**2. TABLE OF CONTENTS:**

A clear identification of the materials by section and page numbers.

**3. TECHNICAL APPROACH**

The technical approach for performing the tasks must include a detailed Scope of Work along with the process for executing the requirements and objectives of the project.

According to the Project Management Institute (PMI) definition, a project is a, temporary endeavor with a set beginning and end. Projects are unique, have specific deliverables and due dates, are multidisciplinary and complex, have inherit conflicts, and are part of programs. Project Management is the application of knowledge, skills, tools and techniques to a broad range of activities in order to meet the requirements of a particular project.

In this project, we will work with SCAG staff to

1. Increase and implement knowledge of Project Management for better planning, control, and problem solving of current projects.
2. Create templates to facilitate planning and scheduling of future projects using knowledge developed through classifying, planning, scheduling, and controlling current projects.
3. Integrate Project Management as fundamental component on all categories of current and future SCAG projects.

A discussion of the difficulties expected or anticipated in performing the tasks, along with a discussion of how the consultant proposes to overcome or mitigate against those difficulties.

Major difficulties of the project could be

1. The differences in background and knowledge of SCAG staff in Project Management. Differences in the background and knowledge of SCAG staff in Project Management creates two potential problems. Either SCAG staff are exceptionally knowledgeable in Project Management, or more commonly SCAG staff have little or no experience with Project Management. Staff that are exceptionally knowledgeable may become complacent, or object to concepts that are incongruent with their experience. Staff with little or no experience in Project Management may feel overwhelmed. To mitigate against the disparate levels of knowledge, the material has been structured in levels of increasing difficulty. The material begins with simply breaking up the project into parts and advances through the statistics of buffer management. Also, in conjunction with in-person training, the material is presented in a multi-media format which allows users to learn at their own pace. Staff with more intimate knowledge of Project Management can use the material for quick review, while less experienced staff have the ability to review materials material multiple times before advancing.
2. The differences in background and knowledge of SCAG staff in MS Project. Disparate levels of background and knowledge of SCAG staff in MS Project are addressed in much the same way as above. The 10 multi-media presentations are ordered by increasing complexity. Staff will be able to review and advance at their own pace. The material begins with opening the program and creating a new project to cross-platform integration of MS Project.
3. Diversification in the definition of tasks and activities in each of the SCAG projects. Projects by definition are unique endeavors. Therefore, the project management tools presented are universally applicable to a wide range of projects. SCAG staff will learn in which classification each of their projects fall and the inherit complexities of each.
4. Lack of reliability in progress reports. The success of this proposal depends on SCAG staff faithfully reporting their progress. Unreliable progress reports may be a result of staff unable to comprehend the material, or unable to fully review the material. A strong emphasis will be placed on SCAG’s initiative to utilize Project Management and MS Project as an integral part of their operations moving forward.

A detailed schedule for completion of the work, including performance and delivery schedules indicating phases or segments of the project, milestones, and significant events.

1. Training in the basic concepts of Project Management. This will be done through a set of 3-5 teaching and case study sessions in each of the SCAG offices in each of the five counties. Sessions will be conducted (x) times a week for (x) hours per session. Each participant will demonstrate mastery of concepts by
2. Training MS Project. This will be done through about 10 online recorded lectures in three levels of Basics, Intermediate, and advanced topics in MS Project. Lectures can be viewed by participants at any time. Each participant will demonstrate understanding of each lecture by
3. Understanding the nature of SCAG projects in the three dimensions of Main Goals and Specifications, Time Schedule, Budget and Required Resources. This is accomplished by independent study by SCAG staff of the three dimensions of each project in conjunction with in person discussions by the consultant.
4. Moving from manual project planning and control to and MS project based planning and control. This will be done by converting all existing manually planned projects to MS Project. Development of user-friendly templates will aid in the continuing use of MS Project once training has conculed.
5. ---------------------------
6. -------------------

A statement of the extent to which the consultant’s proposed approach and Scope of Work will meet or exceed the stated objectives discussed in this RFP. Furthermore, a discussion of how the consultant would modify the scope of work, and/or schedule to better meet these objectives.

