

PREFACE

The U.S. Army Engineer Research and Development Center (ERDC) includes the Coastal and Hydraulics Lab (CHL), the Geotechnical and Structures Lab (GSL), the Environmental Lab (EL) and the Information Technology Lab (ITL) in Vicksburg, Mississippi, the Cold Regions Research and Engineering Lab (CRREL) in Hanover, New Hampshire, the Construction Engineering Research Lab (CERL) in Champaign, Illinois, and the Topographic Engineering Center (TEC) in Alexandria, Virginia. The ERDC is responsible for conducting research in the broad fields of hydraulics, dredging, coastal engineering, instrumentation, oceanography, remote sensing, geotechnical engineering, earthquake engineering, soil effects, vehicle mobility, self-contained munitions, military engineering, geophysics, pavements, protective structures, aquatic plants, water quality, dredged material, treatment of hazardous waste, wetlands, physical/mechanical/ chemical properties of snow and other frozen precipitation, infrastructure and environmental issues for installations, computer science, telecommunications management, energy, facilities maintenance, materials and structures, engineering processes, environmental processes, land and heritage conservation, and ecological processes. This research is conducted by Government personnel and by contract with educational institutions, non-profit organizations and private industries.

The provisions of the Competition in Contracting Act of 1984 (P.L. 98-369) as implemented in the Federal Acquisition Regulation provide for the issuance of a Broad Agency Announcement (BAA) as a means of soliciting proposals for basic and applied research and that part of development not related to the development of a specific system or hardware procurement. To be eligible for consideration and possible contract award, the technology or methodology shall be either basic research, applied research, advanced technology development not for a specific system/hardware, or demonstration and validation. BAAs may be used by agencies to fulfill their requirements for scientific study and experimentation directed toward advancing the state-of-the-art or increasing knowledge or understanding rather than focusing on a specific system or hardware solution. The BAA shall only be used when meaningful proposals with varying technical/scientific approaches can be reasonably anticipated. "Basic Research" is defined as research directed toward increasing knowledge in science with the primary aim being a fuller knowledge or understanding of the subject under study, rather than any practical application of that knowledge. "Applied Research" is the effort that normally follows basic research, but may not be severable from the related basic research; attempts to determine and exploit the potential of scientific discoveries or improvements in technology, materials, processes, methods, devices, or techniques; and attempts to advance the state-of-the-art. This announcement must be general in nature, identify the areas of research interest, include criteria for selecting proposals, and solicit the participation of all offerors capable of satisfying the Government's needs. The proposals submitted under this BAA will be subject to peer or scientific review. Proposals that are selected for award are considered to be the result of full and open competition and in full compliance with the provisions of PL 98-369, the Competition in Contracting Act of 1984. Resulting agreements may be in the form of purchase orders, contracts, grants, or cooperative agreements depending upon the specifics of the effort, such as extent of Government involvement, actual scope of work, and cost.

This guide constitutes the BAA of this Command and conforms to regulatory requirements of the Federal Acquisition Regulation. This guide provides prospective offerors information on the preparation of proposals for basic or applied research. Directions as to form and procedures are included. Offerors are advised that proposals for grants are also solicited through www.grants.gov .

Proposals from U. S. Government facilities and organizations will not be considered under this program announcement.

PERSONS SUBMITTING PROPOSALS ARE CAUTIONED THAT ONLY A CONTRACTING OFFICER MAY OBLIGATE THE GOVERNMENT TO ANY AGREEMENT INVOLVING EXPENDITURE OF GOVERNMENT FUNDS.

This BAA supersedes all previous editions and shall remain in effect until superseded.

Proposals are encouraged from Historically Black Colleges and Universities or Minority Institutions (HBCUs/MIs) for students to provide research support to any of the research and development areas listed in this BAA. This area of student research need is 100% set-aside for HBCU/MIs, as defined by the clause at 252.226.7000 of the Defense Federal Acquisition Regulation Supplement (DFARS). HBCU/MIs interested in submitting a proposal must address the specific areas of research under which they are submitting. They must also clearly state within their proposal their capability to perform the contract and include a positive statement of their eligibility as an HBCU or MI. These contracts will be written in accordance with the Contract Student Regulation as regards pay, GPA requirements, place of performance and every other requirement or statement within the regulation.

ERDC also encourages small business concerns, women owned small businesses, small disadvantaged business concerns, small businesses located in HUBZones, businesses participating in the Small Business Administration 8(a) program, and service disabled veteran-owned small businesses to research proposals for consideration.

The Offeror, by submission of an offer or execution of a contract in response to this solicitation, certifies that the Offeror is not debarred, suspended, declared ineligible for award of public contracts, or proposed for debarment pursuant to FAR 9.406-2. If the Offeror cannot so certify, or if the status of the Offeror changes prior to award, the Offeror must provide detailed information as to its current status.

See security/foreign national requirements at Attachments A and B. These requirements cannot be modified or deleted.

Please contact Mike Lee of the ERDC Contracting Office at 601-634-3903 or via email at Michael.G.Lee@usace.army.mil if you have questions concerning submittal or contractual requirements. For questions concerning proposals to CERL, you may also contact John Akin at 217-373-4490 or Rita S. Brooks at 217-373-7280. For questions concerning proposals to CRREL, you may also contact Lou Ann Duffy at 603-646-4280. Contact the technical personnel listed at the end of each topic area for questions concerning the topic areas

themselves. PREPARATION INSTRUCTIONS AND ADDRESSES SHOWN ON PART III.

TABLE OF CONTENTS

	<u>Page</u>
Part I BACKGROUND AND RESEARCH INTERESTS	0
Conference and Symposia Grants.....	3
Coastal and Hydraulics Laboratory	5
Geotechnical and Structures Laboratory	13
Environmental Laboratory	24
Information Technology Laboratory.....	42
Construction Engineering Research Laboratory	45
Cold Regions Research and Engineering Laboratory.....	55
Topographic Engineering Center	68
Part II PRE-PROPOSAL AND PROPOSAL EVALUATION	81
Part III PRE-PROPOSAL AND PROPOSAL PREPARATION	82
Introduction	82
General Information	83
Type of Contract	86
Contents of Pre-Proposals	86
Contents of Full Proposals	87
ATTACHMENTS	
Attachment A – Clauses for Fixed Price Contracts.....	89
Attachment B – Clauses for Cost-Reimbursable Contracts.....	109
Attachment C - Additional Representations and Certifications.....	128

PART I
BACKGROUND AND RESEARCH INTERESTS OF THE RESEARCH LABORATORIES

The COASTAL AND HYDRAULICS LABORATORY (CHL) has nationally - and internationally - recognized engineering and scientific expertise related to inland waterways and the estuarine and coastal zones. CHL has foremost capabilities in prototype data collection, experimental research and numerical modeling and simulation of processes involving water levels, current, winds, waves and tides, and their interaction with sediments and structures. Specific and unique expertise exists in the engineering, hydrodynamics, sediment transport, dredging and dredged material disposal, physical processes associated with environmental analyses, groundwater modeling, military hydrology, harbor engineering, and riverbank and shore protection. CHL has the Tri-Service Reliance mission for Logistics-Over-the Shore (LOTS) for Sustainment Engineering. The Shore Protection Manual, which is internationally recognized as the most authoritative source of engineering design and guidance for the coastal engineering profession, was originally developed by the Coastal Engineering Research Center (CERC), and is being replaced by the CHL with an updated and greatly expanded Coastal Engineering Manual.

The GEOTECHNICAL and STRUCTURES LABORATORY (GSL) performs research, development and testing in many areas such as: soil mechanics, foundation design, slope stability, seepage analysis, pavements (both expedient and permanent), rock mechanics, engineering geology and geophysics, earthquake engineering, vehicle mobility and trafficability, structural dynamics, explosion and weapon effects, survivability, earth dynamics, construction materials, impact of high-velocity projectiles, development of methods for installation of fixed installation camouflage, concealment and deception, and design and analysis of structures to resist static and dynamic loading. The Geotechnical and Structures Laboratory is equipped to perform any type of laboratory testing, including centrifuge applications, needed to assist in the types of research described herein.

The ENVIRONMENTAL LABORATORY (EL) conducts Military and Civil Works R&D for the Corps of Engineers, other Department of Defense elements, and other Government agencies in the general areas of Restoration (Clean-up) and Conservation. Restoration involves the development of technologies to improve site characterization, reduce the cost and time to remediate contaminated sites, and accurately assess and monitor the hazard associated with contamination. Areas of research include: (a) environmental sensing development, (b) hazardous waste site characterization and treatment, (c) sediment geochemistry and biological effects, (d) water quality modeling, and unexploded ordnance (UXO). Conservation deals with sustaining the natural and cultural resources entrusted to DoD for continued use through improving and developing tools and technologies, which conserve, protect, and enhance natural and cultural resources and foster stewardship. Areas of research include: (a) environmental database development; (b) environmental impact prediction, assessment, and management; (c) environmental criteria for stream channel alteration; (d) natural resource management; (e) nonindigenous aquatic nuisance species management; (f) threatened and endangered species protection and management (g) water quality and ecological systems; (h) outdoor recreation; (i) cultural resources; and (j) ecosystem simulation.

The INFORMATION TECHNOLOGY LABORATORY (ITL) performs research in computer-aided engineering, interdisciplinary engineering areas, computer science, high performance computing, instrumentation systems, and all aspects of information technology. Projects include computer-aided structural engineering, application of computer-aided design and drafting (CADD) and geographic information system (GIS) technology, three-dimensional (3-D) structural stability, finite element method analysis of structures, engineering reliability, instrumentation systems design and development, relational database management, management information systems, information engineering, software engineering, collaborative technology systems, telecommunications, scientific visualization (including virtual reality), office automation, graphic arts and publishing, library systems, and records management. The Information Technology Laboratory administers and operates on behalf of DoD the ERDC High Performance Computing (HPC) Major Shared Resource Center with a variety of advanced HPC systems that are configured to provide leading-edge computational performance, data storage capacity, network capabilities, and scientific visualization capabilities. A variety of languages and commercial software packages are available on these systems. The computational capabilities of the Center's systems may, at the option of the Government, be made available to contractors.

The U.S. Army CONSTRUCTION ENGINEERING RESEARCH LABORATORY (CERL) offers research and development (R&D) support, as well as technical assistance, to a variety of customers throughout the Department of the Army (DA) and other Government agencies. CERL is the lead Army facility for conducting R&D on infrastructure and environmental issues for installations. CERL's research is directed toward increasing the Army's ability to more efficiently construct, operate, and maintain its installations and ensure environmental quality and safety at a reduced life-cycle cost. To accomplish the mission, CERL has two Divisions: Facilities and Installations. Researchers in these Divisions are matrixed across the ERDC organization in multi-disciplinary teams that bring the best expertise to bear on solving problems for the Department of Defense.

The mission of the COLD REGIONS RESEARCH AND ENGINEERING LABORATORY (CRREL) is to solve interdisciplinary, strategically important problems of the US Army Corps of Engineers, Army, Department of Defense, and the Nation by advancing and applying science and engineering to complex environments, materials, and processes in all seasons and climates, with unique core competencies related to the Earth's cold regions. CRREL provides innovative products and solutions in support of the warfighter, homeland security, environment, infrastructure, and civil works water resources requirements. CRREL's research staff utilizes a multi-disciplinary approach to solve difficult environmental physics and cold regions engineering problems. Technical areas of research include Signature Propagation, Terrain Properties and Processes, Biogeochemical Processes in Earth Materials, Environmental Fate and Transport Geochemistry, Maneuver Support and Sustainment, Cold Regions Infrastructure, Water Resources and Geospatial Applications, and Hydrology and Hydraulics.

The TOPOGRAPHIC ENGINEERING CENTER's (TEC) mission is to provide the Warfighter with a superior knowledge of the battlefield, and to support the Nation's civil and environmental initiatives. This mission is accomplished through research, development,

operations and systems support, and the application of expertise in the geospatial, topographic and related sciences. Throughout its history, TEC has developed and exploited geospatial-related technologies critical to meeting the Nation's military and civil needs. Recently, TEC has applied its expertise to the needs of homeland defense and the global war on terrorism. These technologies and their related research, operations and systems development activities, essential to the Army in accomplishing its global mission, include the following:

- Timely acquisition, fusing, analysis, display, and dissemination of remotely sensed, multi-sourced information depicting imagery, features, elevation, and other information essential to accurately describe the land warrior battlespace
- The development of geographic information software that enables reliable, efficient, and secure information management, interoperability and accessibility for various user communities operating globally, each with different needs.
- The development of globally fielded applications and systems for acquiring, accessing, fusing, and delivering terrain and feature information to the soldier.
- The development of accurate on-the-fly global positioning systems for use with inertial guidance as essential positioning engines for acquiring near real time, dynamic, high-accuracy, remotely sensed 3-d terrain and feature information.
- The development of increasingly compact, more efficient, and more comprehensive applications and systems aimed at providing low echelon combat units with information in near-real-time, enabling rapid response to developing situations in any battlespace.
- The development of new and innovative techniques to understand and visualize terrain and battlespace information in all dimensions, and to accommodate reasoning within analytical results.
- The development of accurate and efficient survey and mapping systems for use by both military and civil communities
- Capabilities in acquisition, testing and fielding of topographic systems; advanced and engineering development of imagery systems; and research and development in the areas of imagery and intelligence data exploitation.
- Operational capabilities in geospatial information and imagery requirements development; terrain, hydrologic, and environmental analysis; and information services.

CONFERENCE AND SYMPOSIA GRANTS

I. Introduction

The ERDC supports conferences and symposia in special areas of science that bring experts together to discuss recent research or educational findings or to expose other researchers or advanced graduate students to new research and educational techniques. The ERDC encourages the convening, in the United States, of major international conferences, symposia, and assemblies of international alliances.

II. Eligibility

Notwithstanding the above, the Department of Defense (DOD) has imposed certain restrictions on the ERDC's co-sponsorship of scientific and technical conferences and symposia. Specifically, DOD instruction 5410.20 prohibits co-sponsorship of conferences and symposia with commercial concerns, i.e., ERDC cannot co-sponsor conferences or symposia with a for-profit company. Scientific, technical, or professional organizations which qualify for tax exemption under the provision of 26 U.S.C. Sec. 501 (c)(3) may receive conference and symposia grants.

III. Conference Support

Conference support proposals should be submitted a minimum of six (6) months prior to the date of the conference.

IV. Technical Proposal Preparation

The technical portion of a proposal for support of a conference or symposium should include:

- a. A one page or less summary indicating the objectives of the project.
- b. The topics to be covered.
- c. The location and probable date(s) and why the conference is considered appropriate at the time specified.
- d. An explanation of how the conference will relate to the research interests of the ERDC and how it will contribute to the enhancement and improvement of scientific, engineering, and/or educational activities as outlined in the BAA.
- e. The name of chairperson(s)/principal investigator(s) and his/her biographical information.
- f. A list of proposed participants and the methods of announcement or invitation.
- g. A summary of how the results of the meeting will be disseminated.

Cost Proposal Preparation

The cost portion of the proposal should show:

- a. Total project conference costs by major cost elements.
- b. Anticipated sources of conference income amount from each.
- c. Anticipated use of funds requested.

V. Participant Support

Funds provided cannot be used for payment to any federal government employee for support, subsistence, or services in connection with the proposed conference or symposium.

COASTAL AND HYDRAULICS LABORATORY

I. Introduction

Research is performed in the areas of hydraulic structures such as locks, dams, outlet works, control gates, stilling basins, spillways, channels, fish handling systems, and pumping stations, flood control channels; navigation channels; riverine and estuarine hydrodynamics and transport processes; groundwater; hydrology; dredging-related equipment; and on coastal problems related to shoreline protection; beach erosion; navigation; sedimentation; inlet stabilization; and construction, operation and maintenance of coastal structures (break-water, jetties, groins, seawalls, etc.). Major areas of interest include coastal hydrodynamics (wind waves, tides, currents, wind related water levels); coastal sedimentation (longshore transport, inlet sedimentation); coastal geology and geomorphology; design and stability of coastal structures; and interaction of structures and coastal processes. Other activities include descriptions of coastal processes; theoretical studies; Watershed and regional sediment and water systems studies; numerical and physical model techniques; data collection and analysis techniques; development of laboratory and prototype instrumentation and equipment. The following sections contain information on these research areas and specific research thrusts.

II. Research Areas

A. Physical Processes in Estuaries (CHL-1)

1. The research program in estuarine physical processes deals with the hydrodynamic and transport characteristics of water bodies located between the sea and the upland limit of tidal effects. Research is directed toward knowledge that will improve field measurements and predictions of these processes.

2. Specific areas of required research include the following physical processes in estuaries and other tidal waters.

(a) The propagation of tides.

(b) Transport of salinity, mixing processes, stratified flows.

(c) Transport, erosion, and deposition of sediments, including settling velocity, aggregation of sediment, consolidation of sediment.

(d) Behavior and characteristics of sediment beds, including movement, consolidation, armoring, bonding, physical chemical characteristics, density, erodability.

(e) Flow between aquifers and surface waters.

3. Specific areas of required research include the following activities with respect to the physical processes listed.

(a) The effect of human activities, including dredging construction, vessel traffic, flow diversion, training, structures, and protective structures.

(b) Measurements of parameters that are indicative or descriptive of the processes listed in paragraph 2 by in-situ and remote methods in the lab and field.

(c) Prediction of processes listed in paragraph 2 by analytical methods, physical models, numerical models, and other techniques.

(d) Conceptual and mathematical descriptions of the processes listed in paragraph 2.

(e) Development of materials, equipment, and methods that potentially lead to applied research that would make human activities listed safer, more economical, or more effective.

(f) Development of methods, techniques, and procedures that enable the treatment of an estuary as a system. (Contact: Dr. Rob McAdory, 601-634-3057)

B. Inland Hydraulic Structures (CHL-2)

1. The research program in hydraulic structures is related to the hydraulic performance of locks, dams, outlet works, control gates, stilling basins, spillways, channels, bank protection, riprap stability, pumping plants and other hydraulic structures, and with physical and/or numerical model studies to predict and analyze the physical water quality aspects of water resources projects.

2. Specific areas of required research include the following:

(a) Physical and numerical hydraulic model investigations of a wide variety of hydraulic structures to verify proposed designs and develop more effective and economical designs.

(b) Analysis of model and prototype data and inspection of field installations to develop design criteria for hydraulic structures.

(c) Develop methods of correlating theoretical and experimental information with design methods used by the Corps of Engineers to improve existing procedures and provide material for inclusion in appropriate manuals.

(d) Develop physical and/or numerical models to predict and analyze the water quality aspects of water resources projects and design appropriate hydraulic structures to control water as well as water quantity while satisfying the desired objectives.

(e) Conduct research and/or develop numerical codes to develop techniques for analyzing physical aspects of water quality in lakes and rivers through a better understanding of the hydrodynamics in density-stratified environments and for improving water quality within and downstream of density-stratified reservoirs and to investigate the ability of existing and proposed water resources projects to satisfy established water quality standards.

(f) Basic studies related to development of hydraulic design and operation guidance for hydraulic structures used in inland waterways for navigation and flood control purposes, including wave forces/loads on gates (tainter, miter, etc).

(g) Performance tests, both model and prototype, of hydraulic appurtenances to flood control and navigation dams such as spillways, outlet works, energy dissipators, and approach and exit channels, are conducted and/or analyzed to develop design guidance that will provide structures of maximum efficiency and reliability with minimum maintenance.

(h) Develop innovative methods to prepare and revise engineering manuals for hydraulic design of various hydraulic structures.

(i) Develop innovative methods to conduct training courses on design of various hydraulic structures.

(j) Develop innovative methods to prepare technical reports of all work conducted. (Contact: Jose Sanchez, 601-634-3895)

C. Open Channel Flow and Sedimentation (CHL-3)

1. The Stable Flood Control Channel research project consists of basic studies related to development of hydraulic design guidance for designing modifications to natural stream channels to provide for local flood protection. Emphasis is placed on channel stability as well as channel flow capacity.

2. Specific areas of required research include the following:

(a) Studies related to the development of effective methods to analyze a natural stream's response to modifications made for flood control purposes.

(b) Studies applicable to development of stream bank and streambed protection methods where channel instability exists.

(c) Studies applicable to development of sediment transport, local scour, and stream form relationships for a broad range of stream types, bed and bank materials, and meteorological and hydrological conditions.

(d) Collection and analysis of data which aid in evaluating existing methods and/or developing new methods to analyze channel stability for the variety of channel flow conditions and stream types existing in natural stream systems. (Contact: Dr. Lisa Hubbard, 601-634-4150)

D. Dredging Research (CHL-4)

Protection and enhancement of the environment associated with operation and maintenance of navigable U.S. waterway infrastructure through dredging activities is a national priority. Dredging operations and environmental requirements of navigation projects are inseparable. Research is required to predict the time-dependent movement of non-contaminated sand and sand/silt mixtures of dredged materials placed in the nearshore zone, and all materials placed in the offshore region. The cost of dredging operations attributable to compliance with environmental windows that are determined to be over-restrictive, inconsistent, or technically unjustified can be reduced. More effective contaminated sediment characterization and management will reduce costs and enhance the reliability of methods associated with the assessment, dredging, placement, and control of sediments from navigation projects. Better instrumentation for dredge and site monitoring is required to implement automated dredge inspection and payment methods, and accurately monitor placement of contaminated materials. Emerging technologies regarding innovative equipment and processes should be expeditiously introduced into the dredging arena. Enhanced ecological risk management for dredging and disposal projects through technically sound approaches for characterizing, managing, and conducting risk-based evaluations are required for expanding options regarding both contaminated and non-contaminated dredged materials. (Contact: Mr. Edmond Russo, 601-634-2067)

E. Navigation Channel Design (CHL-5)

1. The research program in navigation channel design involves basic research to develop design guidance for the design of new channels and modifications of existing waterways. It involves identifying maneuvering requirements in restricted waterways that affect the channel dimensions, alignment, and location of appurtenances in the navigation channel under various environmental and vessel traffic conditions. It also involves identifying the stability of the channel, maintenance requirements and designing structures that reduce or eliminate the maintenance requirements. Finally, it involves quantifying the flow and pressure fields generated by a tow or ship passing through a waterway and the related impacts on the sediment resuspension in the channel, channel border, and side channel/backwater areas. Studies involve deep and shallow draft navigation channels and physical and mathematical models. Human factors are included in research and project studies using a ship and tow simulator.

2. Specific areas of required research include the following:

(a) Physical model investigations of a wide variety of navigation channel configurations in many environments with different type vessels to verify proposed designs and to develop more efficient and safe designs and to lower environmental impacts.

(b) Development and enhancement of mathematical models of vessels, both ships and push-tows, for use on the simulator to add vessel types not available or to increase the accuracy with which the model reproduces the vessels response.

(c) Development of methods and modeling techniques to predict the currents and sediment transport characteristics of various channel designs and integrate this with the navigation model studies, including those generated by the vessel movement.

(d) Development of methods and modeling techniques to predict the currents and sediment transport characteristics of various channel designs and integrate this with the navigation model studies.

(e) Development of methods and techniques to prepare and display visual information for the pilot on the simulator projection system.

(f) Development of methods and measurement equipment, techniques for measuring scale model performance in physical model navigation studies.

(g) Development of methods and techniques to improve ship simulator and increase reliability of design estimates, including data and tools for ship motions, draw down, squat, ship-generated waves, and ship maneuvering.

(h) Development of methods and techniques for the analysis and evaluation of model results to optimize the channel design and to determine the level of safety, or conversely, risk involved with the various designs and ship transits. (Contact: Dennis Webb, 601-634-2455)

F. Computer-Aided Hydraulic Engineering (CHL-6)

The objective of this research program is to develop computer-aided design tools that can be used by hydraulic engineers in planning, design, construction, operation, and maintenance of navigation and flood control projects. The scope includes open channel and closed conduit flows, equipment, structures, and sediment transport analysis and modeling. (Contact: Dr. Steve Scott, 601-634-2371)

G. Groundwater (CHL-7)

The groundwater modeling research program is structured to enhance understanding and predict capabilities, including the development of numerical codes, groundwater flows and contaminant transport in both the saturated and unsaturated zones for both porous and fractured media. The goal of the program is the development of modeling techniques, including remedial alternative simulation, for optimal design and operation of the site cleanups. (Contact: Mr. Earl Edris, 601-634-3378)

H. Hydrology (CHL-8)

1. Research in this area primarily addresses military applications related to mobility, counter mobility and water supply.

2. Specific research involves the following areas:

- (a) Remote sensing and quantification of precipitation.
- (b) Development of spatially varying precipitation hydrology models.
- (c) Visualization of results for hydrology and dam break models.
- (d) Rapid procedures for flood forecasting.
- (e) GIS interfacing with existing and new hydrology models.
- (f) Groundwater surface water interaction processes.

(g) Interfacing watershed models with water quality and other environmental models. (Contact: Mr. Earl Edris, 601-634-3378)

I. H&H GIS/DATABASE DEVELOPMENT (CHL-9)

Research involves the following areas:

- (a) Electronic Navigation Charting.
- (b) Integration of GIS/Database and H&H models.
- (c) Watershed management for erosion control.
- (d) Larger River System management for flood control navigation.
- (e) Visualization Techniques. (Contact: Mr. Ronald Heath, 601-634-3952)

J. Coastal Hydrodynamics, Coastal Processes (CHL-10)

Research in shallow water wave estimation; forecasting and hindcasting of wind generated waves for oceanic to local regions; wave theory; statistical distribution of wave parameters; simulation of spectral conditions in wave basins; nearshore currents; wave breaking; wave/current and wave structure interactions; long and short waves in ports and harbors; tsunami modeling; wind generated currents; storm surge; tidal circulation; two- and three dimensional numerical simulation models (including finite difference, finite element, and curvilinear coordinate techniques); coastal meteorology; explosion generated waves; ship

response to winds, currents and waves; moored ship response; mooring design and analysis, ribbon bridge hydrodynamics and turbulence. (Contact: Dr. Don Resio, 601-634-2018)

K. Coastal Inlets, Navigation Channels (CHL-11)

Sediment shoaling in coastal inlet channels; stability and performance of inlet channels; scour at structures; sediment transport modeling; influence of structures such as jetties and breakwaters on wave, current, and sedimentation processes. Numerical modeling of inlet hydrodynamics and sediment-transport processes. Shoreline evolution modeling and storm erosion of beaches, particularly concerning overwash and breaching near inlets; wind and wave generated sediment transport; sediment budget analysis; coastal and inlet geomorphology; and PC-, workstation-, and mainframe-based automated coastal engineering software (including relational and GIS data bases). (Contact: Dr. Nick Kraus, 601-634-2016)

L. Coastal Structure and Facility Design (CHL-12)

Development of functional and stability design criteria for coastal structures and facilities (breakwaters, seawalls, jetties, groins, harbors, marinas, etc.); wave runup, over-topping, refraction, diffraction, transmission, reflection, etc.; design of floating breakwaters; breakwater stability; application of spectral wave conditions to coastal engineering; stability of riprap to irregular wave attack; stability and functional design of overtopped rubble mound breakwaters; scale modeling of armor unit strength; analysis of structural data for floating breakwaters; investigation of numerical structural models for floating breakwaters; development of wave runup gage for rough and porous slopes; investigation of attenuation/mooring force models of floating breakwaters; development of materials and techniques to produce high quality breakwater model armor units; analysis of wave runup overtopping, refraction, diffraction, transmission and/or reflection data on coastal structures and beaches and design of structures for Logistics-Over-The-Shore (LOTS) operations. (Contact: Dr. Don Resio, 601-634-2018)

M. Field and Laboratory Measurements, Data Collection, and Analysis (CHL-13)

Technologies, instrumentation, and monitoring systems in coastal and riverine settings for collecting, analyzing, and disseminating data related to measurements of coastal waves, surface currents, water levels, water quality, sediment, and wind, primarily in the field, but also in a sediment laboratory; advanced data analysis (spectral and nonspectral) techniques; remote sensing techniques; bedload and suspended sediment transport; monitoring and evaluating technical and structural stability of coastal projects; advanced hydrographic survey techniques, field measurement of coastal processes; bathymetric survey systems. (Contact: Dr. Brad Guay, 601-634-2189)

N. Experimental Coastal Model Equipment, Operation and Analysis (CHL-14)

Development of equipment and techniques for specialized model construction, experimental wave generation equipment, specialized data acquisition and analysis systems, advanced model operations techniques, and laboratory and scale effects in movable bed

model studies. (Contact: Jose Sanchez, 601-634-3895)

O. General Coastal Engineering, Coastal Geology, and Dredging Investigations (CHL-15)

Sand bypassing systems and equipment; beachfill design; coastal geology and geomorphology; functional design and evaluation of coastal works and coastal structures; littoral transport; coastal and offshore dredging studies; agitation dredging systems and equipment; physical monitoring of dredged material; physical processes in coastal wetlands; application of Geographic Information Systems; design of nearshore and offshore dredged material placement; evaluation of dredged material disposal sites; analysis of dredging operations management. (Contact: Dr. Jeff Waters, 601-634-2020)

P. Regional and Watershed Sediment Management (CHL-16)

Regional Sediment Management (RSM) research is intended to provide knowledge and tools that the Corps and the Nation need for effective water resource projects. RSM implies the holistic management of sediment within systems or regions to produce environmentally and economically sustainable projects. Goals include improved project design, operation, and maintenance methods, minimized disruption of natural sediment pathways and processes, and mediation of natural processes that have adverse environmental or economic impact. The approach of the Corps research is to produce targeted R&D serving multiple Corps business areas; to employ ongoing projects' experience (including Demonstration Projects) to provide data and lessons learned; to use enabling technologies of local-scale products and tools, including those generated by other R&D programs within and outside the Corps; to generate technologies that integrate the best available knowledge on sediment behavior and regional morphology into management decision support tools for a) regional and basin scale analyses and b) evaluation of the impacts of projects and management decisions on and by long-term, large-scale sedimentation processes. A key element in ERDC research is full coordination with other organizations with sediment management or monitoring expertise. (Contact: Dr. Jeff Waters, 601-634-2020)

GEOTECHNICAL AND STRUCTURES LABORATORY

I. Introduction

Research performed by the Geotechnical and Structures Laboratory's (GSL) nine branches consists of investigations in the areas of soil mechanics, engineering geology, geophysics and seismology, earthquake engineering, pavements (both expedient and permanent), mobility and trafficability of military vehicles, structural design and performance of structures under both static and dynamic loadings, earth dynamics, and the uses and performance of concrete, cement, and other construction materials. Research areas also include measurement and analysis of seismic and acoustic signals to locate airborne and ground military targets and buried objects (including unexploded ordnance) and to characterize earth media. Research on concrete and cement is predominantly related to current recognized needs, both civil and military. Military expediency focuses additional attention on ease and speed of concrete placement, development of very high-strength materials, and use of non-traditional, indigenous, and other special materials in concrete construction. Civil works research focuses primarily on the need to improve the performance of both new and old concrete structures. Structures research involves development, testing, and evaluation of a broad class of structures to resist the effects of static and dynamic loads induced by earthquakes and other sources. The Geotechnical and Structures Laboratory also conducts research involving all aspects for improving the survivability of fixed installations. Research in numerical modeling and computer simulation of many of these topics is also undertaken. The following paragraphs provide a synopsis of the GSL's research responsibilities and, more specifically, describe those areas in which pre-proposals will be considered.

