

PROJECT MANAGEMENT PLAN
JOHN H. KERR
FEASIBILITY STUDY
UNDER SECTION 216 OF PUBLIC LAW 91-611, AS AMENDED



JOHN H. KERR DAM AND RESERVOIR
LOWER ROANOKE RIVER
VIRGINIA AND NORTH CAROLINA

SEPTEMBER 2004



**US Army Corps
of Engineers**
Wilmington District

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Prepared by:

US Army Corps of Engineers
Wilmington District

The State of North Carolina

The Commonwealth of Virginia



**US Army Corps
of Engineers**
Wilmington District



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FEASIBILITY STUDY
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Introduction

The Feasibility Study, authorized under Section 216 of Public Law 91-611, the River and Harbor and Flood Control Act of 1970, as amended, will review the operation of the John H. Kerr Dam and Reservoir and report recommendations to Congress on the advisability of modifying the structures or the structure's operation and for improving the quality of the environment in the overall public interest. Information developed during the Feasibility Study may become the basis for actions specifically authorized by Congress or by the legislatures of the Sponsors, the State of North Carolina, and the Commonwealth of Virginia, for actions under the continuing authorities of the US Army Corps of Engineers, and for actions by non-government organizations. The Study provides interested parties an opportunity to integrate multiple perspectives and assets to achieve the common goal. The parties commit to effective and efficient management of their responsibilities for the Study, and to the sharing of information about the Study.

Approval of participation in this Feasibility Study by the US Army Corps of Engineers, Wilmington District, was based on the Reconnaissance Phase Section 905(b) Analysis for John H. Kerr Dam and Reservoir, Virginia and North Carolina 216 and a Supplemental Sheet prepared in response to comments on the 905(b) from the U.S. Army Corps of Engineers South Atlantic Division. These documents indicate that the Feasibility Study will address subjects determined in the Initial Appraisal Report for the Study, and identified by citizens during hearings held in the Study area. More than 40 topics were identified and categorized into 11 Study Subjects. These tasks have been modified by combining the Downstream Aquatic Habitat task with the Diadromous Fish task to form the Diadromous Fish and Downstream Riverine Aquatic Resources Task. The Applicable Laws and Regulations Task has been deferred until later in the Study process. There are 9 remaining study subjects to be addressed. Task implementation has been developed to consider of each Study Subject. US Army Corps of Engineers Regulation 1105-2-100, Planning Guidance Notebook, provides full guidance regarding conduction of the study.

Study Area Description

The John H. Kerr Dam and Reservoir is located on the Roanoke River, about 178.7 river-miles above the mouth. It is in Mecklenburg County, Virginia, 20.3 miles downstream from Clarksville, Virginia, 18 miles upstream from the Virginia-North Carolina border, and 80 air-miles southwest of Richmond, Virginia. The area of inundation at the top of the gate elevation for the Reservoir extends upstream on the Roanoke River 56 miles and extends 34 miles on the Dan River. The project was completed in 1952.

John H. Kerr Reservoir is a significant regional resource. It provides quality natural resource-based recreation for area residents and a desirable outdoor experience for more than 2 million visitors a year. It provides municipal and industrial water supply, wastewater assimilation, and enhanced farming and forestry opportunities. The Roanoke River Basin below John H. Kerr Dam and Reservoir is one of the finest remaining river swamp forest ecosystems within the eastern United States. These bottomland hardwood forests, uplands, and streams provide a high quality habitat for fish, wildlife and waterfowl.

The study area includes the John H. Kerr Dam and Reservoir and the Roanoke River Basin beginning at the Dam and proceeding downstream to the Albemarle Sound. For this study, the area will be referred to as the Lower Roanoke River Basin. The Study Area is located in Charlotte, Halifax, Mecklenburg, and Brunswick Counties of Virginia, and in Granville, Vance, Warren, Halifax, Northampton, Bertie, Martin and Washington Counties of North Carolina. A Reconnaissance Phase Section 905(B) Analysis is currently underway for the Philpott Lake to determine if there is an interest in undertaking a Section 216 study for Philpott. If a 216 Study is undertaken at Philpott, the study teams will work closely together to assure that any changes are implements system wide. The Philpott Lake study area includes Patrick, Franklin, Henry, and Pittsylvania Counties in Virginia, and Rockingham and Caswell Counties in North Carolina. The study area is located in the following Virginia and North Carolina Congressional Districts, respectively, the 4th and 5th and the 1st and 3rd.

The Phases of the Study

This Project Management Plan (PMP) will be prepared in three phases. The first phase details the plan for the Feasibility Study to the first major decision point, the first In-Progress Review (IPR). In the first phase of the Study, existing data about the Study Subjects will be gathered, and recommendations for further study will be developed. As the Study progresses, the PMP will be modified to detail the plans for Phases 2 and 3. The Sponsors may request changes in the PMP, which will be changed by the USACE as plans for the Study change.

Upon completion of Tasks in Phase One, an IPR with more senior USACE representatives and resource agency representatives will be conducted. The IPR will be a Feasibility Scoping Meeting, as described in USACE Planning Guidance Notebook, Appendix G. The Feasibility Scoping Meeting will ensure that the Study is correctly focused and that the essential Study objectives are addressed.

In Phase Two of the Study, multiple technical studies addressing identified objectives, will be performed to develop specific, quantitative, and qualitative goals and to assess existing problems, needs, and opportunities. Addressing identified objectives in Phase Two via data collection, modeling, and analysis will set the stage for alternative development in Phase Three.

In Phase Three of the Study, alternatives will be developed and evaluated to meet the goals and objectives identified in Phase Two. Outputs and impacts of each alternative will be determined, trade-off analysis performed, and, if appropriate, actions selected for recommendation to Congress. A feasibility report and National Environmental Policy Act documentation will be prepared.

Within the first phase, the Project Management Plan requires the following tasks for each Study Subject.

- ❑ Gather and evaluate existing relevant data.
- ❑ Identify gaps in the existing relevant data.
- ❑ Develop recommendations to fill gaps in the existing relevant data.
- ❑ Identify and evaluate existing methods and tools for study of the subject.
- ❑ Develop a plan to keep models and data available to the public and in compatible formats.
- ❑ Develop an approach for combining individual models and investigations into an overall system evaluation.
- ❑ Develop a stepwise procedure to conceive and test alternatives to the existing condition.
- ❑ Complete a risk analysis evaluation associated with gaps in existing methods and tools necessary for study of the subject.
- ❑ Develop recommendations regarding further study of the subject.

The level of accuracy within the descriptions and the associated cost estimates depends upon the extent of uncertainties and the depth of investigations made in preparing them.

The detailed focus and scope of the entire Feasibility Study is incomplete. All investigations performed for the Study will, at a minimum, comply with legal obligations and administration policy and will not compromise professional standards. This will allow the all results of the Study, even parts not receiving detailed analysis, to be of use and value to the Sponsors and USACE. Requirements exceeding these minimum standards are presumed and will be negotiated by the Sponsors and the USACE, based on complexity, available resources, and associated risks.

For each Study Subject, adequate information will be developed in Phase One to produce a product allowing the Sponsors and USACE decision-makers to decide what additional investigation may be needed. Documentation and evaluation of existing data and study methods will be produced for use by the Sponsors and USACE regardless of whether it becomes incorporated as a Study Subject in the Feasibility Study. Initial goals of the IPR are to provide information for determining areas in need of further study and to provide information regarding authorized operation of John H. Kerr Dam and Reservoir for environmental restoration considerations and for the Sponsors in the performance of their authorized functions.

Communication and Decision-making Processes

The Project Delivery Team (referred to as the Study Management Team in the Feasibility Cost Sharing Agreement) is committing to the detailed Task Outline described below, to ensure full communication and for identifying and resolving any concerns, problems, or disagreements. Resolutions shall be reached through discussion among employees in the study management level in which the issue arises and will be resolved at the earliest possible stage.

Examples of matters that may be discussed in these processes include coordination of USACE's requests for funds with the funding cycles of the Sponsors, a Sponsor's potential need to suspend the Study due to lack of funding, and identification of work which the Sponsors may propose for negotiation as work in-kind.

USACE and the Sponsors commit to appointing individuals with equivalent authority to act for them, to ensure constant representation is available during established time periods for these processes. Communication may include telephone and electronic communications and face-to-face discussions, as needed to keep each other timely informed on all matters related to the Study.

As the Feasibility Cost Sharing Agreement states, the John H. Kerr 216 Executive Committee is tasked with ensuring consistent and effective communication. The following individuals are designated to serve on the Executive Committee: David Paylor, Virginia Deputy Secretary of Natural Resources; John Morris, Director, North Carolina Division of Water Resources; and the District Engineer of the Wilmington District Corps of Engineers. The Executive Committee will generally oversee the Study, consistent with this PMP, and will make recommendations deemed warranted to the District Engineer, including suggestions to avoid potential sources of dispute. The Executive Committee will meet at least quarterly until the end of the Study Period. Location and specific times will be determined during conduction of the study.

The Project Delivery Team will inform the Executive Committee of significant pending issues and actions and will prepare monthly written reports to the Executive Committee documenting the progress of the Study. Task expenditures will be documented in these monitoring reports to provide adequate time for full discussion of possible excess Study Costs before they are incurred.

To ensure timely completion of the John H. Kerr 216 Feasibility Study, any member of the Executive Committee, the Project Delivery Team, or subject matter specialist employed by USACE may request immediate discussion of any arising issues affecting the Study.

Upon the conclusion of Phase One, the PDT will prepare and present recommendations for Phase Two, to the Executive Committee. Recommendations from the PDT will include a proposed scope of work which will define tasks, costs, responsible parties, and cost sharing requirements. The Executive Committee will present the final recommendation to the USACE, Wilmington District Commander. Each phase of the Study will undergo this uniform approach for development and presentation.

Prior to issuance of any order under the Study contract, the party issuing the order shall allow other involved parties a minimum of ten working days to review the order. Proposals for contract award will be available for evaluation by interested and involved parties to the required extent as defined by all applicable laws and regulations.

Public Involvement, Collaboration, and Coordination with Other Agencies

As established by USACE Regulation 1105-2-100, Planning Guidance Notebook, Appendix B, the Feasibility Study will document substantial active involvement by interested government and non-governmental agencies and organizations. The goal of public involvement is to obtain information and views of those with an interest in the Study, so that their comments and concerns receive full consideration in the planning process. Significant public involvement has occurred and been acknowledged for a substantial period of time regarding application for a renewed license of hydropower facilities downstream of the John H. Kerr Dam by the Federal Energy Regulatory Commission (FERC) of Dominion Inc.

A Sponsors' Advisory Committee has been established by the sponsors, the states of Virginia and North Carolina, which includes many of those who participated in the FERC process. The Sponsors' Advisory Committee will provide input to the Sponsors for consideration during decision-making activities affecting the Study. The Sponsors' Advisory Committee includes representatives of federal, state, and local governments, and representatives of businesses and environmental organizations. Primary responsibility of the Sponsors' Advisory Committee, under the John H. Kerr Feasibility Study, is to avoid conflicting interests amongst involved parties, especially potential contractors.

Formal collaboration or coordination between USACE and other agencies is not anticipated during Phase One. However, during Phase One, subject matter specialists, many of whom participated in the FERC process and are members of the Sponsors' Advisory Committee, will be consulted regarding the Study Subjects. Other steps facilitating public involvement will be developed for Phases Two and Three.

Costs for attendance at the Sponsors' Advisory Committee Meetings by members of the Executive Committee, the Project Delivery Team, and individuals responsible for performing work for USACE or for performing in-kind work for the Sponsors shall be included in total project costs and cost shared. Other expenses of the Sponsors' Advisory Committee shall not be included in total project costs or cost shared.

For each of the 9 Study Subjects Tasks identified in the PMP for Phase One, subject matter experts are identified, including USACE employees, the Sponsors, and employees or representatives of other government and non-government organizations, and businesses. Many of these subject matter experts have participated in the Dominion's Inc. FERC license renewal process. The subject matter experts will be consulted for information and advice during the performance of each task. For the purpose of completing Phase One actions, the sponsors will contribute 50% of the total project cost by in-kind services.

TASKS AND COSTS FOR PHASE I

Phase I - Task 1. Downstream Flow Regime and Effects on Riparian Ecosystem

Task Funding Priority¹: This Task is assigned a funding priority of **HIGH**.

Phase II - Task 1.A: What water levels constitute a flood and what releases from John H. Kerr Reservoir result in those water levels?

Existing data regarding the relationships between releases from John H. Kerr Reservoir and downstream flooding will be gathered and evaluated in the study. Existing methods and tools for study of this subject will also be evaluated. The study will provide information about data, methods, and tools to aid in making recommendations for further study of this subject, which will be considered at the first In-Progress Review.

The relationships between John H. Kerr Reservoir and downstream flooding are influenced by the water releases from the two reservoirs operated by Dominion Inc. immediately downstream of John H. Kerr Reservoir, at Lake Gaston and Roanoke Rapids hydropower projects. These relationships of downstream flow to flooding are also influenced by characteristics of the floodplain.

For the purposes of this study, flooding will be considered to occur when water leaves the Roanoke River channel and enters the floodplain. The amount of daily average flow that causes flooding varies among different reaches of the River. Water from John H. Kerr Reservoir contributes to downstream controlled flooding in two ways:

- ❑ Total dispatch of water for a given week – the weekly declaration as affected by the Southeastern Power Association contract and operating guidelines, including flood control; and
- ❑ Dispatch of water at any particular time within a given week – by Dominion Inc. or Progress Energy for power generation, or when the USACE supersedes this normal operation for flood control. The apportionment of the weekly declaration among different days of the week by Dominion Inc. or Progress Energy is referred to as within-week peaking.

A primary cause of controlled flooding is the determination of weekly releases, including management of flood events (referred to as "flood operations"), by the USACE. Weekly declarations over a threshold level can result in downstream flooding. Flood operations sometime require the controlled release of water when John H. Kerr Reservoir is above an elevation of 300 feet, mean sea level. During flood operations, the John H. Kerr, Gaston and Roanoke Rapids hydropower

¹ Task Funding Priorities were established to help schedule the completion of task items. All study subjects are important and will be addressed. However, due to funding limitations it was necessary to rank the tasks.

projects are operated in conformance with the existing Water Control Plan for John H. Kerr Dam and Reservoir. This study will examine the John H. Kerr flood operations and their effects. Unless significantly impacted by the flood operations, the Federal Energy Regulatory Commission (FERC) licensed discharges from Lake Gaston and Roanoke Rapids hydropower projects will be beyond the scope of this study.

A secondary cause of controlled flooding is the generation of peaking power by Dominion Inc. and Progress Energy. The magnitude and frequency of discharges for peaking power can cause the River's stage at locations downstream of the Roanoke Rapids hydropower project to exceed channel capacity, and thus water to flow into the floodplain, depending on the magnitude, duration, and pattern of peaking events.

The effects of the peaking flow regime downstream of Roanoke Rapids hydropower project were studied in the FERC re-licensing of Dominion's Inc. projects. The settlement agreement developed during re-licensing will result in additional studies cooperatively managed by Dominion Inc. and resource agencies to further investigate the potential impacts of within-week peaking on the downstream riparian ecosystem. USACE involvement in these additional studies would enhance the John H. Kerr 216 study process for the following reasons:

- ❑ *Studying the impacts of growing season floods will involve many of the same indicator species and methods – regardless of whether the cause of the flooding is USACE or Dominion Inc. operations.*
- ❑ *The within-week apportionment of the weekly declaration relies on relationships between the USACE, Dominion Inc., and Progress Energy that will likely be examined during the John H. Kerr 216 study.*

Phase 1 - Tasks 1.A.1 - 1.D.3 Subject Matter Specialists:

- ❑ Dominion Inc.
- ❑ The Nature Conservancy (TNC)
- ❑ NC Department of Environment and Natural Resources (NCDENR)
- ❑ Division of Water Resources (NCDWR)
- ❑ Division of Water Quality (NCDWQ)
- ❑ Natural Heritage Program (NCNHP)
- ❑ Roanoke River National Wildlife Refuge (RRNWR)
- ❑ US Fish and Wildlife Service (USFWS)
- ❑ US Army Corps of Engineers (USACE)
- ❑ International Paper (IP)
- ❑ US Geological Survey (USGS)

Phase I - Task 1.A.1: Identify, Review and Select Flow Model

TEAM PRIORITY RATING ²: This task is rated as a number one priority by the members of the team.

METHODS: Review literature, communicate with hydrologic modelers by telephone, and participate in discussion with Subject Matter Specialists to determine the model for use in the study. Unless contra-indicated by the review, the Roanoke River Basin Reservoir Operations Model (RRBROM) will be the preferred model – given that it has been used extensively throughout the FERC re-licensing and is already familiar to many stakeholders.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by USACE.

TIME: 20 person days

ESTIMATED PROJECT COST: \$13,000

SPONSORS' IN-KIND WORK: \$0

² Team Priority Ratings were established by the Resource Teams. The ratings reflect the team's recommendation regarding the proper sequencing of task completion.

