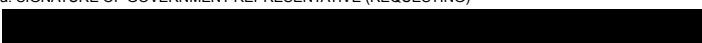


INTERAGENCY AGREEMENT		1. IAA NO. 31310019S0027			PAGE 1 OF 34	
2. ORDER NO.		3. REQUISITION NO. RES-19-0284		4. SOLICITATION NO.		
5. EFFECTIVE DATE 09/23/2019		6. AWARD DATE 09/23/2019		7. PERIOD OF PERFORMANCE 09/26/2019 TO 12/31/2021		
8. SERVICING AGENCY ENGINEERS U S ARMY CORPS OF ALC: DUNS: 098165889 +4: 3909 HALLS FERRY ROAD VICKSBURG MS 39180 POC Jennifer Maher TELEPHONE NO. 6016347432				9. DELIVER TO JOSEPH KANNEY US NUCLEAR REGULATORY COMMISSION 11555 ROCKVILLE PIKE MAIL STOP TWFN-10 B01 ROCKVILLE MD 20852-2738		
10. REQUESTING AGENCY ACQUISITION MANAGEMENT DIVISION ALC: 31000001 DUNS: 040535809 +4: US NUCLEAR REGULATORY COMMISSION 11555 ROCKVILLE PIKE MS T7-B20 ROCKVILLE MD 20852-2738 POC JENNIFER DUDEK TELEPHONE NO. 301-415-2257				11. INVOICE OFFICE US NUCLEAR REGULATORY COMMISSION ONE WHITE FLINT NORTH 11555 ROCKVILLE PIKE MAILSTOP 03-E17A ROCKVILLE MD 20852-2738		
12. ISSUING OFFICE US NRC - HQ ACQUISITION MANAGEMENT DIVISION MAIL STOP TWFN-07B20M WASHINGTON DC 20555-0001				13. LEGISLATIVE AUTHORITY Economy Act		
				14. PROJECT ID		
				15. PROJECT TITLE COASTAL FLOODING PROBABILISTIC FLOOD HAZARD ASSESS		
16. ACCOUNTING DATA 2019-X0200-FEEBASED-60-60D002-11-6-182-1014-251B						
17. ITEM NO.	18. SUPPLIES/SERVICES			19. QUANTITY	20. UNIT	21. UNIT PRICE
	IAA Agreement Number: 31310019S0027 The U.S. Nuclear Regulatory Commission and the U.S. Army Corps of Engineers hereby enter into this Agreement for the project entitled "Technical Assistance for Coastal Flooding Probabilistic Flood Hazard Assessment Pilot Study." The period of performance for this project shall commence on September 26, 2019 and will expire on December 31, 2021. Continued ...					
23. PAYMENT PROVISIONS				24. TOTAL AMOUNT \$150,000.00		
25a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (SERVICING)				26a. SIGNATURE OF GOVERNMENT REPRESENTATIVE (REQUESTING) 		
25b. NAME AND TITLE		25c. DATE		26b. CONTRACTING OFFICER JENNIFER A. DUDEK		26c. DATE 09/23/2019

CONSIDERATION AND OBLIGATION:

(a) The authorized cost ceiling of this Agreement is \$390,620.00.

(b) The amount presently obligated with respect to this Agreement is \$150,000.00. When and if the amount(s) paid and payable to the USACE hereunder shall equal the obligated amount, the USACE shall not be obligated to continue performance of the work unless and until the NRC Contracting Officer shall increase the amount obligated with respect to this Agreement. Any work undertaken by the USACE in excess of the obligated amount specified above is done so at the USACE's sole risk.

The following documents are hereby made a part of this Agreement:

Attachment No.1: Statement of Work

Attachment No.2: IAA Standard Terms and Conditions

NRC Contracting Officer's Representative (COR):

Joseph Kanney

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DUNS: 040535809

ALC: 31000001

Continued ...

00001	TAS: 31X0200.320 Master IAA: N/A Authorized Cost Ceiling Line Item Ceiling: \$390,620.00 Incrementally Funded Amount: \$150,000.00 The total amount of award: \$390,620.00. The obligation for this award is shown in box 24.				390,620.00
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**Statement of Work (SOW) for
“Technical Assistance for Coastal Flooding Probabilistic Flood Hazard
Assessment Pilot Study”**

1.0 PURPOSE. This study will assist the U.S. Nuclear Regulatory Commission (USNRC) with the execution of a Coastal Flood Hazard Pilot Study to demonstrate the application of Probabilistic Flood Hazard Assessment (PFHA) to external flooding at a hypothetical nuclear power plant site due to coastal flooding phenomena (e.g., storm surge and associated storm rainfall and riverine discharge).

2.0 BACKGROUND. The U.S. Army Engineer Research and Development Center, Coastal and Hydraulics Laboratory (ERDC-CHL), has been collaborating with U.S. Nuclear Regulatory Commission (NRC) in performing a comprehensive assessment of uncertainties in probabilistic storm surge modeling under the USNRC sponsored “Quantification of Uncertainties in Probabilistic Storm Surge Models”. The probabilistic assessment of risk posed by flooding hazards has been an area of concern that was recently the focus of a revaluation by the NRC. A Probabilistic Flood Hazard Assessment (PFHA) research program that focuses on nuclear facilities has been implemented to aid the development of regulation and guidance that incorporates the latest developments in quantitative risk assessments. This project is part of NRC’s PFHA Research Program. The programmatic basis for the PFHA Research Program is a joint User Need Request from the Office of New Reactors and the Office of Nuclear Reactor Regulation. This research project will demonstrate the development of a set of site-specific probabilistic flood hazard curves (e.g., still water levels, total water levels, wave impacts, time to peak loadings, duration of inundation and period of recession, etc.), and characterizes the uncertainty associated with these hazards. A key element to this pilot will be to quantify the aleatory and epistemic uncertainties to support the intended application of the PFHA results (e.g., input to Nuclear Power Plant (NPP) external flooding PRAs).

PFHA provides a quantitative relation between the probability of occurrence and magnitude for various flood hazards. This pilot project will focus on flooding mechanisms or processes that may impact nuclear power plants in coastal settings. This will include flooding from storm surge, wind, waves (including wave setup and runup), tides, and concurrent riverine flooding. A comprehensive flood hazard assessment will comprise probabilistic modeling of individual processes as well as composite modeling of coincident and/or correlated processes (e.g., riverine flooding concurrent or correlated with storm surge). The expected result will be flood hazard curve families for several coastal flooding scenarios that relate flooding frequencies and magnitudes and include estimates of uncertainty.

Specifically, this PFHA pilot will demonstrate the development of a set of site-specific probabilistic flood hazard curves (e.g., still water levels, total water levels, wave impacts, time to peak loadings, duration of inundation and period of recession, etc.), and characterize the uncertainty associated with these hazards. A key element to this pilot will be to quantify the aleatory and epistemic uncertainties to support the intended application of the PFHA results (e.g., input to NPP external flooding PRAs). This effort will incorporate insight from previous NRC research in the quantification of uncertainty in probabilistic storm surge models.

2.1 General Requirement. The NRC, as part of its mission to regulate commercial uses of nuclear material, including nuclear power, formulates policies and regulations governing nuclear reactors. In order to assure that nuclear power facilities can be operated without undue risk to the health and safety of the public, general design criteria have been established for facilities' structures, systems, and components that are important to safety. Natural hazards represent one of the principal threats to the safety of nuclear facilities. The regulatory design bases for protection against natural phenomena have been established in 10 CFR Part 50, Appendix A, Criterion 2 of the General Design Criteria. In general, this criterion establishes that the structures, systems and components important to safety shall be designed to withstand natural phenomena without loss of capability to perform their safety functions. It further specifies that the design for a site needs to consider the most critical historical event on record along with a margin to take into account the limitations in accuracy, quality and extent of the record. Within the NRC's regulatory framework the margin referred to in the General Design Criterion 2 was originally estimated utilizing a deterministic approach which did not specifically consider quantitative estimates of risk. Since those origins, NRC has been moving toward a risk-informed, performance-based approach by incorporating probabilistic risk assessment in the evaluation of natural hazards. One of the advantages of this approach is that it provides for the quantification of uncertainties associated with the probabilistic modelling on hazards.

2.2 Relationship to Other Projects.

ERDC-CHL is completing a comprehensive assessment of uncertainties in probabilistic storm surge models in support of the U.S. Nuclear Regulatory Commission's (USNRC) efforts to develop a framework for probabilistic storm surge hazard assessment for nuclear power plants. Insights acquired from this effort will be incorporated into this Pilot Study. ERDC-CHL has been engaged in multiple efforts to develop a clear understanding of the joint probability of storm forcing and hazards through the execution of various regional probabilistic flood hazard assessment studies. These include the North Atlantic Coast Comprehensive Study for the U.S. North Atlantic coast from Virginia to Maine and the Coastal Texas Protection and Restoration Study for the coast of Texas. ERDC is currently executing the South Atlantic Coast Study that will quantify coastal hazards for the South Atlantic coast of the US, the east coast of the Gulf of Mexico, and Puerto Rico and the Virgin Islands. Modeling performed on these and other regions will be considered in the site location for this Pilot Study.

