

**COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT  
BETWEEN  
U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER  
ENVIRONMENTAL LABORATORY]  
AND  
KOREA OCEAN RESEARCH AND DEVELOPMENT INSTITUTE  
FOR  
MARINE CONTAMINATED SEDIMENT MANAGEMENT**

This Cooperative Research and Development Agreement (CRADA), is entered into by and between the U.S. Army Engineer Research and Development Center, Environmental Laboratory 3909 Halls Ferry Road, Vicksburg, MS 39180-6199 hereinafter referred to as ERDC-EL and Korea Ocean Research and Development Institute, 1270 Sadong Ansan Kyunggido, 426-744, Republic of Korea, hereinafter referred to as KORDI, pursuant to the authority contained in the Federal Technology Transfer Act of 1986 (15 U.S.C. 3710a), as amended,

WHEREAS the United States Congress has declared that one of the purposes of such legislation is to improve the economic, environmental and social well-being of the United States by stimulating the utilization of federally funded technology developments by such PARTIES; and,

WHEREAS, the Federal Technology Transfer Act of 1986, among other technology transfer improvements, has provided each Federal agency with the authority to permit the Director of Government-operated Federal Laboratories to enter into Cooperative Research and Development Agreements (CRADAs) with Federal or non-Federal entities, including private firms and organizations, for the purposes of providing to, or obtaining from, collaborating PARTIES, personnel, services, property, facilities, or equipment toward the conduct of specified research and development efforts which may include the disposition of patent rights in the inventions which may result from such collaborations; and,

WHEREAS, ERDC-EL's mission includes research and development with respect to marine contaminated sediment management, hereinafter referred to as "the Technology"; and,

WHEREAS, ERDC-EL possesses certain advanced scientific skills, facilities, special equipment, information, computer software, and know-how pertaining to the Technology and is interested in the utilization of the Technology in the private and public sectors; and

WHEREAS, KORDI is a education research and development organization in the Republic of Korea having expertise in the Technology and,

WHEREAS, KORDI has a need for access to specific technological capabilities uniquely available at ERDC-EL, and

WHEREAS, KORDI is willing to collaborate with the ERDC-EL on projects of mutual interest and,

WHEREAS, it is the intention of the PARTIES hereto that research and development activities conducted under this CRADA should be to their mutual benefit and the benefit of the people of the United States; and,

WHEREAS, the cooperative research to be conducted under this CRADA will be cooperatively planned and conducted;

NOW, THEREFORE, the PARTIES hereby agree as follows:

Article 1. Definitions. As used in this CRADA, the following terms shall have the following meanings and such meanings should be equally applicable to both the singular and plural forms of the terms define

1.1 "CONFIDENTIAL" as used in this Agreement refers to PROPRIETARY INFORMATION and/or data given or imparted in confidence by either PARTY.

1.2 "CLASSIFIED" means all information and/or data classified in accordance with the national security laws of the United States.

1.3 "CONTROLLED UNCLASSIFIED" means unclassified information to which access or distribution limitations have been applied according to national laws, policies, and regulations of the United States Government.

1.4 "CRADA" means this cooperative research and development agreement, including any appendices.

1.5 "FOREIGN NATIONAL" means a private individual, not representing either a foreign government or a firm or person sponsored by a foreign government, who is not a citizen of the United States or its territories. This does not include permanent United States residents, formerly

immigrant aliens, resident aliens, or intending U.S. citizens. (Source: AR 380-10, *Foreign Disclosure and Contacts With Foreign Representatives*, 6 June 2003)

1.6 “PARTY” means any signatory to this CRADA.

1.7 “INTELLECTUAL PROPERTY” means patents, copyrights, trade secrets, and trademarks protected by Federal Law and foreign counterparts.

1.8 “INVENTION” means and is limited to any INVENTION or discovery that is or may be patentable under Title 35 of the United States Code or the patent laws of any foreign country or any novel variety of plant that is or may be protected under the Plant Variety Protection Act (7 U.S.C. §7321 et seq.).

1.9 “MADE with respect to inventions that are patentable” means conception or first actual reduction to practice during the performance of a work statement under the CRADA by one of the parties to the CRADA (35 U.S.C §201(g)).

1.10 “PROPRIETARY INFORMATION” means information which embodies trade secrets developed at private expense or which is business or financial information which is privileged or CONFIDENTIAL under the Freedom of Information Act (5 U.S.C. §552 (b) (4)), provided that such information:

- (1) Is not generally known or available from other sources without obligations concerning their confidentiality;
- (2) Has not been made available by the owners to others without obligation concerning its confidentiality; and
- (3) Is not already available to the Government without obligation concerning its confidentiality.

1.11 “SUBJECT DATA” means all recorded information first produced in the performance of a work statement under this CRADA, both processed and unprocessed generated from modeling and prototype implementation, and can be either numeric, alphanumeric, text, photographs, or other recorded forms.

1.12 “PROTECTED CRADA INFORMATION” means SUBJECT DATA which is marked as being PROTECTED CRADA INFORMATION by a PARTY to this CRADA and which would have been PROPRIETARY INFORMATION had it been obtained from a non-federal entity.

1.13 “SUBJECT INVENTION” means any INVENTION conceived or first actually reduced to practice in the performance of a work statement under this CRADA.

## Article 2. Cooperative Research.

2.1 The purpose and object of this collaborative effort is to provide for the sharing of information and joint conduct of research and development investigations related to marine contaminated sediment management. The scope and obligations of the PARTIES pursuant to this cooperative research and development program are itemized in Appendix A. Each PARTY hereto agrees to utilize whatever personnel, facilities, equipment, skills, know-how, and information as they consider necessary, consistent with their own policies, missions, requirements, and available resources.

2.2 Work Statements. Specific collaborative studies consistent with the scope and obligations set forth in Appendix A shall be documented in work statements executed as amendments to this Agreement as set forth in Article 8.7 and shall be subject to the terms and conditions of this Agreement. The work statement shall include a description of the tasks to be performed by each PARTY, the products to be delivered, schedule and any other particulars deemed necessary by the PARTIES. If any services to be performed by the ERDC-EL require reimbursement, the work statement shall also specify the estimated cost of the work to be performed. KORDI understands and agrees that 15 U.S.C. 3710a permits federal laboratories to provide personnel, services, facilities, equipment, intellectual property, and other resources toward the conduct of research under a CRADA, but specifically prohibits the transfer of funds to the non-federal KORDI. An initial work statement is included at Appendix B. Article 2.6 refers to all financial obligations associated with such work statements.

