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KAREN ELLISON, RECORDER

Assessor's Parcel Number: N/A

Date: OCTOBER 20, 2014

Recording Requested By:

Name: EILEEN CHURCH, PUBLIC WORKS (JE)

Address:

City/State/Zip:

Real Property Transfer Tax: $ N/A

RESEARCH AGREEMENT #2014.208

(Title of Document)

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APPROVED AUGUST 21, 2014 ITEM #5

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BY _____ DEPUTY

RESEARCH AGREEMENT

No. 1400978

BY AND BETWEEN

Douglas County Public Works

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 August 1, 2014, by and between Douglas County, having its principal place of business at 1120 Airport Road, Minden, NV 89423, ("Sponsor"), and the Board of Regents of the Nevada System of Higher Education (NSHE), on behalf of 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. Sponsor and University are sometimes collectively referred to as the "Parties" or individually as a "Party."

RECITALS

WHEREAS, Sponsor wishes to have a research project performed in accordance with the scope of work 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.

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 Sponsor certain research ("Research") described in the Scope of Work 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-doctoral fellows, or faculty members).

2. Period of Performance. The Project period under this Agreement is intended to commence on September 1, 2014 and continue until August 31, 2016. This Agreement may be extended for additional periods of performance beyond the Initial Term, upon written approval by Sponsor and University.

3. Compensation and Payment.

3.1. Compensation. University agrees to provide the services set forth in Paragraph 1 at a cost not to exceed Ninety Thousand Dollars ($90,000) ("Compensation").

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

3.3. Invoicing.
Invoices shall be delivered to:

Douglas County
1120 Airport Road
Minden, NV 89423

Payments to the University 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 Sponsor. The person with primary responsibility for supervision of the performance of the Research on behalf of Sponsor shall be Jon S. Erb, P.E.; Civil Engineer III, or such other person as may be designated by Sponsor, 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 Elie Hajj, Ph. D. (the "Principal Investigator"). 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 Sponsor 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 Sponsor upon completion of the Research within 60 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.

7.1. Confidential Information. All reports, data, other information of a proprietary, technical or business nature provided by one Party to the other Party in connection with the Research, whether in oral, written, graphic or electronic form and which is clearly marked or otherwise communicated to the recipient Party as Confidential Information. Confidential Information shall not include information which:

a) is presently or becomes generally known or available to the public through no act or failure to act by the recipient party;

b) is known by the recipient party at the time the information is received or, in the case of Intellectual Property, at the time of recipient Party's generation of such Intellectual Property;

c) is hereafter furnished to the recipient Party by a third party, as matter of right and without restriction on disclosure;

d) has been developed independently by recipient Party, as evidenced by contemporaneous written documentation.

e) is required by law or court order to be disclosed. In the event of a request for such a disclosure, recipient Party will, to the extent permitted by law, provide the disclosing Party with prompt written notice thereof so that disclosing Party may seek a protective order or other appropriate remedy.

7.2. Confidentiality Obligation. During the term of this Agreement and for a period of three (3) years thereafter, each Party will maintain all Confidential Information of the other Party as confidential and will not disclose any such Confidential Information or use any such Confidential Information for any purpose except as expressly authorized in the Agreement or to perform necessary tasks for the subject matter of this Agreement. A recipient Party will promptly notify a disclosing Party upon discovery of any unauthorized use or disclosure of the disclosing Party's Confidential Information.

7.3. Open Records Act. Notwithstanding the foregoing, the Parties acknowledge that they are governmental entities and thus are subject to the Nevada Open Records Act, NRS Code 239.005 to 239.011. Therefore, this Agreement and any confidential information provided pursuant hereto may be subject to public disclosure. Any person who provides University or the Sponsor 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 Sponsor a royalty free non-exclusive license, with right to sublicense, to use the data for internal and commercial purposes.

9. Publication. Sponsor 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.

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 Sponsor, as to its conception or reduction to practice, shall remain the sole and exclusive property of University, and Sponsor shall have no title or claim to such intellectual property.

10.2. Sponsor Intellectual Property. Intellectual property independently conceived or reduced to practice or writing by Sponsor 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 Sponsor, and the University shall have no title or claim to such intellectual property. Sponsor shall allow University access to Sponsor Intellectual Property only as far as is necessary to allow University to successfully conduct the Scope of Work of this Agreement.

11. Compliance with Laws. In performance of the Research, Sponsor 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 Sponsor 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, 10, and 11 of this Agreement.

