

SCOPE OF WORK, SCHEDULE, AND COST PROPOSAL

Integrated Water Resources Plan, Franklin TN

Prepared by CDM, September 2009

This scope of work, illustrated in **Figure 1**, outlines two major Phases during which a comprehensive, implementable, and fundable Integrated Water Resources Plan (IWRP) will be developed with the City of Franklin, focusing on stakeholder-derived objectives as the central measure of success. This approach will progressively screen alternatives in a way that is technically robust and broadly acceptable to the City, the regulatory community, advocacy groups, and citizens. The general approach of stakeholder integration and integrated analysis of alternatives for capital improvements and resource management opportunities across the spectrum of water-related utilities has been successfully applied in numerous communities and cities across the United States. The two phases are briefly described below, and broken down by tasks in the pages that follow.

- **PHASE I: Preferred Alternatives:** Phase I, which is expected to take 9 to 12 months, will include a series of stakeholder workshops and public forums to outline overall objectives for the City and its environmental resources; a proposed project schedule is provided in **Table 1**. These objectives will guide the formulation of alternatives for capital improvements (such as plant improvements) and resource management opportunities (such as water conservation, water recycling, *etc.*). An integrated model will be used that will simulate alternatives in all of the utilities and provide output to stakeholders and decision makers in the context of their own stated objectives. The process will screen the available alternatives down to those that are most broadly acceptable, and is expected to yield 3 to 4 preferred plans, which are defined as groups of projects or programs centered on specific themes (such as the lowest cost, the greatest improvement to the river, *etc.*). Phase I will also yield preliminary cost estimates for the alternatives, as well as professional assessments on likely permitting and environmental issues. At this point, only Phase I is scoped in detail and budgeted, since the work beyond the identification of the preferred alternatives depends very much on the nature of the alternatives that are to be carried forward into Phase II.
- **PHASE II: Finalization of an Integrated Water Resources Plan:** Phase II is expected to take 12 to 15 months to complete, the schedule will depend upon the outcome of Phase I but at a minimum, will include the following analyses:
 - Detailed technical analysis of the preferred alternatives,
 - Continued modeling and screening of the plans to compare and rank them with stakeholder input,
 - Identification of a single preferred plan (the IWRP) from among the alternatives (or by creating a blend of the preferred alternatives),
 - Conceptual design of identified projects (siting, sizing, performance needs, *etc.*),
 - Permitting assistance for identified projects,
 - Detailed cost analysis, and
 - Financing plan for the implementation of the IWRP