Phase I - Task 1.A.2: Identify, Review and Select Flood Model

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Phone conversations and discussions with Subject Matter Specialists and other technical experts in this field shall be conducted. The Flood Model and Digital Elevation Map (DEM), developed by the Nature Conservancy, will be reviewed first, and if acceptable, the consideration of additional data sources will not be necessary.

If the existing flood model is acceptable, the time and estimated cost below will be considerably reduced. Initial review of the flood model will focus on its workings and accuracy. Additional evaluation may be needed later, depending on Tasks 1B, 1C, and 2A, to make sure the flood model provides the necessary outputs for these other tasks.

METHOD OF ACCOMPLISHMENT: This task will be completed 80% by USACE and 20% by NCDWQ.

TIME: 10 person days

ESTIMATED PROJECT COST: \$7,000

SPONSORS' IN-KIND WORK: \$1,400

NC: \$1,400

VA: \$0

Phase I - Task 1.A.3: As Needed, Scope Tasks for Development or Revision of Flow and Flood Models

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Communicate with hydrological modelers by telephone and use the input provided by the Subject Matter Specialists to develop an accurate list of tasks and associated costs for development or revision of flow models.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$7,000

SPONSORS' IN-KIND WORK: \$3,500

Phase I - Task 1.B. *How does the flow regime affect downstream agriculture and silviculture operations? When examining the impacts of flooding, consider the frequency, duration, magnitude and timing of flood events.*

The downstream areas that are subject to flooding, and their elevations, will be identified using the flood model and DEM, developed by TNC. TNC also has land ownership data available in digital format. This geospatial data regarding land uses and associated elevations will be combined with the flow and flood models to assess the effects of flow regime on existing land use. Present farming and silviculture practices will be determined by literature review, and by personal interview. It is expected that a non-traditional method will be developed using the existing GIS information to analyze the economic impacts of John H. Kerr's flood operations on hunting, fishing, forestry and farming as well as highway, water supply and sewer infrastructure.

A primary focus of this task will be the effect of downstream flooding on farming and forestry operations – with access by equipment and usability of farm and forest operation roads being a key indicator. Effects of flooding on forest growth and regeneration will be addressed in Task 1.C. International Paper has an electronic database of their forestry operations road network. Additional field data using a global positioning system (GPS) may be needed to further define important roads, and additional information on road grade elevations may be needed. Interviews with local experts (foresters, farmers, and agencies) will be used to identify key roads in the network. These same experts will also be consulted to determine a reasonable recovery time after flooding before roads can be used by equipment. Additionally, input will be sought from experts working on Task 6 – Downstream Flow-based Recreation – so that key access roads for hunting and fishing are included in the GIS road database for later use by that team.

Quantification of flood damage cost and frequency was last developed for the Lower Roanoke River during 1982 to 1983. The existing flood damage curves will be evaluated for present accuracy and adequacy for use in the study of this subject. This will be done by determining if the existing curves identify the land that could currently be covered by flood flows and if the range of flows that the curves are based on reflect the actual flood stages. Aerial photography will be used to determine any significant land use changes that have occurred since 1983. It is expected that new flood damage curves will be developed with input from the Sponsors, foresters and agriculturists. These curves will provide a method for analysis of the possible flood damage to downstream land.

The flood damage curves will be based on elevation data for the point where agricultural or forestlands and access roads are submerged. The flood model developed by TNC may be used. The season of the year will be considered in the flood damage curves in order to determine crop loss and effect on silviculture

operations. The duration and frequency of flooding will also be considered for differential effects on vegetation damage and road usage. The economic loss under the existing conditions will be compared with the economic loss under any revised operation plan that may be studied. The available data will be obtained about present and anticipated land use, land cover, and development in the 100-year flood plain. This data will be evaluated for relevance and adequacy for the study of this subject. If gaps in the relevant data are identified, they will be evaluated for significance, and, if needed, recommendations for obtaining additional data will be developed.

Phase I - Task 1.B.1: Evaluate Adequacy of Existing Imagery and Survey Data

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Conduct a literature review and discussions with local experts to identify existing imagery and survey data. Acquire best available data, analyze for adequacy, and identify data gaps. The initial review will focus on: the data used in the DEM and flood model developed by TNC; land use data assembled by TNC; and available data on forestry and agriculture roads. The road database will be evaluated with input from Task Group 6 for use by that team to evaluate hunting and fishing (boating) access.

METHOD OF ACCOMPLISHMENT: This task will be completed 50% by USACE and 50% by NCDWQ.

TIME: Economist: 14 days Biologist: 14 days

ESTIMATED PROJECT COST: \$22,400³

SPONSORS' IN-KIND WORK: \$11,200

NC: \$11,200

VA: \$0

³ *Time and costs may be reduced if existing TNC models are used.*

Phase I - Task 1.B.2: Prepare Scope for Acquisition of Additional Imagery and/or Survey Data as Needed

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Determine appropriate methodology and area of coverage, identify product standards and potential sources. Prepare Scope of Work.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: Economist: 14 days Biologist: 10 person days

ESTIMATED PROJECT COST: \$19,200³

SPONSORS' IN-KIND WORK: \$9,600

Phase I - Task 1.B.3: Identify analyses to be performed (in Phase 2) Using a GIS Database Containing Best Available Information.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Identify the best available data for the database. Include identification of key roads and an analysis of recovery time for road use following flooding. Consider information that will be needed (e.g. flood damage curves) that will be needed for economic analyses during Phase 3.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

C. How does the downstream riparian ecosystem respond to flow and flood regimes - considering the frequency, duration, magnitude and timing of inundation?

Key indicator species of terrestrial and aquatic plants and animals will be identified for evaluating how the various downstream ecotypes respond to inundation. The study task group has identified four lifecycle components that will be evaluated for plants and animals:

- Plants
 1. Effect on mature trees – survival and productivity; dendrochronology
 2. Effect on seedlings – identify survival/mortality thresholds; duration of flooding etc.
 3. Effect on regeneration – germination, re-sprouting, and seed establishment
 4. Effect on seed production – influences recruitment; mast production for foraging

- Animals
 1. Survival – (drowning, water quality)
 2. Feeding
 3. Reproduction
 4. Resting/Roosting

The output from flow and flood modeling described in Task 1A will be used as input data for Species and Community Response models. These will focus on how species and communities respond to flood regimes of various frequencies, durations, magnitudes, and seasonal timings.

In addition to impacts on plant and animal species in the floodplain due to submergence, downstream inundation can also affect riparian flora and fauna by producing changes in water quality. The issue of how water quality is influenced by flow and flood regimes will be directly addressed in Task 2A. Task 1C will address how the riparian species and communities respond to changes in water quality. The effect of water quality on the four animal and plant lifecycle components listed above will be an additional variable to include in the development of Species and Community Response Models, with output from the water quality model developed in Task 2A providing input.

Available data related to this subject will be summarized and catalogued, and recommendations for further data collection will be prepared. Existing methods and tools for analysis and study of this subject will be identified.

An array of flow conditions will be developed for the models, representing high and low frequency flooding, and high, normal and low flow antecedent conditions, to allow for analysis of flood events under various operational

scenarios. These operational scenarios for John H. Kerr Dam and Reservoir will include altering the flood control operation, and altering the guide curve. It is expected that some existing Species and Community Response models can be adapted to local site conditions, and that other models will need to be developed. The estimates of time and cost required for doing this work are based on developing generic scopes of work for both adapting the existing models and developing new models.

Depending on the results of the studies conducted during Task 1C, one potential alternative outcome would be the establishment of an adaptive management process for further testing and modification of John H. Kerr Reservoir operations with respect to downstream flooding and the riparian ecosystem.

Phase I - Task 1.C.1: Evaluate Adequacy of Existing Species and Community Response Models

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Conduct a Literature review and discussions with experts to identify key indicator species -including a review of those identified by the Terrestrial Ecosystems Work Group during FERC re-licensing of the Dominion Inc. projects, as well as other species to be determined. Existing Species and Community Response models will be reviewed to determine what additional information needs to be developed. Acquire best available data, analyze for adequacy, and identify data gaps.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 25 person days and \$10,000 for acquisition

ESTIMATED PROJECT COST: \$30,000

SPONSORS' IN-KIND WORK: \$15,000

Phase I - Task 1.C.2: Develop a Request for Proposals (RFP) to Conduct a Detailed Literature Review of How the Selected Species and Communities Respond to Environmental Changes

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Identify the scope of habitat variables and species of consideration. Identify product standards and potential investigators, and prepare a Scope of Work. This task will lead into a two-part effort under Phase 2 of the Project. The first part will be in response to this RFP and will produce a detailed literature review of how the selected species and communities respond to habitat changes, including preliminary identification of key variables. The Task Group will review this work product during Phase 2 and develop RFP's for the second part of the Phase 2 work – conducting the studies needed to develop or modify Species and Community Response models. Costs are only for Phase 1 and based on developing the RFP for 15 species and communities, may involve more or less.

METHOD OF ACCOMPLISHMENT ⁴: This task was determined to be Phase II work.

TIME: 10 person days

ESTIMATED PROJECT COST: \$0

SPONSORS' IN-KIND WORK: \$0

**Phase I - Task 1 Total Cost: \$106,600 ⁵
Sponsors' In-kind Work: \$44,700**

⁴ This task and costs will be included in the Phase II Scope of Work.

⁵ Time and costs may be reduced if existing TNC models are used.

Phase I - Task 2. Water Quality

Task Funding Priority: This Task is assigned a funding priority of **HIGH**.

Phase I - Task 2 A. How does flow regime affect downstream water quality in floodplain areas, tributaries, and the main river channel?

Existing methods and tools for determining water quality changes will be identified and evaluated. It is expected that significant baseline water quality data is available for the study area. However, it is also expected that some additional water quality data collection will be required, and the estimates of time and cost for this work are based on this.

The tasks under this item may link to methods and tools developed as part of Item 1, including: floodplain water level gauges; the Roanoke River Basin Reservoir Operations Model (1.A.2); and an inundation model developed by the Nature Conservancy (1.B). Additional methods and tools will need to be developed that relate inundation to water quality, as influenced by timing and duration.

Available data related to this subject will be summarized and catalogued, and recommendations for further data collection will be prepared. Existing methods and tools for analysis and study of this subject will be prepared.

Existing data will be gathered regarding discharge practices and water quality releases from John H. Kerr Dam under various flow conditions, impacts on floodplains due to adjacent land use, changes in water quality resulting from floodplain inundation, and the effects of drainage of the flood plains to the river. Water quality parameters to consider should be dissolved oxygen (DO), temperature, nutrients, chlorophyll a, chemical oxygen demand (COD), biological oxygen demand (BOD), and sediment oxygen demand (SOD). Also is higher resolution topography of the floodplain needed? This data will be evaluated for relevance and adequacy for the study of this subject. If gaps in the relevant data are identified, they will be evaluated for significance, and, if needed, recommendations for obtaining additional data will be developed.

Any modeling or monitoring required should be able to handle ramp down quantity and duration for any season. This modeling and monitoring should be able to detect DO concentrations and other parameters concentrations at various points in the river and floodplain, address optimum DO for migrating fish, assess assimilative capacity, and determine impacts to water quality standards. The modeling should also be able to assess rapid fluctuations in reservoir releases and subsequent river flows, and the model release maximum should be higher than under existing operations. Finally the up and downstream boundaries of the model need to be determined and if tasks A and B need to be combined.

Phase I - Tasks 2.A.1 – 2.C.3: Subject Matter Specialists:

- ❑ Dominion Inc.
- ❑ NC Division of Water Quality (NCDWQ)
- ❑ NC Wildlife Resources Commission (NCWRC)
- ❑ Roanoke River National Wildlife Refuge (RRNWF)
- ❑ US Army Corps of Engineers Wilmington District (USACE)
- ❑ US Fish and Wildlife Service (USFWS)
- ❑ US Geological Survey (USGS)
- ❑ VA Department of Game and Inland Fisheries (VADGIF)
- ❑ VA Department of Environmental Quality (VADEQ)
- ❑ The Nature Conservancy (TNC)
- ❑ Weyerhaeuser
- ❑ Other agencies as appropriate

Phase I - Task 2.A.1: Evaluate Adequacy of Existing Water Quality Data and Prepare Recommendations for Further Data Collection as Needed

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Consult with Sponsors and decide what data will be needed to answer the questions that will lead to an adequate description and discussion of water quality issues in the Feasibility Report.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 60% by NCDWQ and 40% by USACE.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,800

NC: \$4,800

VA: \$0

Phase I - Task 2.A.2: Prepare Scope for Collection of Water Quality Data as Needed

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Communicate with water quality experts by telephone and use the input provided by the Subject Matter Specialists to develop an accurate list of tasks and associated costs. Data collected needs to be in appropriate areas such as in critical habitat areas (spawning and nursery) in the entire river for anadromous fish and the data needs to be adequate for modeling to predict DO conditions in the floodplain and river under various flow, temperature, and duration scenarios.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 50% by NCDWQ and 50% USACE.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

NC: \$4,000

VA: \$0

Phase I - Task 2.A.3: Prepare Scope for Development or Revision of Water Quality Models related to flood plain flooding

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Communicate with hydrological modelers by telephone and use the input provided by the Subject Matter Specialists to develop an accurate description of tasks and estimated associated costs. Include in the discussions conditions such as why the DO sag in the lower river does not flush out as expected.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 60% by NCDWQ and 40% USACE.

TIME: 50 days

ESTIMATED PROJECT COST: \$40,000

SPONSORS' IN-KIND WORK: \$24,000

NC: \$24,000

VA: \$0

Phase I - Task 2 B. How do downstream flows maintained by releases from John H. Kerr Reservoir affect water quality in the river channel between Roanoke Rapids and the mouth of the river?

The FERC license for the Lake Gaston and Roanoke Rapids hydroelectric projects requires minimum flows that vary by month. The North Carolina Division of Water Quality (NCDWQ) uses these minimum flows to determine assimilative capacity in the Roanoke River and establish effluent limits for point source discharges. However, the water quality model used by NCDWQ does not specifically address flood plain flooding/re-entry, fluctuating flows, and coastal plain hydrology. An agreement between the USACE, the North Carolina Wildlife Resources Commission (NCWRC), and Dominion Inc. also sets flow targets for the spring run of diadromous fish species.

This section of the Water Quality study item will focus on downstream water quality in the river channel to develop a model that can be linked to the reservoir operations flow model developed in 1.A.2. The existing assimilative capacity model ends at Hamilton and additional modeling should not only consider this area but include factors such as wind and lunar tides and saltwater intrusion. The existing water quality monitoring stations will be examined and water quality experts within NCDWQ will be consulted. The anticipated outcome is a data collection approach and flow related model that can be used to evaluate reservoir operations and make decisions regarding assimilative capacity through the river mouth for existing and potential future dischargers. Assimilative capacity should consider temperature, flow, and DO inputs from floodplain drainage.

Phase I - Task 2.B.1: Evaluate Adequacy of Existing Water Quality and Stream Flow Gauging Station Data

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Meet with NCDWQ, USGS, and other Subject Matter Specialists and use their input. Consider whether locations and lengths of record from existing stations are adequate or if additional data is needed.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 60% by NCDWQ and 40% USACE.

TIME: 10 days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,800

NC: \$4,800

VA: \$0

Phase I - Task 2.B.2: Prepare Scope for Collection of Water Quality Data as Needed

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Communicate with water quality experts by telephone and use the input provided by the Subject Matter Specialists to develop an accurate list of tasks and associated costs. Data collected needs to be in appropriate areas such as in critical habitat areas (spawning and nursery) in the entire river for anadromous fish and the data needs to be adequate for modeling to predict DO conditions in the river under various flow, temperature, and duration scenarios.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 50% by NCDWQ and 50% USACE.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 2.B.3: Prepare Scope for Development or Revision of Downstream Water Quality Models

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Meet with NCDWQ, USGS, and other Subject Matter Specialists to develop an accurate description of tasks and estimated associated costs. Assure that model can be linked to reservoir operations model.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 60% by NCDWQ, 40% USACE.

TIME: 50 days

ESTIMATED PROJECT COST: \$40,000

SPONSORS' IN-KIND WORK: \$24,000

NC: \$24,000

VA \$0

Phase 1 - Task 2 C: Evaluate the water quality of the release from the John H. Kerr Dam impoundment through the Roanoke Rapids tailrace.

The turbines at John H. Kerr Dam have recently been modified to improve dissolved oxygen (DO) concentrations in the water released from the powerhouse. Also, the replacement of the six main turbines will begin in the summer of 2004, and at least 3 of the 6 will be aspirating turbines. This is an attempt to address long-standing concerns about water quality standards and aquatic biota in Lake Gaston downstream of the discharge. A DO gage was installed by USGS in early December 2003 to assess if additional measures will be needed to meet water quality goals. Real-time data from this gage is available at the following web site:

http://waterdata.usgs.gov/va/nwis/uv?dd_cd=08&format=gif&period=7&site_no=02079500

An additional concern is the impact the peaking operations (rapid fluctuations in discharge) at John H. Kerr and the water quality in the tailrace have on the downstream water quality through the Roanoke Rapids tailrace.

Phase I - Task 2.C.1: Evaluate Adequacy of Existing Water Quality Data and Prepare Recommendations for Further Data Collection as Needed

TEAM PRIORITY RATING: This task is rated as a number three priority by the members of the team.