2.3 Review of Work. Periodic discussions shall be held between ERDC-EL and KORDI personnel for the purpose of reviewing the progress of work, as required. It is understood that the nature of this sponsored research is such that completion within the period of performance specified, or within the limits of financial support allocated, cannot be guaranteed. Accordingly, it is agreed that all sponsored research is to be performed on a best efforts basis.

2.4 Technical Management. The Technical Managers for each PARTY are identified in Article 8.11 of this AGREEMENT. These individuals will be responsible for the scientific and technical conduct of this project for their respective organizations. If any of the Technical Representatives are unable to serve as technical managers during the term of the CRADA, KORDI or ERDC-EL will advise the other in writing of a successor.

2.5 Scope Change. If at any time either technical representative determines that the research data dictate a substantial change in the direction of the work, the PARTY shall promptly notify the

other PARTY and the PARTIES shall make a good faith effort to agree on any necessary written change to the SOW.

2.6 Financial Obligations. The cost of labor, supplies, materials, equipment, overhead, and other expenses, direct and indirect, computed in accordance with ERDC standard accounting procedures which are incurred by ERDC-EL in connection with this Agreement, necessary to the performance of specific work as agreed to by both PARTIES, are chargeable to KORDI. Prior to the commencement of any agreed upon work by ERDC-EL, KORDI will deposit with the ERDC Disbursing Officer sufficient funds to cover the estimated cost of the specific work to be performed. In order for the work effort to be commenced in time, funds must be mailed thirty (30) days in advance. Progressive deposits may be made during the course of this Agreement according to the schedule agreed upon in the work statement; however, at no time shall the costs incurred by the ERDC exceed the funds deposited by KORDI. Any funds on deposit over and above the total cost incurred will be refunded within 90 days after determination of final costs.

Many financial management systems, including that used by the U.S. Army Corps of Engineers, require that the employer's tax identification number (EIN) be entered during setup of a new account. Accordingly, this information is provided below:

ERDC EIN: 62-1642142

KORDI EIN: xx-xxxxxxx

There are three ways funds may be sent to ERDC:

a. Check - In order for the work effort to be commenced in time, funds must be mailed thirty days in advance. Checks should be made payable to "Treasury of the United States" and forwarded to:

U.S. Army Engineer Research and Development Center  
ATTN: CEERD-RM-FA/Cecilia Cole  
3909 Halls Ferry Road  
Vicksburg, MS 39180-6199

The following information must be included with the check.

ERDC-EL POC: Dr. Todd Bridges CEERD-EM-D

Purpose of funds: For ERDC-EL assistance pursuant to a cooperative research and development agreement "Marine Contaminated Sediment Management".

b. EFT – In order for the work effort to be commenced in time, EFT funds must be received two weeks in advance. ERDC's transfer information is:

Beneficiary: Engineer Research & Development Center  
Beneficiary Bank: Trustmark National Bank  
ATTN: Amy Haygood  
P.O. Box 39  
Vicksburg, MS 39180  
USA  
ABA is 065300279 (routing number)  
For questions, email [Laverne.D.Green@erdc.usace.army.mil](mailto:Laverne.D.Green@erdc.usace.army.mil) or  
[Cecilia.C.Cole@erdc.usace.army.mil](mailto:Cecilia.C.Cole@erdc.usace.army.mil).

c. Wire Transfer – In order for the work effort to be commenced in time, wire transfer funds must be received two weeks in advance. For wire transfer information, email [Cecilia.C.Cole@erdc.usace.army.mil](mailto:Cecilia.C.Cole@erdc.usace.army.mil) and [Laverne.D.Green@erdc.usace.army.mil](mailto:Laverne.D.Green@erdc.usace.army.mil).

### Article 3. Data Rights and Publication.

3.1 Rights. KORDI understands and agrees that ERDC-EL shall not disclose to KORDI SUBJECT DATA or any other information developed or compiled by ERDC-EL that is identified as classified or controlled unclassified. Uncontrolled unclassified SUBJECT DATA that is developed or compiled under this CRADA shall be prepared, analyzed, shared, and mutually interchanged by the PARTIES. However, such uncontrolled unclassified SUBJECT DATA shall not be disclosed to any third PARTY without mutual consent of the PARTIES to this CRADA, except that ERDC-EL may disclose non-proprietary SUBJECT DATA when required to do so for government purposes.

### 3.2 PROPRIETARY INFORMATION.

3.2.1. ERDC-EL agrees that any proprietary or CONFIDENTIAL information furnished by KORDI to ERDC-EL under this CRADA, or in contemplation of this CRADA, shall be used, reproduced and disclosed by ERDC-EL in accordance with the Trade Secrets Act (18 U.S.C. 1905) and only for the purpose of carrying out this CRADA, unless written consent to such release is obtained from KORDI.

3.2.2. All PROPRIETARY INFORMATION exchanged between the PARTIES (e.g., documents, descriptions, drawings, photographs, tapes, e-mail, or other media), will be clearly identified and marked with an appropriate notice on each page.

3.2.3. Information imparted orally shall not be protected under this paragraph, unless such information is subsequently reduced to tangible form within fifteen (15) days of disclosure and a copy thereof furnished to the PARTY receiving the PROPRIETARY INFORMATION.

3.3. Publications. ERDC-EL and KORDI agree that the results of research under this CRADA may be published jointly or separately by either PARTY, but they will confer and consult prior to the publication of SUBJECT DATA to assure that no proprietary or CONFIDENTIAL information is released and that patent rights are not jeopardized. It is agreed that prior to either PARTY submitting a manuscript for review or publication containing results of research under this CRADA, a copy of the manuscript will be submitted to the other PARTY at least ninety (90) days prior to publication.

3.4 PROTECTED CRADA INFORMATION. Pursuant to 15 USC § 3710a (c) (7) (B), with respect to information resulting from the performance of this CRADA that would be PROPRIETARY or CONFIDENTIAL if the information had been obtained from the KORDI, ERDC-EL may provide appropriate protection against the dissemination of such information, including exemption from the Freedom of Information Act (5 U.S.C. 552).

