PROFESSIONAL SERVICES AGREEMENT
Integrated Water Master Plan
City Project No. 171845

This Professional Services Agreement ("Agreement") is entered into and effective between CITY OF GLENDALE, an Arizona municipal corporation ("City") and Carollo Engineers, Inc., a Delaware corporation, ("Consultant") as of the ____ day of ________________, 2019 ("Effective Date").

RECITALS

A. City intends to undertake a project for the benefit of the public and with public funds that is more fully set forth in Exhibit A, Project (the "Project");

B. City desires to retain the professional services of Consultant to perform certain specific duties and produce the specific work as set forth in the attached Exhibit B, Project Scope of Work ("Scope");

C. Consultant desires to provide City with professional services ("Services") consistent with best consulting or architectural practices and the standards set forth in this Agreement, in order to complete the Project; and

D. City and Consultant desire to memorialize their agreement with this document.

AGREEMENT

The parties hereby agree as follows:

1. Key Personnel; Other Consultants and Subcontractors.

1.1 Professional Services. Consultant will provide all Services necessary to assure the Project is completed timely and efficiently consistent within Project requirements, including, but not limited to, working in close interaction and interfacing with City and its designated employees, and working closely with others, including other consultants or contractors, retained by City.

1.2 Project Team.

a. Project Manager.

(1) Consultant will designate an employee as Project Manager with sufficient training, knowledge, and experience to, in the City's opinion, complete the project and handle all aspects of the Project such that the work produced by Consultant is consistent with applicable standards as detailed in this Agreement; and

(2) The City must approve the designated Project Manager.

b. Project Team.

(1) The Project Manager and all other employees assigned to the Project by Consultant will comprise the "Project Team."

(2) Project Manager will have responsibility for and will supervise all other employees assigned to the Project by Consultant.

c. Discharge, Reassign, Replacement.

(1) Consultant acknowledges the Project Team is comprised of the same persons and roles for each as may have been identified in Exhibit A.

(2) Consultant will not discharge, reassign, replace or diminish the responsibilities of any of the employees assigned to the Project who have been approved by City without City's prior written consent unless that person leaves the employment of Consultant, in which event the substitute must first be approved in writing by City.
(3) Consultant will change any of the members of the Project Team at the City’s request if an employee’s performance does not equal or exceed the level of competence that the City may reasonably expect of a person performing those duties, or if the acts or omissions of that person are detrimental to the development of the Project.

d. Subcontractors.

(1) Consultant may engage specific technical contractors (each a "Subcontractor") to furnish certain service functions.

(2) Consultant will remain fully responsible for Subcontractor’s services.

(3) Subcontractors must be approved by the City.

(4) Consultant will certify by letter that all contracts with Subcontractors have been executed incorporating requirements and standards as set forth in this Agreement.

2. Schedule. The Services will be undertaken in a manner that ensures the Project is completed timely and efficiently in accordance with the Project.

3. Consultant’s Work.

3.1 Standard. Consultant must perform Services in accordance with the standards of due diligence, care, and quality prevailing among consultants having substantial experience with the successful furnishing of Services for projects that are equivalent in size, scope, quality, and other criteria under the Project and identified in this Agreement.

3.2 Licensing. Consultant warrants that:

a. Consultant and its Subconsultants or Subcontractors will hold all appropriate and required licenses, registrations and other approvals necessary for the lawful furnishing of Services ("Approvals"); and

b. Neither Consultant nor any Subconsultant or Subcontractor has been debarred or otherwise legally excluded from contracting with any federal, state, or local governmental entity ("Debarment").

(1) City is under no obligation to ascertain or confirm the existence or issuance of any Approvals or Debarments, or to examine Consultant’s contracting ability.

(2) Consultant must notify City immediately if any Approvals or Debarment changes during the Agreement’s duration. The failure of the Consultant to notify City as required will constitute a material default under the Agreement.

3.3 Compliance.

a. Services will be furnished in compliance with applicable federal, state, county and local statutes, rules, regulations, ordinances, building codes, life safety codes, and other standards and criteria designated by City.

b. Consultant must not discriminate against any employee or applicant for employment on the basis of race, color, religion, sex, national origin, age, marital status, sexual orientation, gender identity or expression, genetic characteristics, familial status, U.S. military veteran status or any disability. Consultant will require any Sub-contractor to be bound to the same requirements as stated within this section. Consultant, and on behalf of any subcontractors, warrants compliance with this section.

