**ELEMENT 1**
**AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009**
**CWA SECTION 205(j)/604(b) GRANT**
**WATER QUALITY MANAGEMENT PLANNING**

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| **Name of Project:** | Developing Analytical Modeling Tools for Performing Resource Assessments of Assimilative Capacity in Support of the Georgia Comprehensive Statewide Water Management Plan |
| **Lead Organizations:** | U. S. Environmental Protection Agency<br>Georgia Environmental Protection Division |
| **Cooperating Organizations:** | Federal, State, and Local Partners in<br>The Georgia Comprehensive Statewide Water Management Planning Process |

**Background:**

Georgia's future relies on the protection and sustainable management of the state's limited water resources. In 2004 the Georgia General Assembly passed the "Comprehensive Statewide Water Management Planning Act" which called for the development of a statewide water management plan. The legislation established a far-reaching vision for water management as follows*:* "Georgia manages water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens." The legislation assigned the responsibility for developing a draft plan to the Georgia Environmental Protection Division and established a planning oversight committee, the Georgia Water Council, composed of legislators, legislative appointees, and state agency heads with water related responsibilities. The legislation called for an initial draft plan by July 1, 2007 and for the Water Council to recommend a final draft plan to the General Assembly the first day of the regular session in 2008.

The Water Council worked with the EPD in developing planning objectives and tools, and in establishing a Statewide Advisory Committee, Technical Advisory Committees and Basin Advisory Committees. The Council reviewed and approved each draft plan and recommended the final draft plan to the General Assembly in January 2008. The General Assembly debated the provisions of the draft plan and approved the plan on February 5, 2008. Governor Perdue signed HR1022, the Statewide Water Plan, on February 6. The approved plan can be found at http://www.georgiawaterplanning.org/. The major components of the State Water Plan are as follows:

- **Resource Assessments**

The Georgia Environmental Protection Division (EPD) will conduct water resource assessments to develop a sound scientific understanding of the condition of water

resources, in terms of the quantity of surface water and groundwater available to support current and future instream aquatic life uses and offstream human uses and to assess current water quality conditions and the assimilative capacity of surface waters. This work will meet the provisions of the Clean Water Act for the restoration and protection of (1) water quality, (2) hydrological systems, and (3) aquatic resources and their habitats.

• **Forecasting**

Forecasts of future population expectations, water demands, wastewater returns, land surface types and distribution and employment characteristics will be developed. Water use will be developed for: 1) domestic/ commercial water use; 2) industrial water use; 3) energy water use, and 4) agricultural water use.

• **Regional Water Planning**

Regional water planning councils will prepare recommended Water Development and Conservation Plans (WDCPs). These regional plans will promote the sustainable use of Georgia's waters, through the selection of an array of management practices, to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens. WDCPs will describe the water resources, water users, local governments and education partners in each region. The plans will include forecasts through 2050 of population, and domestic and commercial water use, as well as a comparison of these forecasts with the water resource assessments for each region. Based on these comparisons, the WDCPs will recommend regionally appropriate management practices for water protection that may include green infrastructure, water or energy efficiency improvements or other environmentally innovative activities to encourage quality growth and low-impact development initiatives, green infrastructure planning, land conservation, open space protection programs and innovative practices to manage stormwater.

The plans will identify steps, which will be taken to ensure that the forecasted needs can be met. If "gaps" between available and future (or current) demands are identified, the councils will determine which water and land use management practices should be employed to ensure there is sufficient water and assimilative capacity to meet future needs while protecting public health and natural systems and enhancing the quality of life for all citizens.

EPD will provide the regional water planning councils with technical assistance, such as contractor support, resource assessments, forecasts and guidance. After the regional WDCPs are adopted, EPD permits and Georgia Environmental Facilities Authority (GEFA) grants and loans for water projects will be guided by the each regional plan.

The initial regional Water Development and Conservation Plans are scheduled for completion in 2011. EPD, in cooperation with federal agencies, local governments, and other partners, will continue to monitor water resources to maintain and update information on the status and condition of the state's waters. This information will

support future revisions in resource assessments and management practices and provide the basis for updates to the regional WDCPs.