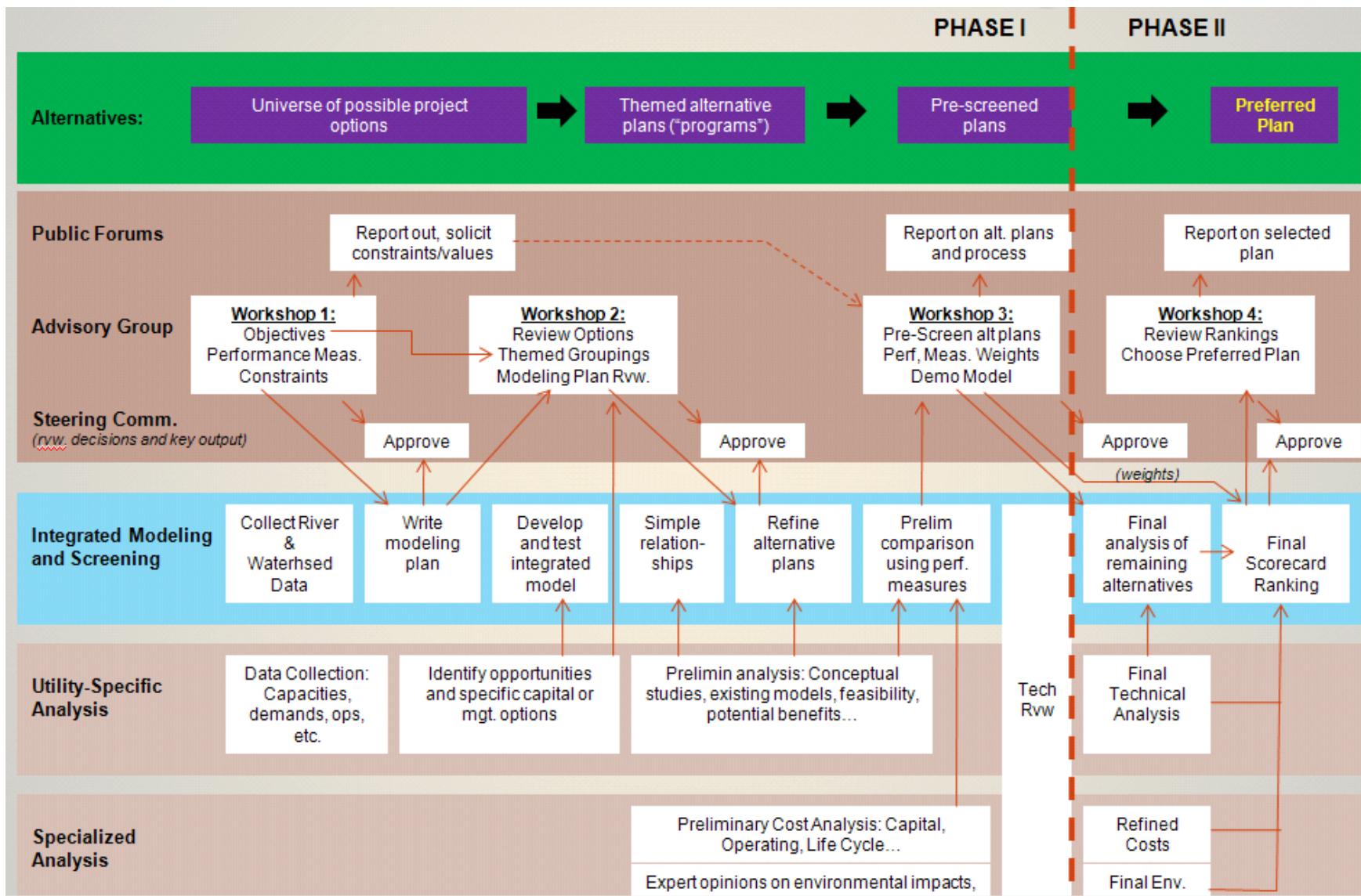


Figure 1
 Illustrated Work Plan
 Franklin Integrated Water Resources Plan

PHASE I

Task 1 - Stakeholder and Public Involvement

CDM will facilitate engagement of stakeholders from the beginning and throughout the entire planning process, which will help define the objectives of the plan, identify potential solutions, collaborate on the formulation of analysis tools, and providing recommendations for the Board of Mayor and Aldermen (BOMA). CDM has assumed a baseline number of meetings, around which our project costs have been formulated. Based on our experience with similar projects, each of the following workshops and meetings has been scheduled for four hours. However, we recognize that additional meetings with all subsets of stakeholders may be required and the cost of those meetings has been provided separately. These meetings may consist of one of three types and could include stakeholder workshops, technical review meetings, or information update/report-out meetings.

Task 1.1 - Kickoff Meeting with Client

The kickoff meeting with the client will follow CDMs matrix analysis approach to project planning that involves the entire team on the project's objectives. During this facilitated meeting, team members will agree on the factors that are necessary for the project to succeed and they take responsibility for implementing an action plan to meet project goals. This meeting will also be used to identify participants for the following stakeholder groups:

- **Steering Committee:**
 - Work with consultant to direct the process
 - Recommend BOMA approval of decisions and deliverables
 - Recommend policy decisions on service areas (WW / Reuse)
- **Stakeholder Advisory Group:**
 - Participates in workshops
 - Makes decisions subject to approval by Steering Committee
 - Likely to include City officials, watershed organizations, utility directors, state regulatory representatives, public representatives, USGS, technical reviewers, City task force representatives, others.
- **Public Citizens**
 - Receive reports on project progress
 - Provide ideas, information, values to Advisory Group

Task 1.2 - Introductory Stakeholders Meeting

CDM will facilitate a meeting with the Steering Committee, Stakeholder Advisory Group, and any members of BOMA who desire to participate. During this meeting, we will outline the approach and timeline for Phase I, define the roles of the stakeholders and explain the first need for information from the stakeholders, which will be discussed in the subsequent workshop: Objectives, Performance Measures, and Constraints.