3.4.1. Each PARTY may designate as PROTECTED CRADA INFORMATION any SUBJECT DATA produced by its employees; and with the agreement of the PARTY initially developing the information, mark any SUBJECT DATA produced by that PARTY's employees. All such designated PROTECTED CRADA INFORMATION shall be appropriately marked.

3.4.2. For a period of five years from the date PROTECTED CRADA INFORMATION is produced, the PARTIES agree not to further disclose such information except as:

- (1) Necessary to perform this CRADA;
- (2) Provided in Article 3, Data Rights and Publication;
- (3) Requested by ERDC-EL to be provided to other government facilities for government use only with the same protection in place; or
- (4) Mutually agreed by the PARTIES in advance.

3.4.3. The obligations of 3.4.2 above shall end sooner for any information which shall become publicly known without the fault of any PARTY, shall come into a PARTY's possession without breach by that PARTY of the obligations of 3.4.2 above, or shall be independently developed by a PARTY's employees who did not have access to PROTECTED CRADA INFORMATION.

3.5 ERDC-EL shall have unlimited rights in all SUBJECT DATA produced or provided by the PARTIES under this CRADA, except for information marked as being copyrighted, PROTECTED CRADA INFORMATION, or PROPRIETARY INFORMATION.

3.6 Ownership of Copyrights in Subject Data. KORDI may copyright SUBJECT DATA produced by either party to the extent permitted by law. When KORDI obtains a copyright, KORDI shall affix the applicable copyright notice 17 U S C §§ 401, 402, and 403, and an acknowledgement of the scientific and technical contributions of ERDC-EL. KORDI agrees to grant to the U.S. Government a royalty free, non-exclusive, irrevocable, paid-up license to use, modify, prepare derivative works, reproduce, distribute, perform, or display SUBJECT DATA, throughout the world by, or on behalf of, the U.S. Government for government purposes. KORDI agrees to acquire rights from employees and contractors in SUBJECT DATA as needed to implement this license grant by including a “work for hire” provision in its contracts and subcontracts, including employment agreements, or by direct assignment of rights in SUBJECT DATA to KORDI as appropriate.

#### Article 4. Patent and Other Intellectual Property Rights.

4.1 Limited Scope. The United States Government shall retain ownership in any intellectual property to which it has title prior to this agreement. Likewise, KORDI shall retain ownership in any intellectual property to which it has title prior to this agreement.

4.2 Reporting. ERDC-EL shall report to KORDI within ninety (90) days of each SUBJECT INVENTION developed under this CRADA reported to ERDC-EL by its employees. KORDI shall report to ERDC-EL within ninety (90) days of each SUBJECT INVENTION reported to KORDI by any of its employees.

4.3 KORDI Employee INVENTIONS. ERDC-EL, on behalf of the U.S. Government, waives any ownership rights the U.S. Government may have in SUBJECT INVENTIONS MADE by KORDI employees and agrees that KORDI shall have the option to retain title in any such employee SUBJECT INVENTION and to obtain patents therein. KORDI shall notify ERDC-EL within ninety (90) days of reporting the invention to ERDC-EL of its election of this option and shall have the right to timely file patent applications on such SUBJECT INVENTION at its own expense. KORDI agrees to grant to the U.S. Government on KORDI's employee's SUBJECT INVENTIONS a non-exclusive, irrevocable, paid-up license in the patents covering such SUBJECT INVENTIONS to practice or have practiced, throughout the world by or on behalf of the U.S. Government. Such non-exclusive license shall be evidenced by a Confirmatory Instrument prepared by KORDI in a form acceptable to ERDC-EL. With regard to SUBJECT

INVENTIONS to which KORDI retains right and title and files applications, such applications shall be filed prior to the running of any statutory bar period, priority period or any applicable filing deadline that will bar the granting of a patent or other statutory rights on the INVENTION.

4.4 ERDC-EL Employee INVENTIONS. ERDC-EL, on behalf of the U.S. Government, shall have the initial option to retain title to each SUBJECT INVENTION MADE by its employees and to obtain patents therein. ERDC-EL shall notify KORDI within ninety (90) days of reporting the invention to KORDI of its election of this option and shall have the right to timely file patent applications on such SUBJECT INVENTION at its own expense. KORDI shall have the option to negotiate a license on any such INVENTIONS. Any exclusive license shall be subject to the reservation by the U.S. Government of an irrevocable, paid-up right to practice or have practiced the SUBJECT INVENTION on behalf of the U.S. Government for government purposes. Such exclusive license shall be evidenced by a Confirmatory Instrument.

4.5 KORDI Employee/ERDC-EL Employee Joint INVENTIONS. Joint SUBJECT INVENTIONS shall be jointly owned if KORDI files the patent application on the joint SUBJECT INVENTION. KORDI shall be responsible for filing U.S. Patent Applications for joint SUBJECT INVENTIONS in a timely manner. If KORDI does not file a U.S. Patent Application on a joint SUBJECT INVENTION within six (6) -months after disclosure to either PARTY, and ERDC-EL desires to file a patent application, KORDI agrees to assign its rights in the INVENTION to ERDC-EL at no cost and ERDC-EL will file a U.S. Patent Application on such joint SUBJECT INVENTION. ERDC-EL, in turn, agrees to grant KORDI a royalty-free non-exclusive license or to negotiate an exclusive license for a reasonable fee as set forth in paragraph 4.8 below. The non-filing PARTY shall reasonably cooperate and assist the filing PARTY in perfecting the patent application, and the Filing PARTY shall have the right to control the prosecution of the U.S. Patent Application. ERDC-EL retains an associate power of attorney on joint SUBJECT INVENTIONS filed as patent applications by other PARTIES to this agreement.

4.6 Patent Applications. Patent applications and other INTELLECTUAL PROPERTY applications on SUBJECT INVENTIONS shall be filed prior to the running of any statutory bar period, priority period, or applicable filing deadline that would bar the granting of a patent or other INTELLECTUAL PROPERTY right on a SUBJECT INVENTION.

4.6.1 KORDI shall enter into agreements with its employee, contractor, and subcontractor inventors to ensure assignment of their INVENTIONS to KORDI and to ensure cooperation with preparation and filing of patent applications on their INVENTIONS.

4.6.2 The PARTY filing an application under Article 4.5 shall provide the other PARTY with copies of the application at least thirty (30) days prior to filing, and shall use best efforts to provide the other PARTY the right to inspect and copy documents relevant to the application.

