RESEARCH AGREEMENT

No. 2100137

BY AND BETWEEN
City of Sparks

AND

The Board of Regents of the Nevada System of Higher Education obo
University of Nevada, Reno

This Research Agreement ("Agreement") is entered into and is effective as of as of the date of last signature by the Parties hereto, by and between City of Sparks, a municipal corporation, having its principal place of business at 431 Prater Way, Sparks, NV 89431, ("Sparks") and the Board of Regents of the Nevada System of Higher Education (NSHE), obo the University of Nevada, Reno, an institution of higher education of the State of Nevada, ("University") having its principal place of business at 1664 North Virginia Street, Reno, NV 89557 (Sparks and University each to be referred to as "Party" or together as "Parties") .

RECITALS

WHEREAS, Sparks, with City of Reno, own the Truckee Meadows Water Reclamation Facility ("TMWRF");

WHEREAS, Sparks desires to monitor and conduct environmental surveillance at the TMWRF to determine the extent of the presence of SARS-COV2 marker in order to further determine the presence of COVID-19 in the local community;

WHEREAS, Sparks determines this project to be a necessary response to the COVID-19 pandemic emergency and that costs related to this project are eligible for funding from the Coronavirus Aid, Relief, and Economic Security ("CARES") Act Coronavirus Relief Fund ("CRF") that has been allocated Sparks;

WHEREAS, University has prepared a proposal Entitled *Investigation of SARS-CoV-2 Presence in Wastewater and Community Prevalence Monitoring* and Sparks and University wish to have the research project performed in accordance with the scope of work and budget outlined in this Agreement;

WHEREAS, the performance of such research is consistent, compatible and beneficial to the academic role and mission of University as an institution of higher education; and

WHEREAS, University is qualified to conduct the research associated with such project.

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AGREEMENT

NOW, THEREFORE, for and in consideration of the mutual covenants, conditions and undertakings herein set forth, the parties agree as follows:

1.   Scope of Work.   University agrees to perform for Sparks certain research ("Research") described in the Scope of Work and provide the deliverables set forth in Appendix A, which is attached hereto and incorporated herein by this reference. Principal Investigator may select other University employees to participate in the Research (including but not limited to, University technicians, undergraduate and graduate students, post-doctural fellows, or faculty members).

2.   Period of Performance.   The Project period under this Agreement is intended to commence upon execution of this Agreement by both parties and continue to December 30, 2020.   This Agreement may be extended for additional periods of performance beyond the Initial Term, upon written approval by Sparks and University, however, all costs must be incurred and research completeby December 30, 2020.

3.   Compensation and Payment.

3.1.   Compensation.   Sparks shall pay to University a total not to exceed One Million Seven Hundred Ninety Thousand Three Hundred Eighty-five and 00/100 Dollars ($1,790,385.00) ("Compensation") for performance of the Research under this Agreement. A budget itemizing the costs for providing the Research is set forth in Appendix A.

3.2.   Payment. Monthly cost reimbursable payments shall be made by Sparks to University based upon monthly invoices submitted by University. Invoices submitted to Sparks shall be paid by Sparks within thirty (30) days of receipt. The monthly invoices for services performed shall be submitted by the 15th of each month and shall identify the direct, facility, and administrative costs incurred during the previous month. Final payment shall be made upon completion of the Research.

3.3.   Invoicing.
Invoices shall be delivered to:

> Michael Drinkwater
> Truckee Meadows Water
> Reclamation Facility
> 8500 Clean Water Way
> Reno, NV 89502

Compensation checks shall reference the appropriate UNR account number and be payable to "Board of Regents, NSHE obo the University of Nevada, Reno" and shall be delivered to:

> University of Nevada, Reno
> Controller's Office
> Mail Stop 124
> Reno, NV 89557-0025

4.   Technical Supervision

   4.1.   Supervision by Sparks. The person with primary responsibility for supervision of the performance of the Research on behalf of Sparks shall be Michael Drinkwater, Treatment Plant Manager, or such other person as may be designated by Sparks, who shall have primary responsibility for technical supervision of the Project.

