EXHIBIT A-1

Satsop River Floodplain Restoration Project – R-70-09889-35-00

Scope of Work

INTRODUCTION

Grays Harbor County seeks to remove a rip-rap revetment on the east bank of the Satsop River along a reach approximately one mile downstream of State Highway 12. The intent of the rip-rap removal is to allow the river to migrate more freely to the east within its channel migration zone, to restore floodplain function, and to reduce erosive forces on the west bank of the river and protect agricultural lands downstream of the project site.

The rip-rap removal plan will require river engineering and geomorphic evaluation to predict how the river will respond to the project. In 2004 the US Army Corps conducted hydraulic modeling and evaluated potential flood impacts of rip-rap removal. Although the current project will make use of the Corps study, the river channel has shifted dramatically and much of the previous hydraulic analysis is no longer representative of current conditions. The scope for the current work includes the following tasks.

SPECIFIC SCOPE OF WORK

Task 1 – Project Coordination and Outreach

The objective of this task is to define project goals and public outreach needs. Consultant will compile a list of known and potential objectives for the project. These will be discussed and finalized during a Project Kick-Off Meeting with the County and (possibly) stakeholders. Key members of the Consultant team will meet with County staff to refine the scope of work, confirm schedule milestones, and identify deliverables to be produced. The kick-off meeting will also give attendees the opportunity to share information, data, concerns, or constraints they feel are important to the project. The project team will also decide what actions will be taken to communicate with stakeholders and residents.

Task 1 Deliverables:

- Kick-off Meeting and stakeholder outreach plan

Task 2 – Hydrologic, Hydraulic, and Geomorphic Modeling and Analysis

Task 2a: Hydrology - Hydrologic data needed for the project will be developed. Peak flow hydrology of the Satsop River has been studied in detail in past work (including by WSE), but the analysis needs to be updated to include recent USGS peak flow data. An understanding of the duration of high flows at the project site is also required for the geomorphic assessment. This will be developed using the USGS mean daily flow data for the Satsop River gage. Lastly, an evaluation of the concurrence of Satsop and Chehalis River high flows will be prepared to provide insight into the influence the Chehalis River has on hydraulics through the project reach.

Task 2b: Hydraulics - The current project requires an evaluation of river channel and floodplain hydraulic conditions to inform the design of a rip-rap removal alternative that the County and local landowners can rely upon to solve existing problems and not create new ones. Accurate hydraulic analysis is crucial to understand current conditions and the potential benefits and impacts of the proposed project. To provide the necessary hydraulic information for the study reach a two-dimensional (2D) numerical hydraulic model will be created. This model will be used to:

- Simulate detailed velocity patterns, from which zones of likely sediment deposition and bank erosion can be identified.
- Simulate flood levels throughout the project reach.

- Test alternative solutions and provide detailed velocity and shear stress output to predict the response of the channel bed and overbank. This will simplify design refinement to eliminate undesirable geomorphic conditions.
- Provides data needed for future floodplain restoration design
- Produce graphics that can be used to help stakeholders understand the benefits and impacts of the project.

To characterize current hydraulic conditions, an SRH-2D model will be developed for the lower 2.5 miles of the Satsop River, from just upstream of the SR-12 bridge to the confluence with the Chehalis River. The lateral extent of the model will be defined to include the entire 100-year floodplain of the Satsop River. Subtasks under this task include:

1. Create a bathymetric (underwater) land surface using the 2011 cross section surveys of the study reach. Merge the bathymetric surface with the 2012 FEMA LiDAR data to create a seamless digital terrain model (DTM) of the study reach. Import the DTM into SRH-2D as a bed elevation layer.
2. Define the model boundary, create the model finite element mesh, and assign roughness parameters.
3. Establish upstream and downstream boundary conditions for the main channel for each flow scenario using the hydrologic data developed in Task 2a and the HEC-RAS model developed in 2012 by WSE for the Chehalis River Basin Flood Authority.
4. Calibrate the model to known water surface elevations over a range of flows, to the extent that observed flow and stage data are available. The calibration effort will make use of flood survey records, aerial photos, and anecdotal information as available to determine the extent and magnitude of historical flood events within the study reach and use this information as appropriate to calibrate the hydraulic model for flood events. Calibration runs may assume steady-state conditions, depending upon the availability of time dependent data.
5. The model will be used to provide information on hydraulic conditions within the existing system, which will allow a baseline assessment of sedimentation and bank erosion in the existing channel.

Task 2c: Channel Migration Assessment - The Satsop River through the project reach is very active and will continue to change with or without the rip-rap removal project. Recent migration of the river has threatened public infrastructure, such as the Grays Harbor PDA wellhead, while generally reducing migration to the west. The removal of rip-rap could change the current situation and if done incorrectly could threaten private lands to the west and public infrastructure such as Keys Road to the east. It is important for the design team to understand the hydraulic and geomorphic characteristics of the existing system and to use this information to develop a design that minimizes these risks. Available data including the 2004 USACE report and aerial photographs will be reviewed and used to assess current and projected channel migration in the project reach

Task 2 Deliverables:

- Hydrologic data.
- Hydraulic model development and calibration summary
- Baseline channel migration assessment

Task 3 – Alternative Development and Selection

The County and Consultant team will develop a list of performance criteria that can be used to screen potential rip-rap removal alternatives. These may include: (1) estimated project costs; (2) permitting issues; (3) land acquisition issues; (4) long term operations and maintenance needs; (5) potential habitat benefits, and (6) risks and uncertainties.

The Consultant team will then identify up to three rip-rap removal alternatives and will evaluate the potential benefits, impacts, and costs of each. Alternatives may be simulated using the hydraulic model and compared to the baseline (no action) condition. Predictions of changes in flooding and geomorphic characteristics in response to the proposed project will be prepared. If potentially significant adverse conditions are identified, the alternatives will be refined to minimize these impacts.

An evaluation matrix will be filled out to document how each alternative ranks relative to the performance criteria. The consultant team will prepare draft documentation and graphics to support internal, agency, and stakeholder presentations.

Task 3 Deliverables:

- Matrix comparing alternatives
- Presentation graphics and documentation for each alternative

Task 4 – Permitting and Land Issues Strategy

The consultant team will develop a strategy to minimize permitting timelines and costs. As part of the alternatives analysis, the team will evaluate each alternative with respect to expected permit requirements and complexity. This information will be used to refine the design to optimize permitting. As needed, the team will contact regulatory agencies (such as the Corps of Engineers and Washington Department of Fish and Wildlife) to coordinate conceptual design ideas and request initial input regarding permitting requirements and timelines.

Another goal of the design will be to minimize the need to acquire land or easements for the project. However, we recognize that temporary construction easements may be required and that strategic land acquisitions or permanent easements may be required to implement the project. As part of the alternatives analysis the consultant team will evaluate each alternative being considered with respect to the expected land acquisition and easement requirements and complexity.

Task 4 Deliverables:

- Permitting Issues and Strategy
- Property and Easement Issues and Strategy

Task 5 – Preliminary Engineering Design and Implementation Plan

Task 5 includes preliminary engineering design, cost estimates, and development of an implementation plan for the preferred alternative (schedule for final engineering, permits and land acquisition, etc.). Preliminary design drawings will be developed to a level necessary to support permit submittals. Preliminary cost estimates for the design will be developed to ensure the project can be completed within the available funding. The project team, in collaboration with Grays Harbor County will then compile a schedule for future tasks including obtaining permits and easements, final design engineering, and project implementation.

Task 5 Deliverables:

- Preliminary Engineering
- Implementation Plan and Schedule