APPENDIX A

SCOPE OF SERVICES

MARICOPA ASSOCIATION OF GOVERNMENTS (MAG)

FY 2016 SYSTEMS MANAGEMENT AND OPERATIONS PLAN

I. WORK PLAN AND TASKS

The purpose of this Section is to outline the major tasks required to be performed by the CONSULTANT in order to produce the needed analyses and deliverables for MAG.

The CONSULTANT shall perform a comprehensive study, based on the tasks described below, leading to the development of a Systems Management and Operations (SM&O) Plan for the MAG planning area. The primary goal of this study is to produce this Plan, utilizing knowledge gained from current best practices, to help guide the MAG region in making strategic investments needed to expand and support: (1) essential technology infrastructure components, and (2) resources essential for the efficient operation and management of critical components of the regional transportation system. The adoption and implementation of the resulting Plan is expected to result in improved safety, efficiency and reliability of the transportation system.

Oversight for the study will be provided by a Technical Advisory Group (TAG), to be formed by MAG, that will consist of all members of the MAG ITS Committee and some members of the MAG TRC Committee. Progress review meetings will occur throughout the study to review findings and recommendations, and to confer at key study milestones. At two such milestones draft recommendations will be presented to MAG committees for review. The execution of each task will result in a Task Report that will document the work performed, findings and recommendations. The finalized Task Reports will serve as the basis for chapters of the Final Report.

STUDY TASKS

Task 0. Project Management & Technical Oversight Process

Project Management
The CONSULTANT shall manage all study activities and closely coordinate such activities with the MAG Project Manager (PM). The project shall adhere to the planned schedule, included in Section III, as feasible. Any agreed upon changes to the planned schedule shall be documented via a contract amendment. The CONSULTANT shall participate in monthly project coordination meetings with the MAG Project Manager.

Project Oversight
A Technical Advisory Group (TAG) will be established by MAG to provide oversight to the study. The TAG will be made up of members of the ITS Committee, and a few members of the Transportation Review Committee, staff members from ADOT, FHWA and MAG. Progress review meetings will be held, as needed, in coordination with the monthly ITS Committee meetings. Draft documents will be submitted to the MAG PM one week prior to the planned distribution to the TAG. Two weeks will be provided for review by the TAG, followed by discussion of comments at a TAG meeting. All comments on drafts will be addressed in final documents and delivered to the MAG PM. All documents shall be delivered to MAG in Microsoft Word, Excel, Powerpoint and Adobe Acrobat PDF formats.

Deliverables: Project Management Plan (PMP). The PMP will include the TAG role, a stakeholder communications plan, quality control plan, and the planned schedule in Excel (using the format provided by MAG). The schedule should include: 1) all project meetings, 2) anticipated dates for deliverables to be submitted to the MAG PM at least one week ahead of submission of draft deliverables to the TAG, 3) and dates for reports to or actions to be taken by the various MAG Committee's as appropriate (MAG ITS, Transportation Review, Transportation Policy, and Management Committees, and Regional Council).

Task 1: Identify Best Practices in Urban Transportation Systems Management & Operations

In carrying out this study task the CONSULTANT shall:

1. Utilize the panel of SM&O experts and thought leaders already established by MAG for an opinion survey to be conducted during this study task. This panel will include at least one member from outside the US to provide an international perspective. The panel composition and an overview goals of the survey will be presented to the TAG at the project kickoff meeting.

2. Conduct an opinion survey with panel members using an online survey tool to identify the top 10 urban areas with exemplary practices in managing and operating multi-modal, cross-jurisdictional transportation systems. At least one urban area that is comparable to MAG in distributed road ownership and traffic management responsibilities will be identified. The panel will also be asked to identify notable examples from these areas on strategic-, programmatic-, and deployment-level SM&O strategies.

3. Organize and facilitate a "virtual" meeting between the TAG and the expert panel via a webinar to enable discussion and collaboration. Panel members will discuss the exemplary practices in each of these urban areas. They will also be asked to provide comments on the focus areas listed below in 4(b) through 4 (f), as much as feasible.

4. Conduct phone interviews with relevant authorities at each of the exemplary regions, and follow-up interviews with expert panel members (as necessary) to gather information and summarize findings under the following headings for each exemplary region examined:

    a) Transportation System Description: Describe the transportation system and its characteristics as it pertains to SM&O. Highlight key similarities or differences in comparison to the MAG region. For example, the presence of an arterial grid network similar to the MAG region.
    b) Institutional Framework: Identify the supporting institutional framework for best SM&O practices. This shall include information from published studies together with relevant information from agency SM&O Plans. How are the reviewed major urban regions organized to coordinate across facilities and modes such as freeway operations with adjacent arterial facilities owned by local agencies? How do the regions in the US address planning for operations within the metropolitan planning process?
    c) Alternate Business Models: Identify alternate business models being used to support SM&O practices, including public-private partnerships. How have other major urban regions organized, both institutionally and financially, to manage and operate their urban transportation system? This review shall highlight practices in the urban regions comparable to the MAG region. How are transportation SM&O functions staffed and funded at the regional and

local levels? What are the staffing qualifications, training and certification requirements, position descriptions and salary ranges?