   4.2.   Supervision by University. The person with primary responsibility for supervision of the performance of the Research on behalf of University shall be Krishna Pagilla, Ph.D. No other person shall replace or substitute for him/her in the supervisory responsibilities hereunder without the prior written approval of University, which may be granted or withheld at University's sole discretion.

5.   Reporting Requirements. University shall provide written reports to Sparks on the progress of the performance of Research as outlined or required in the Scope of Work. A final written report shall be furnished to Sparks upon completion of the Research within 90 days of the last day of the project period and after the final payment has been received.

6.   Equipment. All equipment, instruments and materials purchased or used by University in connection with performance of the Research shall at all times remain under the sole control and ownership of University.

7.   Confidentiality. The parties acknowledge that they are both governmental entities and thus subject to the Nevada Open Records Act, NRS Code 239.005 to 239.011. Pursuant to the Act, this Agreement, any confidential information provided pursuant hereto, may be subject to public disclosure. Any person who provides either party with records that such person believes should be protected from disclosure for business reasons must indicate the confidentiality of such records upon disclosure.

8.   Data Ownership. University shall retain ownership of all data and information generated as a result of conducting the Research. University grants Sparks the right to use the data for its purposes in connection with the TMWRF.

9.   Publication. Sparks recognizes that the results of University's involvement in the Research must be publishable or otherwise available for public dissemination, and agrees that University has the right to present at international, national or regional professional meetings or symposia, and to publish in journals, theses, or dissertations, or otherwise of their own choosing, methods, information and data resulting from or gained in pursuing the Research in connection with this Agreement.

10.   Intellectual Property. It is not anticipated that any Intellectual Property will be developed as a result of the research.

   10.1.   University Intellectual Property. Intellectual property independently conceived or reduced to practice or writing by University prior to entering into this Agreement with no facilities, contribution, involvement or support by Sparks, as to its conception or reduction to practice, shall remain the sole and exclusive property of University, and Sparks shall have no title or claim to such intellectual property.

10.2 Sparks Intellectual Property. Intellectual property independently conceived or reduced to practice or writing by Sparks prior to entering into this Agreement with no facilities, contribution, involvement or support by University, as to its conception or reduction to practice, shall remain the sole and exclusive property of Sparks, and the University shall have no title or claim to such intellectual property.

10.3 Project Intellectual Property. University shall own all right, title and interest in all Intellectual Property conceived or reduced to practice solely by the University and/or University employees in carrying out the Scope of Work and may, at its election, file all patent applications related thereto. University hereby grants to Sparks a perpetual, non-transferrable, non-exclusive, royalty-free license to have made, use, and sell, with no right to sublicense, limited to its own internal use.

11. Compliance With Laws. In performance of the Research, Sparks and University shall comply with all applicable federal, state and local laws, codes, regulations, rules and orders.

12. Relationship of Parties. In assuming and performing the obligations of this Agreement, University and Sparks are each acting as independent parties and neither shall be considered or represent itself as a joint venturer, partner, agent or employee of the other. Neither party shall use the name or any trademark of the other party in any advertising, sales promotion or other publicity matter without the prior written approval of the other party.

13. Termination and Survival.

13.1. Termination. This Agreement may be terminated by either party at any time, by giving written notice thereof to the other party. Such termination shall be effective thirty (30) days after receipt of such notice. Termination shall not relieve either party of any obligation or liability accrued hereunder prior to such termination, or rescind or give rise to any right to rescind any payments made prior to the time of such termination.

13.2. Survival. Termination of this Agreement by either party, for any reason, shall not affect the rights and obligations of the parties accrued prior to the effective date of termination of this Agreement. No termination of this Agreement, however effectuated, shall affect the parties' rights and obligations under Paragraphs 7, 8, 9, and 10 of this Agreement.