2.3 Project POCs.

The technical POC for US Nuclear Regulatory Commission is Dr. Joseph Kanney phone: (301) 251-7600, email: Joseph.Kanney@nrc.gov

The financial POC for US Nuclear Regulatory Commission is Jennifer Dudek phone: (301) 415-2257, email: Jennifer.Dudek@nrc.gov

The technical POC for ERDC-CHL is [REDACTED]
phone: [REDACTED], email: [REDACTED]

The financial POC for ERDC-CHL is Ms. Valencia R. Flaggs
phone: (601) 634-3092, email: Valencia.R.Flaggs@usace.army.mil

2.4 Project Delivery Team.

Name	Title	Role	Organization
[REDACTED]	Group Leader, Coastal Hazards Group	Principal Investigator	ERDC-CHL
[REDACTED]	Research Civil Engineer (Hydraulics)	Co-PI, PDT*, Engineer	ERDC-CHL
[REDACTED]	Research Mathematician	PDT, ADCIRC SME*	ERDC-CHL
[REDACTED]	Senior Research Engineer	PDT, Engineer	ERDC-CHL
[REDACTED]	Research Civil Engineer (Hydraulics)	PDT, Engineer	ERDC-CHL
[REDACTED]	Research Scientist	PDT, Meteorologist	ERDC-CHL
[REDACTED]	Senior Hydraulic Engineer	HEC-RAS 2D SME, TR***	IWR-HEC
[REDACTED]	Hydraulic Engineer	HEC-HMS SME, TR	IWR-HEC
[REDACTED]	Associate Professor	Metamodeling SME, TR	University of Notre Dame

* Project delivery team

** Subject matter expert

***Technical reviewer

2.5 Experience and Capability of Key Personnel and ERDC. The following are identified as key personnel for this SOW.

[REDACTED]

[REDACTED] will serve as Principal Investigator (PI) and Technical POC for this study. [REDACTED] is the Group Leader of the Coastal Hazards Group at the U.S. Army Corps of Engineers (USACE), Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL) in Vicksburg, MS. He received BS and ME degrees in Civil Engineering from the University of Puerto Rico at Mayagüez. [REDACTED] received a PhD in Civil Engineering with specializations in oceanography and probabilistic hazard analysis from the University of Puerto Rico at Mayagüez. He has over 12 years of

experience working at CHL in the area of coastal storm hazards, and has been Principal Investigator and/or Statistical Lead in several studies in this area.

██████████ is presently the ERDC Statistical Lead in research related to the Coastal Hazard System (national coastal storm hazards data resource), coastal flood risk, coastal life-cycle risk analysis, and coastal structure engineering. Currently, ██████████ is the Principal Investigator of the U.S. Nuclear Regulatory Commission (USNRC) sponsored “Quantification of Uncertainties in Probabilistic Storm Surge Models”. The work is in support of the USNRC efforts to develop a framework for probabilistic flood hazard assessment for critical infrastructure such as nuclear power plants. ██████████ is a PI for the Coastal Hazards System: South Atlantic Regional Systems Management Study that will quantify coastal hazards for the South Atlantic and Eastern Gulf Coasts of United States as well as Puerto Rico and the U.S. Virgin Islands. ██████████ was also Co-PI and Statistical Lead in the North Atlantic Comprehensive Coastal Study (NACCS), which quantified coastal hazards from Maine to Virginia, as well as the USACE Coastal Texas Study. He is also PI of the Joint Probability Assessment of Coastal Storm Response for a Comprehensive Barrier Protection, Galveston Bay and Vicinity, TX study, in collaboration with Texas A&M and Jackson State University’s Coastal Hazards Center. ██████████ recently served as the Statistical Lead of a study to develop new flood mapping technologies based on high-fidelity modeling in support of the FEMA Region V portion of the National Flood Insurance Program (NFIP). Research work units led by ██████████ include the Coastal Hazards System, Stochastic Forcing for Coastal Structures and Coastal Hazards Rapid Prediction.

██████████ has also served in several site-specific studies for USACE coastal risk studies and is presently collaborating in cooperative R&D with various academic institutions, including University of Notre Dame, and McGill University in Quebec, Canada. Awards received include the 2016 ERDC Herbert D. Vogel Engineer of the Year Award, the highest honorary award granted to engineers working at ERDC’s Vicksburg site. ██████████ was also the recipient of the 2015 Great Minds in STEM’s Civil Engineer Award at the Hispanic Engineering National Achievement Award Conference. Also, ██████████ is member of the American Statistical Association (ASA).

██████████ serves as a Research Hydraulic Engineer in the U.S. Army Corps of Engineers (USACE), Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL). ██████████ has been collaborating as one of the technical leads in the U.S. Nuclear Regulatory Commission (USNRC) sponsored “Quantification of Uncertainties in Probabilistic Storm Surge Models”. The work is in support of the USNRC efforts to develop a framework for probabilistic flood hazard assessment for critical infrastructure such as nuclear power plants. ██████████ has participated in four U.S. NRC Probabilistic Flood Hazard Assessment workshops where he has presented the work performed as part of the project. ██████████ also conducts research as a Principal Investigator of a research work unit about reliability of rubble mound

coastal structures. He also participates in regional coastal hazard studies, applying state of the art statistical tools to quantify coastal storm hazards and related uncertainties. As part of the Coastal Hazards Group, he specializes in reliability analysis of coastal structures, coastal structure analysis and design, Monte Carlo life-cycle analysis, quantification of uncertainty in probabilistic storm surge models, and probabilistic coastal hazard assessment. [REDACTED] has been with CHL since 2014 and has been a registered Professional Civil engineer in Puerto Rico since 2006 and in Mississippi since 2014. Before working with CHL, [REDACTED] was a civil engineer at a consultant firm in San Juan, Puerto Rico for eight years where he performed over twenty hydrologic and hydraulic studies of rivers and streams in support of flood control works, road and bridge designs, and land development projects.

[REDACTED]

[REDACTED] serves as a Research Mathematician at the US Army Corps of Engineers at the Engineering Research and Development Center (Waterways Experiment Station), Coastal and Hydraulic Laboratory since 2008. He is a recognized expert in the development and application of coastal and riverine numerical models, model coupling and system integration, and storm surge modeling. [REDACTED] is currently (1) leading the continued development of the Coastal Storm Modeling System, (2) working on the development of a next generation unstructured wave model, (3) working on linking sediment transport libraries with hydrodynamic codes, (4) leading the coastal numerical modeling study for storm damage reduction for the Coastal Texas Study, (5) working with an interdisciplinary team to develop a USACE "Total Watershed Decision support" capability, and (6) recently completed work on the North Atlantic Coast Comprehensive Study: Numerical Modeling, where he served as a co-PI on what is to date the largest USACE civil works modeling study, using over 100 million CPU hours to complete. [REDACTED] has authored and co-authored over 14 publications and is a member of ASCE, AGU, AS&BPA, and SIAM.

[REDACTED] is an active part of the ADCIRC development team and every three years helps to organize and host the annual ADCIRC User's Group meeting at ERDC Vicksburg, MS. [REDACTED] is involved in cooperative research with NCEP and NCAR utilizing various meteorological products in support of geophysical scale model studies. [REDACTED] is also involved with NOAA's Geophysical Fluid Dynamics Laboratory researchers on using their atmospheric forecast models to drive the CSTORM hydrodynamic models for surge, circulation, and wave conditions, including the use of ensemble forecast products. [REDACTED] serves as one of the Army's representatives on the DoD High Performance Computing Modernization Programs (HPCMP) User's Advocacy Group.

[REDACTED]

[REDACTED] is a Senior Research Engineer for the U.S. Army Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL) since October 2018. Prior to this, he was a Principal for Noble Consultants/GEC Inc. since August 1, 2017. He retired as senior research

engineer from the ERDC CHL on July 31, 2017 after 30 years. [REDACTED] began his career with CHL in 1987 after receiving BS and MS degrees in Civil Engineering from Oregon State University. He received his PhD from the University of Delaware in Civil Engineering in 1999. He has over 140 publications and led USACE research in coastal life-cycle risk analysis, coastal flood risk, the Coastal Hazards System (a national coastal storm data resource), surrogate modeling of coastal storm hazards and coastal structure engineering. He is a registered Civil Engineer in Mississippi and a registered Diplomate of Coastal Engineering by the American Society of Civil Engineers.