II. Research Areas

A. Earthquake Engineering (GSL-1)

Research areas of interest include the dynamic behavior of soil and rock; liquefaction of soils, including coarse-grained and fine-grained soils; in-situ testing to evaluate properties related to dynamic behavior; in-situ testing to evaluate susceptibility to liquefaction; methods of analysis of dynamic behavior of earth materials; methods of analysis of dynamic soil-structure interaction; risk-based and probability-based methods of analysis; seismic wave propagation in earth materials; seismically induced settlements in soils and remedial treatment of soils potentially susceptible to earthquake-induced instability or strength loss; computer visualization and dynamic simulation; site response analysis; and strong motion instrumentation. (Contact: Dr. Joseph E. Koester, 601-634-2202)

B. Geophysics (GSL-2)

ERDC supports research in the development of land, air, or waterborne geophysical methods to be used for characterization of hazardous waste sites, cavity/tunnel detection, detection and monitoring of seepage, nondestructive investigation of archeological sites, location of groundwater, and detection of buried objects; analytical and data-processing techniques, borehole surveys, crosshole seismic imaging, electromagnetic detection of anomalies, seismic surveys, subbottom profiling, and acoustic impedance surveys; characterization of physical and mechanical properties of earth materials; and uses of microgravity. (Contact: Dr. Lillian D. Wakeley, 601-634-3215)

C. Mobility of Vehicles (GSL-3)

The Mobility Systems Branch addresses engineering research on the performance of vehicles operating cross country and on-road, and/or in negotiating dry and wet obstacles in worldwide terrains. This is a highly specialized technical area involving engineering mechanics, vehicle dynamics, mathematics, statistics, computer specialties, geology, and soil mechanics. Research in this area includes developing fundamental relations between soil and vehicle running gear; improving criteria concerning the effects of vehicle vibration on human response; developing algorithms describing weather effects on terrain, multi-vehicle movements along road nets, stochastic processes describing influence of uncertainties of data elements, and developing modeling and simulation capabilities for near real-time assessments of mobility and countermobility for battlefield operations and operations other than war. (Contact: Dr. William E. Willoughby, 601-634-2447)

D. Pavement Technology (GSL-4)

Research is conducted in support of the Corps mission, requiring the design and construction of roads and airfields worldwide and other engineering functions as they relate to pavements and expedient surfacing. This involves the formulation of engineering criteria for the design, construction, evaluation, maintenance, and rehabilitation of permanent and expedient airfields, pavements, railroads, and ports. Research areas of interest include improved design procedures, material characterization and evaluation, nondestructive testing, rapid repair of structures, expedient surfacing, aircraft and vehicular ground flotation, access/egress systems, gravel surfaced and non-surfaced areas, the use of geotextiles and geomembranes, grid-confining systems, stabilization, dust-control materials and techniques, and advanced binder systems. (Contact: Mr. Don R. Alexander, 601-634-2731)

E. Soil and Rock Mechanics (GSL-5)

Research is needed to: (a) improve methods for prediction and control of erosion of unlined spillway channels during uncontrolled releases; (b) develop innovative methods for flood protection and flood fighting, including field evaluations of promising technologies; (c) develop guidance for applications of trenchless technology on Corps structures, including measures to ensure safety and stability of Corps structures when trenchless technology is used to install pipelines, cables, or conduits through or beneath levees and other structures; (d) develop improved methods, including risk-based methods for analyzing earth and rockfill dams and other water control structures for both static- and earthquake-induced stresses; (e)

improve the state of knowledge of physical and engineering properties of soil, rock, and clay shales; earth-rock mixtures, granular filters, cohesive and noncohesive fine-grained soils susceptible to liquefaction; and soils susceptible to drastic volume changes (collapse, consolidation, swell); (f) develop rational analytical procedures and more reliable prediction of behavior of partially saturated soils; (g) determine the response of soils in situ to static and dynamic loading and unloading; (h) determine the susceptibility of earth dams to cracking, hydraulic fracturing, and internal erosion; (i) evaluate improved defensive design measures in use of materials, particularly in filter and transition zones and impervious barriers; (j) improve procedures for monitoring and analysis of the performance of new and existing structures, particularly the use and interpretation of observations and data from specialized instrumentation, and expedient systems for rapid inspection and evaluation of the integrity of dams; (k) improve the understanding of the aging processes in dams and the influence of aging (particularly deterioration of safety-related features) on long-term maintenance and/or rehabilitation requirements for dams; (l) develop a better understanding of failure mechanisms to improve design of defensive measures, to provide information for remedial repairs, to assess potential damages resulting from failure, and to provide a basis for emergency actions; (m) develop expedient remedial measures when hazardous conditions are identified and, thus, reduce the damages and catastrophic potential of dam failures; (n) develop methodology to evaluate forces exerted on structural elements by adjacent soil masses that result from long-term variation in soil properties; (o) develop improved methodology for design and construction procedures for shallow and deep foundations, including mats, footings, piers, and piles for buildings, hydraulic structures and waterfront structures; (p) large-scale physical and numerical modeling of deep underground structures (tunnels, shafts, chambers, and intersections); (q) predictions of rock mass dredgability; (r) acoustic emission (micro-seismic) applications in geotechnical engineering; (s) geotechnical aspects of hazardous and low-level radioactive waste disposal; (t) evaluation of rock for use as riprap; (u) grouting of soil and rock masses; (v) sliding stability of gravity structures, and (w) centrifuge modeling of structures founded on or in rock. (Contact: Dr. Joseph P. Koester, 601-634-2202)

F. Engineering Geology (GSL-6)

The GSL conducts a broad range of research in the field of engineering geology in support of federal or other Government technical missions. Specific areas of interest within this field include: application of remote sensing to geologic and geomorphic assessments; geo-archeological investigations; applied and numerical geomorphic analysis; computer applications in geotechnical engineering; 3-D visualization systems; uses of geographic information systems; geohydrology in military and civil applications; geologic mapping; geologic applications of mathematical techniques and geostatistics; groundwater monitoring, including well installation and design; geologic application of groundwater models; integration of geological and geophysical subsurface exploration techniques; land-loss studies; remedial measures at groundwater contamination sites; seismic hazard characterization and evaluation; subsurface exploration methods (drilling and sampling techniques); test site selection; conceptual and geologic and hydrogeologic models. (Contact: Dr. Lillian Wakeley, 601-634-3215)

G. Excavation, Structural Demolition, and Obstacle Creation (GSL-7)

Current criteria for improved demolitions call for significantly reduced manning levels and preparation times to accomplish assigned missions. Cost effectiveness, versatility, and safety are also of great importance. Current efforts involve technologies for the standoff creation and reduction of all types of battlefield obstacles, and the excavation of fighting positions. A prime consideration is the development of more efficient means for the application of various types of energetic materials to targets of interest. In addition, modern materials and design principles used in typical target structures must be incorporated into future plans and guidelines for demolitions. Typical missions of interest are road cratering, anti-tank ditching, bridge and tunnel demolition, and the breaching of walls, bunkers, levees, and dams. (Contact: Mr. Henry S. McDevitt, 601-634-2705, Mr. Steve Shore, 601-634-2246, and/or Ms. Pam Kinnebrew, 601-634-3366)

H. Ammunition Storage Safety (GSL-8)

The military services must store large amounts of munitions, both for war reserves and for training purposes. New conceptual designs for components or systems for storage are needed to reduce the likelihood of an accidental detonation of stored munitions, limit the propagation of airblast and fragments, or mitigate the safety hazards produced by an accidental detonation. In addition, test data and simulation techniques are needed to aid in the definition of the safety hazards from such detonations, and the mechanics of blast propagation among munition stores. Obsolete munitions are often disposed of by deliberate, controlled detonation. Research is needed on new methods for safe, efficient, and environmentally acceptable methods for deactivation of a wide variety of munition types. (Contact: Mr. Henry S. McDevitt, 601-634-2705, and/or Mr. Will McMahon, 601-634-2183)

I. Physical Simulation of Munition Phenomenology (GSL-9)

The mechanical effects induced by munition detonations are physically simulated using a variety of energy sources. Simulations are performed at full- and small (1/2 to 1/10) scale. The mechanical effects from conventional energetic materials are normally performed at small scale. These studies could benefit from improved (better fidelity, less expensive) simulators and simulation techniques. They could also enhance the development of test methodology for micro-scale (1/100 to 1/10) testing. Micro-scale test methodology includes the miniature high-fidelity energy sources, miniature sensors, advanced optical techniques, high-fidelity construction techniques for miniature structures, and theoretical developments in the scaling of material behavior. (Contact: Mr. Henry S. McDevitt, 601-634-2705, and/or Mr. Steve Shore, 601-634-2246)

J. Advanced Seismic and Acoustic Sensors, Measurements, Processing, Analysis, and Modeling (GSL-10)

Research addresses seismic and acoustic sensing, processing, analysis, and modeling of ground and air targets using advanced ground-based sensor systems. This effort focuses on passive technology. Processing methods include array processing and other methods of calculating source direction, noise suppression, advanced adaptive processing, and signal

classification and identification. Phenomena of interest include direct propagation within the same medium and propagation across boundaries, such as geologic layers and the air/soil interface. Modeling involves phenomenology models of signal propagation. The objectives include sensing, detecting, and locating airborne and ground military targets and buried objects. Also included are medium characterization and classifying and identifying sources based on their acoustic and seismic signatures. (Contact: Dr. Lillian D. Wakeley, 601-634-3215)

K. Laboratory Tests and Constitutive Model Development for Geologic Materials (GSL-11)

This research requires the formulation of mathematical constitutive models to simulate the mechanical behavior of geological and structural materials and incorporation of models into application-oriented prediction/analysis techniques. Also of interest are the development of dynamic test equipment and techniques and the experimental evaluation of geological and structural material response to high-pressure transient loadings. (Contact: Mr. Henry S. McDevitt, 601-634-2705)

L. Projectile Penetration (GSL-12)

Theoretical and experimental studies of projectile stresses and trajectories due to impact and penetration into geologic and man-made targets and development of design criteria for shield systems include development of equipment and diagnostic techniques to examine the response of targets to low- and high-velocity impact of penetrators, rods, etc. (Contact: Mr. Henry S. McDevitt, 601-634-2705)

M. Computational Structural Mechanics for DOD Applications (GSL-13)

The efficient use of scalable computers will require fundamentally new concepts in computational mechanics algorithms. Research includes mathematical formulations and development of scalable computational mechanics algorithms in the areas of structural response, penetration, contact impact, structure-medium interaction, and interdisciplinary flow-thermal-structural interactions. This research area also includes development of computational models for new materials and composite construction (consisting of concrete, composite, and/or geologic materials), as well as the behavior and control of structures composed of such composite construction for military applications. (Contact: Dr. James T. Baylot, 601-634-2137)

N. Concrete Materials (GSL-14)

Aggregates comprise as much as 80 percent of the volume of concrete. Characteristics and behavior of various types of aggregates, and chemical and physical interaction between aggregates and other concrete components, are critical to overall concrete performance. Research areas include: nature of and potential for reactions between aggregates and alkalis; significance of and techniques for regulating aggregate moisture content; importance of aggregate shape and size distributions; and contribution to concrete durability. Optimizing the

use of marginal natural aggregates, such as those with high clay contents of low structural integrity, also could be investigated, as could the use of man-made aggregates such as recycled concrete and lightweight aggregates. Use in concrete of by-products of other industrial processes, such as fly ash, silica fume, and ground granulated blast-furnace slag, is increasing with knowledge of the potential benefits to concrete properties. These uses contribute to solutions of industrial waste disposal problems while enhancing potential for development of new types of concrete with properties tailored to special uses. Knowledge of the mechanisms by which these materials interact with cement, aggregates, and other concrete ingredients is essential. Another area of particular research interest is the effects of these materials on concrete strength and durability as is the use of cementitious materials other than portland cement, including some fly ashes and slags.

Additional research leading to the establishment of optimum quantities of pozzolans and cement in concretes for general and special uses is needed. Specialized uses of concrete and increased demands on concrete performance have increased the importance of chemical admixtures such as water reducers, set retarders, set accelerators, air-entraining admixtures, and foaming and defoaming agents. The mechanisms by which many of these admixtures function are virtually unknown. Reinforcing in concrete is critical to concrete design and construction. Research areas include materials and methods of reinforcing, prevention of corrosion of reinforcing materials, and performance of reinforced concrete in severe environments (freezing and thawing, chloride penetration, and elevated temperatures). Polymer concretes are being used both for both restoration and new construction. Interaction among components of these composite materials, and the ranges of characteristics that could be achieved with different combinations of materials, are little known. Research areas include polymer-impregnated concrete, polymer or resin concrete, or polymer Portland-cement concrete. Research is needed on the means of formulating concretes to achieve specified performance, such as concretes with very high tensile or compressive strength, low shrinkage, rapid hardening, very low permeability, resistance to abrasion and erosion, shock-attenuating properties, ultra-low density, ability to float indefinitely, or thermal insulation properties. (Contact: Dr. Toy Poole 601-634-3261)

O. Concrete Properties and Analyses (GSL-15)

New technologies are continually being developed for nondestructive testing of various materials. Development of new methods could lead to applications in analysis of properties and performance of concrete. Links must be developed between the sophisticated testing methods and the needs of concrete technology. New dielectric, piezoelectric, or ceramic composites, for example, may be appropriately used in new concrete test methods, if these links are made.

Many of the research areas outlined in the previous paragraphs are related to methods of testing and analysis of concrete. Consideration of aggregate quality and moisture content and the use of admixtures apply to analytical considerations. In addition, investigations are needed for new methods and for modifications to existing methods and apparatuses for testing concrete materials and structures. This need derives partially from uses of new materials. Special-use concretes and technologies, such as placement of roller-compacted

concrete, also demand new testing technologies.

Thermal properties of concrete and the heat generated during curing of mass concrete are also related to many of the above considerations. Understanding heat generation and thermal and mechanical stresses will require computer-assisted modeling of concrete performance.

Other research requirements in testing and analysis include:

1. Determining critical materials and procedures for minimizing cracking in concrete and developing guidelines for predicting concrete performance. This includes developing criteria for predicting durability and longevity of concrete and grout.
2. Classifying chemical admixtures by chemical composition and mechanism of performance.
3. Developing methods of artificially accelerating curing of concrete and new means of simulating real-world conditions and long time periods.
4. Developing innovative systems to construct concrete structures more economically.
5. Developing theoretical, computational, and experimental methods for effectively characterizing stress, strain, progressive damage, and fracture of engineering materials subjected to static and dynamic loads. (Contact: Dr. Toy Poole 601-634-3261)

P. Maintenance, Repair, and Rehabilitation of Concrete (GSL-16)

Assessment of remaining life, maintenance and minor remedial measures, repair and rehabilitation, and surveillance and monitoring are topics of interest. Structures of interest include concrete locks and dams and appurtenant concrete and steel structures (outlet works, retaining walls, gates, piles, bulkheads, tunnels, intakes, etc.). (Contact: Dr. Toy Poole 601-634-3261)

Q. Other Areas of Concrete Research (GSL-17)

Materials that are not actually components of concrete are important in some concrete applications. Basic research is needed on the properties and performance of such materials as: curing compounds, coatings, and overlays; epoxy resins or other agents for improving bond between old and new concrete; waterstop materials for use in hydraulic structures, and methods of characterizing and testing such materials; grouts for injection underground in very fine fracture systems or porous media; and organic and inorganic composites that are used in construction. Grouts and concretes are being used at present for disposal of waste. This use is likely to increase, and research is needed on optimum proportions of cement-based materials for waste-

disposal technology. In addition, grouts and concretes will be important in disposal of both commercial and defense-related low-level and high-level radioactive wastes. Additional basic research is required on the behavior of cement-based materials in the probable geologic conditions of this disposal, and radioactive conditions. (Contact: Dr. Toy Poole 601-634-3261)

R. Bridge Research (GSL-18)

Research is needed on the response of bridges to unique military vehicles and military dynamic loads (blast and fragmentation); specifically the prediction of loads and the structural response.

This effort involves the following research:

- a. Development of techniques to simulate military dynamic loads on bridges.
- b. Analysis of structural loading and damage resulting from dynamic loads.
- c. Development and/or integration of models (empirical, analytical, numerical, etc.) and hardware to improve subject matter expert (SME) response time, provide highly accurate engineer analysis to deployed personnel, and improve the capability of personnel in the field to collect engineering data. (Contact: Mr. Terry R. Stanton., 601-634-3408)

S. Structures Research (Civil Works) (GSL-19)

1. Research is needed to develop design and analysis methods for eliminating or reducing structural vibration of steel gates subject to flow conditions that have the potential to induce structural vibrations.

2. Research is needed to develop validated nonlinear design and analysis tools for gravity and arch dams. The concrete may be placed with conventional techniques or with roller-compacting procedures. Also, research is needed in the area of ductility of lightly reinforced concrete members to evaluate existing intake towers during a maximum credible earthquake.

3. Research efforts are needed in the general area of structural reliability and risk analysis for assessing sensitivity of structural design and analysis procedures, vulnerability of structures, and assessment of critical design parameters to develop appropriate load-resistance factors.

4. Nonlinear and linear system identification research is needed for improving current vibration testing, data acquisition, data processing, and analysis techniques for determining linear and nonlinear dynamic and static response properties of structures

and structural systems subjected to earthquakes, blast effects from mining (or other) operations, other transient random, harmonic dynamic loads, and static or pseudostatic loads.

5. Research is needed to develop simplified and advanced computerized methods for soil-structure interaction (SSI) analysis. Potential investigations include Winkler and Pasternak methods, nonlinear finite-element method and boundary elements. The SSI techniques are to be applied to shallow and deep foundations, wall, and U-frame structures.

6. Research is needed for development of computer programs for design of hydraulic structures and related structures to support the Corps Civil Works mission. Such structures include miter gates, tainter gates, floodwalls, retaining walls, pile groups, sheet piles, cellular cofferdams, culverts, and conduits. (Contact: Dr. Stanley Woodson, 601-634-2479)

T. Structures Research (Military) (GSL-20)

1. Research is needed on the response of aboveground and shallow-buried structures subjected to military dynamic loads; specifically, the prediction of the load and response to failure of aboveground and shallow-buried structures. This effort will involve the following research:

a. Development of techniques to simulate military dynamic loads on aboveground and mounded structures.

b. Development of design procedures for components in semihardened and protected facilities.

c. Analysis of structural loading and damage resulting from internal or external detonations.

d. Development of fast-running models for PC based applications to predict the response of structures, both hardened and unhardened, to single and multiple explosive detonations. (Contact: Mr. Frank Dallriva, 601-634-2758 or Dr. Stanley Woodson, 601-634-2479)

2. Research on deeply based structures and hardened existing systems involving the following:

a. Development of comprehensive structural design for deeply buried and surface-buried structures subjected to airblast-induced and direct-induced ground shock from surface and shallow earth-penetrating high-energy sources.

b. Formulation of computer models for SSI and pre- and post-test

analysis of structural response to include correlation and comparison with experimental data. (Contact: Dr. James T. Baylot, 601-634-2137)

3. Research on surveillance and intrusion detection sensors involves the constraints of the environment on sensor systems used to detect intruders and placed along the perimeter of high-value military installations. Improved methods for rapid and accurate measurement of predetermined influential environmental parameters must be developed. Analytical techniques relating to specific sensing phenomenologies and target/nontarget-generated signatures and signature wave interactions to variations in environmental characteristics are required. Of particular interest is the integration of multiple sensor systems (both detection-type and environmental/background monitoring transducers) that use various sensing phenomena for enhanced target detection and classification and increase nuisance and background signature rejection. Research studies are required in the determination of automated techniques for monitoring sensor system response and sensitivity to provide optimum and consistent performance as a function of time varying changes of influential environmental characteristics. (Contact: Ms. Pam Kinnebrew, 601-634-3366)

4. The Corps of Engineers is involved with research on the design of military facilities for protection from high-energy sources. These efforts include the following research:

a. Prediction of the response of structural elements common to conventional or expedient construction to military loads.

b. Methods of retrofitting conventional buildings to harden them against nearby military high-energy sources.

c. Development of innovative design of structural components, such as windows and doors, subject to high-energy sources.

d. Development of analytical methods for predicting the effects of forced entry devices on structural components.

e. Development of innovative designs using low-density materials for expedient protection of troops and equipment from the effects of military high-energy sources.

f. Development of microprocessor-based software/hardware and supporting documentation to aid in the assessment of structural survivability to the effects of conventional and advanced weapons systems. The software will address the integration of databases, weapons effects calculations, and operational factors associated with engineer survivability missions.

g. Development of a procedure to ensure robust codes, user-friendly interfaces, and supporting documentation for use in the testing and development

of microprocessor-based survivability and structural assessment software/hardware. (Contact: Dr. Robert Hall, 601-634-2567)

U. Multispectral Camouflage Research (GSL-21)

This research area involves all aspects of fixed-facility camouflage, concealment, and deception (CCD). Fixed facilities include stationary and relocatable high-value targets. The general goal is to directly and indirectly increase the survivability of U.S. and Allied facilities and improve the U.S. and allied counter-CCD capability against adversaries. Multispectral refers to those areas of the electromagnetic spectrum used by the United States and potential adversaries in reconnaissance and surveillance and in attack platform target acquisition and detection. Major objectives include: quantifying or otherwise evaluating CCD technology effectiveness; investigating materials and techniques for signature modification; developing decoy concepts, procedures, and applications; developing computer-based analytical procedures for simulating scenes; developing instrumentation for and conducting target/background signature measurements; assessing the United States and threat operations and sensor capabilities with both currently fielded and new design reconnaissance and surveillance and attack platform sensors and systems; developing applications for intelligence information for military missions; providing guidance to field commanders and information for the RDT&E community; and studies of the interaction of camouflage technology with other operational factors, particularly in determining operational supportability, costs and manpower, interoperability, and joint interoperability requirements. (Contact: Ms. Pam Kinnebrew, 601-634-3366)

V. TeleEngineering Operations (GSL-22)

TeleEngineering operations is an engineering analysis reach back (i.e., telepresence) capability to support personnel in the execution of their mission across the full operational spectrum. Research in this area includes the development and/or integration of models (empirical, analytical, numerical, etc.) and hardware to improve subject matter expert (SME) response time, provide highly accurate engineer analysis to deployed personnel, and improve the capability of personnel in the field to collect engineering data. (Contact: Ms. Rhonda D. Taylor, 601-634-2795)

W. Countermine Phenomenology (GSL-23)

This research addresses methods and procedures to develop and demonstrate advanced technologies that support the Army's requirements for improved detection of mines and minefields. Additional research work is needed in the areas of geo-environmental modeling; exploiting phenomenological processes to reduce false alarm rates; and predicting sensor performance based on sensing, data analysis, display, and platform navigation/positioning. Special areas of interest include novel sensing concepts for the detection of buried objects (metallic and nonmetallic) using a combination of magnetic, electromagnetic induction, ground penetrating radar, seismic/acoustic, chemical, and/or nuclear methods. Fundamental measurements and models that define/predict the

performance of these sensing methods in various soils/mine target conditions are also of interest. (Contact: Dr. Larry N. Lynch, 601-634-2230)

ENVIRONMENTAL LABORATORY

Environmental Sensing

I. Introduction

Current research is in the acquisition of information by remote sensor systems, the impact of the environment on imaging and other sensor systems, and advanced signal processing. Sensors using electromagnetic, seismic, and acoustic energy forms are of interest. In addition, work is conducted to determine terrain and other environmental effects on high-technology sensor systems. Sensor systems include optical and infrared millimeter wave (active and passive). Briefly described below are specific research areas.

II. Research Area

Sensing (EL-1)

The EL has an ongoing program to develop and demonstrate advanced technologies that support the Army's requirements for improved detection and discrimination of unexploded ordnance (UXO). Additional research work is needed in the Areas of UXO sensing, data analysis, display, and platform navigation/positioning. Special areas of interest include novel sensing concepts for the detection of buried objects (metallic and nonmetallic) using a combination of magnetic, electromagnetic induction, ground penetrating radar, seismic/acoustic, chemical, and/or nuclear methods. Fundamental measurements and models that define/predict the performance of these sensing methods in various soils/UXO target conditions are also of interest. Research is also needed to develop advanced data analysis techniques that can significantly reduce the number of false alarms arising from natural and man-made sources. (Contact: Dr. John Ballard, 601-634-2246)

Hazardous Waste Site Characterization and Treatment

I. Introduction

An extensive research and development program is being conducted by the Department of Defense to assist in the cleanup of contamination at military installations. The EL is developing technologies for characterizing, monitoring, and applying physical, chemical and biological treatment of toxic and hazardous waste in contaminated surface and ground waters and soils. The EL is also developing, evaluating, and verifying numerical models and guidance for solid waste disposal systems.

II. Research Areas

A. Innovative Technologies for Rapid Characterization and Monitoring of Hazardous Waste Sites (EL-2)

The EL, in coordination with the U.S. Army Environmental Center and other Tri-Service agencies, has developed the Site Characterization and Analysis Penetrometer System (SCAPS). The SCAPS is specially designed to conduct rapid site characterization/screening of installations for possible contamination. The SCAPS R&D Program is currently developing sensors for use with the cone penetrometer to detect contaminants such as petroleum, oil and lubricant products (i.e., aviation fuels, diesel, gasoline), explosives compounds, volatile organic carbons (VOCs), heavy metals, and radio nuclides. Additional areas of R&D include: advanced computational techniques for 3-D visualization of subsurface contamination; rapid data acquisition, analysis and interpretation; technologies to quantify levels of contamination; enhanced sampler technology development; contaminant monitor development for biological and chemical treatment assessment; and automated techniques for monitoring/assessing operational performance of remedial site cleanup operations. (Contact: Mr. John H. Ballard, 601-634-2446)

B. Innovative Technologies for Treating Hazardous Waste and Contaminated Surface and Ground Waters (EL-3)

Presently, EL is continuing to conduct research, develop technologies and apply strategies to treat complex organic- and metal-contaminated hazardous liquids, off-gases, soils sludges, sediments, and residuals from past disposal practices. Research is divided into two major categories: technologies for treating contaminated soils and sediments, and innovative technologies for treating contaminated surface and ground waters. Areas of R&D include: (1) physical and chemical technologies to minimize or reduce the quantity and toxicity of hazardous waste, (2) biological processes and methods to detoxify/destroy hazardous waste constituents, (3) techniques for in situ treatment of groundwater aquifers, (4) laboratory design criteria for and field implementation of piloting equipment for promising technologies, (5) computer-based techniques to assess operational performance of various treatment processes/systems and (6) improved analytical chemistry techniques and methodology to assess treatment technologies. (Contacts: Dr. Steve Larson, 601-634-3431 (metals); Mr. Chris McGrath or Dr. Jeff Davis (physical-chemical organics), 601-634-3798 or 601-634-4846, respectively; Dr. Jeff Davis (bioremediation), 601-634-4846; Dr. Doug Taggart, (analytical chemistry methods), 402-444-4300; Dr. Robert P. Jones (environmental risk assessment), 601-634-4098)

C. Design, Evaluation, Verification and Modeling of Solid and Hazardous Wastes and Contaminated Sediments (EL-4)

Presently, efforts are continuing to develop water balance and leachate models for solid waste disposal systems and dredged material disposal facilities. Additional work is needed to model innovative designs, nonsoil surface materials, cobbled surfaces, preferential flow through heterogeneous waste materials and other layers, and effects of complex mixtures of vegetation including trees. Similarly, additional work is needed to verify the existing

models. (Contact: Dr. Paul R. Schroeder, 601-634-3709)

Sediment Geochemistry and Biological Effects

I. Introduction

Potential adverse environmental impacts of disposal of contaminated sediments must be assessed prior to permitting operations. This includes the determination of the impacts that contaminated dredged materials exert on the environment prior to dredging.

II. Research Areas

A. Environmental Risk Assessment (EL-5)

Current research on the fate and effects of environmental contaminants occurs under the general paradigm of Environmental Risk Assessment. Specific studies fall into one or more of the following areas:

1. Hazard Identification. This is the process of showing causality (i.e., a chemical or complex mixture can cause some adverse effect). If this causality can be demonstrated, the chemical is referred to as a "hazard." If there is no causal link, risk need not be quantified. Important target receptors are also identified by this stage (for example, humans, endangered species, ecologically or economically important species). Research is conducted to develop the technology for hazard identification and the establishment of causality. (Contact: Dr. Todd Bridges, 601-634-3626)

2. Effects Assessment. While Hazard Identification decides if a chemical or complex mixture is toxic, Effects Assessment establishes the relationship of the toxicant dose and associated biological response. This is accomplished via experimental research in which surrogate species are exposed to gradients (spatial, concentration, etc.) of the hazard in question, and biological effects are monitored. Biologically important endpoints measured include survival, growth, reproduction and population-level parameters. These endpoints must be accompanied by technically sound interpretive guidance. Results are expressed in dose-response or exposure-response relationships. Research is conducted to develop the necessary experimental/statistical designs, technically sound tests (for example, chronic sublethal sediment bioassays) and appropriate extrapolations (for example, high dose to low environmentally realistic exposures, surrogate test species to receptor of interest). Analysis of the uncertainty associated with these effects assessments is also conducted. (Contact: Dr. Todd Bridges, 601-634-3626)

3. Exposure Assessment. In Exposure Assessment, the magnitude, frequency and duration of contaminant exposure relative to the target receptor(s) are determined. This research is model-intensive, with both descriptive and quantitative models being used to evaluate pathways and routes. A pathway exists if the hazard travels between the initial

source of contamination and the ultimate biological receptor. An exposure route is pathway that the chemical contacts the receptor (for example, ingestion, inhalation, dermal absorption, bioaccumulation, trophic transfer). Analysis of the uncertainty associated with these exposure assessments is also conducted. (Contact: Dr. Jeffrey Stevens, 601-634-4199)

4. Risk Characterization, Management, Communication, and Analysis. Outputs from the Effects Assessment and Exposure Assessments are joined in Risk Characterization to yield an estimate of risk. Research is conducted to determine the best ways to characterize risk both numerically and descriptively. Also, uncertainty analysis is undertaken to identify the qualitative and quantitative important sources of uncertainty. Techniques employed include error propagation, probability distributions, sensitivity analysis, Monte Carlo simulation and others.

Once environmental risk has been quantified, management action may be required. Research is conducted to develop management alternatives, which range from no action to extensive (and expensive) remediation. Results of the Environmental Risk Assessment are weighed and balanced with other factors such as applicable laws and regulations, engineering feasibility, potential benefits, costs, economic impacts, and the socio-political decision environment. Risk Communication is a dialogue that occurs at two levels: between the risk assessor and the risk manager, and between the risk manager and the public. Research is conducted to identify optimal procedures for communicating environmental risks, including an appreciation for the limits and uncertainties of the numerical results. Risk Analysis is a broad, inclusive term encompassing the processes of Risk Assessment, Risk Management, and Risk Communication as well as any field verification or monitoring activities. Field verification is a study or studies carried out to determine the accuracy of laboratory observations and predictions. Field monitoring (in the context of Risk Assessment) is undertaken to ensure that steps taken to manage the chemical risks were successful. Field research studies are carried out for both verification and monitoring purposes. (Contact: Dr. Robert Jones, 601-634-4098)

5. Technology Transfer. Develop and analyze technology transfer concepts; analyze target audiences for technical information; test innovative methods of transferring dredging research results and technology to supplement conventional technology transfer. Included may be such items as interactive CD-ROM and PC technology applied to training and general information transfer; technology applications of electronic media using the Internet; and innovative public information systems/products. The Dredging Operations and Environmental Research (DOER) program audiences include Corps of Engineers and the Department of Defense; Congress and other Federal, State, and local agencies; port and transportation authorities; universities; environmentalists and other public interest groups; and the general public. (Ms. Janean Shirley, 601-634-3616)

B. Sediment Water Interactions (EL-6)

Current research encompasses a wide range of investigations designed to increase understanding of sediment-water interactions. Emphasis is on conduct of investigations for determining the impacts that sediment/soil properties have on sorption and transformation of explosives and release of semi-volatile contaminants to the atmosphere. Factors responsible

for sorption and transformation of explosives include redox potential, pH, and the geochemical characteristics of the soil or sediment. Factors affecting the release of semivolatile contaminants from soil or sediment to the atmosphere include relative humidity, wind speed, contaminant concentration, moisture content, porosity, and organic carbon content. Research is also conducted on colloidal system contaminant transport, accelerated sediment oxidation, and the role of solution chemistry in contaminant partitioning between sediment and water. (Contact: Dr. Mark Chappell, 601-634-2802)

Biodegradation of Contaminants. Studies in the biodegradation area emphasize destruction of organic contaminants for remediation purposes. Emphasis is on (1) delineating biodegradative pathways; (2) determining intermediate and final products and by-products; (3) assessing the role of environmental factors in regulating the pathways utilized and the rate and extent of destruction of the parent compound; (4) determining the survival and activity of microorganisms added to soils, sediments, and biotreatment systems; and (5) enhancing biodegradation to obtain the maximum destruction of organic contaminants within a soil, sediment, or treatment system. (Contact: Dr. Karl Indest, 601-634-2366)

C. Techniques for Contaminated Dredged Material Disposal and Treatment (EL-7)

Specific areas of required or anticipated research include the following:

1. Application of innovative techniques, equipment, and control measures for dredging, transport, and placement of contaminated sediments. (Contact: Mr.-Mike Channell, 601-634-2386.)

2. Development of cost-efficient technologies for control-treatment of contaminated dredged material, including assessment of physical/chemical processing technologies for application to contaminated dredged material slurries, supernatant, and leachate; techniques for evaluating the processing technologies; methods for site evaluation; and techniques for evaluating cost-effectiveness. (Contact: Mr. Mike Channell, 601-634-2386.)

3. Development or enhancement of computer models to be included in the ADDAMS to evaluate the environmental impacts of dredged material disposal. Evaluations include water quality impacts of initial release in open water, effluent discharge, runoff and leachate, benthic impacts, plant and animal uptake, and volatilization. (Contact: Dr. Paul R. Schroeder, 601-634-3709)

4. Development and/or application of new or improved environmental chemistry methodologies to assess contaminant concentrations of dredged material focusing on cost-effectiveness, quality assurance, and lower detection limits. (Contact: Bobby Jones, 601-634-3721)

5. Demonstration of bioremediation technology to recalcitrant organic compounds in confined disposal facilities for dredged material, including evaluation of amendments needed to successfully utilize composting, land treatment, and land farming

technologies, assessment of cost versus performance, and development of techniques for enhancing intrinsic bioremediation. (Contact: Dr. Trudy Estes, 601-634-2125)

Water Quality Modeling

I. Introduction

The Corps of Engineers is involved in research and development related to water quality and contaminant fate/transport modeling for surface water, watersheds, and the subsurface, or groundwater. The research encompasses a wide range of environmental issues, such as water quality and ecosystem linkages, contaminant transport and fate, eutrophication, effects of land use/management on watershed runoff quality, total maximum daily loads (TMDLs), and ecological and human health risk assessment as related to contaminants in the environment. Research may include model development and field and laboratory investigations to improve model descriptions and to provide required data for model validation.

II. Research Area

Numerical Water Quality and Contaminant Modeling (EL-8)

This area of work is oriented toward development and application of water quality and contaminant fate/transport models for surface water and the subsurface, or groundwater. Surface water modeling includes watersheds and receiving waters, e.g., riverine, reservoir, wetland, estuarine, and coastal water bodies. Groundwater modeling includes modeling both the unsaturated and saturated zones, as well as multi-component flow and transport. Models are utilized for conventional water quality (e.g., nitrogen, phosphorus, carbon, dissolved oxygen, etc.) and contaminants, i.e., toxic substances, such as organic chemicals, trace metals, radionuclides, explosives, and other military unique compounds. Emphasis includes the following: formulation of appropriated physical, chemical, and biological algorithms; improvement of mathematical and numerical methods; collection and assemblage of data for model evaluation; conduct of field and laboratory process investigations designed to develop/improve model descriptions, dynamic linkage of water quality and biological models, including biomass-based, individual-based, and population-based biological models; integration of contaminant exposure models with biological effects data or models to quantify risk; incorporation of uncertainty analysis into modeling; linkage of physical/chemical models with biological population models; linkage of cross-domain models for system wide modeling; development of routines/linkages to include the effects on water quality of watershed landscape features (e.g., buffer zones) and vegetation management; development of a risk assessment modeling system; and development of software to provide graphical user interfaces and modeling environments to enhance model utility and ease of application. (Contact: Dr. Barry Bunch, 601-634-3617)

CONSERVATION

Environmental Impact Prediction, Assessment and Management

I. Introduction

This research program addresses environmental impact prediction, assessment, and remediation and is intended to provide Corps, Army, and other field operating elements with techniques and methodologies for environmental assessments and EIS preparation, guidance on selecting appropriate planning, design, construction, and operation alternatives, and implementation of the planning function pursuant to NEPA and other legislation and guidance. Specific objectives include:

A. Developing, verifying, and demonstrating practical prediction and assessment techniques including applying and refining habitat-based evaluation methods, evaluating mitigation measures, developing streamlined frameworks for environmental monitoring, applying ecosystem simulation principles to environmental analysis, and estimating future habitat quality.

B. Documenting and quantifying environmental effects associated with various types of Corps, Army, and other activities. Research has included the effects of aquatic habitat modification on anadromous fishes, the effects of selective clearing and snagging on in stream habitat, and the benefits of channel modification for aquatic habitat in reservoir tailwaters and local flood control channels.

C. Developing and demonstrating design, construction, and management alternatives that will minimize adverse effects and protect natural and cultural resources. Research has included techniques for managing wildlife habitats, preserving archeological sites, and stabilizing eroding shorelines.

II. Research Areas

A. Biotechnical Shore Stabilization (EL-11)

Biotechnical (sometimes called bioengineering) shore stabilization is the use of a combination of live vegetation and structural materials (for example, breakwaters, geotextiles, erosion control fabrics/mats, building materials) for erosion control of shores. Shores of particular interest are those of streams, lakes, or dredged material deposits and subject to erosion from waves, surface runoff, and wind. Research is needed to determine the causes and amounts of erosion and to identify and assess cost-effective biotechnical erosion control methods. Studies may include, but are not limited to, identifying, developing, and cultivating appropriate flood-tolerant plants and varieties or cultivars and cost-effective installation procedures of biotechnical techniques. (Contact: Dr. David L. Price, 601-634-4874).

