



## Exhibit A – Scope of Work

University of Nevada, Reno

July 2, 2018

Rick Warner  
Washoe County Community Services Department  
1001 E. Ninth St.  
Reno, NV 89512

Re: Proposal

Project Title: **Development and Process Research to Achieve Biosolids and Reclaimed Water Treatment Goals at South Truckee Meadows WRF**

UNR PI: Dr. Krishna Pagilla

UNR SP #: 1801186

Proposed project funding: \$298,694 (direct costs \$215,173; indirect costs \$83,521 at UNR rate of 44%)

Dear Rick:

The University of Nevada, Reno (UNR) will be pleased to participate in the above referenced research project and encloses the proposed scope of work and budget. Should this proposal be awarded, UNR looks forward to working Washoe County Community Services Department and is prepared to establish the necessary inter-institutional agreements upon notification of award.

As a state institution of higher education, UNR is limited in indemnification and maintains self-insurance in accordance with Nevada Revised Statute. Only clauses applicable to non-profit educational institutions should be flowed down from any prime award. If an award is issued, UNR reserves the right to negotiate terms and conditions including flowed-down FARS clauses.

In the event this proposal is awarded, please issue the award document to our legal name:

**Board of Regents, Nevada System of Higher Education, on behalf of the University of Nevada, Reno**

Sponsored Projects / Mailstop 325  
University of Nevada, Reno  
Reno, NV 89557-0240  
(if by email: [ospadmin@unr.edu](mailto:ospadmin@unr.edu))

For questions of a technical or program nature, please contact the project director. For contractual or business questions, please contact this office and refer to the above SP number.

Sincerely,

Erika Waday  
Information & Training Specialist  
Encl.

**Sponsored Projects**  
University of Nevada, Reno/325  
Reno, Nevada 89557-0325  
(775) 784-4040 office  
(775) 784-6680 fax  
[www.unr.edu/ospa](http://www.unr.edu/ospa)

## **PROJECT PROPOSAL**

**Principal Investigator:** Krishna Pagilla, Ph.D., P.E.

**Project Number:**

**1. Project Title:**       **Development and Process Research to Achieve  
Biosolids and Reclaimed Water Treatment Goals at  
South Truckee Meadows WRF**

**2. Principal Investigators:**   **Krishna Pagilla, Ph.D., P.E., Professor (PI)**  
Board of Regents, NSHE, obo University of Nevada, Reno  
Director, Nevada Water Innovation Campus  
Department of Civil and Environmental Engineering  
Phone: 775-682-1918; E-mail: [pagilla@unr.edu](mailto:pagilla@unr.edu)

**Yu Yang, PhD, Assistant Professor (Co-PI)**  
Department of Civil and Environmental Engineering  
Phone: 775-682-6609; E-mail: [yuy@unr.edu](mailto:yuy@unr.edu)

**3. Project Manager:**       **Rick Warner, PE**  
Senior Engineer  
Washoe County Community Services Division  
1001 E. Ninth Street, Reno, NV 89512  
Phone: 775-954-4621  
E-mail: [rwarn@washoecounty.us](mailto:rwarn@washoecounty.us)

**3. Scope of Work:**        See Page 2

**4. Duration of the Project:**   July 1, 2018 to December 31, 2019

**5. Specified Deliverable Items:**

As described in the Scope of Work

**6. Equipment:**       None

**7. Budget:**       See page 7

### **3. Scope of Work**

#### **Development and Process Research to Achieve Biosolids and Reclaimed Water Treatment Goals at South Truckee Meadows WRF**

The project described here is to research and develop strategies to achieve wastewater and biosolids treatment goals and reclaimed water management at the Washoe County's South Truckee Meadows Water Reclamation Facility. This project will consist of several sub-projects over the duration of July 1 – December 31, 2019 to assist Washoe County in wastewater treatment and operation optimization, biosolids management, indirect potable reuse demonstration, and reclaimed water quality management investigations at STMWRF. The sub-projects are outlined below. A detailed scope and methods for each sub-project will be developed during initial stages of each sub-project.