This Scope of Work meets 100% of the stated objectives discussed in this RFP, and exceeds them in the following ways:

**A) Examination of current projects to develop time, budget, and resource templates for future projects.**

All projects by definition are unique. However, one of the consultant’s main takss in this project is to find the appropriate point on the continuum between particularity and commonality. While the tasks of each individual project may not fit into business-as-usual, have one-of-a-kind deliverables, and are aimed at meeting a specific need of SCAG, it is the consultant’s objective to classify them. During classification, the consultant identifies common activities among a set of projects in each specific category. This knowledge is used to develop a typical work-breakdown-structure (WBS) for the project in each category. The WBS includes the (i) time, (ii) resource, (iii) budget, and (iv), life cycle type (S shape or J shape) of the work package forming a set of activities for each project.. This WBS template can be applied to all current and future projects in each category of projects. Having such a template can greatly simplify future projects – just fill in the blanks, while at the same time can ensure important steps and activities are not overlooked. Furthermore, the project plan can be continuously improved and enhanced as the organization gains additional experience with these projects.

**B. Development of a hybrid project budgeting support system**

 A “top-down” budgeting support system will be developed both for comparison of the present projects and more importantly for budgeting of the future projects. In top-down budgeting, executives and managers use their collective experience to estimate the major activity costs of a project. This estimated budget is moved down to middle-managers in charge of further distributing the budget for their assigned activity. This budget trickles down until all activities identified by the WBS are budgeted. Though individual activities may have a larger margin of error, top-down budgeting is quite accurate at the bottom-line. The top-down approach will serve as a guideline for the manual “bottom-up” budgeting by SCAG staff to create more accurate budget forecasts.

**.C) Development of a project classification for Program Management**

Where Project Management is the ability to coordinate activities and resources for the completion of a unique deliverable, Program Management is the ability to coordinate and evaluate all of an organization’s projects. The consultant will study SCAG’s projects and classify them into 4 categories: (a) *Derivative projects:* Produce deliverables onlyincrementally different in product or process from existing offerings. Ex. planning solid-waste disposal for a new housing development. *Platform projects:* Major departures from existing offerings which become "platforms" for the next generation of SCAG projects. Ex. Developing new standards for air quality control. Breakthrough projects: Newer ideas that are proprietary to the industry or organization, or something that SCAG has been developing over time. Ex. Inland ports or truck-only roads. R&D projects: Blue sky, visionary endeavors oriented toward using newly developed technologies, or existing technologies in a new manner. Ex: New highway infrastructure to facilitate inter-vehicle communication.

Classification allows SCAG to: (a) View the mix of projects, (b) Analyze and adjust the mix of projects, (c) Assess the resource requirement indicated by the size, timing, and number of projects, (d) Identify and adjust the gaps in the categories, sizes, and timing of the projects, (e) Identify potential career paths for developing project managers,. An schematic representation of the distribution of the projects (an example shown below) can also help SCAG to (a) Assess resource availability, (b) Reduce the project and criteria set, (c) Prioritize the projects within categories, (d) Select the projects to be funded and held in reserve, and (e) Implement the projects.



**4. TASKS:**

**(i) Tasks Defined in the RFP**

1. Develop detailed schedules for 30 - 40 Planning and Information Technology Projects using Microsoft Project (SCAG already owns the software):

a). Produce schedule task details, network logic and durations;

In close communication with SCAG staff:

1. We will study the scope of work and define the comprehensive characteristics of each project in the three dimensions of specification, time, and budget.
2. Use this knowledge to develop a typical work-breakdown-structure (WBS) for the project in each category. The WBS defines the details of the project in a hierarchical approach; each level is a more detailed representation of the higher level. The lowest level (referred to as work package) is the most detailed definition of the project activities. Each element of the WBS is defined in terms of its goal as well as the required time, budget, and resources.
3. After the WBS, we will create a Critical Path Network (CPN) by defining the precedence of the activities.
4. Next, we prepare the MS Project baseline for each of the 30 - 40 Planning and Information Technology Projects. The baseline will include the critical path network, the deterministic duration of the project, earliest and latest start and end dates for each activity, and the probability of completing the project on time. The base-line of each project will also contain the Planned Value (baseline cost of scheduled work) also known as Budgeted Cost of Work Scheduled (BCWS). The BCSW shows the expected progress of the project and the budget absorbed based on the initial schedule or the most recent information. Graphically, the BCSW is generally an S-shaped curve. Progress advances slowly, then accelerates and an increasing rate until work hits an inflection point mid-way through the project at which progress advances at a decelerating rate until the project is complete. Though S-Shaped Planned Value cures are the most common, certain projects with intensive pre-planning phases, such as information technology projects, have J-shape curves. This means slight constraints in the later stages of the project can have a profound impact on the project quality, budget, and time.
5. Finally, we will prepare the required resource utilization curves for the main resources of all projects.