4.6.3 A first PARTY having rights in a SUBJECT INVENTION may elect not to file patent applications or statutory registration applications thereon in particular country(ies) outside of the United States, provided it so notifies the other PARTY in writing within ninety (90) days from the date it reports the SUBJECT INVENTION to the other PARTY or such later date on which it acquires such rights in the SUBJECT INVENTION, provided that such notice shall be provided in a reasonable time to permit the other PARTY to establish patent rights in the SUBJECT INVENTION. Thereafter, the other PARTY may elect to file such applications on the SUBJECT INVENTION in the identified countries, and the first PARTY shall assign its interests in the SUBJECT INVENTION in those identified countries to the other PARTY. This assignment shall be subject to the retention by the first PARTY of a non-exclusive, irrevocable, paid-up license to practice, or have practiced, the SUBJECT INVENTION in the identified countries in the case of KORDI and throughout the world in the case of ERDC-EL.

4.7 Patent and Other Intellectual Property Expenses. The expenses attendant to the filing, prosecution, issuance, and maintenance of patent and intellectual property applications as specified above shall be borne by the PARTY filing the patent or intellectual property application.

4.8 Royalties to ERDC-EL. In this or any foreign country in which KORDI obtains title to a patent or other intellectual property rights grant, on any Subject Invention made solely by ERDC-EL employees or made jointly by ERDC-EL and KORDI employees, KORDI shall pay to ERDC-EL a royalty based on a reasonable rate applied to a royalty base. Both the royalty rate and the royalty base shall be negotiated in good faith. The royalty rate and the royalty base shall fairly reflect the relative contributions of the parties to the making of the Subject Invention and to the work under this CRADA, patent prosecution expenses, the risks incurred by KORDI, and the costs of subsequent research and development needed to bring the Subject Invention to the point of practical application. Any such royalty payments should be made payable to "DFAS – Rock Island" and forwarded to:

DFAS – Rock Island OPLOC  
ATTN: DFAS-RI-FD  
Building 68  
Rock Island, IL 61299-8300

A report shall accompany each payment identifying this CRADA and stating the manner in which the amount of the funds was calculated. Copies of the report should also be provided to:

U.S. Army Research Laboratory  
ATTN: AMSRL-CS-TT (Mr. Wanko)  
2800 Powder Mill Road  
Adelphi, MD 20783-1197

U.S. Army Eng. R&D Ctr. /ERDC  
ATTN: CEERD-OT (Bea Shahin)  
2902 Newmark Drive  
Champaign, IL 61822-1076

4.9 Prosecution of Patent and Intellectual Property Applications. Both PARTIES agree to cooperate with the other in the preparation, filing and prosecution of patent or other INTELLECTUAL PROPERTY applications on any SUBJECT INVENTION in this or any foreign country. Each PARTY shall provide the other PARTY with a copy of any patent or other INTELLECTUAL PROPERTY application on any SUBJECT INVENTION filed in this or a foreign country within sixty (60) days after filing, along with the power to inspect the patent or other INTELLECTUAL PROPERTY application..

4.10 Transfer of Rights to Inventors. In this or any foreign country where none of the PARTIES to this CRADA elects to file a patent or other INTELLECTUAL PROPERTY rights application on a SUBJECT INVENTION, any or all of the PARTIES may transfer their patent or other INTELLECTUAL PROPERTY rights to the employee inventor(s) with the reservation of a non-exclusive, non-transferable, irrevocable, world-wide, paid-up license to practice or have practiced the INVENTION by or on behalf of the PARTIES.

4.11 Maintenance Fees. The fees payable to a patent office in order to maintain the intellectual property will be paid by the PARTY owning the patent, at its option. If that PARTY decides not to pay the maintenance fees, it shall notify the other PARTY, who may pay the maintenance fees if it desires to maintain the enforcement of the patent. If neither PARTY wishes to pay maintenance fees, the inventor(s) will be given a timely notice and opportunity to do so.

#### Article 5. Representations and Warranties.

5.1 Representations and Warranties of ERDC-EL. ERDC-EL hereby represents and warrants to KORDI as follows:

5.1.1 Organization. ERDC-EL is a research and development center of the Department of Army and is wholly owned by the U.S. Government whose substantial purpose is the performance of research, development, or engineering by employees of said Government.

5.1.2 Mission. The performance of the activities specified by this CRADA are consistent with the mission of ERDC-EL.

5.1.3 Power and Authority. All prior reviews and approvals required by regulations or law have been obtained by ERDC-EL prior to the execution of this CRADA. The ERDC-EL official executing this CRADA has the requisite authority to do so.

5.2 Representations and Warranties of KORDI. KORDI hereby represents and warrants to ERDC-EL as follows:

5.2.1 Corporate Organization. KORDI, as of the date hereof, is a research and development institution duly organized, validly existing and in good standing under the laws of the Republic of Korea.

5.2.2 Statement of Ownership. KORDI is a foreign owned entity.

5.2.3 Power and Authority. KORDI has the requisite power and authority to enter into this CRADA and to perform according to the terms thereof. The KORDI official executing this CRADA has the requisite authority to do so.

5.2.4 Due Authorization. The Board of Directors and stockholders of KORDI have taken all actions required to be taken by law, KORDI's Certificate or Articles of Incorporation, its bylaws or otherwise, to authorize the execution and delivery of this CRADA.

5.2.5 No Violation. The execution and delivery of this CRADA does not contravene any material provision of, or constitute a material default under any material Agreement binding on KORDI or any valid order of any court, or any regulatory agency or other body having authority to which KORDI is subject.

#### Article 6. Termination.

6.1 Termination by Mutual Consent. KORDI and ERDC-EL may elect to terminate this CRADA, or portions thereof, at any time by mutual written consent. In such event the PARTIES shall specify in writing the disposition of all tangible property, intellectual property, and other results of work accomplished or in progress, arising from or performed under this CRADA.

## 6.2 Termination by Unilateral Action.

6.2.1 Written Notice. Either PARTY may unilaterally terminate this entire CRADA at any time by giving the other PARTY written notice not less than thirty (30) days prior to the desired termination date; provided, however, that no PARTY shall have the right to terminate its obligation under Article 3, Data Rights and Publication.

6.2.2 Data Rights. If either PARTY unilaterally terminates this CRADA pursuant to Clause 6.2.1, each PARTY shall return any and all SUBJECT DATA developed by the other PARTY which it may have in its possession and will retain no rights to publish said SUBJECT DATA developed by the other PARTY after the effective date of the unilateral termination.