##### **1. Sub-Project Title: COAG/FLOC/SED/GMF (CFSF) Pilot Demonstration Assistance**

**Project Duration:** 9 months

**Project Team:** Krishna Pagilla and Yu Yang

**Students:** 2 graduate students and 2 undergraduate students

**Goal:** Monitor, sample, and analyze the pilot scale CFSF unit at STMWRF to demonstrate its ability to achieve organic, inorganic and microbial contaminant removal for indirect potable reuse and landscape irrigation purposes.

##### **Tasks:**

Task 1: Develop sampling, monitoring and analysis plan

Task 2: Collect data from the CFSF pilot plant as per Task 1

Task 3: Analyze results and report the findings to the County

**Scope:**

- UNR will develop the sampling, monitoring and analysis plan
- UNR will conduct sampling and monitoring
- UNR will conduct selected analyses (Turbidity, SS, Algae, and performance parameters)
- UNR will either conduct in-house and/or use external labs for selected analyses (Giardia/Crypto, Viruses, Arsenic, Other Heavy Metals)

**Budget:****\$79,321**

2 Graduate Students (5 months each), Undergraduate Student (6 months), Faculty Time (1 month), Materials and Supplies, Local Travel, Student Tuition, Indirect Costs

**2. Project Title: Aerobic Digester Optimization Research and Development****Project Duration:** 18 months**Title:** Optimization of Aerobic Digestion of Waste Activated Sludge with and without Polymer Thickening**Project Team:** Krishna Pagilla**Students:** One Graduate Student**Goal:** Conduct lab scale and full investigations to optimize aerobic digestion at the STMWRF.**Tasks:**

Task 1: Develop a study plan including sampling, monitoring, and analytical methods

Task 2: Conduct lab scale investigations on the effects of polymer addition on oxygen transfer and thickening.

Task 3: Conduct full scale investigations of aerobic digester to optimize VS reduction and maximize oxygen transfer.

Task 4: Data collection and analysis for report preparation and presentations

**Scope:**

- UNR will develop the sampling, monitoring and analysis plan
- UNR will assist the County in Lab scale column construction and procurement of materials
- UNR will conduct lab scale testing for oxygen transfer with and without polymer
- UNR will conduct sampling and monitoring of full scale aerobic digesters
- UNR will conduct specialized testing (SOUR, thickenability) for full scale digester optimization
- Washoe County will contract with local laboratory for polymer examinations, alkalinity and ammonia testing

**Budget:**

**\$69,368**

Graduate Student (12 months) Faculty Time (0.5 month), Materials and Supplies, Student Travel, Tuition, Indirect Costs

**3. Project Title: Monitoring of STMWRF IPR Demonstration for  
PPCPs/Bacteria/Protozoa/Viruses, and CEC Removal Performance Indicators in 2018**

**Project Duration:** 6 months

**Project Team:** Krishna Pagilla

**Students:** Lin Li, Kyle Pierce, Laura Haak, Vijay Sundaram (Students supported by USBOR Project and TMWA STMWRF Support Project). Supported by 2 Undergraduate students.

**Goal:** Monitor the STMWRF IPR demonstration pilot scale system to meet Class A+ regulations and requirements in terms of TOC removal, pathogen removal, CEC removal, and perchlorate/bromate removal.

**Task:** A draft sampling and monitoring plan has been developed to monitor the pilot scale IPR consisting of Coagulation-Flocculation-Sedimentation-Filtration Trailer, Ozone-BAC Trailer, and Advanced Treatment Trailer (GAC, UV, Ultrafiltration). This sub-project will refine the draft plan into a final plan to conduct the following:

- Analysis of samples collected will be conducted in-house at UNR and also sent to external laboratories.

- The funding requested is primarily for sampling supplies, external lab costs for virus, protozoa, and CECs
- Virus analysis will be conducted by Prof. Joan Rose' lab at Michigan State University on samples sent by UNR. It is anticipated to conduct 5 sampling events totaling 30 samples (estimated cost of \$40,350). A subcontract will be set-up with Michigan State University for this purpose.
- The CEC sampling will be conducted by UNR and samples will be analyzed by an external lab as well as UNR. It is anticipated that we will collect 16 samples for PPCP suite, PFAS/PFOS, NDMA/NMOR, perchlorate, bromate, and TOC/DOC analysis. (estimated cost of \$10,118)
- Sampling equipment and supplies are estimated at a cost of \$4,000.
- Arsenic analysis will be conducted by Wet Lab through the existing contract with Washoe County.