METHODS: Collect and review existing water quality data, potential sources include the Subject Matter Specialists. Consult with Sponsors, and these specialists to determine data requirements and decide what data will be needed to answer the questions that will lead to an adequate description and discussion of water quality issues in the Feasibility Report.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 60% by NCDWQ and 40% USACE.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,800

NC: \$4,800

VA: \$0

Phase I - Task 2.C.2: Prepare Scope for Collection of Water Quality Data as Needed

TEAM PRIORITY RATING: This task is rated as a number three priority by the members of the team.

METHODS: Develop Monitoring Plan Scope of Work with input from the Subject Matter Specialists.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 50% by NCDWQ and 50% USACE.

TIME: 10 days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

NC: \$4,000

VA: \$0

Phase I - Task 2.C.3: Prepare Scope for Development of Water Quality Models related Reservoir releases

TEAM PRIORITY RATING: This task is rated as a number three priority by the members of the team.

METHODS: To accomplish this task, modeling of the releases would be required. This would require not only release data, but also data from the impoundments from John H. Kerr Reservoir through Roanoke Rapids tailrace. Communicate with hydrological modelers by telephone and use the input provided by the Subject Matter Specialists to develop an accurate description of tasks and estimated associated costs

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 60% by NCDWQ and 40% USACE.

TIME: 50 days

ESTIMATED PROJECT COST: \$40,000

SPONSORS' IN-KIND WORK: \$24,000

NC: \$24,000

VA: \$0

Phase I - 2 Total Cost: \$168,000
Sponsors' In-kind Work: \$98,400

Phase I - Task 3. Sedimentation and Channel Morphology

Task Funding Priority: This Task is assigned a funding priority of **LOW**.

Phase I - Task 3 A. How does the managed flow regime affect the channel morphology of the main river channel and the tributaries?

The past, present, and future behavior of the Roanoke River will be investigated using tools in the following disciplines: hydrology, sedimentation, channel geometry, and water management operations. Data necessary to determine river trends (qualification and quantification, both spatial and temporal) and associated impacts in the Roanoke River Basin will be identified. The study area will include the Roanoke River below the Fall Line and dams downstream to just below Williamston, NC; other sites for possible study as Reference Rivers are the lower Tar and Meherrin Rivers. The period of time required for these investigations will depend largely on the availability and interpretation of existing data and securing the services of specific experts. The goal of this task group is to determine the rates of bank erosion (retreat), the volume of sediment deposition on the floodplain and to determine whether increases in erosion and deposition can be linked to dam operations associated with, the flood control project.

Flow release schedules by dam operations are not compatible for the maintenance of stable bed and banks of the river (dynamic equilibrium). Equilibrated systems transport and store sediment such that the regime fluvial geomorphic form of the river is maintained. The erosion, entrainment, transport and deposition of sediment will be studied. Frequent and prolonged growing season floods may cause erosion of and/or suppression of vegetation on the banks eliminating forage and cover for fish and other aquatic organisms when the banks are partially or wholly inundated. Lack of bank vegetation may result in decreased bank stability and increased erosion. Bank erosion may also provide for an increase in suspended sediment load giving rise to water quality concerns, lead to increased over bank deposition downstream (levees and floodplains), and aggradations of the channel. Existing bottomland hardwood (and cypress-tupelo) plant communities are negatively impacted by increased sediment deposition.

Phase I - Task 3 A 1 - 3 B 4: Subject Matter Specialists

- ❑ US Geological Survey (USGS)
 - Reston, Virginia
 - Raleigh, North Carolina
 - Baltimore, Maryland
- ❑ Roanoke River National Wildlife Refuge (RRNWR)
- ❑ US Army Corps of Engineers, Wilmington District (USACE)
- ❑ NC Division of Water Quality (NCDWQ)
- ❑ Dominion Inc.
- ❑ Riverine Geomorphologists, Sedimentation Expert (as needed)

Phase I - Task 3.A.1: Establish a database on available information regarding hydrology channel morphology, sedimentation dynamics and water management operations and evaluate its adequacy.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Contact Sponsors and other appropriate parties to develop an inventory of available data by type, including: hydrologic, channel geometric, hydraulic, sediment, land use, and bank erosion. Data will be consolidated and evaluated for its usefulness in the John H. Kerr Dam and Reservoir Section 216 study. Contact USGS-National Center Research District Offices (in Raleigh and Baltimore), USACE, and NCDOT for existing data on channel morphology measurements, discharge, and stage data. Contact USFWS Roanoke River National Wildlife Refuge and Dominion Inc. for existing bank erosion data. Contact Phil Townsend (University of Maryland) for GIS database information.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by USACE.

TIME: 30 days

ESTIMATED PROJECT COST: \$20,000

SPONSORS' IN-KIND WORK: \$0

Phase I - Task 3.A.2: Prepare Scope(s) of work for collection of appropriate data to fill gaps required to determine impacts John H. Kerr Dam and Reservoir may have on Channel Morphology.

TEAM PRIORITY RATING: This task is rated as a number four priority by the members of the team.

METHODS: Consult with Sponsors and other appropriate parties and subject matter experts to determine data needs. Probable data needs and specific methods include: Development of a GIS map showing the area affected by John H. Kerr Dam and Reservoir, including the boundary of the study area, river reaches, and tributaries, problem areas, number and type of problems (increased channel width, abrupt increases in bed slope, reaches of low bed slope, cutoffs and changes in channel alignment), soil classification maps, and aerial photographs. Classifying historical trends of channel behavior within study area boundary, during the engineering time scale not geological time. Determination of historic rates of erosion and dam release flow regime and the collection of dendrogeomorphic (tree-ring) data. Determine current erosion rates using erosion pins and other methods. Determine appropriate reference reaches. Temporal analysis of geometric data and compare with reference streams. Inventory available data for the lower Roanoke River by type: hydrologic, channel geometric, hydraulic, sedimentary, land use and bank erosion from on going studies (contact USGS, Dominion Inc. and USFWS-RRNWR). Conduct retrospective analysis of other studies, as well as collecting, organizing and processing the existing prototype data including gage data, surveys, sediment concentrations and bed material gradation.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by USACE.

TIME: 15 days

ESTIMATED PROJECT COST: \$12,000

SPONSORS' IN-KIND WORK: \$0

Phase I - Task 3 B: How does the managed flow regime affect the movement of sediment in the main river channel, its tributaries, and throughout the floodplain?

Severe reduction in peak flows after the dams became operational has greatly reduced normal (coarse grained) levee deposition. Back swamp sedimentation has increased, slowly rendering the riparian floodplain areas more homogenous and compromising topographic diversity. Loss of topographic diversity will potentially lead to substantial loss of floodplain ecosystem diversity on the lower river. Bank erosion from prolonged low high flows and high low flows result in increased sedimentation, negatively impacting water quality and aquatic organisms.

Phase I - Task 3 B 1: Establish and evaluate a database on available information regarding sedimentation dynamics within the lower basin relative to hydrologic and water management operations.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Contact Sponsors and other appropriate parties to determine what sediment data is available evaluate data for adequacy, and identify data gaps required to understanding historical behavior of the river, trends in aggradations/degradation under the control of John H. Kerr Dam and Reservoir.

METHOD OF ACCOMPLISHMENT: This task was determined to be Phase II work.

TIME: 10 days

ESTIMATED PROJECT COST: \$0⁶

SPONSORS' IN-KIND WORK: \$0

⁶ *This task and costs will be included in the Phase II Scope of Work.*

Phase I - Task 3 B 2: Determine short-term bank erosion processes that may be linked to artificial prolongation of discharge surges and other artificial flow scenarios.

TEAM PRIORITY RATING: This task is rated was not rated by the members of the team.

METHODS: Consult subject matter specialists to determine the number and frequency of data collection efforts and the cost to collect and analyze the data. Determine feasibility of shear stress analyses with DOPPLER technology which gives velocity and bottom profile information along selected reaches during a few of the more extreme hydropower discharge hydrographs if sediment appropriate data are not available.

METHOD OF ACCOMPLISHMENT: This task was determined to be Phase II work.

TIME: 2 days

ESTIMATED PROJECT COST: \$0⁷

SPONSORS' IN-KIND WORK: \$0

⁷ *This task and costs will be included in the Phase II Scope of Work.*

Phase I - Task 3 B 3: Determine adequacy of sedimentation studies currently in progress on the lower Roanoke River in addressing the impacts the operations of John H. Kerr on sedimentation dynamics.

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Consult with Sponsors (specifically Phil Townsend and Cliff Hupp) and others as appropriate to discuss adequacy of current NSF project proposed results.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by USACE.

TIME: 2 days

ESTIMATED PROJECT COST: \$2,000

SPONSORS' IN-KIND WORK: \$0

Phase I - Task 3.B.4: Prepare Scope for the Development of a Model(s) that is able to predict and evaluate sediment transport under different flow regimes.

TEAM PRIORITY RATING: This task is rated as a number three priority by the members of the team.

METHODS: Consult with fluvial riverine geomorphologists, sedimentation experts and hydrologists and use the input provided by the Subject Matter Specialists to develop an accurate description of data and effort necessary to develop a model capable of sediment transport prediction under different flow regimes.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by USACE.

TIME: 5 days

ESTIMATED PROJECT COST: \$5,000

SPONSORS' IN-KIND WORK: \$0

Phase I - Task 3 Total Cost: \$39,000
Sponsors' In-kind Work: \$0

Phase I - Task 4. Reservoir Resources

Task Funding Priority: This Task is assigned a funding priority of **MEDIUM**.

Task 4 A. What Future Patterns of Shoreline Protection and Development on John H. Kerr Dam and Reservoir Would Best Serve the Needs of All Stakeholders? How Could That Protection and Development Best be assured?

The Master Plan for John H. Kerr Dam and Reservoir Section 216 was last revised in August 1980. A revision date has not been established for the Master Plan. Potential changes in project operations as a result of the John H. Kerr 216 Study may be inconsistent with the current Master Plan. There should be ongoing monitoring to determine whether proposed changes as a result of the John H. Kerr 216 Study necessitate changes to the Master Plan.

PHASE I - TASKS 4.A.1 – 4.B.4 Subject Matter Specialists:

- ❑ NC Department of Parks and Recreation (NCDPR)
- ❑ NC Wildlife Resources Commission (NCWRC)
- ❑ Regional Partnership of Local Government
- ❑ Roanoke River Basin Association (RRBA)
- ❑ Southeastern Power Administration (SEPA)
- ❑ US Army Corps of Engineers, Wilmington District (USACE)
- ❑ VA Department of Conservation & Recreation (VADCR)
- ❑ VA Department of Game and Inland Fisheries (VADGIF)

Phase I - Task 4.A.1: Review the August 1980 Master Plan Including all Appendices (e.g. Shoreline Management Plan) Developed for John H. Kerr Reservoir and Identify how Shoreline Erosion, Reservoir Fisheries and Wildlife Resources, Timber Resources, Recreational Use, Real Estate Values and the Local Economy are Likely to be Affected by the John H. Kerr 216 Study.

TEAM PRIORITY RATING: This task is rated as a number four priority by the members of the team.

METHODS: Review the 1980 John H. Kerr Dam and Reservoir Master Plan and summarize the issues within the Master Plan that are related to the resource elements listed above being studied in the John H. Kerr 216 Study. This process will help to ensure that the John H. Kerr 216 Study and updated Master Plan support each other. **Note:** During Phase 2 of the John H. Kerr 216 Study process, review the Master Plan and recommend revisions to the Master Plan to insure consistency between the operation guidelines and the Master Plan.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 75% by USACE and 25% by VADGIF⁸.

TIME: Planner: 4 days

ESTIMATED PROJECT COST: \$9,600

SPONSORS' IN-KIND WORK: \$2,400

NC: \$0

VA: \$2,400

⁸ Sponser may inlist the aid of local government to coplete this task.

Phase I - Task 4.A.2: Develop Scope of Work to Inventory Reservoir Shoreline Condition and Land Use Practices

TEAM PRIORITY RATING: This task is rated as a number five priority by the members of the team.

METHODS: Inventory available aerial photography for the study area and develop plan to accomplish ground truthing. The purpose is to ultimately identify areas where vegetation has been cleared and locate structures such as docks, piers and bulkheads. The task would also include delineation of the following: areas with existing and potential erosion problems, areas with high concentrations of shoreline structures, and areas with significant resources that may be vulnerable to clearing or other changes in land use. The data collected in this task would be linked to a GIS database. A cost estimate for collecting the base information using LIDAR would be developed by the team. Aerial photography (scale: 1 in. = 400 feet or less) would be needed to determine land use surrounding the reservoir. The cost of converting the LIDAR data to digital 2-foot contour maps would be developed.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 75% by USACE, 12.5% by VADGIF, and 12.5% by NCDWQ.

GIS Specialist: 1 week

ESTIMATED PROJECT COST: \$4,000

SPONSORS' IN-KIND WORK: \$1,000

NC: \$500

VA: \$500

Phase I - Task 4.A.3: Inventory and compare existing local government land use regulations on lands in close proximity to the reservoir.

TEAM PRIORITY RATING: This task is rated as a number nine priority by the members of the team.

METHODS: Review states laws and compare local government (Warren, Vance and Granville Counties in NC and Halifax, Charlotte and Mecklenburg Counties in Virginia) and town and cities comprehensive plans and land use regulations. Similarities and differences in plans and regulations should be identified as well as planned future patterns of development and resource protection.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 50% byVADGIF and 50% NCDWQ⁹.

TIME: Planner: 2 days

ESTIMATED PROJECT COST: \$1,600

SPONSORS' IN-KIND WORK: \$1,600

NC: \$800

VA \$800

⁹ Sponser may inlist the aid of local government to coplete this task.

Phase I - TASK 4.A.4: Develop a scope of work to identify current recreational facilities and use and determine current and future needs as well as the relationship between reservoir water management and recreational use..

TEAM PRIORITY RATING: This task is rated as a number three priority by the members of the team.

METHODS: Review existing public recreational facilities and available use data for the reservoir and determine its adequacy. This review should include bank fishing areas, boating access areas, day use areas, camping facilities, wildlife hunting areas, etc. Consult local governments, state and local agencies from North Carolina and Virginia, university professionals and non-governmental organizations involved in recreational planning and development.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 75% by VADGIF and 25% by NCDWQ.

TIME: VA and NC Recreational Planner: 1 week

ESTIMATED PROJECT COST: \$4,000

SPONSORS' IN-KIND WORK: \$4,000

NC: \$1,000

VA: \$3,000

Phase I - Task 4 B. How does Water Management in John H. Kerr Reservoir Affect Shoreline Erosion, Reservoir Fisheries and Wildlife Resources, Timber Resources, Recreational Use, Real Estate Values and the local economy?

Water levels in the reservoir have been identified as an important concern for reservoir fisheries and wildlife management, recreational use, stability of the lakeshore, timber resources, property values and the local economy. Improved understanding of the relationship between these variables and lake levels will allow them to be considered along with other factors in evaluating any potential changes in reservoir operations. The reservoir operations model will be an important link between inflow/outflow and water levels, which in turn affect reservoir resources.

Phase I - Task 4.B.1: Develop a Scope of Work to Evaluate the Relationship Between Reservoir Water Management and Lake Fisheries.

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Consult agencies from North Carolina and Virginia, university professionals and non-governmental organizations involved in fisheries management and research. Evaluate adequacy of existing species and community response models and identify data gaps. Consideration should be given as to how reservoir water management impacts entrainment and impingement of fish through the dam.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 100% by VADGIF.

TIME: Fisheries Biologist 1 weeks

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$8,000

NC: \$0

VA: \$8,000

Phase I - Task 4.B.2: Develop a Scope of Work to Evaluate the Relationship Between Reservoir Water Management and Real Estate Values.

TEAM PRIORITY RATING: This task is rated as a number eight priority by the members of the team.

METHODS: Consult local governments and real estate interests. Consider both the actual lake level, as well as the amount of variation.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 50% NCDWQ and 50% VADGIF ¹⁰.

TIME: Planner: 1 week

ESTIMATED PROJECT COST: \$4,000

SPONSORS' IN-KIND WORK: \$4,000

NC: \$2,000

VA: \$2,000

¹⁰ Sponser may inlist the aid of local government to coplete this task.

Phase I - Task 4.B.3: Develop a Scope of Work to Evaluate the Relationship Between Reservoir Water Management and Shoreline Erosion.

TEAM PRIORITY RATING: This task is rated as a number seven priority by the members of the team.

METHODS: Consult agencies from North Carolina and Virginia, university professionals, non-governmental organizations and USACE staff involved in shoreline erosion and stability.

METHOD OF ACCOMPLISHMENT: This task will be accomplished 75% by USACE, 12.5% by VADGIF, and 12.5% by NCDWQ.

TIME: Geomorphologist: 2 weeks

ESTIMATED PROJECT COST: \$10,000

SPONSORS' IN-KIND WORK: \$2,500

NC: \$1,250

VA: \$1,200

Phase I - Task 4.B.4: Develop a Scope of Work to Evaluate the Relationship Between Reservoir Water Management and Timber Resources on Project Lands.

TEAM PRIORITY RATING: This task is rated as a number ten priority by the members of the team.