3.4 Coordination: Interaction.

a. For projects that the City believes requires the coordination of various professional services, Consultant will work in close consultation with City to proactively interact with
any other professionals retained by City on the Project ("Coordinating Project Professionals").

b. Consultant will meet to review the Project, Schedule and in-progress work with Coordinating Project Professionals and City as often and for durations as City reasonably considers necessary in order to ensure the timely work delivery and Project completion.

c. For projects not involving Coordinating Project Professionals, Consultant will proactively interact with any other contractors when directed by City to obtain or disseminate timely information for the proper execution of the Project.

3.5 Work Product.

a. Ownership. Upon receipt of payment for Services furnished, Consultant grants to City, and will cause its Subconsultants or Subcontractors to grant to the City, the exclusive ownership of and all copyrights, if any, to evaluations, reports, drawings, specifications, project manuals, surveys, estimates, reviews, minutes, all "architectural work" as defined in the United States Copyright Act, 17 U.S.C § 101, et seq., and other intellectual work product as may be applicable ("Work Product").

(1) This grant is effective whether the Work Product is on paper (e.g., a "hard copy"), in electronic format, or in some other form.

(2) Consultant warrants, and agrees to indemnify, hold harmless and defend City for, from and against any claim that any Work Product infringes on third-party proprietary interests.

b. Delivery. Consultant will deliver to City copies of the preliminary and completed Work Product promptly as they are prepared.

c. City Use.

(1) City may reuse the Work Product at its sole discretion.

(2) In the event the Work Product is used for another project without further consultations with Consultant, the City agrees to indemnify and hold Consultant harmless from any claim arising out of the Work Product.

(3) In such case, City will also remove any seal and title block from the Work Product.

4. Compensation for the Project.

4.1 Compensation. Consultant's compensation for the Project, including those furnished by its Subconsultants or Subcontractors will not exceed $2,432,358 as specifically detailed in Exhibit D ("Compensation").

4.2 Change in Scope of Project. The Compensation may be equitably adjusted if the originally contemplated Scope as outlined in the Project is significantly modified.

a. Adjustments to Compensation require a written amendment to this Agreement and may require City Council approval.

b. Additional services which are outside the Scope of the Project contained in this Agreement may not be performed by the Consultant without prior written authorization from the City.

c. Notwithstanding the incorporation of the Exhibits to this Agreement by reference, should any conflict arise between the provisions of this Agreement and the provisions found in the Exhibits and accompanying attachments, the provisions of this Agreement shall take priority and govern the conduct of the parties.

4.3 Allowances. An “Allowance” may be identified in Exhibit D only for work that is required by the Scope and the value of which cannot reasonably be quantified at the time of this Agreement.
a. As stated in Sec. 4.1 above, the Compensation must incorporate all Allowance amounts identified in Exhibit D and any unused allowance at the completion of the Project will remain with City.

b. Consultant may not add any mark-up for work identified as an Allowance and which is to be performed by a Subconsultant.

c. Consultant will not use any portion of an Allowance without prior written authorization from the City.

d. Examples of Allowance items include, but are not limited to, subsurface pothole investigations, survey, geotechnical investigations, public participation, radio path studies and material testing.

4.4 Expenses. City will reimburse Consultant for certain out-of-pocket expenses necessarily incurred by Consultant in connection with this Agreement, without mark-up (the "Reimbursable Expenses"), including, but not limited to, document reproduction, materials for book preparation, postage, courier and overnight delivery costs incurred with Federal Express or similar carriers, travel and car mileage, subject to the following:

a. Mileage, airfare, lodging and other travel expenses will be reimbursable only to the extent these would, if incurred, be reimbursed to City of Glendale personnel under its policies and procedures for business travel expense reimbursement made available to Consultant for review prior to the Agreement's execution, and which policies and procedures will be furnished to Consultant;

b. The Reimbursable Expenses in this section are approved in advance by City in writing; and

c. The total of all Reimbursable Expenses paid to Consultant in connection with this Agreement will not exceed the "not to exceed" amount identified for Reimbursable Services in the Compensation.

5. Billings and Payment.

5.1 Applications.

a. Consultant will submit monthly invoices (each, a "Payment Application") to City's Project Manager and City will remit payments based upon the Payment Application as stated below.

b. The period covered by each Payment Application will be one calendar month ending on the last day of the month.