B. Freshwater Fishery Investigations (EL-12)

Primary areas of research are predicting environmental impacts of navigation and flood control projects on fishes and other aquatic fauna, restoration of aquatic habitats, conservation of endangered fish species, evaluating wetland fish communities, and fishery management in vegetated waterbodies. New and innovative approaches to determine physiological, behavioral, population, and community level responses of fishes to dynamic habitat variables are of interest, along with technological advancements in sampling capability. Demographic and landscape models are anticipated products of this research. (Contact: Dr. Jack Killgore, 601-634-3397)

C. Freshwater Macro invertebrate Investigations (EL-13)

This research addresses the development and application of methods for assessing the environmental effects of Corps of Engineers activities by analysis of macro invertebrate populations and communities. Studies involve laboratory evaluation of behavior and physical condition, or field studies that involve secondary production or the determination of selected biotic indices (such as species richness, diversity, evenness, relative species abundance, etc.) of naturally occurring mollusk, chironomid, or oligochaete communities. (Contact: Dr. Timothy Lewis, 601-634-2141)

D. Mitigation (EL-14)

An avoidance, minimization, and/or compensation process is required for impacts from water resources projects on ecological resources (fish, wildlife, habitat, or installation activities). Planning and implementing mitigation is a complex process, and new ideas that contribute to success of mitigation are invited. Subjects such as Best Management Practices for avoiding or minimizing impacts, planning for mitigation based on impact analysis, incremental analysis to justify mitigation, mitigation banking, future predictions, and mitigation for indirect or cumulative impacts are included. (Contact: Ms. Kelly Burks-Copes, 601-634-2290)

E. In stream Flow Requirements for Aquatic Biota (EL-15)

Research focuses on development and application of fish habitat assessment methods. Currently, the most widely used system, the Physical Habitat Simulation System (PHABSIM), is used to assess the effects of reservoir operations on downstream fish habitat. Research is needed to better quantify the relationships for fish preference and flow conditions, as well as habitat requirements for aquatic invertebrates. Verification studies of these models will be required as development continues. -Assessment methods must be able to evaluate the impacts of a variety of reservoir operations such as base load or peaking hydropower releases and at multiple scales from single project to basin – wide studies. (Contact: Dr. John Nestler, 601-634-3870)

F. Behavioral and Structural Fish Barriers (EL-16)

Entrainment of fish at Corps hydropower projects may result in passage of fish through turbines with attendant death or injury from impact with runner blades, pressure

changes, or shear forces. Evaluations of a number of behaviorally based technologies and structural barrier designs conducted under laboratory and field conditions have yielded results that are generally inconsistent. Consequently, there currently exist no consistent guidelines for selection of appropriate technology for site-specific applications at Corps dams. Research is required to relate effectiveness of different technologies to size and species of fish, dam design, operations, season, and other site-specific conditions. The information produced by this research will be used to develop specifications and guidelines for fish protection technologies at Corps dams to reduce entrainment and mortality. This effort may involve literature synthesis, laboratory research, design and fabrication of prototype systems, or field studies. (Contact: Dr. John Nestler, 601-634-3870)

G. Fish Guidance and Bypass Systems (EL-17)

CE water resource activities may result in blockage of historical fish migration routes through waterways. These blockages, with associated fragmentation of habitats, may have severe impacts on anadromous and catadromous fish populations. A variety of bypass system technologies are available to guide fish around dams. However, many of these systems operate at reduced efficiencies because they damage fish, fish are unable to locate entrances to the systems, or because fish become disoriented and "fall back" after an initial successful passage. Research is required to better understand the hydraulic and behavioral characteristics of fish bypass systems, including the use of behavioral technologies to guide fishes towards these systems and to successfully orient them within the system. (Contact: Dr. John M. Nestler, 601-634-3870)

H. Coastal Ecology (EL-18)

Research topics in coastal ecology include multidisciplinary investigations of the environmental impacts of engineering activities in the coastal zone, such as dredging, dredged material disposal, and construction of coastal structures (e.g., jetties, breakwaters, groins, seawalls, marinas). Emphasis is placed on improved technologies for assessment, protection, and management of fish and shellfish resources and their habitats. Of particular relevance are proposals dealing with endangered species (e.g., sea turtles, marine mammals), beneficial uses of dredged material and habitat restoration in the coastal zone (e.g., marsh, oyster reef or mudflat creation), and application of population dynamics and ecological models for impact prediction and assessment at population/community/ecosystem/watershed levels. Other areas of interest include effects of beach nourishment and use of offshore borrows areas, seasonal restrictions on dredging and disposal operations, artificial reef technologies, and cumulative impact determination and mitigation techniques. (Contact: Dr. Douglas Clarke, 601-634-3770)

I. Techniques for Designing, Operating and Managing Dredged Material Disposal Facilities and Beneficial Use Projects (EL-19)

A. Refinement and verification of techniques for designing, operating, and managing dredged material disposal areas.

B. Development of a computerized economic database for costs associated with dredging sediments; disposing of dredged material; and constructing, rehabilitating, and operating and managing dredged material disposal areas.

C. Development and refinement of computer models for dredged material management and beneficial use to be included in the ADDAMS. (Contact: Dr. Paul R. Schroeder, 601-634-3709)

Environmental Criteria for Stream Channel Alteration Projects

I. Introduction

The Corps of Engineers is involved in the alteration of stream channels for flood control, navigation, channel stabilization, and stream relocation. Modifications to channels include removal of snags and vegetation, channel alignment (straightening), channel enlargement, construction of levees, stream bank protection, and grade control. The Corps is also involved in regulating and furnishing technical assistance to States in regard to other types of channel alterations such as gravel mining. Work at the EL and elsewhere has generated environmental design criteria for stream channel alterations to improve the net effect of these projects. Examples of environmental design features include low-flow channels, combinations of structure and vegetation, management of cutoff bendways and other backwater areas, and recreational trails.

II. Research Areas

A. Riparian and Instream Habitat Restoration (EL-20)

Current research includes formulating guidelines for stream restoration and environmental enhancement of flood control projects. Among the general issues addressed are, instream and riparian habitat assessment; benefits of habitat improvement, structures and techniques; impacts of vegetation on flow conveyance, channel stability, and sediment transport; construction practices; and monitoring and maintenance. Proposals are invited in these general areas and related efforts. In addition, specific needs include the following: (1) Techniques to quantify habitat and other environmental benefits of restoration efforts, (2) Algorithms that account for momentum losses at vegetated floodplain/channel interfaces, (3) Data supporting evaluations of the hydraulic impacts of instream structures, (4) Case studies of monitoring and maintenance plans, and (5) Development and refinement of related computerized databases and models. (Contact: Dr. J. Craig Fischenich, 601-634-3449)

B. Assessing Benefits of Channel Modifications (EL-21)

Dams and local flood control structures may degrade aquatic habitat conditions in tailwaters and streams. In some cases, habitat degradation can be eliminated, stabilized or reversed through channel modification for aquatic habitat (i.e., construction of low-cost, low-head weirs to create pools) with minimal changes in dam operation or flood channel design.

However, there are no widely accepted methods available to incrementally relate instream aquatic habitat value, channel modifications, and instream flows to allow trade-off analysis between cost, design, and habitat benefits. It is desirable to modify existing instream flow methods or develop new methods that will allow incremental assessment of habitat values, alternative flows, and different channel designs. This work may involve data collection, analysis, interpretation, and software development. (Contact: Dr. John Nestler, 601-634-3870)

Natural Resource Management

I. Introduction

As a part of its mission responsibilities, the Corps of Engineers must maintain and manage millions of acres of land, much of it surrounding over 700 water resource development projects throughout the United States. This includes fish and wildlife habitat sites, specific communities such as riparian zones and wetlands, and recreation sites. Technology needed for managing and enhancing these facilities includes research areas that involve endangered species, waterfowl, riparian zone management, range and turfgrass management, insect pest management, and the general stewardship of these natural resources. Developed technology is provided to Corps Civil Works projects as well as military installations and other cooperating Federal agencies.

II. Research Areas

A. Natural Resources Stewardship (EL-22)

1. Integrated Natural Resources Management. Research includes biological diversity, holistic ecology, and the stewardship and management of habitat-related natural resources at Corps water resource projects and military installations. Emphasis is on integrated natural resources management, which includes the analysis of human-related activities on biological resources and the effects of biological resources on other resources. Current research includes integrated ecosystem management, analysis of impacts to natural landscapes and their components, habitat delineation and analysis, and program development for natural resources management. Related components to complete stewardship include management of information and databases. The work involves literature synthesis, field studies, data analysis, and report preparation. (Contact: Dr. David L. Price, 601-634-4874)

2. Riparian Zone Management. Research addresses riparian habitat assessment, restoration, and management for natural resources stewardship on Civil Works lands and Department of Defense military installations. Emphasis is on the development of methods and technical guidelines appropriate for managing riparian zones and associated habitats on multiple-use lands. This also includes research on transition areas between riparian areas and other systems. Research includes literature searches, field investigations, restoration projects, data analysis, and development of reports and management action plans. Priorities will depend on regional needs, as determined by study sponsors (that is, Corps districts/sponsors and military installations). (Contact: Dr. Richard Fischer, 502-315-6707)

3. Tools for Natural Resources at Multiple Scales. Management of resources in today's climate requires an awareness of scale and context of those resources. Issues ranging from genetic diversity to watershed or landscape planning are relevant to management decisions. Planners, regulators, and land managers must be able to use existing tools (decision-support systems, models, databases, procedures, etc.) and to adapt new tools to their needs. Although the general processes of resource inventory, impact assessment, and management or mitigation will remain applicable, those activities may be conducted in a different context or at more scales than before. Work under this announcement would supply tools for natural resources management in an ecosystem or holistic context. (Contact: Ms. Antisa Webb, 601-634-4259)

B. Wildlife Resource Management (EL-23)

The EL is developing user information for Department of Defense (DoD) personnel involved in the administration, planning, and operation of wildlife management programs and activities. The emphasis is to provide technology transfer on biologically sound, technically reliable, and cost-effective wildlife-related management strategies appropriate for Civil Works projects and DoD installations. The major product is the "U.S. Army Corps of Engineers Wildlife Resources Management Manual." Reports for the manual are arranged in nine chapters. Reports are currently needed on wildlife species, management techniques, and plant materials. Reports are primarily extensive literature reviews on a particular subject, which results in the presentation of appropriate information in a comprehensive and readable style. The basic format is established in the reports completed to date. Proposals should identify a specific section (or sections) to be prepared and should include an outline and description of topics to be developed for the report. Other tasks in this work area include habitat assessments, population surveys, and development of management plans. (Contact: Dr. Richard Fischer, 502-315-6707)

C. Endangered Species (EL-24)

This effort involves studies of endangered and threatened species on DoD and other Federal agency lands. Tasks would include site-specific surveys, habitat analysis, and development of management plans for species of concern. Individual studies would involve literature searches and synthesis of information, field investigations, data analysis, coordination with Federal and state agencies and conservation organizations, and preparation of endangered species survey reports and management guidelines. Management recommendations will be specific to the region of study. Species of concern will vary, depending on requests from Civil Works projects and military installations. (Contact: Dr. Richard Fischer, 502-315-6707)

D. Waterfowl Resources (EL-25)

Investigations include studies on waterfowl biology and habitat management on Civil Works projects and Department of Defense military installations. Emphasis is on waterfowl habitat assessment, population surveys, and development of stewardship and management plans for various waterfowl habitat management programs. Current studies involve developing

management plans for various habitat management practices such as moist-soil systems, greentree subimpoundments, and created ponds. The effort would include literature reviews, field investigations, data analysis, development of techniques and management guidelines, and preparation of technical reports. (Contact: Dr. Richard Fischer, 502-315-6707)

E. Wetlands (EL-26)

Wetlands research, especially as it pertains to wetlands restoration and development, has been occurring as an ongoing activity of the Corps of Engineers for the past two decades, primarily as a secondary or minor objective of navigation or flood control objectives. The EL has been at the forefront in developing the technology that allowed this important wetlands work to take place, has developed a number of these wetlands, and has developed long-term monitoring methodologies to document the progress and ecological succession of these wetlands. In addition, methodologies for delineating and evaluating wetlands on a national basis that have become the mandatory wetlands regulatory framework for Federal agencies have been developed. This research is expected to continue as part of a series of wetlands task areas. Research task areas outlined below will be conducted both in-house at EL, with other agencies, or will be contracted. Studies must be short term due to funding and time constraints, and must address one or more of the research tasks. (Contact: Mr. Glenn Rhett, 601-634-3717)

1. Critical Processes of Wetlands. To examine the basic physical, chemical, and biological processes that cause wetlands to provide important functions, and to relate those processes and functions to other aspects of wetlands work in the Corps of Engineers. (Contact: Dr. Morris Mauney, 601-634-4258)

2. Wetlands Delineation and Evaluation. Objectives of this task are to examine technical assumptions in the 1987 "Corps of Engineers Wetland Delineation Manual" and to develop techniques to assess wetland functions. The first objective will be accomplished through a combination of field and laboratory studies to examine hydrology/vegetation/soil relationships, morphological development of hydric soils, and physiological response of vegetation to soil saturation in relation to the growing season. The second objective will also be accomplished through field and laboratory studies. Efforts will focus on model development employing the Hydrogeomorphic Approach to Assessment of Wetland Functions (HGM) and implementation of basic research to test assumption in the HGM models. Both national and regional models will be developed using regional experts and published literature. HGM models will be field tested and assumptions examined using field studies to ascertain physical, chemical, and biotic wetland characteristics associated with different wetland functions and wetland types. (Contact: Dr. Morris Mauney, 601-634-4258)

3. Wetlands Restoration, Protection and Creation. To study existing wetlands restoration, protection and creation sites built from dredged material for compensatory mitigation, and for other non-regulatory purposes such as shoreline stabilization and erosion control. To test wetlands techniques and further refine those techniques to be applicable for the broad range of wetlands projects encompassed within Corps of Engineers activities, including addressing erosion and subsidence on a large scale. To test guidelines for wetlands restoration, protection and creation that can be used for mitigation, O&M, general construc-

tion, and other Corps of Engineers projects, and that will also find use by permit applicants as they mitigate for lost wetlands. To test and verify the Corps wetlands engineering handbook. (Contact: Dr. Morris Mauney, 601-634-4258)

Nonindigenous Aquatic Nuisance Species Management

I. Introduction

In a 1993 report, the U.S. Congress, Office of Technology Assessment estimated that non-indigenous pest species have resulted in U.S. losses of millions to perhaps billions of dollars annually.

They reported documented losses of \$97 billion between 1906-1991. When environmental conditions are favorable, non-indigenous species, such as hydrilla (*Hydrilla verticillata*) and the zebra mussel (*Dreissena polymorpha*), become established and disrupt the aquatic environment and economy of infested areas.

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (Public Law 101-646) and the River Harbor Act of 1958; (Public Law 85-500) as amended, direct the Corps of Engineers to develop environmentally sound control methods to prevent, monitor, and control introductions of non-indigenous aquatic nuisance species.

II. Research Areas

A. Aquatic Plant Control (EL-27)

Aquatic plant research for the management of non-indigenous aquatic plant species in navigable waters, tributary streams, connecting channels, and other allied waters is a continuing activity of the Corps of Engineers. The research thrust is to reduce non-indigenous plant populations to non-problem levels, enhancing and/or replacing these non-indigenous species with indigenous species as more beneficial and productive aquatic habitat. Currently, research is focused on developing effective economical and environmentally compatible technologies for managing two emerging problem aquatic plants, hydrilla and Eurasian watermilfoil. Areas of technology development include advanced management strategies and applications, techniques for establishing desirable aquatic vegetation, and computer-based systems for aquatic plant management planning. (Contact: Dr. Timothy Lewis, 601-634-2141)

1. Aquatic Plant Ecology. Current ecological research on both nonindigenous nuisance-forming plants and desirable native aquatic plant species is needed; including plant propagule ecology, modes of spread, methods of propagation and restoration (particularly desirable native species). In addition, research evaluating the effectiveness of aquatic plant management techniques and their impact on the ecology of aquatic habitats is desired. Development and evaluation of aquatic plant community quantification techniques is needed to support both research and operational needs. In addition, the development of PC-based simulation models of plant growth or effectiveness of management techniques is desired.

Expansion of these models to include spatial distribution to 2-D and 3-D graphical displays to enhance management planning and implementation are also sought. (Contact: Dr. Michael Smart, 972-436-2215, ext. 21.)

2. Techniques for Assessing Aquatic Plant-Infested Environments. Current techniques for quantitatively sampling and mapping aquatic plant-infested environments are highly labor intensive and only provide a low-resolution picture of environments that exhibit a high degree of spatial variability. High-resolution automated and semi-automated techniques are needed. Research area has focused on remote sensing techniques such as use of airborne scanners and state-of-the-art hydroacoustic equipment. Future research will focus on developing theoretically feasible measurement systems into devices, which may be employed by operational aquatic plant managers. (Contact: Mr. Bruce M. Sabol, 601-634-2297)

3. Biological Control Methods for Aquatic Plants. Current research involves biological control of problem aquatic macrophytes using microorganisms, aquatic invertebrates and vertebrates. The objective is to develop an operational capability for biological agents to control aquatic plants. Research topics of interest include specificity and ecology of microflora of aquatic macrophytes, stimulants and attractants of invertebrates impacting aquatic macrophytes, and revegetation with desirable aquatic plants for the inhibition or prevention of problem plant species. (Contact: Dr. Michael Grodowitz, 601-634-3182)

4. Chemical Control Methods for Aquatic Plants. A need exists for development of aquatic plant management methods, which utilize both herbicides and plant growth regulators to selectively control or maintain plant populations below nuisance levels. Research is needed on the physiological weak points in the growth cycle of nuisance aquatic plants for application of control measures, herbicide delivery systems (water-dispersible granules, emulsifiable concentrations, flowable suspensions, etc.) to deliver the active ingredient to the target plant, and field evaluations of the effects of aquatic herbicides and plant growth regulators on nuisance species as well as selected non-target plant species. Evaluation of the effects of chemical control on plant growth, flowering/seed production and reproductive structures is also needed. (Contact: Dr. Kurt Getsinger, 601-634-2498)

5. Aquatic Plant Establishment and Succession. The creation of new submersed aquatic plant habitats by reservoir and waterway construction provides an ideal environment for the establishment of weedy submersed plants. These species are well adapted for colonizing new and/or disturbed substrates. Given time, ecological succession may lead to the development of more desirable plant communities composed of native vegetation. However, man-induced disturbances to the system maintain the aquatic environment in an ecologically immature state, favoring reestablishment of problematic weedy species. Proposals should examine methods establishing native aquatic plants or altering the species composition of submersed aquatic plant communities to minimize the growth of exotic weedy species and encourage the growth of more desirable nonproblem vegetation. (Contact: Dr. R. Michael Smart, 972-436-2215, Ext. 21)

6. Relationships Between Fish and Aquatic Plants. Aquatic plant control

methods are developed to be environmentally compatible, regardless of the situation and/or the control method being implemented. Aquatic plants, though problems to water uses, provide habitat for fisheries and organisms that support fish populations. Currently, there is insufficient data for developing the relationships between fish and aquatic plants that are needed to dictate the degree of control of the plants without destroying the habitat, thus ensuring compatibility. (Contact: Dr. Jack Killgore, 601-634-3397)

B. Aquatic Nuisance Species (EL-28)

The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 specified that the Assistant Secretary of the Army, Civil Works, would develop a program of research, technology development, and demonstration for the environmentally sound control of zebra mussels in and around public facilities.

Control strategies suitable for large waterways will be based primarily on physical rather than chemical methods to ensure that native biota and potable water supplies will not be negatively affected. Ongoing and planned studies consist of the following: analysis of the biology and physiology of zebra mussels; investigation of physical condition, habitat requirements, and size demography of naturally occurring populations of zebra mussels; and evaluation of the tolerance of zebra mussels to desiccation, elevated temperatures, anoxia and other controls. In addition to biological studies, considerable effort will be devoted to modifying existing operation, maintenance or design features of structural components of the facility. Interest exist for all public facilities along waterways and includes water intake plants, navigation locks, gated dams, outlet works, pumping plants, and drainage structures. (Contact: Dr. Timothy Lewis, 601-634-2141)

Water Quality and Ecological Systems

I. Introduction

The Corps of Engineers is involved in research to develop water quality and ecological system models for riverine, reservoir, wetland, coastal and marine surface and groundwater. Current research encompasses a wide range of environmental issues. Emphasis is on short- and long-term field and laboratory investigations to improve the techniques for evaluating water quality and developing water quality management guidelines. The research also emphasizes the development of biological models for terrestrial, lacustrine, palustrine, estuarine and coastal environments to assist in evaluating potential effects of natural and man-made alterations.

II. Research Areas

A. Limnological Investigations and Water Quality Management (EL-29)

Current research encompasses a wide range of investigations designed to increase the Corps' understanding of important limnological processes influencing tailwater, reservoir, wetland and coastal quality. Emphasis is on short- and long-term field and laboratory

investigations, the development of improved techniques for evaluating water quality conditions, formulation of sample design methodologies, and development of improved water quality management guidelines. Research is also conducted in the area of simplified techniques for the description and prediction of water quality conditions and problems and watershed management. This includes TMDL's nutrient criteria and bioassessments. Integrated methods for water quality management are developed and evaluated. Proposals for research categories are invited. (Contact: Dr. Dave Soballe 601-634-4631)

B. Ecological Modeling (EL-30)

Research into the development and application of a variety of biological models for terrestrial, lacustrine, palustrine, estuarine, and coastal habitats. This research involves the use of traditional population and community dynamics models as well as spatially explicit, structured-population and individual oriented models for addressing a wide variety of biological problems. Research is also ongoing for the integration of physical and biological models spanning different spatial and temporal scales. The integrated models can be utilized to analyze interrelations and dependence across trophic levels in a simulation mode and to determine the potential effects of alterations (natural and man-made perturbations) to the ecological system. (Contact: Dr. Patrick Deliman, 601-634-3623)

Outdoor Recreation

I. Introduction

Research and development is conducted in support of outdoor recreation planning and management at 463 multipurpose reservoirs located in 43 states. These projects include 11.5 million acres of land and adjacent water and a total shoreline length over triple the coastline of the continental United States. The Corps of Engineers is the largest supplier of water-oriented outdoor recreation opportunities in the nation.

All aspects of public use of multi-purpose water resource development projects are considered in recreation research and development. The trend is, where feasible, to develop automated tools for use by the planner and manager in the interest of efficiency of operation. This objective is considered in the context of providing high quality recreation experiences for the visitors to these lakes in a safe and pleasant atmosphere. Some current examples of research thrust in this area follow.

II. Research Areas

A. Carrying Capacity (EL-31)

Ongoing research and technical support are currently concentrated on physical and social carrying capacity of lake water surface and lakeshores. Shoreline management aspects of this work addresses commercial marina development, public access for boating and related activities, and management of private use of public lands at approximately 450 projects. Land-based support facilities including boat-launching ramps, parking, and pedestrian access are important features. (Mr. Scott Jackson, 601-634-2105).

User Fees (EL-32)

Investigate and develop automated systems for registration of users, collection and analysis of trends data, and special feature capabilities including differential pricing, reservations, and credit card use in support of camping and day-use recreation fees at Corps of Engineers' recreation sites. Automated systems are designed for on site use of personal computers (Contact: Mr. Scott Jackson, 601-634-2105.)

Economic Impacts of Recreation Management (EL-33)

Advance techniques to assess economic impacts of recreation-resource management and for estimation of use in and beyond developed parks. Investigate and develop regional recreation demand models for application to water resource system studies. (Contact: Mr. Scott Jackson, 601-634-2105.)

Customer Trends and Satisfaction (EL-34)

Improve methods for identification of needs and demands of the using public and for monitoring recreation management to meet expectations of the public. (Contact: Mr. Scott Jackson, 601-634-2105.)

B. Insect Pest Management (EL-35)

Integrated control programs are being developed and tested for various aquatic (Diptera) and terrestrial (Dictyoptera and Isoptera) pest insects. Research should address the development of programs, which utilize a multifaceted approach to control, including the use of biological pesticides as well as mechanical and cultural control practices. New and innovative approaches to control are being sought, especially those that utilize existing technologies incorporated into a working management program. (Contact: Dr. Alfred F. Cofrancesco, 601-634-3182).

INFORMATION TECHNOLOGY LABORATORY

Research Areas

A. Computer-Aided Engineering (ITL-1)

Through the Computer-Aided Structural Engineering (CASE) Project, research is performed in development of computer tools and procedures for use in the design of structures utilized in the Corps' Civil Works mission. Research is performed related to risk analysis, engineering reliability, and computer science techniques to enhance computational capabilities for solution of scientific and engineering problems. Graphical user interfaces and data presentation/visualization techniques are developed. Solid modeling techniques are being studied for three-dimensional (3-D) structure representation. Accuracy of computational results is a matter of deep concern for many of the numerical procedures used by ERDC and other Corps offices. Innovations in numerical analysis are continuously investigated to save costs in computer time and ensure confidence in computation results, especially as applied to different size computers. Interface systems for electronic transfer of computer-generated drawings between minicomputer- and microcomputer-based hardware are investigated. Military-related research work includes development of a rapid interactive 3-D structural computer modeling system to aid in the analysis/design of structures under 3-D dynamic and static loadings. Assessment of load capacity of structures when material data and geometry are incomplete is also being investigated. (Contact: Mr. Wayne Jones, 601-634-3758)

B. Information Technology (ITL-2)

Applied research is conducted in designing and deploying large information systems in enterprise-wide operating environments. An area of emphasis is large on-line databases to be used concurrently by many geographically dispersed users via Intranet and/or Internet access from a PC. Both thick and thin clients are of interest. Studies and evaluations are being conducted on state-of-the-art software engineering methodologies advocated by researchers in universities and industry. Investigations may be conducted on any phase of software development, deployment, and operation. Also subject to study are the operational infrastructure and the effect of the infrastructure on the performance of software systems as perceived by the end user. An area of special interest is the design and execution of many user performance tests. The purpose of these tests may be to predict operational performance of a given infrastructure under a specified workload or to design an infrastructure to achieve a given level of performance under a specified workload.

Basic and applied research is conducted in developing and applying new numerical simulation techniques to model continuum and discrete mechanics, hierarchical and nonhierarchical organizations, and inorganic and organic systems. These techniques include agent-based or cellular automata-based modeling, finite difference/finite element techniques, artificial intelligence systems, boundary element methods, discrete deformation analysis, discrete element codes, and other techniques. (Contact: Dr. Cary Butler, 601-634-4410)

Research is planned in advancing collaborative capabilities combining evolving communications technology and multi-media presentation capability. This may involve automation/integration of media presentation considering such areas as documents, graphic arts, audio, video, and interactive presentations. Electronic flow of report information including management, searching, routing, tracking, and simultaneous review is also of interest. Additional research is planned in other information technology areas such as advanced topics in data, voice, and video transmission using evolving communication systems and their integrations with other information systems, innovations in library science to expand organization, and accessibility of all media and visual information. (Contact: Mrs. Alice Duke, 601-634-3667)

C. Computer-Aided Design and Drafting/Geographical Information System Technologies (ITL-3)

Through the CADD/GIS Technology Center for Facilities, Infrastructure, and Environment, research is performed to support the application of computer-aided design and drafting (CADD), facility management (FM), and geographic information system (GIS) technologies in new and existing mission areas within the DoD and other participating Federal agencies (particularly as applied to facilities, infrastructure, and the environment). CADD/GIS/FM capability is being widely integrated into the planning, engineering, construction, and facility management responsibilities of the DoD, other Federal agencies, state and local governments, and industry. Because of the expanding development of computer methods to meet the demands of technological advancements, interfacing these methods with CADD/GIS/FM platforms is especially crucial. As the use of CADD/GIS/FM evolves and expands, the need to integrate other existing design and analysis computer tools, including relational databases, spatial data analysis, automated cost estimating, and specification generation, etc., with CADD/GIS/FM systems and to evaluate new applications is of primary interest. Other research includes productivity studies and criteria requirements for new technology development, self-instructional training guides, and pilot projects in technology usage. (Contact: Mr. Harold L. Smith, 601-634-4190)

D. High Performance Computing (HPC) and Networking (ITL-4)

The ERDC hpc Major Shared Resource Center (MSRC), located in ITL, maintains large-scale, parallel computer systems for the DoD Science and Technology (S&T) community. In addition to providing computer access, the ERDC MSRC conducts research related to the efficient use of HPC systems and networking technologies by this geographically dispersed community. Of special interest are technologies, services, and techniques for innovative access to workflow management on HPC resources by a distributed user community, for example, Web-based visualization tools and techniques for content-based management and analysis of terabyte-scale data. Also of interest are the development of a robust checkpoint-restart capability on HPC architectures; parallel data-compression algorithms; the application of scalable parallel algorithms to DoD S&T applications; the instrumentation of scientific applications for gathering performance metrics and development of tools for automating that instrumentation; and technologies and techniques for managing operational resource utilization and modeling future requirements. (Contact: Mr. John E. West,

601-634-3629)

E. Corps of Engineers Enterprise Infrastructure Services (CEEIS) (ITL-5)

The Corps of Engineers Enterprise Infrastructure Services (CEEIS) Program Management Office, located in the ITL, supports research to maintain state-of-the-art systems and networks in the Corps of Engineers. Development and design of advanced networking and security technologies are applied to the Corps' corporate information technology architecture as well as interfacing with U.S. Army, DoD, and public customers. This unit operates the Corps-wide networking, security, and computing infrastructure including wide area networking, layered security model, enterprise-level centralized applications, business contingency designs and deployments, and network and systems management functions. This operational arm of ITL provides additional experience and insight into enterprise management and designs to assist in research missions. The CEEIS office assists customers inside and outside USACE in the design and deployment of IT infrastructures and services. In addition, development and design in systems, database management, and storage area network engineering are conducted to sustain a viable, robust enterprise computing infrastructure. (Contact: Dr. Peggy Wright, 601-634-4630)

F. Sensors, sensor systems, data acquisition, processing, and transmission systems (ITL-6)

Research and development is conducted in the general area of sensors, automatic data acquisition systems, automatic data processing and interpretation systems, data storage systems, and data and information transmission systems that support military engineering, civil engineering, environmental engineering, and homeland defense. Some specific areas of interest include artificial neural networks for processing and interpretation of sensory data; nanotechnology related to construction; ultra-wideband radar for structural inspection related to military applications; microelectromechanical systems (MEMS); voltage generators; new methods for displaying data; graphical user interfaces for controlling sensors or displaying sensor output; sensors and sensor systems for intruder detection; feedback control systems for protecting structures and other assets from chemical and biological weapons; smart sensors that process and interpret their data and provide information to the user as opposed to just data; agent-based sensory systems; micro-sensors; advanced very-high-resolution acoustic imaging systems for inspecting underwater structures or monitoring marine life in turbid water; methods to classify underwater acoustical moving targets; advanced high-speed and/or very-high-shock data acquisition systems; advanced seismic, infrared, optical, and acoustic sensors; advanced charge-coupled device (CDD)-based sensory systems; high-shock, high-frequency sensors; stress, displacement, pressure, and chemical sensors; digital sensing methods; electromagnetic sensors for all parts of the spectrum (radar, infrared, microwave, x-ray, radio, visible light); digital signal processing (DSP) related to these spectra; sensors for monitoring structural response, for monitoring the conditions at dams or locks, for measuring sediment transport, for measuring roadbed or bridge response, for measuring stream velocity gradients, or for measuring pollutants; and novel supervisory control and data acquisition (SCADA) systems. (Contact: Dr. Charles R. Welch, 601-634-3297).

CONSTRUCTION ENGINEERING RESEARCH LABORATORY

Facilities Division

I. Research Areas

A. Innovative CBRN Protection for Facilities (CERL-1)

Proposals are sought which address the need for an improved ability to protect mission critical facilities from attacks using CBRN (chemical, biological, radiological, or nuclear) agents in internal and/or external agent releases. In particular, methodologies for designing, constructing, operating and commissioning CBRN protection systems in a building system are sought. Ideally, the CBRN protection systems should be integrated into the building in such a way that other building systems and functions are not negatively impacted. We are also interested in methods of optimizing the effectiveness of CBRN systems while minimizing life cycle costs and improving reliability and confidence in the system's required level of protection as well as cost effective means of certifying and recertifying protection levels of CBRN protection systems. (Contact: James Miller, 217-373-4566)

B. Commissioning Procedures (CERL-2)

Proposals are sought for execution of commissioning procedures in accordance with UFGS 15995 and standard industry practice for new and existing facilities being constructed by USACE in OCONUS locations. Focus of this work is assuring that the mechanical and electrical systems in newly constructed or newly renovated facilities are operating correctly and efficiently upon completion of construction and that the mechanical and electrical systems in these facilities continue to operate correctly for the life of the facility. A commissioning report shall be prepared which evaluates quality of contractor workmanship and quality/completeness of HVAC TAB report, readiness of the project for execution of commissioning, observations and findings, including problems noted, corrective actions, and Lessons Learned and recommendations to the Government to improve the construction and commissioning process. (Contact: James Miller, 217-373-4566)

C. Energy Technology Assessments of Army Installations (CERL-3)

This research would develop a database of energy conservation options (ECOs) that will be most appropriate for implementation in common Army facilities on an Army installation, and provide an overall energy conservation strategy for that installation. This will allow the installation to comply with the Energy Policy Act of 2005 (EPACT 2005) by decreasing energy consumption and increasing use of renewable energy technologies where they are life cycle cost effective. The work shall include conducting on-site review and analysis of the Army installation's facility and industrial energy systems and requirements; developing and analyzing potential energy saving and cost reduction opportunities at the installation; and disseminating the results through workshops and publications. The level of detail for the energy technology assessment will vary depending on which Army installation is selected for this work. The types of facilities to be assessed include, but are not limited to, barracks, operations and administrative and training, dining, maintenance, service, warehouse, and industrial with welding, painting, and compressed air. The Contractor's assessment team of subject matter experts (SME) shall collectively possess expertise and demonstrated practical

experience in all of the following areas: central energy plants and advanced district heating and cooling distribution systems; energy technologies for buildings; heating, ventilation, and air conditioning (HVAC) systems; HVAC retrofits; building envelope retrofits for thermal performance and air tightness; lighting; and infrared thermography. (Contact: Dahtzen Chu, 217-373-6784)

D. Innovative Energy Efficiency and Energy Security Initiatives (CERL-4)

Proposals are sought which address the need for improved energy efficiency and improved energy security by federal, state, and private sector energy users. Federal agencies are required to meet stringent energy efficiency targets mandated by Executive Order. Products/methods/techniques that will improve overall energy efficiency or reduce reliance on non-renewable energy sources are of interest. These include but are not limited to: combined heat and power generation, fuel cells, low Nox boilers/burners, natural gas cooling and compressed air, storage cooling, wind, geothermal, and solar power generation, and high efficiency heating/ventilating/and air-conditioning systems. In addition, proposals are also sought for products/methods/techniques that will improve the robustness of energy delivery systems and reduce the risk of loss of energy services due to economic dislocations, depletion of natural resources, natural or man-made disasters, as well as for products/methods/techniques which will facilitate cost effective, reliable, and sustainable utility support to deployed forces in underdeveloped regions of the world. (Contact: James Miller, 217-373-4566)

E. Fuel Cell Technology Advancements (CERL-5)

Proposals are sought which address the following research areas for stationary fuel cell technology: a) development of an advanced technology base, b) innovative and/or lower-cost manufacturing, packaging, and assembly processes, c) balance-of-plant (BOP) components, and d) advanced field demonstrations of pre-commercial systems. (Contact: Frank Holcomb, 217-373-5864).

