STATEMENT OF OBJECTIVES
Environmental Monitoring Research
Energy and Environmental Sciences Branches,
NIWC Pacific, San Diego California

1.0 SCOPE

1.1 The Naval Information Warfare Center (NIWC), Pacific environmental program ensures military mission activities are conducted in compliance with all applicable environmental laws, regulations, and policies. Article I B of the master agreement states the objectives of the CESU are to: provide research, technical assistance and education to federal land management, environmental and research agencies and their potential partners; develop a program of research, technical assistance and education that involves the biological, physical, social sciences needed to address resource issues and interdisciplinary problem-solving at multiple scales and in an ecosystem context at the local, regional, and national level; and place special emphasis on the working collaboration among federal agencies and universities and their related partner institutions.

1.2 In agreement with the above stated goals, the recipient/cooperator agrees to provide the necessary personnel required to conduct academic research, perform quality assurance on data management, and sample evaluation for on-going Environmental monitoring research efforts at the Naval Information Warfare Center (NIWC), Pacific for the environmental program within the NIWC Pacific Energy and Environmental Sciences Branches, located at San Diego, California. The scope of this agreement includes supporting the program manager (PM) through various program management duties such as environmental microbial experiment development, in vitro assay development, and sample characterization analysis.

1.3 This work requires an onsite support person located at the Naval Information Warfare Center (NIWC), Pacific, Energy and Environmental Sciences Branch, located at San Diego, California. The required technical activities will support many of the Navy's commitments to comply with federal environmental and natural resource mandates and to foster strong environmental stewardship, health and safety to benefit regional resources that are covered in the Installation's INRMP. Therefore, this work requires knowledge of the Installation's INRMP. The work shall involve: sample characterization experiments, statistical comparative analysis of characterization data, and prepare report(s). Task requires experience with modern and classical approaches for cultivation of microorganisms and running the Physiologically Based Extraction Tests (PBET). At least 100% time is anticipated for 12-month base period and two 12-month option periods.

2.0 AUTHORITY

2.1 This cooperative agreement will be awarded using 16 U.S.C. § 670(c) as the awarding authority. In addition, the efforts completed under this agreement must be performed in a manner that is conducive to guidance outlined under the Endangered Species Act (16 USC 1531 et seq.), the Sikes Act Improvement Act (16 USC 670 et seq.), and the Migratory Bird Treaty Act (16 USC 1361 et seq.) and other regional regulatory guidelines.

2.2 In accordance with section *6305 – Using cooperative agreements* of the *Federal Grant and Cooperative Agreements Act of 1977* (31 U.S.C. § 6301 et seq.), all CESU projects must carry out a public purpose of support or stimulation, instead of acquiring goods or services for the exclusive direct benefit of the United States Government. Examples of carrying out a public purpose may include, but are not limited to, the following:

-Project results including all microbial and PBET study results are made available to a wide audience (including nonfederal entities) through peer review publications. In addition, the microbial data will be used to improve technology development which will be made available to federal, state, and private agencies.

-Project results/outputs from this study will be add to the scientific literature/knowledge base, with applicability and utility beyond the scope of the project footprint/study area.

-Results of this research will add to the academic and other nonfederal partner institutions (and their personnel) gain professional experience, increase knowledge, and develop skills and abilities through the development of analytical methods used to characterize environmental microbial populations under this effort.

-For all the work under this agreement students benefit from direct interaction with federal scientists, program and technical staff, and field unit managers

2.3 In accordance with section *6305 – Using cooperative agreements* of the *Federal Grant and Cooperative Agreements Act of 1977* (31 U.S.C. § 6301 et seq.), substantial involvement is expected between the Department of Defense and the recipient when carrying out the activity contemplated by the cooperative agreement. The DoD agrees to participate at a national level in support of the CESU program as accepted in the Master MOU for the establishment and continuation of the CESU program Article II 1-4 and Article VI 1-7.

The installation further (hence DOD) agrees to provide substantial involvement as directed under the appropriate CESU Master Agreement to include, but are not limited to, the following:

 NIWC Pacific is involved in development of study methodology, data gathering, analysis, and report writing
NIWC Pacific actively participates and collaborates in carrying out the project plan of work, reviews and approves activities, helps train, or select project staff or trainees
NIWC SSC Pacific incurs in-kind or direct expenditures in carrying out the activities specified in the project agreement. Examples include, but are not limited to, the following:
 Providing laboratory space and materials
 Providing vehicles for any field related work
 Providing computing services
 Providing staff time to work on the project

3.0 DESCRIPTION OF OBJECTIVES

As shown below, there are multiple objectives and optional efforts associated environmental monitoring at the Naval Information Warfare Center (NIWC), Pacific. SOO Objective Tasks 3.1 thru 3.4 will be funded as the Basic Tasks each year. Optional Effort 1 in SOO Section 6.0 and

Optional Effort 2 in SOO Section 7.0 will be Optional and may be funded during each year depending on project conditions and needs.