b). Determine inter-project constraints; The time required to complete a project, availability of key resources, cost of resources, and timing of solutions to technological problems will be identified as inter-project constraints. Besides the conventional methodologies embedded into MS Project, such as Critical Path Network (CPN) and Critical Path Method (CPM), as well as related knowledge such as Problem Evaluation and Review Technique (PERT) , we will also use a state-of-the-art project planning and control tool called the Critical Chain Project Management (CCPM) technique. CCPM was developed by Eliahu Goldratt on the foundations of the well know book “The Goal” and the Theory of Constraints.

c). Schedule input for inter-project constraints.

Working closely with SCAG staff, the consultants will meet with selected team members of each project to discuss the constraints found in our research, request feedback from SCAG staff, and request input for additional unidentified constraints.

**Task Durations.** A project is a composed of three types of work: Known Work + Known Unknown Work + Unknown Work. Task durations are highly variable. People in charge of estimating activity durations usually give a number that they expect to have a 10% or less) chance of missing. Therefore, there is a high chance (90% or more) that the task duration is less than the given number and the projects managers use the opportunity of benefiting from these task buffers. The idea is to motivate people to give a number that they know has a high (50% or more) chance of missing? The idea is to move the task buffers to a pool and allow the tasks use the buffer only if they need it. Pictorial representation of taking the buffers off the task and pool it at the end of the critical chain is show below.



It can be mathematically shown that the buffer for the critical chain is smaller than the summations of the buffers required for all the tasks on the critical chain. Indeed problem evaluation and review technique (PERT) has a partial – but not very clear - view on this property.

**Activity Completion Syndromes.** We will clarify that (i) protecting task times with buffers (knowing that there is a 90% or more chance to complete the task before the quoted time) will degrade on-time performance, (ii) providing specific due date to complete each specific task is against a systematic approach, (iii) Aggressive-but-possible task times could have in on time completion of the projects. We will show the impact of Parkinson’s syndrome, Continue to Polish syndrome, and Student Syndrome as portrayed by Goldratt at CCPM on extending the duration of activities . Schematic representation of the student syndrome is shown below.



**Multitasking.**  In many situations existing project work is not complete before new projects shift priorities leading to multi-tasking. The problems in a project cascade into another project, and there will be a constant pressure to increase staff for peak loads. Therefore, a project’s most likely completion time is much larger than the sum of the averages of the tasks making up it’s longest path (due to synchronization or due to task dependencies). As it is shown the duration of each task in case of multitasking (switching between tasks) is longer than the case starting a new task only after completing the existing task.



**Integration nodes and Synchronization Delays.** In the conventional methodologies such as critical path network (CPN) and critical path method(CPM) embedded into MS project, only activity dependencies are considered. Duration of a projects is determined not only by task dependencies but also by synchronization at the integration nodes (activities with several immediate precedence). For example if the expected duration of each task in the following projects are is 15 days. Then according to CPM computations embedded into MS Project the duration of both projects are 30 days. But in this computation we only considered dependencies and not integrations.



Task durations are highly variable, the 30 days is expected value. Given uncertainties involved in estimating task durations, the actual task durations, for example, may vary from 5 to 25 days. In the first project start of task 3 is defined by the actual duration of task 1, while in the second project start of task 3 is defined by the maximum of the actual duration of both task 1 and task 2. Synchronization of task 1 and task 2 is the key issue in on time completion of the second project. We will cooperate with SCAG staff to recognized the impact of identify integration points and the needs for synchronization at that

Ta We will clarify the importance of controlling (i) Synchronization Delays, (ii) Integration (assembly) points, (iii) integration of the CPM with availability of resources, and

**Pipelining**. The concept is to start the tasks not ASAP but based on the availability of the most constrained resource. The most heavily loaded shared resource (constraint), determines the project due dates. Project needs to starts based on constraint’s capacity. This will also alleviate multitasking.



**Integrate Resource Constraint and CPM to find the Critical Chain, as well as Project Buffer and Feeding Buffers.** The example below clarifies the situation. Given CPM computation the project will take 15 weeks, and all tasks are on the critical path. If the project was grated for 20 days duration, there is a 5 weeks project buffer.



Integrating resources into CPM computations leads a project buffer of 2 weeks and a feeding buffers each of 3 weeks.