d) SM&O Tools: Identify tools that are being used to support SM&O practices. How much of SM&O functions are automated and how are such systems supported? What decision support and analytical tools are being used to help refine traffic operations?

e) Performance Measurement and Data: Identify how system performance is addressed. What metrics are used? Describe the mechanism for establishing and reporting on performance targets. How independent or transparent is the process? Are periodic or ongoing web-based performance reports provided? How is data shared with the MPOs for performance measurement – What is the process for quality control of data?

f) Technology Investment Decisions: What are the oversight practices for key technology investment decisions? Are there established technical oversight processes and do they utilize panels of experts? What is the current strategy/decision process for the adoption of appropriate new technologies to replace old technologies? Are there specific considerations of equipment life-cycle, annual maintenance cost, system reliability degradation?

Deliverables: Task 1 Report - Best Practices in Urban Transportation SM&O - Document the findings in a synthesis report. The report will include key findings on effective practices related to institutional frameworks, alternative business models, tools, performance measures and data, and technology investments, as well as other relevant findings (such as project prioritization processes). This will be followed by short case studies on the 10 urban areas, with information summarizing the transportation system in each area and its characteristics, particularly similarities or differences in comparison to the MAG region, as well as the relevant innovations including, but not limited to:

- Connections with the private sector for data and service delivery,
- Innovative public-private partnerships,
- Effective practices in SM&O program planning, including processes for prioritizing and programming project investments in a performance-based process,
- Examples of ICM implementation involving freeways, arterials, data sharing and elevated multi-agency operations; and
- Multi-agency TMC/TOC operations.

Lessons learned will be an important part of the discussion and summary.

Task 2: Current and Planned (Near-Term) ITS Infrastructure and Current SM&O Practices

The CONSULTANT shall address the following objectives to document the status of current and near-term ITS infrastructure, and management and operations practices in the MAG region and where feasible, compare them to best practices:

1. A review of freeway ITS infrastructure – all elements of the Freeway Management System.
2. A review of arterial ITS infrastructure – update elements addressed in the 2011 MAG Regional SMO survey.
3. Current connectivity and control of ITS infrastructure.
4. Current freeway and arterial operational functions.
5. Prevailing Concept of Operations and identify key enablers such as better institutional support, resources, business processes.

6. Evaluate the life-cycles of current ITS technology infrastructure.
7. Utilization of performance measures to monitor progress and allocate resources.
8. Staffing and staff development in essential technical skills.

Near-term ITS infrastructure is defined as what is implemented by the end of FY2020 or June 2021.

The following subtasks will be carried out to address the objectives stated above.

Task 2.1 Review of Freeway and Arterial ITS Infrastructure

The CONSULTANT shall develop and administer an electronic survey to gather information on existing and planned (near-term) infrastructure coverage with a focus on ITS and operations-related infrastructure, staffing, Traffic Management Center (TMC) operations and hours, performance measures, and performance monitoring, among others. Two separate surveys will be developed and distributed, one for ADOT focused on freeway technology infrastructure and operations, and the second survey focused on arterials to be distributed to all other MAG member agencies (within the MAG planning area in Maricopa and Pinal counties). The information gathered via the surveys will be summarized to produce the ITS Infrastructure Summary.

Infrastructure questions will focus on range of technologies used for freeway and arterial operations and management, density of deployment, locations (corridors), gaps in device coverage, telecommunications capabilities, interconnection (and ability to control devices in real-time), traffic signal software, equipment performance measures, equipment maintenance strategies, and any use of lifecycle costing or tracking. Another important component will be questions focused on infrastructure planning and funding at the agency level. Information from this portion of the survey will be summarized in tables/matrices and will be organized into logical sections for readability. The results will be formatted so that this information can be easily updated in the future.

The execution of this task shall answer the following questions and summarize the information using appropriate tables/matrices/graphics and will be organized into logical sections for readability. The CONSULTANT shall format this information so that it can be easily updated in the future.

Freeway Infrastructure:

- The current FMS coverage in miles, and planned additional coverage and schedule.
- Basic FMS infrastructure features and operations elements - Fiber-optic backbone, CCTV, ramp meters, DMS, Alert, FSP, Centralized ATMS for ramp meters and interchange traffic signals.
- Anticipated ITS infrastructure on the South Mountain Freeway.
- Funding of costs associated with FMS infrastructure and operations -- FMS infrastructure funded by the MAG RTP; FMS operations (Phoenix component) funded by ADOT & MAG.