Objective/Task	Base Year	Option Year 1	Option Year 2	Option Year 3	Option Year 4
Objective 3.1, Task 1 – Sample Characterization Analysis on Environmental Relevant Microbes**	**	**	**	**	**
Objective 3.2, Task 2 – Comparison to Standard Methods**	**	**	**	**	**
Objective 3.3, Task 3 – Physiological Based Extraction Tests (PBET)**	**	**	**	**	**
Objective 3.4, Task 4 – Statistical Analysis of Characterization Analysis**	**	**	**	**	**
Optional *Effort* 1 – 6.0 Tasks 6.1 – 6.4	***	***	***	***	***
Optional *Effort* 2 - 7.0 Tasks 7.1 – 7.4	***	***	***	***	***

**Basic Task to be funded each year.

***Optional *Efforts* - may be funded at any time for award each year.

3.1 Task 1: Sample Characterization Analysis on Environmental Relevant Microbes.

Plan and conduct characterization analysis studies of micro-organisms using Environmental Protection Agency (EPA) recommended Standard Test Organisms (STO), virus, bacteria, and protozoa. Conduct studies using NIWC Pacific laboratory space and materials to determine sensor capacity to detect target pathogens and characterize pathogenicity and protein expression. This task requires experience with modern and classical approaches for cultivation of microorganisms, analytical and molecular biology tools including HPLC, GC/MS, raman spectroscopy, cloning and transfection, and gene-expression. Microeco physiology and experience working with pathogenic and facultative pathogenic microbes is preferred. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will be the data that goes into a report detailing the quantitative results of the analysis, diagnostic photographs, and reference collections for each species (the Navy will prepare the report).

3.2. Task 2: Comparison to standard methods

A comparative analysis of sensor to standard analytical methods to detect environmental microbes will be conducted. Both quantitative and qualitative means of detections will be compared and contrasted. This task will require experience with classical culture techniques along with quantitative polymerase chain reaction (QPCR), and immuno-assay techniques and flow cytometry. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will be a report detailing the quantitative results of the analysis, diagnostic photographs and reference collections for each species.

3.3. Task 3: Physiological Based Extraction Tests (PBET)

Plan, optimize, and conduct characterization analysis studies of contaminated soils using modified EPA approved PBET assay for organic contaminants. Conduct studies using NIWC Pacific laboratory space and materials to determine quantitative digestion level and relative bioavailability. This task requires experience with optimizing and running the physiological based assay experimental devices and assay methodology. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will

be the data that goes into a report detailing the quantitative results of the analysis, diagnostic photographs, and reference collections for each species (the Navy will prepare the report).

3.4 Task 4: Statistical analysis of characterization analysis
Perform appropriate statistical analysis of characterization analysis from experiments conducted in Section 3.1. and 3.2. Analysis should include use of standard statistical software packages (e.g. SPSS, SAS, JMP, etc) and be organized and plotted using spreadsheets (e.g. Microsoft Excel). All work will be conducted at NIWC Pacific. The deliverable will be a report detailing the quantitative results of the analysis.

4.0 QUALIFICATIONS

4.1 Post-doctoral student or professional in the field of general and environmental microbiology with experience of understanding microbial physiology on molecular and cellular levels in artificial and natural ecosystems.
4.2 Must understand and utilize in vitro physiological based extraction-based assays and understand link of digestion and relative bioavailability.
4.3 Must understand and utilize different approaches to demonstrate targeted link of metabolic activity and gene/protein expressions among facultatively pathogenic and nonpathogenic microorganisms.
4.4 Must have BSL2 working experience in cultivation and archiving of bacteria from culture collections and environmental isolates.
4.5 Must have knowledge of cultivation and characterization environmental pathogens or related field with a combination of experience/expertise described in (4.1) above, plus additional experience/expertise related to one or more of the following technical areas.

4.5.1 This performer should have demonstrated skills in interpreting organic GCMS and Raman spectral data.

4.5.2 This person should have completed basic microbiology laboratory training in order to culture and maintain no greater than CAT 2 organisms.

5.0 GOVERNMENT FURNISHED MATERIALS

5.1 The government will provide all resources necessary to complete work on site.

6.0 OPTIONAL <u>Effort</u> 1 – May be awarded at any time each year depending on project conditions and needs (subject to availability of funds).