[REDACTED] recent research has focused on understanding the coastal storm hazards on U.S. coasts. He led development of the Coastal Hazards System. This ambitious program attempted to understand coastal storm physics and the probabilistic nature of coastal storm response, create a sample of storms that spans the full range of possible storms along all coasts, model these storms in high fidelity, compute the joint probability of storm responses and then distribute the storm modeling and statistics via a simple-to-use web portal in a context that promotes risk assessment. A related effort that [REDACTED] led was to utilize comprehensive storm response modeling to train surrogate and machine learning models to rapidly predict storm response for emergency operations, design of experiments parameter sampling, and to rapidly and efficiently compute storm-related risk. One of the primary products from this work was hurricane response prediction software called Coastal Hazards Rapid Prediction System (CHRPS).

3.0 OBJECTIVES. The objective of this study is to develop and demonstrate an approach to fully characterize uncertainties in site-specific storm surge flood hazard estimates for the full range of average recurrence intervals (ARIs) of interest for critical infrastructure facilities such as NPPs.

4.0 SCOPE OF WORK. The objectives of this Statement of Work will be attained through execution of the following Scope of Work, which includes Tasks 1 through 8 listed below.

4.1 Task 1: Site Selection.

4.1.1 Task Description.

The main objective of this task is to assist NRC staff in selecting a site location for the PFHA pilot study. The focus will be on coastal areas and adjoining watersheds that are representative of settings where nuclear power plants could be sited. Priority will be given to locations for which existing hydrodynamic (storm surge), hydrologic, and hydraulic models are available.

4.1.2 Interaction with Sponsor.

ERDC-CHL will participate in a series of conference calls with NRC staff to:

- Review site location criteria,
- Identify candidate locations, and
- Select final location.

4.1.3 Deliverables.

The selection process activities will be documented in a Technical Letter Report.

Task 1 deliverables are:

1. Participation in 2-hour task kickoff conference call to discuss the parameters of the site selection task.
2. Preparation for and participation in up to three (3) 2-hour working conference calls to discuss sites as identified by NRC and ERDC-CHL.
3. Participation in a 1-hour conference call to make a final selection.
4. Technical letter report that summarizes the site selection.

4.2 Task 2: Data Collection and Analysis.

4.2.1 Task Description.

ERDC-CHL will assist NRC staff in collecting and analyzing data and other information applicable to the selected site location and modeling approaches/methods. Examples include, but are not limited to:

- Existing hydrodynamic, hydrologic and hydraulic models and results
- Existing climate and precipitation information
- Historical information on extratropical and tropical storms affecting the region
- Available water level observations (e.g. river discharge, tides)
- Existing site information
 - site topography (e.g. from LIDAR [Light Detection and Ranging], and existing digital elevation models)
- Existing watershed information
 - land use and land cover data
 - watershed topography (from e.g., LIDAR, United States Geological Survey [USGS] Quadrangles topographic maps)
 - river channel floodplain profiles and extents
 - soils and soil moisture climatology

ERDC-CHL will provide data analysis (e.g., data cleaning, processing, trend analysis) as well as geographic information system (GIS) and mapping assistance to NRC. ERDC-CHL will document the data collection and analysis activities in a Technical Letter Report.

4.2.2 Interaction with Sponsor.

ERDC-CHL will participate in a series of conference calls with NRC staff to review data collection goals, identify candidate datasets, and discuss data analysis activities.

4.2.3 Deliverables.

ERDC-CHL will document the data collection and analysis activities in a Technical Letter Report.

Task 2 deliverables are:

1. Participation in three (3) 1-hour conference calls to identify data sources and discuss what data gathering will be required for the selected location.
2. Preparation for and participation in up to four (4) 2-hour working conference calls to discuss data collection and analysis (roughly 1 call each for existing models, climate/precipitation data, watershed data, and site information).
3. Technical Letter report that summarizes data collection and analysis.

4.3 Task 3: Review and Selection of Probabilistic Modeling Approach and Methods.

4.3.1 Task Description.

ERDC-CHL will assist NRC staff in selecting an overall probabilistic modeling approach and methods for probabilistic modeling of specific processes. Issues to consider include but are not limited to:

- Simulation vs data-driven approaches
- Event-based vs continuous modeling approaches
- Monte Carlo simulation vs logic tree approaches
- Direct simulation vs response surface approaches (Gaussian Process Metamodeling)
- Random vs stratified sampling (e.g. from tropical and extratropical cyclone populations)
- Individual hydrodynamic, hydrologic, and hydraulic modeling tools
- Methods for quantifying the combined hazard.

4.3.2 Interaction with Sponsor.

ERDC-CHL staff will participate in a series of conference calls with NRC staff to discuss the issues associated with different probabilistic approaches, the manner in which they will be addressed within the review, and the selection of probabilistic modeling approaches and methods that will be followed.

4.3.3 Deliverables.

ERDC-CHL will document the methods reviewed and final selections in a Technical Letter Report.

Task 3 deliverables are:

- Participation in a 2-hour task kickoff conference call to discuss the issues outlined in section 4.3.1, prioritize them, and agree on an efficient review strategy.
- Preparation for and participation in three 2-hour working conference calls to discuss review findings and select overall approach and specific methods.
- Technical Letter Report that describes probabilistic modeling approaches and methods reviewed, as well as the final selections.

4.4 Task 4: Construct inputs for Hydrodynamic, Hydrologic and Hydraulic Modeling.

4.4.1 Task Description.

ERDC-CHL will assist NRC staff in developing the probabilistic space-time inputs to the hydrodynamic, hydrologic, and hydraulic models used in the study. This will include an aleatory model for stochastic aspects of these processes as well as characterization and quantification of epistemic uncertainties (e.g. model structure and parameter uncertainties).

4.4.2 Interaction with Sponsor.

ERDC-CHL will participate in a series of conference calls with NRC staff to review candidate aleatory and epistemic modeling approaches, and quantification methods.

4.4.3 Deliverables.

ERDC-CHL will document the inputs and models used in a Technical Letter Report.

Task 4 deliverables are:

- Preparation for and participation in up to two (2) 2-hour working conference calls to define the aleatory models that will be adopted in the pilot study.
- Preparation for and participation in up to two (2) 2-hour working conference calls to identify and characterize significant epistemic uncertainties and select associated quantification methods.
- Technical Letter Report that documents efforts on this task.

4.5 Task 5: Hydrodynamic, Hydrologic, and Hydraulic Modeling.

4.5.1 Task Description.

ERDC-CHL will run the simulations to compute the responses of the inputs developed as part of Task 4. The types of simulations will be based on the outcome of the assessment performed in the previous tasks. The hydrodynamic, hydrologic

and hydraulic modeling, as well as the computation of the joint responses, will be carried out as follows:

ADCIRC and hydraulic modeling (soft-coupling) of subset of storms

4.5.1.1 Watershed hydrologic modeling

- Frequency analysis of rainfall and routing (e.g., HEC-HMS, GSSHA)
 - Informed by rainfall distributions and/or JPM-parametric TC rainfall simulations

4.5.1.2 Coastal hydrodynamic modeling

- ADCIRC and STWAVE simulations of select storms
 - Informed by varying river discharges in ADCIRC model (maximum **200 storms**).
- Wave transformation from offshore save point locations to Structure, System or Component (SSC) element to be analyzed
 - Cross-shore models (1D)
 - FUNWAVE
 - CSHORE
 - Application of metamodeling techniques to wave transformation.

4.5.1.3 Riverine hydraulic modeling

- Hydraulic simulations (e.g., HEC-RAS [unsteady flow], GSSAH, or hydrologic model routing if sufficient) with ADCIRC simulation results as tidal boundary conditions

4.5.1.4 Metamodeling of combined surge/riverine flooding response

4.5.1.5 Combined surge/riverine hazard

- Frequency analysis of riverine discharges
- Riverine stage-discharge relationship
- Storm surge and riverine stage correlation
- Joint probability analysis model, e.g., JPM
 - Informed by metamodeling of combined surge/riverine response

4.5.2 Interaction with Sponsor.

ERDC-CHL will participate in a series of conference calls with NRC staff to discuss details related to the performance of the simulations and review the results.

4.5.3 Deliverables.

ERDC-CHL will document the efforts and results on this task in a Technical Letter Report.

Task 5 deliverables are:

- Preparation for and participation in three (3) 2-hour working conference calls to discuss select the details for performing simulations (sampling procedures, number of runs, structuring of coupled simulations when needed, etc.) as identified by NRC and ERDC-CHL.
- Execution of the simulations.
- Preparation for and participation in two (2) 2-hour working conference calls to review the simulation results.
- Technical Letter Report to document efforts on this task, as well as the input and output data for this task.

4.6 Task 6: Construct Final Hazard Curves.

4.6.1 Task Description.

ERDC-CHL will assist NRC staff in convolving the simulations into hazard curves for selected flooding hazards (e.g., still water level, total waters level, forces). This task will include uncertainty quantification and sensitivity analysis.