5.2 Payment.

a. After a full and complete Payment Application is received, City will process and remit payment within 30 days.

b. Payment may be subject to or conditioned upon City's receipt of:

(1) Completed work generated by Consultant and its Subconsultants and Subcontractors; and

(2) Unconditional waivers and releases on final payment from all Subconsultants and Subcontractors as City may reasonably request to assure the Project will be free of claims arising from required performances under this Agreement.

5.3 Review and Withholding. City's Project Manager will timely review and certify Payment Applications.

a. If the Payment Application is rejected, the Project Manager will issue a written listing of the items not approved for payment.
6. Termination.

6.1 For Convenience. City may terminate this Agreement for convenience, without cause, by delivering a written termination notice stating the effective termination date, which may not be less than 15 days following the date of delivery.
   a. Consultant will be equitably compensated for Services furnished prior to receipt of the termination notice and for reasonable costs incurred.
   b. Consultant will also be similarly compensated for any approved effort expended, and approved costs incurred, that are directly associated with Project closeout and delivery of the required items to the City.

6.2 For Cause. City may terminate this Agreement for cause if Consultant fails to cure any breach of this Agreement within seven days after receipt of written notice specifying the breach.
   a. Consultant will not be entitled to further payment until after City has determined its damages. If City's damages resulting from the breach, as determined by City, are less than the equitable amount due but not paid Consultant for Services furnished, City will pay the amount due to Consultant, less City's damages, in accordance with the provision of Sec. 5.
   b. If City's direct damages exceed amounts otherwise due to Consultant, Consultant must pay the difference to City immediately upon demand; however, Consultant will not be subject to consequential damages more than $1,000,000 or the amount of this Agreement, whichever is greater.

7. Conflict. Consultant acknowledges this Agreement is subject to A.R.S. § 38-511, which allows for cancellation of this Agreement in the event any person who is significantly involved in initiating, negotiating, securing, drafting, or creating the Agreement on City’s behalf is also an employee, agent, or consultant of any other party to this Agreement.

8. Insurance. For the duration of the term of this Agreement, Consultant shall procure and maintain insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of all tasks or work necessary to complete the Project as herein defined. Such insurance shall cover Consultant, its agent(s), representative(s), employee(s) and any subcontractors.

8.1 Minimum Scope and Limit of Insurance. Coverage must be at least as broad as:
   a. Commercial General Liability (CGL): Insurance Services Office Form CG 00 01, including products and completed operations, with limits of no less than $1,000,000 per occurrence for bodily injury, personal injury, and property damage. If a general aggregate limit applies, either the general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit.
   b. Automobile Liability: Insurance Services Office Form Number CA 0001 covering Code 1 (any auto), with limits no less than $1,000,000 per accident for bodily injury and property damage.
   c. Professional Liability. Consultant must maintain a Professional Liability insurance covering errors and omissions arising out of the work or services performed by Consultant, or anyone employed by Consultant, or anyone for whose acts, mistakes, errors and omissions Consultant is legally liability, with a liability insurance limit of $1,000,000 for each claim and a $2,000,000 annual aggregate limit.
   d. Worker's Compensation: Insurance as required by the State of Arizona, with Statutory Limits, and Employers' Liability insurance with a limit of no less than $1,000,000 per accident for bodily injury or disease.
8.2 **Indemnification.**

a. To the fullest extent permitted by law, Consultant must defend, indemnify, and hold harmless City and its elected officials, officers, employees and agents (each, an "Indemnified Party," collectively, the "Indemnified Parties") for, from, and against any and all claims, demands, actions, damages, judgments, settlements, personal injury (including sickness, disease, death, and bodily harm), property damage (including loss of use), infringement, governmental action and all other losses and expenses, including attorneys' fees and litigation expenses (each, a "Demand or Expense" collectively "Demands or Expenses") asserted by a third-party (i.e. a person or entity other than City or Consultant) and that arises out of or results from the breach of this Agreement by the Consultant or the Consultant's negligent actions, errors or omissions (including any Subconsultant or Subcontractor or other person or firm employed by Consultant), whether sustained before or after completion of the Project.

b. This indemnity and hold harmless provision applies even if a Demand or Expense is in part due to the Indemnified Party's negligence or breach of a responsibility under this Agreement, but in that event, Consultant will be liable only to the extent the Demand or Expense results from the negligence or breach of a responsibility of Consultant or of any person or entity for whom Consultant is responsible.

c. Consultant is not required to indemnify any Indemnified Parties for, from, or against any Demand or Expense resulting from the Indemnified Party's sole negligence or other fault solely attributable to the Indemnified Party.