14. Uncontrollable Forces. Neither Sparks nor University shall be considered to be in default of this Agreement if delays in or failure of performance shall be due to uncontrollable forces the effect of which, by the exercise of reasonable diligence, the nonperforming party could not avoid. The term "uncontrollable forces" shall mean any event which results in the prevention or delay of performance by a party of its obligations under this Agreement and which is beyond the control of the nonperforming party. It includes, but is not limited to, fire, flood, earthquakes, storms, lightning, epidemic, war, riot, civil disturbance, sabotage, inability to procure permits, licenses, or authorizations from any state, local, or federal agency or person for any of the supplies, materials, accesses, or services required to be provided by either Sparks or University under this Agreement, strikes, work slowdowns or other labor disturbances, and judicial restraint.

15. Miscellaneous.

15.1. Assignment. Neither party shall assign or transfer any interest in this Agreement, nor assign any claims for money due or to become due under this Agreement, without the prior written consent of the other party.

15.2. Entire Agreement. This Agreement, with its attachments, constitutes the entire agreement between the parties regarding the subject matter hereof and supersedes any other written or oral understanding of the parties. This Agreement may not be modified except by written instrument executed by both parties.

15.3. Successors and Assigns. This Agreement shall be binding upon and inure to the benefit of the parties, their successors and permitted assigns.

15.4. Notices. Except as provided in Section 3 hereof regarding payment of invoices, any notice or other communication required or permitted to be given to either party hereto shall be in writing and shall be deemed to have been properly given and effective: (a) on the date of delivery if delivered in person during recipient's normal business hours; or (b) on the date of delivery if delivered by courier, express mail service or first-class mail, registered or certified, return receipt requested. Such notice shall be sent or delivered to the respective addresses given below, or to such other address as either party shall designate by written notice given to the other party as follows:

To University

Attn: Charlene Hart
Office of Sponsored Projects
University of Nevada, Reno
204 Ross Hall MS 325
Reno, NV 89557

To Sparks:

Attn: Michael Drinkwater
Truckee Meadows Water Reclamation
Facility
8500 Clean Water Way
Reno, NV 89502

15.5. Order of Precedence. In the event of any conflict, inconsistency or discrepancy amount, the Agreement and any other documents listed below shall be resolved by giving precedence in the following order.
   (a) This Agreement including the Exhibits hereto
   (b) Purchase Order issued by Sparks. In the event a purchase order is issued under this Agreement and such purchase order contains standardized terms and conditions, the terms and conditions of this Agreement shall supercede and replace all such purchase order standardized terms and conditions.

15.6. Governing Law and Disputes. This Agreement shall be interpreted and construed in accordance with the laws of the State of Nevada, without application of any principles of choice

of laws. Disputes that cannot be resolved by Sparks and University shall be determined by a court of competent jurisdiction in the State of Nevada.

15.7. <u>Nonwaiver</u>. A waiver by either party of any breach of this Agreement shall not be binding upon the waiving party unless such waiver is in writing. In the event of a written waiver, such a waiver shall not affect the waiving party's rights with respect to any other or further breach.

15.8. <u>Use of Name</u>. Neither party shall use the name of the other party in any news release or advertising or any publications directed to the general public without written approval of the other party.

15.9. <u>Attorney Fees</u>. The prevailing Party in any action or suit to enforce the terms or conditions of this Agreement shall be entitled to recover its costs of court and reasonable attorneys' fees incurred in enforcing the terms or conditions of this Agreement.

15.10. <u>Counterparts and Facsimile Signatures</u>. This Agreement may be executed in one or more counterparts each of which shall be deemed an original but all of which together shall constitute one and the same instrument. Signed signature pages may be transmitted by facsimile, and any such signature shall have the same legal effect as an original.

15.11. <u>Severability</u>. If any provision of this Agreement is held void or unenforceable, the remaining provisions shall nevertheless be effective, the intent being to effectuate this Agreement to the fullest extent possible.

15.12. Both Parties shall maintain adequate commercial insurance or maintain a program of self-insurance for general, professional, auto liability, and workers compensation to cover risks posed by the performance of this project.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their duly authorized representatives effective as of the day and year first written above.

