

GCA 5977 Columbia River Crossing

THIS AGREEMENT is made and entered into between the State of Washington, Department of Transportation, hereinafter called the "State," and the Regents of the University of California, the University of California, San Diego hereinafter designated as the "Research Agency," collectively referred to as the "PARTIES" and individually as the "PARTY."

WHEREAS, the State has a need to perform research relating to the Columbia River Crossing for experimental evaluation of p-y curves considering liquefaction development, and

WHEREAS, the State does not have the necessary personnel or testing facilities to perform those research projects, and

WHEREAS, the Research Agency has the qualified personnel and testing facilities to be able to conduct the desired research, and

WHEREAS, the State desires to contract with the Research Agency to conduct specified research projects, and,

NOW THEREFORE, pursuant to chapter 39.34 RCW and RCW 47.01.260 and in consideration of the terms, conditions, covenants, and performance contained herein or attached as exhibits and incorporated and made a part hereof, the parties hereto agree as follows:

Section I Scope of Work

The work to be performed by the Research Agency is identified in Exhibit A, Scope of Work, attached to this Agreement. The Research Agency will have complete responsibility for the employment and supervision of all personnel used in completing the assigned work. The Research Agency is authorized to use the services of subconsultants when additional skills, expertise or equipment is necessary in performing work under this Agreement pursuant to the requirements of Section VI below.

Section II Reports

2.1 The Research Agency shall submit to the State narrative progress reports as specified in the Scope of Work. Report format and reporting period will be as prescribed by the State. The report is to be concise but in sufficient detail to enable an evaluation of the progress of the research.

2.2 A final report of the findings and results of the research, including interim and task reports which provide documentation of technical data and their analysis, shall be prepared by the Research Agency. The Research Agency shall furnish to the State the number of copies of the draft and approved final report as specified in the Scope of Work. The "WSDOT Research Report Requirements," attached hereto as Exhibit B, shall be used by the Research Agency as a guide for writing final and interim reports and working papers.

Section III

Agreement Term

3.1 The term of this Agreement shall be from the date of execution and continuous through June 30, 2011, or until a written notice of termination has been issued, whichever occurs first.

3.2 The term of this Agreement may only be extended by following the procedures outlined in Section XIV. below.

Section IV

Cost

4.1 The maximum amount payable under this Agreement shall not exceed Thirty Five Thousand Eight Hundred Eighty Two dollars (\$35,882.00).

4.2 Any request for a change in the maximum amount payable of this Agreement shall be in accordance with Section XIV, Amendment, below.

Section V

Payment

5.1 Payments to the Research Agency shall be for actual direct costs and related indirect costs incurred in the performance of the work and services. The Research Agency shall bill for salaries and wages at the employees current rates in effect upon execution of this Agreement.

5.2 Reimbursement for indirect overhead costs attributable to a study will be made based upon the percentage derived from calculations in accordance with the current "Federal Rate Agreement for Colleges and Universities". That rate is Fifty Four Point Five Percent (54.5%).

5.3 Reimbursement shall be limited to the maximum dollar amount authorized by the Agreement.

5.4 Other direct non salary costs, including applicable indirect costs, will be billed at the Research Agencies actual cost without any additional markup to the State. Supporting invoices for such charges shall be maintained by the Research Agency and shall be supplied to the State upon request.

5.5 The Research Agency shall not be allowed to bill for any subconsultants or subcontractors unless prior written authorization is received from the State prior to incurring any such costs.

5.6 Any out-of-state travel must have prior written approval (written approval shall include receipt of e-mail authorizing travel by appropriate WSDOT authority) of the WSDOT Research Office to be eligible for reimbursement. Current Research Agency travel regulations and rate shall apply to all in-state and out-of-state travel for which reimbursement is claimed.

5.7 The Research Agency agrees to pay, up front, for all costs incurred in conducting the work agreed upon in the Agreement and shall be reimbursed by the State upon approval by the State of the Research Agency's billings. The Research Agency may invoice the State for work performed at any time but an invoice may not be submitted more often than once per month. Claims for reimbursement shall be supported by the Research Agency's records. Invoices detailing the charges and expenses by major budget category incurred shall be submitted to the State for payment. Progress billings shall be identified by the word "Progress." The final billing shall be submitted within 90 days of task completion and shall be identified by the word "Final." Audits will be made in accordance with Federal OMB Circular A-133.

Section VI Subcontracting

6.1 The Research Agency shall not assign, sublet, or transfer any of the work specified in the Agreement without written approval from the State.