METHODS: Consult agencies from North Carolina and Virginia, university professionals, non-governmental organizations and USACE staff involved in timber resources. Evaluate adequacy of existing species and community response models and identify data gaps.

METHOD OF ACCOMPLISHMENT: This task will be accomplished 75% by USACE, 12.5% by VADGIF, and 12.5% by NCDWQ.

TIME: Forester: 2 weeks

ESTIMATED PROJECT COST: \$10,000

SPONSORS' IN-KIND WORK: \$2,500

NC: \$1,250

VA: \$1,200

Phase I - Task 4.B.5: Develop a Scope of Work to Evaluate the Relationship Between Reservoir Water Management and Wildlife.

TEAM PRIORITY RATING: This task is rated as a number six priority by the members of the team.

METHODS: Consult agencies from North Carolina and Virginia, university professionals, non-governmental organizations and USACE staff involved in wildlife management and research. Evaluate adequacy of existing species and community response models and identify data gaps.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 100% by VADGIF.

TIME: Wildlife Biologist: 2 weeks

ESTIMATED PROJECT COST: \$10,000

SPONSORS' IN-KIND WORK: \$10,000

NC: \$0

VA: \$10,000

Phase I - Task 4 C. How does Hydropower Generation at John H. Kerr Reservoir, Lake Gaston and Roanoke Rapids Affect Shoreline Erosion, Timber Resources, Reservoir Fisheries and Wildlife, Recreational Use, Real Estate Values and the local economy at John H. Kerr Reservoir?

Hydropower generation has been identified as an important concern for reservoir fisheries and wildlife management, timber resources, recreational use, shoreline stability, property values and the local economy. Improved understanding of the relationship between these variables and power generation will allow them to be considered along with other factors in evaluating any potential changes in reservoir operations. The reservoir operations model will be an important link between inflow/outflow and water levels - that in turn affect reservoir resources.

Phase I - Task 4.C.1: Develop a Detailed Study Plan to Determine Impacts to Recreation, Lake Fisheries, and Shoreline Vulnerability With Various Scenarios of Hydropower Generation (considering economic and ecological standards).

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Consult agencies from North Carolina and Virginia involved in fisheries management and recreation, along with adjacent property owners' organizations and businesses involved in lake recreation. Review available models and assessment methodologies and develop a scope of work to assess effects of various hydropower generation schemes on reservoir recreation, fisheries and wildlife populations, timber resources, property values, the local economy, and shoreline stability.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 100% USACE¹¹.

TIME: Planner: 2 weeks Economist: 1 weeks

ESTIMATED PROJECT COST: \$12,000

SPONSORS' IN-KIND WORK: \$0

Phase I Task 4 Total Cost: \$73,200
Sponsors' In-kind Work: \$36,000

¹¹ This task may be completed by private industry under contract to USACE.

Phase I - Task 5. Downstream Flow Based Recreation

Task Funding Priority: This Task is assigned a funding priority of **MEDIUM**.

Phase I - Task 5 A. What impacts do releases from John H. Kerr Dam and Reservoir have on motorized and non-motorized boating, fishing, camping, and hunting in the areas on and along the Roanoke River in North Carolina, downstream of Roanoke Rapids? What impacts do releases have on nature-based recreation (including aesthetics, wildlife educational opportunities, nature photography and bird watching) in the river study area? Existing data will be reviewed, and new data collected, so that economic benefits of downstream river-related recreation can be evaluated. One product of the study will be a model to evaluate recreation use under different flow regimes.

PHASE I - TASKS 5 A 1 - 5 A 5 Subject Matter Specialists:

- ❑ NC Division of Water Resources (NCDWR)
- ❑ NC Wildlife Resources Commission (NCWRC)
- ❑ The Nature Conservancy (TNC)
- ❑ US Army Corps of Engineers, Wilmington District (USACE)
- ❑ VA Department of Conservation & Recreation (VADCR)
- ❑ Roanoke River Partners (RRP)
- ❑ Roanoke River National Wildlife Refuge (RRNWR)

Phase I - Task 5 A 1: Review and summarize existing data related to downstream recreational uses.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Study team will: (1) Compile a bibliography of information on recreational users of the lower Roanoke River that NCWRC has available; (2) develop a list of outfitters and describe the data available for platform and paddle trail users; (3) review and describe the NCWRC database of hunting permits for the lower Roanoke River, as well as the database of licenses issued for hunting and fishing guides; and (4) examine the NC Division of Parks and Recreation State Comprehensive Outdoor Recreation Plan (SCORP) to see if regional data exists for different types of use.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by NCWRC. This Task has been completed.

TIME: 3 days

ESTIMATED PROJECT COST: \$2,400

SPONSORS' IN-KIND WORK: \$2,400

NC: \$2,400

VA: \$0

Phase I - Task 5 A 2 TASK: Develop a Request for Proposals (RFP) to review and screen various approaches for analyzing the effect of different flow regimes on recreational use.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: The analysis will focus on fishing, hunting, camping, and nature observation as the best indicators of the effect of flow management alternatives on downstream recreation. This task will lead into a two-part effort under Phase 2 of the Project. The first part will be in response to this RFP and will produce a review of the various approaches. The approaches reviewed will include surveys of users, interviews with experts (guides, outfitters, NCWRC and USFWS staff), and analysis of carrying capacity at different flows (e.g. area of hunting land available at different flow levels). The study team will review this work product during Phase 2 and recommend a study approach for approval by the Executive Committee. After approval, an RFP will then be developed for the second part of the Phase 2 work – performing the analysis using the approach selected during step 1 of Phase 2.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by NCDWR. This task has been completed.

TIME: 2 days

ESTIMATED PROJECT COST: \$1,600

SPONSORS' IN-KIND WORK: \$1,600

NC: \$1,600

VA: \$0

Phase I - Task 5 A 3 TASK: Develop a Scope of Work for analyzing the effect of different flow regimes on downstream recreation using an approach based on geographic information.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: The study team will prepare a Scope of Work that uses information on access roads and recreational areas (hunting, camping, boat access) in a GIS format. This geographic information will be examined in the context of what areas are flooded under different flow regimes. An enhanced scope of work will expand the analysis to include a GIS-enhanced Delphi exercise with a group of experts – guides, outfitters, NCWRC enforcement officers, and National Wildlife Refuge staff.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by VADPR. This Task has been completed.

TIME: 2 days

ESTIMATED PROJECT COST: \$1,600

SPONSORS' IN-KIND WORK: \$1,600

NC: \$0

VA: \$1,600

Phase I - Task 5 A 4: Develop a scope of work to produce a processing tool / model that merges the hydrology / flood model with a qualifier and quantifier of recreational use for fishing, hunting, camping and nature-based recreation.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: The study team will prepare a Scope of Work to produce this model / processing tool during Phase 2 of the Project. The objective is to allow consistent, relatively simple evaluation of recreational impacts in conjunction with different hydrology simulations. This tool should be applicable to the efforts of the Integration Task group.

METHOD OF ACCOMPLISHMENT: This task will be completed 100% by USACE. This Task has been completed.

TIME: 2 days

ESTIMATED PROJECT COST: \$1,600

SPONSORS' IN-KIND WORK: \$0

Phase I - Task 5 A 5 One meeting of the study team will be needed to allow review and finalization of the RFP and Scopes of Work (one day, 2 federal and 3 state employees).

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHOD: Scope of Work will be reviewed at the final Team Meeting.

METHOD OF ACCOMPLISHMENT: This Task will be accomplished 40% USACE and 60% NCDWR.

ESTIMATED PROJECT COST: \$4,000

SPONSORS' IN-KIND WORK: \$2,400

NC: \$2,400

VA: \$0

Phase I - Task 5 Total Project Cost: \$11,200
Sponsors' In-Kind Work: \$8,000

Phase I - Task 6. Salt Wedge/ Salt Water Intrusion

Task Funding Priority: This Task is assigned a funding priority of **LOW**.

Phase I - Task 6 A. How is the location of the salt wedge in the lower river affected by different releases from the reservoir?

Existing data regarding the relationships among the releases from John H. Kerr Reservoir, Lake Gaston and Roanoke Rapids Hydropower Projects and the salt wedge dynamics in the Lower Roanoke River will be gathered and evaluated in the study. In addition, there are other weather related factors that have been found to have an influence in the salt wedge dynamics in the Lower Roanoke River. Weather data (winds, drought/drought operations, and hurricanes) will also be gathered and analyzed. The study will provide information about data, methods and tools to aid in making recommendations for further study of this subject, which will be considered at the first IPR.

The relationships among John H. Kerr Reservoir, Lake Gaston and Roanoke Rapids Hydropower Projects and the salt wedge dynamics in the Lower Roanoke River downstream may be influenced by both project operations and weather factors.

For the purposes of this Study, salt-water wedge will be considered when oceanic/marine seawater migrates from the Albemarle Sound into the Lower Roanoke River. Influences can be; (1) the lack of river flow (drought/drought operations) (2) directional winds-weather and (3) hurricanes.

The first, drought operations related, may cause salt-water intrusion due to the lower water release from Roanoke Rapids Dam. The lower water flow from the Roanoke Rapids Hydropower plant may be insufficient to impede the salt-water migration upstream.

The second, weather related, may cause more saline water from the Pamlico Sound into the waters of the Roanoke River. Southwesterly winds cause the more saline waters of the Pamlico Sound into the Albemarle Sound then inland up the Roanoke River. Also, Northwest wind tides (an effect similar to bathtub sloshing) in the Albemarle Sound may cause a movement of salt-water up the Roanoke River.

Lastly, are hurricanes, which are a natural weather phenomena which forces saltier Albemarle Sound water inland by the hurricane's storm surge. The hurricane's forward momentum preceding landfall produces an abnormally "higher tide" on the north side of the hurricane moving ashore/inland by the counter clockwise winds of the hurricane.

PHASE I - TASKS 6 A 1 – 6 B 3 Subject Matter Specialists:

- ❑ NC Division of Water Quality (NCDWQ)
- ❑ US Army Corps of Engineers, Wilmington District, (USACE)
- ❑ US Fish and Wildlife Service (USFWS)
- ❑ Weyerhaeuser Corporation

Phase I - Task 6.A.1 Evaluate the adequacy of existing river stage, storm surge, sea level rise, tidal, water quality, salt water wedge, and weather data.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Consult with Subject Matter Specialists and decide what data will be needed to answer the questions that will lead to an adequate description and discussion of salt-water intrusion issues in the Feasibility Report.

METHOD OF ACCOMPLISHMENT: This task will be completed 70% by USACE and 30% USGS ¹².

TIME: 16 person days.

ESTIMATED PROJECT COST: \$11,000

SPONSORS' IN-KIND WORK: \$

¹² This work will be accomplished using a Government Order issued to USGS.

Phase I - Task 6 A 2: Prepare recommendations for further data collection.

TEAM PRIORITY RATING: This task is rated as a number two priority by the members of the team.

METHODS: Consult with Subject Matter Specialists and decide what data will be needed to answer the questions that will lead to an adequate description and discussion of salt-water intrusion issues in the Feasibility Report.

METHOD OF ACCOMPLISHMENT: This task will be completed 50% by USACE and 50% USGS ¹³.

TIME: 10 person days.

ESTIMATED PROJECT COST: \$7,000

SPONSORS' IN-KIND WORK: \$0

¹³ This work will be accomplished using a Government Order issued to USGS.

Phase I - Task 6.A.3: Prepare scope for development or revision of models

TEAM PRIORITY RATING: This task is rated as a number three priority by the members of the team.

METHODS: Consult with Subject Matter Specialist and develop an accurate list of tasks and associated costs. Possible in kind service, in house model (inter-agency), or contracted model.

METHOD OF ACCOMPLISHMENT: This task will be completed 70% by USACE and 30% USGS ¹⁴.

TIME: 6 person days.

ESTIMATED PROJECT COST: \$4,000

SPONSORS' IN-KIND WORK: \$0

¹⁴ This work will be accomplished using a Government Order issued to USGS.

Phase I - Task 6 B. How Does the Salt Wedge Affect Water Quality, Wetlands, Aquatic Habitat and Fish Resources?

The salt wedge and its location can affect fishery resources. Most resident freshwater fish and other aquatic organisms are intolerant to salt water and may be displaced from preferred habitat by salt intrusion, spawning success may be reduced. Many freshwater marsh and wetland forest plants are also intolerant to salt may be damaged or killed by the presence of a salt wedge. It also can affect water quality - particularly in terms of dissolved oxygen concentrations at different depths in the water column. The presence of salt may be inconsistent with intended uses such as irrigation or commercial use.

PHASE I - TASK 6 B 1: Review the Existing Water Quality Data - Including Dissolved Oxygen and Salinity

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Consult Weyerhaeuser, NCDWQ, and USGS.

METHOD OF ACCOMPLISHMENT: This task was determined to be Phase II work.

TIME: 5 person days

ESTIMATED PROJECT COST: \$0¹⁵

SPONSORS' IN-KIND WORK: \$0

¹⁵ *This task and costs will be included in the Phase II Scope of Work.*

Phase I - Task 6 B 2: Review the Existing Fisheries Data in the Vicinity of the River Mouth and Salt Wedge, and Also Information Available in Scientific Literature.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Consult NCWRC, the Division of Marine Fisheries (NCDMF) and the National Marine Fisheries Service (NMFS).

METHOD OF ACCOMPLISHMENT: This task was determined to be Phase II work.

TIME: 15 person days

ESTIMATED PROJECT COST: \$0¹⁶

SPONSORS' IN-KIND WORK: \$0

¹⁶ *This task and costs will be included in the Phase II Scope of Work.*

Phase I - Task 6 B 3: Develop a Detailed Study Plan and Cost Estimate to Evaluate the Influence of the Salt Wedge on Water Quality, Wetlands, Aquatic Habitat, and Fish Resources.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Consult NCWRC, NCDMF, NMFS, Weyerhaeuser, USGS, and NCDWQ.

METHOD OF ACCOMPLISHMENT: This task was determined to be Phase II work.

TIME: 10 person days

ESTIMATED PROJECT COST: \$0¹⁷

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 6 Total Costs: \$42,000
Sponsors' In-Kind Work: \$21,000

¹⁷ *This task and costs will be included in the Phase II Scope of Work.*

Phase I - Task 7. Diadromous Fish and Downstream Aquatic Resources

Task Funding Priority: This Task is assigned a funding priority of **HIGH**.

Phase I - Task 7 A. How Does Alteration of the Downstream Flow Regime Affect Habitat for Aquatic Organisms in the Main River Channel and Tributaries?

During re-licensing of Dominion' Inc. hydroelectric projects, a habitat based instream flow study was conducted using the Instream Flow Incremental Methodology (IFIM). This has been invaluable in developing minimum flow recommendations, and to some degree in examining the impacts of peak releases for power generation. Additional study is needed to evaluate the potential effects of peaking power releases, and to gain more insight into target base flows – particularly for diadromous species.

PHASE I - TASKS 7 A 1 – 7 A 3 Subject Matter Specialists:

- ❑ Dominion Inc.
- ❑ National Marine Fisheries Service (NMFS)
- ❑ NC Division of Marine Fisheries (NCDMF)
- ❑ NC Division of Water Resources NCDWR)
- ❑ NC Wildlife Resources Commission (NCWRC)
- ❑ US Army Corps of Engineers, Wilmington District, (USACE)
- ❑ US Fish and Wildlife Service – South Atlantic Fisheries (USFWS-SAF)
- ❑ Virginia Department of Game and Inland Fisheries (VADGIF)

Phase I - Task 7 A 1: Review the Existing IFIM Study and Fishery Data Obtained During Re-licensing

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Review data provided by Dominion Inc. and consult with members of the Fisheries Technical Work Group formed during re-licensing as well as other Subject Matter Specialists.

METHOD OF ACCOMPLISHMENT: This task will be completed 20% by USACE, 40% by NCDWR and 40% NCWRC.

TIME: 10 days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$6,400

NC: \$6,400

VA: \$0

Phase I - Task 7 A 2: Develop a Detailed Study Plan, Scope of Work and Cost Estimate to Address Questions Related to Project Operations and Downstream Aquatic Biota.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team. This task was ranked slightly lower than the other tasks by the team.

METHODS: Consider approaches including: mesohabitat mapping and modeling; sampling for fish species dependent on shallow habitat areas; observations of fish behavior and movement; and comparisons with similar rivers not subject to peaking generation. Plans should allow for independent technical review of fish data and analysis as needed to put it in the broader context of the operation of John H. Kerr Dam and Reservoir and identify opportunities to partner with ongoing related studies. Results should provide an opportunity to contrast habitat availability at different points in a peaking cycle or describe fish response to high flows. Results should also lead to identifying relative population levels of species whose preferred habitat might be limited by high flows.

METHOD OF ACCOMPLISHMENT: This task will be completed 50% by USACE 50% by NCWRC.

TIME: 30 days

ESTIMATED PROJECT COST: \$24,000

SPONSORS' IN-KIND WORK: \$12,000

NC: \$12,000

VA: \$0

7 A 3 TASK: Develop a Detailed Study Plan to Evaluate Different Target Flows for Diadromous Fish Reproduction.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Consider approaches including: comparison of velocity profiles at selected locations over a range of flows; and monitoring of fish runs and spawning activity under different flow conditions. Results should describe effect of different flows on velocities throughout the water column, and, in turn, how this affects spawning behavior and egg viability.