**Project Introduction:**

Georgia has more than 70,000 miles of streams, 400,000 acres of lakes, 4,500,555 acres of freshwater wetlands, 384,000 acres of tidal wetlands, 854 square miles of estuaries, 100 miles of coastline, and an enormous amount of water in aquifers. Additionally, over the course of an average year Georgia will receive fifty inches of precipitation. These waters are used in a wide variety of ways, and are affected by a number of human activities. Assessing these resources and their condition, as well as determining what factors influence the ability to protect and utilize these resources in a sustainable manner, is vital to effective water quality planning. If Georgia is to develop water resource plans that allow continued sustainable use and enjoyment of the state's water resources, the state must first define the capabilities and current use of these water resources. These resource capabilities must be defined in terms of the quality of each water resource to support additional water withdrawals and to safely assimilate pollutants while protecting public health and natural systems and enhancing the quality of life for all citizens.

This project is a part of the statewide resource assessment related to assessment of current water quality and the analysis of assimilative capacity available in Georgia's waters on a watershed or regional basis. Georgia issued an RFQ for the statewide project in 2008 and a contractor was selected through a competitive process. The overall project was divided into watershed units and work was initiated in FY2009 on several watersheds with work on the remaining watersheds to be initiated in FY2010. The budget for this project in FY2010 was threatened by shortfalls in state revenues due to the current economic downturn experienced in Georgia and across the nation and the world. The ARRA funds have helped to bridge the gap between available funds and needed funds to accomplish this project. These funds will allow the contractor to maintain staffing at the levels necessary to complete the project in the time allotted and will allow Georgia to complete the resource assessment in time for the work to provide the necessary foundation for regional water planning council's development of the water quality protection and assimilative capacity elements of their Water Development and Conservation Plans. This project will provide for the preservation of seven jobs in the private sector. These jobs include 2 Senior Watershed/Lake Modelers, 2 Junior Watershed/Lake Modelers, 1 Senior River Modeler, 1 Junior River Modeler and 1 Engineering Technician (data compilation, data processing, etc.). The fact that the contract for the work is already in place will allow the project to be started and completed expeditiously.

This project will develop the analytical modeling tools for performing water quality assessments of selected watersheds in the Chattahoochee River Basin to allow Georgia to manage point and nonpoint source pollution on a watershed basis to ensure the physical, chemical and biological integrity of those waters is maintained now and into the future. This requires protecting waters that currently meet water quality standards and restoring waters whose physical, chemical or biological integrity are impaired. The tools along with water use forecasts will allow the regional water planning councils to develop a shared vision for the region's future. If gaps between available

assimilative capacity and future demands are identified, the councils will decide which water, landuse and best management practices should be employed to ensure there is sufficient assimilative capacity to meet future needs and what actions can be taken for restoration. The EPD will strongly encourage green infrastructure and other environmentally innovative best management practices to protect water quality and biological integrity of Georgia waters and to conserve assimilative capacity and promote water and energy efficiency. EPD will use the computer models to test the ability of the recommended green infrastructure and innovative practices to close any identified assimilative capacity gaps. The water quality models will also be used in concert with water quantity models (being developed as an additional part of the overall resource assessment process) to address Clean Water Act provisions for anti-degradation and restoration of water quality, hydrological systems and aquatic resources and their habitats.

This project will provide for immediate and longterm economic and environmental benefits. The modeling tools will provide the analysis needed for the regional water planning councils to determine the most environmentally sound best management practices to protect and sustain water quality. The modeling tools will be used to determine wastewater treatment levels needed to protect water quality and provide the information to assess current loads and predict future loads based on population forecasts. In some cases it can be anticipated that following the completion of regional water development and conservation plans in 2011 work to construct new or upgraded water pollution and/or install green infrastructure or other best management practices will begin immediately providing economic stimulus as a result of an increase in construction projects. The design and construction of one new water pollution control plant and/or several green infrastructure or other best management practices will provide an economic stimulus that will surpass the funding provided in this grant. Considering this project addresses several high growth areas in the Chattahoochee River watershed, it is likely that a number of water pollution control projects including green infrastructure or other environmentally innovative projects will be initiated shortly after the approval of the water development and conservation plans. Extrapolating this project to the entire state would suggest that a significant number water pollution control projects would be initiated following approval of the water development and conservation plans for the ten new regional water planning regions. In addition, significant economic stimulus could also result from regionally appropriate management practices that may include innovative ways to manage impervious surfaces to increase infiltration of stormwater including enhancement or expansion of existing programs such as post-construction stormwater management, quality growth and low-impact development initiatives, green infrastructure planning, land conservation, open space protection programs and other environmentally innovative practices. This work will provide long-term public benefits by investing in environmental protection and restoration that will provide sustainable water resources to support the state’s economy, protect public health and natural systems, and enhance the quality of life for all Georgians.