F. Industrial Process Optimization (CERL-6)

This research would identify new opportunities for industrial energy reduction achieved through new and innovative technologies, improved system or operational modifications, while simultaneously improving production efficiencies, reducing costs, and/or reducing toxic air emissions. Emphasis would be placed on implementing changes that could be applied to numerous military industrial and non-industrial installations. The research would provide results on the latest industrial technologies or operational changes, and quantify the associated cost/benefits for any proposed change. (Contact John Vavrin 217-373-5856, or john.vavrin@us.army.mil)

G. Innovative Electrical Power Architecture for Energy Surety (CERL-7).

This research focuses on developing innovative distributed electrical power architecture for Army installations and training ranges. These innovative power architecture concepts are envisioned to be "plug and play" with autonomous controls that proactively sense the demand power requirements and seamlessly match them up with appropriate power sources from renewable power, diesel generators, energy storage devices, etc., plus the local utility grid. The architecture must be scalable to accommodate small (kilo-watt) to large (mega-

watt) power demands and supplies. Such architecture will provide revolutionary capabilities to Army fixed systems, and be matured to serve as a force synchronization tool for energy sharing, i.e., field commanders getting power from those with excess to those that need it. (Contact: Dr. Tom Hartranft, 217-373-6713)

H. Fiber Reinforced Polymer (FRP) Composites for Infrastructure Applications (CERL-8)

The application of structural FRP composite materials/systems to facility construction application involves working knowledge of composites manufacturing, interfacial behavior of composite materials, fracture mechanisms in composites, composite materials joining technologies, composite design criteria, composite durability, composite quality assurance, smart composites, composite repair techniques, and other appropriate phenomena and the ability to develop constitutive and other models of these phenomena for this application. Moreover the Government seeks development of concepts and prototype demonstrations for facility construction applications using composite materials systems. Of particular interest for further development is the application of FRP composites for navigational gates and gate components as well as heavy-duty FRP composite sheet pilings. (Contacts: Jonathan Trovillion, 217-373-4551 and Richard Lampo, 217-373-6765)

I. Reduced Footprint Technologies for Forward Facilities Early Entry & Sustainment (CERL-9). This research calls for structural/materials models, concepts, and/or applied research that support Forward Facilities early entry and sustainment to meet immediate Short-Term, Interim and Objective Force goals. Research under this BAA entry includes structural/materials innovations and technologies that can improve forward operating base (FOB) and point of debarkation (POD) facility construction practices and systems. R&D supporting this activity should emphasize innovations and technologies that offer strong potential to deliver or upgrade facilities more efficiently and effectively at a minimal logistics footprint. This includes technologies that integrate indigenous and/or advanced materials/systems with state-of-the-art practices in design, construction, and deconstruction while considering environmental and total life cycle cost factors. This also includes models that address unique material constitutive behavior, structural-materials behavior or interactions and building envelope / structural analyses. Three target areas to focus R&D proposal include 1) Rapid POD facility upgrade and repair technologies, 2) Reduced footprint systems for conventional FOB construction and 3) Innovative systems for non-conventional FOB construction. (Contact: Jonathan Trovillion, 217-373-4551).

J. Roofing (CERL-10)

Research and development efforts are currently requested in the following areas:

1. Perform studies of roofing material degradation processes, including performance of accelerated weathering and laboratory testing of new and aged materials and development of degradation models. Materials shall include the following: elastomeric and thermoplastic polymeric sheets, modified bitumen, bituminous built-up, and asphalt shingle.

2. Development of standard serviceability tests and performance criteria for roofing materials and systems based on degradation models. (Contact: Dave Bailey, 217-373-6781)

K. Construction Materials Made From Recycled Wastes (CERL-11)

Research is currently being conducted on construction materials made from recycled, post-consumer wastes with a primary focus on products made from recycled plastics. Work on these type materials is in support of Executive Order 13101, Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition. Required research on these polymeric materials includes, but is not limited to, studies concerning: relationship of fabrication techniques to end-product properties, degradation mechanisms in various environmental exposures, long-term mechanical properties and durability in severe and varying environments, creep behavior at varied temperatures and loads, behavior and design of bolted connections, quality assurance techniques, design criteria for structural applications, and modeling techniques to predict material behavior in different loading situations over the life-cycle of the product. (Contact: Richard Lampo, 217-373-6765)

L. Innovative Corrosion Control (CERL-12)

This area focuses on research, development and field tests to reduce corrosion of electrical-mechanical systems and structural systems at military and civil works facilities. The components most susceptible to corrosion include: building structural components and utilities (that will not be privatized at some installations) such as: metal buildings, metal roofing and siding, doors, aircraft hangars, outdoor electrical sheet metal for air conditioners, electrical boxes, underground pipes (gas water, steam, high temperature hot water), pipes in buildings, boilers, chillers, condensate lines, water storage tanks, water treatment plants, sewage treatment plants, and navigation and dam structures. The general areas to be researched for corrosion reduction include corrosion control technologies using: (a) Coatings, (b) Cathodic Protection, (c) Advanced (Corrosion Resistant) Materials Selection and Design, (d) Water Treatment, and (e) Remote Corrosion Assessment and Management. Contact: Ashok Kumar, 217-373-7235.

M. Innovative Electrical-Mechanical Systems To Increase Efficiency, Reliability, Safety, and Security (CERL-13). Contact: Ashok Kumar, 217-373-7235.

The research program in this area supports both the Military and Civil Works missions of the U. S. Army Corps of Engineers. This work focuses on research, development and field tests to increase efficiency, reliability, safety and security using innovative electrical and mechanical systems.

For military installations, innovative electrical mechanical systems are needed to increase the efficiency, reliability, safety, and security of building and utility systems such as heating, ventilation, and air conditioning (HVAC) systems, chillers, boiler plants, water treatment plants and sewage treatment plants.

New technology to automate lock controls using programmable logic controllers (PLC) is needed. The technology will also include video surveillance and central pilothouse controls. Locks can also be operated remotely from off site locations. Remote control and communication technology to operate a number of locks from an off site lock control room needs to be developed, field tested, demonstrated and validated. Monitoring technology can be used for predictive maintenance to monitor the condition of lock and dam operating equipment to avoid unscheduled breakdown. Various sensors and monitoring software need to be developed. Neural networks, artificial intelligence and trending software are needed to set up alarms. Emerging technology for barge lashing, thrusters for barges, and automated pilot controls of barges needs to be developed and demonstrated to increase efficiencies and security.

N. Electro-osmotic technology for water and chemical containment (CERL-14)

Electro-osmosis is the transport of cations due to the application of an external electric field. Because of the molecular binding nature of water molecules, water molecules are transported along with the cations. This technique has been used in civil engineering to dewater dredgings and other high-water content waste solids, consolidate clays, strengthen soft sensitive clays, and increase the capacity of pile foundations. Electro-osmosis has received significant attention in the last 5 years as a method to remove hazardous contaminants from groundwater or to arrest water flow. Although results have shown the technique to be feasible, they have not been remarkable. Research is needed in overcoming the limitations of current techniques, determining new application and demonstrating application techniques. Contact: Vince Hock, 217-373-6753.

O. Evaluation and Mitigation of Multi-Hazard Effects on Conventional Buildings (CERL-15)

The Department of Defense (DoD) and other Federal agencies are responsible for the design, construction, and maintenance of conventional buildings. The structural systems for such buildings are constructed of reinforced concrete, masonry, steel frames, timber, light gage steel, and light gage wood. All of these systems are vulnerable in varying degrees to extreme loading, including earthquake effects, wind loading, flooding, fire, explosion, and impact. Many critical and high potential loss facilities in the DoD and other Federal agencies have some or all of these vulnerabilities, making them and the missions they support susceptible to the effects of any or all of these extreme loads. Vulnerabilities of structures supporting in-theater operations is also a concern. Research areas include: vulnerability/hazard assessments, strengthening existing structures, progressive collapse mitigation, protective measures for designing new structures, and multi-hazard design approaches that simultaneously address two or more extreme loading phenomena. Also of interest is the capability to protect critical equipment from damaging effects of extreme loading events, so that government facilities remain fully functional following them. (Contact: James Wilcoski, 217-373-6763)

P. Critical Infrastructure Protection for Utility Systems (CERL-16)

Utility systems provide the electricity, water, transportation fuel, heating, cooling, communications and compressed air that are required for carrying out military installation missions. The objective of this research is to develop methods, simulation tools, and models to enable installation and military planners to plan, assess, optimize, and monitor the ability of utility systems to support normal operations requirements, as well as, military force projection. New technologies and methods are needed for conducting utility system simulations using real-time data, as well as historical, generic, or hypothetical scenarios. (Contact: Vince Hock, 217-373-6753)

Q. Infrastructure Management, Facilities Maintenance (CERL-17)

This research calls for Army infrastructure planning, maintenance, repair and modernization (SRM) technologies that will facilitate limited budgets and mission emphasis for the Future Force. Specifics include planning and budgeting for SRM activities based upon mission priorities, computerized maintenance management support and deconstruction. (Contact: Don Hicks 217-373-6712).

R. Modeling and Simulation/Analysis tools for Infrastructure Applications (CERL-18)

This research supports decision support tools for infrastructure at military installations. The tools include the capability to generate Infrastructure requirements from the mission and the ability to handle complex changes in mission requirements with an analysis that can examine multiple scenarios and assist decision-makers determine the optimum choice given system constraints. Tools provide the capability for modeling and simulation as well as analysis in engineering, architectural, environmental and economic domains. The tools encompass modeling for individual facilities, an entire installation or a region of the country. (Contact: Alan Anderson, 217-373-7233)

Installations Division

I. Research Areas

A. Inventory, Assessment, and Monitoring (CERL-19)

This research develops innovative and improved technologies and procedures for (1) inventorying threatened and endangered plant and animal populations and assessing long term population viability and habitat health and (2) inventorying archeological sites, traditional cultural sites, and historic structures and landscapes; assessing their eligibility for listing on the National Register of Historic Places; and monitoring impacts to significant sites, structures, and landscapes. Research efforts should consider ecosystem and regional as well as local installation contexts when evaluating population viability, habitat health, and the significance of cultural sites. (Contact: Lucy Whalley, 217-373-7243). Specific research efforts are requested in the following areas:

1. Improved methods for inventorying threatened and endangered species

and collecting related environmental data pertaining to endangered species management,

2. Improved methods for measuring a full range of habitat conditions and biological and abiotic environmental parameters,
3. Inventory and assessment of invasive species,
4. Predictive modeling of archeological sites,
5. Environmental reconstruction and geomorphological analysis related to identifying areas of past human habitation and use,
6. Geophysical techniques for surveying and assessing archeological sites,
7. Identifying, documenting, and assessing the significance of historic structures and landscapes and archeological sites,
8. Condition assessment and monitoring systems for historic structures and landscapes,
9. Inventory and monitoring systems for archeological sites,
10. Acquiring, processing, integrating, and/or analyzing remotely sensed data and imagery for natural and cultural resources inventory, assessment, and monitoring.

B. Land Management (CERL-20)

The goal of research in land management is to develop and improve planning and management tools and procedures that enable land managers to address the priorities of the military mission, meet the requirements of environmental legislation, and support the stewardship of natural and cultural resources on military lands. (Contact: Alan Anderson, 217-373-7233). Specific research efforts are requested in the following areas:

1. Impacts of military land use activities on species listed pursuant to the Endangered Species Act and developing management plans and mitigation strategies,
2. Fragmentation of habitat of threatened and endangered species,
3. Developing technologies for integrating cultural and natural resources management planning,
4. Predicting and controlling erosion and dust associated with military training activities,

5. Evaluating the carrying capacity of training lands and improving understanding of the impacts of military training on the environment,
6. Developing new technologies designed to mitigate environmental effects of training on the landscape,
7. Assessing and modeling the effects of helicopter, aircraft, blast, and small arms noise on animals and humans,
8. Designing noise data collection systems for installations,
9. Developing noise impact mitigation techniques,
10. Developing technologies for control of invasive species,
11. Developing sustainability indices and risk assessments for military training lands,
12. Designing predictive computer models and decision support tools for assessing environmental change, the effects of both human and natural influences on the environment, and the integrated management of natural and cultural resources,
13. Developing a full range of land use planning tools to facilitate long term sustainability of defense installations,
14. Developing databases relevant to land and ecosystem management and improving information flow for modeling and decision support purposes,
15. Identifying, designing, and/or developing a computing system environment and/or protocols to facilitate interactions between analysis tools and common delivery mechanisms under development by CERL and ERDC.

C. Pollution Abatement/Pollution Prevention at Industrial Operations (CERL-21)

Proposals are sought in the general area of Army industrial waste treatment which provide field work, scientific, engineering and laboratory analysis, and special studies within the thrust areas listed in Table A below. The studies can range in scope from literature review, to field data collection, laboratory testing to pilot demonstration, and review of engineering plans and designs (Contact: Dr. Steve Maloney, 217-373-3482, except as otherwise noted)

TABLE A. Thrust Areas Identified by the U.S. Army for Pollution Abatement/Pollution Prevention Operations Thrust Areas

Depot Waste Treatment Technologies:

- Industrial wastewater sludge treatment
- New materials and waste generated from next generation weapons systems

Ordinance Waste Treatment Technologies:

- VOC control in propellant production
- Treatment of new generation explosives and their production by-products, e.g. components of insensitive munitions

Out of Process Reuse:

- Reuse of explosives and propellants in non-military applications
- Reuse of production by-products in non-military applications

Troop Installation Air Pollution Control:

- Compliance with the Clean Air Act
- Indoors air pollution
- Radon management
- Control of solvent emissions from painting, cleaning, and depainting

- Industrial Operations Air Pollution Control (Contact: James Hay, 217-373-3485)
- Control of solvent emissions from painting, cleaning, and depainting
- Compliance with the Clean Air Act
- Industrial air pollution control
- Emission monitoring

Water/Wastewater Treatment Technology:

- Compliance with the Safe Drinking Water Act
- Water recycling, conservation, and demand optimization
- Compliance with the Clean Water Act
- Wastewater treatment plant retrofit and upgrade
- Collection system rehabilitation and optimization

Solid Waste Management:

- Solid waste minimization
- Solid waste characterization
- Solid waste reduction/recycling/composting
- Solid waste incineration/landfilling

Hazardous Waste Management:

- Lead-based paints
- PCB management
- Waste oil management
- HAZMIN plan optimization
- Bar code tracking of hazardous materials/wastes

D. Compliance at Industrial Processes (CERL-22)

Research is requested in the following areas:

1. Technologies to reduce the cost to treat wastewaters from energetic production and demilitarization.
2. Heavy metal discharges from industrial operations.
3. Environmental impacts of privatized collection and treatment systems.
4. Methods for demolishing buildings contaminated with energetics.
5. Faster and cheaper technologies for treating and disposing of military unique and energetic production wastes including alternatives to Open Burning/Open Detonation (OB/OD).
(Contact: Steve Maloney, 217-373-3482)

E. Compliance at Troop Installations (CERL-23) (Debbie Curtin, 217-398-5567):

This research calls for applied research to meet environmental regulation as it applies to installation activities. Research under this BAA includes technologies that enable continued operation of compliance sites, meeting regulatory requirements without negative impact on mission for CONUS installations. This includes, but is not limited to technologies that address compliance issues associated with noise, solid waste, hazardous waste/hazardous materials, water quality, wastewater, stormwater, air emissions. This also includes integrated monitoring networks and reporting systems to provide consistency environmental assessment data critical for successful integration of pollution prevention standard solutions.

Another target area under this BAA is to develop/update Environmental Governing Standards for OCONUS installations and provide the technologies to effectively comply with the standards.

F. Pollution Prevention (CERL-24) (Debbie Curtin, 217-398-5567):

Proposals are sought that use pollution prevention technologies, methodologies, processes that support or eliminate environmental compliance issues. In particular methodologies and technologies that provide alternatives to hazardous materials/waste, contaminant reduction, and improved pollution control across all media areas in CONUS and OCONUS operations.

G. Business Process Reinvention (CERL-25):

This research calls for new business processes and supporting technologies that will enable the DoD and civilian Federal agencies to efficiently and effectively exchange information, evaluate performance, and ensure regulatory compliance. Specific emphases include (1) Support of Environment, Safety and Occupational Health (ESOH) regulatory compliance research and program development, including the application of audit business processes and Environmental Management System program development; (2) Knowledge and information management; (3) Army Performance Improvement Criteria (APIC) processes; (4) Base Realignment and Closure (BRAC) analysis; (5) Change and transition management; and (6) Organizational development (teaming, facilitation, focus groups, and business process re-engineering). (Contact: Michelle Hanson, 217-373-3389)

H. Socio-Cultural Analysis (CERL-26):

Understanding urban and social environments requires the ability to model complex interactions between 1) infrastructure systems and services, 2) human populations and society, and 3) natural and man-made environments and their impact on military operations. Proposals are sought for the development of new and improved concepts, methods, and tools for acquiring and representing spatial-temporal information that can be combined with cognitive and behavioral processes to advance the fundamental understanding of the spatial-temporal, socio-cultural dimensions of human social dynamics. (Contact: Alan Anderson, 217-373-7233). Specific research efforts are requested in the following areas:

1. Understanding human military theater phenomena including but not limited to: aggregate behavior, nonlinear phenomena, networks with distributed or local control, and combinations of continuous and discrete behavior;
2. Development of computation techniques that enable discovery of new information and relationships that cut across disciplines (spatial and behavioral);
3. Development of abstract models or ontologies to represent fundamental understanding of the complex urban environments;
2. Development of technology transfer methods to take theory/concepts to operational environments through use of novel computation and simulation techniques;
5. Develop improved methods to characterize non-trivial spatial and temporal patterns and define relationships between physical environment (i.e., soils, vegetation, climate, surface geology) and human/cultural aspects (i.e., population/ethnic group movement, human patterns and behaviors).

COLD REGIONS RESEARCH AND ENGINEERING LABORATORY (CRREL)

I. Research Areas:

A. Signature Propagation Technical Area (CRREL-1)

The Signature Propagation technical area focuses on research to increase knowledge and understanding of the dynamic changes to electromagnetic, acoustic, and seismic signatures of personnel, vehicles, aircraft and other military sources in response to changing terrain state and complex terrain features and geometry. The understanding gained serves to improve our ability to predict signature behavior in support of materiel development, algorithm science and technology, sensor performance templates for tactical decision-making, force protection, and visualization for mission planning and rehearsal. Military broadband wireless communication networks will operate in radio frequencies ranging from hundreds of MHz to several GHz. Terrain and environmental variability will significantly influence network performance. Research is focused on innovative approaches to gain fundamental understanding of the terrain and other environmental influences on propagation in the millimeter to meter wavelength region of terrain, terrain condition and other geo-environmental factors. Basic experimentation, theoretical formulation, and simulation activities in this technical area includes the description of propagation along the surface of the earth, novel techniques for

characterizing impacts of large and small-scale topographic features, electrical properties of surficial materials, vegetation, and near-surface atmospheric disturbances. Seismic and acoustic spectrum research focuses on the development of fundamental understanding of the propagation processes in different terrestrial materials and in the lower atmosphere and algorithm development for improved target detection and classification. Of particular interest, this technical area seeks to develop theory and validation for full three-dimensional expression of 1) the character of seismic surface waves under strongly heterogeneous near-surface geological conditions and complex surface geometry at multiple scales; 2) the character of acoustic waves as affected by meter-scale turbulent boundary layer meteorology; heterogeneous ground impedance and topographic and terrain feature controls; and 3) the phenomenology of seismic-acoustic coupling. Other research focuses on the variation in personnel signatures (seismic, infrared, visual) due to weather, terrain, and cultural activity.

Products of this technical area support information superiority critical to military operations through improving terrain analysis support to command, control, communication, computer, information, surveillance, and reconnaissance (C4ISR) and tactical communications achieving Army and joint concepts for “see first”, “understand first”, “act first”, and “finish decisively”. By increasing our understanding of geo-environmental enablers and constraints to sensing (C4ISR) and radio frequency propagation this research will lead to improved terrain analysis and mission planning tools. The seismic-acoustic technology has been extended to support for the Biogeochemical Processes in Earth Materials technical area (CRREL-3) on reducing military generated noise impacting local population densities, encroachment of urban development around military lands, and sensitivity to wildlife. The research area operates in a unique niche of physics based modeling and simulation with an emphasis on the implications of the dynamics of the environment on systems performance. The Signature Propagation technical area is highly complementary to CRREL’s Terrain Properties and Processes Technical Area (CRREL-2).

Contact: Dr. J. Michael Boteler, 603-646-4767. Specific research efforts are requested in the following areas:

1. Environmental effects on seismic and acoustic wave propagation and sensors
2. Innovative and/or integrative research in geospatial research and engineering
3. Seismic-acoustic target localization in urban and other complex environments
4. Acoustic/seismic sensor performance modeling
5. Seismic signal modeling for battlefield sensors
6. Site characterization for seismic-acoustic signal modeling
7. Surface radio wave propagation
8. Weather and terrain effects on intrusion detection sensor performance

9. Seismic, acoustic, and infrasound propagation in complex environments
10. Electromagnetic remote sensing and sub-surface detection
11. Electromagnetic modeling and numerical methods
12. Signature phenomena and other exploitation techniques for remote sensing of kinetic hazards

B. Terrain Properties and Processes Technical Area (CRREL-2)

The Terrain Properties and Processes technical area investigates fundamental processes and properties of terrain and terrestrial materials as affected by the atmosphere and applies this knowledge to solving a broad range of military and civil problems. The range of research topics is broad and involves laboratory experiments, field expeditions, and numerical modeling. Research focuses on environmental physics in such topic areas as electromagnetics, boundary layer processes, fluid flow in porous media, and thermodynamics. These topics include energy exchange with the terrain, transport of gas, water, and vapor in soils and snow, weather effects on sensor performance, ice accumulation, snow and ice mass balance, permafrost degradation, snow metamorphism, and snow, soil, and micrometeorological modeling. Terrestrial surfaces extend to permafrost, glaciers, as well as river, lake and sea ice covers. At the microscale, this technical area focuses on improving the understanding of the physical processes associated with mass, momentum, and thermal transport in the atmosphere and at the terrain surface. This includes measurements and theoretical developments to improve prediction of processes and integrates our understanding into larger-scale models. Efforts to predict atmosphere-terrain interactions are focused on the impact of short vegetation on thermal and spectral signatures, developing computationally efficient models for very high spatial resolution, identifying terrain features and soil strength with spectral imagery, understanding and modeling impacts of pressure-driven flow on atmosphere-terrain exchange, and modeling freezing rain in complex terrain. Military research on terrain state aims to extend understanding of weather-driven terrain material property changes at tactical-relevant scales. This technical area also investigates, models, and predicts viewable gap fraction in complex terrain with vegetation, slope, and aspect and conducting area-wide assessments of target infrared contrast.

The Terrain Properties and Processes technical area contributes to Army, DoD, and national capabilities by defining the natural environment and the terrestrial-climate impacts on plans and operations as well as critical infrastructure. A key interest for the Army is the development of tactical decision aids for terrain reasoning and situational awareness. The relevance of the work relies on ability to predict the state of the environment for any weather, any time of day, and any season. This allows the military to exploit the dynamics of the environment rather than conquer it, allowing the military commander to exercise terrain advantage. This technical area also contributes to the body of knowledge supporting long range Corps programs in water resources planning and management and assistance to other

Federal agencies responsible for understanding changes in climate dynamics and its impacts on civilization. The Terrain Properties and Processes technical area is strongly synergetic with CRREL's Signature Propagation Technical Area (CRREL-1).

Contact: Ms Janet P. Hardy, 603-646-4306. Specific research efforts are requested in the following areas:

1. Signature and scene prediction and synthesis for the millimeter-wave spectral region
2. Algorithms to recover geophysical products from remote sensing measurements to drive models of surface energy balance and signature prediction
3. Methods to spatially distribute models of snow cover, soil, and vegetation energy and mass interactions in the boundary layer
4. Penetration of energy transfer components into snow
5. Characterization and modeling of weather, obscurants, and terrain conditions related to the spatial winter boundary layer
6. Environmental and atmospheric effects on winter battlefields
7. Physically accurate modeling to produce synthetic scenes and data for a global range of environmental conditions
8. In-flight aircraft icing prediction detection system
9. Geophysics of snow, ice, and frozen ground
10. Spatial distribution of snow properties
11. Geological and geophysical processes of permafrost, glaciers, and ice sheets
12. Lunar and planetary site characterization
13. Vapor-driven snow metamorphosis coupling Lattice-Boltzmann air flow with discrete element model of snow
14. Air-sea surface energy exchange and sea ice mass redistribution in the Arctic
15. High resolution sea ice modeling
16. Infrared and millimeter wave signatures in urban and other complex terrain
17. Terrain and cultural factors effecting deterrence planning and operations

C. Biogeochemical Processes in Earth Materials Technical Area (CRREL-3)

The Biogeochemical Processes in Earth Materials technical area focuses on understanding the interaction of biological systems, in particular the establishment, growth, and dynamics of plant and microbial communities, with a variety of earth materials such as soil, rocks, sediment, dust, and with engineered materials that mimic properties of these natural materials (i.e., geomimetics), such as high surface area and reactivity. The properties of these materials are studied both *in situ* in the field, and via laboratory experimentation. This technical area spans basic research to field demonstrations.

The goal of research in this technical area is to exploit understanding of biological, geological, and chemical interactions to further technology development in environmental remediation and ecosystem restoration, sustainable military training lands and ranges, biosensor development, and terrain reasoning and assessment. A further goal is to understand hierarchical or scalable relationships between the fundamental large-scale biogeochemical processes and smaller-scale “drivers” that constrain such processes, i.e., climate and physiography. Understanding the hierarchical linkage between fundamental processes and the drivers characterizing a particular biome or ecoregion can aid in the development of predictive capabilities at the landscape level such as plant material suitability for a military installation, persistence and fate of harmful chemicals or microorganisms in the environment, or response of biosensors in the battlespace environment.

Research under this technical area is being impacted and enhanced by the following emerging concepts and technological developments applied to biogeochemical systems and materials:

Omics. Spin-offs of genome characterization (genomics), protein and other biomolecule characterization (proteomics), and metabolomics, will continue to provide new, rapid, high throughput bioanalytical techniques and novel methodological approaches to research in this technical area. This could revolutionize study and assessment of interactions between biological systems and the environment and make feasible real-time analytical and assessment capabilities available to end users.

Nanomaterials development. Research in chemistry, materials science, and pharmacology on synthesis and properties of small particles (< 0.1 μ m) with highly reactive surface materials may make possible development of materials that mimic natural geologic and soil materials (geomimetics), but exhibit enhanced properties such as mechanical strength, novel catalytic properties, or variable dielectric behavior, i.e., carbon nanotubes. However, such novel materials may pose an environmental risk that has not been well characterized.

Informatics and knowledge management. Advances in informatics and emerging concepts of knowledge management will have a major impact on the ability to analyze large amounts of diverse biological, physical, and chemical data for biological and environmental systems. It will enable the extract of new information from datasets using sophisticated statistical, ontological, and reasoning techniques. Such approaches were not feasible in the past due to

the computational overhead and sheer processing power required. New paradigms for understanding biological and computational systems, i.e., cellular automata, finite-state machines, state and transition theory, etc., when merged with modern digital data processing power will make it possible to field complex, real-time assessment techniques and technologies.

Computational chemistry and computational biology refers to *in silico* techniques (i.e., performed on computer or via computer simulation) and attendant software that make it possible to virtually perform complex or numerous chemical and biological “experiments,” or even experiments impossible or infeasible to carry out in the laboratory. These computational techniques promise a significant cost savings and increased productivity that will maximize knowledge gained from more costly laboratory experimentation, and provide analytical input to future automated risk assessment and reduction applications for end users. Validation by *in vitro* experimentation will be conducted when appropriate.

Contact: Dr. Terry M. Sobecki, 603-646-4563. Specific research efforts are requested in the following areas:

1. Biological process affecting the nature and rate of transformation of natural constituents in environmental media (soil, water, air) or on anthropogenic surfaces under environmental conditions
2. Biological processes affecting the nature and rate of transformation of contaminants and other anthropogenic materials in environmental media or on anthropogenic surfaces under environmental conditions
3. Restoration of plant communities at site and landscape scales
4. Plant and plant community adaptation to extreme environmental conditions
5. Behavior of soil microbes or microbial communities under extreme natural or anthropogenic conditions
6. Ecosystem disturbance detection, assessment, monitoring concepts, and methodologies for anthropogenic influences landscapes or settings
7. Biogeochemical processes in natural and disturbed ecosystems and terrain
8. Biosensor development employing microbes, microbial physiology, or principles of microbiology for detection of chemical and biological threats or contaminants
9. Microbe and biomolecule behavior in soils and on anthropogenic surfaces
10. Application of advanced bioanalytical and genomics methods to assessing the nature and rate of biogeochemical processes in natural and artificial environments

11. Application of advanced concepts of complexity, computational biology, knowledge management, and related fields to studying and predicting the behavior of microbial and plant communities in a variety of environmental conditions

D. Environmental Fate and Transport Geochemistry Technical Area (CRREL-4)

Basic and applied research is aimed at understanding site conditions and environmental characteristics affecting the fate and transport of existing and emerging contaminants, military and industrial compounds, and natural substances under earth surface conditions. The goal of the Environmental Fate and Transport Geochemistry technical area is to understand and characterize site conditions themselves and develop appropriate detection, assessment, and sampling technologies applicable to military installations, existing and formerly used training ranges, and civil projects aimed at remediation, restoration, or protection of the environment. Research in the technical area can be divided into four broad focus areas:

Characterization and sampling of energetic and munitions compounds. Research is ongoing on the distribution and fate of explosive residues, smokes, propellants, and spent projectiles from military munitions on training range soils, on transport of explosive residues, military-specific compounds, and their breakdown products via and into surface and groundwater and the air. Emphasis is on developing appropriate or innovative sampling methodologies and analytical methodologies for these difficult to characterize non-homogeneously distributed compounds. Recently, research has begun on the distribution, fate, effect, and possible mobilization and transport of tungsten from munitions projectiles. This research produces field sampling and laboratory analytical methods for explosive residues that are widely accepted within and outside of DoD.

Contaminated site characterization using geophysical methods. Transport of contaminants is difficult to predict in complex geological settings and cold regions with discontinuous permafrost due to lateral and vertical heterogeneity in the soils and vadose zone. Research-based site investigations using innovative multiple-technique geophysical methods that include two- and three-dimensional resistivity, electromagnetic instruments, and ground penetrating or other types of radar provides a way to more effectively and rapidly characterize such variable site conditions. It also provides the basis for better one-, two-, and three-dimensional conceptual site models to predict pathways for the movement of surface and groundwater and associated contaminants. These techniques are particularly useful in cold regions, such as military installations in Alaska, due to intermittently or continuously frozen ground and access or trafficability limitations.

Unexploded ordnance (UXO) discrimination using innovative geophysical methods. This research is directed at increasing the understanding of the nature and causes of UXO target responses to geophysical surveying methods and fostering better target discrimination. This is particularly important in cold regions where freeze-thaw cycling and the presence of frozen ground can impact soil moisture and other properties that some geophysical methods are particularly sensitive. Improved numerical modeling that supports signal interpretation to determine size, location, orientation, magnetic permeability, and conductivity of a candidate

target relative to known UXO signatures is an important facet of this work. Novel seismic and acoustic methods are also of potential application in this technical area.

Characterization and sampling of petroleum, organic solvent, and biological contaminants in groundwater and soils. This area focuses on applied research on the suitability of various materials and techniques for sampling and characterizing environmental media. For example, suitability of various well-casing materials for groundwater monitoring wells or the ability of various groundwater-sampling devices to collect representative samples. It also includes research on appropriate and representative sampling for volatile and semi-volatile organic compounds in environmental media and on chemical and biological characterization of soil material dispersed and transported via aeolian dust.

Research under this technical area will be potentially be impacted and enhanced by the following emerging technologies that are shaping the expectations of how fate and transport data and information is collected, assessed, and conveyed to end users:

Recent advances in the study and manufacturing of microelectromechanical systems (MEMS), photoreactive bandgap materials (PRBs) and biosensors suggest eventual development of technologies leading to dispersible, active chemical sensors responsive to various environmental conditions or states, and therefore a future capability for geospatially-distributed, remotely-queriable sensing systems for natural or built environments.

Continued advances in robotics will spur demand for development of a wide variety of on-board instrumental analysis techniques able to qualitatively and quantitatively analyze soils and other environmental media. Formerly relegated only to the laboratory, this portends real-time, onsite analysis and assessment of munitions and energetics on training ranges and other hazardous environments may become routine.

Advances in application and analysis of hyperspectral and other EM-sensor imaging make conceivable real-time, spatially-distributed assessment capabilities for simultaneous determination of environmental parameters and contaminant distributions.

Evolution and development of new concepts of spatial organization and structure coupled with advances in informatics and knowledge management principles, practice, and technology is spurring the development of novel computational approaches to pattern recognition and change detection. This may lead to more holistic and sensitive approaches to environmental risk assessment and ecological status assessment of complex natural and anthropogenic systems.

Contact: Dr. Terry M. Sobecki, 603-646-4563. Specific research efforts are requested in the following areas:

1. Environmental investigation methods, techniques, and approaches adapted to extreme

environmental conditions or inaccessible locations

2. Physics and chemistry of water and its behavior in cold-region soils and geological settings
3. Physics and chemistry of water and its behavior in extremely arid environments
4. Innovative detection and analysis methods for contaminants in soil, water, and air *in situ* or in the laboratory
5. Rates and magnitude of fundamental soil, water, and atmospheric processes in extreme environments as they affect the fate and transport of natural substances and contaminants
6. Development of computational approaches to evaluating the nature, reactivity, fate, and transport of trace metals and organic compounds in the environment
7. Development of innovative sampling methods and protocols for contaminants in environmental media (i.e. soil, water, air)
8. Application of informatics and knowledge management principles, practice, and techniques to natural product and contaminant fate and transport assessment and management in the environment

E. Maneuver Support and Sustainment Technical Area (CRREL-5)

This technical area encompasses research and development that combines research and practice to develop innovative solutions for challenging problems in a wide variety of environments. These environments include temperate and extreme conditions and remote sites, such as the Polar Regions. Operations, logistics, and support needs in challenging environments are expensive, highly complex, and extend beyond the state of current technology. This research also focuses on technologies to optimize vehicle mobility in a variety of developed and undeveloped terrains in all seasons. The research needs require development of engineering principles for force projection airfields in remote-austere environments and the sustainment of operational capabilities in remote, extreme cold regions. This includes manned and unmanned vehicle performance, all-season terrain mechanics, and characterizing and improving materials and engineered systems for all-season vehicle maneuver support. Technological capabilities include neural networks, expert systems, and smart technologies. These advancements permit modeling complex terrain behavior and provide new methods for solving problems that involve the mechanics of engineering materials.