Arterials Infrastructure:

- Update all elements addressed in the 2011 MAG Regional TSMO Survey, current and planned.
- Current coverage of arterial traffic signal systems - expressed in miles of arterials and the total number of traffic signals.
- Funding sources for costs associated with arterial ITS infrastructure and operations.

- Basic arterial ITS infrastructure features and operations elements - TMC, Fiber-optic communications backbone, CCTV, DMS, Centralized ATMS.
- Signal controller technologies in use across the region.
- Infrastructure available for data collection for system performance monitoring.

Task 2.2 Review of Current SM&O Functions and Concept of Operations

During this task the CONSULTANT shall identify all freeway and arterial SM&O functions that are currently being performed across the MAG region. For freeway functions, identify currently established practices in Integrated Corridor Management, Traffic Incident Management, ramp metering and the posting of travel times. Identify which functions are reactive and which are proactive. A similar summary of functions shall be produced for arterials.

Develop a high level Concept of Operations that will adequately describe and illustrate key aspects of the current functions and operations of freeways and arterials. It will identify key business processes, and also estimate potential benefits and return on investment for these operations. Review the MAG Performance Dashboard to determine if it can help support some of the benefits assessment. This will be limited to currently established functions and will not include any new functions that are being studied and yet to be established in connection with planned Active Traffic Management (ATM) projects. The following topics will be addressed:

Freeways:
- Describe the range of freeway traffic management and operations functions currently performed.
- Identify key areas and functions that need to be improved. Identify key enablers such as better institutional support, resources, and business process improvements.
- Describe the business case for supporting the current FMS operation. What are the likely benefits accrued and the estimated annual Return on Investment (ROI).

Arterials:
- Describe the range of traffic management functions currently performed by city TMC staff.
- Identify any key areas and functions that need to be improved.
- Identify key enablers such as better institutional support, resources, and business process improvements.
- Describe the business case for supporting the current TMC operations and expanded hours of operations.
- Describe the likely benefits accrued and the estimated annual Return on Investment (ROI).
- Describe any signal controller technology deficiencies.

Task 2.3 Review Technology Utilization

Utilizing survey information, perform a review of lifecycle costs of key ITS technology elements currently being utilized on freeways and arterials. Follow-up with selected agencies to discuss challenges with equipment lifecycles, and lifecycle planning that is currently being done, equipment compatibility issues, challenges with legacy systems and equipment procurement issues, and other relevant topics.

Identify what key ITS technologies have proven to be cost-effective and assess how much longer each particular technology may be viable. Identify specific technologies that support key functions for which alternatives may exist as more efficient technologies or

an established service provider with an efficient and more economical solution. Identify which ITS technologies may need to be replaced or upgraded.

Draw upon findings from the best practices review in Task 1 and produce a comparison of how current ITS technology infrastructure is being utilized to make decisions related to operations and management.

Task 2.4 Lessons Learned & Recommendations

Identify lessons learned from the implementation of ITS infrastructure on freeways and arterials over the last 20 years. In addition to information from the survey, the CONSULTANT will also perform phone interviews with key agency staff to identify notable shifts and trends over the last 20 years, and how they may impact agency operations and management in the future. This subtask will also examine institutional processes, such as staffing and resource allocation, training and capacity building, inter- and intra-agency coordination and necessary formal agreements. Some of this might relate to current operating models or perhaps to partnerships (public-public and public-private) and other institutional dimensions.

The results from executing this task shall include, but not be limited to recommendations for: (a) utilization of performance measures to monitor progress and allocate resources; (b) potential institutional changes to better facilitate the shift to a focus on SM&O; (c) necessary staffing and training needs to better address SM&O.

Deliverables: Task 2 Report - ITS Infrastructure and SM&O Practices – This report will document the findings of subtasks, 2.1 through 2.4.

Task 3: Develop the Long Term Vision and Concept of Systems Management and Operations

The CONSULTANT shall execute this task to establish the long term vision (2030) and the desired Regional Concept of SM&O for the MAG region, based on: (1) Infrastructure improvements identified in current MAG plans for this period; (2) Sound assumptions on likely future scenarios, the influence of emerging technological advances in areas related to mobility; (3) Other likely trends in travel behavior and travel patterns. Considering rapid pace at which SM&O related technologies are evolving, the long term vision will be based on the horizon year 2030 and realistic technology evolution milestones anticipated within this period.

In addition to the essential coordination between freeways and arterials, the Concept will also incorporate improvements and changes that are likely to emerge by 2030 with varying degrees of certainty such as:

- Implementation of Active Traffic Management (ATM) at appropriate locations in several phases. This will draw upon the current experience of ATM implementation in the US and network screening guidelines to identify the best potential ATM sites.
- Migration to new data sources including detection technology, probe vehicles and private data sources.
- Refinements to Freeway-Arterial operations for Integrated Corridor Management.
- Desired freeway safety features such as a system to reduce wrong-way entry at ramps.
- Relevant applications based on Vehicle-to-Vehicle (V2V) communications - ref. AASHTO CAV roadmap.
- USDOT plans including Crash Avoidance Metric Partnership (CAMP) V2I Applications Program.