Task 1.3 - Workshop 1: Objectives, Performance Measures, and Constraints

The first workshop will be used to develop consensus identification of the following three guiding sets of information:

- Objectives: These will represent the consensus voice of the stakeholders from beginning to end of this project. All subsequent analysis and comparisons will be linked to these objectives so that decisions can be made around agreeable goals for Franklin. Examples of project objectives might

include lowest cost, improve conditions of the Harpeth River, increase efficiency of resource utilization, *etc.* Ideally, we will work with the stakeholders to identify commonality or redundancy in voiced objectives, and produce a list of approximately 5 – 8 governing objectives.

- **Performance Measures:** Performance measures are quantifiable (or qualifiable on a relative scale) characteristics of alternatives that can be compared in direct relation to the project objectives. Examples of performance measures might include low flow frequency in the Harpeth River, life-cycle cost, likelihood of permitting hurdles, environmental impacts, *etc.*
- **Constraints:** Constraints help bound the problem, and avoid consuming unnecessary time analyzing or debating alternatives that are physically, economically, environmentally, or even politically infeasible.

Task 1.4 - Workshop 2: Initial Formulation of Alternatives

CDM will facilitate a workshop to present, and modify as necessary, a list of specific project or resource management opportunities for stormwater, water supply, wastewater, and water reuse in Franklin. CDM will facilitate discussions on the possible groupings of alternatives and how these groups of alternatives could be integrated. Ideally, each individual grouping will be centered on a theme that is linked to one of the objectives – for example, we may work with the stakeholders on developing a “low cost” grouping, a grouping that is most beneficial to the river, *etc.* These can later be compared and blended as the project and screening process progress.

Following this workshop, the preliminary list of alternatives from Phase 1 will be finalized and CDM will assume that 8 to 10 alternative project groupings (“alternative plans”) will be identified for further screening and analysis. These alternatives can include a combination of infrastructure projects, institutional controls, conservation programs, public education campaigns, *etc.*

Task 1.5 - Workshop 3: Identification of Preferred Alternatives

During this final workshop in Phase I, the alternatives will be evaluated using a scorecard approach. Stakeholders will have been asked to assign weights to the performance measures developed in Workshop 1 (either as individuals, or as organizations as fairness warrants). Results of technical analysis, preliminary cost and environmental analysis, and integrated modeling will be used to populate a matrix of the alternatives and the performance measures. The outcome of this meeting will be a preferred set of 3 to 4 alternatives that most broadly support the stakeholders’ collective objectives, and which will be further developed and analyzed in Phase II. At the end of this phase, the analysis will be conceptual, aimed at distinguishing key performance characteristics of the alternative plans. Phase II will refine the analysis, but because of the screening process in Phase I, will be able to effectively focus on those alternatives which offer the most promise.

Task 1.6 - Public Forums

The CDM project team will coordinate two public forums during which information will be provided to the general public regarding the project objectives and alternatives arising from the selection process. The focus of these meetings will be on educating the community and providing the general public an opportunity to provide feedback to the consulting team and the stakeholder advisory group.

Task 1.7 - Technical Modeling Meeting

CDM will host a meeting for interested parties to review the technical formulation and functionality of the integrated model (developed under Task 2). During this meeting, technical specialists will be available to provide detailed information regarding the model assumptions, construction and integrations of model relationships and the overall process of running the model.

Task 1.8 – Additional Meetings

As noted in the general discussion of Task 1, additional meetings may be necessary to fully engage stakeholders throughout the entire planning process, fully describe the formulation and use of technical analysis tools, and satisfy communication needs for BOMA and the public. These meetings may consist of one of three types and could include stakeholder workshops, technical review meetings, or information update/report-out meetings.