6.2.3 New Commitments. ERDC-EL shall make no new commitments after receipt of a written termination notice from KORDI and shall, to the extent feasible, cancel all outstanding commitments and contracts by the termination date.

## Article 7. Liability.

7.1 To the extent permitted by law, each PARTY assumes liability for the negligent actions of its employees or agents that are the cause of the injuries or damages that occur during the performance of this CRADA.

7.2 No Warranty. Except as specifically stated herein, neither PARTY makes any express or implied warranty as to any matter whatsoever, including the conditions of the research or any INVENTION or project.

7.3 Force Majeure. Neither PARTY shall be considered in default for any unforeseeable event beyond its reasonable control not caused by the fault or negligence of such PARTY, which causes such PARTY to be unable to perform its obligations under this CRADA (and which it has been unable to overcome by the exercise of due diligence), including, but not limited to, flood, drought, earthquake, storm, fire, pestilence, lightning and other natural catastrophes, epidemic, war, riot, civic disturbance or disobedience, strikes, labor dispute or failure or threat of failure, or sabotage, or any order or injunction made by a court or public agency. In the event of the occurrence of such a force majeure event, the PARTY unable to perform shall promptly notify the other PARTY. It shall further use its best efforts to resume performance as quickly as possible and shall suspend performance only for such period of time as is necessary as a result of the force majeure event.

7.4 Indemnification. KORDI holds the U.S. Government harmless and indemnifies the Government for all liabilities, demands, expenses and losses arising out of the use by KORDI, or any PARTY acting on its behalf or under its authorization, of ERDC-EL's research and technical development or out of any use, sale or other disposition by KORDI, or others acting on its behalf or with its authorization, of products MADE by the use of ERDC-EL's technical developments. This provision shall survive termination of this CRADA.

#### Article 8. Miscellaneous.

8.1 Officials Not to Benefit. No member of, or delegate to the United States Congress, or resident commissioner shall be admitted to any share or part of this CRADA, nor to any benefit that may arise therefrom; but this provision shall not be construed to extend to this CRADA if made with a corporation for its general benefit.

8.2 Governing Law. The technical validity, performance and effect of this CRADA for all purposes shall be governed by the laws applicable to the Government of the United States.

8.3 Entire CRADA. This CRADA constitutes the entire agreement between the PARTIES concerning the subject matter hereof and supersedes any prior understanding or written or oral agreement relative to said matter.

8.4 Headings. Titles and headings of the sections and subsections of this CRADA are for the convenience of references only and do not form a part of this CRADA and shall in no way affect the interpretation thereof.

8.5 Waivers. None of the provisions of this CRADA shall be considered waived by any PARTY hereto unless such waiver is given in writing to all other PARTIES. The failure of any PARTY to insist upon strict performance of any of the terms and conditions hereof, or failure or delay to exercise any rights provided herein or by law, shall not be deemed a waiver of any rights of any PARTY hereto.

8.6 Severability. The illegality or invalidity of any provisions of this CRADA shall not impair, affect or invalidate the other provisions of this CRADA.

8.7 Amendments and Modifications. If either PARTY desires a modification in this CRADA, the PARTIES shall, upon reasonable notice of the proposed modification by the PARTY desiring the change, confer in good faith to determine the desirability of such modification. Such modification shall not be effective until a written amendment is signed by all the PARTIES

hereto by their representatives duly authorized to execute such amendment. All amendments will be considered integral parts of this CRADA and will be included in an appendix specifically for said amendments.

8.8 Title to Property. The purchase or use of any property to carry out this CRADA does not affect the ownership rights that would otherwise apply. All equipment developed or acquired under this CRADA shall be the property of the PARTY developing or acquiring such equipment. However, property directly provided under this CRADA by either PARTY, regardless of who uses the property in the performance of the work, shall remain the property of the providing PARTY unless other disposition is mutually agreed upon in writing by the PARTIES. The PARTY holding the title to the equipment utilized in carrying out this CRADA is responsible for the maintenance of the equipment and the costs of transportation to and from the site where it will be used.

8.9 Assignment. Neither this CRADA nor any rights or obligations of any PARTY hereunder shall be assigned or otherwise transferred by either PARTY without the prior written consent of the other PARTY. In no event shall any rights or obligations of this CRADA be assigned or transferred to a PARTY not a citizen and resident of the United States of America.

8.10 Official notices pertaining to amendments, disputes, or termination shall be signed by a duly authorized representative and shall be delivered by U.S. Certified mail, or other form of express mail service. All such official notices shall be addressed as follows:

For ERDC-EL:           U.S. Army Engineer Research and Development Center  
                              ATTN: CEERD-OT (Bea Shahin)  
                              2902 Newmark Drive  
                              Savoy, IL 61822-1076  
                              217-373-7234

For KORDI:             Dr. Suk Hyun Kim  
                              Korea Ocean Research and Development Institute  
                              1270 Sadong Ansan Kyunggido, 426-744  
                              Republic of KOREA  
                              82-31-400-6181

Either PARTY may change such address by giving notice to the other PARTY in this manner.

8.11 General written notices pertaining to or required by this AGREEMENT, such as progress reports, may be signed by the representatives named below and delivered by hand or sent by U.S. mail or an express service.

For ERDC-EL: U.S. Army Engineer Research and Development Center,  
Environmental Laboratory  
Attn: CEERD-EM-D (Dr. Todd Bridges)  
3909 Halls Ferry Road  
Vicksburg, MS 39180-6199  
601-634-3626  
[Todd.S.Bridges@erdc.usace.army.mil](mailto:Todd.S.Bridges@erdc.usace.army.mil)

For KORDI: Dr. Suk Hyun Kim  
Korea Ocean Research and Development Institute  
1270 Sadong Ansan Kyunggido, 426-744  
Republic of KOREA  
82-31-400-6181  
[shkim@kordi.re.k](mailto:shkim@kordi.re.k)

Either PARTY may change its authorized representative by giving notice to the other PARTY in this manner.

8.12 Independent Contractors. The relationship of the PARTIES to this CRADA is that of independent contractors and not as agents of each other or as joint venturers or as business partners. Each PARTY shall maintain sole and exclusive control over its personnel and operations.