- Possible entry of autonomous vehicles into the fleet.
- Implementation of new light rail corridors.
- Influence of ridesharing programs growth and evolution in their business models and on-demand transportation options.
- National initiatives, such as Smart Cities, encouraging integration and connectivity of multiple agency systems, including transportation infrastructure and operating systems.
- Effect of any regional projects that might change the footprint such as lane additions, South Mountain Freeway, Tempe Streetcar, projects funded with Prop 404 in City of Phoenix, I-10/I-17 Near-term improvements and road diets.

The long term vision should not necessarily be constrained by the existing institutional structure of ownership and facility management. This task will also identify: (a) key challenges (from today's perspective) to achieving the 2030 vision; and (b) possible solutions for such challenges, including a more effective regional institutional framework to support traffic operations and management. This task will also describe a process how the region might move from the current environment to the 2030 vision.

In executing this task the CONSULTANT shall prepare and facilitate 2 virtual charrettes involving TAG members. Information gathered in Tasks 1 and 2, as well as knowledge of local agency priorities, transportation system challenges, and agency relationships will be utilized. These virtual charrettes will be structured to allow for focused discussion and brainstorming on what could be implemented as part of a 2030 system in the MAG region, perhaps tackling two or three key topics at a time. Potential topics for these charrette discussions include:

- Connected traveler expectations.
- CV/AV Impacts on the future transportation systems and likely technology milestones.
- The realities of rapidly emerging technologies – short lifecycle, constant innovation, and compatibility with legacy equipment and systems.
- Streamlining systems for operations and cost efficiencies.
- Asset management and proactive maintenance of new technologies.
- Next-Generation corridor management strategies.
- Staff Knowledge/Skills/Abilities (KSAs) for new technologies and highly integrated systems.
- Performance metrics, performance goals, and return on investment.
- Institutional readiness for 2030 SM&O.
- Regional operations business models – In-house, collaborative, outsourced.

The CONSULTANT will work with the TAG to map out specific focus areas for the Concept, and will share interim concept ideas with the TAG, prior to formalizing the draft deliverable. Potential elements of the Concept of Operations are envisioned to include:

- Active management strategies, including ATM and ICM on freeways and actively managed arterials.
- Coordinated operation of ramp meters and adjacent traffic signals.
- Seamless coordination for freeways and arterials as part of advanced ICM operations.
- Full multimodal information sharing and coordinated operations on corridors.
- Decision Support Systems (DSS) that can support proactive and predictive system operations.
- Virtual and multi-jurisdictional operations capabilities.
- Integration of new data sources, such as probe data, to support real-time operations and performance measures.
- Connected and Autonomous Vehicles.

- Expansion of the TIM Coalition and coordinated incident response (to include all local law enforcement agencies).
- Active performance management that informs day-to-day operations.
- Data management and seamless information sharing.
- Business models for leveraging private sector advances in traveler information and connectivity to travelers.

Deliverables: Task 3 Report – Long Term Vision and Future Concept of Operations.

Task 4: Establish Regional Priorities for SM&O Investments

The CONSULTANT shall execute this task to develop and recommend a methodology to classify facilities on the freeway and arterial road network into a tiered hierarchy from an operations viewpoint. This methodology, upon adoption by MAG, will serve as the basis for future regional SM&O investments. The resulting classification of the road network will guide future decisions to allocate regional resources to either build or replace necessary ITS infrastructure, and to support staff resources necessary to operate the facilities at the desired level of SM&O, as identified in the Long Term Vision and the Concept of SM&O. It is anticipated that some of the costs associated with operating key regional facilities may need to be partially funded by the region. These costs will include the costs to implement and operate sub-regional Traffic Management Centers that will be essential to support traffic management operations beyond normal working hours. The CONSULTANT shall also review and incorporate any regional priorities, relevant to traffic management and operations, recommended in the Central Phoenix Framework Study.

Task 4.1: Methodology to Establish a Hierarchy of Road Facilities for SM&O

The CONSULTANT shall perform the following as part of this subtask:

a. Review alternate approaches for screening road facilities to determine regional SM&O investment priorities.
b. Develop draft criteria for defining a tiered hierarchy/classification of road facilities considering:
   i. Compliance with CFR 23.511 requirements that calls for the identification of *Routes of Significance for the state's Real-Time System Management Information Program.*
   ii. Address factors such as – high volume facilities such as freeways and major arterials on NHS, freight corridors, transit corridors, performance with respect to road safety, performance with respect to travel time reliability,
   iii. Take into consideration the impact of population and demographic trends,
   iv. Role of ICM operations (such as parallel arterials for alternate routing), availability of arterial data, and
   v. Jurisdictional and regional significance (such as proximity to major special event venues).
c. Recommend a process for reviewing and updating of facility classification, as necessary, prior to each TIP programming cycle.
d. Review of draft criteria by the TAG & TRC (formal presentation).