Task 2 - Integrated Modeling

This task includes the development and application of an integrated computer modeling tool that will simulate the behavior and interactions of the Harpeth River, water supply, wastewater, stormwater, and water reuse programs in Franklin. It will integrate utility-specific technical information into a platform that can compare and contrast the benefits and shortcomings of alternative IWRP formulations. The model will be developed with software such as Microsoft EXCEL, STELLA, or an equivalent platform that allows dynamic simulation of integrated systems over extended time periods. The model will account for future demands, historical hydrology, and the dynamics of existing and planned infrastructure in the Franklin study area. Most importantly, it will represent all of the water-related utilities, the river, *and their interdependencies* in a single platform in a way that will allow simple evaluation and comparison of integrated plans. It is the interdependencies of utilities, the river, and the watershed that warrants the formulation of integrated plans, and the model will be one of the means to this end.

Task 2.1 - River/Watershed Data

It is assumed that one of the central focal points of the project is the Harpeth River. Therefore, this task involves collection and aggregation of river data and is developed based on assumptions regarding the availability, comprehensiveness, suitability and quality of existing data. At a minimum, the following datasets are assumed to be available to the project team. As needed, data and information collected during this task will help CDM and stakeholders better understand the dynamics of the Harpeth River, and will be incorporated into the integrated model developed under other following subtasks.

- Reports and studies on the Harpeth River hydrology, management and regulations, past infrastructure designs, biology and ecology, and population growth patterns
- Watershed land uses, area, soils, slope
- Geographic build-out limits for service area
- Precipitation records
- Historical evaporation rates
- Hydrologic flow records and relevant statistics (USGS and/or TVA daily time series, monthly average and median flows, 7Q10, etc.)
- Information on rainfall-runoff relationships
- Hydraulic travel times and residence times in any impounded areas downstream of Franklin
- Intake elevations at supply locations
- Low flow requirements, including ecological flow targets throughout watershed and their rationale (aquatic species and habitat requirements)
- Demand projections for relevant river withdrawals, including seasonal variability
- In-Stream Hydrologic Alteration Model and supporting data, used to develop withdrawal ARAP
- TMDL studies
- Existing and proposed NPDES permits
- HRWA studies, reports and supporting data
- Designated river uses, restrictions and 303d status

- Upstream withdrawals and downstream rights or permits
- Water quality on nutrients, DO, bacteria, chlorophyll, TSS, *etc.*
- Water quality issues affecting chemical treatability for drinking water which may include metals, toxics, *etc.*
- Historical discharge rates and concentrations

Task 2.2 – Simplified Relationships

The data collected above will be used to develop generalized relationships suitable for a conceptual representation of the Harpeth River in the Integrated Model. Unlike high-resolution multidimensional models that are specific to water quality, hydrology, or hydraulics, and which take a long time to develop and run, the Integrated Model is intended to capture the fundamental dynamics of the river at a level that allows the discernment of plans that are beneficial from those with limited benefits or detrimental impacts. It is envisioned that, based on the data collected in Task 2.1, simplified relationships for rainfall-runoff, travel times, pollutant loading, and dilution will be developed and included in the conceptual integrated model.

Task 2.3 - Modeling Plan

CDM will draft a modeling plan memorandum. This document will revolve around the project objectives and performance measures as defined by the stakeholders in the workshops in Task 1. At a minimum, the modeling plan will include:

- Software selection
- Necessary resolution
- Planning horizon (into the future)
- Historical record (for climate and hydrology data)
- Resolution for the representation of each utility and its dynamics (demands, loads, peaking, *etc.*)
- Model input
- Model output
- Scenario definition and flexibility of formulation
- Techniques for uncertainty and sensitivity analysis (forms of “risk”), if desired
- Formulation plan for addressing each of the stakeholders’ identified performance measures

Task 2.4 - Model Development/Testing

CDM will develop a conceptual dynamic model of the Harpeth River and Franklin’s water-related utilities. At a conceptual level (sufficient for distinguishing benefits and disadvantages of alternative integrated plans), it will include the river hydrology, basic water quality relationships, the utilities which will be addressed by this IWRP, demands, in-stream flow requirements, assimilative capacities, operating costs, *etc.* The model will include representation of existing infrastructure and facilities, as well as options for including possible new infrastructure in the future (as part of integrated plans). It will therefore be capable of simulating the alternative plans, their impacts, and their potential benefits.

The first step will be to draw a representation of the system, including the interdependencies between the river, the watershed, and the utilities. This will serve two purposes: it will help people understand the interconnectivity of the various resources and facilities, and will also serve as the functional outline of the model. Next, available data and simplified mathematical relationships will be entered, both from

Task 2.1 and from Task 3 (utility-specific information). The model will be tested for accuracy of the water balance, load balances, operational representation, and river representation. Comparative scenarios will be run and results will be compared to published data, as available.