CITY OF SPARKS

BOARD OF REGENTS, NSHE OBO
UNIVERSITY OF NEVADA, RENO

"Sparks"

"University"

By: _____

By: _____

Name: Neil C. Krutz, ICMA-CM
Title: City Manager

Name: Charlene Hart
Title: Associate Vice President for
            Research Administration

Date: _____8/19/20_____

Date: _____08/19/2020_____

APPROVED AS TO LEGAL FORM:

By_____

City Attorney's Office

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Proposal

1. Project Title:	**Investigation of SARS-CoV-2 Presence in Wastewater and Community Prevalence Modeling**
2. Principal Investigator:	**Krishna Pagilla, Ph.D., P.E., Ralph and Rose Hoeper Engineering Professor and Chair, Civil and Environmental Engineering Director, Nevada Water Innovation Institute**
	University of Nevada, Reno
	Department of Civil and Environmental Engineering
	Phone: 775-682-7918; E-mail: pagilla@unr.edu
3. Project Manager:	**Michael Drinkwater, PE**
	Manager, Truckee Meadows Water Reclamation Facility
	mdrinkwater@cityofsparks.us
	775-861-4116 (direct)
4. Statement of Work:	See attached
5. Duration of the Project:	Ongoing with ending date of December 30, 2020
6. Deliverables:	As described in the Statement of Work
7. Equipment:	As described in budget description
8. Budget and Description:	**$1,790,385** (As described in the Statement of Work)

Statement of Work

Background and Introduction

The COVID-19 disease pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has rapidly spread around the world. World Health Organization (WHO) has designated COVID-19 as a Public Health Emergency of International Concern on January 30, 2020 (Chan et al. 2020). Since the first case of COVID-19 has been confirmed in Wuhan city, China, on December 31, 2019 (Chen et al., 2020b; Xiang et al., 2020), COVID-19 has been found in more than 200 countries nearly 18 million population infected until August 5, 2020. So far, the number of deaths caused by COVID-19 has already exceeded 700,000 worldwide, including over 160,000 deaths in the US. On March 5, 2020, the first COVID-19 case was confirmed in Washoe Country, NV. Since then there has been 5,319 positive cases and 115 deaths in total until August 3, 2020. It is possible the cases of active infection are much higher than the identified number of cases because COVID-19 testing has been limited and asymptomatic individuals do not undergo testing.

It is well known that sewage (wastewater) contains human pathogens due to excretion of the same in urine and feces by humans. The Centers for Disease Control (CDC) has important guidelines which state that the risk of being infected from water and wastewater is negligible (https://www.cdc.gov/coronavirus/2019-ncov/php/water.html). However, monitoring of wastewater or other environmental media (air, soil, and water) has been an important method to determine community prevalence of disease due to pathogens by measuring certain molecular markers, and is known as environmental surveillance (ES). Numerous cities and regions around the world are conducting ES to monitor SAR-CoV-2 is determine the incidence of COVID-19 in the community (Water Research Foundation, wrf.org). However, no wastewater SARS-CoV-2 environmental surveillance has been conducted in the Truckee Meadows region. Early intervention in wastewater environmental surveillance may provide us valuable data on the estimation and prediction of the community prevalence of COVID-19. This project is useful currently and scalable in monitoring the SARS-CoV-2 pandemic and potential future outbreaks in the Truckee Meadows region.

Project goal and tasks

The main goal of this research is to conduct environmental surveillance of wastewater at the Water Reclamation Facility (TMWRF) and in the collection systems by monitoring of SARS-COV2 marker during the pandemic in the Truckee Meadows region. The monitoring data is used to develop models that can indicate community prevalence of COVID-19 in the population. The modeling tools will include the COVID-19 epidemiological testing data from local health agencies to develop a predictive ability for incidences of increase or decrease in COVID-19. These tools will help the decision makers in development of management actions to deal with the pandemic in the region.