4.6.2 Interaction with Sponsor.

ERDC-CHL staff will participate in conference calls with NRC to discuss the details of the hazard curve construction and to review the results.

4.6.3 Deliverables.

ERDC-CHL will document the efforts and results on this task in a Technical Letter Report.

Task 6 deliverables are:

- Preparation for and participation in two (2) 2-hour working conference calls to discuss the details for hazard curve construction.
- Computational resources to perform the hazard curve computations, uncertainty quantification, and sensitivity analysis.
- Preparation for and participation in two (2) 2-hour working conference calls to review the uncertainty quantification results.
- Preparation for and participation in two (2) 2-hour working conference calls to review the sensitivity analysis results.
- Technical letter report to document efforts on this task.

4.7 Task 7. Peer Review.

4.7.1 Task Description.

ERDC-CHL staff will assist the NRC in developing and executing an “in-process” peer review for this study. This will include developing a peer review plan, identifying peer reviewers, and interacting with peer reviewers as Tasks 2-6 are performed.

4.7.2 Interaction with Sponsor.

ERDC-CHL staff will participate in conference calls to identify peer reviewers and finalize a peer review plan.

4.7.3 Deliverables.

ERDC-CHL will document the in-process peer review in a Technical Letter Report.

Task 7 deliverables are:

- Preparation for and participation in up to two (2) 1-hour conference calls to identify peer reviewers and finalize a peer review plan.
- Interaction with peer reviewers at each stage of the project (Task 2-6).
- Letter report documenting the interactions with the peer reviewers (e.g. reviewer comments and the responses to the comments).

4.8 Task 8. Knowledge Transfer.

4.8.1 Task Description.

ERDC CHL will conduct the following knowledge transfer activities:

- Report on project activities through presentation(s) and panel discussion(s) at the NRC PFHA Research Workshops at NRC HQ. Three workshops are planned (FY20, FY21, and FY22).
- Assist the NRC COR in conducting a one-day training seminar at NRC HQ, based on the results and lessons learned in the project.
- Prepare a draft NUREG/CR report summarizing project activities and results, which will be submitted to the NRC COR for review. This report will be based on the Technical Letter Reports for Tasks 1-6 and include documentation of peer review activities. A final report based on NRC comments will be prepared and submitted.
- At least Bi-weekly Phone Conferences with NRC COR to review progress (typically 1 hour).

4.8.2 Interaction with Sponsor.

ERDC-CHL staff will participate in bi-weekly progress conference calls, NRC PFHA Research Workshops and training seminar to present results.

4.8.3 Deliverables.

ERDC-CHL will document project activities in a NUREG/CR report.

Task 8 deliverables are:

- Report on project activities through presentation(s) and panel discussion(s) at the NRC PFHA Research Workshops (PFHA) at NRC HQ. Three workshops are planned (FY20, FY21, and FY22)
- Assistance to the NRC COR for conducting a one-day training seminar at NRC HQ, based on the results and lessons learned in the project.
- Draft NUREG/CR report summarizing project activities and results, which will be submitted to the NRC COR for review. This report will be based on the Technical Letter Reports for Tasks 1-6 and include documentation of peer review activities. A final report based on NRC comments will be prepared and submitted.
- At least Bi-weekly Phone Conference with NRC COR to review progress (typically 1 hour)

5.0 Deviation from RFP Statement of Work, Assumptions and Potential Problems.

Task 5 of the RFP statement of work provided four options A through D for the hydrodynamic, hydrologic, and hydraulic modeling. The statement of work presented herein adopts option C, which corresponds to tasks 4.5.1.1 and 4.5.1.5. Options A and B were removed as separate items because those items are contained within subsequent options. The implementation of the full-coupling of the full JPM storm suite, option D, is still the subject of active research and was therefore not considered herein. The uncertainty associated with developing and implementing this option may result in an effort that could significantly exceed the advised level-of-effort for this pilot study (Section 5.2 of RFP SOW). An important assumption in this SOW is that the pilot study will be located within the domain of an existing and validated ADCIRC model. Therefore, it is expected that grid work will be minimal. It is also expected that the hydrologic and hydraulic modeling will be based on an existing model setup. The proposal contemplates more flexibility for adapting the H/H model than the hydrodynamic model, which needs to be set up for execution in supercomputers.

6.0 COST. Costs estimates are as follows.

Task	Description	Cost
Task 1	Site Selection	
Task 2	Data Collection and Analysis	
Task 3	Review and Selection of Probabilistic Modeling Approach and Methods	
Task 4	Construct inputs for Hydrodynamic, Hydrologic and Hydraulic Modeling	

Task 5	Hydrodynamic, Hydrologic, and Hydraulic Modeling	
Task 6	Construct Final Hazard Curves	
Task 7	Peer Review	
Task 8	Knowledge Transfer	
	Total Labor Costs	
	Overhead	
	Travel	
	G&A Expenses	
	TOTAL Costs	\$390,620

Labor Category	Rate	FY 2019	FY 2020	FY 2021	FY 2022	Total Labor Costs
Principal Investigator / Project Engineers	Varies*	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>	<u>Hours</u>
		270	1,500	1,528	245	3,543
		<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>	<u>Cost</u>

* refer to enclosure 3 IAA Cost Proposal.

7.0 SCHEDULE. A proposed schedule is provided based on the due dates presented in the RFP Statement of Work. It supposes a tentative project period of performance of September 1, 2019 to December 31, 2021.

Task	Description	Start Date	Completion Date
1	Site Selection	Sept 2019	Jan 2020
	Draft Technical Letter Report	-	16 Dec 2019
	<i>NRC comments*</i>	-	3 weeks
	Final Technical Letter Report	-	15 working days
2	Data Collection and Analysis	Dec 2019	Mar 2020
	Draft Technical Letter Report	-	17 Feb 2020
	<i>NRC comments*</i>	-	4 weeks
	Final Technical Letter Report	-	20 working days
3	Review and Selection of Probabilistic Modeling Approach and Methods	Jan 2020	Jul 2020
	Draft Technical Letter Report	-	16 Jun 2020
	<i>NRC comments*</i>	-	4 weeks
	Final Technical Letter Report	-	20 working days

4	Construct inputs for Hydrodynamic, Hydrologic and Hydraulic Modeling	Mar 2020	Nov 2020
	Draft Technical Letter Report	-	16 Oct 2020
	<i>NRC comments*</i>	-	3 weeks
	Final Technical Letter Report	-	20 working days
5	Hydrodynamic, Hydrologic, and Hydraulic Modeling	Oct 2020	Mar 2021
	Draft Technical Letter Report	-	16 Feb 2021
	<i>NRC comments*</i>	-	4 weeks
	Final Technical Letter Report	-	20 working days
6	Construct Final Hazard Curves	Feb 2021	July 2021
	Draft Technical Letter Report	-	16 Jun 2021
	<i>NRC comments*</i>	-	4 weeks
	Final Technical Letter Report	-	20 working days
7	Peer Review	Sept 2019	Oct 2021
	Draft Technical Letter Report	-	16 Sept 2021
	<i>NRC comments*</i>	-	4 weeks
	Final Technical Letter Report	-	20 working days
8	Knowledge Transfer	Sept 2021	Dec 2021
	Preparation of Draft NUREG-CR Report	-	16 Sept 2021
	<i>NRC Comments*</i>	-	6 weeks
	Preparation of Finalized NUREG-CR Report	-	30 working days
	Knowledge Transfer Seminar Materials	-	16 Oct 2021

* Denotes sponsor action

8.0 DELIVERABLES. Project deliverables will consist of monthly letter status reports (MLSRs), seven (7) technical letter reports, conference calls as itemized in Section 4.0 of this SOW, participation in up to three (3) PFHA Research Workshops, materials and participation in one-day training seminar, and a NUREG Report.

9.0 MEETINGS AND TRAVEL. Conference calls constitute the primary type of meetings that will be executed in this contract. The scope and timing of working conference calls are laid out in Section 4.0 of this statement of work. Bi-weekly project status conference calls will be held every two weeks. Meetings that involve travel are mainly associated with the eighth task of this SOW, knowledge transfer. The PI and up to one staff shall make up to three (3) three-day trips to meet with NRC staff and participate at NRCs PFHA workshops at NRC Headquarters in Rockville, MD. Workshops are planned for FY 20, FY21 and FY22. The PI and up to one staff shall make one (1) one-day trip to NRC Headquarters in Rockville, MD to conduct a knowledge transfer seminar based on the results and lessons learned in the project. The PI and up to one staff will participate in two one-day project review meetings at NRC HQ in Rockville, MD in FY20 and FY21.