8.3 **Other Insurance Provisions.** The insurance policies required by the Section above must contain, or be endorsed to contain the following insurance provisions:

a. **The City, its officers, officials, employees and volunteers are to be covered as additional insureds of the CGL and automobile policies for any liability arising from or in connection with the performance of all tasks or work necessary to complete the Project as herein defined.** Such liability may arise, but is not limited to, liability for materials, parts or equipment furnished in connection with any tasks, or work performed by Consultant on its behalf and for liability arising from automobiles owned, leased, hired or borrowed on behalf of the Consultant. General liability coverage can be provided in the form of an endorsement to the Consultant’s existing insurance policies, provided such endorsement is at least as broad as ISO Form CG 20 10, 11 85 or both CG 20 10 and CG 23 37, if later revisions are used.

b. For any claims related to this Project, the **Consultant’s insurance coverage shall be primary insurance** with respect to the City, its officers, officials, employees, and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees or volunteers shall be in excess of the Consultant’s insurance and shall not contribute with it.

c. Each insurance policy required by this Section shall provide that coverage shall not be canceled, except after providing notice to the City.

8.4 **Acceptability of Insurers.** Insurance is to be placed with insurers with a current A.M. Best rating of no less than A: VII, unless the Consultant has obtained prior approval from the City stating that a non-conforming insurer is acceptable to the City.

8.5 **Waiver of Subrogation.** Consultant hereby agrees to waive its rights of subrogation which any insurer may acquire from Consultant by virtue of the payment of any loss. Consultant agrees to obtain any endorsement that may be necessary to effect this waiver of subrogation. The Workers' Compensation Policy shall be endorsed with a waiver of subrogation in favor of the City for all work performed by the Consultant, its employees, agent(s) and subcontractor(s).
8.6 Verification of Coverage. Within 15 days of the Effective Date of this Agreement, Consultant shall furnish the City with original certificates and amendatory endorsements, or copies of any applicable insurance language making the coverage required by this Agreement effective. All certificates and endorsements must be received and approved by the City before work commences. Failure to obtain, submit or secure the City’s approval of the required insurance policies, certificates or endorsements prior to the City’s agreement that work may commence shall not waive the Consultant’s obligations to obtain and verify insurance coverage as otherwise provided in this Section. The City reserves the right to require complete, certified copies of all required insurance policies, including any endorsements or amendments, required by this Agreement at any time during the Term stated herein.

Consultant’s failure to obtain, submit or secure the City’s approval of the required insurance policies, certificates or endorsements shall not be considered a Force Majeure or defense for any failure by the Consultant to comply with the terms and conditions of the Agreement, including any schedule for performance or completion of the Project.

8.7 Subcontractors. Consultant shall require and shall verify that all subcontractors maintain insurance meeting all requirements of this Agreement.

8.8 Special Risk or Circumstances. The City reserves the right to modify these insurance requirements, including any limits of coverage, based on the nature of the risk, prior experience, insurer, coverage or other circumstances unique to the Consultant, the Project or the insurer.

9. E-verify, Records and Audits. To the extent applicable under A.R.S. § 41-4401, the Consultant warrant their compliance and that of its subconsultants with all federal immigration laws and regulations that relate to their employees and compliance with the E-verify requirements under A.R.S. § 23-214(A). The Consultant or subconsultant’s breach of this warranty shall be deemed a material breach of the Agreement and may result in the termination of the Agreement by the City under the terms of this Agreement. The City retains the legal right to randomly inspect the papers and records of the other party to ensure that the other party is complying with the above-mentioned warranty. The Consultant and subconsultant warrant to keep their respective papers and records open for random inspection during normal business hours by the other party. The parties shall cooperate with the City’s random inspections, including granting the inspecting party entry rights onto their respective properties to perform the random inspections and waiving their respective rights to keep such papers and records confidential.

10. No Boycott of Israel. The Parties agree that they are not currently engaged in, and agree that for the duration of the Agreement they will not engage in, a boycott of Israel, as that term is defined in A.R.S. §35-393.

11. Attestation of PCI Compliance. When applicable, the Consultant will provide the City annually with a Payment Card Industry Data Security Standard (PCI DSS) attestation of compliance certificate signed by an officer of Consultant with oversight responsibility.