Specifically, the following sub-goals or objectives are being considered:

1) Develop methods to sample wastewater and determine SARS-CoV-2 marker in Truckee Meadows Water Reclamation Facility using RT-qPCR method and sampling preparation techniques;

2) Expand analytical capability of SARS-CoV measurement capability using digital droplet PCR for large scale sample analysis;

3) Monitor selected sites SARS-CoV-2 marker (using RT-qPCR and ddPCR methods) in wastewater in the collection systems, likely hot-spots (such as hospitals sites), and WRF (whole community aggregated sites);

4) Determine SAR-CoV-2 marker fate with time under sewer conditions (wastewater characteristics and physical conditions) and determine the fate and removal of SARS-CoV-2 during wastewater treatment in the WRFs; and

5) Develop a community prevalence framework and model based on the SARS-CoV-2 data from wastewater monitoring, and health and COVID-19 disease monitoring data from health agencies; and develop a predictive tool for incidence of COVID-19 in the population.

Project Plan and Methods

The above objectives will be achieved by conducting the following tasks. Detailed methods for conducting the work are being currently developed based on existing capabilities and new capabilities are being compiled by UNR currently. Specific tasks identified currently to prepare budget estimate include the following:

Task 1: Initial Investigations of Methods and Best Practices

1.1 Review current practices related to the pandemic of COVID-19 and the surveillance of SARS-CoV-2 in wastewater. The objective is to identify and summarize all relevant literature and state-of-the-art methodologies for the monitoring of SARS-CoV-2 (currently under progress by UNR).

1.2 Conduct interviews with utilities/operators. The objective is to identify the wastewater sampling locations and fluctuations of possible incoming virus and their impact on the stability of virus presence.

1.3 Develop the method of sampling and the method of SARS-CoV-2 quantification in UNR's biomolecular lab based on existing publications and utility interviews (under progress).

1.4 Document a quality assurance and quality control (QA/AC) checklist. To assess possible contamination from field conditions during sampling, a QA/QC plan will be developed. This will include preparation of field blanks for each sampling campaign and laboratory blank for each assay; follow minimum information for publication of quantitative real-time PCR experiments (MIQE) guidelines in RT-qPCR assay.

Deliverables: A detailed report including SARS-CoV-2 sampling and analytical methods and state-of-the-art procedures in assessing community prevalence of COVID-19 based on wastewater based epidemiology. This report will be include SARS-CoV-2 preliminary data and QA/QC protocols from TMWRF and other regional facilities (for comparative purposes).

Task 2: Investigation of SARS-CoV-2 Presence in Wastewater

2.1 A data collection campaign will include sampling (frequency to be determined) at TMWRF, (and STMWRF, and RSWRF for comparative purposes); collection systems of the region including hot spots; and high density occupancy facilities. Sample sites at each plant will include raw sewage and the finished effluent and at manholes within the collection systems. Both grab and composite using refrigerated samplers will be conducted.

2.2 Characterization of wastewater characteristics at each sampling sites to develop relationships between physical, chemical, and biological constituents in wastewater and transport of SARS-CoV-2 through the collection systems.

2.3 Develop a future sampling and testing plan for potential continued persistence of COVID-19. UNR is already collected samples at the WRFs for future analysis. UNR will carry out a detailed sampling campaign plan in preparation for the sampling campaigns. The goal is to develop the best practices and considerations for sample design, data collection and sample assay method.

Deliverables: A detailed report including SARS-CoV-2 data from various locations in TMWRF service area and TMWRF including physical, chemical and biological characteristics of wastewater associated with each sample. This will include only data collected until the end of this project. The report will be include analysis of Washoe County District Health Data on COVID-19 for comparing with wastewater data.

Task 3: Develop Community Prevalence Framework and Modeling Tool

3.1 Community health data collection will retrieve statistics for confirmed COVID-19 cases from the Washoe County Department of Health and Nevada State Public Health Laboratory. Parameters of interest include daily statistics for positive tests, hospitalization rates, death rates, and demographic information.