**Project Objectives:**

The purpose of this project is to develop the analytical modeling tools for performing resource assessments of the assimilative capacity of selected water bodies in the Chattahoochee River Basin. The Contractor will be required to develop computer modeling tools for watersheds, streams and rivers, and lakes using software specified by the Georgia EPD. The results of this work will be used by the newly formed regional water planning councils in the development of their Water Development and Conservation Plans in support of the Georgia Comprehensive Statewide Water Management Plan. The following sections describe the tasks required to develop the models and tools needed for this Work Plan.

## Task 1: Quality Assurance Project Plan

The Contractor will be expected to adhere to a high standard of quality. A Quality Assurance Project Plan (QAPP) shall be developed to ensure that all work meets the needs of Georgia EPD. The QAPP shall address both technical quality and practicable/operational quality. The QAPP needs to be prepared following EPA Guidance as appropriate for this scope of work. The QAPP shall be prepared within 30 days from Notice to Proceed and submitted to EPD for approval.

## Task 2: Data Compilation and Management

The modeling tools will require historic data of various types for either model input or model calibration. The data types described in this section are general in nature and will be needed for most model applications. Other model specific data requirements will be described later.

In general, the Contractor shall identify sources, collect available data, and develop digital databases and accompanying geographic information system (GIS) map coverages for the data categories described in this and following tasks. Data should be collected for the time period that includes, at a minimum, the period from 1997 through 2007. All numerical databases will be developed using the Water Resources Database (WRDB) software, which is available from Georgia EPD. A description of the data categories follows.

- Water Quality Data: Georgia EPD and U.S. Geological Survey (USGS) have monitored water quality for a variety of water bodies at various locations in the Chattahoochee River Basin.

- Flow Data: The USGS has monitored streamflow at a variety of locations in the Chattahoochee River Basin.

- Watershed Assessment Data: Georgia EPD has required some municipalities to perform watershed assessments for the watersheds in their jurisdictions. These watershed assessments include initial and long-term water quality monitoring programs.

- Facility NPDES Monitoring Data: Municipal and industrial wastewater treatment facilities with National Pollutant Discharge Elimination System (NPDES) permits have monitoring data that includes effluent flow and quality. These data are often recorded on a daily basis and summarized monthly. Note that in the case of the Chattahoochee River Basin, it will also be necessary to obtain information from facilities located in Alabama.

- Water Withdrawal Data: Municipal and industrial facilities that operate water withdrawals have data on their withdrawal rates. These data are often recorded on a daily basis and summarized monthly. Note that in the case of the Chattahoochee River Basin, it will be necessary to obtain information from facilities located in Alabama.

- Heat Load Data: Heat load data for power plants and other facilities will have to be compiled. These data will include both flow and temperature discharge data. These data may not be available in NPDES compliance reports, so the Contractor will have to develop an alternative method for estimating heat loads that will be approved by Georgia EPD.

- Meteorological Data: A number of organizations including the National Climatic Data Center (NCDC) and UGA's Georgia Automated Environmental Monitoring Network (GAEMN) have meteorological data at a number of locations within and near the Chattahoochee River Basin. Typical meteorological data parameters include precipitation, air temperature, dew point temperature, barometric pressure, solar radiation, relative humidity, and wind speed. These data are collected in various time intervals including 15-minute, hourly, or daily.

The Contractor, with assistance from Georgia EPD, shall identify the available data for the watersheds, retrieve the data, and develop a database containing these data using WRDB. For the Chattahoochee River Basin, the Contractor shall coordinate with regulatory agencies in the State of Alabama, with Georgia EPD's assistance, to compile similar data from facilities on the Alabama side.

All of the data types described above have a location associated with them that can be used to create GIS coverages. The Contractor will develop and maintain GIS coverages for each data type that includes the location and other descriptive information for the site using GIS software. The software needs to be compatible with ArcGIS developed by Environmental Systems Research Institute (ESRI). The Contractor will work with Georgia EPD to develop the GIS database structure to be used for all data types.

**Task 3: Watershed Modeling**

As a part of the process of determining the assimilative capacity for the rivers, the Contractor shall develop watershed models for each river. Watershed models will be developed for the Chattahoochee River Basin from Buford Dam to Lake Seminole. The

watershed models will be designed to perform a continuous simulation for flow and water quality for the period 1997 through 2007.