6.1 Option Task 1: Task 1: Sample Characterization Analysis on Environmental Relevant Microbes- Down Selection. This would be a continuation of previous 3.1 tasking but based on a down selected microbial population with more targeted characteristics of interest (e.g. physiochemical properties, mutagenicity, expression). Methodology to be the same as that in task 3.1 with same set of deliverables.

6.2 Option Task 2: A comparative analysis of sensor to standard analytical methods to detect environmental microbes will be conducted. Both quantitative and qualitative means of detections will be compared and contrasted. This task will require experience with classical

culture techniques along with quantitative polymerase chain reaction (QPCR), and immuno-assay techniques. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will be a report detailing the quantitative results of the analysis, diagnostic photographs, and reference collections for each species.

6.3 Option Task 3: Optimization of Physiological Based Extraction Tests (PBET) – additional source material. Methods and approach the same as described under task 3.3. Work will be conducted at NIWC Pacific. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will be the data that goes into a report detailing the quantitative results of the analysis, diagnostic photographs and reference collections for each species (the Navy will prepare the report).

6.4 Option Task 4: Statistical analysis of characterization analysis
Perform appropriate statistical analysis of characterization analysis from experiments conducted in Section 3.1and 3.2. Analysis should include use of standard statistical software packages (e.g. SPSS, SAS, JUMP, etc) and be organized and plotted using spreadsheets (e.g. Microsoft Excel). All work will be conducted at SSC Pacific. The deliverable will be a report detailing the quantitative results of the analysis.

7.0 OPTIONAL <u>Effort</u> 2 – May be awarded at any time each year depending on project conditions and needs (subject to availability of funds).

7.1 Option Task 1: Task 1: Additional Sample Characterization Analysis On Environmental Relevant Microbes- continued Down Selection. This would be a continuation of previous 3.1 tasking but based on a down selected microbial population with more targeted characteristics of interest (e.g. physiochemical properties, mutagenicity, expression). Methodology to be the same as that in task 3.1 with same set of deliverables.

7.2 Option Task 2: A comparative analysis of additional sensor to standard analytical methods to detect environmental microbes will be conducted. Both quantitative and qualitative means of detections will be compared and contrasted. This task will require experience with classical culture techniques along with quantitative polymerase chain reaction (QPCR), and immuno-assay techniques. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will be a report detailing the quantitative results of the analysis, diagnostic photographs, and reference collections for each species.

7.3 Option Task 3: Optimization of Physiological Based Extraction Tests (PBET) – additional source material. Methods and approach the same as described under task 3.3. Work will be conducted at NIWC Pacific. All materials and supplies will be provided by NIWC Pacific. All work will be conducted at NIWC Pacific. The deliverable will be the data that goes into a report detailing the quantitative results of the analysis, diagnostic photographs, and reference collections for each species (the Navy will prepare the report).

7.4 Option Task 4: Statistical analysis of characterization analysis
Perform appropriate statistical analysis of characterization analysis from experiments conducted in Section 3.1 and 3.2. Analysis should include use of standard statistical software packages (e.g.

SPSS, SAS, JUMP, etc) and be organized and plotted using spreadsheets (e.g. Microsoft Excel). All work will be conducted at SSC Pacific. The deliverable will be a report detailing the quantitative results of the analysis.

8.0 **PERIOD OF PERFORMANCE**

8.1 The base period of performance will be 12 months from date of award.

8.2 This work includes four 12-month option periods with the first one beginning at the end of the base period of performance.

8.3 Two Optional Efforts that will be 12 months each once exercised and can be awarded anytime.

9.0 COORDINATION

9.1 Installation POC: All work will be coordinated with Kara Sorensen, NIWC Pacific, phone 619-553-1340 and email is sorensek@spawar.navy.mil.

9.2 USACE POC: Kathy Mitchell, Environmental Agreements PM, phone 817-886-1709 and email is kathy.s.mitchell@usace.army.mil

10.0 DELIVERABLES

10.1 Progress reports every three months detailing, accomplishments, plans for the following quarter, effort expended, and any problems encountered. Report schedule every three months due prior to the end of December, end of March, end of June and end of September.
10.2 Annual report detailing, accomplishments, plans for the following quarter, effort expended, and any problems encountered. The annual report is due at the end of each 12-month period of performance.
10.3 A final technical report summarizing all the work completed. The draft final technical report is due 60 days prior to final deliverable date to be determined after award during initial start meeting. The final report with government comments addressed on date to be determined after award during initial start meeting.

11.0 This cooperative agreement may be administered through a CESU only upon mutual agreement and official authorization by both parties of the acceptance of the application of the CESU Network IDC rate (17.5%).

This cooperative agreement is subject to and recipient/cooperator shall comply with 32 CFR subpart 32.34 “Equipment”, 32.35 “Supplies”, and 32.36 “Intangible Property” which includes use of research data.

[End of SOO]