3.2 County level health statistics related to the course of illness for COVID-19 across different demographic groups will be compared to reported statistics from other cities and published literature. This will provide a more reliable estimate for illness duration and the rates of hospitalization, asymptomatic cases, and deaths across diverse demographic groups.

3.3 Existing sewage surveillance programs for early detection of virus outbreaks will be reviewed to incorporate best practices in this work. Examples include early warning systems for polio outbreaks, malaria, antibiotic resistance, and enteric viruses based on environmental surveillance.

3.4 Develop a conceptual framework and modeling tool(s) to describe how the SARS-CoV-2 environmental surveillance can be applied for decision making to protect public health and ensure early detection of outbreaks. Advanced methods including network modeling, artificial intelligence, and statistical modeling will be used to develop the predictive tool for COVID-19 community prevalence.

Deliverables: A conceptual framework and model to determine trends in community prevalence of COVID-19 based wastewater based epidemiology data and WCDH's testing data.

Project Team

The project team is comprised of environmental engineers (Dr. Krishna Pagilla, Tatiana Guarin), environmental data expert (Laura Haak), environmental molecular biologist (Lin Li), community health specialist (Dr. Joshua Garn), artificial intelligence and network modeler (Dr. Hamed Ebrahimian), and health systems information modeler (Amir Talei-Khoei). A team of additional faculty, research assistants, staff, and consultants will assist in this project. This multi-disciplinary team will plan, conduct, model, and develop predictive tool(s) for community prevalence of COVID-19 using environmental surveillance of wastewater.

Principal Investigator:
Dr. Krishna Pagilla, PhD, PE, Director, Nevada Water Innovation Institute

Core Team Members:

Dr. Lin Li, PhD, Post-Doctoral Scholar, Nevada Water Innovation Institute, UNR
Laura Haak, PhD Candidate; Nevada Water Innovation Institute, UNR
Tatiana Guarin, PhD Candidate; Nevada Water Innovation Institute, UNR
Dr. Joshua Garn, Assistant Professor, School of Community Health Sciences, UNR
Dr. Hamed Ebrahimian, Assistant Professor, Civil and Environmental Engineering, UNR
Dr. Amir Talei-Khoei, Associate Professor, Information Systems, School of Business, UNR

Project Duration

The project is ongoing and will continue until December 30, 2020 following City of Sparks Council's approval of the scope and budget.

Project Budget and Description

The estimated budget for the project is - **$1,790,385.** The details are shown below in the table.

Category	Funds Requested
	$
Senior Personnel Salary	168,000
Student Salary and Stipends	106,000
Fringe Benefits	64,934
Travel Expenses	3000
Materials and Supplies	200,000
Services	100,000
Sub-Awards	100,000
Tuition Fees Benefits to Students	5,000
Equipment	750,000
Total Direct Costs (TDC)	$1,496,934
Total Modified Direct Costs (TMDC) (TDC minus (equipment + tuition))	666,934
Facilities and Administration Costs (44% of TMDC)	293,451
Total Direct and Indirect Costs	**1,790,385**

This budget estimate is based personnel costs to conduct the project, equipment needed to increase capacity and acquire high volume molecular biology equipment for a BSL2 lab, safety and field equipment for sampling and analysis, external services with commercial labs for quality assurance and control work, consulting services for external experts to peer review and provide additional guidance/support for project team, materials and supplies for laboratory and field work, travel costs for transport and personnel, tuition benefits to students as per UNR rates, fringe benefits as per UNR rates, and facilities and administration costs.

The major equipment includes, but not limited to, the following:

- Digital Droplet PCR System
- Wastewater Analyses – Organics – Total Organic Carbon/Total Nitrogen Analysis
- Refrigerated Automated Samplers
- Wastewater Inorganic Analysis – Ion Chromatograph
- Molecular Biology Equipment – PCR Workstation, Nanodrop Spectrophotometer, UV/VIS Spectrophotometer, Flourescent Microscope, Spectrophotometer, Laminar Flow Chamber
- Large Autoclave/Sterlizer
- -80C and -20C Sample Freezers

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