Watershed models will be developed using either Hydrologic Simulation Program Fortran (HSPF) or the Loading Simulation Program in C++ (LSPC). The Environmental Protection Agency (EPA) Regions 3 and 4 developed LSPC for preparing TMDLs. It utilizes the hydrologic core program of HSPF with a custom interface of the Mining Data Analysis System (MDAS) and modifications for non-mining applications such as nutrient and pathogen modeling.

Each watershed model will be divided into modeling sub-basins based on hydrologic criteria to be represented as a series of hydraulically connected sub-watersheds in which the watershed model will calculate surface water runoff and the advective transport of constituents using historic precipitation data. Because of the water temperature issues in the Upper Chattahoochee Watershed (Buford Dam to Franklin, GA), this watershed model will also include water temperature modeling.

The following data and other modeling requirements will be required to perform the continuous watershed model simulations:

- Meteorological Data: Hourly meteorological data from weather stations within, or in close proximity to, the sub-watershed will be used in the watershed model. Precipitation data for the watershed will be gathered from several sources and the watershed will be subdivided into Thiessen polygons with precipitation stations as centers, in order to select the station for the watershed. The potential evapotranspiration will be calculated from the maximum and minimum daily temperatures obtained from either NCDC or GAEMN stations. The Hamon PET method will be used to calculate hourly potential evapotranspiration using air temperature, a monthly variable coefficient, the number of hours of sunshine (based on latitude), and absolute humidity (computed from air temperature).

- Land Use/Land Cover: The watershed model uses land cover data as the basis for representing hydrology and nonpoint source loading. The Contractor shall obtain, from EPD or other sources if more recent data is available, the most current digital map coverages for land use/land cover for the watersheds to be modeled. In addition, forecasted future land use coverages will be provided to the Contractor to use for future planning. Land cover categories for modeling will include open water, urban, barren or mining, cropland, pasture, forest, grassland, and wetlands. Coverages of imperviousness will also be utilized to develop the typical imperviousness percentages for each land use category. The percent imperviousness of a given land category will be calculated as an area-weighted average of land use classes encompassing the modeling land category.

- Soils Data: Soils data for the watershed will be obtained from the State Soil Geographic Database (STATSGO). There are four main

hydrologic soil groups. The different soil groups range from soils that have a low runoff potential to soils that have a high runoff potential. The total area that each hydrologic soil group covers within each sub-watershed will be determined. The hydrologic soil group that has the highest percent of coverage within each sub-watershed will be used to represent the sub-watershed.

- Digital Elevation Model: Digital elevation model (DEM) data will be obtained for the watersheds modeled and shall have a 10-meter grid resolution. These data will be used to determine the channel and watershed slopes for use in the watershed model.

- Point Source Discharge Data: The watershed model should be designed to include point source discharge data.

The watershed models will include all point sources of nutrients and organic material. Georgia EPD will prepare the Georgia DOSAG models that will be used to determine wasteload allocations (WLAs). These models will be incorporated into the watershed models. This may be represented as a single load representing one or more discharges to the watershed.

The watershed model will be calibrated to daily flows and discrete instream water quality data measured by Georgia EPD, USGS, local municipalities, counties, George Power, and the Corps of Engineers, if available. The watershed models will simulate the rainfall runoff process for both flow and water quality and the results of these models will be used as tributary inputs to the lake and or river models.

**Task 4: River Modeling**

The Contractor shall develop one-dimensional hydrodynamic and water quality models for the Chattahoochee River from Rock Shoals Dam to Oswichee Creek (approximately 19 miles), and from Walter F. George dam to Bryans Creek (approximately 46 miles). River modeling will be done using Georgia EPD's EPD RIV-1. Model development and calibration shall be done using a period between 1997 and 2007 that has the most complete available data for model input and calibration. The period should span a minimum of two years.

Requirements of the river modeling also include:

- River Cross Sections: The EPD RIV-1 hydrodynamic model requires river channel cross sections as input for the open channel hydraulics calculations. The Contractor shall obtain available measured cross sections for the modeled river segments and incorporate them into the model geometry. Where cross section data are not available, cross sections may be developed using other means to be approved by Georgia EPD.

- Watershed Inflows: River model input data for watershed contributions of flow and water quality will be obtained from the watershed model results.

- Meteorological Data: Hourly meteorological data from one or more monitoring stations in the vicinity of the river will be used as model input.

- USGS Streamflow Data: USGS streamflow data will be used where appropriate for boundary flow input.

- Water Quality Data: Available water quality data collected at the boundary will be used as model input.

- Facility Monitoring Data: Daily facility operating data for both wastewater discharges and water withdrawals will be used in the model for the period modeled.