8.13 Use of Name or Endorsements. KORDI shall not use the name or any trademarks of ERDC-EL or the U.S. Army Corps of Engineers, or the U.S. Government on any product or service which is directly or indirectly related to either this CRADA or any patent license or assignment agreement which implements this CRADA unless permission has been obtained from the appropriate Public Affairs approving authority. ERDC-EL shall assist in obtaining such approval as appropriate. By entering into this CRADA, ERDC-EL does not directly or indirectly endorse any product or service provided, or to be provided, by KORDI, its successors, assignees, or licensees. KORDI shall not in any way imply that this CRADA is an endorsement of any such product or service.

8.14 Covenant Against Contingent Fees. KORDI warrants that no person or selling agency has been employed or retained to solicit or secure this CRADA upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by KORDI for the purpose of securing business. For breach or violation of this warranty, ERDC-EL shall have the right to annul this CRADA without liability, or, in its discretion, to add to the CRADA price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

8.15 Preference for U.S. Industry. The PARTIES agree that a purpose of this CRADA is to provide substantial benefit to the U.S. economy. Accordingly, KORDI agrees that any product MADE or produced under this CRADA, used or sold by KORDI or any licensee or sub-licensee shall be manufactured substantially in the United States.

8.16 Access to Government Automated Information Systems. Both PARTIES agree that any non-Government persons working under this agreement (including U.S. citizens) who require access to Government Automated Information Systems (stand alone computers, network computers/system, email) shall, at a minimum, be designated into a ADP-III position (non-sensitive) in accordance with DoD regulation 5220-22-r, *Industrial Security*.

#### Article 9. Transfer to Foreign-owned or Foreign-controlled Entities.

9.1 FOREIGN NATIONALS Participation. Travel and/or visits by FOREIGN NATIONALS to ERDC-EL facilities related to CRADA coordination, negotiation or execution will be governed by the provisions of Army Regulation 380-10, *Disclosure of Information and Visits of Foreign Nationals*. Travel and/or visits by FOREIGN NATIONALS will be conducted with Headquarters, United States Army Corps of Engineers, Foreign Disclosure Office (CEMP-OI-FL) and follow procedures issued by that office. FOREIGN NATIONALS who may be involved in any work performed under this agreement must be identified by the KORDI and approved by ERDC-EL before participating in this agreement. Accordingly, KORDI agrees to furnish the name of any FOREIGN NATIONAL who may be involved in the work performed under this agreement, along with documentation to verify that each was legally admitted into the United States and has authority to work and/or attend school in the United States. This information should be forwarded to:

Director  
U.S. Army Engineer Research and Development Center  
ATTN: CEERD-SE (Linda McGowan)  
3909 Halls Ferry Road  
Vicksburg, MS 39180-6199

9.2 Export Control Laws. The PARTIES understand that information and technology resulting from the performance of this CRADA may be subject to export control laws and regulations, and each PARTY is responsible for its own compliance with such laws and regulations. Consideration has been given to the provisions of Executive Order 12591. If it is determined that, under the International Traffic Arms Regulation or Export Administration Regulation controls are required on technology which may be transferred under this CRADA, such determination(s) shall be included in the CRADA or amendments. Nothing in this CRADA waives any such statutory or regulatory requirement.

Article 10. Alternative Dispute Resolution.

10.1 Settlement. In the event that a dispute arises under this CRADA which cannot be readily resolved, it shall be submitted jointly to the signatories of this CRADA. The PARTIES shall seek in good faith to resolve the issue through negotiation or other forms of non-binding alternative disputes resolution mutually acceptable to the PARTIES. A joint decision of the signatories or their designees shall be the disposition of such dispute. No action in law or equity shall be brought until the provisions of this paragraph 10.1 have been carried out.

10.2 Continuation of Work. Pending the resolution of any dispute or claim pursuant to this Article, the PARTIES agree that performance of all obligations shall be pursued diligently.

Article 11 Surviving Provisions.

11.1 The Articles covering Definitions, Financial Obligations, Data Rights and Publications, Patent and Other Intellectual Property Rights, Representations and Warranties, Liability, Amendments and Modifications, Notices, Transfer to Foreign-owned or Foreign-controlled Entities, Alternative Dispute Resolution, and Surviving Provisions shall survive the completion, termination, or expiration of this agreement.

Article 12. Duration of CRADA and Effective Date.

12.1 It is mutually recognized that the development program cannot be rigidly defined in advance and that the contemplated time periods for completion of each phase are good faith guidelines subject to adjustment by mutual agreement, to fit circumstances as the development program proceeds. In no case will this CRADA extend beyond 5 years, unless it is amended in accordance with Article 8.

12.2 Effective Date. This CRADA shall enter into force following final signature.

IN WITNESS WHEREOF, the PARTIES have caused this CRADA to be executed by their duly authorized representatives as follows:

For the KOREA OCEAN RESEARCH AND DEVELOPMENT INSTITUTE:

Ki Dai Yum  
 KiDai Yum, PhD  
 President

10/1/07  
 Date

For the US ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER,  
 ENVIRONMENTAL LABORATORY:

By my signature below, I approve this CRADA with a nondomestic partner; and, in accordance with 1-13 of AR 70-57, I have determined as follows: (1) Collaboration with a foreign entity is the best option for achieving ERDC-EL's objectives, and such foreign participation is consistent with US and Department of Defense (DOD) policy; (2) a CRADA is the best mechanism to support the collaboration; (3) as outlined in E.O. 12591, I have considered whether entities or governments of the Republic of Korea permit and encourage US participation on a comparable basis, whether the Republic of Korea has policies that protect US intellectual property rights, and whether the Republic of Korea has adopted adequate measures to prevent the transfer of strategic technology to destinations prohibited under national security export controls. The appropriate laboratory and center officials have determined that the International Traffic in Arms Regulations (22 CFR Parts 120-130), the Export Administration Regulations (15 CFR Parts 730-774), and DOD guidance do not require control of the technology to be transferred.

Beth C. Fleming  
 BETH C. FLEMING, PhD  
 Director

9/18/07  
 Date

## APPENDIX A

COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT  
BETWEEN  
U.S.ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER-  
ENVIRONMENTAL LABORATORY  
AND  
KOREA OCEAN RESEARCH AND DEVELOPMENT INSTITUTE

## Scope of Cooperative Research and Development Program

The purpose of this cooperative research and development agreement is to provide for the joint conduct of research and development investigations related to technology on marine contaminated sediment management. The respective obligations of the PARTIES in performing the cooperative research and development program are as follows:

## ERDC-EL:

- (1) Shall make available laboratory engineers and scientists to collect data and conduct collaborative research related to marine contaminated sediment management.
- (2) Shall exchange research study results and technical information related to marine contaminated sediment management and areas of common interest.
- (3) Shall provide expert consultations related to marine contaminated sediment management and areas of common interest.