14. Uncontrollable Forces. Neither Sponsor 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 Sponsor 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 Sponsor:

Attn: Jon S. Erb, PE
Douglas County
1120 Airport Road
Minden, NV 89423
Douglas County

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 Sponsor. 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 supersede 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 Sponsor and University shall be determined by a court in the Ninth Judicial District Court, State of Nevada.

15.7. Non-waiver. A purported 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. Use of Name. Sponsor may not use the name of University in any news release or advertising or any publications directed to the general public without written approval of University.

15.9. Attorney Fees. 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. Counterparts and Facsimile Signatures. 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. Severability. 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.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed this ____ day of _____, 2014, by their duly authorized representatives.

DOUGLAS COUNTY PUBLIC WORKS	**BOARD OF REGENTS, NSHE OBO UNIVERSITY OF NEVADA, RENO**
"Sponsor"	"University"
By: Nancy McDermid	By: Thomas A. Lewis
Nancy McDermid	~~Charlene Hart~~
Title: Vice-Chairman, Douglas County Board of Commissioners	Title: ~~Assistant Vice President for Research Administration~~ Grants & Contracts Manager
Date: August 21, 2014	Date: 9/3/14

SCOPE OF WORK

COOPERATIVE TECHNICAL ASSISTANCE AGREEMENT FOR PAVEMENT TECHNOLOGY

INTRODUCTION

The pavement technology program is a bi-annual cooperative program between the Douglas County Public Works Department (DCPW) and the Pavements/Materials Engineering Program at the University of Nevada, Reno (UNR). The program is designed to work on issues that are critical to the design and construction of long lasting roads throughout Douglas County.

The Pavements/Materials Program (PMP) in the Department of Civil and Environmental Engineering at the University of Nevada will provide the DCPW various analytical, research, development, and testing support as may be determined by the DCPW, through consultation with PMP personnel to be necessary and/or desirable to improve the performance and durability of asphalt pavements in Douglas County, Nevada. The following Tasks will be completed during the period of September 1, 2014 – August 31, 2016.

TASK A: REVIEW AND UPDATE PAVEMENT PERFORMANCE PREDICTION MODELS FOR DOUGLAS COUNTY

With the reduced funding levels, an efficient management of pavement conditions is essential as pavements continue to age and gradually deteriorate until failure. The use of a pavement management system (PMS) is intended to provide decision makers with a systematic process for planning the maintenance and repair of the roadway network in order to optimize the overall condition of the pavement network. However, an effective pavement management process has to be customized to fit the specific needs of the agency. This involves reliable predictions of future conditions of the road pavement which is typically done using performance models that can estimate the rate of pavement deterioration as a function of time. Such predictions are then used to select the appropriate maintenance and rehabilitation treatments for the various sections on the roadway network.

The performance prediction models typically incorporate few key characteristics of the road pavement such as; conditions of the existing pavement, materials type and properties, traffic volume and combinations, and climate. In other words, the prediction models are highly localized. Therefore, national generic performance prediction models cannot be applied to effectively estimate the long-term performance of a pavement on a specific project within a given locality. Hence, the need for a roadway agency to develop and/or calibrate the prediction models to better reflect the conditions of the pavements under its jurisdiction. Such process will be achieved using the historical pavement distress data collected for the roadway network. Furthermore, the performance prediction models would need to be updated on a regular basis as new materials are used or modifications to the pavement structural design are implemented, etc.

Douglas County is currently responsible for maintaining approximately 171 miles of paved roadways and 60 miles of gravel roadways. The DCPW uses the MicroPAVER software developed by the U.S. Army Corps of Engineers as a pavement management tool to collect, store, and analyze the pavement conditions data. The MicroPAVER develops performance prediction models using a general procedure called the Family Method. A group of pavement sections with similar deterioration curves

is defined as the family. The user would typically define the family based on stored inventory data such as pavement type, functional road classification, traffic information, etc. Accordingly, the condition data, in terms of Pavement Condition Index (PCI), and pavement age information for all pavement segments in the family are compiled into a file that is used to create the performance prediction model. The developed model would define the average behavior of the pavement sections in the family and allow for a future prediction of the pavement condition by shifting the family curve to the latest condition/age point of the analyzed pavement segment.