Current efforts include working with small unmanned vehicles and developing an

understanding of complex vehicle-to-terrain interactions. In addition, the changing landscape of future conflicts requires new maneuver support research in nonlinear theater and urban environments. Consideration of vertical envelopment, inter-modal logistics, and environmental impacts are critical to real-time military planning. Other applications include instrumentation for measurement of porous media strength and permeability, specialized heavy-vehicle mobility instrumentation, and extreme cold hardened instrumentation and analyses packages. Military opportunities include developing the capability to prepare our expeditionary military for operations in harsh environments, which necessitates understanding austere logistics and its relationship to overall maneuver support.

Other work requires the development of logistics and transport models to accurately represent the adaptation of vehicles to challenging terrain conditions or the adaptation of the terrain itself. These models should predict the impact of “next generation” mobility technologies, and illustrate the cost/benefit return-on-investment and payback schedules for implementation of said technologies. Transport requirements also include the interaction of equipment, vessels and aircraft with changing ice conditions in the Polar Regions.

Contact: Dr. Bradley Guay, 603-646-4119. Specific research efforts are requested in the following areas:

1. All-season mobility modeling and field testing
2. All-season terramechanics modeling
3. All-season vehicle dynamics models
4. Vehicle simulation and visualization
5. Weather and vehicle interactions
6. Obscured environment (non-weather) and vehicle interactions
7. Cold Regions robotic vehicle performance
8. Cold Regions equipment design and engineering
9. Robust logistics analyses
10. Polar and austere environment engineering
11. Unpaved airfields
12. Implications of new vehicle technology
13. Environmental impact of vehicle operations

14. All-season air and ground vehicle operations

F. Cold Regions Infrastructure Technical Area (CRREL-6)

The Cold Regions Infrastructure technical area provides Cold Regions research and technology solutions for construction, operations, and maintenance of standard and strategic facilities worldwide. Key issues facing the DoD include 1) strategic national defense facilities will continue to be located in cold climate and remote locations; 2) critical defense facilities in remote locations require highly reliable transportation infrastructure including airfields to sustain all-weather and year-round operations; 3) most facilities are one-off standard designs and many facilities unique/prototypical designs, thus, performance criteria must be adapted to provide high reliability; 4) severe climate and lack of local infrastructure add significant costs to design, construct and sustain facilities, airfields and other transportation infrastructure in Cold Regions; and 5) *in situ* testing of operational facilities is expensive and acceptance criteria difficult to define.

The Cold Regions Infrastructure technical area is largely a Center of Excellence type activity with a primary mission of transferring knowledge and capability directly to individual users through technical support. Current focus is on providing services, often in partnership with USACE elements including Alaska District and New York District to agencies planning, constructing or operating facilities in winter environments. Research opportunities are leveraged with funding from other Federal agencies. Recent efforts have focused on technical support of the design, construction and operation of missile defense facilities in Alaska and National Science Foundation facilities in the Antarctica and the Arctic. Significant operational issues are solved and value engineering impacts related to building envelopes and airfields/pavements are realized. Other key military facility design and construction efforts have benefited from CRREL's Cold Regions infrastructure support in recent years. This has included work on military hospitals, flight simulators and strategic communications and surveillance facilities in cold regions where high interior humidity is required by users, but presents substantial building operational challenges in cold regions.

Thawing frozen ground in the Earth's Arctic Regions will be a formidable infrastructure challenge in the coming decades. New requirements stem from the necessity to adapt to a climate variability in the Polar Regions. Most current infrastructure design requirements are dated and no longer produce serviceable design lives for foundations, transportation facilities, and structures in these changing environments. Much of the technology adapted for use in the oil and gas industry in the 1970's is outdated. Virtually all new infrastructure projects need development of new requirements documents and technically advanced designs that operate well above the current minimum standards.

Contact: Dr. Bradley Guay, 603-646-4119. Specific research efforts are requested in the following areas:

1. All-season airfields and pavements models

2. All-season geomaterials modeling and stabilization
3. All-season pavement testing and evaluation
4. Building envelopes in Cold regions facilities
5. Environmental loads and design criteria for facilities
6. Utilities and heat storage in Cold regions facilities
7. Permafrost engineering
8. Polar engineering
9. Low temperature concrete admixtures and placement
10. Novel materials for Cold regions infrastructure

G. Water Resources Geospatial Applications Technical Area (CRREL-7)

The Water Resources Geospatial Applications technical area conducts research to improve data collection, analyses, and decision support through appropriate use of remote sensing and geographic information systems (GIS) technologies and applications. The direct and reimbursable support to the research in this technical area results in the development of software tools and methods to improve the use of geospatial technologies across all Corps business areas to effectively manage water resources, emergency situations, real estate, environmental restoration, regulatory, navigation and operations projects and programs.

These technologies are being used to support stability, reconstruction, and homeland security operations, develop sound water resources solutions, and enhance life-cycle infrastructure management. The dedicated, highly technical staff has multidisciplinary expertise, which has allowed them to develop advanced hardware and software resources to provide around-the-clock database and application support. These developments have led to geospatial tools for data management and decision support for USACE Enterprise GIS, the Corps Water Management System, the Formerly Used Defense Sites Program, the Iraq Reconstruction Tracking System, Emergency Management (EngLink), the Wetlands Regulatory Program, and the Defense Installation Spatial Data Infrastructure Strategic Viewer. Customer breadth and satisfaction with these products is demonstrated by steadily increasing funding for this research area, projects of larger scope, and an expanding customer base (e.g., moving from primarily Civil Works Corps of Engineers applications to larger DoD and other nationwide projects). The approach of this technical area has led to a demonstrated unique capability to deliver operational geospatial information systems, which are fully extensible and transferable across functional areas.

Contact: Mr. Timothy Pangburn, 603-646-4296. Specific research efforts are requested in the following areas:

1. Geostatistical methods for accuracy assessment of derived geospatial information
2. Real-time precipitation and snowmelt runoff prediction through integration of remote sensing and GIS technologies
3. Remote sensing to collect and analyze airborne electromagnetic Arctic sea ice thickness data relevant to climatic change
4. GIS technologies for environmental and water resources applications
5. Geospatial decision support systems
6. Wetlands delineation

H. Hydrology and Hydraulics Technical Area (CRREL-8)

Research activities in the Hydrology and Hydraulics technical area address the fundamental aspects of Cold regions hydrology and hydraulics. Specifically, this area includes direct and reimbursable research characterizing winter impacts on operation and management of Corps structures; ice jam mitigation measures and emergency operations; geospatial distribution and water equivalent estimation of snow pack; volume and timing of snowmelt soil infiltration and runoff; water quality, ecosystem restoration and environmental remediation in Cold regions; and watershed and basin water management, hazard mitigation, and methodologies for regional watershed/water resources management systems in regions affected by seasonal dynamics.

Products in this technical area directly support USACE water resources, environment, homeland security, and warfighting missions through support of flood damage reduction, navigation, ecosystem restoration, water supply, recreation, hydroelectric power, shore protection, regulatory, and environmental stewardship. This technical area has demonstrated a unique ability to align snow and ice science and engineering with operational needs to develop effective tools for direct operational use in both civil and military applications. The Hydrology and Hydraulics technical area is a unique niche within DoD and includes national and international experts in snowmelt hydrology, ice engineering, combined with extensive experience in hydrologic analyses and regional watershed and basin management.

Contact: Mr. Timothy Pangburn, 603-646-4296. Specific research efforts are requested in the following areas:

1. Hydraulics, hydrology, and sediment transport in Cold Regions
2. Wetlands and winter ecology
3. Runoff and sediment yield of glacierized basins

4. Rapid flood control structure assessment
5. Ice scour around bridge piers
6. Cold Regions coastal shoreline protection

TOPOGRAPHIC ENGINEERING CENTER (TEC)

TOPOGRAPHY, IMAGERY AND GEOSPATIAL (TIG) RESEARCH DIVISION Geospatial Applications Branch

I. Introduction

Conducts research and development in surveying and mapping to include the Global Positioning System (GPS), hydrographic surveys, and dam and lock measurement. Use remote sensing as well as field and laboratory research to study spectral reflectance, luminescence and emittance for civil and military applications.

Surveying and Mapping

TEC serves as the USACE Survey Engineering and Mapping Center of Expertise to provide consistency of surveying and mapping products and to maintain the capability to manage complex, nation-wide survey systems, such as differential Global Positioning System networks, and structural deformation/monitoring systems. The emphasis is on research to develop new techniques, equipment and procedures for surveying and mapping in support of USACE Civil Works, Military applications, Environmental Restoration and Military Construction applications; and transfers new technology to USACE districts and divisions through reimbursable consulting, training, and standards development.

II. Research Areas

A. Datums (TEC-1)

TEC seeks further analysis of geodetic vertical datum and benchmark stability, and optimum methods to monitor unstable networks relative to stable references over 100 miles away. (Contact Mr. James Garster, 703-428-9026)

The object is to develop new techniques, methods, and procedures for determining the precise position of points on the ground using existing or developing Positioning/Navigation (POS/NAV) equipment. New equipment is developed based on the integration of several new or developing POS/NAV sensors in order to meet Corps Civil Works requirements and Field

Military needs.

B. Hydrographic Surveying (TEC-2)

The object of this research is to improve or develop new techniques, methods and procedures for determining the position of surface and subsurface objects and the depth of the bottom of harbors, lakes, and rivers. Researchers provide precise locations using new or existing hardware or suites of hardware. In addition, users need improved capabilities to remotely determine the geotechnical characteristics of river bottom sediments and their distribution. (Contact Dr. Robert Mann, 703-428-6819)

C. Deformation (TEC-3)

The object is to improve or develop new techniques, methods and procedures for measuring and monitoring the deformation of structures such as dams, locks, levees, etc. Researchers provide precise locations and changes in structures using new or existing hardware or suites of hardware. (Contact Mr. James Eichholz, 703-428-3605)

D. Database Development (TEC-4)

The object is to provide technical leadership to Corps districts and division and support to HQ USACE in the definition and establishment of Geospatial data standards, plans, policies, and procedures. In this research area TEC identifies, develops, analyzes, reviews, and evaluates applications and technologies that manipulate and process varying levels of topographic and hydrographic geospatial information. TEC seeks new or existing database manipulation techniques, methods and procedures to manage information on Corps projects, dams, river charts, harbors and other information of interest to the Corps Districts, Division, Military Engineers and national emergency and defense objectives. Investigations include the use of information from new terrain sensors such as IFSAR and LIDAR to populate databases. Activities also include data dissemination approaches and system development using Web-based GIS and map applications. (Contact Mr. Anthony Niles, 703-428-6816)

II. Research Areas

A. Imaging/Spectral Research (TEC-5)

The objective is to conduct research in remote sensing as well as field and laboratory research to determine relations between earth surface components, target/background characteristics, and their imaged patterns or spectral reflectance, luminescence, and emittance values as recorded by airborne or satellite remote sensing systems. This activity may include (through synthesis chemistry) the development of optical labels or taggants to be

used in active or passive systems for synoptic or integrated into distributed sensors arrays. These taggants may be organic or inorganic as driven by the need and target detection (e.g., quantum materials like semiconductors or organic fluorophores). (Contact Dr. John Anderson, 703-428-6698)

Data Representation Branch

II. Research Areas

A. Rendering and Display (TEC-6)

The object is to develop new capabilities and techniques for rendering and displaying terrain and environment information.

B. Integration and Exploitation (TEC-7)

The object is to develop techniques for integration and exploitation of digital topographic databases, aerial and satellite imagery, 3-D solids models and network-based geospatial information to produce computer generated images and future map representations.

C. Terrain Evaluation and Reasoning (TEC-8)

The object is to develop new terrain evaluation and terrain reasoning capabilities to provide the war fighter with improved situation awareness.

D. Battlefield Terrain and Environment (TEC-9)

The object is to provide the Army/DoD with advanced techniques for merging, visualizing, and analyzing battlefield terrain and environment information.

E. Application of Results (TEC-10)

The object is to develop better means of applying results of research to battlefield operations, military crisis support, and infrastructure problems. (Contact Mr. Vineet Gupta, 703-428-6838)

Data and Signature Analysis Branch

I. Introduction

Conducts research in remote sensing as well as field and laboratory research to determine relations between earth surface components, target/background characteristics, and their imaged patterns or measured spectral signatures (as recorded by airborne or satellite remote sensing systems. Explores and develops methods and processes that exploit geospatial information to enhance understanding of battlespace environmental effects on missions across the spectrum of

military operations.

II. Research Areas

A. Terrain Reasoning (TEC-11)

The object is to conduct terrain-reasoning research, which evaluates dynamic terrain controls on military functions of a force/unit/warfighter (multi-echelon) in a mission context.

B. Decision Support Tools (TEC-12)

The object is the development of a comprehensive suite of Physical Combat Environment Decision Support Tools that exploits the geospatial context of battlespace environmental information necessary to support the decision and execution process across military systems and platforms of existing forces, the Objective Force and Future Combat Systems. (Contact Dr. Robert Mann, 703-428-6735)

Information Generation and Management Branch

I. Introduction

Conducts research of techniques, equipment, and systems for creating and maintaining spatial data bases from remotely sensed imagery, remotely placed sensors, automatic data processing and interpretation systems (e.g., geotext), and other environmental data resources (e.g., web). Develops techniques and methodologies for storing, retrieving, manipulating, analyzing, visualizing, and disseminating these data for use in a broad range of military and civil applications. Conducts research in the areas of geospatial information exploitation, management and dissemination to provide the war fighter with improved intelligence, command and control (C2) and targeting. Develops new methods for displaying data; for graphical user interfaces; for controlling sensors or displaying sensor output. Monitors and evaluates government and industry developments in the areas of spatial data bases generation technologies and geographic information processing.

II. Research Areas

A. Spatial Data Bases (TEC-13)

The object is to conduct research on techniques and equipment for the modeling, representation, and structuring of data in spatial data bases, including temporal properties. Input information can be derived from remotely sensed imagery, terrestrial sensors, or existing terrain/environmental data. Investigate tools for the generation and exploitation of metadata. Extend the capabilities of GIS data structures to more robustly accommodate 3-D and temporal data. Conduct research and develop tools to extend capabilities of wireless disconnected construction, update, and maintenance of geospatial data.

B. Data Manipulation (TEC-14)

The object is to develop techniques and methodologies for storing, retrieving, manipulating, and disseminating terrain data for use in a broad range of military and civil applications. Techniques are needed for managing, comparing, and fusing data from multiple sources. Assess the contribution of data derived from variable sources and with differing levels of certainty. Investigate Extract/Load/Transform (ELT) technologies for data reformatting, as well as the use of Application Programmer Interfaces (API) and web services for data access and manipulation. Input data can be vector data, elevation data, intelligence data, imagery, or a combination of the above.

C. Geospatial Information Exploitation (TEC-15)

The object is to conduct research in the areas of geospatial information exploitation, management and dissemination to provide the war fighter with improved intelligence, command and control (C2) and targeting. Geospatial data is acquired via direct remote measurement and/or estimation through modeling approaches with emphasis placed on exploitation/integration using existing commercial off the shelf technology. Research includes the application of future smart sensors that process and interpret collected data onboard before providing end user data.

D. Government and Industry Developments (TEC-16)

The object is to evaluate government and industry developments in the areas of spatial data base generation technologies and geographic information processing.

E. Data Generation (TEC-17)

The object is to conduct research or develop techniques to perform automated/semi-automated extraction of terrain data from remotely sensed imagery, maps, or from direct measurement. Techniques can be based on single or multiple sources. If using multiple sources, fusion issues should be addressed.

F. Spatial Data Mining and Spatial Analysis (TEC-18)

The object is to conduct research and develop tools to use the techniques of spatial data or of spatial analysis on information from a wide variety of terrain, intelligence, environmental, and cultural sources for the purpose of discovering, quantifying, and developing spatial relationships among terrain entities. These relationships can be used for prediction, error detection, and validation of terrain features and attributes. Map algebra techniques and measures for characterizing spatial phenomena are needed, as well as new/improved algorithms for determining suitability, proximity, connectivity, and visibility. Another objective is to utilize the spatio-temporal aspects of terrain, intelligence, environmental, and cultural information to help uncover relationships that can be used to characterize, analyze, and predict human activities.

G. Geospatial Communications (TEC-19)

The object is to conduct research and development on techniques, equipment, and systems for communicating geospatial information among sensors, peers, networks, spatial data bases, and enterprise geographic information systems. There is a need to develop solutions that work on currently fielded or soon-to-be deployed Army tactical networks, across multiple security levels. Research is needed to develop new methods for displaying dynamic data crossing tactical networks, and for graphical user interfaces for controlling sensors and their data across networks.

H. Data Representation (TEC-20)

The objective is to conduct research and development of techniques and methodologies for representing, compressing, or decompressing terrain data. Input can be existing data products or remotely sensed data.

I. Spatial and Temporal Sensor Issues (TEC-21)

The objective is to conduct research and development into techniques and methodologies of sampling and transmitting remotely sensed data having a spatial and/or temporal component. Techniques are needed to analyze sensor signals at (x,y,z,t) and to infer additional information. Input can be from a single sensor or a network of sensors.

J. Image Registration (TEC-22)

The objective is to conduct research and development into techniques to compare imagery and/or remotely sensed terrain data from multiple sources in order to improve spatial registration.

K. Photogrammetric processing software tools (TEC-23)

The objective is to conduct research and development into photogrammetric processing software tools and techniques for selected tactical sensors.

L. Visualization (TEC-24)

The objective is to conduct research and development on techniques, equipment, and systems for visualizing geospatial information. Research will establish design principles and practices for the display of 2-dimensional, 3-dimensional, and temporal data in hardcopy and digital environments. Research will include the investigation of simulation and animation techniques. Physical modeling techniques, as well as digital visualizations, will be evaluated. (Contact Ms. Valerie Carney, 703-428-6840)

M. Geosparing (TEC-25)

The objective is to conduct research and development in the extraction and geotagging of place names in text documents. Research will develop geo-specific approaches to improve precision and recall measures for extracted names. Research will also include the

development of innovative techniques for visualizing the linkage between the original text and the extracted names, correcting errors in extracted names, and utilizing geotagged place names in Geographic Information Systems (GIS).

N. Research Techniques to Display, Fuse, and Exploit Cultural Information for Warfighter Missions (TEC-26)

The objective is to conduct research and development in the display, fusion, and exploitation of the cultural aspects of the mission space. Research will develop analyses, methods, and tools for identifying and understanding critical relationships between people, natural features, and the man-made setting. "Critical" is understood to mean those factors which directly or indirectly impact the success of a mission.

TOPOGRAPHY, IMAGERY AND GEOSPATIAL SYSTEMS DIVISION

Topographic Systems Branch

I. Introduction

Conducts acquisition, testing, and fielding of topographic systems and digital reproduction systems until handoff to the appropriate Readiness Command. After handoff, provides technical support for production engineering to the Readiness Command that is serving in the role of system/item manager. Evaluates currently available commercial topographic equipment for military adaptation in support of force modernization. Provides Technical Data Package maintenance of topographic and related equipment in support of spare/repair parts and obsolete component procurements by the Readiness Command. Provides a standardization function through the maintenance of Performance Specifications, Commercial Item Descriptions and topographic related Sets, Kits and Outfits. Conducts and assists in the fielding of topographic equipment.

II. Research Areas

A. Acquisition, Testing, and Fielding (TEC-27)

The object is to conduct research that will improve the efficiency and quality of acquiring, testing, and fielding topographic systems and digital reproduction systems, thereby facilitating more rapid handoff to appropriate Readiness Command.

B. Systems Evaluation (TEC-28)

The object is to conduct research that will improve speed, quality, and efficiency of evaluation of currently available commercial topographic equipment for military adaptation in support of force modernization.

D. Technical Data Package Maintenance (TEC-29)

The object is to conduct research to more effectively provide Technical Data Package maintenance of topographic and related equipment in support of spare/repair parts and obsolete component procurements by the Readiness Command.

E. Standardization (TEC-30)

The object is to conduct research to improve the standardization function in the maintenance of Performance Specifications, Commercial Item Descriptions and topographic related Sets, Kits and Outfits. (Contact Mr. Mark Hainsey, 703-428-6734)

Imagery Systems Branch

I. Introduction

Conducts advanced and engineering development and provides support for fielding, operations and maintenance of space- related, ground-based Army Tactical Exploitation of National Capabilities (TENCAP) systems. Serves as the TEC interface to the Army Space Programs Office (ASPO). Provides engineering and program management support and consultation to ASPO and other Army organizations to include identification of emerging technologies and new concepts that have potential application to ASPO/TENCAP systems implementations. Interfaces with elements of the National Imagery Intelligence community dealing with imagery systems and imagery architectures.

II. Research Areas

A. Advanced and Engineering Development (TEC-31)

The object is to conduct research on space- and ground-based imagery systems and architectures, along with development of support systems for their fielding, operations, and maintenance.

B. Emerging Technologies and New Concepts – ASPO/TENCAP (TEC-32)

The object is to conduct research and development in engineering to support the Army Space Programs Office (ASPO) and other Army organizations in the identification of emerging technologies and new concepts that have potential application to ASPO/TENCAP systems implementations. (Contact Mr. Matthew Cro, 703-428-6965)

Force Projection Branch

I. Introduction

Conducts research and development in the areas of imagery exploitation, digital image acquisition, processing, and dissemination, and intelligence data exploitation architectures in

support of Army/DoD space and Intelligence and Electronic Warfare (IEW) programs. Develops and demonstrates capabilities to support improvements in the Army's/DoD's ability to conduct surveillance, target acquisition, strike planning, weapons delivery and battle damage assessments in support of precision strike, early entry and depth and simultaneous attack operations. Integrates and demonstrates technologies to improve the representation of realistic synthetic environments in Army and Joint simulations. Provides technical, administrative and program management support required to execute the space, intelligence and topographic programs assigned by TEC, the Army and DoD.

II. Research Areas

A. Imagery Exploitation (TEC-33)

The object is to conduct research and development in the areas of imagery exploitation, digital image acquisition, processing, and dissemination, and intelligence data exploitation architectures in support of Army/DoD space and Intelligence and Electronic Warfare (IEW) programs.

B. Surveillance (TEC-34)

The object is to conduct research supporting improvements in the Army's/DoD's ability to conduct surveillance, target acquisition, strike planning, weapons delivery and battle damage assessments in support of precision strike, early entry and depth and simultaneous attack operations.

C. Army and Joint Simulations (TEC-35)

The object is to integrate and demonstrate technologies to improve the representation of realistic synthetic environments in Army and Joint simulations.

TOPOGRAPHY, IMAGERY AND GEOSPATIAL OPERATIONS DIVISION Geospatial Information and Imagery (GII) Requirements Branch

I. Introduction

Research is required in areas related to the use of geospatial information in Army applications to include modeling & simulation, command and control systems and weapon systems. Topics of interest include issues associated with data accuracy and its effect on the reliability of tactical decision aids; data integrity issues that include collection and use of information from sources of differing dates and geometry; sensitivity of tactical decision aids to variations in quality of input data; presentation of confidence information associated with tactical decision aids; flexible decision aids that accommodate input data of varying levels of density and completeness; and tools that facilitate integration of information from dissimilar sources. In addition, means of symbolizing and displaying vector topographic data as a map background is of interest.

II. Research Areas

A. Data Accuracy (TEC-36)

Research is directed toward knowledge that will improve our ability to incorporate data accuracy in tactical decision aids.

B. Data Integrity (TEC-37)

Specific area of required research includes techniques to automatically identify content, currency and accuracy of information in a data set.

C. Presentation of Confidence Information (TEC-38)

Research is required to convey the degree of confidence that a user should place in a derived tactical decision aid.

D. Flexible Tactical Decision Aids (TEC-39)

Research is directed towards processes that will allow a tactical decision aid to “gracefully degrade” based upon the fidelity of information that is available at the time. Includes research to “fill in information voids” with the best available information.

E. Data Fusion (TEC-40)

Research is focused on techniques and procedures to reconcile differences in source data sets due to accuracy, quality, content, nomenclature, completeness, source date, compilation date, etc.

F. Vector Map Background Display (TEC-41)

Research is required in design of map background symbols and display characteristics that retain interpretability at multiple display resolutions. (Contact Mr. Steve Bolduc, 703-428-6748)

Analytical Services Branch

I. Introduction

Oversees the Operations Division’s modernization efforts. Assesses, develops, integrates, and trains solutions and improvements to the Operations Division’s collection, management, production, and dissemination of products and services. Evaluates, develops and integrates hardware, software and techniques into the Division’s information and production systems. Manages and maintains the Division’s automated information systems. Manages and maintains TEC’s classified network systems. Manages and maintains TEC’s secure information assurance program. Acts as the Information Assurance Manager for the USACE DODIIS Site and its multiple locations. Provides miscellaneous cartographic and publishing technical services to all Operations Division projects and programs.

II. Research Areas

A. Modernization of Operations Division activities (TEC-42)

The object is to conduct research on advanced methods of collections, management, production, and dissemination of geospatial and imagery information.

B. Manage Classified Information Systems (TEC-43)

The object is to conduct research on advanced information management, network management, database management, and information assurance technologies.

C. Cartographic Technical Services (TEC-44)

The object is to conduct research on advanced electronic publishing, editing, printing, scanning and cartographic support equipment, techniques, and management.

D. Modeling & Simulation Terrain Database Production (TEC-45)

The object is to conduct research on advanced techniques for the production of modeling and simulation runtime terrain databases and semi-automated forces runtime databases. (Contact Mark Weipert, 703-428-6955)

Hydrologic and Environmental Analysis Branch

I. Introduction

Serves as DoD's primary agent for military hydrologic analysis and water detection. Prepares water resources analyses to support DoD and DA planning, training, and operations. Manages the DoD Water Detection Response Team in support of all DoD well drilling operations. Produces reimbursable studies to support DoD, DA, and Corps environmental remediation and compliance efforts.

II. Research Areas

A. Military Hydrology and Water Detection (TEC-46)

The object is to conduct research studies in military hydrology and water detection. Research includes development of advanced methods of water detection and hydrologic analysis, including improved methods of integrating new information with existing data systems in support of DoD, DA, and Corps planning, training, and operations.

B. Water Detection and Drilling Management (TEC-47)

The object is to conduct research into more efficient and capable management of DoD Water Detection Response Team and other functions in support of all DoD well drilling operations. Research includes methods of improving support to DoD, DA, and Corps environmental remediation and compliance efforts. (Contact Laura Dwyer, 703-428-6895)

Terrain Analysis Branch

I. Introduction

Serves as the Department of the Army's primary agent for terrain analysis. Meets high-priority requirements validated by DA from Army components of Unified Combatant Commands for terrain analysis including urban, and tactical and country-scale mobility/counter mobility products and services. Serves as TEC's management focus for current operational support and civil works emergency operations.

II. Research Areas

A. Terrain Analysis (TEC-48)

The object is to conduct research into terrain analysis techniques and standards, and in their application to development of urban and mobility/counter mobility products and services.

B. Current Operational Support and Emergency Operations (TEC-49)

The object is to conduct research in information management as it relates to military crisis support and civil emergency operations. (Contact Glenn Frano, 703-428-8351)

Information Services Branch

I. Introduction

Collects, maintains, manages, and disseminates geospatial information and imagery from multiple sources, to support analyses at TEC and elsewhere within Army. Serves as the Acquisition Monitor for the Army's Commercial and Civil Imagery Programs.

II. Research Areas

A. Geospatial Information (TEC-50)

The object is to conduct research into improved methods of collection, maintenance, management, and dissemination of geospatial information and imagery from multiple sources.

B. Acquisition Monitoring (TEC-51)

The object is to conduct research into better means of monitoring imagery acquisition for purposes of serving the Army's Commercial and Civil Imagery Programs. (Contact Mary Pat Santoro, 703-428-6903)

Research includes development of advanced methods of water detection and hydrologic analysis, including improved methods of integrating new information with existing data systems in support of DoD, DA, and Corps planning, training, and operations.

C. Water Detection and Drilling Management (TEC-52)

The object is to conduct research into more efficient and capable management of DoD

Water Detection Response Team and other functions in support of all DoD well drilling operations. Research includes methods of improving support to DoD, DA, and Corps environmental remediation and compliance efforts. (Contact Laura Dwyer, 703-428-6895)

PART II

PRE-PROPOSAL AND PROPOSAL EVALUATION

A. Upon receipt of a pre-proposal (not to exceed 5 pages), the ERDC staff will perform an initial review of its scientific merit and potential contribution to the Army mission and also determine if funds are expected to be available for the effort. Offerors of pre-proposals which show merit and are of interest to the ERDC will be encouraged to submit a full proposal (in the format outlined in Part III) and these proposals will be evaluated in accordance with the criteria detailed below:

B. Proposals submitted in response to this BAA which result in the award of a contract instrument will be evaluated as received using the following factors/criteria:

1. The overall scientific and/or technical merits of the proposal.
2. The potential contributions of the effort to the ERDC mission.
3. The offeror's capabilities, related experience, facilities, techniques, or unique combinations of these; which are integral factors for achieving the proposal's objectives.
4. The qualifications, capabilities, and experiences of the proposed principal investigator, team leader, and other key personnel who are critical to achievement of the proposal's objectives.
5. The reasonableness and realism of proposed costs and fee, if any, and the availability of funds.
5. Past Performance.

C. For grants and cooperative agreements, the two principal selection criteria, unless statute provides otherwise, will be: (1) the technical merits of the proposed research and development, and (2) the potential relationship of the proposed research and development to Department of Defense missions.

D. Pre-proposals and proposals not considered having sufficient scientific merit or relevance to the Army's needs or those in areas for which funds are not expected to be available may be declined.

PART III

PRE-PROPOSAL AND PROPOSAL PREPARATION

SECTION 1 - INTRODUCTION

This part is intended to provide information needed in preparing research proposals for submission to ERDC.

All offerors must be registered in the Central Contractor Registration (CCR) system at www.ccr.gov before award can be made.

Proposals should include details on expected use of the DoD High Performance Computing (HPC) Center systems.

Applicants for grants and cooperative agreements must also provide their DUNS number (Duns and Bradstreet Data Universal Numbering System).

Organizations or individuals interested in submitting research proposals to ERDC are encouraged to make preliminary inquiries as to the general need for the type of research effort contemplated before expending extensive effort in preparing a detailed research proposal or submitting proprietary information. Points of contact are listed with the specific research areas for each laboratory. The research proposal often represents a substantial investment of time and effort by the offeror, and it should present the proposed research effort in sufficient detail to allow ERDC to evaluate the scientific merit and relevance of the proposed research and to determine funding availability.

Pre-proposals and proposals must reference the code number for the specific research area (e.g., CHL-1, CRREL-10, CERL-15).

If the Contractor anticipates the efforts of foreign nationals on any proposal submitted hereunder, he must provide their name, nationality, and extent of involvement in the proposed research. Foreign nationals cannot work under a contract or any instrument unless all ERDC-required security clearances and approvals have been obtained. Security requirements are further addressed in Attachment A, Fixed Price Contracts, FAR/DFARS Contract Clauses and Attachment B, Cost-Reimbursable Contracts, FAR/DFARS Contract Clauses. There is no exception to these requirements.

Note that no funds available to the Department of Defense may be provided to any institution of higher education that either has a policy of denying or that effectively prevents the Secretary of Defense from obtaining, for military recruiting purposes, entry to campuses or access to students on campuses or access to directory information pertaining to students.

Note that there is a new requirement for contractor reporting if the contract is funded with military funds. The below info is provided for your assistance in complying. At the website listed, there are FAQs you may also find helpful.

“The Office of the Assistant Secretary of the Army (Manpower & Reserve Affairs) operates and maintains a secure Army data collection site where the contractor will report ALL contractor manpower (including subcontractor manpower) required for performance of this contract. The contractor is required to completely fill in all the information in the format using the following web address: <https://contractormanpower.army.pentagon.mil>. The required information includes: (1) Contracting Office, Contracting Officer, Contracting Officer’s Technical Representative; (2) Contract number, including task and delivery order number; (3) Beginning and ending dates covered by reporting period; (4) Contractor name, address, phone number, e-mail address, identity of contractor employee entering data; (5) Estimated direct labor hours (including sub-contractors); (6) Estimated direct labor dollars paid this reporting period (including sub-contractors); (7) Total payments (including sub-contractors); (8) Predominant Federal Service Code (FSC) reflecting services provided by contractor (and separate predominant FSC for each sub-contractor if different); (9) Estimated data collection cost; (10) Organizational title associated with the Unit Identification Code (UIC) for the Army Requiring Activity (the Army Requiring Activity is responsible for providing the contractor with its UIC for the purposes of reporting this information); (11) Locations where contractor and sub-contractors perform the work (specified by zip code in the United States and nearest city, country, when in an overseas location, using standardized nomenclature provided on website); (12) Presence of deployment or contingency contract language; and (13) Number of contractor and sub-contractor employees deployed in theater this reporting period (by country). As part of its submission, the contractor will also provide the estimated total cost (if any) incurred to comply with this reporting requirement. Reporting period will be the period of performance not to exceed 12 months ending 30 September of each government fiscal year and must be reported by 31 October of each calendar year. Contractors may use a direct XML data transfer to the database server or fill in the fields on the website. The XML direct transfer is a format for transferring files from a contractor’s systems to the secure web site without the need for separate data entries for each required data element at the web site. The specific formats for the XML direct transfer may be downloaded from the web site.”

SECTION 2 - GENERAL INFORMATION

A. AWARDS:

With the submittal of all required information as described herein and the favorable evaluation of your proposal, the Government may unilaterally make award; therefore, it is in the Contractor’s best interest to review all requirements listed within. Note that contract clauses are self-deleting; therefore, there is neither a requirement nor need for a modification to the award if any clause is found not applicable. Performance after the receipt of an award signed by the Contracting Officer indicates your full acceptance of all terms and conditions within the award.

Awards will be made on SF-33, SF-26, DD-1155, or other document as appropriate. Offerors shall provide a completed Attachment C with their technical and cost proposals. Awards will consist of all applicable clauses and contracts shall be in accordance with the Uniform Contract Format (UCF), which follows:

SECTION A- SOLICITATION/CONTRACT FORM SF 33

SECTION B- SUPPLIES OR SERVICES AND PRICES/COST

ITEM 1- Perform all work necessary for research and development efforts in accordance with Contractor's proposal dated _____, entitled _____, submitted under BAA Topic No. _____.

SECTION C- DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK

SECTION D (Packaging and Marking)

SECTION E (Inspection and Acceptance)

SECTION F (Deliveries or Performance)

SECTION G (Contract Administration Data)

SECTION H (Special Contract Requirements)

SECTION I (Contract Clauses). Note: If award is made unilaterally, offeror agrees to clauses mentioned within this BAA for their particular contract type.

SECTION K (Representations, Certifications, and Other Statements of Offerors) SEE ATTACHMENT C OF THIS BAA. ATTACHMENT C MUST BE COMPLETED BY EACH OFFEROR AND SUBMITTED WITH EACH PROPOSAL

SECTION L (Instructions, Conditions, and Notices to Offerors or Respondents) is included within this BAA solicitation

SECTION M (Evaluation Factors for Award)- is the evaluation criteria listed in Part II of this BAA.