10.0 SPONSOR RESPONSIBILITIES. The main responsibility of the sponsor will be study oversight, including systematic input and collaboration in decision-making. In accordance with the RFP SOW and this proposal, close collaboration between NRC and ERDC CHL is required and shall be conducted through conference calls described in Section 4.0. Sponsor shall execute the reviews and comments for the submitted draft

work plans, letter reports, and NUREG-CR report in the timeframe established in the statement of work.

11.0 PROGRESS REPORTING. A Monthly Letter Status Report (MLSR) will be submitted to the NRC Project Manager by the 20th of the month following the reported month, following the requirements of the RFP Statement of Work. The MLSR will consist of a technical progress report and a financial status report. The report shall include agreement/order summary information, work completed during the specified period, milestone schedule information, problem identification and resolution, travel plans, and staff hour summary. The MLSR will be provided to NRC's Contracting Officer Representative (COR).

12.0 TECHNOLOGY / FOCUS AREA. Numerical / Flood Risk Management.

13.0 SECURITY. Information produced in this study is unclassified.

14. MATERIALS/SERVICES. No new material and service acquisitions have been identified to be considered critical for the success of the project.

NRC GENERAL TERMS AND CONDITIONS (GT&C) FOR INTERAGENCY AGREEMENTS (IAA)**General Guidance**

Note: If the Order(s) issued pursuant to the GT&Cs will be fully funded you may delete Clause 5, "Limitation of Funds." However, by including it in multiple Order IAAs, NRC has the option to incrementally fund future orders.

1. Technical Direction

The NRC Contracting Officer's Representative (COR), as named in the NRC SOW, is responsible for ensuring that the services required under this project are delivered in accordance with the terms of the SOW. All technical direction instructions to the Servicing agency must be issued through the COR.

Technical direction includes interpreting technical specifications, providing needed details, and suggesting possible lines of inquiry. Technical direction must not constitute new work or affect overall project cost or period of performance. Technical direction must be confirmed in writing to the servicing agency with a copy provided to the cognizant NRC Contracting Officer (CO).

2. Key Personnel

The individual(s) identified as key personnel is (are) considered essential to the successful performance of the work. The servicing agency agrees that these personnel shall not be removed from the project or replaced without complying with the following:

- If one or more of the key personnel, for whatever reason, becomes or is expected to become unavailable for work under this IAA for a continuous period exceeding 30 workdays, or is expected to devote substantially less effort to the work than indicated in the proposal or initially anticipated, the servicing agency shall immediately notify the NRC CO of its intent to make key personnel replacements.
- All requests for approval of substitutions on a project shall be in writing and shall provide detailed explanation of the circumstances necessitating the proposed substitutions. The request shall contain a complete résumé for the proposed substitute and other information requested by the NRC CO to approve or disapprove the proposed substitution. The NRC will evaluate such requests and promptly notify the servicing agency of its approval or disapproval thereof in writing.
- The project may be terminated if the NRC determines that:
 - o Suitable and timely replacements of key personnel who have been reassigned, terminated, or have otherwise become unavailable for the project are not reasonably forthcoming.
 - o The resultant reduction of effort or expertise would be so substantial as to impair the successful completion of the work order.

3. Billing Requirements

Servicing agency shall bill NRC monthly for costs paid in support of NRC projects by the agreement number. The servicing agency shall bill and collect from NRC by an electronic transfer of funds through the U.S. Treasury Intergovernmental Payment and Collection System (IPAC).

The servicing agency voucher shall identify the NRC agreement number, and the NRC and servicing agency budget and reporting (B&R) numbers.

The servicing agency voucher, at a minimum, shall indicate the month that costs were incurred and the dollar amount of these costs. In some instances because of accrual accounting and other adjustments, the amounts may differ slightly from the original accrual amount.

When the Status Report costs differ from the amount billed, servicing agency shall provide an explanation of the difference on the voucher.

The servicing agency voucher shall be sent to support the IPAC funds transfer. The instructions must identify the billable activities as specified by 10 CFR Part 170. The servicing agency voucher and other required documentation shall be submitted to—

NRC Payments
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mailstop O3-E17A
Rockville, MD 20852-2738

Electronic Commercial Vendor and IPAC Payments:

Effective immediately, commercial vendors and Federal entities should use the new electronic mailing addresses shown below:

Invoice and training billing Email address – NRCPayments@NRC.gov

IPAC billing Email address – NRCIPAC.Resource@NRC.gov

4. Status Reports

The servicing agency shall submit a Status Report in accordance with the SOW and the Status Report Requirements, if attached to the SOW, to the NRC CO and NRC COR with a copy to the Office of Administration/Acquisition Management Division to ContractsPOT.Resource@nrc.gov.

5. Limitation of Funds

NRC is not obligated to reimburse the servicing agency for costs incurred by its contractors in excess of the total amount obligated by an appropriately executed IAA form. The NRC Contracting Officer will formally notify the servicing agency of any projects that are intended to be phased out or terminated as soon as such intent is known, preferably at least 30 days before the proposed termination date. For IAAs with fixed performance periods, the servicing agency should assume that the program will terminate on the last day of the period specified on the IAA form.

If at any time the servicing agency has reason to believe that the costs will exceed the total amount authorized, the servicing agency must notify the NRC CO. In the absence of formal

NRC instructions to continue or to terminate a work order, the servicing agency will notify the NRC CO in writing when the accrued costs of any NRC Order approaches 75 percent of the authorized funding level provided on the IAA form.

The notification should include the estimated date when the accrued costs will equal the authorized funds, and may, if appropriate, recommend or request the NRC action desired. After this notification, the NRC will evaluate costs incurred against technical progress and, if necessary, will:

- Increase funding authorization
- Change the scope of the work
- Change the period of performance
- Terminate the project

The servicing agency shall notify the NRC CO in writing when it is anticipated that the work cannot be completed within the period of performance indicated on the IAA form. Notification shall be made in sufficient time to allow for the issuance of a modification to the IAA authorizing an extension of the work period to the date necessary to complete the authorized work. If the period of performance is not extended, the NRC CO shall notify the servicing agency via issuance of a modification for closeout of the IAA.

6. Organizational Conflict of Interest

By submitting a proposal to the NRC, the servicing agency acknowledges the disclosure requirements of: 1) the NRC Clause, the NRC Conflict of Interest, Management Directive 11.8; and 2) that Section 170A of the Atomic Energy Act of 1954, as amended, requires that NRC be provided with disclosures on potential conflicts when NRC obtains technical, consulting, research and other supporting services. The servicing agency further recognizes that the assignment of NRC work to the servicing agency must satisfy NRC's organizational conflict of interest (OCOI) standards.

Therefore, the servicing agency, in its proposal to NRC (which will be incorporated into an interagency agreement between NRC and the servicing agency), is required to make an assertion per #1 or #2 of Part A below. If the servicing agency selects #1, then, it must also fill out the accompanying Part B – whereby the servicing agency must, again, make an assertion by answering each of the five (5) NRC OCOI provisions per the NRC Acquisition Regulation (NRCAR).

PART A:

"In accordance with **US Army Engineer Research and Development Center Coastal and Hydraulics Laboratory (ERDC-CHL)** role in, and responsibility for, disclosing its relationships with organizations which conduct business in the same and/or similar technical area as described by the present and/or ongoing NRC project's scope of work, and in accordance with the NRC clause as stated herein, **ERDC-CHL** hereby asserts that it has examined its relationships with all such organizations, and has also examined its current and future/planned work, and where appropriate, its past work (generally for the previous five years), for other organizations and **ERDC-CHL** states the following:

1) _____ hereby discloses the following relationships _____ [state the name of persons, organizations, and business relationships, etc. **] _____ that may give rise to a potential OCOI. (Servicing agency must answer the questions in Part B below);

Or

2) **ERDC-CHL** to the best of its knowledge and belief, asserts that it has no current work, planned work, and where appropriate, past work for the servicing agency and others (to mean - organizations in the same and/or similar technical area as the present and/or ongoing NRC project scope of work); and **ERDC-CHL** hereby asserts that it is not aware of any same/similar technical work that would give rise to any potential OCOI as defined in the Atomic Energy Act of 1954, as amended.