The implementation of MicroPAVER by DCPW was based on a single family prediction model for paved asphalt roadways. Accordingly, some concerns were raised about the applicability and suitability of the selected single model to Douglas County's roadway conditions. Furthermore, the model is constrained to have a decreasing deterioration rate with time/age and cannot consider any potential improvements in the pavement condition as a result of surface treatment. For instance, a recent study completed by the Pavements/Materials Program at UNR for the Washoe County Regional Transportation Commission (RTC) clearly showed that the impact of slurry seal on pavement performance is strongly related to pavement age at the time of its application (1, 2). An optimum pavement age was recommended for the sequential applications of the slurry seal in order to be effective in terms of both the benefit to the road users and the cost-benefit ratio for the agency. On another study, the UNR research team evaluated the long-term performance and effectiveness of eleven different maintenance treatments for flexible pavements that the Nevada DOT (NDOT) has implemented for the past 15 years (3). The analysis evaluated the likelihood of enhancing the pavement performance as well as the anticipated benefit-cost ratios. The data showed that the performances of the treatments depend on the traffic level, the existing pavement condition, and the time of application. Accordingly, a set of guidelines were provided that can help selecting the most cost-effective maintenance treatment.

In this task, the currently used prediction model from the MicroPAVER software will be evaluated and revised as needed. The current pavement distress data from the DCPW PMS, which were collected few years ago for the Douglas County roadway network, will be acquired and analyzed. The study will also make use of any additional pavement distress data that may become available during the course of this contract. It is anticipated that the variation in the age and conditions of the pavement segments currently in the PMS database will allow for the necessary revision of the performance prediction model. Care will also be taken to identify the pavement segments that received surface treatments throughout their service life. The study will also assess the applicability of the findings from the RTC (1, 2) and NDOT (3) studies to Douglas County's road network for developing criteria and time-based preventive maintenance or rehabilitation strategies. The adopted priority matrix (Table 1) will be revised as needed based on the findings from this study.

Table 1. Adopted Priority Matrix by DCPW

PCI	Arterial	Collector	Local	Budget Category
86-100	4* 0.0%#	5 5.2%	6 11.9%	Routine Maintenance
56-85	1 0.7%	2 21.2%	3 25.3%	Preventive Maintenance
0-55	7 0.0%	8 12.3%	9 23.4%	Major M&R

* 1 = Highest Priority; 9 = Lowest Priority

% Network Pavement Area

TASK B: REVIEW OF CURRENT PAVEMENT STRUCTURAL DESIGN METHOD USED BY DCPW

DCPW currently uses the 1993 AASHTO "Guide for the Design of Pavement Structures" to design the structural sections for all asphalt pavements under its jurisdiction. The 1993 AASHTO Guide is based on information obtained at the AASHO Road Test, which was constructed and tested during the period of 1958 to 1960 near Ottawa, Illinois. Using the results of the AASHO Road Test, an empirical flexible pavement design equation was developed that correlates; *materials properties (resilient modulus)*, *traffic*, *structural capacity (structural number)*, *reliability*, *variability*, and *ride quality* (change in serviceability). The result of the design equation is an estimation of the structural number (SN) required to protect the various pavement layers beneath the asphalt concrete (AC) layer. The main inputs for the design equation are: Reliability, Serviceability, Design Traffic, Material Properties and Layer coefficients, and Drainage.

In this task the key inputs for the 1993 AASHTO Guide for new and rehabilitated pavements will be evaluated to assess their applicability to Douglas County road network. Accordingly, as needed, an experimental plan will be developed to collect the necessary information for identifying the appropriate input parameters. It should be noted that the execution of the experimental plan is not part of this current agreement term.

On the other hand, based on existing literature as well as the research team experience with related studies, recommendations will be made on how to select candidate projects for the use of geosynthetic with asphalt overlay or as an aggregate base reinforcement. Also, recommendations will be developed about the use of FWD to assess the structural condition of existing pavements and its applications for the design of rehabilitation strategies. A training workshop for the back-calculation of pavement layers properties based on FWD data will be prepared and provided as deemed necessary.

TASK C: TECHNICAL ASSISTANCE

The objective of this task is to provide technical assistance to DCPW on pavements/materials engineering technical issues that may arise during the period of the 2014-2016 Agreement. The technical assistance will be provided in the form of short technical reports, workshops, or subject-specific technical meetings.

FACILITIES

The proposed research will be conducted by the Pavements/Materials Program of the University of Nevada, Reno. The PMP is a nationally recognized teaching and research area in the College of Engineering. The Harry Reid Engineering Laboratory at UNR is a fifty thousand square foot facility which was officially opened during fall 1991. The PMP laboratory occupies parts of the first and second floors and is fully ***accredited and certified by the AMRL*** (http://www.amrl.net/amrlsitefinity/default/aap/r18labs.aspx). The laboratory employs a full-time research engineer with strong background in both highway materials testing and electronics. He is responsible for maintaining the AMRL accreditation requirements and for training other laboratory personnel. The current capabilities of the PMP laboratory in the area of asphalt binders and mixtures testing span over a wide range of advanced testing procedures and equipment.

APPENDIX B

BUDGET