METHOD OF ACCOMPLISHMENT: This task will be completed 50% by USACE, 25% by NCDWR, and 25% by NCWRC.

TIME: 24 days

ESTIMATED PROJECT COST: \$19,000

SPONSORS' IN-KIND WORK: \$9,500

NC: \$9,500

VA: \$0

Phase I - Task 7 B. *What affect does the operation of the dam have on diadromous fish?*

During re-licensing of Dominion's Inc. hydroelectric projects, state and Federal fishery agencies developed a draft restoration plan for diadromous fisheries in the Roanoke River. This plan will provide a valuable resource in the evaluation of dam affects on migratory aquatic species. However, additional study is needed to address uncertainties regarding affected species. Some of these uncertainties include: respective use of upstream habitats, the extent they use this habitat, access to this habitat, potential for successful restoration and the economic benefits of restoration. Additional studies should also determine what actions the Corps of Engineers should take to promote diadromous fish restoration in the Roanoke River and determine the feasibility of potential restoration alternatives.

Phase I - Task 7 B 1: Review the Existing Diadromous Fish Restoration Plan and Fishery Data related to diadromous fish.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Review data provided by Dominion Inc. and meet with members of the Fisheries Technical Work Group formed during re-licensing.

METHOD OF ACCOMPLISHMENT: This task will be completed 50% by USACE and 50% by NCWRC.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

NC: \$4,000

VA: \$0

Phase I - Task 7 B 2 TASK: Develop a Detailed Study Plan, Scope of Work and Cost Estimate to Address Questions Related to Habitat Restoration for Diadromous Fish.

TEAM PRIORITY RATING: This task is rated as a number one priority by the members of the team.

METHODS: Consider habitat mapping; fish sampling; observations of fish behavior and movement; and comparisons with similar unregulated rivers. Opportunities to partner with ongoing related studies should be identified. Case studies of fish restoration alternatives should be collected and reviewed. Topics shall be addressed with regard to diadromous fish populations, their status, and thorough assessment of potential fish passage designs applicable for restoration of diadromous species including American shad, river herring, American eel, and sturgeon. This Study Subject should include a preliminary economic analysis of the benefits of diadromous fish restoration including recreational and commercial harvest components focusing on the Roanoke-Albemarle system as well as other fisheries supporting diadromous species in the North Atlantic. NOAA Fisheries can assist with scoping the economic analysis and may provide some technical assistance.

METHOD OF ACCOMPLISHMENT: This task will be completed 50% by USACE and 50% by NCWRC.

TIME: 20 person days

ESTIMATED PROJECT COST: \$16,000

SPONSORS' IN-KIND WORK: \$8,000

NC: \$8,000

VA: \$0

Phase I - Task 7 Total Costs: \$75,000
Sponsors' In-Kind Work: \$39,900

Phase I - Task 8. Water Supply Use of Reservoir

Task Funding Priority: This Task is assigned a funding priority of **LOW**.

Phase I - Task 8 A. What are existing and potential future water supply withdrawals from the three impoundments?

Existing methods and tools for determining water supply will be identified and evaluated. Significant baseline water supply data is available for the study area. However, it is expected that additional water supply data may be required, and estimates of time and cost for this work are based on this.

The tasks under this item will link to methods and tools developed as part of previous items and/or result in the development of new tools using GIS technology. The Roanoke River Basin Reservoir Operations Model (RRBROM) (1.A.2) will be reviewed and analyzed to determine its effectiveness in supplying results needed to analyze future impacts.

Available data related to this subject will be summarized and catalogued, and recommendations for additional data collection will be prepared. Existing methods and tools for analysis and study of this subject will be prepared.

Existing data will be gathered regarding both water supply intakes located in the reservoir and downstream. Water supply discharge practices for John H. Kerr Dam under various flow conditions as well as changes in available water supply resulting from various operational constraints will be reviewed. These data will be evaluated for relevance and adequacy for the study of this subject. If gaps in the relevant data are identified, they will be evaluated for significance, and, if needed, recommendations for obtaining additional data will be developed.

PHASE I - TASKS 8 A 1 - 8 B 6: Subject Matter Specialists:

- ❑ City of Virginia Beach (CVB)
- ❑ Dominion Inc.
- ❑ NC Division of Water Resources (NCDWR)
- ❑ Roanoke River Basin Association (RRBA)
- ❑ Southeastern Power Administration (SEPA)
- ❑ US Army Corps of Engineers, Wilmington District (USACE)
- ❑ VA Department of Environmental Quality (VADEQ)

Phase I - Task 8 A 1: Evaluate Adequacy of Existing Water Supply Data and Prepare Recommendations for Further Data Collection as Needed.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Consult with Subject Matter Specialists and decide what data will be needed to answer the questions that will lead to an adequate description and discussion of water supply issues in the Feasibility Report. Determine cumulative data needs on basin for water supply from both surface and subsurface sources.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 8 A 2 TASK: Prepare Scope for Collection of Water Supply Data as Needed.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Communicate with water supply experts by telephone and use the input provided by the review committee to develop an accurate list of tasks and associated costs.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 3 person days

ESTIMATED PROJECT COST: \$3,000

SPONSORS' IN-KIND WORK: \$1,500

Phase I - Task 8 A 3: Prepare Scope for Development or Revision of Water Supply Models related to future withdrawals.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Communicate with hydrological modelers by telephone and use the input provided by the review committee to develop an accurate list of tasks and associated costs.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days.

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 8 A 4: Review/Analyze RRBROM for adequacy to provide desired Water Supply impacts and make recommendation for its use/revision or development of a new tool.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Employ existing data set and evaluate results.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 45 person days

ESTIMATED PROJECT COST: \$36,000

SPONSORS' IN-KIND WORK: \$18,000

Phase I - Task 8 B: What percentage of the water is consumptive, and how will this affect lake levels and downstream flows?

This section of the Water Supply study item will focus on a review of all related water supply plans, projections and inter-basin transfers (IBT) of water supply as well as consumptive impacts. Existing water supply locations will be examined for capacity, expansion connects ability to other systems and water supply experts within municipal, industrial and governmental arenas will be consulted. The anticipated outcome is a real time data collection/input approach and water supply related model that can be used to evaluate impacts on reservoir operations and make decisions regarding available capacity during critical drought periods.

Phase I - Task 8 B 1: Prepare Scope for Development of a new GIS Model or Revision of RRBROM for Water Supply Related to Consumptive Impacts and IBT.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Meet with municipal, industrial, governmental, and other experts along with the input provided by the review committee to develop an accurate list of tasks and associated costs. Assure that model can be linked to reservoir operations model.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 8 B 2: Evaluate Adequacy of Existing Data and Prepare Recommendations for Further Data Collection through consultation with various experts.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Consult with Subject Matter Specialists and decide what data will be needed to answer the questions that will lead to an adequate description and discussion of consumptive and IBT issues in the Feasibility Report. Determine cumulative data needs for basin.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 8 B 3: Prepare Scope for Collection of Consumptive and IBT Data as Needed.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Communicate with related experts by telephone and use the input provided by the review committee to develop an accurate list of tasks and associated costs.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 3 person days

ESTIMATED PROJECT COST: \$3,000

SPONSORS' IN-KIND WORK: \$1,500

Phase I - Task 8 B 4: Prepare Scope for Development or Revision of models to evaluate future critical periods on a real time basis.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Communicate with hydrological modelers and use the input provided by the review committee to develop an accurate list of tasks and associated costs.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$8,000

SPONSORS' IN-KIND WORK: \$4,000

Phase I - Task 8 Total Costs: \$82,000
Sponsors' In-Kind Work: \$41,000

Phase I - Task 9. Operating Policies and Administrative Procedures.

Task Funding Priority: This Task is assigned a funding priority of **HIGH**.

Phase I - Task 9 A. How are operations of the dam influenced by operating policies and procedures?

A key part of this study will entail describing the policies and administrative procedures that influence operational decisions at John H. Kerr Dam and Reservoir. This information will be described clearly and thoroughly so that it can be easily understood and interpreted by all stakeholders. Policies and procedures will also be defined in a manner that allows them to be incorporated in all relevant models used in other task items. In this way, potential changes in policies and procedures can be evaluated for their effects on the reservoir and downstream resources.

TASKS 9.1 – 9.3: Subject Matter Specialists:

- ❑ City of Virginia Beach (CVB)
- ❑ Dominion Inc.
- ❑ Hydro Logics, Inc. (HLI)
- ❑ NC Division of Water Resources (NCDWR)
- ❑ Southeastern Power Administration (SEPA)
- ❑ US Army Corps of Engineers , Wilmington District (USACE)
- ❑ VA Department of Environmental Quality (VADEQ)

Task 9.A.1: For Each of the Following Policies or Sources of Policy, Provide Details on Source(s) and Purpose(s). How Formulated? How Amended? How and When Renewed? What are the Terms and Conditions? How It Influences the Operation of John H. Kerr?

- ❑ SEPA contracts
- ❑ John H. Kerr guide curve and stage release policies
- ❑ USACE informal policies and procedures for adjusting to weather forecasts and other inputs
- ❑ Interactions with Philpott Lake operations
- ❑ All storage accounts and their management
- ❑ Spawning release strategies
- ❑ Water quality betterment strategies
- ❑ USACE Drought Management Plan and Policies
- ❑ Agreements between USACE and Dominion Inc.
- ❑ USACE water allocation policies
- ❑ Any other policies, procedures, or practices that influence the management of John H. Kerr Dam and Reservoir

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Literature review, agency coordination, and documentation.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 15 person days

ESTIMATED PROJECT COST: \$10,000

SPONSORS' IN-KIND WORK: \$5,000

Phase I - Task 9.A.2: Describe the Way These Policies are Formulated and Implemented. How Do They Interact? How are they Weighted? What are Their Cumulative and Net Effects?

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Literature review, agency coordination, and documentation. This policy framework is, in large part, implemented in the Roanoke River Basin Reservoir Operations Model (RRBROM). USACE will work with the entities responsible for maintaining the model to complete (as necessary) and, especially, to document the implementation of all relevant polices and administrative procedures. USACE will prepare a document explaining this policy framework in layman's terms, with input from SEPA and the private utilities. The policy framework will be transparent to anyone who reads the document.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 12 person days

ESTIMATED PROJECT COST: \$9,000

SPONSORS' IN-KIND WORK: \$4,500

Phase I - Task 9.A.3: Evaluate the Economic Relationships between the Various Parties Involved in the Generation and Transfer of Electricity.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Literature review, agency coordination, and documentation. Document the exchange of electricity and dollars over the last five years. Outline who buys how much at what cost, and then to whom it is sold and for what price.

METHOD OF ACCOMPLISHMENT: Method of accomplishment was not identified by the team for this task.

TIME: 10 person days

ESTIMATED PROJECT COST: \$7,000

SPONSORS' IN-KIND WORK: \$3,500

Phase I - Task 9 Total Costs: \$26,000
Sponsors' In-Kind Work: \$13,000

Phase I - Task 10. Modeling Oversight.

Task Funding Priority: Not applicable.

Phase I - Task 10.1.A: Why it is necessary to have a Modeling Oversight Team for this study?

Modeling is an integral part of the following resource specific study teams: (1) Downstream Flow Regime and Effects on Riparian Ecosystems; (2) Water Quality; (3) Sedimentation & Channel Morphology; (4) Downstream Flow Based Recreation; (5) Salt Wedge; (6) Diadromous Fish and Downstream Riverine Aquatic Resources; and (7) Water Supply. Since some level of modeling effort is required for seven of the nine resource specific teams it is recommended that a modeling team be established to oversee the modeling efforts. Specific modeling efforts should continue to be completed by the resource specific task group recommending the modeling effort. The purpose of the modeling team would be to assure that: (1) required resource specific modeling programs are compatible, (2) data collected is gathered in a manner which can be used for the modeling program; and (3) that duplication of modeling efforts is avoided. The modeling team should have at least one representative from each of the resource specific study teams. It is suggested that the Modeling Team have the individuals on the following list as members. Mr. Tony Young is proposed as the Team Leader for this team.

PHASE I - TASKS 10 1.A Subject Matter Specialists:

- NC Division of Water Quality (NCDWQ)
- NC Division of Water Resources (NCDWR)
- The Nature Conservancy (TNC)
- Unidentified Stakeholder (To be Determined)
- US Army Corps of Engineers, Wilmington District (USACE)
- Virginia Department of Environmental Quality (VADEQ)

Phase I - Task10.A.1: Evaluate Modeling and Data Requirements and Modeling Outputs for the (Resource Teams as Requested by Individual Team Leaders, Project Manager and Lead Planner.

TEAM PRIORITY RATING: This task was not rated by the members of the team.

METHODS: Meetings of the Modeling Oversight Team are required only to review modeling requirements and output from the various resource teams. Team Leaders of teams requiring review of modeling requirements and outputs will request a review through the Team Leader of the Modeling Oversight Team. Request for reviews will be provided concurrently to the Project Manager and the Lead Planner. Team meetings will be scheduled, as needed, by the Modeling Oversight Team, Team Leader. The Modeling Oversight Team will provide results of reviews concurrently to the Team Leader of the Team requesting the review, the Project Manager and the Lead Planner.

METHOD OF ACCOMPLISHMENT: This task will be accomplished by the by the following Team: Adugna Kebede, NCDWQ; (2) Jim Mead, NCDWR; Tom Francen, NCDWR; Joe Hassel, VADWQ; Sam Pearsall, TNC, Terry Brown, USACE, Tony Young, USACE and Stakeholder Representative (vacant). The Leader of the Modeling Oversight Team is

TIME: 10 person days

ESTIMATED PROJECT COST: \$0¹⁸

SPONSORS' IN-KIND WORK: \$0

Phase I Total Costs: \$495,000
Sponsors' In-Kind Work: \$227,760

¹⁸ The Modeling Oversight Team will not be funded seperately***They will be funded using funds program for the Resource Team requesting review.

Tasks and Costs for Phase II

Phase II - Task 1: Downstream Flow Regime and Effects on Riparian Ecosystem

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist *Taken from Phase I. Change as required.*

- Dominion Inc.
- The Nature Conservancy (TNC)
- NC Department of Environment and Natural Resources (NCDENR)
- Division of Water Resources (NCDWR)
- Division of Water Quality (NCDWQ)
- Natural Heritage Program (NCNHP)
- Roanoke River National Wildlife Refuge (RRNWR)
- US Fish and Wildlife Service (USFWS)
- US Army Corps of Engineers (USACE)
- International Paper (IP)
- US Geological Survey (USGS)

1. Background

A. The Wilmington District is conducting a Feasibility Study under Section 216 of the River and Harbor Flood Control Act of 1970 in order to review the operation of the John H. Kerr Dam and Reservoir. The Wilmington District will then issue a report on the advisability of modifying the structure or operation of the dam in order to meet current and projected needs and for improving the quality of the environment in the overall public interest.

B. A Modeling Oversight Team for the Kerr 216 study has recently been established to oversee modeling and data requirements and needed modeling outputs for the other resource specific study teams, including oversight of the flood model. The team leader is Tony Young, US Army Corps of Engineers (USACE), Wilmington District.

C. Having an acceptable flood mapping model is an integral part of the assigned tasks for the study teams. The Project Management Plan requires under task 1.A.2 that a flood model be identified, reviewed, and selected. The PMP further specifies that a digital elevation

model and associated flood depth mapping model developed by The Nature Conservancy (hereinafter, the “TNC flood model”) will be evaluated for use in the Section 216 study. The task 1 team is chaired by Jim Mead of NC Department of Environment and Natural Resources.

D. The TNC flood model requires the Roanoke River Basin Reservoir Operations Model (RRBROM) as a data-source on the front end, and it requires Arc GIS 9.n to generate flood depth maps as overlays on other geographic data sets. The contractor will be required to provide his own, licensed copy of Arc GIS 9.n and will be provided with copies of the RRBROM and the TNC flood model. The former will be licensed to the contractor for use exclusively in the Roanoke River Basin, and the latter is in the public domain.

E. In addition, the contractor will be provided with a current copy of the Section 216 Project Management Plan and with contact information for all the parties mentioned in this scope of work.

2. Tasks and Deliverables (written for an outside contractor – would have to be modified for in-house USACE or DENR application)

A. The contractor is not required to evaluate the outputs of the RRBROM, since that has been accomplished under a different scope of work. The contractor will be trained in the use of the RRBROM by Brian McCrodden of HydroLogics, Inc. which developed the RRBROM. Mr. McCrodden will provide technical support for the contractor’s use of the RRBROM as needed.

B. The contractor will evaluate the digital elevation model (DEM) that is part of the TNC flood model. The contractor will consult with Phil Townsend of University of Maryland who developed the DEM. The contractor may choose to spot-check a statistically robust sample of elevations using GPS in the field or, with Jim Mead’s concurrence, to utilize some other less labor intensive strategy for validating the DEM.

C. The contractor will evaluate and comment on the regressions utilized for converting flows at the tail race of Roanoke Rapids Dam to river stages at various points downstream. The contractor will consult with Brian McCrodden of HydroLogics, Inc. which developed those equations.