Task 2.5 – Preliminary Alternatives Analysis

The completed, integrated model will be used to test and compare alternative plans as formulated by the stakeholders and CDM team. It will also be used to refine and adapt these plans based on results. Preliminary results will be provided to stakeholders in the form of scorecard analysis in Workshop 3. At this point, the model may also help identify specific project options, or even complete alternatives (groups of projects) that are impractical or which have very limited benefits. In such cases, the stakeholders may agree to not carry such alternatives forward for further analysis. As defined in the modeling plan, the model may also be used to address questions of uncertainty in hydrologic or performance data, as well as the sensitivity of solutions to changes in capacities or operating requirements. Ultimately, the purpose of the integrated model in Phase I is to simulate and refine alternative plans, and use results to identify a smaller set of most preferred plans to carry forward to Phase II.

Task 2.6 – Scorecard Tool

In order to provide a comprehensive and consistent basis for comparing alternatives, CDM will apply a tool for organizing interdisciplinary information, incorporating stakeholder values (e.g. “which is more important, cost or river flow?”), and comparing each alternative to all the others using common performance measures. CDM routinely uses Criterion Decision Plus (CDP) or EVAMIX (a spreadsheet program) to help rank alternatives in integrated water resource plans. These tools can mix quantitative and qualitative data in a single matrix, are easy to use, and provide a transparent and reproducible evaluation process that lends itself to stakeholder participation. It will be populated with performance measures that come out of the integrated model (Tasks 2.4 and 2.5) as well as the utility-specific analysis in Task 3. The scorecard tool will be used before and/or during Workshop 3 to rank the alternative plans. The tool will illuminate areas of consensus among stakeholders, the ways in which the stakeholders’ values have influenced the rankings, and the principal similarities and differences between the alternatives. This type of transparent illustration of results is extremely important in building consensus. The task will include the structuring of the tool and collaboration with project team experts in establishing qualitative scores for performance measures that cannot necessarily be quantified (for example, “poor-fair-good-best”)

Task 3 - Technical Analysis of Infrastructure and Resource Management Options

During this task, the project team will review existing studies, reports and plans that have been developed for each utility. The project team has assumed that these existing documents have identified a set of project options on a utility specific basis and that there is a basis established for conceptual capital and O&M costs developed for project alternatives. These projects, in addition to other previously unidentified projects that might arise when system integration is considered, will subsequently become building blocks for the development of themed alternatives in the integrated resources plan. The effects of these options will be simplified for analysis in the integrated model, (e.g., an increased water withdrawal could result in a decreased downstream wastewater assimilation capacity). Additionally, for this task, the project team will document the permitting requirements necessary for each of the alternatives to be evaluated in this task. The output of the following subtasks will be:

- Options for projects or operations of each utility previously identified
- Options for projects or operations of each utility NOT previously identified (these may be entirely new as developed by project experts, or may be adaptations of previously identified options to better address integration needs)
- Preliminary cost estimates for project options (capital and operating costs, on unit bases)
- Permitting requirements for each project option
- Simplified way(s) to represent the influence of each project option on other utilities and the river

Task 3.1 - Water Supply

Existing reports and modeling that have been developed for the City's water supply system, including the water treatment plant and distribution system will be reviewed. There has been a significant effort on developing the basis for additional withdrawal from the Harpeth River and water treatment plant infrastructure improvement. It is assumed that data from these previous projects are comprehensive and can be used to develop a complete list of water supply projects and options for consideration in the integrated model. From this review, a technical memorandum will be prepared which will include a compilation of specific information with respect to water treatment plant capacities (both hydraulic and treatment), distribution system capacity, demand projections, existing project drawings, *etc.*