12.1 A notice, request or other communication that is required or permitted under this Agreement (each a "Notice") will be effective only if:

a. The Notice is in writing, and

b. Delivered in person or by overnight courier service (delivery charges prepaid), certified or registered mail (return receipt requested).

c. Notice will be deemed to have been delivered to the person to whom it is addressed as of the date of receipt, if:

(1) Received on a business day before 5:00 p.m. at the address for Notices identified for the Party in this Agreement by U.S. Mail, hand delivery, or overnight courier service; or

(2) As of the next business day after receipt, if received after 5:00 p.m.
d. The burden of proof of the place and time of delivery is upon the Party giving the Notice.
e. Digitalized signatures and copies of signatures will have the same effect as original signatures.

12.2 **Representatives.**

a. Consultant. Consultant’s representative (the "Consultant’s Representative") authorized to act on Consultant’s behalf with respect to the Project, and his or her address for Notice delivery is:

Carollo Engineers, Inc.
Lisa M. Freestone, P.E., Vice President
4600 E. Washington Street, Suite 500
Phoenix, AZ 85034

b. City. City’s representative ("City’s Representative") authorized to act on City’s behalf, and his or her address for Notice delivery is:

City of Glendale
c/o Martin A. Soma PE
Sr. Civil Engineer
Suite 315
5850 W. Glendale Ave
Glendale, Arizona 85301

*With required copy to:*

City Manager
City of Glendale
5850 West Glendale Avenue
Glendale, Arizona 85301

City Attorney
City of Glendale
5850 West Glendale Avenue
Glendale, Arizona 85301

c. Concurrent Notices.

(1) All notices to City’s representative must be given concurrently to City Manager and City Attorney.

(2) A notice will not be deemed to have been received by City’s representative until the time that it has also been received by the City Manager and the City Attorney.

(3) City may appoint one or more designees for the purpose of receiving notice by delivery of a written notice to Consultant identifying the designee(s) and their respective addresses for notices.

d. Changes. Consultant or City may change its representative or information on Notice, by giving Notice of the change in accordance with this section at least ten days prior to the change.

13. **Financing Assignment.** City may assign this Agreement to any City-affiliated entity, including a non-profit corporation or other entity whose primary purpose is to own or manage the Project.

14. **Entire Agreement; Survival; Counterparts; Signatures.**

14.1 **Integration.** This Agreement contains, except as stated below, the entire agreement between City and Consultant and supersedes all prior conversations and negotiations between the parties regarding the Project or this Agreement.

a. Neither Party has made any representations, warranties or agreements as to any matters concerning the Agreement’s subject matter.

b. Representations, statements, conditions, or warranties not contained in this Agreement will not be binding on the parties.
c. Inconsistencies between the solicitation, any addenda attached to the solicitation, the response or any excerpts attached as Exhibit A, and this Agreement, will be resolved by the terms and conditions stated in this Agreement.

14.2 Interpretation.
   a. The parties fairly negotiated the Agreement's provisions to the extent they believed necessary and with the legal representation they deemed appropriate.
   b. The parties are of equal bargaining position and this Agreement must be construed equally between the parties without consideration of which of the parties may have drafted this Agreement.
   c. The Agreement will be interpreted in accordance with the laws of the State of Arizona.

14.3 Survival. Except as specifically provided otherwise in this Agreement, each warranty, representation, indemnification and hold harmless provision, insurance requirement, and every other right, remedy and responsibility of a Party, will survive completion of the Project, or the earlier termination of this Agreement.

14.4 Amendment. No amendment to this Agreement will be binding unless in writing and executed by the parties. Electronic signature blocks do not constitute execution for purposes of this Agreement. Any amendment may be subject to City Council approval.

14.5 Remedies. All rights and remedies provided in this Agreement are cumulative and the exercise of any one or more right or remedy will not affect any other rights or remedies under this Agreement or applicable law.

14.6 Severability. If any provision of this Agreement is voided or found unenforceable, that determination will not affect the validity of the other provisions, and the voided or unenforceable provision will be reformed to conform with applicable law.

14.7 Counterparts. This Agreement may be executed in counterparts, and all counterparts will together comprise one instrument.