The river model will be calibrated with available USGS streamflow data and water quality data collected at locations within the model reach and during the modeling period.

**Task 5: Lake Modeling**

The Contractor shall develop lake models for West Point and Walter F. George in the Chattahoochee River Basin and Lake Seminole, which straddles portions of both the Chattahoochee and Flint River Basins, and shall consist of linked hydrodynamic and water quality models. Both the hydrodynamic and water quality models will be three-dimensional. The lakes will be modeled in three-dimensions, which will allow Georgia EPD to calibrate the models to site-specific data and to determine the effect of direct discharges into the lake without assuming laterally average segments.

The Environmental Fluid Dynamics Code (EFDC) will be used to simulate the internal flows and water temperature of the lake models. The Water Quality Analysis Simulation Program (WASP) will be used to simulate the fate and transport of water quality constituents within the lake. Model development and calibration will be done for a period within 1997 through 2007 that has the most complete data set, and should span a minimum of two years.

Lake Hydrodynamic Modeling

EFDC is a general-purpose hydrodynamic model capable of simulating one, two, and three-dimensional flow in surface water systems including rivers and lakes. The Contractor shall develop an EFDC model for each lake, which will include:

- A three-dimensional model grid having an appropriate resolution based on lake shoreline and bathymetric data.
- Boundary inflows provided by results from the HSPF or LSPC watershed model

- Hourly meteorological data including barometric pressure, air temperature, relative humidity, dew point, rainfall, evaporation, wind speed, solar radiation, and cloud cover
- Water temperature modeling

Estimated bottom elevations and shoreline boundaries define the EFDC model grid. Bathymetric assumptions will be derived from available cross-sections from lake bathymetry. In addition, any previously developed models for the lakes will be examined to insure consistency.

EFDC requires boundary conditions to simulate circulation and transportation. These conditions include the water elevations at the downstream boundary, watershed inflows, and meteorological data. The upstream boundaries will be the tributary flows and water quality results from the watershed models. The lake levels recorded at the lake dam will be used to define the water surface elevation at the downstream boundary.

The meteorological data that will be used include barometric pressure, air temperature, relative humidity, dew point, rainfall evaporations, wind speed, solar radiation, and cloud cover. These data are measured at the NCDC or GAEMN stations.

Water temperature will be simulated in EFDC using solar radiation, atmospheric temperature, heat transfer at the water surface, and the temperature of the hydraulic inputs.

Lake Water Quality Modeling

WASP is a dynamic compartmental model designed for aquatic systems that models the time varying processes of advection, dispersion, point and diffuse mass loading, and boundary exchange and can be structured in one, two, or three dimensions. WASP contains a series of independent kinetic process routines that can be employed. WASP will be used with its eutrophication module (EUTRO) which models conventional water quality constituents and algal kinetics. The water quality constituents and nutrient and algal kinetics in EUTRO are as follows:

- Organic nitrogen
- Ammonia
- Nitrate-nitrite
- Organic phosphorus
- Orthophosphate
- Chlorophyll *a*
- Dissolved oxygen
- Biochemical oxygen demand (BOD)

WASP is not a hydrodynamic model. The model uses the EFDC model results contained in the hydrodynamic linkage file, to provide the transport parameters required by the WASP water quality model. Therefore, the WASP model segmentation shall be compatible with the EFDC grid structure.

The WASP model simulates sediment oxygen demand, reaeration, full nutrient dynamics, and algal kinetics. Boundary inflow and constituent concentrations of BOD, total nitrogen, and total phosphorus will be imported from the calibrated HSPF or LSPC models. Since the watershed models only predict total nitrogen and phosphorus loadings, these lumped constituents must be partitioned into their component parts including organic phosphorus, ortho-phosphate, organic nitrogen, ammonia, and nitrate-nitrite for use as input to the lake water quality model. The nitrogen and phosphorus loads will be fractionated based on the results of measured water quality data.

If there are direct discharges to the lakes, daily discharge flows, 5-day BOD, ammonia, total phosphorus, and dissolved oxygen concentrations for the NPDES permitted discharges will be obtained from Operating Monitoring Reports (OMRs) and will be input into the model. If the lake has direct water withdrawals, daily water withdrawal data will also be input into the model.

The model lake water quality model will be calibrated with existing water quality data including chlorophyll *a*, nitrogen components, phosphorus components, dissolved oxygen profiles, and water temperature profiles.