Task 3.2 – Stormwater

Basin water quantity master plans and stormwater models based on the master plans have previously been developed for the City of Franklin by CDM. CDM was also involved in the development of Franklin's stormwater utility and stormwater management manual and regulations. These existing studies will be reviewed. Because CDM has been integrally involved with these stormwater planning efforts, the applicability of information from these previous projects is known and the level of effort needed to develop a complete list of stormwater supply projects for consideration in the integrated model is well understood. While the stormwater master plans have been completed, it has been a number of years since this work has been done and some level of effort is required to review changes to the system and identify opportunities for future beneficial initiatives. In addition, these stormwater models were developed to specifically evaluate stormwater quantity and additional investigations may be needed to look at stormwater quality. From this review, a technical memorandum will be prepared which will include a compilation of specific information with respect to the applicability of the existing models and basin plans, infrastructure changes that have occurred since completion of previous studies and the status of the MS4 permit and institutional controls for the stormwater system that provide opportunities for developing project alternatives.

Task 3.3 - Wastewater

While CDM has previously assisted the City of Franklin with work at the existing wastewater treatment plant, it has been a number of years since the Value Engineering Report for the last wastewater treatment plant expansion was completed. The wastewater treatment plant and collection system is the utility for which the least recent information is currently available. During this phase, analysis will be required to develop a complete list of alternative projects and associated costs to be considered in the integrated model. From this review, a technical memorandum will be prepared which will include a compilation of specific information with respect to the wastewater treatment system capacities, including both hydraulic and treatment, demand projections, collection system and I/I information, existing project drawings, *etc.*

Task 3.4 - Reclaimed Water

Existing reports and studies that have been developed for the City's reuse system will be reviewed. SSR has made significant progress in identifying both the institutional and infrastructure requirements for expanding the reuse system. It has been assumed that data from these previous projects are comprehensive and can be used to develop a complete list of reuse projects for consideration in the integrated model. From this review, a technical memorandum will be prepared which will include a compilation of specific information with respect to the existing models and basin plans, infrastructure changes that have occurred since completion of previous studies and the status of the institutional controls that could be used to develop options for the reclaimed water system.

Task 3.5 - Environmental/Permitting Issues

For this task, the project team will meet with the various state and federal agencies that may be required to review and approve permits for the various proposed projects. We will identify and document the permitting requirements necessary for each of the alternatives to be presented in the plan, and what types of studies, investigations or reports that may be needed to support the project permitting process. The project team will also use this information to establish a rating factor for the potential for successful permitting of each alternative for analysis in the model. From this review, a technical memorandum will be prepared which will include a compilation of the specific information needed to develop permits for proposed projects.

Task 3.6 - Preliminary Cost Analysis

Planning level project costs for comparative purposes during Task 3 will be developed or refined. For each alternative, capital and O&M costs will be estimated to facilitate the analysis and scoring of project alternatives that will be discussed in Workshop 3. Construction cost estimates will be developed using CDM's experience in design, bidding and construction of similar projects. Capital costs will be developed to include, in addition to construction costs, an allowance for engineering, legal, and administrative costs and services. Operation and maintenance costs will be estimated as present worth costs over the expected design life of the also will be considered as necessary. From this analysis, a technical memorandum will be prepared which will include a compilation of the planning level costs specific to each proposed project.

Task 4: Quality Assurance and Deliverables

At CDM, quality is defined as meeting or exceeding our client's requirements and objectives and those we set for ourselves. As a result, CDM has a formalized Quality Management Procedure which delineates the procedures we follow to meet our quality expectations. In accordance with CDMs quality policy, this task provides technical review prior to delivery of the Phase I Report.

Task 4.1 Technical Review Meeting

CDM will convene a technical review panel to review the results from Phase I, including review of assumptions, river dynamics, integrated modeling work, and the detailed characterization of specific project options, their costs, and their likely environmental issues.

Task 4.2 Phase I Report – Summary of Preferred Alternatives

Based on technical analysis, qualitative features of the alternatives, and preferences of the stakeholders, CDM will formulate a Draft Phase I Report describing the preferred alternatives and the stakeholder driven process used to derive them.