6.2 The Research Agency shall comply with all Federal and State of California laws and regulations, including Title 6, Civil Rights Act of 1964 (Exhibit C) that pertain to the work being performed and including affirmative action when retaining a subconsultant. Exhibit "C" is attached hereto and by this reference made a part of this Agreement.

Section VII Patent and Invention Rights

7.1 Should patentable discoveries or inventions result from work described herein, the Research Agency shall maintain effective procedures to adhere to the provisions of Public Law 96-517 and the implementing regulations of 37 CFR Part 401, including but not limited to the following:

7.2 The Research Agency may elect to retain title to any invention conceived or first reduced to practice by Research Agency personnel in the course of work performed under this Agreement.

7.3 The State and the U.S. Government reserve a nonexclusive, nontransferable, paid-up license for the practice of any such invention for State and U.S. Government purposes, in the United States, its territories, and throughout the world and such additional rights as conferred by sections 202-204 of Title 35 United States Code.

7.4 The Research Agency shall include the following statement in the second paragraph of the specification of the application for any patents issued on a subject invention: "The United States Government and the State of Washington have rights in this invention pursuant to the Agreement between the University of California and the Washington State Department of Transportation dated day of .20 ____."

7.5 The Research Agency shall provide the State with a list of all subject inventions or certification that there were no such inventions at the time of filing the final report as required by this Agreement.

Section VIII Inspection of Work

The State and the Federal Highway Administration shall at all times be accorded proper facilities for review and inspection of the work hereunder and shall at all reasonable times have access to the premises, to all data, notes, records, computer programs, correspondence, instructions, and memoranda of every description pertaining to the work hereunder.

Section IX Records

The State will exercise general supervision over this Agreement. The Research Agency shall maintain accounting records and other evidence pertaining to the cost incurred for this Agreement. These records will be made available for inspection by the State, Federal Highway Administration, or any authorized representative of the State or Federal Government at all reasonable times at the office of the Research Agency. The minimum retention period of these records shall be six (6) years, which is in accordance with the U.S. Department of Transportation, Federal Highway Administration Common Rule 49 CFR 18 and/or the Research Agency's Federal Auditor approved policy and procedures on record retention.

Section X Rights to Data

The Research Agency grants to the State and the U.S. Government a royalty-free, non exclusive, irrevocable license to reproduce, translate, publish, use and dispose of, for state government purposes, and to authorize others to do so, all data collected and reports and documents produced.

Section XI

Equipment and Instrumentation

11.1 All apparatus and equipment purchased or manufactured for which reimbursement is sought shall be used exclusively on this Agreement and shall remain the property of the State; however, the Research Agency shall be the custodian and will be responsible for maintaining current inventories of nonexpendable items until disposition has been made by the State.

11.2 All Major items of equipment and apparatus for which reimbursement is sought and which are not identified specifically and approved as part of this Agreement require written approval from the State prior to purchase. A major equipment or apparatus item is one costing \$5,000 or more and/or has a life expectancy of one year or more.

11.3 The Research Agency shall maintain an inventory of all major equipment or apparatus items.

11.4 A complete inventory of all major equipment and apparatus, as defined above, acquired by the Research Agency for research and other assigned tasks shall be submitted to the State on or before July 1 of each year until notice of disposition has been issued. The following shall be furnished for each inventory item: (a) item name, (b) date of acquisition OR manufacturer, (c) serial number, (d) make/model identification, (e) Research Agency's identification number, if different than "C," (f) physical location, and (g) total cost.

11.5 Upon completion of the research work, arrangements for the equipment's further use, by the State, on other approved research or for its disposal will be made by the State.

Section XII

Publication

12.1 The Research Agency shall be free to copyright any material, including computer software that is a part of a Research Task with the provision that the State and the Federal Highway Administration reserve a royalty-free, non-exclusive and irrevocable license to reproduce, publish or otherwise use, and to authorize others to use, the material for government purpose.

12.2 Research Agency shall have the right to publish the results of the work conducted by Research Agency under this Agreement to the extent such results do not contain confidential information of WSDOT, provided WSDOT has the opportunity to review and comment on any proposed manuscripts describing said work thirty (30) days prior to their submission for publication. Research Agency agrees to consider WSDOT's comments prior to publication. However, if such submission would cause the loss of significant patent rights, Research Agency will, at its option, either delete the enabling portion of the proposed publication, or withhold publication for an additional sixty (60) days until U.S. patent filings are completed.