## KORDI:

- (1) Shall make available engineers and scientists to collect data and conduct collaborative research related to marine contaminated sediment management.
- (2) Shall exchange research study results and technical information related to marine contaminated sediment management and areas of common interest.
- (3) Shall provide expert consultations related to marine contaminated sediment management and areas of common interest.

## APPENDIX B

WORK STATEMENT  
PURSUANT TO  
COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT  
BETWEEN THE  
U.S. ARMY ENGINEER RESEARCH AND DEVELOPMENT CENTER-  
ENVIRONMENTAL LABORATORY  
AND  
KOREA OCEAN RESEARCH AND DEVELOPMENT INSTITUTE

Pursuant to Article 2.2 of the subject AGREEMENT, this Work Statement defines a particular research activity (consistent with the scope and obligations set forth in Appendix A) to be conducted under the AGREEMENT.

1.0 TITLE: Develop Risk-Informed Decision Framework for Busan South Harbor (BSH-RIDF) and Confined Aquatic Disposal for Mukho Harbor (MH-CAD) Projects

2.0 BACKGROUND

Marine Contaminated Sediment Research Program(MCSR), Korea Ocean Research and Development Institute, Sadong 1270, Ansan, Republic of Korea and Center for Contaminated Sediments, U.S. Army of Corps Engineer Research and Development Center (ERDC), Vicksburg, Mississippi, U.S. has reached the common understanding that joint research on the issues concerned with marine contaminated sediment management will be useful for both institutions furthering out their respective advancement on the research capabilities.

ERDC and KORDI has developed a cooperative research and development agreement to evaluate management options for contaminated sediments in Busan South Harbor by developing risk-informed decision framework (BSH-RIDF) and design confined aquatic disposal (CAD) for Mukho Harbor (MH-CAD) as part of a dredging project in Korea for the year of 2007 (1<sup>st</sup> year of the 1<sup>st</sup> stage of total 3 years) based on the meetings held in 29 January 2007 in ERDC and 7-8 June 2007 in KORDI along with e-mail correspondence. Busan South Harbor was also visited during the last June meeting. A case study has been chosen by the KORDI in Busan South Harbor, where contaminated sediments need to be dredged and placed in a disposal site as part of a dredging project in the harbor. The KORDI is seeking ERDC expertise in the areas of decision analysis and building/designing disposal facilities.

3.0 PROJECT MANAGERS:

### **1.1 Goals of the BSH-RIDF Project:**

The goals of the BSH-RIDF project are: to (1) review analytical approaches for incorporating environmental risks associated with various hypotheses regarding system response to dredging operations into management objectives that stakeholders care about with emphasis on dredging operation options, (2) develop a integrated ecological assessment and decision methodology to define effective processes for involving decision makers and stakeholders in objective definition and evaluations of tradeoffs and risk, and (3) explore how decision analysis and mathematical modeling might be useful for evaluating the relevance of scientific uncertainty and value judgment.

### **1.2 Goals of the MH-CAD Project:**

The goals of the MH-CAD project are: (1) to review project objectives and CAD facility design objectives; (2) to assist in the development of a testing regimen to meet project objectives and to identify and review testing protocols; (3) to provide guidance in the conduct of laboratory testing; (4) to review laboratory testing results for sizing CAD facilities to store dredged material, for designing physical cap stability during cap placement and for erosional forces, and for chemical stability to control releases of contaminants during placement and in the long term as required to meet project objectives; (5) to provide guidance in the conduct of modeling for design of CAD facility and operational performance such as prediction of losses, releases and water quality impacts during dredged material placement; (6) to review and assist in design procedures and modeling for sizing the CAD facility, for solids and contaminant losses during placement of the dredged material, for selection of capping materials to control erosion at the CAD facility and to provide a stable cap, for selection of capping materials and cap thickness to control long-term contaminant flux from the CAD facility; and (7) to assist in development of an operational plan for the CAD facility.

## **2. Objectives for the year of 2007**

### **2. A. BSH-RIDF**

- Development of risk-informed decision framework: case study for Busan South Harbor, Republic of Korea (RIDF)

### **2. B. MH- CAD**

- Support of confined aquatic disposal design: case study for Mukho Harbor, Republic of Korea (CAD)

## **3. Scope**

### **3. A. BSH-RIDF**

- Develop a risk-informed decision framework (RIDF) document
- Generate raw data for the metrics.
- Develop RIDF text that describes the theoretical and practical basis for the use of Multi-Criteria Decision Analysis (MCDA).
- Communicate to KORDI.

- Develop a survey instrument for eliciting the weights of key stakeholders and decision-makers and develop utility functions.
- Develop tradeoff analysis and sensitivity analysis.
- Develop manuscript for publication.

### **3. B. MH-CAD**

- Review objectives.
- Develop testing regimen.
- Provide guidance for laboratory testing.
- Review laboratory testing results
- Provide guidance for modeling.
- Review and assist in design procedures and modeling.
- Review operational plan.

## **4. Content of Works**

ERDC will work with the KORDI to complete the tasks described below

### **4. A. BSH-RIDF**

- Task 1: The RIDF will be developed such that a statement of problem is clearly and logically connected with a description of the KORDI's dredging objectives and the metrics that will be used to score and rank the alternative contaminated sediment management plans under consideration. The RIDF will include a structure for organizing the metrics within a hierarchical system that will allow for integrating them within commercially available software such as *Criterion Decision Plus*. The metrics will be described in sufficient detail regarding the sources of data for their parameterization and defining each metric. ERDC will rely on KORDI staff to provide the needed information regarding the problem statement, objectives, and metrics. This task will begin during ERDC visit with the KORDI team in Seoul, Korea.
- Task 2: The RIDF requires raw data for each metric identified in Task 1. ERDC will rely on the KORDI team to provide these data for each metric. These data must be obtained by late summer or early fall 2007. The raw data for metrics will be incorporated with the decision analysis approach to rank the alternatives. Those incorporation approaches are explained in Task 3 and 4.
- Task 3: The RIDF will be developed such that it describes the theoretical and practical basis for the use of Multi Criteria Decision Analysis (MCDA) techniques. We will share this information in a meeting with decision-makers and scientists at KORDI to clearly communicate each aspect of this technology in conjunction with Task 4. Such a meeting will also be used to introduce the discussion of the metric set and its importance. Task 3 relies on the availability of the raw metrics data from Task 2. Task 3 will be largely completed during ERDC visit with the KORDI team.
- Task 4. In this task, ERDC will develop a questionnaire, elicit weights, and develop utility functions. We will develop a survey instrument (questionnaire) to elicit the weights of key stakeholders and decision-makers and assume linear utility functions for