Signed:

PART B:

In accordance with **ERDC-CHL** role/responsibility regarding OCOI disclosure, as stated in Part A, above **ERDC-CHL** further discloses, to the best of its knowledge and belief, that:

1) **ERDC-CHL** and/or any of its organizational affiliates* as defined in Part A above [does not] provide advice and recommendations to the NRC in the same technical area (e.g., fire protection, PRA, seismic, vulnerability analysis, fracture mechanics) where it is also providing consulting assistance to any organization regulated by NRC. If **ERDC-CHL** "does" - then **ERDC-CHL** hereby discloses such organization(s) in Part A above;

2) **ERDC-CHL** and/or any of its organizational affiliates as defined in Part A above [does not] provide advice and recommendations to the NRC on the same or similar matter (e.g., particular licensing amendment, particular EIS, particular high level waste repository site) on which it is also providing assistance to any organization regulated by NRC. If **ERDC-CHL** "does" - then **ERDC-CHL** hereby discloses such organization(s) in Part A above;

3) **ERDC-CHL** and/or any of its organizational affiliates as defined in Part A above [will not] be required to evaluate its own products or services, or has been substantially involved in the development or marketing of the products or services of another entity. If **ERDC-CHL** "will" -then **ERDC-CHL** hereby discloses such organization(s) in Part A above;

4) **ERDC-CHL** and/or any of its organizational affiliates as defined in Part A above [does not] have a conflicting role, given the award of the present and/or ongoing NRC project, in which its judgment or the judgment of any of its organizations may be biased in relation to its work for NRC.

If **ERDC-CHL** "does" – then **ERDC-CHL** hereby discloses such conflicting role(s) with organization(s) in Part A above;

5) **ERDC-CHL** and/or any of its organizational affiliates as defined in Part A above [are not] soliciting or performing concurrent work at an applicant or licensee site, while performing work in the same/similar technical area for NRC at the same site. If **(ERDC-CHL)** "are" – then the **ERDC-CHL** hereby discloses such organization(s) in Part A above."

Signed: Ty V. Wamsley, PhD., SES, Director ERDC-CHL

*Organization affiliate – Business concerns which are affiliates (related) to each other when either directly or indirectly, one concern or individual controls or has the power to control another, or when a third party (i.e. parent firm) has the power to control both.

** The Atomic Energy Act of 1952 uses the term "person" to mean any entity – e.g., sole proprietorship, partnership, joint venture, corporation; university; limited partnership, subchapter S corporation; limited liability company, etc.

7. Incompatibility Between Regular Duties and Private Interests

(a) Employees of the servicing agency's contractor shall not be permitted to make or influence any decision on behalf of the contractor which directly or indirectly affect the interest of the Government, if the employee's personal concern in the matter may be incompatible with the interest of the Government. For example: An employee of a contractor will not negotiate, or influence the award of, a subcontract with a company in which the individual has employment relationship or significant financial interest; and an employee of a contractor will not be assigned the preparation of an evaluation for the servicing agency for any technical aspect of the work of another organization with which the individual has an employment relationship, or significant financial interest, or which is a competitor of an organization (other than the contractor who is the individual's regular employer) in which the individual has an employment relationship or significant financial interest.

(b) The contractor shall be responsible for informing employees that they are expected to disclose any incompatibilities between duties performed for the contractor and their private interests and to refer undecided questions to the contractor.

8. Intellectual Property Rights

The statutory, regulatory, and procedural intellectual property policies of servicing agency will be applicable to the work falling under this work order—

- Provided that information concerning disclosures of inventions identified as having been conceived or first actually reduced to practice under Commission-funded work will be reported to the Commission, and the Commission will be kept advised as to their status.
- Except that the Commission reserves the right to control title to inventions as to any rights that vest in the Commission under statute. If servicing agency and servicing agency's

contractor, where the contractor has such rights, should determine not to protect these inventions either domestically or abroad, the Commission will have the right to protect these inventions.

- Provided that if the technology covered by an invention disclosure upon which the servicing agency intends to file a patent application on behalf of the U.S. Government is deemed by the Commission to fall within the Commission's mission, that is, when the technology relates to nuclear facilities and materials safety, safeguards, and environmental protection in support of the Commission's licensing and regulatory functions, the Commission may so notify servicing agency and a determination will be made by the parties as to which party will file the patent application or applications.
- Provided that neither party shall grant an exclusive patent license on an agency owned invention without the approval of the other party.

9. *Acquired Material, Equipment, or Software (Property)*

In accordance with the SOW, the servicing agency proposal must include a description of the property required for project performance that has an estimated acquisition cost of \$500 or more. The proposal must also identify the potential development of NRC-funded software during the project. NRC-funded software is software specifically developed for NRC by the servicing agency and is generally the deliverable for the project.

After the NRC reviews the list of property and NRC-funded software included in the servicing agency proposal, any questions regarding the acquisition of property or the development of NRC-funded software will be addressed with the servicing agency during negotiations. After negotiating project terms and conditions, NRC shall issue the IAA for the servicing agency's acceptance authorizing the work and approving acquisition of property or development of NRC-funded software.

The servicing agency shall submit a written request to the NRC CO for approval to develop additional NRC-funded software or purchase additional property with an estimated acquisition cost of \$500 or more after work initiation. The NRC CO shall approve or disapprove the acquisition or development of any additional items in writing.

The servicing agency shall report property, including software, with an acquisition cost of \$500 or more in the status report in the month the property or software was acquired. The servicing agency shall provide the information required by the Status Report Requirements for each item reported as appropriate, in the status report:

10. *Dissemination of Project Information/Publication Requirements*

(a) Prior to any dissemination, display, publication, presentation, or release of papers, articles, reports, summaries, or abstracts developed under the NRC/servicing agency agreement, the servicing agency shall submit them to the NRC for review and comment. NRC shall have a review and comment period of at least [60] days, after which both an NRC and servicing agency representative at the lowest management level, shall attempt to resolve any differing viewpoints or statements which are the subject of NRC objection. If the matter cannot be resolved at that level, the issue shall be brought up to the next management level in both organizations until an agreement can be reached or it reaches the Office Director level. In the event resolution cannot

be achieved, the NRC may direct the servicing agency to not publish the work as a NUREG/CR, but publish as a servicing agency report without the NRC office name or Contracting Officer's Representative (COR)'s name listed on the report, and with a Disclaimer conspicuously noted on the report, article, summary, abstract or related document that the servicing agency intends to release, display, disseminate or publish to other persons, the public or any other entities:

"The views expressed in this [paper, journal article, report, summary, or abstract] do not represent those of the U.S. Nuclear Regulatory Commission."

(b) The NRC and servicing agency agree to handle all classified information provided or developed during the course of this project in accordance with all applicable laws and regulations governing the handling of such information. In the event NRC determines during its review and comment period that a draft servicing agency paper, article, report, summary, or abstract contains classified information regarding the work performed for NRC, NRC, in addition to commenting on the subject matter, shall also direct the servicing agency to direct an authorized classification authority to appropriately review, classify and mark the product, pursuant to nationally acceptable standards/guidelines. Under these circumstances, the Laboratory will either publish the work solely as a classified product pursuant to NRC direction, or not publish the work in any format. In cases where classification of the product is in dispute, NRC may consult with servicing agency's Office of Classification; however NRC retains the ultimate authority over the classification of the product.

(c) In addition, travel costs to present papers or reports developed under the NRC/servicing agency agreement may not be authorized if the NRC determines that presentation of the paper does not support the NRC program or project. Such determination will not affect payment of the contract work costs.

(d) The servicing agency contractor, to the extent it is permitted to and asserts copyright therein, grants a royalty-free, nonexclusive, irrevocable worldwide license to the Government to use, reproduce, modify, distribute, prepare derivative works, release, display or disclose the articles, reports, summaries, abstracts, and related documents developed under the Agreement, for any governmental purposes and to have or authorize others to do so.

11. Review and Approval of Reports

The servicing agency shall comply with the terms and conditions of the agreement regarding the contents of the draft and final reports, summaries, data and related documents, to include correcting, deleting, editing, revising, modifying, formatting and supplementing and of the information contained therein. Corrective actions shall not be undertaken unless sufficient funding from NRC is available to cover the costs of the corrective actions. Performance under the agreement shall not be deemed accepted or completed until it complies with NRC's directions.

Identification/Marking of Sensitive Unclassified and Safeguards Information. The servicing agency shall comply with the requirements stated MD's 12.7 "NRC Safeguards Information Security Program as follows:

a) Classification Clause

To the extent that the performance of work under this work order involves classified information, the following clause is applicable:

- In the performance of work under this work order, servicing agency shall ensure that a servicing agency authorized classifier shall assign classification levels to all documents, material, and equipment originated or generated by the performing organization in accordance with classification guidance furnished by the Commission. Each subcontract and purchase order issued hereunder involving the generation of classified documents, material, or equipment shall include a provision to the effect that in the performance of such subcontract or purchase order, a servicing agency authorized classifier shall assign classification levels to all such documents, material, and equipment in accordance with classification guidance furnished by the NRC.
- When appropriate, the attached NRC Form 187, "Contract Security and/or Classification Requirements," is a part of this work order. It is the responsibility of the NRC office originating the work order to review the classification assigned and to refer any problems to the NRC Division of Security Operations (DSO), NSIR, for resolution.

b) Safeguards Information, Unclassified Controlled Nuclear Information, or Unescorted Access to Protected and Vital Areas of Nuclear Power Plants

To the extent that the performance of work under this work order involves Safeguards Information (SGI), the following clause is applicable:

In the performance of the work under this project, servicing agency shall assure that the Servicing agency shall mark and protect all documents, material, and equipment originated, generated, or received by the performing organization in accordance with the provisions of Section 147 of the Atomic Energy Act of 1954, as amended, its implementing regulations (10 CFR 73.21), "Protection of Safeguards Information: Performance Requirements." Further guidance on the protection of Safeguards Information and examples of proper marking of cover; title page, and back cover are contained in NRC Management Directive (MD) 12.7,* "NRC Safeguards Information Security Program" and the NRC Guide to Marking Safeguards Information.