**Budget: \$87,289**

One Graduate Student, 2 Undergraduate Students, External Lab Costs (Services), Sampling Supplies, Indirect Costs

**4. Project Title: Assistance to County for STMWRF and STM Reclaimed Water Readiness for Design and Construction Work**

**Project Duration:** 12 months

**Title:** Process Modeling and Support for STMWRF Plant Optimization and Upgrades

**Project Team:** Krishna Pagilla, Eric Marchand

**Students:** One Graduate Student, 2 Undergraduate Student Assistants

**Goal:** To assist Washoe County in various aspects of STMWRF operations and reclaimed water management aspects including reuse options and process modeling efforts.

**Tasks:**

Task 1: Help creating a water quality database for plant performance assessment and use in process modeling (constituents, loadings, graphical presentations)

Task 2: Tune and update existing process modeling scenarios for STMWRF using Biowin software. Work with Washoe County to identify the scenarios and simulate them for process performance and operating conditions needed. Washoe County will provide the Biowin software.

Task 3: Conduct two sampling campaigns to determine the flows and loads and wastewater characteristics for process modeling calibration and validation. County will pay for sampling supplies and external laboratory costs for sample analysis.

**Budget: \$62,716**

One Graduate Student, 2 Undergraduate Students, Faculty Time, Supplies

**Project Team**

The UNR project team will consist of the Principal Investigator, Dr. Krishna Pagilla, PE, Dr. Yu Yang, Assistant Professor, Dr. Eric Marchand, PE, Associate Professor, graduate and undergraduate student assistants. Additional faculty and staff at UNR will be used for unique and supplementary tasks as needed with approval from Washoe County.

**Project Schedule**

The project schedule for UNR tasks will extend over a period of 18 months starting on July 1, 2018 and ending on December 31, 2019. A detailed project schedule for UNR involvement outlining the exact dates of each task described above and the respective deliverables will be developed during the first month of the project.

**Project Costs**

The funding needed for the project is estimated for a total of **\$ 298,694**. The budget supports faculty time (2.5 months), 3 graduate students, 4 undergraduate student assistants, travel costs, materials and supplies, external lab services, and subcontract with Michigan State University for professional lab services. The total direct costs are **\$215,173** and the indirect costs (Facilities and Administration Costs) are charged at 44% (**\$83,521**) of the modified direct

## Exhibit B – Fee Schedule

costs (\$189,823) as per UNR's cost rate. The detailed budget for each sub-project is shown in the Table (1) below.

Table 1. Project Budgets for the Total Project Duration

Item	Sub-Proj 1	Sub-Proj 2	Sub-Proj 3	Sub-Proj 4	All Projects
Faculty Salary	10000	11000	0	10000	31000
Graduate Student Salary	20000	24000	0	20000	64000
Undergraduate Salary	9600	0	9600	4800	24000
Fringe Benefits	3095	3395	240	2975	9705
Travel Costs	1000	3000	1000	1000	6000
Materials and Supplies	10000	4000	4000	2000	20000
Services	0	0	10118	0	10118
Subawards	0	0	40350	0	40350
Tuition and Fees	2000	4000	0	4000	10000
<b>Total Direct Costs (TDC)</b>	<b>55695</b>	<b>49395</b>	<b>65308</b>	<b>44775</b>	<b>215173</b>
<b>Modified Direct Costs (MDC)</b>	<b>53695</b>	<b>45395</b>	<b>49958</b>	<b>40775</b>	<b>189823</b>
<b>Facilities &amp; Admin Costs (F&amp;A)(44% of MDC)</b>	<b>23626</b>	<b>19973</b>	<b>21981</b>	<b>17941</b>	<b>83521</b>
<b>Total (TDC +F&amp;A)</b>	<b>79321</b>	<b>69368</b>	<b>87289</b>	<b>62716</b>	<b>298694</b>