the metrics that will be implemented to generate scores for the measures. The questionnaire will be first deployed by the KORDI team. Once the KORDI team weights are obtained for the final set of metrics, it will then be deployed during a face-to-face meeting of KORDI stakeholders and decision-makers in Fall, 2007. During the meeting, we will also describe the background on the exercise, including its purpose, and will answer any questions or concerns. The list of stakeholder groups to be selected for participation of this effort will be selected by the KORDI team in advance to ensure diversity of opinions (e.g., environment, social, etc.). This survey will also be used to develop a weighting structure for the set of metrics. These values and weights will be used in the amalgamation step to prepare overall scores for each dredging alternative. The raw data from each metric is required to start the weight elicitation and utility function subtasks, so this task can not begin until after Task 2 has been completed.

- Task 5. ERDC will develop a tradeoff analysis and sensitivity analysis. It also relies on the availability of the raw metrics data from Task 2 to complete.
- Task 6. A manuscript detailing the decision analysis process and how it was applied to this case study and used to recommend a preferred dredging alternative will be prepared as the deliverable for this project. Upon KORDI review and approval, the paper will be submitted to a peer reviewed journal acceptable to KORDI.
- Travel. Cost, assuming 2 ERDC staff traveling to S. Korea for one 4-day trip, including burdens, is \$10,000, included in total Section 9. Budget.

#### **4. B. MH-CAD**

- Task 1. ERDC will review project objectives and CAD facility design objectives.
- Task 2. ERDC will assist in the development of a testing regimen to meet project objectives and to identify and review testing protocols.
- Task 3. ERDC will provide guidance in the conduct of laboratory testing.
- Task 4. ERDC will review laboratory testing results for sizing CAD facilities to store dredged material, for designing physical cap stability during cap placement and for erosional forces, and for chemical stability to control releases of contaminants during placement and in the long term as required to meet project objectives.
- Task 5. ERDC will provide guidance in the conduct of modeling for design of CAD facility and operational performance such as prediction of losses, releases and water quality impacts during dredged material placement.
- Task 6. ERDC will review and assist in design procedures and modeling for sizing the CAD facility, for solids and contaminant losses during placement of the dredged material, for selection of capping materials to control erosion at the CAD facility and to provide a stable cap, for selection of capping materials and cap thickness to control long-term contaminant flux from the CAD facility.
- Task 7. ERDC will assist in development of an operational plan for the CAD facility.

## **1. Approach**

### **5. A. BSH-RIDF**

- Defining problems;
- Defining objectives;
- List possible options to achieve the objectives;
- Evaluate performance given an option;
- Eliciting the weights among objectives (Decision makers and stakeholders meeting);
- Integrate the information to recommend the most preferred options

### **5. B. MH-CAD**

- Review project objectives and CAD facility design objectives;
- Assist in the development of a testing regimen to meet project objectives and to identify and review testing protocols;
- Provide guidance in the conduct of laboratory testing;
- Review laboratory testing results for sizing CAD facilities to store dredged material, for designing physical cap stability during cap placement and for erosional forces, and for chemical stability to control releases of contaminants during placement and in the long term as required to meet project objectives;
- Provide guidance in the conduct of modeling for design of CAD facility and operational performance such as prediction of losses, releases and water quality impacts during dredged material placement;
- Review and assist in design procedures and modeling for sizing the CAD facility, for solids and contaminant losses during placement of the dredged material, for selection of capping materials to control erosion at the CAD facility and to provide a stable cap, for selection of capping materials and cap thickness to control long-term contaminant flux from the CAD facility;
- Assist in development of an operational plan for the CAD facility

## 6. Time Schedule

Month (2007)	Objective A: BSH-RIDF
Aug	Develop a risk-informed decision framework (RIDF)
Sep	Generate raw data for the metrics
Oct	Develop RIDF text that describes the theoretical and practical basis for the use of Multi-Criteria Decision Analysis (MCDA). Communicate to KORDI
Nov	Develop a survey instrument for eliciting the weights of key stakeholders and decision-makers and develop utility functions
Nov	Develop tradeoff analysis and sensitivity analysis
Dec	Develop manuscript for publication
Month (2007)	Objective B: MH-CAD
Aug	Review objectives
Sep	Develop testing regimen
Sep-Oct	Provide guidance for laboratory testing
Oct	Review laboratory testing results
Oct-Nov	Provide guidance for modeling
Nov	Review and assist in design procedures and modeling
Dec	Review operational plan

## 7. Deliverable

### 7. A. BSH-RIDF

- One peer reviewed journal articles at SCI level
- USAERDC will help KORDI generating technical report

### 7. B. MH-CAD

- Technical advice on designing criteria for CAD in Korea

## 8. Duration

Project Duration: August, 2007 ~ January, 2008 (6 months)

**9. Budget**

Task	Description	Cost (US\$)
Objective A: BSH-RIDF		
1	Develop a risk-informed decision framework (RIDF) document	4,500
2	Generate raw data for the metrics	5,500
3	Develop RIDF text that describes the theoretical and practical basis for the use of Multi-Criteria Decision Analysis (MCDA). Communicate to KORDI.	8,000
4	Develop a survey instrument for eliciting the weights of key stakeholders and decision-makers and develop utility functions	10,000
5	Develop tradeoff analysis and sensitivity analysis	7,000
6	Develop manuscript for publication	5,000
Subtotal		50,000
Objective B: MH-CAD		
1	Review objectives	1,000
2	Develop testing regimen	3,000
3	Provide guidance for laboratory testing	5,000
4	Review laboratory testing results	5,000
5	Provide guidance for modeling	6,000
6	Review and assist in design procedures and modeling	25,000
7	Review operational plan	5,000
Subtotal		50,000
Data Management Fee		10,000
Total		110,000