B. REPORT REQUIREMENTS:

The number and types of reports will be specified in the contractual document. The reports will be prepared and submitted in accordance with ERDC report procedures which will be provided to the awardees.

C. PROPOSAL PREPARATION AND SUBMISSION:

Proposals should be submitted with a completed Attachment C, as stated in paragraph A of this Section 2, and also a signed and dated SF-33 (available at [http://contacts.gsa.gov/webforms.nsf/0/884DE4C90A9F054C85256A1F005ABDB1/\\$file/sf33.pdf](http://contacts.gsa.gov/webforms.nsf/0/884DE4C90A9F054C85256A1F005ABDB1/$file/sf33.pdf). For grants and cooperative agreements, use the SF-424 located at [http://contacts.gsa.gov/webforms.nsf/0/B835648D66D1B8F985256A72004C58C2/\\$file/sf424.pdf](http://contacts.gsa.gov/webforms.nsf/0/B835648D66D1B8F985256A72004C58C2/$file/sf424.pdf).

In preparing pre-proposals and proposals it is important that the offeror keep in mind the characteristics of a suitable proposal acceptable for formal evaluation. It should include all the information specified in this announcement in order to avoid delays in evaluation. Pre-proposals will be responded to within 60 days of receipt, either encouraging submission of a complete proposal or advising the offeror not to submit. Contract award may be made electronically. Offerors are requested to provide their e-mail address upon submission of proposal and also the name, address, and phone number of their cognizant Defense Contract Audit Agency (DCAA) office, if known.

Pre-proposals and proposals for CHL, GSL, EL, and ITL regarding this BAA should be submitted either to email Chelsea.M.Whitten@usace.army.mil or to:

U. S. Army Corps of Engineers
ERDC Contracting Office (ECO)
Attn: CEERD-CT
3909 Halls Ferry Road
Vicksburg, MS 39180-6199

For inquiries, please contact Chelsea M. Whitten via email or via phone at 601-634-4072.

CRREL's pre-proposals and proposals regarding this BAA should be submitted either to email Lou.Ann.Duffy@usace.army.mil or to:

U. S. Army Corps of Engineers, Engineer Research and Development Center
Cold Regions Research and Engineering Laboratory
Attn: Contracts Office
72 Lyme Road
Hanover, New Hampshire 03755-1290

For inquiries, please contact Lou Ann Duffy via email or via phone at 603-646-4280.

CERL's pre-proposals and proposals regarding this BAA should be submitted either to email John.H.Akin@usace.army.mil or to Rita.S.Brooks@usace.army.mil or to:

U. S. Army Corps of Engineers, Engineer Research and Development Center
Construction Engineering Research Laboratory
Attn: Contracts Office
P. O. Box 9005
Champaign, Illinois 61826-9005

-OR 2902 Newmark Drive
Champaign, Illinois 61822-1076

For inquiries, please contact John Akin via email or via phone at 217-373-4490, or Rita Brooks via email or via phone at 217-373-7280.

TEC's pre-proposals and proposals regarding this BAA should be submitted either to email Nilda.Lugo@usace.army.mil or to:

U. S. Army Corps of Engineers, Engineer Research and Development Center
Topographic Engineering Center
Attn: Contracts Office
7701 Telegraph Rd., P. O. Box 9005
Alexandria, VA 22315-3802

For inquiries, please contact Nilda Lugo via email or via phone at 703-428-6272.

SECTION 3 - TYPE OF CONTRACT

Selection of the type of contract is based upon various factors, such as the type of research to be performed, the contractor's experience in maintaining cost records, and the ability to detail and allocate proposed costs and performance of the work.

A document commonly used because of its suitability in supporting research is a cost-reimbursable type contract. It permits some flexibility in the redirection of efforts due to recent research experiment results or changes in Army guidance.

Fixed-price contracts are used when the research projects costs can be estimated accurately, the services to be rendered are reasonably definite, and the amount of property, if any, is fixed. The negotiated price is not subject to any adjustment on the basis of the Contractor's cost experience in performing the contract.

Contracts awarded by ERDC will contain, where appropriate, detailed special provisions concerning patent rights, rights in technical data and computer software, reporting requirements, equal employment opportunity, etc.

This BAA affords the offeror the option of submitting proposals for the award of a contract, grant, cooperative agreement, or other transaction. However, the type of agreement may change based on the nature of the effort and as a result of negotiation.

SECTION 4 - CONTENTS OF PRE-PROPOSAL

Pre-proposals should be limited to a brief letter (not to exceed five pages) and state the Topic Number under which they are being submitted. Three copies are requested (unless proposal is emailed to CERL). The pre-proposal should contain the following: (in addition to the Representations and Certifications at Attachment C)

1. A title descriptive of the research to be performed.
2. The name and address of the individual, company or educational institution submitting the pre-proposal (to include the email address).

3. The name and phone number of the principal investigator or senior researcher who would be in charge of the project.
4. The duration of the project.
5. The detailed estimated cost (i.e., labor costs, material costs, burdens, etc.).
6. One or more paragraphs describing the objective(s) or goals of the proposed research to include statement of the working hypothesis to be proved or disproved, if appropriate.
7. One or more paragraphs describing the technical approach to be taken in the course of the research. If experimental, it should include a description of the scope of the testing program. If analytical, it should include key assumptions to be made, the scientific basis for the analysis, and the numerical procedures to be used.
8. One or more paragraphs describing the potential military and/or civil payoffs that might ultimately derive from the proposed research to the Corps of Engineers.
9. A one-page curriculum vitae of the principal investigator.

SECTION 5 - CONTENTS OF FULL PROPOSALS

Proposals should be furnished in three copies (unless emailed to CERL), state the Topic Number under which they are being submitted, and contain the following: (in addition to the Representations and Certifications at Attachment C)

TECHNICAL

The technical portion of the proposal should contain the following and any other information the offeror considers necessary to address the evaluation criteria mentioned in Part II:

1. A complete discussion stating the background and objectives of the proposed work, the approaches to be considered, the proposed level of effort, and the anticipated results/products, to include the proposed reports and deliverables to be furnished.
2. The names, brief biographical information, experience, and a list of recent publications of the offeror's key personnel who will be involved in the research.
3. The names of other agencies to which the proposal has also been submitted.
4. A brief description of offeror's organization, to include name, address, phone numbers, and email address.
5. Past performance information to include the name, address, point of contact, phone number, email address, contract identification number, contract award date and amount for a minimum of three (3) customers for whom the offeror has performed

similar services in the last three years.

COST

The cost portion of the proposal should contain a cost estimate for the proposed effort sufficiently detailed by element of cost for meaningful evaluation. The estimate should be detailed for each task of the proposed work and should include the following:

1. A complete detail of direct labor to include, by discipline, hours or percentage of time and salary.
2. Fringe benefits rate and base.
3. An itemized list of equipment showing cost of each item.
4. Description and cost of expendable supplies.
5. Complete detail of travel to include reason/need for travel, destination, airfare, per diem, rental car, etc.
6. Complete detail of any subcontracts.
7. Other direct costs (reproduction, computer, etc.).
8. Indirect cost rates and bases with an indication whether rates are fixed or provisional and the time frame to which they are applied.
9. Proposed fee, if any.
10. Any documentation which supports the above.
11. Offerors should furnish the name and telephone number of their cognizant audit agency.

FIXED PRICE CONTRACTS
FAR/DFARS CONTRACT CLAUSES

ALL APPLICABLE CLAUSES WILL BE INCORPORATED WITHIN THE AWARD DOCUMENTS.

The full text of a clause and its complete prescription may be accessed electronically at the FAR site (clauses beginning with "52.") at <http://www.arnet.gov/far/loadmain52.html> and the DFARS site (clauses beginning with "252.") at <http://www.acq.osd.mil/dp/dfars/tochtml.htm>

52.252-1, Solicitation Provisions Incorporated by Reference.
This solicitation incorporates one or more provisions by reference.

52.252-2 Clauses Incorporated by Reference.
This contract incorporates one or more clauses by reference.

Security Contract Language for all Corps of Engineers' Unclassified Contracts (PIL 2003-06, 19 Feb 03): All Contractor employees (U.S. citizens and Non- U.S. citizens) working under this contract (to include grants, cooperative agreements and task orders) who require access to Automated Information Systems (AIS), (stand alone computers, network computers/systems, e-mail) shall, at a minimum, be designated into an ADP-III position (non-sensitive) in accordance with DoD 5220-22-R, Industrial Security Regulation. The investigative requirements for an ADP-III position are a favorable National Agency Check (NAC), SF-85P, Public Trust Position. The contractor shall have each applicable employee complete a SF-85P and submit to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218) within three (3) working days after award of any contract or task order, and shall be submitted prior to the individual being permitted access to an AIS. Contractors that have a commercial or government entity (CAGE) Code and Facility Security Clearance through the Defense Security Service shall process the NACs and forward visit requests/results of NAC to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218). For those contractors that do not have a CAGE Code or Facility Security Clearance, the U. S. Army Engineer Research and Development Center Security Office, Vicksburg, MS, will process the investigation in coordination with the Contractor and contract employees.

In accordance with Engineering Regulation, ER 380-1-18, Section 4, foreign nationals who work on Corps of Engineers' contracts or task orders (or any instrument) shall be approved by the HQUSACE Foreign Disclosure Officer or higher before beginning work on the contract/task order. This regulation includes subcontractor employees. (NOTE: exceptions to the above requirement include foreign nationals who perform janitorial and/or ground maintenance services.) The contractor shall submit to the Division/District Contract Office, the names of all foreign nationals proposed for performance under this contract/task order, along with documentation to verify that he/she was legally admitted into the United States and has authority to work and/or go to school in the US. Such documentation may include a US

passport, Certificate of US citizenship (INS Form N-560 or N-561), Certificate of Naturalization (INS Form N-550 or N-570), foreign passport with I-551 stamp or attached INS Form I-94 indicating employment authorization, Alien Registration Receipt Card with photograph (INS Form I-151 or I-551), Temporary Resident Card (INS Form I-688), Employment Authorization Card (INS Form I-688A), Reentry Permit (INS Form I-327), Refugee Travel Document (INS Form I-571), Employment Authorization Document issued by the INS which contains a photograph (INS Form I-688B).

Classified contracts require the issuance of a DD Form 254 (Department of Defense Contract Security Classification Specification).

(End of Clause)

252.201-7000, Contracting Officer's Representative

52.202-1, Definitions, in solicitations and contracts that exceed the simplified acquisition threshold. The contracting officer may include additional definitions, provided they are consistent with the clause and the FAR.

52.203-3, Gratuities, in solicitations and contracts with a value exceeding the simplified acquisition threshold.

52.203-5, Covenant Against Contingent Fees, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.203-7, Anti-Kickback Procedures, in solicitations and contracts exceeding the simplified acquisition threshold.

252.203-7001, Prohibition on Persons Convicted of Fraud or Other Defense-Contract-Related Felonies, in all solicitations and contracts exceeding the simplified acquisition threshold.

252.203-7002, Display of DoD Hotline Poster, in solicitations and contracts expected to exceed \$5 million, except when performance will take place in a foreign country.

In solicitations and contracts that exceed the simplified acquisition threshold, insert the clauses at 52.203-8, Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity, and 52.203-10, Price or Fee Adjustment for Illegal or Improper Activity.

52.203-12, Limitation on Payments to Influence Certain Federal Transactions, shall be included in solicitations and contracts expected to exceed \$100,000.

52.204-2, Security Requirements, in solicitations and contracts when the contract may require access to classified information.

52.204-4, Printed or Copied Double-Sided on Recycled Paper, in solicitations and contracts that exceed the simplified acquisition threshold.

52.204-6, Data Universal Numbering System (DUNS) Number.

52.204-7 Central Contractor Registration, plus 252.204-7004 Alternate A instructs to substitute the following paragraph (a) for paragraph (a) of the clause at FAR 52.204-7:

(a) Definitions. As used in this clause--

“Central Contractor Registration (CCR) database” means the primary Government repository for contractor information required for the conduct of business with the Government.

“Commercial and Government Entity (CAGE) code” means—

(1) A code assigned by the Defense Logistics Information Service (DLIS) to identify a commercial or Government entity; or

(2) A code assigned by a member of the North Atlantic Treaty Organization that DLIS records and maintains in the CAGE master file. This type of code is known as an “NCAGE code.”

“Data Universal Numbering System (DUNS) number” means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

“Data Universal Numbering System +4 (DUNS+4) number” means the DUNS number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional CCR records for identifying alternative Electronic Funds Transfer (EFT) accounts (see Subpart 32.11 of the Federal Acquisition Regulation) for the same parent concern.

“Registered in the CCR database” means that—

(1) The Contractor has entered all mandatory information, including the DUNS number or the DUNS+4 number, into the CCR database;

(2) The Contractor’s CAGE code is in the CCR database; and

(3) The Government has validated all mandatory data fields and has marked the records “Active.”

252.204-7000, Disclosure of Information, in solicitations and contracts when the contractor will have access to or generate unclassified information that may be sensitive and inappropriate for release to the public.

252.204-7000, Disclosure of Information, in solicitations and contracts when the contractor will have access to or generate unclassified information that may be sensitive and inappropriate for release to the public.

252.204-7003, Control of Government Personnel Work Product.

252.204-7004 (Alt 1), Central Contractor Registration

252.204-7005, Oral Attestation of Security Responsibilities, in solicitations and contracts that

include the clause at 52.204-2, Security Requirements.

52.205-7000 Provision of Information to Cooperative Agreement Holders, in solicitations and contracts expected to exceed \$500,000.

52.207-5, Option to Purchase Equipment, in solicitations and contracts involving a lease with option to purchase.

52.208-8, Required Sources for Helium and Helium Usage Data, in solicitations and contracts if it is anticipated that performance of the contract involves a major helium requirement.

52.209-6, Protecting the Government's Interests when Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment, in solicitations and contracts where the contract value exceeds \$25,000.

52.209-7000, Acquisition from Subcontractors Subject to On-Site Inspection Under the Intermediate-Range Nuclear Forces (INF) Treaty, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.209-7001, Disclosure of Ownership or Control by the Government of a Terrorist Country, in all solicitations expected to result in contracts of \$100,000 or more. Any disclosure that the government of a terrorist country has a significant interest in an offeror or a subsidiary of an offeror shall be forwarded through the head of the agency to the Director of Defense Procurement, ATTN: OUSD(AT&L)DP/FC, 3060 Defense Pentagon, Washington, DC 20301-3060.

52.209-7002, Disclosure of Ownership or Control by a Foreign Government, in all solicitations when access to proscribed information is necessary for contract performance.

52.209-7004, Subcontracting with Firms That Are Owned or Controlled by the Government of a Terrorist Country, in solicitations and contracts with a value of \$100,000 or more.

52.209-7005, Reserve Officer Training Corps and Military Recruiting on Campus, in all solicitations and contracts with institutions of higher education.

52.211-14, Notice of Priority Rating for National Defense Use, in solicitations when the contract to be awarded will be a rated order.

52.211-15, Defense Priority and Allocation Requirements, in contracts that are rated orders.

52.213-4, Terms and Conditions -- Simplified Acquisitions (Other Than Commercial Items) in orders under the simplified acquisition threshold.

52.214-34, Submission of Offers in the English Language.

52.214-35, Submission of Offers in U.S. Currency.

52.215-1 (Alt I), Instructions to Offerors -- Competitive Acquisition, in all competitive solicitations where the Government intends to award a contract without discussions.

52.215-2, Audit and Records-Negotiation (10 U.S.C. 2313, 41 U.S.C. 254d, and OMB Circular No. A-133), in solicitations and contracts except those for acquisitions not exceeding the simplified acquisition threshold.

52.215-5, Facsimile Proposals.

52.215-8, Order of Precedence -- Uniform Contract Format.

52.215-10, Price Reduction for Defective Cost or Pricing Data.

52.215-11, Price Reduction for Defective Cost or Pricing Data – Modifications.

52.215-14, Integrity of Unit Prices, in solicitations and contracts except for acquisitions at or below the simplified acquisition threshold.

52.215-15, Pension Adjustments and Asset Reversions in solicitations and contracts for which any preaward or postaward cost determinations will be subject to Part 31.

52.215-16, Facilities Capital Cost of Money, in solicitations expected to result in contracts that are subject to the cost principles for contracts with commercial organizations (see FAR 31.2).

If the prospective contractor does not propose facilities capital cost of money in its offer, the contracting officer shall insert the clause at 52.215-17, Waiver of Facilities Capital Cost of Money, in the resulting contract.

52.216-1, Type of Contract, in a solicitation unless it is for a fixed-price acquisition made under simplified acquisition procedures.

252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), in solicitations and contracts that contain the clause at FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors which have comprehensive subcontracting plans approved under the test program described in 219.702(a), use the clause at 252.219-7004, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (Test Program), instead of the clauses at 252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), and FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors that have comprehensive subcontracting plans approved under the test program described in 219.702(a), do not use the clause at FAR 52.219-16, Liquidated Damages-- Subcontracting Plan.

52.219-8, Utilization of Small Business Concerns, in solicitations and contracts when the contract amount is expected to be over the simplified acquisition threshold unless the contract, together with all its subcontracts, is to be performed entirely outside of the United States and its outlying areas.

52.219-9, Small Business Subcontracting Plan, in solicitations and contracts that offer subcontracting possibilities, are expected to exceed \$500,000 (\$1,000,000 for construction of any public facility), and are required to include the clause at 52.219-8, Utilization of Small Business Concerns. When contracting by negotiation, and subcontracting plans are required

with initial proposals as provided for in 19.705-2(d), the contracting officer shall use the clause with its Alternate II.

52.219-16, Liquidated Damages --Subcontracting Plan, in all solicitations and contracts containing the clause at 52.219-9, Small Business Subcontracting Plan, or the clause with its Alternate II.

52.222-3, Convict Labor, in solicitations and contracts above the micro-purchase threshold, when the contract is to be performed in the United States, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands; unless --

(a) The contract will be subject to the Walsh-Healey Public Contracts Act (see Subpart 22.6), which contains a separate prohibition against the employment of convict labor;

(b) The supplies or services are to be purchased from Federal Prison Industries, Inc. (see Subpart 8.6); or

(c) The acquisition involves the purchase, from any State prison, of finished supplies that may be secured in the open market or from existing stocks, as distinguished from supplies requiring special fabrication.

52.222-26, Equal Opportunity.

52.222-21, Prohibition of Segregated Facilities.

52.222-24, Preaward On-Site Equal Opportunity Compliance Evaluation, in when the amount of the contract is expected to be \$10 million or more.

52.222-29, Notification of Visa Denial, in contracts if the contractor is required to perform in or on behalf of a foreign country.

52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts if the expected value is \$25,000 or more, except when work is performed outside the United States by employees recruited outside the United States.

52.222-36, Affirmative Action for Workers with Disabilities, in solicitations and contracts that exceed \$10,000 or are expected to exceed \$10,000, except when work is to be performed outside the United States by employees recruited outside the United States (for the purpose of this, United States includes the several states, the District of Columbia, the Virgin Islands, the Commonwealth of Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and Wake Island).

52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts containing the clause at 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans.

52.222-39, Notification of Employee Rights Concerning Payment of Union Dues Or Fees, if contract is expected to exceed SAT.

52.223-3, Hazardous Material Identification and Material Safety Data, in solicitations and contracts if the contract will require the delivery of hazardous materials as defined in FAR 23.301.

52.223-5, Pollution Prevention and Right-to-Know Information, in all solicitations and contracts that provide for performance, in whole or in part, on a Federal facility. Use Alt II if the contract provides for Contractor activities on a Federal facility.

52.223-6, Drug-Free Workplace, except as provided in paragraph (b) of this section, in solicitations and contracts of any dollar value if the contract is expected to be awarded to an individual or expected to exceed the simplified acquisition threshold if the contract is expected to be awarded to other than an individual. Contracting officers shall not insert the clause at 52.223-6, Drug-Free Workplace, in solicitations and contracts, if the resultant contract is to be performed entirely outside of the United States, its territories, and its possessions or inclusion of these requirements would be inconsistent with the international obligations of the United States or with the laws and regulations of a foreign country.

252.223-7001, Hazard Warning Labels, in solicitations and contracts which require submission of hazardous material data sheets.

252.223-7002, Safety Precautions for Ammunition and Explosives, and 252.223-7003, Change in Place of Performance--Ammunition and Explosives, in all solicitations and contracts for acquisition to which this section applies.

252.223-7004, Drug-Free Work Force, in all solicitations and contracts--(1) That involve access to classified information; or(2) When the contracting officer determines that the clause is necessary for reasons of national security or for the purpose of protecting the health or safety of those using or affected by the product of, or performance of, the contract.(b) Do not use the clause in solicitations and contracts when performance or partial performance will be outside the United States, its territories, and possessions, unless the contracting officer determines such inclusion to be in the best interest of the Government; or When the value of the acquisition is at or below the simplified acquisition threshold.

252.223-7006, Prohibition on Storage and Disposal of Toxic and Hazardous Materials, in all solicitations and contracts which require, may require, or permit contractor performance on a DoD installation. Use the clause at 252.223-7006 with its Alternate I, when the Secretary of the military department issues a determination under the exception at 223.7102(a)(9).

252.223-7007, Safeguarding Sensitive Conventional Arms, Ammunition, and Explosives, in all solicitations and contracts to which DoD 5100.76-M applies, in accordance with the policy at 223.7201. Complete paragraph (b) of the clause based on information provided by cognizant technical or requirements personnel.

52.223-14, Toxic Chemical Release Reporting, in the resulting contract, if the contract is expected to exceed \$100,000 (including all options).

When the design, development, or operation of a system of records on individuals is required to accomplish an agency function, insert the following clauses in solicitations and contracts:

(a) The clause at 52.224-1, Privacy Act Notification.

(b) The clause at 52.224-2, Privacy Act.

252.225-7003, Report of Intended Performance Outside the U. S. in solicitations greater than \$500,000.

252.225-7004, Report of Intended Contract Performance Outside the U. S. and Canada in solicitations greater than \$10 million.

252.225-7006, Quarterly Reporting of Actual Contract Performance Outside the U.S., in contracts expected to exceed \$500,000.

252.225.7012, Preference for Certain Domestic Commodities.

252.225-7018, Notice of Prohibition of Certain Contracts with Foreign Entities for the Conduct of Ballistic Missile Defense Research, Development, Test, and Evaluation.

252.225-7026, Reporting of Contract Performance Outside the United States, in all solicitations and contracts with an estimated or actual value exceeding \$500,000, including those modified to exceed \$500,000.

252.225-7031, Secondary Arab Boycott of Israel.

252.225-7040, Contractor Personnel Supporting a Force Deployed Outside U.S.

252.225-7041, Correspondence in English, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7042, Authorization to Perform, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7043, Antiterrorism/Force Protection Policy for Defense Contractors Outside the United States, in solicitations and contracts that require performance or travel outside the United States

52.225-13, Restrictions on Certain Foreign Purchases, in solicitations and contracts with a value exceeding \$2,500 (\$15,000 for acquisitions as described in 13.201(g)), unless an exception applies.

52.225-14, Inconsistency Between English Version and Translation of Contract, in solicitations and contracts if anticipating translation into another language. Insert the clause with its Alternate I in all R&D solicitations and contracts unless both complete performance and delivery are outside the United States, its possessions, and Puerto Rico. When a proposed contract involves both R&D work and supplies or services, and the R&D work is the primary purpose of the contract, the contracting officer shall use this alternate. In all other proposed contracts involving both R&D work and supplies or services, the contracting officer shall use

the basic clause. Also, when a proposed contract involves either R&D or supplies and materials, in addition to construction or architect-engineer work, the contracting officer shall use the basic clause.

52.226-2, Historically Black College or University and Minority Institution Representation, in solicitations set aside for HBCU/MIs.

252.226-7000, Notice of Historically Black College or University and Minority Institution Set-Aside, in solicitations and contracts set-aside for HBCU/MIs.

52.227-1 Alternate 1, Authorization and Consent. If, in the Government's interest, it is appropriate to exempt one or more specific United States patents from the patent indemnity clause, the contracting officer shall obtain written approval from the agency head or designee and shall insert the clause at 52.227-5, Waiver of Indemnity, in solicitations and contracts in addition to the appropriate patent indemnity clause.

52.227-6, Royalty Information.

252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts when the successful offeror(s) will be required to deliver technical data to the Government. Do not use the clause when the only deliverable items are computer software or computer software documentation (see 227.72), commercial items (see 227.7102-3), existing works (see 227.7105), special works (see 227.7106). Use the clause at 252.227-7013 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(1) In the interest of the Government; and (2) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

252.227-7014, Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, in solicitations and contracts when the successful offeror(s) will be required to deliver computer software or computer software documentation. Do not use the clause when the only deliverable items are technical data (other than computer software documentation), commercial computer software or commercial computer software documentation, commercial items (see 227.7102-3), special works (see 227.7205). Use the clause at 252.227-7014 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(i) In the interest of the Government; and (ii) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

Except as provided in paragraph (b) of this subsection, use the clause at 252.227-7015, Technical Data--Commercial Items, in all solicitations and contracts when the contractor will be required to deliver technical data pertaining to commercial items, components, or processes. Do not require the contractor to include this clause in its subcontracts.

(b) Use the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in lieu of the clause at 252.227-7015 if the Government will pay any portion of the development costs. Do not require the contractor to include this clause in its subcontracts for commercial items or

commercial components.

Use the following clauses in solicitations and contracts that include the clause at 252.227-7013: (1) 252.227-7016, Rights in Bid or Proposal Information; (2) 252.227-7030, Technical Data--Withholding of Payment; (3) 252.227-7036, Declaration of Technical Data Conformity; and (4) 252.227-7037, Validation of Restrictive Markings on Technical Data (paragraph (e) if the clause contains information that must be included in a challenge).

252-227-7017, Identification and Assertion of Use, Release, or Disclosure Restrictions

252.227-7019 Validation of Asserted Restrictions--Computer Software.

252.227-7020 Rights in Special Works.

252.227-7021, Rights in Data--Existing Works, in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts exclusively for existing works when-(1) The existing works will be acquired without modification; and (2) The Government requires the right to reproduce, prepare derivative works, or publicly perform or display the existing works; or (3) The Government has a specific need to obtain indemnity for liabilities that may arise out of the content, performance, use, or disclosure of such data. (b) The clause at 252.227-7021 provides the Government, and others acting on its behalf, a paid-up, non-exclusive, irrevocable, world-wide license to reproduce, prepare derivative works and publicly perform or display the works called for by a contract and to authorize others to do so for government purposes.(c) A contract clause is not required to acquire existing works such as books, magazines and periodicals, in any storage or retrieval medium, when the Government will not reproduce the books, magazines or periodicals, or prepare derivative works.

252.227-7025, Limitations on the Use or Disclosure of Government Furnished Information Marked with Restrictive Legends, in solicitations and contracts when it is anticipated that the Government will provide the contractor, for performance of its contract, technical data marked with another contractor's restrictive legend(s).

252.227-7028, Technical Data or Computer Software Previously Delivered to the Government, in solicitations when the resulting contract will require the contractor to deliver technical data. The provision requires offerors to identify any technical data specified in the solicitation as deliverable data items that are the same or substantially the same as data items the offeror has delivered or is obligated to deliver, either as a contractor or subcontractor, under any other federal agency contract.

252.227-7032, Rights in Technical Data and Computer Software (Foreign), may be used in contracts with foreign contractors to be performed overseas, except Canadian purchases (see paragraph (c) of this subsection), in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, when the Government requires the unrestricted right to use, modify, reproduce, perform, display, release or disclose all technical data to be delivered under the contract. Do not use the clause in contracts for existing or special works. (b) When the Government does not require unlimited rights, the clause at 252.227-7032 may be modified to accommodate the needs of a specific overseas procurement situation. The

Government should obtain rights in the technical data that are not less than the rights the Government would have obtained under the data rights clause(s) prescribed in this part for a comparable procurement performed within the United States or its possessions. (c) Contracts for Canadian purchases shall include the appropriate data rights clause prescribed in this part for a comparable procurement performed within the United States or its possessions.

252.227-7034, Patents--Subcontracts, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

252.227-7037, Validation of Restrictive Markings on Technical Data, in all solicitations and contracts for commercial items that include the clause at 252.227-7015 or the clause at 252.227-7013. Do not require the contractor to include this clause in its subcontracts for commercial items or commercial components.

Pursuant to FAR 27.304-1(e), the contracting officer shall insert the clause at 252.227-7039, Patents--Reporting of Subject Inventions, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form). Report of Subject Inventions and Subcontracts is located at:

<http://www.dtic.mil/whs/directives/infomgt/forms/eforms/dd0882.pdf>

52.227-10, Filing of Patent Applications -- Classified Subject Matter, in all classified solicitations and contracts and in all solicitations and contracts where the nature of the work or classified subject matter involved in the work reasonably might be expected to result in a patent application containing classified subject matter.

52.227-11, Patent Rights -- Retention by the Contractor (Short Form), if all the following conditions apply: (i) The contractor is a small business concern or nonprofit organization as defined in 27.301 or, except for contracts of the Department of Defense (DOD), the Department of Energy (DOE), or the National Aeronautics and Space Administration (NASA), any other type of contractor. (ii) No alternative patent rights clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. To the extent the information is not required elsewhere in the contract, and unless otherwise specified by agency supplemental regulations, the contracting officer may modify 52.227-11(f) to require the contractor to do one or more of the following: (i) Provide periodic (but not more frequently than annually) listings of all subject inventions required to be disclosed during the period covered by the report. (ii) Provide a report prior to the closeout of the contract listing all subject inventions or stating that there were none. (iii) Provide, upon request, the filing date, serial number and title, a copy of the patent application, and patent number and issue date for any subject invention in any country in which the contractor has applied for patents. (iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Federal Government employee is a coinventor. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement, or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-11, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall

be added if necessary to effectuate treaties or agreements to be entered into.

52.227-12, Patent Rights -- Retention by the Contractor (Long Form), if all the following conditions apply: (i) The contractor is other than a small business firm or nonprofit organization. (ii) No alternative clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. (iii) The contracting agency is one of those excepted under subdivision (a)(1)(i) of this section. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-12, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

52.227-13, Patent Rights -- Acquisition by the Government, if any of the following conditions apply: If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

52.227-14, Rights in Data -- General, including its use with Alternate I through Alternate V as may be required or authorized in accordance with paragraphs (b) through (f) of this section, in solicitations and contracts if it is contemplated that data will be produced, furnished, or acquired under the contract, unless the contract is --(i) For the production of special works of the type set forth in 27.405(a), but the clause at 52.227-14, Rights in Data -- General, shall be included in the contract and made applicable to data other than special works, as appropriate; (ii) For the acquisition of existing data works, as described in 27.405(b); (iii) To be performed outside the United States, its possessions, and Puerto Rico, in which case agencies may prescribe different clauses (see paragraph (n) of this section); (iv) A contract involving cosponsored research and development in which a clause providing for less than unlimited right has been authorized. (See 27.408.) (b) If an agency determines, in accordance with 27.404(c), to adopt the alternate definition of "Limited Rights Data" in paragraph (a) of the clause, the clause shall be used with its Alternate I. (c) In accordance with 27.404(d), if a contracting officer determines it is necessary to obtain the delivery of limited rights data, the clause shall be used with its Alternate II. The contracting officer shall, when Alternate II is used, assure that the purposes, if any, for which limited rights data are to be disclosed outside the Government are included in the "Limited Rights Notice" of subparagraph (g)(2) of the clause. (d) In accordance with 27.404(e), if a contracting officer determines it is necessary to obtain the delivery of restricted computer software, the clause shall be used with its Alternate III. Any greater or lesser rights regarding the use, duplication, or disclosure of restricted computer software than those set forth in the Restricted Rights Notice of subparagraph (g)(3) of the clause must be specified in the contract and the notice modified accordingly. (e) The

clause shall be used with its Alternate IV in contracts for basic or applied research (other than those for the management or operation of Government facilities or where international agreements require otherwise), to be performed solely by universities and colleges. The clause may be used with its Alternate IV in other contracts if in accordance with 27.404(f)(1) an agency determines to grant blanket permission for the contractor to establish claim to copyright subsisting in all data first produced without further request being made by the contractor. When Alternate IV is used, the contract may exclude items or categories of data from the blanket permission granted, either by express provisions in the contract or by the addition of a subparagraph (d)(3) to the clause (see 27.404(g)(1)). (f) In accordance with 27.404(i), if a contracting officer needs to have the right to inspect certain data at a contractor's facility or if by an agency, generally the clause shall be used with its Alternate V. (g) N/A; (h) The contracting officer shall normally insert the clause at 52.227-16, Additional Data Requirements, in solicitations and contracts involving experimental, developmental, research, or demonstration work (other than basic or applied research to be performed solely by a university or college where the contract amount will be \$500,000 or less) unless all the requirements for data are believed to be known at the time of contracting and specified in the contract. (See 27.406(b).) This clause may also be used in other contracts when considered appropriate. (i) N/A (j) N/A; (k) In accordance with 27.405(b)(2), when contracting (other than from GSA's Multiple Award Schedule contracts) for the acquisition of existing computer software, the clause at 52.227-19, Commercial Computer Software-Restricted Rights, may be used in the solicitation and contract. In any event, the contracting officer shall assure that the contract contains terms to obtain sufficient rights for the Government to fulfill the need for which the software is being acquired and is otherwise consistent with 27.405(b)(2). (l) N/A ; (m) N/A; (n) Agencies may prescribe in their procedures, as appropriate, a clause consistent with the policy of 27.402 in contracts to be performed outside the United States, its possessions, and Puerto Rico. (o) N/A; (p) N/A; (q) N/A; (r) N/A; (s) In accordance with 27.407, if a contracting officer desires to acquire unlimited rights in technical data contained in a successful proposal upon which a contract award is based, the contracting officer shall insert the clause at 52.227-23, Rights to Proposed Data (Technical). Rights to technical data in a proposal are not acquired by mere incorporation by reference of the proposal in the contract, and if a proposal is incorporated by reference, Section 27.404 must be followed to assure that such rights are appropriately addressed.

52.228-5, Insurance -- Work on a Government Installation, in solicitations and contracts when a fixed-price contract is contemplated, the contract amount is expected to exceed the simplified acquisition threshold, and the contract will require work on a Government installation.

52.228-7, Insurance -- Liability to Third Persons.

52.229-3, Federal, State, and Local Taxes, in solicitations and contracts if the contract is to be performed wholly or partly within the United States, its possessions, or territories, Puerto Rico, or the North Mariana Islands, when the contract is expected to exceed the simplified acquisition threshold.

52.229-6, Taxes -- Foreign Fixed-Price Contracts, in solicitations and contracts expected to exceed the simplified acquisition threshold when a fixed-price contract is contemplated and

the contract is to be performed wholly or partly in a foreign country, unless it is contemplated that the contract will be with a foreign government.