**Task 6: Current Assimilative Capacity Modeling**

The current demand models will be used to assess the current loads. The Contractor shall develop the models for critical conditions in accordance with Georgia EPD standard practices. The critical conditions models will be run with the NPDES point sources at their full permit loads. The Contractor shall train Georgia EPD staff in the use and operation of the models. The calibrated and critical conditions models shall then be submitted to Georgia EPD for review. Georgia EPD will make these models available for technical review by outside parties. The technical review will be performed to validate that the models are appropriate and properly calibrated based on the available data.

**Task 7: Current Assimilative Capacity Modeling Report**

The Contractor shall prepare a draft modeling report that outlines the model structure (including water withdrawals, thermal discharges, and wastewater discharges), model input, modeling parameters, and calibration results. The report should include a sensitivity analysis of the various modeling parameters. Finally, the report should include the results of the critical conditions model and indicate streams that have available assimilative capacity and those that do not. The draft report will be submitted to EPD for review. After receiving comments from EPD and possibly others, the Contractor will incorporate all comments received and submit a final report.

**Task 8: Accounting and Reporting**

The EPD will provide appropriate progress reports to satisfy grant conditions and ARRA reporting requirements. In addition the state will follow all EPA and ARRA accounting guidelines by ensuring that these funds are clearly distinguishable from non-ARRA funds in agency financial systems, grant and contract writing systems, and reporting

systems. In this way the state will insure the transparency, accounting, and reporting requirements of ARRA are met.

**Schedule of Task Completion Dates, Costs and Deliverables**

The deliverables and costs for the tasks outlined above are given in the table below:

| Task | Description | Deliverables | Date | Cost |
|---|---|---|---|---|
| 1 | Data Compilation and Management | | | $ 17,325.00 |
| | | FTP Site for Data Exchange | July-09 | |
| | | Meteorological Data Processed through 2007 | October-09 | |
| | | NPDES Data Processed through 2007 | October-09 | |
| | | Water Withdrawal Data Process through 2007 | October-09 | |
| | | EFDC Grids (West Point, Walter F George, Blackshear, Seminole) | January-10 | |
| 2 | Chattahoochee River Watershed Modeling | | | $122,000.00 |
| | | Chattahoochee River Watershed Model - Calibrated for Hydrology | January-10 | |
| | | LSPC Hydrology Modeling Report for Chattahoochee River Basin | June-10 | |
| | | Chattahoochee River Watershed Model - Calibrated for Water Quality | March-10 | |
| | | LSPC Water Quality Modeling Report for Chattahoochee River Basin | June-10 | |
| | | Future Chattahoochee River Watershed Modeling | December-10 | |
| 3 | West Point Lake Modeling | | | $160,000.00 |
| | | West Point Lake EFDC Model - Calibrated for Hydrodynamics | March-10 | |
| | | EFDC Hydrodynamic Modeling Report for West Point Lake | November-10 | |
| | | West Point Lake WASP Model - Calibrated for Water Quality | August-10 | |
| | | WASP Water Quality Modeling Report for West Point Lake | November-10 | |
| 4 | Lake Walter F. George Modeling | | | $106,675.00 |
| | | Lake Walter F. George EFDC Model - Calibrated for Hydrodynamics | March-10 | |
| | | EFDC Hydrodynamic Modeling Report for Lake Walter F. George | November-10 | |
| | | Lake Walter F. George WASP Model - Calibrated for Water Quality | August-10 | |
| | | WASP Water Quality Modeling Report for Lake Walter F. George | November-10 | |
| 5 | Lake Seminole Modeling | | | $117,150.00 |
| | | Lake Seminole EFDC Model - Calibrated for Hydrodynamics | March-10 | |
| | | EFDC Hydrodynamic Modeling Report for Lake Seminole | November-10 | |
| | | Lake Seminole WASP Model - Calibrated for Water Quality | August-10 | |
| | | WASP Water Quality Modeling Report for Lake Seminole | November-10 | |
| 6 | Chattahoochee River RIV1D Modeling | | | $146,450.00 |
| | | Chattahoochee River RIV-1 | March-10 | |
| | | RIV-1 Hydrodynamic Modeling Report for Chattahoochee River | November-10 | |
| | | Chattahoochee River RIV-1 - Water Quality | August-10 | |
| | | RIV-1 Water Quality Modeling Report for Chattahooche River | November-10 | |
| | | | Total | $669,600.00 |

**Budget Summary: Section 604(b) ARRA 2009 Grant Funds**

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| (1) | Contract | $669,600 |
| **Total Section 604(b) ARRA 2009 Grant Funds** | | $669,600 |