The CONSULTANT shall research different approaches used to identify priority corridors in comparable urban areas. Some of this information may be generated during Task 1 and supplemented by additional research. Factors or criteria to be considered may include, but not limited to, traffic demand, freight corridors, transit corridors, road safety, and travel time reliability. Other considerations could include the role of a facility in ICM

operations (such as parallel arterials that serve as alternate routes during freeway closures), proximity to major traffic generators, traffic volumes, among others.

The CONSULTANT shall coordinate with the TAG to review the methodology, identify appropriate criteria and, if necessary, identify weights for the criteria through a consensus process. The resulting methodology shall be a simple logical process that will consider the key factors for SM&O. The road hierarchy information generated shall result in a map of the region that depicts all freeways and major arterials by their classification.

This task will also develop and recommend an efficient process for reviewing and updating the classification of the road network prior to each MAG TIP programming cycle. Reviewing these corridors over time will account for future growth, increases in traffic volumes or crashes, and other demographic trends.

Upon review and approval by the TAG, the draft criteria and the classification methodology will be presented to the MAG Transportation Review Committee (TRC) and will be modified based on any feedback received prior to work on Task 4.2.

Task 4.2: Identify Initial List of Prioritized Facilities for Regional SM&O Investments

The CONSULTANT shall apply the criteria and methodology developed in the previous subtask to identify the initial/current road hierarchy for SM&O in the MAG region. This information when displayed on a map will identify SM&O investment priority (rank) for each defined road facility. In addition, a list of prioritized facilities will be produced with information on their current and planned ability to be actively managed by the relevant operating agencies.

This phase of the study will conclude with four formal presentations (in addition to ITS/TAG) to MAG committees and obtaining MAG approval of the proposed tiered road hierarchy for SM&O. This task marks an important decision point for developing the SM&O Plan.

Study findings up to this task and the recommendations from this task and the next steps will be presented to the Transportation Review Committee (TRC), Management Committee (MC), Transportation Policy Committee (TPC), and Regional Council (RC). The CONSULTANT will work with the MAG Project Manager and the TAG to resolve any feedback and comments from these Committees, which could result in revisions to the recommended process and methodology.

Deliverables: Task 4 Report – Regional Priorities for SM&O Investments: This document will summarize screening approaches, the draft criteria and any weighting selected for prioritizing, a methodology for reviewing and updating priorities and classifications, and priority corridor maps and list. Number of slides to be used for formal MAG presentations: a maximum of 15 slides for TRC, a maximum of 10 slides for all other committees.

Task 5: Develop Initial SM&O Implementation Plan

The CONSULTANT shall coordinate with the TAG to identify a comprehensive set of recommended strategies/projects for inclusion in the SM&O Implementation Plan, develop an Excel-based tool to estimate costs, and develop a modified TIP programming process.

Task 5.1: Recommended SM&O Strategies

The recommended strategies will primarily focus on the priority corridor facilities and needs, taking into account planned projects such as the completion of the Proposition 400 FMS coverage and completion of the South Mountain freeway. Other initiatives to be considered shall include ICM and Active Traffic Management corridors, virtual or sub-regional TMCs to support extended operating hours. These recommendations will be phased into manageable and logical stages, with the initial phase starting in FY2021, and working toward the 2030 Concept of Operations. The CONSULTANT shall describe and graphically depict proposed strategies and show how strategies will be 'connected' and how each phase will build on prior phases. The phases are defined as:

- Phase 1: 2021-2024
- Phase 2: 2025-2027
- Phase 3: 2028-2030

Task 5.2: Estimate Implementation Costs

The CONSULTANT shall also develop an Excel-based planning tool for generating budget estimates for SM&O, by performing analyses and a breakdown on how much it will cost to build out, operate, and maintain the transportation operations vision developed in earlier tasks. This tool will utilize unit costs from existing and planned ITS infrastructure inventory from earlier tasks or other resources. It is expected that this tool will help identify the long-term financial commitment necessary to fund SM&O, by estimating resources needed for each phase of the Implementation Plan, breaking it down by: (1) Infrastructure Costs - new, replacement, maintenance; and (2) Operational Costs - - staffing, training, equipment, facilities, maintenance

Task 5.3: Develop the TIP Programming Process for SM&O Projects

This task will involve the development of a detailed process that will guide the MAG ITS Committee in recommending individual SM&O projects to be programmed in the MAG TIP. This task will involve extensive consultation with the TAG and MAG staff to describe the current process and introduce process modifications necessary to implement regional SM&O priorities.