52.230-2, Cost Accounting Standards, in negotiated contracts, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is subject to modified coverage (see 48 CFR 9903.201-2 (FAR Appendix)), or the clause prescribed in paragraph (c) of this subsection is used.

(2) FAR 52.230-2 requires the contractor to comply with all CAS specified in 48 CFR 9904 (FAR Appendix), to disclose actual cost accounting practices (applicable to CAS-covered contracts only), and to follow disclosed and established cost accounting practices consistently.

(b) Disclosure and Consistency of Cost Accounting Practices.

(1) FAR 52.230-3, Disclosure and Consistency of Cost Accounting Practices, in negotiated contracts when the contract amount is over \$500,000, but less than \$50 million, and the offeror certifies it is eligible for and elects to use modified CAS coverage (see 48 CFR 9903.201-2 (FAR Appendix)), unless the clause prescribed in paragraph (c) of this subsection is used.

(2) FAR 52.230-3 requires the contractor to comply with 48 CFR 9904.401, 9904.402, 9904.405, and 9904.406 (FAR Appendix) to disclose (if it meets certain requirements) actual cost accounting practices, and to follow consistently its established cost accounting practices.

(c) Consistency in Cost Accounting Practices. The contracting officer shall insert the clause at FAR 52.230-4, Consistency in Cost Accounting Practices, in negotiated contracts that are exempt from CAS requirements solely on the basis of the fact that the contract is to be awarded to a United Kingdom contractor and is to be performed substantially in the United Kingdom (see 48 CFR 9903.201-1(b)(12) (FAR Appendix)).

(d) Administration of Cost Accounting Standards.

(1) FAR 52.230-6, Administration of Cost Accounting Standards, in contracts containing any of the clauses prescribed in paragraphs (a), (b), or (e) of this subsection.

(2) FAR 52.230-6 specifies rules for administering CAS requirements and procedures to be followed in cases of failure to comply.

(e) Cost Accounting Standards -- Educational Institutions.

(1) FAR 52.230-5, Cost Accounting Standards -- Educational Institution, in negotiated contracts awarded to educational institutions, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is to be performed by an FFRDC (see 48 CFR 9903.201-2(c)(5) (FAR Appendix)), or the provision at 48 CFR 9903.201-2(c)(6) (FAR Appendix) applies.

(2) FAR 52.230-5 requires the educational institution to comply with all CAS specified in

48 CFR 9905 (FAR Appendix), to disclose actual cost accounting practices as required by 48 CFR 9903.202-1(f) (FAR Appendix), and to follow disclosed and established cost accounting practices consistently.

52.230-7, Proposal Disclosure—Cost Accounting Practice Changes

252.231-7000, Supplemental Cost Principles, in all solicitations and contracts, which are subject to the principles and procedures described in FAR Subparts 31.1, 31.2, 31.6, and 31.7.

52.232-2, Payment under Fixed-Price Research and Development Contracts.

252.232-7003, Electronic Submission of Payment Requests

252.232-7007, Limitation of Government's Obligation, in solicitations and resultant incrementally funded fixed-price contracts. The contracting officer may revise the contractor's notification period, in paragraph (c) of the clause, from "ninety" to "thirty" or "sixty" days, as appropriate.

252.232-7010, Levies on Contractor Payments.

52.232-9, Limitation on Withholding of Payments, in solicitations and contracts when a supply contract, research and development contract, service contract, time-and-materials contract, or labor-hour contract is contemplated that includes two or more terms authorizing the temporary withholding of amounts otherwise payable to the contractor for supplies delivered or services performed.

52.232-16, Progress Payments, in solicitations that may result in contracts greater than the SAT providing for progress payments based on cost. If the contractor is a small business concern, use the clause with its Alternate I.

52.232-17, Interest, in solicitations and contracts. It may be inserted if the contract will be in one or more of the following categories: Contracts at or below the simplified acquisition threshold; Contracts without any provision for profit or fee with a nonprofit organization; Any other exceptions authorized under agency procedures.

52.232-23, Assignment of Claims, in solicitations and contracts expected to exceed the micro-purchase threshold, unless the contract will prohibit the assignment of claims (see 32.803(b)). The use of the clause is not required for purchase orders. However, the clause may be used in purchase orders expected to exceed the micro-purchase threshold, that are accepted in writing by the contractor, if such use is consistent with agency policies and regulations. If a no-setoff commitment has been authorized (see 32.803(d)), the contracting officer shall use the clause with its Alternate I.

52.232-24, Prohibition of Assignment of Claims, in solicitations and contracts for which a determination has been made under agency regulations that the prohibition of assignment of claims is in the Government's interest.

52.232-25, Prompt Payment, in all solicitations and contracts, except when payment terms

and the late payment penalties are established by other governmental authority (e.g., tariffs). (1) As authorized in 32.904(b)(1)(ii)(B)(4), the contracting officer may modify the date in paragraph (a)(5)(i) of the clause to specify a period longer than 7 days for constructive acceptance, if required to afford the Government a reasonable opportunity to inspect and test the supplies furnished or to evaluate the services performed. (2) As provided in 32.903, agency policies and procedures may authorize amendment of paragraphs (a)(1)(i) and (ii) of the clause to insert a period shorter than 30 days (but not less than 7 days) for making contract invoice payments.

52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration.

52.233-1, Disputes. If it is determined under agency procedures that continued performance is necessary pending resolution of any claim arising under or relating to the contract, the contracting officer shall use the clause with its Alternate I.

52.233-2, Service of Protest, in solicitations for contracts expected to exceed the simplified acquisition threshold.

52.233-3, Protest After Award, in all solicitations and contracts. If a cost reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

52.233-4 – Applicable Law for Breach of Contract Claim.

252.233-7001, Choice of Law (Overseas).

252.235-7010, Acknowledgment of Support and Disclaimer.

252.235-7011, Final Scientific or Technical Report.

52.239-1, Privacy or Security Safeguards, in solicitations and contracts for information technology which require security of information technology, and/or are for the design, development, or operation of a system of records using commercial information technology services or support services.

252.239-7000, Protection Against Compromising Emanations

252.242-7000, Postaward Conference

52.242-13, Bankruptcy, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.242-15, Stop-Work Order. If a cost-reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

52.243-1, Changes -- Fixed-Price, Alternate V.

52.243-6, Change Order Accounting, in solicitations and contracts for research and development contracts of significant technical complexity, if numerous changes are anticipated.

52.243-7, Notification of Changes, in research and development for principal subsystems.

252.243-7001, Pricing of Contract Modifications, in solicitations and contracts when anticipating and using a fixed price type contract.

252.243-7002, Requests for Equitable Adjustment, in solicitations and contracts estimated to exceed the simplified acquisition threshold.

2.244-6, Subcontracts for Commercial Items.

52.245-1, Property Records, in solicitations and contracts when the following conditions exist and the Government maintains the Government's official Government property records: Contracts may provide for the contracting office to maintain the Government's official Government property records when the contracting office retains contract administration and Government property is furnished to a contractor for use on a Government installation; under a contract with a short performance period; or when otherwise determined by the contracting officer to be in the Government's interest.

52.245-2, Government Property (Fixed-Price Contracts), in solicitations and contracts when a fixed-price contract is contemplated, except the contracting officer may insert the clause at 52.245-4, Government-Furnished Property (Short Form), in solicitations and contracts when the acquisition cost of all Government-furnished property to be involved in the contract is \$100,000 or less; unless a contract with an educational or nonprofit organization is contemplated, then use Alt II.

252.245-7001, Reports of Government Property

52.245-9, Use and Charges, when Government will furnish property for performance of the contract.

52.245-18, Special Test Equipment, in solicitations and contracts when the Contractor will acquire or fabricate special test equipment for the Government but the exact identification of the special test equipment to be acquired or fabricated is unknown.

52.245-19, Government Property Furnished "As Is," in solicitations and contracts when Government production and research property is to be furnished "as is."

52.246-7, Inspection of Research and Development -- Fixed-Price, in solicitations and contracts for research and development when the primary objective of the contract is the delivery of end items other than designs, drawings, or reports, and the contract amount is expected to exceed the simplified acquisition threshold; unless use of the clause is impractical and the clause prescribed in 46.309 is considered to be more appropriate.

Use a clause substantially the same as the clause at 252.246-7001, Warranty of Data, in solicitations and contracts that include the clause at 252.227-7013, Rights in Technical Data and Computer Software, and there is a need for greater protection or period of liability than provided by other contract clauses, such as the clauses at-(i) FAR 52.246-3, Inspection of Supplies--Cost-Reimbursement;(ii) FAR 52.246-6, Inspection--Time-and-Material and Labor-Hour;(iii) FAR 52.246-8, Inspection of Research and Development--Cost-Reimbursement; and(iv) FAR 52.246-19, Warranty of Systems and Equipment Under Performance

Specifications or Design Criteria.(2) Use the clause at 52.246-7001, Warranty of Data, with its Alternate I when extended liability is desired and a fixed price incentive contract is contemplated.(3) Use the clause at 52.246-7001, Warranty of Data, with its Alternate II when extended liability is desired and a firm fixed price contract is contemplated.

52.246-9, Inspection of Research and Development (Short Form), in solicitations and contracts for research and development when the clause prescribed in 46.307 or the clause prescribed in 46.308 is not used.

52.246-11, Higher-Level Contract Quality Requirement, in solicitations and contracts when the inclusion of a higher-level contract quality requirement is appropriate (see 46.202-4).

52.246-16, Responsibility for Supplies.

52.246-18, Warranty of Supplies of a Complex Nature, in solicitations and contracts for deliverable complex items when a fixed-price supply or research and development contract is contemplated and the use of a warranty clause has been approved under agency procedures. If the contractor's design rather than the Government's design will be used, insert the word "design" before "material" in paragraph (b)(1). If it is anticipated that recovery of the warranted item will involve considerable Government expense for disassembly and/or reassembly of larger items, the contracting officer may use the clause with its Alternate IV.

52.246-19, Warranty of Systems and Equipment under Performance Specifications or Design Criteria, in solicitations and contracts when performance specifications or design are of major importance; a fixed-price research and development contract for systems and equipment is contemplated; and the use of a warranty clause has been approved under agency procedures.

In (1) contracts requiring delivery of end items that are not high-value items, insert the clause at 52.246-23, Limitation of Liability. (2) In contracts requiring delivery of high-value items, insert the clause at 52.246-24, Limitation of Liability -- High Value Items. (3) In contracts requiring delivery of both high-value items and other end items, insert both clauses prescribed in (1) and (2) of this section, Alternate I of the clause at 52.246-24, and identify clearly in the contract schedule the line items designated as high-value items.

In (1) contracts requiring delivery of end items that are not high-value items, insert the clause at 52.246-23, Limitation of Liability.

(2) In contracts requiring delivery of high-value items, insert the clause at 52.246-24, Limitation of Liability -- High Value Items.

(3) In contracts requiring delivery of both high-value items and other end items, insert both clauses prescribed in (1) and (2) of this section, Alternate I of the clause at 52.246-24, and identify clearly in the contract schedule the line items designated as high-value items.

52.247-63, Preference for U. S.-Flag Air Carriers.

52.247-64, Preference for Privately Owned U. S.-Flag Commercial Vessels.

252.247-7023, Transportation of Supplies by Sea.

252.247-7024, Notification of Transportation of Supplies by Sea, in all contracts for which the offeror made a negative response to the inquiry in the provision at 252.247-7022, Representation of Extent of Transportation by Sea.

52.249-1, Termination for Convenience of the Government (Fixed-Price) (Short Form), as prescribed in 49.502(a)(1), in solicitations and contracts when a fixed-price contract is contemplated and the contract amount is expected to be \$100,000 or less, except

(a) if use of the clause at 52.249-4, Termination for Convenience of the Government (Services) (Short Form) is appropriate

(b) in contracts for research and development work with an educational or nonprofit institution on a no-profit basis,

(c) or if one of the clauses prescribed or cited at 49.505(a), (b), or (e), is appropriate:

- Fixed-price contracts of \$100,000 or less (short form).

(1) General use. Insert the clause at 52.249-1, Termination for Convenience of the Government (Fixed-Price) (Short Form), in solicitations and contracts when a fixed-price contract is contemplated and the contract amount is expected to be \$100,000 or less, except --

(i) If use of the clause at 52.249-4, Termination for Convenience of the Government (Services) (Short Form) is appropriate,

(ii) In contracts for research and development work with an educational or nonprofit institution on a no-profit basis,

(iii) if one of the clauses prescribed or cited at 49.505(a), (b), or (e), is appropriate.

(b) Fixed-price contracts over \$100,000.

(1)

(i) General use. Insert the clause at 52.249-2, Termination for Convenience of the Government (Fixed-Price), in solicitations and contracts when a fixed-price contract is contemplated and the contract amount is expected to be over \$100,000, except in contracts for Research and development work with an educational or nonprofit institution on a no-profit basis. It shall not be used if the clause at 52.249-4, Termination for Convenience of the Government (Services) (Short Form), is appropriate (see 49.502(c)), or one of the clauses prescribed or cited at 49.505(a), (b), or (e), is appropriate.

(e) Subcontracts.

(1) General use. The prime contractor may find the clause at 52.249-1, Termination for

Convenience of the Government (Fixed-Price) (Short Form), or at 52.249-2, Termination for Convenience of the Government (Fixed-Price), as appropriate, suitable for use in fixed-price subcontracts, except as noted in subparagraph (e)(2) of this section; provided, that the relationship between the contractor and subcontractor is clearly indicated. Inapplicable conditions (e.g., paragraph (d)) in 52.249-2 should be deleted and the periods reduced for submitting the subcontractor's termination settlement proposal (e.g., 6 months), and for requesting an equitable price adjustment (e.g., 45 days).

(2) Research and development. The prime contractor may find the clause at 52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), suitable for use in subcontracts placed with educational or nonprofit institutions on a no-profit or no-fee basis; provided, that the relationship between the contractor and subcontractor is clearly indicated. Inapplicable conditions (e.g., paragraph (h)) should be deleted, the period for submitting the subcontractor's termination settlement proposal should be reduced (e.g., 6 months), the subcontract should be placed on a no-profit or no-fee basis, and the subcontract should incorporate or be negotiated on the basis of the cost principles in Part 31 of the Federal Acquisition Regulation

52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), in solicitations and contracts when either a fixed-price or cost-reimbursement contract is contemplated for research and development work with an educational or nonprofit institution on a nonprofit or no-fee basis.

52.249-9, Default (Fixed-Price Research and Development), in solicitations and contracts for research and development when a fixed-price contract is contemplated and the contract amount is expected to exceed the simplified acquisition threshold, except those with educational or nonprofit institutions on a no-profit basis.

52.251-1, Government Supply Sources, in solicitations and contracts when the contracting officer may authorize the contractor to acquire supplies or services from a Government supply source.

252.251-7000, Ordering From Government Supply Sources, in solicitations and contracts which include the clause at FAR 52.251-1, Government Supply Sources.

52.253-1, Computer Generated Forms, in solicitations and contracts that require the contractor to submit data on Standard or Optional Forms prescribed by this regulation and forms prescribed by agency supplements.

ATTACHMENT B
COST-REIMBURSABLE CONTRACTS
FAR/DFARS CONTRACT CLAUSES

ALL APPLICABLE CLAUSES WILL BE INCORPORATED WITHIN THE AWARD DOCUMENTS.

The full text of a clause and its complete prescription may be accessed electronically at the FAR site (clauses beginning with "52.") at <http://www.arnet.gov/far/loadmain52.html> and the DFARS site (clauses beginning with "252.") at <http://www.acq.osd.mil/dp/dfars/tochtml.htm>

52.252-1, Solicitation Provisions Incorporated by Reference.

This solicitation incorporates one or more provisions by reference.

52.252-2 Clauses Incorporated by Reference.

This contract incorporates one or more clauses by reference.

Security Contract Language for all Corps of Engineers' Unclassified Contracts (PIL 2003-06, 19 Feb 03): All Contractor employees (U.S. citizens and Non- U.S. citizens) working under this contract (to include grants, cooperative agreements and task orders) who require access to Automated Information Systems (AIS), (stand alone computers, network computers/systems, e-mail) shall, at a minimum, be designated into an ADP-III position (non-sensitive) in accordance with DoD 5220-22-R, Industrial Security Regulation. The investigative requirements for an ADP-III position are a favorable National Agency Check (NAC), SF-85P, Public Trust Position. The contractor shall have each applicable employee complete a SF-85P and submit to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218) within three (3) working days after award of any contract or task order, and shall be submitted prior to the individual being permitted access to an AIS. Contractors that have a commercial or government entity (CAGE) Code and Facility Security Clearance through the Defense Security Service shall process the NACs and forward visit requests/results of NAC to the U. S. Army Engineer Research and Development Center Security Office, Attn: CEERD-SE-Z, 3909 Halls Ferry Rd., Vicksburg, MS 39180 (601-634-3527 or 4218). For those contractors that do not have a CAGE Code or Facility Security Clearance, the U. S. Army Engineer Research and Development Center Security Office, Vicksburg, MS, will process the investigation in coordination with the Contractor and contract employees.

In accordance with Engineering Regulation, ER 380-1-18, Section 4, foreign nationals who work on Corps of Engineers' contracts or task orders (or any instrument) shall be approved by the HQUSACE Foreign Disclosure Officer or higher before beginning work on the contract/task order. This regulation includes subcontractor employees. (NOTE: exceptions to the above requirement include foreign nationals who perform janitorial and/or ground maintenance services.) The contractor shall submit to the Division/District Contract Office, the

names of all foreign nationals proposed for performance under this contract/task order, along with documentation to verify that he/she was legally admitted into the United States and has authority to work and/or go to school in the US. Such documentation may include a US passport, Certificate of US citizenship (INS Form N-560 or N-561), Certificate of Naturalization (INS Form N-550 or N-570), foreign passport with I-551 stamp or attached INS Form I-94 indicating employment authorization, Alien Registration Receipt Card with photograph (INS Form I-151 or I-551), Temporary Resident Card (INS Form I-688), Employment Authorization Card (INS Form I-688A), Reentry Permit (INS Form I-327), Refugee Travel Document (INS Form I-571), Employment Authorization Document issued by the INS which contains a photograph (INS Form I-688B).

Classified contracts require the issuance of a DD Form 254 (Department of Defense Contract Security Classification Specification).

(End of Clause)

252.201-7000, Contracting Officer's Representative.

52.202-1, Definitions, in solicitations and contracts that exceed the simplified acquisition threshold. The contracting officer may include additional definitions, provided they are consistent with the clause and the FAR.

52.203-3, Gratuities, in solicitations and contracts with a value exceeding the simplified acquisition threshold.

52.203-5, Covenant Against Contingent Fees, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.203-7, Anti-Kickback Procedures, in solicitations and contracts exceeding the simplified acquisition threshold.

252.203-7001, Prohibition on Persons Convicted of Fraud or Other Defense-Contract-Related Felonies, in all solicitations and contracts exceeding the simplified acquisition threshold.

252.203-7002, Display of DoD Hotline Poster, in solicitations and contracts expected to exceed \$5 million, except when performance will take place in a foreign country.

In solicitations and contracts that exceed the simplified acquisition threshold, insert the clauses at 52.203-8, Cancellation, Rescission, and Recovery of Funds for Illegal or Improper Activity, and 52.203-10, Price or Fee Adjustment for Illegal or Improper Activity.

52.203-12, Limitation on Payments to Influence Certain Federal Transactions, shall be included in solicitations and contracts expected to exceed \$100,000.

52.204-2, Security Requirements, in solicitations and contracts when the contract may require access to classified information.

52.204-4, Printed or Copied Double-Sided on Recycled Paper, in solicitations and contracts

that exceed the simplified acquisition threshold.

52.204-6, Data Universal Numbering System (DUNS) Number.

52.204-7, Central Contractor Registration, plus 252.204-7004 Alternate A instructs to substitute the following paragraph (a) for paragraph (a) of the clause at FAR 52.204-7:

(a) Definitions. As used in this clause--

“Central Contractor Registration (CCR) database” means the primary Government repository for contractor information required for the conduct of business with the Government.

“Commercial and Government Entity (CAGE) code” means—

- (1) A code assigned by the Defense Logistics Information Service (DLIS) to identify a commercial or Government entity; or
- (2) A code assigned by a member of the North Atlantic Treaty Organization that DLIS records and maintains in the CAGE master file. This type of code is known as an “NCAGE code.”

“Data Universal Numbering System (DUNS) number” means the 9-digit number assigned by Dun and Bradstreet, Inc. (D&B) to identify unique business entities.

“Data Universal Numbering System +4 (DUNS+4) number” means the DUNS number assigned by D&B plus a 4-character suffix that may be assigned by a business concern. (D&B has no affiliation with this 4-character suffix.) This 4-character suffix may be assigned at the discretion of the business concern to establish additional CCR records for identifying alternative Electronic Funds Transfer (EFT) accounts (see Subpart 32.11 of the Federal Acquisition Regulation) for the same parent concern.

“Registered in the CCR database” means that—

- (1) The Contractor has entered all mandatory information, including the DUNS number or the DUNS+4 number, into the CCR database;
- (2) The Contractor’s CAGE code is in the CCR database; and
- (3) The Government has validated all mandatory data fields and has marked the records “Active.”

252.204-7000, Disclosure of Information, in solicitations and contracts when the contractor will have access to or generate unclassified information that may be sensitive and inappropriate for release to the public.

252.204-7003, Control of Government Personnel Work Product.

252.204-7004, Central Contractor Registration, Alt A

252.204-7005, Oral Attestation of Security Responsibilities, in solicitations and contracts that

include the clause at FAR 52.204-2, Security Requirements.

52.205-7000 Provision of Information to Cooperative Agreement Holders, in solicitations and contracts expected to exceed \$500,000.

52.207-5, Option to Purchase Equipment, in solicitations and contracts involving a lease with option to purchase.

52.208-8, Required Sources for Helium and Helium Usage Data, in solicitations and contracts if it is anticipated that performance of the contract involves a major helium requirement.

52.209-6, Protecting the Government's Interests when Subcontracting with Contractors Debarred, Suspended, or Proposed for Debarment, in solicitations and contracts where the contract value exceeds \$25,000.

52.209-7000, Acquisition from Subcontractors Subject to On-Site Inspection Under the Intermediate-Range Nuclear Forces (INF) Treaty, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.209-7001, Disclosure of Ownership or Control by the Government of a Terrorist Country, in all solicitations expected to result in contracts of \$100,000 or more. Any disclosure that the government of a terrorist country has a significant interest in an offeror or a subsidiary of an offeror shall be forwarded through the head of the agency to the Director of Defense Procurement, ATTN: OUSD(AT&L)DP/FC, 3060 Defense Pentagon, Washington, DC 20301-3060.

52.209-7002, Disclosure of Ownership or Control by a Foreign Government, in all solicitations when access to proscribed information is necessary for contract performance.

52.209-7004, Subcontracting with Firms That Are Owned or Controlled by the Government of a Terrorist Country, in solicitations and contracts with a value of \$100,000 or more.

52.209-7005, Reserve Officer Training Corps and Military Recruiting on Campus, in all solicitations and contracts with institutions of higher education.

52.211-14, Notice of Priority Rating for National Defense Use, in solicitations when the contract to be awarded will be a rated order.

52.211-15, Defense Priority and Allocation Requirements, in contracts that are rated orders.

52.213-4, Terms and Conditions -- Simplified Acquisitions (Other Than Commercial Items) in orders under the simplified acquisition threshold.

52.214-34, Submission of Offers in the English Language.

52.214-35, Submission of Offers in U.S. Currency.

52.215-1 (Alt I), Instructions to Offerors -- Competitive Acquisition, in all competitive solicitations where the Government intends to award a contract without discussions.

52.215-2, Audit and Records-Negotiation (10 U.S.C. 2313, 41 U.S.C. 254d, and OMB Circular No. A-133), in solicitations and contracts except those for acquisitions not exceeding the simplified acquisition threshold. For cost-reimbursement contracts with educational institutions, and other nonprofit organizations, the contracting officer shall use the clause with its Alternate II.

52.215-5, Facsimile Proposals.

52.215-8, Order of Precedence -- Uniform Contract Format.

52.215-10, Price Reduction for Defective Cost or Pricing Data.

52.215-11, Price Reduction for Defective Cost or Pricing Data – Modifications.

52.215-14, Integrity of Unit Prices, in solicitations and contracts except for acquisitions at or below the simplified acquisition threshold.

52.215-15, Pension Adjustment and Asset Reversions in solicitations and contracts for which any preaward or postaward cost determinations will be subject to Part 31.

52.215-16, Facilities Capital Cost of Money, in solicitations expected to result in contracts that are subject to the cost principles for contracts with commercial organizations (see FAR 31.2).

If the prospective contractor does not propose facilities capital cost of money in its offer, the contracting officer shall insert the clause at 52.215-17, Waiver of Facilities Capital Cost of Money, in the resulting contract.

52.216-1, Type of Contract, in a solicitation unless it is for a fixed-price acquisition made under simplified acquisition procedures.

52.216-7, Allowable Cost and Payment, in solicitations and contracts when a cost-reimbursement contract is contemplated. If the contract is with an educational institution, modify the clause by deleting from paragraph (a) the words "Subpart 31.2" and substituting for them "Subpart 31.3." ' If the contract is with a nonprofit organization other than an educational institution or a nonprofit organization exempted under OMB Circular No. A-122, modify the clause by deleting from paragraph (a) the words "Subpart 31.2" and substituting for them "Subpart 31.7."

52.216-8, Fixed Fee, in solicitations and contracts when a cost-plus-fixed-fee contract is contemplated.

52.216-11, Cost Contract -- No Fee, in solicitations and contracts when a cost-reimbursement contract is contemplated that provides no fee. If a cost-reimbursement research and development contract with an educational institution or a nonprofit organization that provides no fee or other payment above cost is contemplated, and if the contracting officer determines that withholding of a portion of allowable costs is not required, the contracting officer shall use the clause with its Alternate I.

52.216-15, Price Redetermination Prospective.

252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), in solicitations and contracts that contain the clause at FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors which have comprehensive subcontracting plans approved under the test program described in 219.702(a), use the clause at 252.219-7004, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (Test Program), instead of the clauses at 252.219-7003, Small, Small Disadvantaged and Women-Owned Small Business Subcontracting Plan (DoD Contracts), and FAR 52.219-9, Small Business Subcontracting Plan. In contracts with contractors that have comprehensive subcontracting plans approved under the test program described in 219.702(a), do not use the clause at FAR 52.219-16, Liquidated Damages--Subcontracting Plan.

52.219-8, Utilization of Small Business Concerns, in solicitations and contracts when the contract amount is expected to be over the simplified acquisition threshold unless the contract, together with all its subcontracts, is to be performed entirely outside of the United States and its outlying areas.

52.219-9, Small Business Subcontracting Plan, in solicitations and contracts that offer subcontracting possibilities, are expected to exceed \$500,000 (\$1,000,000 for construction of any public facility), and are required to include the clause at 52.219-8, Utilization of Small Business Concerns. When contracting by negotiation, and subcontracting plans are required with initial proposals as provided for in 19.705-2(d), the contracting officer shall use the clause with its Alternate II.

52.219-16, Liquidated Damages --Subcontracting Plan, in all solicitations and contracts containing the clause at 52.219-9, Small Business Subcontracting Plan, or the clause with its Alternate II.

52.222-2, Payment for Overtime Premiums, in solicitations and contracts when a cost-reimbursement contract is contemplated and the contract amount is expected to be over \$100,000.

52.222-3, Convict Labor, in solicitations and contracts above the micro-purchase threshold, when the contract is to be performed in the United States, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, or the U.S. Virgin Islands; unless --

(a) The contract will be subject to the Walsh-Healey Public Contracts Act (see Subpart 22.6), which contains a separate prohibition against the employment of convict labor;

(b) The supplies or services are to be purchased from Federal Prison Industries, Inc. (see Subpart 8.6); or

(c) The acquisition involves the purchase, from any State prison, of finished supplies that may be secured in the open market or from existing stocks, as distinguished from supplies requiring special fabrication.

52.222-26, Equal Opportunity.

52.222-21, Prohibition of Segregated Facilities.

52.222-24, Preaward On-Site Equal Opportunity Compliance Evaluation, in when the amount of the contract is expected to be \$10 million or more.

52.222-29, Notification of Visa Denial, in contracts if the contractor is required to perform in or on behalf of a foreign country.

52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts if the expected value is \$25,000 or more, except when work is performed outside the United States by employees recruited outside the United States.

52.222-36, Affirmative Action for Workers with Disabilities, in solicitations and contracts that exceed \$10,000 or are expected to exceed \$10,000, except when work is to be performed outside the United States by employees recruited outside the United States (for the purpose of this, United States includes the several states, the District of Columbia, the Virgin Islands, the Commonwealth of Puerto Rico, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and Wake Island).

52.222-37, Employment Reports on Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans, in solicitations and contracts containing the clause at 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era, and Other Eligible Veterans.

52.222-39, Notification of Employee Rights Concerning Payment of Union Dues Or Fees, if contract is expected to exceed SAT.

52.223-3, Hazardous Material Identification and Material Safety Data, in solicitations and contracts if the contract will require the delivery of hazardous materials as defined in FAR 23.301.

52.223-5, Pollution Prevention and Right-to-Know Information, in all solicitations and contracts that provide for performance, in whole or in part, on a Federal facility. Use Alt II if the contract provides for Contractor activities on a Federal Facility.

52.223-6, Drug-Free Workplace, except as provided in paragraph (b) of this section, in solicitations and contracts of any dollar value if the contract is expected to be awarded to an individual or expected to exceed the simplified acquisition threshold if the contract is expected to be awarded to other than an individual. Contracting officers shall not insert the clause at 52.223-6, Drug-Free Workplace, in solicitations and contracts, if the resultant contract is to be performed entirely outside of the United States, its territories, and its possessions or inclusion of these requirements would be inconsistent with the international obligations of the United States or with the laws and regulations of a foreign country.

252.223-7001, Hazard Warning Labels, in solicitations and contracts which require submission of hazardous material data sheets.

252.223-7002, Safety Precautions for Ammunition and Explosives, and 252.223-7003, Change in Place of Performance--Ammunition and Explosives, in all solicitations and

contracts for acquisition to which this section applies.

252.223-7004, Drug-Free Work Force, in all solicitations and contracts-(1) That involve access to classified information; or(2) When the contracting officer determines that the clause is necessary for reasons of national security or for the purpose of protecting the health or safety of those using or affected by the product of, or performance of, the contract.(b) Do not use the clause in solicitations and contracts when performance or partial performance will be outside the United States, its territories, and possessions, unless the contracting officer determines such inclusion to be in the best interest of the Government; or When the value of the acquisition is at or below the simplified acquisition threshold.

252.223-7006, Prohibition on Storage and Disposal of Toxic and Hazardous Materials, in all solicitations and contracts which require, may require, or permit contractor performance on a DoD installation. Use the clause at 252.223-7006 with its Alternate I, when the Secretary of the military department issues a determination under the exception at 223.7102(a)(9).

252.223-7007, Safeguarding Sensitive Conventional Arms, Ammunition, and Explosives, in all solicitations and contracts to which DoD 5100.76-M applies, in accordance with the policy at 223.7201. Complete paragraph (b) of the clause based on information provided by cognizant technical or requirements personnel.

52.223-14, Toxic Chemical Release Reporting, in the resulting contract, if the contract is expected to exceed \$100,000.

When the design, development, or operation of a system of records on individuals is required to accomplish an agency function, insert the following clauses in solicitations and contracts:

(a) 52.224-1, Privacy Act Notification. (b) 52.224-2, Privacy Act.

252.225-7003, Report of Intended Performance Outside the U. S., in solicitations greater than \$500,000.

252.225-7004, Report of Intended Contract Performance Outside the U.S. and Canada in solicitations greater than \$10 million.

252.225-7006, Quarterly Reporting of Actual Contract Performance Outside the U.S., in contracts expected to exceed \$500,000.

252.225.7012, Preference for Certain Domestic Commodities.

252.225-7018, Notice of Prohibition of Certain Contracts with Foreign Entities for the Conduct of Ballistic Missile Defense Research, Development, Test, and Evaluation.

252.225-7026, Reporting of Contract Performance Outside the United States, in all solicitations and contracts with an estimated or actual value exceeding \$500,000, including those modified to exceed \$500,000.

252.225-7031, Secondary Arab Boycott of Israel.

252.225-7040, Contractor Personnel Supporting a Force Deployed Outside U.S.

252.225-7041, Correspondence in English, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7042, Authorization to Perform, in solicitations and contracts when contract performance will be wholly or in part in a foreign country.

252.225-7043, Antiterrorism/Force Protection Policy for Defense Contractors Outside the United States, in solicitations and contracts that require performance or travel outside the United States

52.225-13, Restrictions on Certain Foreign Purchases, in solicitations and contracts with a value exceeding \$2,500 (\$15,000 for acquisitions as described in 13.201(g)), unless an exception applies.

52.225-14, Inconsistency Between English Version and Translation of Contract, in solicitations and contracts if anticipating translation into another language. Insert the clause with its Alternate I in all R&D solicitations and contracts unless both complete performance and delivery are outside the United States, its possessions, and Puerto Rico. When a proposed contract involves both R&D work and supplies or services, and the R&D work is the primary purpose of the contract, the contracting officer shall use this alternate. In all other proposed contracts involving both R&D work and supplies or services, the contracting officer shall use the basic clause. Also, when a proposed contract involves either R&D or supplies and materials, in addition to construction or architect-engineer work, the contracting officer shall use the basic clause.

52.226-2, Historically Black College or University and Minority Institution Representation, in solicitations set aside for HBCU/MIs.

252.226-7000, Notice of Historically Black College or University and Minority Institution Set-Aside, in solicitations and contracts set-aside for HBCU/MIs.

52.227-1 Alternate 1, Authorization and Consent. If, in the Government's interest, it is appropriate to exempt one or more specific United States patents from the patent indemnity clause, the contracting officer shall obtain written approval from the agency head or designee and shall insert the clause at 52.227-5, Waiver of Indemnity, in solicitations and contracts in addition to the appropriate patent indemnity clause.

52.227-6, Royalty Information.

252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts when the successful offeror(s) will be required to deliver technical data to the Government. Do not use the clause when the only deliverable items are computer software or computer software documentation (see 227.72), commercial items (see 227.7102-3), existing works (see 227.7105), special works (see 227.7106). Use the clause at 252.227-7013 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be-(1) In the interest of the Government; and (2) Facilitated by the Government relinquishing its right to publish the work

for sale, or to have others publish the work for sale on behalf of the Government.

252.227-7014, Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation, in solicitations and contracts when the successful offeror(s) will be required to deliver computer software or computer software documentation. Do not use the clause when the only deliverable items are technical data (other than computer software documentation), commercial computer software or commercial computer software documentation, commercial items (see 227.7102-3), special works (see 227.7205). Use the clause at 252.227-7014 with its Alternate I in research contracts when the contracting officer determines, in consultation with counsel, that public dissemination by the contractor would be (i) In the interest of the Government; and (ii) Facilitated by the Government relinquishing its right to publish the work for sale, or to have others publish the work for sale on behalf of the Government.

