment)		$91,000.00
3.	ISU Supplies, Materials and Travel	$43,200.00	
4.	Indirect Costs	$26,519.00	
Total Fee (Not to Exceed)		$219,514.00	

Inasmuch as the Iowa State University possesses a high degree of professional skill, it is recommended that the Director of Procurement and Materials Management be authorized to issue a purchase order and enter into an agreement without advertising, per Section 11.4 of the Purchasing Act, in an amount not to exceed $219,514.00.

Funds are being requested in 2017, in Account 201-50000-601170, and are contingent on the Board of Commissioners' approval of the District's budget for that year.

Requested, Catherine A. O'Connor, Director of Engineering, TK
Recommended, Darlene A. LoCascio, Director of Procurement and Materials Management
Respectfully Submitted, Barbara J. McGowan, Chairman Committee on Procurement
Disposition of this agenda item will be documented in the official Regular Board Meeting Minutes of the Board of Commissioners for December 1, 2016