**Buffer Management.** Allocate resources to tasks based on buffer burn rate. In the project example given above each activity has 2/18 = 11% project buffer. Task 1 and task for have 3/5 = 60% and 3/4 = 75% feeding buffers, respectively. Tasks 2, 3, and 5 are on the Critical Chain. The critical chain activities that have consumed more than project buffer rate are painted red, while those consuming less than project buffer rate are painted green. SCAG staff need to allocate more time and effort to the red activities.

2. Assist SCAG staff in using Microsoft Project software to monitor schedule performance.

3. Assist with OWP Development, including providing Scope of Work training (how to write comprehensive work scopes)

4. Train staff on use of MS Project Scheduling software

Consultant will develop 10 lectures on MS Project. These lectures will be developed in PowerPoint slides and delivered using lectures recorded in Camtasia Studio. It should be noted that when a lecture is recorded in Camtasia Studio, the PowerPoint slides, the voice of the consultant, curser movement and any other material written on the monitor (using Smart Podium) will appear in the recorded lectures. SCAG staff will simply listen to the lectures at their own appropriate times with the capability to stop and rewind the lectures. The recorded lectures will be on the following topics:

**1. MS Project Basics.** Start MS project, create project plan, create project plan, define project calendar, define tasks, define priorities, and organize tasks into phases.

**2. Establish Resources and Assign Resources to Tasks.** Establish human, material, capital (equipment, building, etc.), and financial resources. Establish recourse scheduled availability, net availability, and consumption rate. Assign resources to tasks.

**3. Refine the Project Plan.** Apply a task calendar to individual tasks, change task types, split a task, establish recurring tasks, apply task constraints, review the critical path network (CPN), and view resource allocation over time.

**4. Project Information.** Sort, group, and filter project data and information. Customize and print views and reports. Format a Gantt chart, draw in a Gantt chart, create and edit tables and custom views.

**5. Project Tracking – Fundamentals.** Establish project baselines, track projects as scheduled, enter completion percentages, track time-phased actual work, identify over budget tasks and resources, and identify and schedule problems.

**6. Project Tracking – Fine Tuning Tasks and Resources.** Manage task constraints and dependencies, set deadline dates, and establish tasks priorities. Enter resource consumption and cost rates, assign multiple pay rates for a single resource, apply different cost rates per assignment, specify resource availability at different times, resolve resource over allocation, level resource allocation.

**7. Advanced Topics -** **Project Plan Optimization**. Project plan optimization, advanced project plan formatting, advanced project plan tracking, and Working with Resource Pools.

**8. Managing Multiple Projects. Manage consolidated projects, create dependencies between projects.** Integrating MS Project with Other Applications.

**9. Customize MS Project to SCAG needs.**

5. Assist staff with SCAG’s monthly OMS progress reporting and Quarterly Progress Reporting (upload of data)

**Earned Value Analysis.** We also work with SCAG staff on how to conduct Earned Value Analysis using the information provided by MS Project. We will assist SCAG staff to comparethe Current Project status with the Baseline Plan. Earned Value reports will be prepared periodically for each individual projects as well as for the SCAG program as a whole. Work scheduled is measured using budgeted (based) cost. Work performed is measured using (i) actual cost, (ii) budgeted (based) cost. Key performance variables will be computed to evaluate the performance of the projects as well as the overall program. They include: Planned Value (PV), the baseline cost of scheduled work (a.k.a. Budgeted Cost of Work Scheduled (BCWS)). Actual cost of work performe. Also shown by (AC). Earned Value (EV), budgeted cost of work performed (a.k.a. BCWP). Schedule variance: Value of work completed - Value of scheduled work, Cost Variance: Value of work completed - Actual Expenditures. Total Variance: Cost Variance – Schedule Variance. Indices such as Schedule Performance Index: SPI = EV / PV, Cost Performance Index: CPI = EV / AC, Budget At Completion, Estimate At Completion and To Completion will be applied. Schematic representation for each project as well as for the SCAG program as a whole will be prepared. A sample of these representations is shown below:



Key decisions in controlling performance in project management are (i) what is the optimal review frequency? And (ii) What are appropriate acceptance levels at each review stage? Both over-managed and under-managed projects result in higher deviations in the three dimensional space of specifications, time, and cost. It is important to understand the difference between (i) common cause variation: “in-control” or normal variation, and (ii) special cause variation: variation caused by forces that are outside the system. Treating common cause variation as if it were special cause variation degrades the system’s performance.