Except as provided in paragraph (b) of this subsection, use the clause at 252.227-7015, Technical Data--Commercial Items, in all solicitations and contracts when the contractor will be required to deliver technical data pertaining to commercial items, components, or processes. Do not require the contractor to include this clause in its subcontracts.

(b) 252.227-7013, Rights in Technical Data--Noncommercial Items, in lieu of the clause at 252.227-7015 if the Government will pay any portion of the development costs. Do not require the contractor to include this clause in its subcontracts for commercial items or commercial components.

Use the following clauses in solicitations and contracts that include the clause at 252.227-7013: (1) 252.227-7016, Rights in Bid or Proposal Information; (2) 252.227-7030, Technical Data--Withholding of Payment; (3) 252.227-7036, Declaration of Technical Data Conformity; and (4) 252.227-7037, Validation of Restrictive Markings on Technical Data (paragraph (e) if the clause contains information that must be included in a challenge).

252-227-7017, Identification and Assertion of Use, Release, or Disclosure Restrictions

252.227-7019 Validation of Asserted Restrictions--Computer Software.

252.227-7020 Rights in Special Works.

252.227-7021, Rights in Data--Existing Works, in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, in solicitations and contracts exclusively for existing works when-(1) The existing works will be acquired without modification; and (2) The Government requires the right to reproduce, prepare derivative works, or publicly perform or display the existing works; or (3) The Government has a specific need to obtain indemnity for liabilities that may arise out of the content, performance, use, or disclosure of such data. (b) The clause at 252.227-7021 provides the Government, and others acting on its behalf, a paid-up, non-exclusive, irrevocable, world-wide license to reproduce, prepare derivative works and publicly perform or display the works called for by a contract and to authorize others to do so for government purposes.(c) A contract clause is not required to acquire existing works such as books, magazines and periodicals, in any storage or retrieval medium, when the Government will not reproduce the books, magazines or periodicals, or prepare derivative

works.

252.227-7025, Limitations on the Use or Disclosure of Government Furnished Information Marked with Restrictive Legends, in solicitations and contracts when it is anticipated that the Government will provide the contractor, for performance of its contract, technical data marked with another contractor's restrictive legend(s).

252.227-7028, Technical Data or Computer Software Previously Delivered to the Government, in solicitations when the resulting contract will require the contractor to deliver technical data. The provision requires offerors to identify any technical data specified in the solicitation as deliverable data items that are the same or substantially the same as data items the offeror has delivered or is obligated to deliver, either as a contractor or subcontractor, under any other federal agency contract.

252.227-7032, Rights in Technical Data and Computer Software (Foreign), may be used in contracts with foreign contractors to be performed overseas, except Canadian purchases (see paragraph (c) of this subsection), in lieu of the clause at 252.227-7013, Rights in Technical Data--Noncommercial Items, when the Government requires the unrestricted right to use, modify, reproduce, perform, display, release or disclose all technical data to be delivered under the contract. Do not use the clause in contracts for existing or special works. (b) When the Government does not require unlimited rights, the clause at 252.227-7032 may be modified to accommodate the needs of a specific overseas procurement situation. The Government should obtain rights in the technical data that are not less than the rights the Government would have obtained under the data rights clause(s) prescribed in this part for a comparable procurement performed within the United States or its possessions. (c) Contracts for Canadian purchases shall include the appropriate data rights clause prescribed in this part for a comparable procurement performed within the United States or its possessions.

252.227-7034, Patents--Subcontracts, in solicitations and contracts containing the clause at 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

252.227-7037, Validation of Restrictive Markings on Technical Data, in all solicitations and contracts for commercial items that include the clause at 252.227-7015 or the clause at 252.227-7013. Do not require the contractor to include this clause in its subcontracts for commercial items or commercial components.

Pursuant to FAR 27.304-1(e), the contracting officer shall insert the clause at 252.227-7039, Patents--Reporting of Subject Inventions, in solicitations and contracts containing the clause at FAR 52.227-11, Patent Rights--Retention by the Contractor (Short Form).

52.227-10, Filing of Patent Applications -- Classified Subject Matter, in all classified solicitations and contracts and in all solicitations and contracts where the nature of the work or classified subject matter involved in the work reasonably might be expected to result in a patent application containing classified subject matter.

52.227-11, Patent Rights -- Retention by the Contractor (Short Form), if all the following conditions apply: (i) The contractor is a small business concern or nonprofit organization as defined in 27.301 or, except for contracts of the Department of Defense (DOD), the

Department of Energy (DOE), or the National Aeronautics and Space Administration (NASA), any other type of contractor. (ii) No alternative patent rights clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. To the extent the information is not required elsewhere in the contract, and unless otherwise specified by agency supplemental regulations, the contracting officer may modify 52.227-11(f) to require the contractor to do one or more of the following: (i) Provide periodic (but not more frequently than annually) listings of all subject inventions required to be disclosed during the period covered by the report. (ii) Provide a report prior to the closeout of the contract listing all subject inventions or stating that there were none. (iii) Provide, upon request, the filing date, serial number and title, a copy of the patent application, and patent number and issue date for any subject invention in any country in which the contractor has applied for patents. (iv) Furnish the Government an irrevocable power to inspect and make copies of the patent application file when a Federal Government employee is a coinventor. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement, or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-11, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

52.227-12, Patent Rights -- Retention by the Contractor (Long Form), if all the following conditions apply: (i) The contractor is other than a small business firm or nonprofit organization. (ii) No alternative clause is used in accordance with paragraph (c) or (d) of this section or 27.304-2. (iii) The contracting agency is one of those excepted under subdivision (a)(1)(i) of this section. If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause at 52.227-12, with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

52.227-13, Patent Rights -- Acquisition by the Government, if any of the following conditions apply: If the acquisition of patent rights for the benefit of a foreign government is required under a treaty or executive agreement or if the agency head or a designee determines at the time of contracting that it would be in the national interest to acquire the right to sublicense foreign governments or international organizations pursuant to any existing or future treaty or agreement, the contracting officer shall use the clause with its Alternate I. If other rights are necessary to effectuate the treaty or agreement, Alternate I may be appropriately modified. In long term contracts, Alternate II shall be added if necessary to effectuate treaties or agreements to be entered into.

52.227-14, Rights in Data -- General, including its use with Alternate I through Alternate V as may be required or authorized in accordance with paragraphs (b) through (f) of this section, in solicitations and contracts if it is contemplated that data will be produced, furnished, or

acquired under the contract, unless the contract is --(i) For the production of special works of the type set forth in 27.405(a), but the clause at 52.227-14, Rights in Data -- General, shall be included in the contract and made applicable to data other than special works, as appropriate; (ii) For the acquisition of existing data works, as described in 27.405(b); (iii) To be performed outside the United States, its possessions, and Puerto Rico, in which case agencies may prescribe different clauses (see paragraph (n) of this section); (iv) A contract involving cosponsored research and development in which a clause providing for less than unlimited right has been authorized. (See 27.408.) (b) If an agency determines, in accordance with 27.404(c), to adopt the alternate definition of "Limited Rights Data" in paragraph (a) of the clause, the clause shall be used with its Alternate I. (c) In accordance with 27.404(d), if a contracting officer determines it is necessary to obtain the delivery of limited rights data, the clause shall be used with its Alternate II. The contracting officer shall, when Alternate II is used, assure that the purposes, if any, for which limited rights data are to be disclosed outside the Government are included in the "Limited Rights Notice" of subparagraph (g)(2) of the clause. (d) In accordance with 27.404(e), if a contracting officer determines it is necessary to obtain the delivery of restricted computer software, the clause shall be used with its Alternate III. Any greater or lesser rights regarding the use, duplication, or disclosure of restricted computer software than those set forth in the Restricted Rights Notice of subparagraph (g)(3) of the clause must be specified in the contract and the notice modified accordingly. (e) The clause shall be used with its Alternate IV in contracts for basic or applied research (other than those for the management or operation of Government facilities or where international agreements require otherwise), to be performed solely by universities and colleges. The clause may be used with its Alternate IV in other contracts if in accordance with 27.404(f)(1) an agency determines to grant blanket permission for the contractor to establish claim to copyright subsisting in all data first produced without further request being made by the contractor. When Alternate IV is used, the contract may exclude items or categories of data from the blanket permission granted, either by express provisions in the contract or by the addition of a subparagraph (d)(3) to the clause (see 27.404(g)(1)). (f) In accordance with 27.404(i), if a contracting officer needs to have the right to inspect certain data at a contractor's facility or if by an agency, generally the clause shall be used with its Alternate V. (g) N/A; (h) The contracting officer shall normally insert the clause at 52.227-16, Additional Data Requirements, in solicitations and contracts involving experimental, developmental, research, or demonstration work (other than basic or applied research to be performed solely by a university or college where the contract amount will be \$500,000 or less) unless all the requirements for data are believed to be known at the time of contracting and specified in the contract. (See 27.406(b).) This clause may also be used in other contracts when considered appropriate. (i) N/A (j) N/A; (k) In accordance with 27.405(b)(2), when contracting (other than from GSA's Multiple Award Schedule contracts) for the acquisition of existing computer software, the clause at 52.227-19, Commercial Computer Software-Restricted Rights, may be used in the solicitation and contract. In any event, the contracting officer shall assure that the contract contains terms to obtain sufficient rights for the Government to fulfill the need for which the software is being acquired and is otherwise consistent with 27.405(b)(2). (l) N/A ; (m) N/A; (n) Agencies may prescribe in their procedures, as appropriate, a clause consistent with the policy of 27.402 in contracts to be performed outside the United States, its possessions, and Puerto Rico. (o) N/A; (p) N/A; (q) N/A; (r) N/A; (s) In accordance with 27.407, if a contracting officer desires to acquire unlimited rights in technical data contained in

a successful proposal upon which a contract award is based, the contracting officer shall insert the clause at 52.227-23, Rights to Proposed Data (Technical). Rights to technical data in a proposal are not acquired by mere incorporation by reference of the proposal in the contract, and if a proposal is incorporated by reference, Section 27.404 must be followed to assure that such rights are appropriately addressed.

52.228-7, Insurance -- Liability to Third Persons.

52.229-8, Taxes -- Foreign Cost-Reimbursement Contracts, in solicitations and contracts when a cost-reimbursement contract is contemplated and the contract is to be performed wholly or partly in a foreign country.

52.229-10, State of New Mexico Gross Receipts and Compensating Tax, in solicitations and contracts when all three of the following conditions exist:

- (1) The contractor will be performing a cost-reimbursement contract.
- (2) The contract directs or authorizes the contractor to acquire tangible personal property as a direct cost under a contract and title to such property passes directly to and vests in the United States upon delivery of the property by the vendor.
- (3) The contract will be for services to be performed in whole or in part within the State of New Mexico.

52.230-2, Cost Accounting Standards, in negotiated contracts, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is subject to modified coverage (see 48 CFR 9903.201-2 (FAR Appendix)), or the clause prescribed in paragraph (c) of this subsection is used.

- (2) The clause at FAR 52.230-2 requires the contractor to comply with all CAS specified in 48 CFR 9904 (FAR Appendix), to disclose actual cost accounting practices (applicable to CAS-covered contracts only), and to follow disclosed and established cost accounting practices consistently.

(b) Disclosure and Consistency of Cost Accounting Practices.

- (1) 52.230-3, Disclosure and Consistency of Cost Accounting Practices, in negotiated contracts when the contract amount is over \$500,000, but less than \$50 million, and the offeror certifies it is eligible for and elects to use modified CAS coverage (see 48 CFR 9903.201-2 (FAR Appendix)), unless the clause prescribed in paragraph (c) of this subsection is used.

- (2) 52.230-3 requires the contractor to comply with 48 CFR 9904.401, 9904.402, 9904.405, and 9904.406 (FAR Appendix) to disclose (if it meets certain requirements) actual cost accounting practices, and to follow consistently its established cost accounting practices.

(c) Consistency in Cost Accounting Practices. The contracting officer shall insert the clause at 52.230-4, Consistency in Cost Accounting Practices, in negotiated contracts that are exempt

from CAS requirements solely on the basis of the fact that the contract is to be awarded to a United Kingdom contractor and is to be performed substantially in the United Kingdom (see 48 CFR 9903.201-1(b)(12) (FAR Appendix)).

(d) Administration of Cost Accounting Standards.

(1) The contracting officer shall insert the clause at 52.230-6, Administration of Cost Accounting Standards, in contracts containing any of the clauses prescribed in paragraphs (a), (b), or (e) of this subsection.

(2) The clause at 52.230-6 specifies rules for administering CAS requirements and procedures to be followed in cases of failure to comply.

(e) Cost Accounting Standards -- Educational Institutions.

(1) The contracting officer shall insert the clause at 52.230-5, Cost Accounting Standards -- Educational Institution, in negotiated contracts awarded to educational institutions, unless the contract is exempted (see 48 CFR 9903.201-1 (FAR Appendix)), the contract is to be performed by an FFRDC (see 48 CFR 9903.201-2(c)(5) (FAR Appendix)), or the provision at 48 CFR 9903.201-2(c)(6) (FAR Appendix) applies.

(2) The clause at 52.230-5 requires the educational institution to comply with all CAS specified in 48 CFR 9905 (FAR Appendix), to disclose actual cost accounting practices as required by 48 CFR 9903.202-1(f) (FAR Appendix), and to follow disclosed and established cost accounting practices consistently.

52.230-7, Proposal Disclosure—Cost Accounting Practice Changes.

252.231-7000, Supplemental Cost Principles, in all solicitations and contracts, which are subject to the principles and procedures described in FAR Subparts 31.1, 31.2, 31.6, and 31.7.

252.232-7003, Electronic Submission of Payment Requests.

252.232-7010, Levies on Contractor Payments.

52.232-9, Limitation on Withholding of Payments, in solicitations and contracts when a supply contract, research and development contract, service contract, time-and-materials contract, or labor-hour contract is contemplated that includes two or more terms authorizing the temporary withholding of amounts otherwise payable to the contractor for supplies delivered or services performed.

52.232-16, Progress Payments, in solicitations that may result in contracts greater than the SAT providing for progress payments based on cost. If the contractor is a small business concern, use the clause with its Alternate I.

52.232-17, Interest, in solicitations and contracts. It may be inserted if the contract will be in one or more of the following categories: Contracts at or below the simplified acquisition threshold; Contracts without any provision for profit or fee with a nonprofit organization; Any

other exceptions authorized under agency procedures.

52.232-20, Limitation of Cost, in solicitations and contracts if a fully funded cost-reimbursement contract is contemplated whether or not the contract provides for payment of a fee.

52.232-22, Limitation of Funds, in solicitations and contracts if an incrementally funded cost-reimbursement contract is contemplated.

52.232-23, Assignment of Claims, in solicitations and contracts expected to exceed the micro-purchase threshold, unless the contract will prohibit the assignment of claims (see 32.803(b)). The use of the clause is not required for purchase orders. However, the clause may be used in purchase orders expected to exceed the micro-purchase threshold, that are accepted in writing by the contractor, if such use is consistent with agency policies and regulations. If a no-setoff commitment has been authorized (see 32.803(d)), the contracting officer shall use the clause with its Alternate I.

52.232-24, Prohibition of Assignment of Claims, in solicitations and contracts for which a determination has been made under agency regulations that the prohibition of assignment of claims is in the Government's interest.

52.232-25, Prompt Payment, in all solicitations and contracts, except when payment terms and the late payment penalties are established by other governmental authority (e.g., tariffs). (1) As authorized in 32.904(b)(1)(ii)(B)(4), the contracting officer may modify the date in paragraph (a)(5)(i) of the clause to specify a period longer than 7 days for constructive acceptance, if required to afford the Government a reasonable opportunity to inspect and test the supplies furnished or to evaluate the services performed, (2) As provided in 32.903, agency policies and procedures may authorize amendment of paragraphs (a)(1)(i) and (ii) of the clause to insert a period shorter than 30 days (but not less than 7 days) for making contract invoice payments.

52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration.

52.233-1, Disputes. If it is determined under agency procedures that continued performance is necessary pending resolution of any claim arising under or relating to the contract, the contracting officer shall use the clause with its Alternate I.

52.233-2, Service of Protest, in solicitations for contracts expected to exceed the simplified acquisition threshold.

52.233-3, Protest After Award, in all solicitations and contracts. If a cost reimbursement contract is contemplated, the contracting officer shall use the clause with its Alternate I.

52.233-4 – Applicable Law for Breach of Contract Claim.

252.233-7001, Choice of Law (Overseas).

252.235-7010, Acknowledgment of Support and Disclaimer.

252.235-7011, Final Scientific or Technical Report

52.239-1, Privacy or Security Safeguards, in solicitations and contracts for information technology which require security of information technology, and/or are for the design, development, or operation of a system of records using commercial information technology services or support services.

252.239-7000, Protection Against Compromising Emanations

52.242-1, Notice of Intent to Disallow Costs.

52.242-3, Penalties for Unallowable Costs, in all solicitations and contracts, over \$500,000.

52.242-4, Certification of Indirect Costs, into all solicitations and contracts which provide for establishment of final indirect cost rates.

252.242-7000, Postaward Conference.

52.242-13, Bankruptcy, in all solicitations and contracts exceeding the simplified acquisition threshold.

52.242-15, Stop-Work Order, Alternate I.

52.243-2, Changes -- Cost-Reimbursement, Alternate V.

52.243-6, Change Order Accounting, in solicitations and contracts for research and development contracts of significant technical complexity, if numerous changes are anticipated.

52.243-7, Notification of Changes, in research and development for principal subsystems.

252.243-7001, Pricing of Contract Modifications, in solicitations and contracts when anticipating and using a fixed price type contract.

252.243-7002, Requests for Equitable Adjustment, in solicitations and contracts estimated to exceed the simplified acquisition threshold.

52.244-2, Subcontracts, Alternate 1.

52.244-5, Competition in Subcontracting, when the contract amount is expected to exceed the simplified acquisition threshold.

52.244-6, Subcontracts for Commercial Items.

52.245-1, Property Records, in solicitations and contracts when the following conditions exist and the Government maintains the Government's official Government property records: Contracts may provide for the contracting office to maintain the Government's official Government property records when the contracting office retains contract administration and Government property is furnished to a contractor for use on a Government installation; under a contract with a short performance period; or when otherwise determined by the contracting officer to be in the Government's interest.

52.245-5, Government Property (Cost-Reimbursement, Time-and-Material, or Labor-Hour

Contracts).

252.245-7001, Reports of Government Property.

52.245-9, Use and Charges.

52.245-18, Special Test Equipment, in solicitations and contracts when the Contractor will acquire or fabricate special test equipment for the Government but the exact identification of the special test equipment to be acquired or fabricated is unknown.

52.245-19, Government Property Furnished "As Is," in solicitations and contracts when Government production and research property is to be furnished "as is."

Use a clause substantially the same as the clause at 252.246-7001, Warranty of Data, in solicitations and contracts that include the clause at 252.227-7013, Rights in Technical Data and Computer Software, and there is a need for greater protection or period of liability than provided by other contract clauses, such as the clauses at-(i) FAR 52.246-3, Inspection of Supplies--Cost-Reimbursement;(ii) FAR 52.246-6, Inspection--Time-and-Material and Labor-Hour;(iii) FAR 52.246-8, Inspection of Research and Development--Cost-Reimbursement; and(iv) FAR 52.246-19, Warranty of Systems and Equipment Under Performance Specifications or Design Criteria.(2) Use the clause at 252.246-7001, Warranty of Data, with its Alternate I when extended liability is desired and a fixed price incentive contract is contemplated.(3) Use the clause at 252.246-7001, Warranty of Data, with its Alternate II when extended liability is desired and a firm fixed price contract is contemplated.

52.246-8, Inspection of Research and Development -- Cost-Reimbursement, in solicitations and contracts for research and development when the primary objective of the contract is the delivery of end items other than designs, drawings, or reports, unless use of the clause is impractical and the clause prescribed in 46.309 is considered to be more appropriate. If it is contemplated that the contract will be on a no-fee basis, the contracting officer shall use the clause with its Alternate I.

52.246-9, Inspection of Research and Development (Short Form), in solicitations and contracts for research and development when the clause prescribed in 46.307 or the clause prescribed in 46.308 is not used.

52.246-11, Higher-Level Contract Quality Requirement, in solicitations and contracts when the inclusion of a higher-level contract quality requirement is appropriate (see 46.202-4).

In (1) contracts requiring delivery of end items that are not high-value items, insert the clause at 52.246-23, Limitation of Liability. (2) In contracts requiring delivery of high-value items, insert the clause at 52.246-24, Limitation of Liability -- High Value Items. (3) In contracts requiring delivery of both high-value items and other end items, insert both clauses prescribed in (1) and (2) of this section, Alternate I of the clause at 52.246-24, and identify clearly in the contract schedule the line items designated as high-value items.

52.247-63, Preference for U. S.-Flag Air Carriers.

52.247-64, Preference for Privately Owned U. S.-Flag Commercial Vessels.

252.247-7023, Transportation of Supplies by Sea.

252.247-7024, Notification of Transportation of Supplies by Sea, in all contracts for which the offeror made a negative response to the inquiry in the provision at 252.247-7022, Representation of Extent of Transportation by Sea.

52.249-5, Termination for the Convenience of the Government (Educational and Other Nonprofit Institutions), in solicitations and contracts for research and development work with an educational or nonprofit institution on a nonprofit or no-fee basis.

52.249-6, Termination (Cost Reimbursement), in solicitations and contracts except in contracts for research and development with an educational or nonprofit institution on a no-fee basis.

52.249-14, Excusable Delays, in solicitations and contracts for supplies, services, construction, and research and development on a fee basis, when a cost-reimbursement contract is contemplated.

52.251-1, Government Supply Sources, in solicitations and contracts when the contracting officer may authorize the contractor to acquire supplies or services from a Government supply source.

252.251-7000, Ordering From Government Supply Sources, in solicitations and contracts which include the clause at FAR 52.251-1, Government Supply Sources.

52.253-1, Computer Generated Forms, in solicitations and contracts that require the contractor to submit data on Standard or Optional Forms prescribed by this regulation and forms prescribed by agency supplements.

ATTACHMENT C
 ADDITIONAL
 REPRESENTATIONS AND CERTIFICATIONS
 FROM OFFERORS
 FAR/DFARS

CERTIFICATION, SIGNATURE

(If the person signing this contract/offer is other than the secretary/treasurer, vice-president, or president of the organization, and the amount of the contract/offer is in excess of \$100,000, the following certificate must be completed.)

I, _____, certify that I am secretary to the organization named as Contractor herein; that _____, who signed this contract on behalf of the Contractor, was then _____ of said organization; that said contract was duly signed for on behalf of said organization by authority of its governing body and is within scope of its power.

 SECRETARY

52.204-8 – Annual Representations and Certifications

The offeror has completed the annual representations and certifications electronically via the Online Representations and Certifications Application (ORCA) website at <http://orca.bpn.gov> . After reviewing the ORCA database information, the offeror verifies by submission of the offer that the representations and certifications currently posted electronically have been entered or updated within the last 12 months, are current, accurate, complete, and applicable to this solicitation (including the business size standard applicable to the NAICS code referenced for this solicitation), as of the date of this offer and are incorporated in this offer by reference (see FAR 4.1201); except for the changes identified below [*offeror to insert changes, identifying change by clause number, title, date*]. These amended representation(s) and/or certification(s) are also incorporated in this offer and are current, accurate, and complete as of the date of this offer.

FAR Clause	Title	Date	Change

Any changes provided by the offeror are applicable to this solicitation only, and do not result in an update to the representations and certifications posted on

ORCA.

(End of Provision)

DFARS 252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE
GOVERNMENT OF A TERRORIST COUNTRY (Sep 2004)
(Applicable if contract is expected to be \$100,000 or more.)

a) Definitions. As used in this provision-

(1) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means-

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtedness of a firm.

(b) Prohibition on award. In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) Disclosure. If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclose such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the

subsidiary. The disclosure shall include-

- (1) Identification of each government holding a significant interest; and
- (2) A description of the significant interest held by each government.

(End of provision)

DFARS 252.209-7002 DISCLOSURE OF OWNERSHIP OR CONTROL BY A FOREIGN GOVERNMENT

(Applicable if access to proscribed information is necessary for contract performance.)

(a) Definitions. As used in this provision --

(1) "Effectively owned or controlled" means that a foreign government or any entity controlled by a foreign government has the power, either directly or indirectly, whether exercised or exercisable, to control the election, appointment, or tenure of the Offeror's officers or a majority of the Offeror's board of directors by any means, e.g., ownership, contract, or operation of law (or equivalent power for unincorporated organizations).

(2) "Entity controlled by a foreign government" --

(i) Means --

(A) Any domestic or foreign organization or corporation that is effectively owned or controlled by a foreign government; or

(B) Any individual acting on behalf of a foreign government.

(ii) Does not include an organization or corporation that is owned, but is not controlled, either directly or indirectly, by a foreign government if the ownership of that organization or corporation by that foreign government was effective before October 23, 1992.

(3) "Foreign government" includes the state and the government of any country (other than the United States and its possessions and trust territories) as well as any political subdivision agency, or instrumentality thereof.

(4) "Proscribed information" means --

(i) Top Secret information;

(ii) Communications Security (COMSEC) information, except classified keys used to operate secure telephone units (STU IIIs);

(iii) Restricted Data as defined in the U.S. Atomic Energy Act of 1954, as amended;

(iv) Special Access Program (SAP) information; or

(v) Sensitive Compartmented Information (SCI).

(b) Prohibition on award. No contract under a national security program may be awarded to an entity controlled by a foreign government if that entity requires access to proscribed information to perform the contract, unless the Secretary of Defense or a designee has waived application of 10 U.S.C. 2536(a).

(c) Disclosure. The Offeror shall disclose any interest a foreign government has in the Offeror when that interest constitutes control by a foreign government as defined in this provisions. If the Offeror is a subsidiary, it shall also disclose any reportable interest a foreign government has in any entity that owns or controls the subsidiary, including reportable parents, and the ultimate parent. Use separate paper as needed, and provide the information in the following format:

- o Offeror's Point of Contact for questions about Disclosure
(Name and Phone Number with Country Code, City Code and Area Code,
as applicable)
- o Name and Address of Offeror
- o Name and Address of Entity Controlled by a Foreign Government
- o Description of Interest, Ownership Percentage, and Identification of
Foreign Government

(End of Provision)

FAR 52.227-7 PATENTS-NOTICE OF GOVERNMENT LICENSEE (use if Government is obligated to pay a royalty on a patent involved in the prospective contract)

The Government is obligated to pay a royalty applicable to the proposed acquisition because of a license agreement between the Government and the patent owner. The patent number is ____ [Contracting Officer fill in], and the royalty rate is ____ [Contracting Officer fill in]. If the offeror is the owner of, or a licensee under, the patent, indicate below:

___Owner

___Licensee

If an offeror does not indicate that it is the owner or a licensee of the patent, its offer will be evaluated by adding thereto an amount equal to the royalty.

(End of Provision)

FAR52.230-1 COST ACCOUNTING STANDARDS NOTICES AND CERTIFICATION

(Applicable if proposed contract subject to CAS as specified in 48 CFR 9903.201 (FAR Appendix))

Note: This notice does not apply to small businesses or foreign governments. This notice is in three parts, identified by Roman numerals I through III.

Offerors shall examine each part and provide the requested information in order to determine Cost Accounting Standards (CAS) requirements applicable to any resultant contract.

If the offeror is an educational institution, Part II does not apply unless the contemplated contract will be subject to full or modified CAS coverage pursuant to 48 CFR 9903.201-2(c)(5) or 9903.201-2(c)(6), respectively.

I. Disclosure Statement--Cost Accounting Practices and Certification

(a) Any contract in excess of \$500,000 resulting from this solicitation will be subject to the requirements of the Cost Accounting Standards Board (48 CFR Chapter 99), except for those contracts which are exempt as specified in 48 CFR 9903.201-1.

(b) Any offeror submitting a proposal which, if accepted, will result in a contract subject to the requirements of 48 CFR Chapter 99 must, as a condition of contracting, submit a Disclosure Statement as required by 48 CFR 9903.202. When required, the Disclosure Statement must be submitted as a part of the offeror's proposal under this solicitation unless the offeror has already submitted a Disclosure Statement disclosing the practices used in connection with the pricing of this proposal. If an applicable Disclosure Statement has already been submitted, the offeror may satisfy the requirement for submission by providing the information requested in paragraph (c) of Part I of this provision.

Caution: In the absence of specific regulations or agreement, a practice disclosed in a Disclosure Statement shall not, by virtue of such disclosure, be deemed to be a proper, approved, or agreed-to practice for pricing proposals or accumulating and reporting contract performance cost data.

(c) Check the appropriate box below:

___ (1) Certificate of Concurrent Submission of Disclosure Statement.

The offeror hereby certifies that, as a part of the offer, copies of the Disclosure Statement have been submitted as follows:

(i) Original and one copy to the cognizant Administrative Contracting Officer (ACO) or cognizant Federal agency official authorized to act in that capacity (Federal official), as applicable; and

(ii) One copy to the cognizant Federal auditor.

(Disclosure must be on Form No. CASB DS-1 or CASB DS-2, as applicable. Forms may be obtained from the cognizant ACO or Federal official and/or from the loose-leaf version of the Federal Acquisition Regulation.)

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the Disclosure Statement.

____ (2) Certificate of Previously Submitted Disclosure Statement. The offeror hereby certifies that the required Disclosure Statement was filed as follows:

Date of Disclosure Statement: _____ Name and Address of Cognizant ACO or Federal Official Where Filed: _____

The offeror further certifies that the practices used in estimating costs in pricing this proposal are consistent with the cost accounting practices disclosed in the applicable Disclosure Statement.

____ (3) Certificate of Monetary Exemption. The offeror hereby certifies that the offeror, together with all divisions, subsidiaries, and affiliates under common control, did not receive net awards of negotiated prime contracts and subcontracts subject to CAS totaling \$50 million or more in the cost accounting period immediately preceding the period in which this proposal was submitted. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

____ (4) Certificate of Interim Exemption. The offeror hereby certifies that (i) the offeror first exceeded the monetary exemption for disclosure, as defined in (3) of this subsection, in the cost accounting period immediately preceding the period in which this offer was submitted and (ii) in accordance with 48 CFR 9903.202-1, the offeror is not yet required to submit a Disclosure Statement. The offeror further certifies that if an award resulting from this proposal has not been made within 90 days after the end of that period, the offeror will immediately submit a revised certificate to the Contracting Officer, in the form specified under subparagraph (c)(1) or (c)(2) of Part I of this provision, as appropriate, to verify submission of a completed Disclosure Statement.

Caution: Offerors currently required to disclose because they were awarded a CAS-covered prime contract or subcontract of \$50 million or more in the current cost accounting period may not claim this exemption (4). Further, the exemption applies only in connection with proposals submitted before expiration of the 90-day period following the cost accounting period in which the monetary exemption was exceeded.

II. Cost Accounting Standards--Eligibility for Modified Contract Coverage

If the offeror is eligible to use the modified provisions of 48 CFR 9903.201-2(b) and elects to do so, the offeror shall indicate by checking the box below. Checking the box below shall mean that the resultant contract is subject to the Disclosure and Consistency of Cost Accounting Practices clause in lieu of the Cost Accounting Standards clause.

____ The offeror hereby claims an exemption from the Cost Accounting Standards clause under the provisions of 48 CFR 9903.201-2(b) and certifies that the offeror is eligible for use of the

Disclosure and Consistency of Cost Accounting Practices clause because during the cost accounting period immediately preceding the period in which this proposal was submitted, the offeror received less than \$50 million in awards of CAS-covered prime contracts and subcontracts. The offeror further certifies that if such status changes before an award resulting from this proposal, the offeror will advise the Contracting Officer immediately.

Caution: An offeror may not claim the above eligibility for modified contract coverage if this proposal is expected to result in the award of a CAS-covered contract of \$50 million or more or if, during its current cost accounting period, the offeror has been awarded a single CAS-covered prime contract or subcontract of \$50 million or more.

III. Additional Cost Accounting Standards Applicable to Existing Contracts

The offeror shall indicate below whether award of the contemplated contract would, in accordance with subparagraph (a)(3) of the Cost Accounting Standards clause, require a change in established cost accounting practices affecting existing contracts and subcontracts.

___ yes___ no

(End of provision)

FAR 52.242-4 CERTIFICATION OF FINAL INDIRECT COSTS

(a) The Contractor shall --

(1) Certify any proposal to establish or modify final indirect cost rates;

(2) Use the format in paragraph (c) of this clause to certify; and

(3) Have the certificate signed by an individual of the Contractor's organization at a level no lower than a vice president or chief financial officer of the business segment of the Contractor that submits the proposal.

(b) Failure by the Contractor to submit a signed certificate, as described in this clause, may result in final indirect costs at rates unilaterally established by the Contracting Officer.

(c) The certificate of final indirect costs shall read as follows:

CERTIFICATE OF INDIRECT COSTS

This is to certify that I have reviewed this proposal to establish final indirect cost rates and to the best of my knowledge and belief:

1. All costs included in this proposal _____ (identify proposal and date) to establish final indirect cost rates for _____ (identify period covered by rate) are allowable in accordance with the cost principles of the Federal Acquisition Regulation (FAR) and its supplements applicable to those contracts to which the

final indirect cost rates will apply; and

2. This proposal does not include any costs, which are expressly unallowable under applicable cost principles of the FAR or its supplements.

FIRM:

SIGNATURE:

NAME OF CERTIFYING OFFICIAL:

TITLE:

DATE OF EXECUTION:

(End of Clause)

DFARS 252.204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION

(a) Definitions. As used in this clause-

(1) "Central Contractor Registration (CCR) database" means the primary DoD repository for contractor information required for the conduct of business with DoD.

(2) "Data Universal Number System (DUNS) number" means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.

(3) "Data Universal Numbering System +4 (DUNS+4) number" means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

(4) "Registered in the CCR database" means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a

prospective awardee must be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.

(2) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.

(3) Lack of registration in the CCR database will make an offeror ineligible for award.

(4) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.

(c) The Contractor is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete.

(d) Offerors and contractors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at <http://www.ccr.gov>.

(End of clause)

252.247-7022 REPRESENTATION OF EXTENT OF TRANSPORTATION BY SEA
(Applicable if procurement greater than SAT).

(a) The Offeror shall indicate by checking the appropriate blank in paragraph (b) of this provision whether transportation of supplies by sea is anticipated under the resultant contract. The term "supplies" is defined in the Transportation of Supplies by Sea clause of this solicitation.

(b) Representation. The Offeror represents that it-

_____ Does anticipate that supplies will be transported by sea in the

_____ Does not anticipate that supplies will be transported by sea in the performance of any contract or subcontract resulting from this solicitation.

(c) Any contract resulting from this solicitation will include the Transportation of Supplies by Sea clause. If the Offeror represents that it will not use ocean transportation, the resulting contract will also include the Defense FAR Supplement

clause at 252.247-7024, Notification of Transportation of Supplies by Sea.
(End of provision)