PHASE II

The final phase of this project is to identify a single preferred alternative as the Final Integrated Water Resources Plan. The final plan will include a detailed technical analysis of the preferred alternatives and a ranking tool to prioritize the alternatives for the stakeholders according to project specific objectives. This will include a workshop to review the alternatives ranking and recommend a plan. A plan for the recommended alternative will be developed, and will include conceptual engineering/design, cost estimating, permitting and planning, a funding plan, an implementation schedule and identification of critical path items, and continued stakeholder outreach necessary to ensure continued broad support during finalization of the plan. CDM will incorporate the results of both phases into a comprehensive Integrated Water Resources Plan which will present a precise summary of the Phase I and Phase II analyses, document the stakeholder involvement process, and present a detailed roadmap including

scope, schedule and funding plan for the City of Franklin. The plan will present a long-term program to meet water resources needs for the next 20 years by identifying the alternatives, their recommended timing, effects, and estimated costs. The highest level of detail will be provided for near-term projects (5 to 10 year horizon), with the understanding that the plan should be periodically updated based on growth, water use and climate trends.

Task 1 - Refined Technical Analysis

As needed, CDM will refine the technical analysis of the component projects or opportunities within the preferred alternatives. This may include (for example) facilities modeling, collection system modeling, water quality modeling, hydraulic and performance calculations, *etc.* The work will support the continued integrated modeling (below) and will lead up to the conceptual design task.

Task 2 - Continued Integrated Modeling and Stakeholder Involvement

CDM will build upon the integrated modeling tool and scorecard tool developed in Phase I as information on the preferred alternatives is refined through detailed analysis (above). The scorecard tool will be updated with refined scores, and will be used at a 4th stakeholder workshop to help select the preferred plan. It is envisioned that this process may not necessarily require selecting from among the remaining alternatives, but that it may include combining the attractive features of the preferred alternatives into a final plan.

Task 3 - Conceptual Design and Cost Estimates to Develop a Selected Alternative

During Phase II, the list of preferred alternatives for long-term water supply solutions will have been developed, and presented to stakeholders for feedback. In order to advance the analysis to develop a final plan, planning-level estimates of the costs of those alternatives will be developed. The purpose of the design task under Phase III will be to advance the design of the selected alternative(s) so that a more accurate understanding of the project details will be available for developing the final plan, and specifically for estimating total project costs, scheduling, implementation issues and permitting requirements. Emphasis will be placed on projects recommended for near-term implementation. The level of detail for design will be dependent upon the alternatives selected, but at a minimum will include land/easement requirements, site planning and layout, Identification and preliminary sizing of major mechanical or electrical systems, preliminary engineering of major structures, and geotechnical evaluation of sites/routes as needed.

Task 4 - Final Plan Development

Development of a final plan will incorporate the critical aspects of scheduling, permitting and funding in addition to the specific design aspects of the selected alternative. The following subtasks provide a general description of these key plan elements that will be provided along with the details of the project conceptual design.

Task 4.1 - Scheduling

One of the key aspects of water resources planning is the scheduling for major program elements. Under this task CDM will develop an integrated schedule listing the major components of each of the alternatives identifying when each phase of the alternative must be initiated and completed in order to have the infrastructure improvements in place in time to meet demands. CDM will develop the schedule with sufficient flexibility as future conditions change as a result of growth, system performance, system structural integrity, system maintenance needs, regulatory requirements, and other factors.

Task 4.2 - Permitting Plan

Our cost estimate for this task does not include the actual permitting as we cannot estimate the level of effort required for this process until the preferred alternative has been identified and preliminary design components are developed. Some alternatives may be scheduled several years into the planning period, and permitting will not be necessary until the alternatives are ready for implementation. CDM will develop a detailed plan for obtaining the permits for each of the selected alternatives, including initial coordination with all regulatory agencies, and present the estimated costs for obtaining the permits for the selected alternative upon adoption of the IWRP.

Task 4.3 - Funding Plan

Once a preferred alternative has been selected, CDM will collaborate with Jackson-Thornton to identify potential funding sources for the alternatives which may include appropriations such as the Water Resources Development Act, Special Appropriations or loans based on rate impacts analyses or other State financing programs. The results of the financial analysis will be summarized and a schedule for funding will be developed. The funding planning process will use information developed through the prior cost estimating and schedule development tasks. A cash flow needs assessment will be developed for the entire program and will include the total dollars needed and timing for major project expenditures. The CDM team will meet with the various funding agencies and determine the process, timing and key elements of the various grant/loan programs. Similar to the permitting process, an overall plan for program funding will be ready to implement upon adoption of the IWRP.