12.3 Nothing in this Agreement shall be construed to affect the preparation and filing of theses by students working on a Research Task in accordance with the practices normally followed or required by Research Agency regulations.

12.4 All reports published shall contain the following statement on the Credit Sheet: "The contents of this document reflect the views of the author(s), who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission, Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification or regulation,"

12.5 The final document must include one of the following statements, depending on the funding source, on the cover or frontispiece:

Prepared for Washington State
Department of Transportation

or

Prepared for
Washington State Department of Transportation
and in cooperation with
U.S. Department of Transportation
Federal Highway Administration

12.6 The State will notify the Principal Investigator (the person designated in the Agreement to conduct the Research work) of which statement to use prior to delivery of the final report. Required formatting for the technical page and the WSDOT research document (WA-RD) report guidelines is contained in the State's WSDOT Research Program Manual and available at the following website: www.wsdot.wa.gov/.

Section XIII Amendment

The Agreement may be amended to extend the term, change the cost, or to modify the scope of work or phases designated for the Research work or for any other purpose deemed necessary by the State. The Agreement amendments will be mutually agreed upon and fully executed in writing prior to the Research Agency performing any additional work to be covered by such Amendment, or incurring additional costs over the original agreement maximum amount.

Section XIV Termination of Contract

If it is considered to be in the best interests of the State, the State may terminate this Agreement upon giving thirty (30) days notice in writing to the Research Agency. The Research Agency may also terminate this Agreement by giving thirty (30) days' notice in writing to the State. Neither party shall incur any new obligations for the terminated portion of this Agreement after the effective date and shall cancel as many obligations as possible. Full credit shall be allowed for all non-cancelable obligations properly incurred up to the effective date of termination.

Section XV Legal Relations

The Research Agency shall comply with all Federal, State, and Local Laws and Ordinances applicable to the work to be done under this Agreement as allowed by State of Washington statute.

Section XVI Legal Responsibility

16.1 Each PARTY to this Agreement shall be responsible for any and all costs, claims, judgment, and/or awards of damages, arising out of, or resulting from any negligent act or omission on the part of itself, its employees, its agents, or its officers arising out of or connected with this Agreement. Neither PARTY assumes any responsibility to the other PARTY for the consequences of any negligent act or omission of any person, firm, or corporation not a PARTY to this Agreement.

16.2 The terms of section shall survive the termination of this Agreement.

Section XVII Dispute Resolution

In the event that a dispute arises under this Agreement, it shall be resolved as follows: The State and the Research Agency shall each appoint a member to a dispute board. These two members shall select a third member not affiliated with either agency. The dispute board shall evaluate the facts, contract terms, and applicable statutes and rules and make a determination of the dispute. The decision made by this board shall be final and binding on the Parties to this Agreement. Each Party will provide for the cost of their appointed representative and will share equally in the cost of the third member.

Section XVIII Independent Capacity

The employees or agents of each PARTY who are engaged in the performance of this Agreement shall continue to be employees or agents of that PARTY and shall not be considered for any purpose to be employees or agents of the other PARTY.

Exhibits

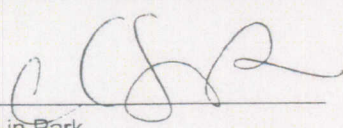
Exhibit A, Scope of Work

Exhibit B, WSDOT Research Report Requirements

Exhibit C, Title 6. Civil Rights Act of 1964

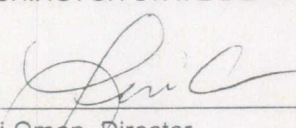
IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year last signed by the parties below.

REGENTS OF THE UNIVERSITY OF CALIFORNIA, UNIVERSITY OF CALIFORNIA, SAN DIEGO

By 
Clairce Lin Park
Contract and Grant Officer

Date: 4/16/09

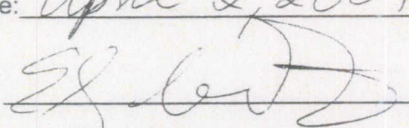
STATE OF WASHINGTON
WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

By 
Leni Oman, Director
Office of Research and Library Services

Date: 4/20/09

Approved as to form:

Date: April 2, 2009

By: 

Name: Elizabeth Thompson-Lagerberg
Assistant Attorney General

Exhibit A

Experimental evaluation of p-y curves considering liquefaction development

Problem Statement

Upon liquefaction of the soil surrounding a pile foundation, there is clear evidence and agreement amongst the community that the strength and stiffness of the soil dramatically reduces. Consistent with this observation, to model the soil-pile system, the strength and stiffness of soil resistance (p - y) curves, which have been derived from piles tested in stable (non-liquefied) ground, are commonly reduced. However, it is unclear how the shape and amplitude of the reduced p - y curves develop during pore pressure build-up. The characteristics of the soil resistance functions, during the development of pore pressures, are needed for reliable design of pile foundations in areas prone to earthquake-induced soil liquefaction.