To the extent that performance of work under this work order involves unclassified controlled nuclear information (UNCI), the following clause is applicable:

In the performance of the work under this project, servicing agency shall assure that the Servicing agency shall mark and protect all documents, material, and equipment originated, generated, or received by the performing organization in accordance with the provisions of Section 148 of the Atomic Energy Act of 1954, as amended, its implementing servicing agency regulations, and servicing agency orders and guidance.

It is the responsibility of the NRC office originating the work to indicate whether the work will involve SGI or unescorted access to protected and vital areas of nuclear power plants. An NRC Form 187, "Contract Security and/or Classification Requirements," shall be completed to indicate such access.

c) Proprietary Information

In connection with the performance of work under this work order, NRC may furnish for the servicing agency review, evaluation, or other use certain trade secrets or confidential or privileged commercial or financial information determined by the office to be exempt from public

inspection or disclosure. A synopsis of such information must be submitted in writing to the servicing agency before reaching agreement with the office on the acceptance and use of the information. Up-to-date guidance on the protection of proprietary information used in reports prepared by the Servicing agency on proper marking of cover, title page, and back cover may be obtained from the NRC COR.

Proprietary or other privileged information may be provided by the office on an individual basis to servicing agency employees working as NRC consultants with the understanding that it shall be protected from disclosure and shall be returned to the office upon completion of the work. Any such claimed proprietary data will be appropriately identified and marked as such. The use of proprietary information in reports prepared by consultants requires protection. Further information may be obtained from the NRC COR.

d) Other Sensitive Unclassified Non-Safeguards Information (SUNSI)

Information other than safeguards, unclassified controlled nuclear, proprietary information, and pre-decisional information may at times be determined to be sensitive. The use of such information in reports requires the specific NRC designation and protection as prescribed by the NRC SUNSI policy. Further information may be obtained from the NRC COR.

12. Sensitive Information Work Efforts

To the extent that the performance under this work order involves classified information, the following clauses are applicable:

- Responsibilities. The servicing agency and the servicing agency contractor, if any, shall be responsible for safeguarding Restricted Data, Formerly Restricted Data, and other National Security Information and for protecting it against sabotage, espionage, loss, and theft in accordance with applicable NRC and servicing agency security regulations and requirements.
- Transmission of Classified Matter. Except as otherwise expressly provided, servicing agency or the servicing agency contractor shall, upon completion or termination of the work order, transmit to the NRC program office all classified matter in its possession or in the possession of any person under its control in connection with performance of this work order. If retention of any classified matter is required by servicing agency or the servicing agency contractor, servicing agency must obtain the approval of the NRC program office and complete a certificate of possession specifying the classified matter to be retained.
- Regulations. Servicing agency and the servicing agency contractors shall be responsible for compliance with all applicable NRC and servicing agency security regulations and requirements.
- Definition of Restricted Data. The term "Restricted Data," as used in this clause, means all data concerning (1) the design, manufacture, or utilization of atomic weapons; (2) the production of special nuclear material; or (3) the use of special nuclear material in the production of energy, but does not include data declassified or removed from the Restricted Data category pursuant to Section 142 of the Atomic Energy Act of 1954, as amended.
- Definition of Formerly Restricted Data. The term "Formerly Restricted Data," as used in this clause, means classified information related primarily to the military utilization of atomic

weapons that can be adequately safeguarded as National Security Information, subject to the restrictions on transmission to other countries and regional defense organizations that apply to Restricted Data.

- Definition of National Security Information. National Security Information is information that has been determined pursuant to Executive Order 13526 or any predecessor order to require protection against unauthorized disclosure and is so designated.
- Security Clearance of Personnel. servicing agency and servicing agency laboratories shall not permit any individual to have access to Restricted Data, Formerly Restricted Data, or National Security Information, except in accordance with the Atomic Energy Act of 1954, as amended, Executive Orders 12968 and 10865, and servicing agency regulations or requirements applicable to the particular type or category of classified information to which access is required.
- Safeguards Information Access. The servicing agency and servicing agency laboratories shall not permit any individual to have access to Safeguards Information, except in accordance with 10 Code of Federal Regulations Part 73.22 and NRC Management Directive 12.7.
- Liability. It is understood that the unauthorized disclosure or the failure to properly safeguard Restricted Data, Formerly Restricted Data, or National Security Information that may come to the servicing agency or to any person under an NRC/servicing agency order in connection with work under the order may subject the performing organization, and its agents, employees, or subcontractors, to administrative sanctions and criminal liability under the laws of the United States. (See the Atomic Energy Act of 1954, as amended [42 U.S.C. 2011et seq.], 18 U.S.C. 793 and 794; and Executive Orders 13526 and 12968.)
- Subcontracts and Purchase Orders. Except as otherwise authorized in writing by the Commission, servicing agency shall insert provisions similar to the foregoing in all subcontracts and purchase orders under this work order.

13. Software Development

Systems development efforts shall comply with applicable Government-wide Federal Information Processing Standards developed by the National Institute of Standards and Technology, applicable public laws, Office of Management and Budget circulars, and NRC policies and procedures. Particular attention is necessary to incorporate security features in the design of systems that process sensitive data. The format of software deliverables is specified in NRC Bulletin 0904-4. If any deliverable is provided on diskette, the diskette shall be scanned for viruses by the contractor and verified to be free of viruses before delivery to NRC. All software development, modification, or maintenance tasks shall follow general guidance provided in NUREG/BR-0167, "Software Quality Assurance Program and Guidelines." NRC shall advise the servicing agency Patent Counsel with respect to any rights in the software that NRC desires under any particular project, which rights include NRC imposing restrictions on use, and distribution of the software by servicing agency.

14. Copyright in Computer Software and Codes

In the event that the servicing agency desires to assert a copyright of any computer software or computer code funded in whole or in part by NRC, the servicing agency shall request, in writing,

the written approval of the cognizant NRC CO before advising servicing agency's patent counsel of its desire to seek the copyright.

If NRC determines that public health and safety or other programmatic considerations dictate that the Servicing agency contractor should not be given permission to copyright the computer software or code, the NRC CO, after consultation with the NRC program office division director or designee and the NRC Office of the General Counsel (OGC) shall so advise the servicing agency in writing.

Alternatively, if permission to copyright computer software or a computer code is granted, the cognizant NRC CO, after consultation with NRC program office division director or designee and OGC, shall provide the servicing agency with written notice of that decision. In those cases in which the NRC CO determines that the rights retained by the Government pursuant to the copyright provisions of the servicing agency's contract should be modified to protect NRC's interests, NRC will advise servicing agency's patent counsel of NRC's desire to modify servicing agency's standard policy with respect to permission for a contractor to assert copyright in that code. The servicing agency and NRC will then jointly determine the appropriate provisions for the code. The servicing agency patent counsel shall provide the Laboratory with written notice, with a copy to the NRC CO, of that joint determination. The Laboratory may then proceed to assert copyright.

In no case shall the servicing agency take action relating to assertion of copyright until the NRC CO provides written approval of the request to assert copyright. Further, the servicing agency shall not permit a contractor to assert copyright of NRC-funded computer code or computer software without the written approval of the NRC CO. Where NRC has not granted permission to copyright, NRC recognizes that once the servicing agency has delivered to NRC a developed version of a particular code, the servicing agency may exercise the existing right the servicing agency and other parties have to further develop, without NRC funds, software codes that are in the public domain and to copyright the new, non-NRC-funded versions of these codes without NRC approval.

15. Appropriate Use of Government Furnished Information Technology (IT) Equipment and/or its Services/Access

When the NRC work at a servicing agency site requires electronic processing of information, servicing agency will follow NIST Special Publication (SP) 800-37 Rev. 1 or later, and SP 800-53 Rev. 3 or later (which are based on FIPS-199 and FIPS-200). For those specific projects with electronic processing of Safeguards Information (SGI), Restricted Data (RD) and/or Unclassified Nuclear Information (UCNI), the NRC shall provide servicing agency with the appropriate requirements that must be met on a project by project basis. In addition, for those specific projects that require classified electronic information processing, servicing agency will follow the CNSS policy, directives, instructions, and guidance.