D. The contractor will evaluate and comment on the regressions utilized for converting flood stages in the river at downstream points to flood depths in the floodplain. The contractor will consult with Phil Townsend who developed those equations.

E. The contractor will evaluate and comment on the GIS strategies used for converting flood depths in the floodplain to maps of flood depths in GIS format. The contractor will consult with Bruce Stauffer of ATS, Inc. which developed those strategies and the final Arc GIS version of the TNC flood model.

F. The contractor will consult with Tony Young, Jim Mead, and Sam Pearsall (The Nature Conservancy). These consultations will be aimed at confirming that the model is capable of meeting the flood modeling needs of the Section 216 Study.

G. The contractor will provide Jim Mead and Tony Young with a written, summary report covering the results of these consultations and evaluations along with recommendations for upgrading the TNC flood model as necessary and appropriate, or alternatively, with recommendations for replacing the model with another that will better meet the purposes of the Section 216 Study. The contractor's conclusions will specifically address the validity of the DEM, the logic and logical consistency of the conversion algorithms and model strategies, and the utility of the product for the purposes of Task 1 of the Section 216 Study.

3. Point of Contact

The point of contact for this contract is:

Jim Mead
NC Division of Water Resources – DENR
1611 Mail Service Center
Raleigh, NC 27699-1611
919/715-5428
FAX 919/733-3558

John H. Kerr 216 Study
Downstream Riparian Ecosystem Task Group
Developing Baseline Information To Evaluate Impacts of
Downstream Flooding on Agriculture, Timber Operations, and Road Access
Task 1.B Phase II Scope of Work

BACKGROUND

Flood control is the original and primary authorized purpose of J.H. Kerr Reservoir, and this flood control storage has significantly modified downstream hydrology. While downstream flood damages and hazards have been reduced, concerns have been raised about the adverse impacts of extended growing season floods on the downstream riparian ecosystem. These concerns are a major reason behind the Feasibility Study being conducted by the Wilmington District of the US Army Corps of Engineers (USACE) under Section 216 of the River and Harbor Flood Control Act of 1970 in order to review the operation of the John H. Kerr Dam and Reservoir.

Flood control has the highest priority in determining flows downstream of Roanoke Rapids during high inflow periods at Kerr Reservoir. The 216 study will need to determine if the current flood damage curves and operating procedures during high inflows need to be updated in light of new information about downstream flood impacts and updated land use data. Any changes to flood control operations that might be proposed to benefit downstream ecosystems will need to be evaluated to determine the extent of flood control benefits under the proposed changes.

TASKS AND OUTPUT PRODUCTS

MAPPING

All maps produced by the contractor must be in digital format using Arc Info version 9.n. The contractor will produce GIS layer maps for the following nine parameters:

1. Land Ownership – obtain the most current digital information compiled by the Nature Conservancy (TNC) and consult with TNC to determine if additional updates are needed.
2. Agricultural Land Use – consult with TNC, the Natural Resource Conservation Service (NRCS), and large agricultural operations.
3. Silviculture Land Use – consult with TNC, International Paper (IP), and the NC Division of Forest Resources. This layer will be limited to forested lands whose primary management focus is timber production.

4. Forested Lands Managed for Conservation Purposes – consult with TNC, IP, the NC Wildlife Resources Commission (NCWRC), and the US Fish and Wildlife Service (USFWS). The lands identified in this layer may be used for timber production, but conservation purposes play a large role in land management.
5. Structures – based on land use and tax maps

Roads and Bridges – subdivided into four types:

6. Publicly maintained – consult NCDOT mapping information
7. Forestry Operations – consult IP
8. Agriculture – consult NRCS and major agriculture operations
9. Hunting Access – consult NCWRC, USFWS, and the Roanoke Tar River Gun Club. This layer may include roads also included in the agriculture or forestry operations maps that are key for hunting access.

The contractor will consult with TNC, USFWS, NCWRC, NRCS, IP, the Roanoke Tar River Gun Club, and major agricultural operations to determine if updates or data gaps need to be addressed in creating the digital maps, and to identify important access roads for forestry, agriculture or hunting. If necessary, GIS information may be collected in the field, including information about road grade elevations.

The output products for the mapping tasks will include:

- A report documenting the sources of information used in assembling geographic information.
- Digital (Arc Info version 9.n) and hard copy maps showing the baseline information for each of the nine parameters separately.
- The same nine maps, overlaid with the maps showing the extent of inundation under different flood scenarios (produced by the flood model). At least two flood scenarios will be used: a.) five day release at 20,000 cfs; and b.) three day release at 35,000 cfs.
- A report summarizing the acreage, roads, and structures affected by the flood scenarios, and a comparison of scenarios.

Baseline Information for Flood Damage Assessment

This task may be performed by a separate contractor or sub-contractor, but will require familiarity with and ability to use the information produced in the mapping task.

The contractor will consult with the Wilmington District, USACE and prepare a report describing the flood damage and hazard assessment information on which the current flood control operation is based.

The contractor will consult with TNC, NRCS, IP, and major agricultural interests to prepare a report on flood impacts on timber and crop production. During the consultation process, the land use GIS map layers and flood model will be used in an interactive manner to assess the effects of different flood scenarios. This assessment will reflect the season, duration and magnitude of flooding. Impacts will include both access/operations and effects on crop or timber loss.

The contractor will consult with TNC, NCWRC, USFWS, and the Roanoke Tar River Gun Club to prepare a report on flood impacts on hunting and other recreational uses. This evaluation of impacts will consider both impaired access and flooded lands, and also estimate the number of users affected per day on a seasonal basis.

The contractor will summarize the roads and structures affected by flood events from 20,000 cfs to 50,000 cfs in 5,000 cfs increments.

The contractor will prepare a report summarizing any differences between the flood damage and hazard assessment information currently used by the USACE and the updated information on land use, ownership, and potential flood damages and hazards.

John H. Kerr 216 Study
Downstream Riparian Ecosystem Task Group
Comprehensive Vegetation Map
Task 1.C.1 Phase II Scope of Work

A vegetation and land-cover map for the Roanoke River Basin below Roanoke Rapids Dam was developed in 1997 from imagery and field data collected in 1993-1995:

Townsend, P. A. and S. J. Walsh. 1997. Landcover classification and flood inundation models of the lower Roanoke River basin through remote sensing and GIS. Component report from The Roanoke River Bioreserve: A preliminary assessment of flow modifications on hydrology, geomorphological processes, and vegetation. The Nature Conservancy North Carolina Chapter, Durham NC.

The contractor will be provided with an Arc-Info version of the 1997 map in digital form and copies of the associated vegetation sampling data. The contractor will develop an updated version of the map using appropriate current, remotely-sensed data supplemented by one field season (2005) of intensive ground sampling and verification. Data from the 2004 NC vegetation Pulse samples may also be made available to the contractor, in which case they should also be used for ground-truth. The revised vegetation map will be developed at the same horizontal resolution (25 meter grid) and using the same classification¹⁹ as the 1997 map. The contractor will provide the resulting map in Arc-Info 9.n format.

The contractor will provide Arc-Info data sets and maps of vegetation and land-use change between 1997 and the present to quantify and map: a) any change from one class to another (two classes – changed and not changed); b) any change from forest to non-forest and from non-forest to forest classes; and c) all detected class-to-class changes comprehensively.

The contractor will provide a detailed account of the work done to develop the data and the final products. The contractor will fully characterize the resulting data and provide a written report with maps and tables summarizing the project and illustrating the maps developed.

¹⁹ The classification can be finer than that developed in 1997. However, it must be possible to aggregate the new classes into the 1997 classes. In other words, the 1997 classes can be split into subclasses where it is appropriate and possible.

Data standards and meta-data requirements

The contractor will report all processing and evaluation steps undertaken. The report should document error levels associated with the analyses, including geo-registration and attribute/interpretation errors. In particular, the contractor will provide a detailed statistical analysis of the sources of error and uncertainty in the resulting maps and change analyses. All data should be provided in a standardized format with standardized map projections and a metadata documented in a common format (e.g., FGDC standards). Field data should also be provided in a standardized (spreadsheet format), with complete documentation, geo-coordinates, and biological information following established standards and nomenclature.

John H. Kerr 216 Study
Downstream Riparian Ecosystem Task Group
Bottomland Hardwood Productivity Study
Task 1.C.2 Phase II Scope of Work

This scope of work is limited to the bottomland hardwood forests found downstream of Roanoke Rapids dam. The purpose of the study is to determine the influence of John H. Kerr Reservoir operations on the incremental growth of mature bottomland hardwood trees in the canopy.

1. Identify areas and forest types throughout the floodplain that may be impacted by USACE flood control operations.
 - a) Use the existing GIS-based flood model and digital elevation map, cross-referenced to the GIS vegetation layer database already developed by Townsend, to identify bottomland hardwood forest stands and topographic areas that are subject to inundation.
 - b) For each area identified in 1a, use the flood model and the digital elevation map to model years when flooding did and did not occur during the growing season for each bottomland hardwood stand.
2. Investigate the relationship between tree growth and the downstream flooding regime.
 - a) Examine existing tree core specimens to determine coverage of the topographic areas and forest types identified in part 1.
 - b) Extract additional core samples from mature trees (trees present before the reservoir began operation in 1950) as needed to represent the different topographic areas and forest stands identified in part 1 above. Species to be examined will include *Quercus* spp., *Carya* spp. and *Ulmus* spp. Additional species may be considered depending on readability of growth rings. In planning any additional collection of tree core samples, the contractor will ensure that there are adequate numbers and geographic coverage of samples to allow the effects of flooding to be isolated from other factors such as climatic events, insect infestations, etc.
 - c) Conduct a dendrochronological analysis on suitable extracted cores stratified across the different areas identified in part 1. The contractor will consider other factors that can affect tree growth and discuss any major historic events that might influence growth patterns in the sampling areas. The analysis will be conducted to isolate the effects of flooding alone on tree growth and to investigate whether growth patterns have been altered by the operation of J.H. Kerr reservoir. Growth will be compared before and after the reservoir began regulating downstream flows, and also between years with and without prolonged growing season floods.

3. Investigate the relationship between flooding and historic seedling recruitment
 - a) Examine existing tree core specimens to determine coverage of the topographic areas and forest types identified in part 1.
 - b) Extract additional core samples from younger trees (trees established after the reservoir began operation in 1950) as needed to represent the different topographic areas and forest stands identified in part 1 above. Species to be examined will include *Quercus* spp., *Carya* spp. and *Ulmus* spp. Additional species may be considered depending on readability of growth rings. In planning any additional collection of tree core samples, the contractor will ensure that there are adequate numbers and geographic coverage of samples to allow the effects of flooding to be isolated from other factors such as climatic events, insect infestations, etc.
 - c) Conduct an age distribution analysis on suitable extracted cores – from both older and younger trees - stratified across the different areas identified in part 1. The contractor will consider other factors that can affect seedling survival and discuss any major historic events that might influence seedling recruitment in the sampling areas. The analysis will be conducted to isolate the effects of flooding alone on seedling survival and to investigate whether recruitment has been altered by the operation of J.H. Kerr reservoir. Dendrochronological analysis will evaluate age distribution, by species, to identify periods when there are either gaps or surges in recruitment of tree seedlings. Age distribution will be compared before and after the reservoir began regulating downstream flows, and also between years with and without prolonged growing season floods.

4. Provide a report describing the methods employed for data collection and data analysis, the results, an analysis of statistical value and probable error, and conclusions. The complete data set, copies of all model runs, and any new maps employed should be attached. Any new tree cores collected and any equipment purchased should be delivered for archival purposes to a suitable party identified by the study review team

Phase II - Task 2: Water Quality

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist *Taken from Phase I. Change as required.*

- Dominion Inc.
- NC Division of Water Quality (NCDWQ)
- NC Wildlife Resources Commission (NCWRC)
- Roanoke River National Wildlife Refuge (RRNWF)
- US Army Corps of Engineers Wilmington District (USACE)
- US Fish and Wildlife Service (USFWS)
- US Geological Survey (USGS)
- VA Department of Game and Inland Fisheries (VADGIF)
- VA Department of Environmental Quality (VADEQ)
- The Nature Conservancy (TNC)
- Weyerhaeuser
- Other agencies as appropriate

Phase II - Task #.Alpha.#: (Individual Task Description. Repeat as necessary.)

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks. (Use this for now.)

METHODS: (Discussion of methods recommended to complete the task.)

METHOD OF ACCOMPLISHMENT: (Describe how team recommends task should be completed.)

TIME: (How much time in person days will task take.)

ESTIMATED PROJECT COST (provide estimated cost.)

SPONSORS' IN-KIND WORK: (Leave blank.)

Phase II - Task #.Alpha.#: (Repeat as necessary.)

Phase II - Task 3: Sedimentation and Channel Morphology

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist ***Taken from Phase I. Change as required.***

- ❑ US Geological Survey (USGS)
 - Reston, Virginia
 - Raleigh, North Carolina
 - Baltimore, Maryland
- ❑ Roanoke River National Wildlife Refuge (RRNWR)
- ❑ US Army Corps of Engineers, Wilmington District (USACE)
- ❑ NC Division of Water Quality (NCDWQ)
- ❑ Dominion Inc.
- ❑ Riverine Geomorphologists, Sedimentation Expert (as needed)

Sub-Task 3.A.1

Determine if the rate of erosion on the stretch of the Roanoke River between Weldon and downstream of Williamston to Devil's Gut is accelerated by the operations of J.H. Kerr Dam and/or the peaking operations of Dominion Power's Gaston and Roanoke Rapids hydro-power projects.

- a) Start by enhancing existing twenty-two transects established by Dominion Power and USFWS by:
 - *Evaluating each transects to ensure the toe and the top of the levee are being adequately monitored.*
 - *Measure the slope of the bank at each transects.*
 - *Take cross sectional measurements of the river channel at each transect.*
- b) Establish new erosion transects in association with the floodplain transects for the sediment transport study being conducted by Townsend, Hupp and Peet.
- c) If necessary, establish new transects in those reaches of the river where monitoring gaps exist in an effort to more adequately determine the impacts of flood control operations (no more than ten new sites are expected).
- d) Measure pins after high flow (flood control) and peaking events. This may be required 3-6 times per year depending on flow conditions.
- e) Determine erosion rates and incorporate applicable data into models and compare erosion rates with a reference stream (see section 3).

3.B.4.1. Prepare a detailed study work plan, which defines study objective and tasks.

3.B.4.2. Assemblies and Review of Existing Information. Focus on historical conditions before 1950, current conditions, and the intervening rate of change in response to the last 50 years of reservoir operation. Information should include, but not be limited to:

3.B.4.2.1 Hydraulic and Hydrologic Data

3.B.4.2.2 Geomorphologic Data for both river channel and adjacent flood plain

3.B.4.2.3 Reservoir Operational Characteristic

3.B.4.2.4 Water Quality-monitoring data with particular emphasis on, total suspended solids (TSS).

3.B.4.2.5 Information and documentation of relevant previous studies

3.B.4.3. Analyze Adequacy of Existing Information. This task will analyze existing information assembled in task 2 to determine if it is adequate to develop relationships between flow release operations and observed sedimentation problems in the lower river and extrapolate these relationships to develop flow management alternatives. The analyses could utilize statistical tools and simple channel stability concepts for example

3.B.4.3. Analyze Adequacy of Existing Information. This task will analyze existing information assembled in task 2 to determine if it is adequate to develop relationships between flow release operations and observed sedimentation problems in the lower river and extrapolate these relationships to develop flow management alternatives. The analyses could utilize statistical tools and simple channel stability concepts for example.

3.B.4.4. Design New Data Collection and Analysis Programs. If the analysis in task 3 determines that additional field data and more refined analysis such as hydrodynamic and sediment transport modeling is necessary, these programs will be designed in this task. A phased approach is suggested

3.B.4.4.1 Design Field Analysis to evaluate sediment stability

3.B.4.4.2 Preliminary design of field analyses to predict sediment transport.

3.B.4.5. Implementation of Phase 1 Field Investigations. Field Investigations could include

3.B.4.5.1 Hydrographic surveys of channel cross-sections and adjacent flood plain

3.B.4.5.2 Stage, Current meter and total suspended solids (TSS) sampling at fixed locations

3.B.4.5.3 Current meter and TSS profiling across river at various locations and times

3.B.4.5.4 Survey of channel bottom and bank characteristics at various locations along the lower river

Estimated Cost for Task 3.A.1 and Task 3.B.4.1-5

Task	Estimated Cost
3.A.1. Determine rate of erosion Weldon to Devil's Gut	60,000
3.B.4.1. Work Plan Development	3,000
3.B.4.2. Assembly Existing Information	6,000
3.B.4.3. Analysis of Existing Information	8,000
3.B.4.4. Design of Field Data Collection	8,000
3.B.4.5. Field Data Collection	75,000
Total Cost	161,000

Notes:

3.B.4.5. Field data collection cost represent cost for surveying approximately 60 river cross section and centerline profiles between cross sections, as well as 60 sediment grab samples and grain size analysis.