Scope of Work

The objective of this project is to experimentally determine nonlinear p - y curves at various levels of earthquake-induced excess pore pressure. These experimentally developed curves will support computational modeling of soil-pile systems, including those anticipated at the Columbia River Crossing project. To address this objective, a single soil-pile experiment series will be conducted at the University of California, San Diego (UCSD) in a large laminar soil box. The laminar box will be mounted on the uniaxial shake table in the Charles Lee Powell Laboratory at UCSD in a level ground configuration. A single pile will be placed in the laminar box and surrounded by medium-loose saturated Nevada sand, with a target relative density of $D_r = 50$ -55%. The pile will be instrumented with high elongation strain gages along its length to capture its bending moment distribution. Pore pressure transducers will be placed near to the pile and far from the pile vertically in the soil column to monitor the build-up of pore pressure during dynamic shaking. Soil pressure sensors and accelerometers will also be distributed in the homogeneous soil layer. Cameras will be used to monitor the surface of the soil model during shaking. Dynamic base shaking will be applied to the model to generate a minimum of three target excess pore pressure ratios (tentative target $r_u = 25\%$, 50% , and 100%). Upon reaching these target ratios, the pile will be laterally loaded monotonically at its head to induce inertial-equivalent response. Resistance at the soil-pile interface will be evaluated by back-calculating the pressure-deformation relationship during each of the monotonic loading phases. Parallel cyclic simple shear tests will be conducted on the sand to be used in these experiments. These tests are to be conducted by others and not part of the scope of UCSDs efforts. UCSD will coordinate with the soil testing laboratory selected to assure the sand used in the shake table tests are provided in a timely manner.

Outcome and Scholarly Contributions

Test data from this experiment series are needed for model validation. A validated model may then be used to extend the parameters of the test series to, for example, deeper soil deposits, larger pile diameters, various excess pore pressure ratios, etc. This work will result in a report summarizing the experimental methods, data analysis and post-processing, and findings of the study. Experimental data obtained from the study will be provided to WSDOT and project partners with this report to support computational modeling efforts.

Future Efforts

Findings from this study will be unique to prior soil-pile-liquefaction experiments, where resistance functions have been determined only under fully liquefied soil conditions ($r_u = 100\%$). Important parameters that should be considered in future study include; varying soil layering and type and varying pile geometries (size and boundary conditions). It may be feasible in the future for example to consider two piles tested simultaneously in one soil column – this would allow direct comparison of two types of pile geometries. In addition, investigations at a larger scale (e.g. using the large high performance shake

table at UCSDs NEES facility) would provide useful comparison to the moderate scale model proposed herein.

Schedule and Deliverables

Table 1 presents the target schedule of efforts for this project. The requested duration of the project is April 1, 2009 – November 30, 2009.

Task Description	Approximate Time Frame (Duration)
Model design and instrumentation plans	4/1/09 – 4/30/09 (1 Month)
Model construction	5/1/09 – 5/31/09 (1 Month)
Test execution	6/1/09 – 6/10/09 (1 week)
Model dismantle	6/10/09 – 6/17/09 (2 weeks)
Data analysis and reporting	6/18/09 – 11/30/09 (5 months)

At the conclusion of the *model design* phase, a preliminary report summarizing the model geometry and instrumentation will be provided to WSDOT and project partners for review. A draft report summarizing the experimental methods, data analysis and post-processing, and findings of the study will be provided following the *data analysis and reporting* phase of the work.

Budget Request

Resources are requested to support staff efforts related to mechanical and technical set-up and teardown of the model; the cost of instrumentation and materials, including construction of the pile and cost of the sand, and the stipend and fees for one graduate research student. Associated resources required in each of these categories are outlined in the attached budget.

Project Team

Professor Hutchinson will be responsible for overseeing the project, with assistance from one graduate research student and laboratory staff. UCSD is responsible for: design of the experiment, preparation of the model, instrumentation of the pile and surrounding soil, execution of the experiments, data analysis and post-processing, and report preparation.