The CONSULTANT shall present options to the TAG for how funding could be allocated between regionally significant projects and other priority projects identified by partner agencies. Factors that could influence priority projects that are not deemed to be regionally significant could be future growth areas, anticipated development, or a significant change in demographic and population patterns.

An example for a possible the end result of applying the modified process will be that, a certain percentage of funds to be allocated by MAG (this will be a MAG policy decision to be made at a later date) for SM&O improvements (or ITS projects) will be targeted to be programmed for high priority regional SM&O projects identified in the Implementation Plan. The remaining funds will be available to be programmed for other regionally prioritized SM&O projects.

The source and the amount of funds to be programmed for projects that support critical operations, as well necessary eligibility criteria, will be based initially on the need for such support for subregional TMCs.

Member agencies will be able to request regional SM&O funds for new infrastructure, upgrades, replacements as well as funding support for critical operations (subject to eligibility criteria) on facilities that are classified as regionally critical.

Such an approach will expand the availability of regional funds for both infrastructure and operations, and will help focus resource allocation for improving SM&O on facilities that are clearly identified as regional priorities. The resulting process shall ensure that opportunity is provided for smaller agencies, possibly not linked by regionally significant road facilities, to access regional funds for developing their SM&O infrastructure.

The resulting Initial SM&O Implementation Plan and the Programming Process for SM&O may be applied during the programming of new ITS projects in the TIP in FY2021, anticipated to occur in August 2017.

Deliverables: Task 5 Report: Initial SM&O Implementation Plan - (a) A report that will document the recommended strategies/projects for inclusion in the Initial SM&O Implementation Plan; (b) An Excel-based tool for estimating SM&O costs; and (c) Recommend modifications to TIP process for programming future ITS or SM&O projects, based on regional SM&O priorities.

Task 6: Recommend Data Collection, Performance Measurement and Reporting Processes

This goal of this task will be to generate recommendations for establishing an active performance management program at MAG, that will be able to generate performance reports on SM&O at the system level or for large projects. It is anticipated that future SM&O programs and large projects will be evaluated by MAG using performance-based criteria. There is a strong correlation between this task and Task 7, which will involve an annual MAG review of progress and performance trends.

Performance measures identified from exemplary urban areas during Task 1 and associated data will be reviewed to identify SM&O performance metrics that could be utilized by MAG, based on data currently available. Regional data sources such as the MAG Regional Transportation Safety Information Management System (RTSIMS) for crash data, and the Regional Archived Data System (RADS) server for traffic data will be reviewed. This task will identify any significant data gaps and coordination required for gathering any additional data elements required for performance measurement, available from ADOT, DPS (for incident management data) and local agencies (for arterial traffic data).

The CONSULTANT shall coordinate with MAG staff to review the existing MAG performance measurement metrics and process, identify and recommend additional SM&O metrics on system performance to be included in reports at MAGnitude, the MAG website for performance measurement.

The CONSULTANT shall also explore the feasibility, based on Task 1 best practices, of establishing a regional traffic data collection infrastructure layer that could either utilize existing SM&O infrastructure or gradually build such a layer as part of regionally funded new SM&O infrastructure on key facilities.

Deliverables: Task 6 Report: Recommended Processes for Data Collection, Performance Measurement and Reporting

Task 7: Recommend the Framework for Annual SM&O Performance Review

The CONSULTANT shall research best practices and potential models for MAG to conduct an annual SM&O performance review. This research will likely include annual performance reports by some larger transit operators that reports on performance against service goals, revenue, etc.

A strawman version will be developed for review by the TAG, which will highlight: (a) key performance metrics identified in Task 6; (b) a process for establishing key performance goals and targets that could be utilized to demonstrate the return on investment related to SM&O strategies. The strawman version shall include guidance for reporting on system level performance for top tier facilities, and for selected regionally significant projects. The data analysis required for the SM&O Performance Review will be performed by MAG staff and will be automated where feasible, based recommendations in the strawman version, to be reviewed and recommended by the MAG ITS Committee for reporting annually to all higher MAG committees. This review will identify system performance outputs with respect many metrics including safety, mobility, reliability and efficiency, and also identify both past and future programmed SM&O investments. The CONSULTANT shall provide sample reporting formats, as well as recommend a methodology for distributing the report, including posting on the MAG Performance Measurement website.

Deliverables: Task 7 Report: Framework for an Annual SM&O Performance Review

Task 8: Produce the MAG SM&O Plan FY2021-FY2030 Final Report & Executive Summary

The CONSULTANT shall summarize the key findings from all Task Reports into one Final Report and an Executive Summary for review and approval by MAG.

Deliverables: Final Report & Executive Summary. Final documents delivered and participate in four formal presentations at MAG on the SM&O Plan.