Phase II - Task 4: Reservoir Resources

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist ***Taken from Phase I. Change as required.***

- NC Department of Parks and Recreation (NCDPR)
- NC Wildlife Resources Commission (NCWRC)
- Regional Partnership of Local Government
- Roanoke River Basin Association (RRBA)
- Southeastern Power Administration (SEPA)
- US Army Corps of Engineers, Wilmington District (USACE)
- VA Department of Conservation & Recreation (VADCR)
- VA Department of Game and Inland Fisheries (VADGIF)

Phase II - Task #.Alpha.#: (Individual Task Description. Repeat as necessary.)

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks. (Use this for now.)

METHODS: (Discussion of methods recommended to complete the task.)

METHOD OF ACCOMPLISHMENT: (Describe how team recommends task should be completed.)

TIME: (How much time in person days will task take.)

ESTIMATED PROJECT COST (provide estimated cost.)

SPONSORS' IN-KIND WORK: (Leave blank.)

Phase II - Task #.Alpha.#: (Repeat as necessary.)

Phase II - Task 5: Downstream Flow Based Recreation

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase I - Task 5 A. What impacts do releases from John H. Kerr Dam and Reservoir have on motorized and non-motorized boating, fishing, camping, and hunting in the areas on and along the Roanoke River in North Carolina, downstream of Roanoke Rapids? What impacts do releases have on nature-based recreation (including aesthetics, wildlife educational opportunities, nature photography and bird watching) in the river study area? Existing data will be reviewed, and new data collected, so that economic benefits of downstream river-related recreation can be evaluated. One product of the study will be a model to evaluate recreation use under different flow regimes.

PHASE II - TASKS 5 A 1 - 5 A 5 Subject Matter Specialists:

- ❑ NC Division of Water Resources (NCDWR)
- ❑ NC Wildlife Resources Commission (NCWRC)
- ❑ The Nature Conservancy (TNC)
- ❑ US Army Corps of Engineers, Wilmington District (USACE)
- ❑ VA Department of Conservation & Recreation (VADCR)
- ❑ Roanoke River Partners (RRP)
- ❑ Roanoke River National Wildlife Refuge (RRNWR)

Phase II - Task 5.A.1: Review Studies Related to Recreation in the Lower Roanoke River. Bibliography Assembled by Kent Nelson, NCWRC, February 16, 2004.

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: Review, analyze and summarize the following reports:

Finke, J. R. and S. Van Horn. 1993. 1990 North Carolina Angler Opinion Survey. Federal Aid in Fish Restoration Project F-23-17. N.C. Wildlife Resources Commission, Division of Boating and Inland Fisheries, Raleigh. 55pp.

Reports the results of a 1990 mail survey sent to 5,832 randomly selected license holders to assess their opinions on angling and fishery management programs in North Carolina. A total of 3,251 anglers responded to the survey. Licensed anglers in the coastal region most often (54%) fished in warmwater streams and rivers; reflecting their use of the most accessible resource available. Forty-five percent of anglers fishing warmwater streams and rivers made over 20 trips per year. Freshwater anglers in the coastal region most often fished by boat (76%) or from the bank (23%). Anglers fishing warmwater streams and rivers preferred fishing by boat (70%) or from the bank (28%)

U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 2001 National Survey of Fishing, Hunting and Wildlife-Associated Recreation.

An interview-based survey which estimates participation and expenditures in hunting, fishing and other wildlife-related recreation in the U.S. by state.

Schuhmann, P. W. 1999. Economic valuation of Roanoke River striped bass recreational fishery. Federal Aid in Fish Restoration Project F-22. North Carolina Wildlife Resources Commission, Division of Inland Fisheries, Raleigh. 26pp.

The economic value of the 1996 spring striped bass fishery on the Roanoke River was estimated based on willingness to pay for marginal changes in expected catch rates. Data were derived from angler-completed questionnaires and a random utility model was used to value hypothetical changes in trip quality. The value of the 3-month striped bass fishery was estimated from \$796,500 to \$814,000. Reported expenditures were greater for catch-and-release anglers (\$115 per day) in comparison to harvest-oriented

anglers (\$22 per day). Study covered the length of the Roanoke River downstream from Roanoke Rapids dam.

Kornegay, J. W. 2000. Roanoke River sport fishery creel survey, 1997-1999. Federal Aid in Fish Restoration Project F-22. North Carolina Wildlife Resources Commission, Division of Inland Fisheries, Raleigh. 19 pp.

A non-uniform probability stratified access point creel survey was used to estimate sport fishing effort, total catch and harvest of striped bass and other species from the Roanoke River Striped Bass Management Area during each spring (typically mid-March to the end of May), 1997-1999. Other objectives were to estimate numbers of striped bass caught and released during the harvest seasons and to estimate numbers of striped bass caught and released after season closure. Total angling effort for striped bass and other species, principally largemouth bass and hickory shad, ranged from 118,990 angler-hours in 1997 to 136,646 angler hours in 1998. During the open striped bass seasons of 1997-1999, North Carolina residents of counties not bordering the Roanoke River accounted for 49-54% of all anglers. Out-of-state anglers accounted for only 2% of all anglers during the open harvest seasons, but their proportions increased to 4-10% during post-harvest periods. The increasing participation of non-local anglers on the Roanoke River likely reflects widespread publicity about the striped bass fishery.

Kornegay, J. W. and K. L. Nelson. 1997. Roanoke River sport fishery creel survey, 1994-1996. Federal Aid in Fish Restoration Project F-22. North Carolina Wildlife Resources Commission, Division of Inland Fisheries, Raleigh. 20 pp.

A non-uniform probability stratified access point creel survey was used to estimate sport fishing effort, total catch and harvest of striped bass and other species from the Roanoke River Striped Bass Management Area during each spring, 1994-1996. Other objectives were to estimate numbers of striped bass caught and released after season closure in 1995 and 1996 and to collect economic data for the Schuhmann (1999) study in 1996. Total estimated angling effort for striped bass and other species during the creel survey periods ranged from 52,289 angler-hours in 1994 to 144,954 angler-hours in 1996. During the 79-day study period in 1996, Roanoke River anglers spent \$212,298 fishing for striped bass, \$50,332 fishing for largemouth bass, and \$139,340 for other species. During the 3-year study, from 60-68% of the interviewed anglers resided in counties that bordered Roanoke River. The

proportion of anglers who were non-North Carolina residents ranged from 0.8-1.4%.

METHOD OF ACCOMPLISHMENT: A method of accomplishment has not yet been assigned to this task..

TIME:

ESTIMATED PROJECT COST: \$5,000

SPONSORS" IN-KIND WORK:

Phase II - Task 5.A.2: Geographic-based Evaluation of Flooding Impacts on Recreation Access and Immersion of Recreation Lands.

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: Identify access roads, boat ramps, and recreation lands for inclusion in the GIS database being developed by the Downstream Riparian Ecosystem Task Group

- ❑ Start with existing GIS “layers” for roads and digital elevation map
- ❑ Interview NC Wildlife Resources Commission enforcement officers, National Wildlife Refuge staff, commercial guides, and hunting club managers to identify important access and lands.
- ❑ As needed, recommend addition of roads to the existing GIS layer. This would be part of the effort overseen by the Downstream Riparian Ecosystem Task Group, and would entail GPS measurements and notations regarding road grade elevation with respect to topography.

Evaluate the effects of John H. Kerr Reservoir operation on access roads, boat ramps, and recreation lands.

- ❑ Quantify the acreage submerged.
- ❑ Quantify the acreage cut off from access.
- ❑ Identify ramps and sections of the river that become difficult or impossible to use.
- ❑ Repeat evaluation for existing operating procedures and potential alternatives.

Supplement the quantification of part 2 above through a Delphi exercise conducted with local experts.

- ❑ Convene a group of the same individuals consulted in part 1b above.
- ❑ Use computer projection equipment, the flood model developed by the Downstream Riparian Ecosystem Task Group, and the GIS database of roads, boat ramps and recreation lands described in part 1.
- ❑ Display the extent of flooding caused by various reservoir operation alternatives and obtain input on desirable and undesirable effects.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST: \$10,000

SPONSORS" IN-KIND WORK:

Phase II Task 5.A.3: Downstream Recreation Carrying Capacity

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: The study area is defined to be the Roanoke River from Roanoke Rapids, NC to its terminus in Albemarle Sound, NC. Indicator activities shall include the following: hunting, fishing, nature observation, and canoe trail use. Potential sources of data include hunting permits, boat trailer counts, and boat ramp parking capacity – all available from NCWRC. In addition, interviews with local experts and others (outfitters, camping platform users, etc.) may be needed to evaluate how many people elect not to engage in an activity under certain flow and flooding conditions – regardless of the level of physical constraint on the activity.

- Determine the existing recreational carrying capacity of the river - in user days - by activity type.
- Determine how changes in flow and flooding affect the recreational carrying capacity of the river, measured in user days.
- Determine the existing recreational carrying capacity of lands within the floodplain of the Roanoke River - in user days - by activity type.
- Determine how changes in flow and flooding affect the recreational carrying capacity, by activity type, of the lands within the floodplain as well as those lands that become inaccessible during high water events along the Roanoke River in the study area.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST: \$35,000

SPONSORS" IN-KIND WORK:

Phase II - Task 5.A.4: Determination of How Recreation User Days are Influenced by John H. Kerr Reservoir Operations

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: The scope is limited to the stream flows downstream of Dominion's Roanoke Rapids power station (see map ____). The impact of flows from John H. Kerr Reservoir through the Gaston and Roanoke Rapids power stations will be measured.

- ❑ Taking data and/or information resulting from the tasks 6.A.2 and 6.A.3 above, develop a data processing tool to quantify and summarize the impacts of the flow releases related to John H. Kerr Lake operations on various types of downstream flow-based recreation activities. Seasonal variation in impacts will also be considered. Indicator activities shall include the following: hunting, fishing, nature observation, and canoe trail use.
- ❑ A methodology will be included for measuring the benefits or costs, in user days, of different flow regimes from John H. Kerr Reservoir. Demand for recreation activities will be limited to the carrying capacity by:
 - access for boating (includes parking and ramps),
 - hunting permits issued according to each sites' acres, or
 - maximum capacity of canoe trails or the outfitters that serve them.
- ❑ This processing tool will be able to be linked to the flow and flood models developed in Task 1, so that the Integration Team can efficiently evaluate the effect of different flow scenarios on downstream recreation user days.
- ❑ For each recreation activity, the complete range of available flows will be considered, with a notation of the minimum, maximum, and optimum flow to calculate the beneficial recreation output. If access by trail or road is essential for the recreation activity, the flooding of trails or roads can be a constraint.
- ❑ If necessary, develop an instrument to forecast future demand or "willingness to pay" for the indicator activities. The instrument will be developed consistent with the Office of Management and Budget (OMB) guidelines and submitted to OMB for approval.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST: \$10,000

Phase II - Task 5 Total Costs: \$
Sponsors' In-Kind Work: \$

Phase II - Task 6: Salt Wedge

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist *Taken from Phase I. Change as required.*

- NC Division of Water Quality (NCDWQ)
- US Army Corps of Engineers, Wilmington District, (USACE)
- US Fish and Wildlife Service (USFWS)
- Weyerhaeuser Corporation

Phase II - Task #.Alpha.#: (Individual Task Description. Repeat as necessary.)

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks. (Use this for now.)

METHODS: (Discussion of methods recommended to complete the task.)

METHOD OF ACCOMPLISHMENT: (Describe how team recommends task should be completed.)

TIME: (How much time in person days will task take.)

ESTIMATED PROJECT COST (provide estimated cost.)

SPONSORS' IN-KIND WORK: (Leave blank.)

Phase II - Task #.Alpha.#: (Repeat as necessary.)

Phase II - Task 7 Diadromous Fish and Downstream Riverine Aquatic Resources

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist ***Taken from Phase I. Change as required.***

- Dominion Inc.
- National Marine Fisheries Service (NMFS)
- NC Division of Marine Fisheries (NCDMF)
- NC Division of Water Resources NCDWR)
- NC Wildlife Resources Commission (NCWRC)
- US Army Corps of Engineers, Wilmington District, (USACE)
- US Fish and Wildlife Service – South Atlantic Fisheries (USFWS-SAF)
- Virginia Department of Game and Inland Fisheries (VADGIF)

Phase II - Task #.Alpha.#: (Individual Task Description. Repeat as necessary.)

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks. (Use this for now.)

METHODS: (Discussion of methods recommended to complete the task.)

METHOD OF ACCOMPLISHMENT: (Describe how team recommends task should be completed.)

TIME: (How much time in person days will task take.)

ESTIMATED PROJECT COST (provide estimated cost.)

SPONSORS' IN-KIND WORK: (Leave blank.)

Phase II - Task #.Alpha.#: (Repeat as necessary.)

Phase II - Task 8: Water Supply

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist ***Taken from Phase I. Change as required.***

- City of Virginia Beach (CVB)
- Dominion Inc.
- NC Division of Water Resources (NCDWR)
- Roanoke River Basin Association (RRBA)
- Southeastern Power Administration (SEPA)
- US Army Corps of Engineers, Wilmington District (USACE)
- VA Department of Environmental Quality (VADEQ)

Phase II - Task #.Alpha.#: (Individual Task Description. Repeat as necessary.)

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks. (Use this for now.)

METHODS: (Discussion of methods recommended to complete the task.)

METHOD OF ACCOMPLISHMENT: (Describe how team recommends task should be completed.)

TIME: (How much time in person days will task take.)

ESTIMATED PROJECT COST (provide estimated cost.)

SPONSORS' IN-KIND WORK: (Leave blank.)

Phase II - Task #.Alpha.#: (Repeat as necessary.)

Phase II - Task 9. Operating Policies and Administrative Procedure

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task 9.A How are the operations of the dam influenced by operating policies and procedures?

The Flood Control Act of 1944 authorized John H. Kerr Dam and Reservoir for the multiple purposes of flood control, navigation, water supply, water quality enhancement, recreation, and hydroelectric generation. Power from the project is marketed by the Southeastern Power Administration as provided by federal law. In the subsequent sixty years, this statutory authorization has been implemented through operating policies and administrative procedures of the U.S. Army Corps of Engineers (USACE), Wilmington District. Today, the dam is operated under a water control plan, guide curve, contracts for hydroelectric generation and water supply, and other non-statutory requirements. It is operated in hydrologic coordination with the USACE, Wilmington District's Philpott Dam, located upstream, and Dominion Inc.'s Roanoke Rapids and Gaston Projects (Federal Energy Regulatory Commission (FERC) Number 2009), located just downstream.

As stated in the John H. Kerr Reservoir Section 216 Study Reconnaissance Report (March 2001), the Feasibility Study now being prepared will result in a recommendation whether the structure, operation, or storage allocation of the reservoir should be modified for the purpose of improving the overall public benefits of the project in the study area, which includes John H. Kerr Reservoir and the Roanoke River downstream to Albemarle Sound. This task will: (1) identify and describe each policy that guides project operation, storage allocations, and downstream releases including its legal authority and terms; (2) describe how the many policies are integrated in actual operational decisions, including the respective responsibilities of the USACE, Wilmington District and third parties for implementation; (3) describe the policies that allocate the revenues associated with such hydroelectric generation; (4) evaluate the scope of discretion available to the USACE, Wilmington District to change current operation or storage allocation for the stated purpose of the Feasibility Study; (5) describe the statutes, rules, and policies that direct the marketing of power from the project by the Southeastern Power Administration (SEPA) and how they interact with the authorities under which the USACE, Wilmington District operates the project; and (6) determine how much latitude is available for operational changes under each policy affecting the project and what procedure is necessary to change each policy.

This task will require compilation and review of relevant documents and interviews of appropriate employees and consultants of USACE, Wilmington District and third parties. The report will describe these policies in pragmatic terms. It may be organized by policy, project purpose, or in any other functional manner that the consultant and the John H. Kerr Section 216 Feasibility Operating Policies and Administrative Procedures Study Team determines will best assist the USACE, Wilmington District, study's sponsors, and other stakeholders to understand how alternative plans would change current policies for operation or storage allocation. In sum, the report will put the reader into the shoes of the actual operators, so that the procedures they follow, and the actual factors they consider for their operational decisions will be transparent.

Phase II - Task 9.A.1 - 9.A.4: Subject Matter Specialist

- ❑ City of Virginia Beach (CVB)
- ❑ Dominion Inc.
- ❑ Hydro Logics, Inc. (HLI)
- ❑ NC Division of Water Resources (NCDWR)
- ❑ Southeastern Power Administration (SEPA)
- ❑ US Army Corps of Engineers , Wilmington District (USACE)
- ❑ VA Department of Environmental Quality (VADEQ)

Phase II - Task 9.A.1: Identify each policy that guides the current operation of the reservoir and the storage allocation. Describe the origin (including any express legal authority history or administration, and specific terms, including any provision for amendment, termination, or expiration, of each policy.