16. NRC Information Technology Security Training

The servicing agency and its contractors shall ensure that their employees, consultants, and subcontractors with access to the NRC's information technology (IT) equipment and/or IT services complete NRC's online initial and refresher IT security training requirements to ensure that their knowledge of IT threats, vulnerabilities, and associated countermeasures remains current. Both the initial and refresher IT security training courses generally last an hour or less and can be taken during the employee's regularly scheduled work day. Agency/Contractor shall

ensure that their employees, consultants, and subcontractors, with access to the NRC's IT equipment, complete the Information Security (INFOSEC) Awareness Training annually; no later than December 31.

The servicing agency and its contractor employees, consultants, and subcontractors shall complete the NRC's online, "Computer Security Awareness" course on the same day that they receive access to the NRC's IT equipment and/or services, as their first action using the equipment/service. For those contractor employees, consultants, and subcontractors who are already working under an existing agreement/contract, the online training must be completed in accordance with agency Network Announcements issued throughout the year.

The servicing agency and its contractor employees, consultants, and subcontractors who have been granted access to NRC information technology equipment and/or IT services must continue to take IT security refresher training offered online by the NRC throughout the term of the agreement/contract.

The servicing agency and its contractor employees will receive notice of NRC's online IT security refresher training requirements through agency-wide notices.

The NRC reserves the right to deny or withdraw the servicing agency and its contractor use or access to NRC IT equipment and/or services should the Agency/Contractor violate the Agency/Contractor's responsibility under this clause.

17. Contract Security Requirements for Unescorted Access to Nuclear Power Plants

If performance under this work order involves unescorted access to protected and vital areas of nuclear power plants or access to nuclear power reactor SGI, individual contractors requiring access to protected and vital areas of nuclear power plants or access to nuclear power reactor SGI shall be approved for unescorted access in accordance with the following procedures:

17.1 Temporary Approval

The contractor (servicing agency employees and contractors) does not need a temporary approval if he or she has a valid Government clearance, for example, a servicing agency "Q" or "L" clearance. If the contractor employee does not have such a clearance, the contractor shall submit the information discussed below within 30 calendar days following contract award, modification, or proposal of new personnel for contract tasks. This information shall be provided for each person proposed to perform tasks requiring unescorted access to nuclear power plants or access to nuclear power reactor SGI. If access to SGI is needed, and unescorted access is not required, the provisions of 10 CFR 73.22 must be followed as a condition for access to SGI. The information shall be provided to the NRC Division of Facilities and Security (DFS) through the NRC COR and consists of the following:

- A completed Personnel Security Forms Packet, including an SF 86, "Questionnaire for National Security Positions," and copies of the individual's 5-year employment and education history checks, including verification of the highest degree obtained
- A reference from at least one additional person not provided by the individual

- Results of a psychological evaluation (This is not a requirement of the background check that is required for access to SGI.)
- Form FD-258, ORIMDNRC000Z (Fingerprint Card)
- A certification that the contractor has found all checks acceptable

The results of a psychological examination that uses a reliable written personality test or any other professionally accepted clinical evaluation procedure shall be used to evaluate a subject's trustworthiness, reliability, and stability. The servicing agency and contractor shall review all required information for accuracy, completeness, and legibility, except Part 2 of the SF 86, which must be completed in private and submitted, along with the Form FD-258 by the individual to the contractor in a sealed envelope, or the individual shall be fingerprinted by the subject utility, and the contractor shall be subject to the utility's access authorization program. As described in this section, DFS shall conduct criminal history and credit checks and a security assurance interview with the individual. On the basis of the results of these checks, DFS shall determine the individual's eligibility for temporary access and indicate an objection or no objection to NRC pending completion of the required background investigation.

17.2 Final Approval

Final approval shall be granted if:

- The individual has completed processing (by the Office of Personnel Management) of the required investigation resulting in NRC endorsement for unescorted access at all nuclear facilities for the life of the contract.
- The contractor has obtained unescorted access authorization (other than temporary access) at the specific utility through that utility's access authorization program, resulting in unescorted access at a specific facility.
- The individual possesses a valid Government-issued clearance as verified by DFS.
- A valid Government-issued clearance is defined as a U.S. Government-issued security clearance equivalent to or higher than an NRC "L" clearance (i.e., Secret) based on a comparable investigation not more than 10 years old. The investigation may involve an National Agency Check and Inquiries (NACI) or other investigation as deemed necessary by DFS in accordance with 10 CFR Part 10, 10 CFR 73.22, NRC MD's 12.3, "NRC Personnel Security Program" and 12.7 "NRC Safeguards Information Security Program." Any question regarding the individual's eligibility for unescorted access to protected or vital areas of nuclear power facilities will be resolved in accordance with the provisions set forth in MD 12.3, which are incorporated into the Order by reference as though fully set forth therein. The contractor shall, for each contractor individual approved for access under the provisions of this section, submit to DFS through NRC a signed statement from the individual that he or she understands his or her responsibility to report information bearing on his or her continued eligibility for access authorization as specified in MD 12.3. Access to SGI not also involving unescorted access to protected and vital areas of nuclear power plants shall require the submission of a completed Personnel Security Forms Packet to DFS through NRC and will require a Background Check in accordance with 10 CFR Part 73.22 and MD 12.7. Any questions regarding the individual's eligibility for access to nuclear power reactor SGI shall be resolved in accordance with the provisions set forth in MD 12.7, which is

incorporated into this contract by reference as though fully set forth herein. On the basis of the review of the applicant's security forms by DFS and/or the receipt of adverse information by NRC, the individual may be denied access to nuclear power reactor SGI until a final determination of his or her eligibility for access is made under the provisions of MD 12.7.

17.3 Fitness for Duty

Pursuant to NRC policy, all individuals proposed for work under this IAA who require unescorted access to nuclear power plants shall be subject to the requirements of the licensee's fitness-for-duty program (10 CFR Part 26).

17.4 Basic Exposure Control and Personnel Dosimetry Training Requirements

The contractor shall certify that personnel working under the scope of this contract have completed basic exposure control and personnel dosimetry training sufficient to meet the requirements of commercial nuclear power plants for unescorted access. Site specific training obtained at each site shall still be required during the performance of work under this contract in addition to the basic training.

17.5 Subcontractor Information—Subcontracting

The servicing agency organization shall notify the issuing NRC office in writing reasonably in advance of entering into any major or significant technical service subcontract not contained in the original proposal. "Major or significant" must be used with judgment and related to the total value of the project and/or impact on the results. This advance notification shall include the following:

- A description of services to be called for by the subcontract
- Identification of the proposed subcontractor
- The proposed subcontract costs (in total)
- A statement that the proposed subcontract will not result in a real or apparent organizational conflict-of-interest situation. If the NRC program office requires additional specific subcontractor information or limitations, those requirements shall be stated in the IAA modification authorizing the subcontract.

18. Information on NRC Cooperative Programs with Foreign Governments and Organizations and With U.S. Industry

Servicing agency facilities, contractors, and subcontractors working on NRC cooperative programs with foreign governments and organizations and with U.S. industry perform this work with the understanding that draft or formal reports on this work are to be available only to participants in the program until public availability is authorized by the NRC office. Reports or codes (including data) on this work shall be issued as "Draft Preliminary Reports (Codes)" until the office authorizes issuance of the report as a formal report with the designation NUREG/IA-XXXX for international agreement reports or NUREG/CR-XXXX for contractor reports. Details of the handling of reports may be obtained from the NRC COR.

19. Stop-Work Order

The NRC CO may, at any time, by written modification to the servicing agency, require the servicing agency to stop all or any part of the work called for by this work order for a period of up to 90 days after the order modification is delivered to the servicing agency, and for any further period to which the parties may agree. Any such order will be specifically identified as a "stop-work order" issued pursuant to this clause. Upon receipt of such an order, the servicing agency shall forthwith comply with its terms and take all reasonable steps to minimize the incurrence of cost allocable to the work covered by the order during the period of work stoppage.

Within a period of 90 days after a stop-work order is delivered to servicing agency or within any extension of that period to which the parties shall have agreed the office shall either:

- Cancel the stop-work order
- Terminate the work covered by this work order

If a stop-work order issued under this clause is cancelled or the period of the stop-work order or any extension thereof expires, servicing agency will authorize the resumption of the work. An adjustment will be made in the delivery schedule or cost, or both, and the Order must be modified in writing accordingly. If a stop-work order is not cancelled and the work covered by the order is terminated in accordance with the terms of the GT&C section of the IAA, costs resulting from the stop-work order will be allowed in arriving at the termination settlement.

20. Termination

This Agreement may be unilaterally terminated by either party generally upon 30 days' written notice to the other party. NRC will pay its share of any project expenses up to the termination date. Any expenses incurred in terminating this agreement will be paid by the party terminating the agreement. Any unexpended funds shall be returned to the NRC.