II. DELIVERABLES

Required products from this study are listed below by task. An administrative draft of each deliverable report will be submitted in electronic form and hard copy format (upon request) to the MAG project manager for review. The CONSULTANT shall address comments from the MAG project manager in the draft deliverable, before it is distributed to the TAG for review. Comments received during the TAG review process will be incorporated into the final documents and delivered as shown in the planned schedule. All documents shall be delivered to MAG in Microsoft Word, Excel, Powerpoint and Adobe Acrobat PDF formats.

Task 0: Project Management & Technical Oversight Process

Deliverables: Project Management Plan (PMP). The planned schedule in Excel (using the format provided by MAG), depicting: 1) all project meetings, 2) anticipated dates for deliverables to be submitted to the MAG PM, at least one week ahead of submission of draft deliverables to the TAG, 3) and dates for reports to or actions to be taken by the various MAG Committee's as appropriate (MAG ITS, Transportation Review, Transportation Policy, and Management Committees, and Regional Council).

Task 1: Best Practices in Urban Transportation SM&O

Deliverables: A synthesis report that will include key findings on effective practices related to institutional frameworks, alternative business models, tools, performance measures and data, and technology investments, as well as other relevant findings (such as project prioritization processes). This will be followed by short case studies on the 10 urban areas, with information summarizing the transportation system in each area and its characteristics, particularly similarities or differences in comparison to the MAG region, as well as the relevant innovations.

Task 2: Current and Planned (Near-Term) ITS Infrastructure and Current SM&O Practices

Deliverables: A task report that will document findings from the four subtasks on: (a) Review of freeway and arterial ITS infrastructure; (b) Review of current SM&O functions and Concept of Operations; (c) Review technology utilization; (d) Lessons learned from the ITS implementation over the last 20 years.

Task 3: Long Term Vision and Concept of Systems Management and Operations

Deliverables: Facilitate TAG discussions through two virtual charrettes to develop the long term vision and the Concept of SM&O for the region. A task report will document the process followed and the conclusions reached by the TAG.

Task 4: Regional Priorities for SM&O Investments

Deliverables: A task report that will document the methodology developed to classify facilities on the freeway and arterial road network into a tiered hierarchy for optimizing future regional investments in SM&O. This report will summarize screening approaches, criteria and any weighting used for prioritizing, and a methodology for reviewing and updating priorities and classifications, and priority corridor maps. Deliver a total of five formal presentations to MAG committees on the recommended methodology. Number of slides to be used for formal MAG presentations: a maximum of 15 slides for TRC, a maximum of 10 slides for all other committees.

Task 5: Initial SM&O Implementation Plan

Deliverables: This task will deliver: (a) A report that will document the recommended strategies/projects for inclusion in the Initial SM&O Implementation Plan; (b) An Excel-based tool for estimating SM&O costs; and (c) Recommend modifications to TIP process for programming future ITS or SM&O projects, based on regional priorities.

Task 6: Data Collection, Performance Measurement and Reporting Processes

Deliverables: This task produce a report that will recommend ways to enhance existing processes for data collection, performance measurement and reporting.

Task 7: Framework for Annual SM&O Performance Review

Deliverables: This task will produce a report that will recommend a framework for an annual SM&O performance review with guidance on reporting on system level performance for top tier facilities, and for selected regionally significant projects.

Task 8: MAG Systems Management and Operations Plan Draft Final Report & Executive Summary

Deliverables: A Draft Final Report that summarizes key findings from all tasks into one report and an Executive Summary. Four (4) formal presentations will be made to MAG Committee seeking approval of the Draft Plan.

III. SCHEDULE

MAG Systems Mangement and Operations Plan - Kimley-Horn & Associates
PLANNED SCHEDULE