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: Policy will be broadly defined to include any form of written document or unwritten practice or procedure that guides reservoir operation. Such policies include: (1) the 1944 authorization and the Chief of Engineers' report incorporated therein; (2) an other relevant acts of Congress, (3) the USACE's Engineering Regulations and Pamphlets; (4) the John H. Kerr Reservoir Water Control Plan; (5) any policy for coordination of John H. Kerr and Philpott; (6) any contract or other form of agreement with Dominion Inc. for operation of the John H. Kerr Powerhouse or for the benefit of the Roanoke Rapids and Gaston Project; (7) any contract or other form of agreement with the SEPA; (8) any contract or other form of agreement for storage or release of water for the purpose of water supply; (9) any form of agreement with North Carolina Department of Environment and Natural Resources (NCDENR), North Carolina Division of Water Quality (NCDWQ) or North Carolina Wildlife Resources Commission (NCWRC) for storage or release for downstream environmental quality; (10) any policy agreements or informal coordination with the Smith Mountain and Leesville projects; (11) the FERC License for the Dominion Inc.'s projects on the Roanoke River and the related settlement agreement; and (12) any other policies relevant to the operation of the John H. Kerr project.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST

SPONSORS' IN-KIND WORK:

Phase II - Task 9.A.2: Describe how the identified policies are integrated in the actual decisions for storage, allocation of storage, and release of water. Describe the extent to which the John H. Kerr Reservoir Water Control Plan, on its face (especially the guide curve and the release schedule), is consistent with such policies, and the extent to which they are written or otherwise extraneous to that plan.

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: Describe the relative priorities for water management by season or otherwise, for example under high and low inflow conditions, and the procedure for resolving any potential or actual conflict between project purposes. Describe whether and how the USACE, Wilmington District delegates or shares any responsibility for operation to Dominion Inc., SEPA, or any other third parties with which it has contractual or other relationships for such management. The final topic will include any storage accounts. For example, describe how the USACE, Wilmington District establishes the Weekly or Daily Declaration, and how Dominion Inc. implements such declaration these declarations are modified and implemented.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST

SPONSORS' IN-KIND WORK:

Phase II - Task 9.A.3: Describe the economic relationships between the USACE, Wilmington District, and Dominion Inc., SEPA, and any other third parties involved in power generation.

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: Document the payments among the parties since 1952. Identify retail customers of such generation services, by location and amount, over the same period. Define the relationship among the flows, hydraulic head, power generation, and power values at John H. Kerr so that alternative flow schedules can be financially evaluated. These relationships should be documented in suitable detail and format to be used in subsequent modeling. The analysis should include both wholesale and retail power rates and should include the effects of planned power generation upgrades at John H. Kerr.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST

SPONSORS' IN-KIND WORK:

Phase II - Task 9.A.4: For each type of change in operation or storage allocation as identified in paragraph 5(c) of the "Supplemental Sheet, Reconnaissance Report" (May 29, 2001), describe what change in current policies would be necessary for implementation of such change, and whether policies expressly permit or prohibit such change.

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks.

METHODS: Analyze whether the 1944 authorization, subsequent acts of Congress affecting the project as well as the general laws that apply to all of the USACE's civil works projects including it permit or prohibit such change in operation or storage allocation.

METHOD OF ACCOMPLISHMENT: This task should be undertaken by a private consultant.

TIME:

ESTIMATED PROJECT COST

SPONSORS' IN-KIND WORK:

Phase II - Task 9 Total Costs: \$
Sponsors' In-Kind Work: \$

Phase II - Task 10: Modeling Oversight

Task Funding Priority: A funding priority has not yet been established for Phase II tasks. (Use this for now.)

Phase II - Task #.Alpha Description of subject being studied. (Repeat as necessary to cover all subjects.)

Detailed description of subject and how the study relates to the 216 Study.

Phase II - Task #.Alpha.# - #.Alpha.#: Subject Matter Specialist *Taken from Phase I. Change as required.*

- NC Division of Water Quality (NCDWQ)
- NC Division of Water Resources (NCDWR)
- The Nature Conservancy (TNC)
- Unidentified Stakeholder (To be Determined)
- US Army Corps of Engineers, Wilmington District (USACE)
- Virginia Department of Environmental Quality (VADEQ)

Phase II - Task #.Alpha.#: (Individual Task Description. Repeat as necessary.)

TEAM PRIORITY RATING: Team priority ratings have not yet been identified for Phase II tasks. (Use this for now.)

METHODS: (Discussion of methods recommended to complete the task.)

METHOD OF ACCOMPLISHMENT: (Describe how team recommends task should be completed.)

TIME: (How much time in person days will task take.)

ESTIMATED PROJECT COST (provide estimated cost.)

SPONSORS' IN-KIND WORK: (Leave blank.)

Phase II - Task #.Alpha.#: (Repeat as necessary.)

TASKS AND COSTS FOR PHASE 3

Tasks and associated costs for Phase 3 will be determined during Phase 2 of the study.

The estimated cost for Phase 3 of the study is: \$800,000.

During Phase 3 it will be necessary to integrate study elements and consider overall alternatives. The PDT in consult with appropriate subject matter specialists will develop a process to formulate alternatives. The suggested approach is to make use of all of the interrelationships and feedback loops between the various components of the Roanoke system. A diagram illustrating the linkages between the different study elements is shown on the following page.

TOTAL STUDY COSTS

The total study costs at this time are estimated to be 3,000,000 dollars. Cost amounts may change throughout the various phases of this study.

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REFERENCES CITED

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ATTACHMENT 1
JOHN H. KERR DAM AND RESERVOIR SECTION 216 STUDY SCHEDULE

John H. Kerr Dam and Reservoir Section 216 Study Schedule

905(b) Report approved	May 2001
Sponsors' Advisory Committee formed	November 2001
PMP completed	January 2002
FCSA executed	June 2003
Technical work groups formed/Team leaders assigned	May 2004\
Work groups complete phase 1 scope of work (SOW)	March 2004
Begin phase 1 feasibility	April 2004
Work groups complete SOW for phase 2	October 2004
Work groups begin phase 2	December 2004
Work groups complete scope of work for phase 3	December 2005
Work groups begin phase 3	January 2006
Work groups complete phase 3	March 2007
Feasibility report and NEPA documents complete	June 2007
Feasibility report approved by Division	July 2007

**ATTACHMENT 2
EXECUTIVE COMMITTEE
AND PROJECT DELIVERY TEAM MEMBERS**

JOHN H. KERR 216 STUDY

EXECUTIVE COMMITTEE MEMBERS:

<u>NAME</u>	<u>ORGANIZATION</u>	<u>E-MAIL ADDRESS</u>	<u>PHONE</u>
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SPONSORS' ADVISORY COMMITTEE MEMBERS:

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JOHN H. KERR 216 STUDY

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Tony Young	USACE, Wilmington	michael.a.young@saw02.usace.army.mil	910-251-4455

²⁰ Deputy District Engineer for Programs and Project Management

JOHN H. KERR 216 STUDY

INTERESTED PERSONS

<u>NAME</u>	<u>ORGANIZATION</u>	<u>E-MAIL ADDRESS</u>	<u>PHONE</u>
Gene Adesso	Roanoke River Basin Association	gene@gaddesso.net	919-870-0833
Tom Augspurger	US Fish & Wildlife Service	tom_augspurger@fws.gov	919-856-4520 ext. 21
Jerad Bales	US Geological Survey	jdbales@usgs.gov	919-571-4048
Marc Bernstein	NC Attorney General's Office	mbern@mail.jus.state.nc.us	919-716-6956
Mike Canada	FWS/Roanoke River Natl Wildlife Refuge	mike_Canada@fws.gov	252-794-3808
Wayne Carter	Mecklenburg County	hwcarter@meckcom.net	804-476-3310
David Coburn	NC State Parks/Kerr Lake SRA	david.coburn@ncmail.net	252-438-7791
John Davy	VA Dept. of Conservation & Recreation	jdavy@dcr.state.va.us	804-786-1119
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Jack Hearne	Steele Creek Marina	marinajack@mindspring.com	252-213-1913
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Harvey Hill	FWS/Roanoke River Natl Wildlife Refuge	harvey_hill@fws.gov	252-794-3808
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Wilson Laney	US Fish & Wildlife Service	Wilson_laney@fws.gov	919-515-5019
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JOHN H. KERR 216 STUDY

INTERESTED PERSONS (con't)

<u>NAME</u>	<u>ORGANIZATION</u>	<u>E-MAIL ADDRESS</u>	<u>PHONE</u>
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Ron Sechler	National Marine Fisheries Service	ron.sechler@noaa.gov	252-728-5090
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John Sutherland	NC Division of Water Resources	john.Sutherland@ncmail.net	919-715-5446
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Cindy Tripp	Roanoke River Partners	director@roanokeriverpartners.org	252-794-2793
Scott Van Horn	NC Wildlife Resources Commission	scott.vanhorn@ncwildlife.org	919-528-9886
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Tom Wilcox	VA Dept of Game & Inland Fisheries	twilcox@dgif.state.va.us	804-367-8998
Nancy Wilson	Vance County Dept of Tourism	vctourism@gloryroad.net	252-438-2222

ATTACHMENT 3
WORK GROUPS

WORK GROUPS

Downstream Flow and Riparian

Ecosystem

Jim Mead, LEAD - NCDWR
Jeff Richter – USACE
John Hazelton – USACE
Jennifer Everett – NCDWQ
John Dorney – NCDWQ
Adugna Kebede – NCDWQ
Earl Gillis – NCWRC
Linda Pearsall (NCNHP)
John Ellis – USFWS
Jean Richter – FWS – ref
Harvey Hill –FWS – ref
Jerad Bales – USGS
Sam Pearsall – TNC
Bob Lindsay – RRBA
Bob Graham – Dominion
Masato Miwa – IP

Water Quality

Jennifer Everett, LEAD - NCDWQ
Frank Yelverton, LEAD – USACE
Jim Mead – NCDWR
Jim Mulligan – NCDWQ
Adugna Kebede – NCDWQ
Pete Kornegay – NCWRC
Wayne Jones – NCWRC
Joe Hassell – VADEQ
Bud LaRoche – VADGIF
Tom Augsburg – USFWS
Jean Richter – FWS – ref
Jerad Bales – USGS
Bill Bolin – Dominion
Martin Lebo – Weyerhaeuser

Diadromous Fish and

Downstream Riverine Aquatic Resources

Pete Kornegay, LEAD – NCWRC
Chuck Wilson, LEAD – USACE
Bill Bolin – Dominion
Pres Brownell – NMFS
Tom Fransen – NCDWR
Bob Graham – Dominion
Joe Hightower – USGS
Wilson Laney – USFWS
Bud LaRoche – VADGIF
Jim Mead – NCDWR
Kent Nelson – NCWRC
Dave Penrose – NCDWQ
Sara Winslow – NCDMF

Sedimentation & Channel

Morphology

Hasan Pourtaheri, LEAD - USACE
Greg Williams, LEAD – USACE
Jennifer Everett – NCDWQ
Adugna Kebede – NCDWQ
Jean Richter – FWS – ref
Cliff Hupp – USGS
Phil Townsend – TNC
Bill Bolin – Dominion

Reservoir Resources

Tom Fransen, LEAD - NCDWR
Bud LaRoche, LEAD - VADGIF
Dianne Edwardson – USACE
Frank Snipes – USACE
Wayne Jones – NCWRC
Scott VanHorn – NCWRC
Brian Strong – NCDPR
Leon App – VADCR
Bob Munson – VADCR
Carter Edge – SEPA
Gene Adesso – RRBA
Jack Hearne – Steel Crk Marina
Russel Slayton – RPLG
Jim Thorton – Dominion

Downstream Flow-based

Recreation

Jim Mead, LEAD – NCDWR
Dianne Edwardson – USACE
Frank Snipes – USACE
Kent Nelson – NCWRC
Leon App – VADCR
Bob Munson – VADCR
Jean Richter – FWS – ref
Harvey Hill –FWS - ref
Cindy Tripp – RR Partners
Jack Hearne – Steel Crk Marina
Jim Thorton – Dominion

Salt Wedge

John Hazelton, LEAD – USACE
Greg Williams, LEAD – USACE
Tom Fransen – NCDWR
Jennifer Everett – NCDWQ
Jim Mulligan – NCDWQ
Adugna Kebede – NCDWQ
Pete Kornegay – NCWRC
Jerad Bales – USGS
Jim Thorton – Dominion
Martin Lebo – Weyerhaeuser

Water Supply

Tom Fransen, LEAD -NCDWR
Terry Wagner, LEAD - VADEQ
Allen Piner – USACE
Tony Young – USACE
John Morris – NCDWR
Joe Hassell – VADEQ
Carter Edge – SEPA
Bob Lindsay – RRBA
Tom Leahy – VA Beach
Russell Slayton – RPLG
Jim Thorton – Dominion

Operating Policies and

Administrative Procedures

John Morris, LEAD – NCDWR
Joe Hassell, LEAD – VADEQ
Terry Brown – USACE
Diane Edwardson – USACE
Jim Mead – NCDWR
Tom Fransen – NCDWR
Pete Kornegay – NCWRC
Carter Edge – SEPA
Sam Pearsall – TNC
Richard Roos-Collins – TNC
Bob Lindsay – RRBA
Tom Leahy – VA Beach
Jerry Lovelace – RPLG
Jim Thorton – Dominion
Brian McCrodden – Hydrologics

Modeling Oversight

Tony Young, LEAD - USACE
Terry Brown - USACE
Tom Francen - NCDWR
Joe Hassell - VADWQ
Adugna Kebede - NCDWQ
Jim Mead - NCDWR
Sam Pearsall - TNC
Vacant - Stakeholder Representative

Team Leaders

Jennifer Everett, - NCDWQ
Tom Fransen, - NCDWR
Pete Kornegay, – NCWRC
Bud LaRoche, - VADGIF
Jim Mead, – NCDWR
John Hazelton, – USACE
John Morris, – NCDWR
Hasan Pourtaheri, - USACE
Terry Wagner, - VADEQ
Greg Williams, – USACE
Chuck Wilson, – USACE
Frank Yelverton, – USACE
Tony Young, - USACE

ATTACHMENT 4
THREE PHASE STUDY APPROACH

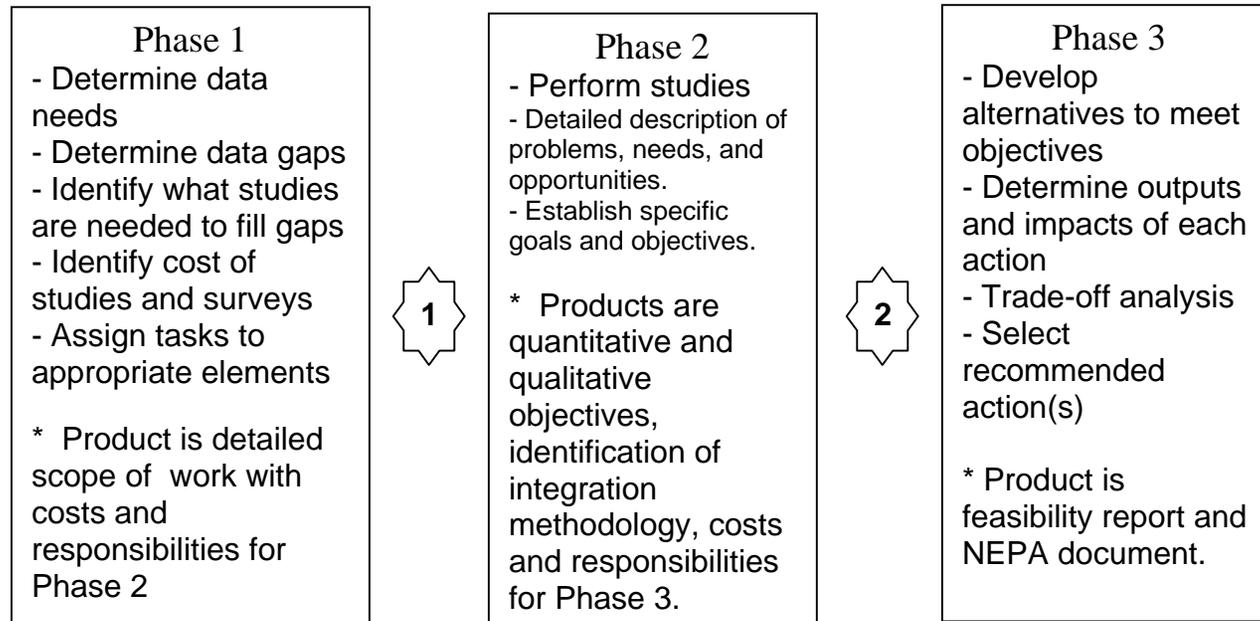
ATTACHMENT 4

THREE PHASE STUDY APPROACH

Corps Requirements: PMP and FCSA must identify full cost of feasibility study
FCSA must identify allocation of costs for each partner

Sponsor Requirements: PMP should be structured to be useful to project sponsor and beneficiaries.
PMP should identify stakeholder contributions
PMP should address tasks, methods, costs, and responsible parties

Actions: Project Management Plan will be structured to identify a 3-phase approach, identify Subject Matter Specialists for phase 1 activities, and costs for each project phase. The three phases are described in the following table.



1 Decision Point 1 – what studies, surveys, etc. will be conducted in Phase 2 and how will the costs be allocated.

2 Decision Point 2 – what objectives will be addressed in Phase 3 and how will costs be allocated.

ATTACHMENT 5
FEASIBILITY COST SHARING AGREEMENT