	Meetings & Deliverables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		2016											2017					
		Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	MAG ITS Committee Meeting (Date, first Wednesday of the month unless otherwise noted)	10	7	12	9	14	4	1	1	5	3	7	12	2	6	4	1	6
	MAG ITS Committee Meeting (Week occurring on)	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	
	Technical Advisory Group Meeting	x	x	x	x	x	x	x		x	x	x			x	x		
	Draft Deliverable	0	1 2		3	4	4				5	5	6	7	8	8		
	Final Deliverable	0		1 2		3				4		5		6	7		8	
	TASK - DELIVERABLE																	
0	Project Management and Technical Oversight Process																	
	Project Coordination Meetings w/ MAG PM	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		
	Project Management Plan	x x x	D R F															
1	Best Practices in Urban Transportation Systems Management & Operations																	
	Establish panel of experts	x x																
	Conduct opinion survey with panel of experts to identify top 10 regions	x x																
	Interview authorities at top 10 sites on 4b through 4f	x x x																
	Virtual meeting: Collaborative Review of Best Practices - Webinar PowerPoint/TAG meeting	x	x x															
	Task 1 Report	x x	D R R R	R F														
2	Current & Planned ITS Infrastructure and Current SM&O Practices																	
2.1	Review of Freeway and Arterial ITS Infrastructure	x x x x	x x x															
2.2	Review of Current SM&O Functions and Concept of Operations	x x	x x x															
2.3	Review of Technology Utilization		x x x															
2.4	Lessons Learned & Recommendations		x x															
	Task 2 Report		x	D R R F														
3	Long Term Vision and Concept of Systems Management and Operations																	
	Prepare Interactive Webinar Materials			x x x x	x													
	Hold Interactive Webinars/Virtual Charrettes			x	x													
	Task 3 Report			x x x	x x	D R R F												
4	Regional Priorities for SM&O Investments																	
4.1	Methodology to Establish a Hierarchy of Road Facilities for SM&O				x x x	x												
	Presentation of Methodology & Draft Criteria to TAG & TRC						x											
4.2	Identify Initial List of Prioritized Facilities for Regional SM&O Investments					x x	x x x											
	Presentations to ITS TRC MC TPC RC						x x	x x x x	x x x x									
	Task 4 Report					D R R	R R R R	R R R R	R R R R	R F								
5	Initial SM&O Implementation Plan																	
5.1	Recommended SM&O Strategies									x x x x	x x x x x							
5.2	Estimate Implementation Costs									x x	x x x x x							
5.3	Develop TIP Programming Process for SM&O Projects										x x x x x							
	Task 5 Report										D1 R R R	R D2 R R F						
6	Data Collection, Performance Measurement and Reporting Processes																	
	Recommend SM&O Performance Metrics and Identify Data Sources												x x x x	x				
	Recommend Additional MAG Performance Measures on SM&O												x x x					
	Explore Feasibility of Regional Traffic Data Collection Infrastructure												x x x					
	Task 6 Report												D	R R R F				
7	Recommend the Framework for Annual SM&O Performance Review																	
	Develop strawman version of SM&O performance review													x x x x				
	Task 7 Report													D	R R R F			
8	MAG SM&O Plan FY 2021-FY 2030 Final Report Executive Summary																	
	Executive Summary													x x x	D1 R R	R D2 R R		
	Draft Report													x x x	D1 R R	R D2 R R		
	Presentations														x x	x x x x x	x x	
	Final SM&O Plan FY2021-FY2030															x x x	x x x F	
	MAG Approvals																	
	MAG ITS and TAG		x	x	x	x	x	x		x	x	x		x	x	x		
	MAG Transportation Review Committee						x	x									x	
	MAG Management Committee								x									x
	MAG Transportation Policy Committee								x								x	
	MAG Regional Council								x									x

x Meetings
x Task activity
D Draft deliverable
F Final deliverable
R Review period
0,1,2.. Deliverable Number by Task

IV. CONSULTANT WORK TEAM

Kimley Horn and Associates, Inc. – Prime Consultant

Lisa Burgess	Alan Toppen
Pierre Pretorius	Mark Dunzo
Deanna Haase	Cole Dagerhart
Douglas Gettman	Nick Warren
Brent Crowther	Dennis Motiani
Michael Grandy	Natalie Smusz-Mengelkoch
Amy Garinger	Heather Stifanos
John Kissinger	Lyndee Walborn
William Roll	Jessica Jensen
Randy Durrenberger	

ICF International, Inc – Subconsultant

Michael Grant	Lindsay Oluyede
Deepak Gopalkrishna	Jessica Clion
Janet D'Ignazio	

The CONSULTANT shall form a work team of key personnel (as named above) to perform project tasks.

Pierre Pretorius will service as the CONSULTANT's project director. He will be primarily responsible for overseeing the project, and ensuring quality control. Lisa Burgess will be the project manager. She will have the primary responsibility for executing project tasks according to the Work Plan and Schedule, and coordinating with MAG.

V. BUDGET

The budget for the project by task is as follows:

TASK	BUDGET
Task 0: Project Management & Technical Oversight Process	$ 22,215.89
Task 1: Best Practices in Urban Transportation SM&O	$ 40,669.60
Task 2: Current and Planned ITS Infrastructure and Current SM&O Practices	$ 31,095.91
Task 3: Long Term Vision and Concept of Systems Management and Operations	$ 38,471.99
Task 4: Regional Priorities for SM&O Investments	$ 52,515.52
Task 5: Initial SM&O Implementation Plan	$ 53,762.07
Task 6: Data Collection, Performance Measurement and Reporting Processes	$ 25,066.93
Task 7: Framework for Annual SM&O Performance Review	$ 19,202.89
Task 8: MAG Systems Management and Operations Plan Draft Final Report & Executive Summary	$ 16,703.23
TOTAL	**$299,704.03**

A labor/dollar allocation and project task breakdown is included on the next page.