15. Term.

15.1 Renewals. The term of this Agreement commences upon the effective date and continues for a 2 year initial period. The City may, at its option and with the approval of the Consultant, extend the term of this Agreement an additional 2 years, renewable on an annual basis. Consultant will be notified in writing by the City of its intent to extend the Agreement period at least thirty (30) calendar days prior to the expiration of the original or any renewal Agreement period. Price adjustments will only be reviewed during the Agreement renewal period and will be a determining factor for any renewal. There are no automatic renewals of this Agreement.

15.2 Extension for Procurement Process. Upon the expiration of the Term of this Agreement, including the initial term and any renewals, at the City's sole discretion, this Agreement may be extended on a month-to-month basis for a maximum of six (6) months to allow for the City to complete its procurement process to select a vendor to provide the services/materials similar to those provided under this Agreement. The City will notify the Contractor in writing of its intent to extend the Agreement at least thirty (30) calendar days prior to the expiration of the Term. Any extension provided under this subsection will continue under the same terms and conditions as in effect immediately prior to the expiration of the then-current term.

16. Dispute Resolution. Any controversy or claim arising out of or relating to this contract, or the breach thereof, shall be settled by arbitration administered according to the American Arbitration Association's Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator may be entered in any court having jurisdiction thereof.

17. Exhibits. The following exhibits, with reference to the term in which they are first referenced, are incorporated by this reference.
Exhibit A  Project
Exhibit B  Scope of Work
Exhibit C  Schedule
Exhibit D  Compensation

The parties enter into this Agreement effective as of the date shown above.

City of Glendale,
an Arizona municipal corporation

By: Kevin R. Phelps
Its: City Manager

ATTEST:

Julie K. Bower  (SEAL)
City Clerk

APPROVED AS TO FORM:

Michael D. Bailey
City Attorney

Carollo Engineers, Inc.,
a Delaware corporation authorized to do business in Arizona

By: Lisa M. Freestone, P.E.
Its: Vice President

By: George P. Maseeh, P.E., BCEE
Its: Senior Vice President
EXHIBIT A
Professional Services Agreement

PROJECT

INTEGRATED WATER MASTER PLAN
CIP Project No. 171845

DESCRIPTION OF PROJECT:

The City of Glendale (City) is developing an Integrated Water Master Plan (IWMP) to improve service performance and reliability, reduce risk, and enhance sustainability of the City’s potable water, wastewater, and reclaimed water systems. The IWMP will update and integrate the City’s water resources, potable water, wastewater, and reclaimed water master plans through the year 2055 planning horizon. The IWMP will guide future Capital Improvement Programs for the Water Services Department and provide a long-term roadmap for the City to continue providing reliable water utility services to its customers.
EXHIBIT B
Professional Services Agreement

SCOPE OF WORK

INTEGRATED WATER MASTER PLAN
CIP Project No. 171845

The attached Scope of Work dated 3/25/2019 (37 pages) is incorporated herein to Exhibit B.
ATTACHMENT TO EXHIBIT B
Professional Services Agreement
CITY OF GLENDALE, ARIZONA
INTEGRATED WATER MASTER PLAN
Project No. 171845

SCOPE OF WORK

BACKGROUND
This Integrated Water Master Plan (IWMP) will update and integrate the City of Glendale’s (CITY) water resources, water, wastewater, reclaimed water and storm water master plans through the year 2050 planning horizon. The IWMP will provide a long-term roadmap for the CITY to continue to provide water utility services to its customers. The IWMP will be based on key results of the following previous planning efforts, and reference documents will be included as appendices in an electronic format:

- Glendale General Plan
- 2003 Water Master Plan
- 2008 Groundwater Master Plan
- 2008 Sewer System Modeling and Master Planning
- 2010 Glendale West Area Reuse Pipeline
- 1987 Glendale-Peoria Area Drainage Master Plan
- 2011 Stormwater Management Plan
- CITY Growth Trends and Development Projections
- CITY’s most recently adopted Infrastructure Improvement Plan (IIP)
- Prior CITY water, wastewater, reclaimed water, and stormwater master planning work

Carollo Engineers (CONSULTANT) will complete the IWMP as described in the following Scope of Work.

PROJECT ASSUMPTIONS
This Scope of Work is based on the following assumptions:

A. CITY will provide the existing water model and wastewater hydraulic models to CONSULTANT.
B. CONSULTANT will select a hydraulic model software for the water and sewer models based on understanding of the CITY’s needs and experience with current available software. CONSULTANT will develop the IWMP water and sewer models in the chosen software.
C. CITY will provide current Geographic Information System (GIS) data for the water, wastewater, reclaimed water, and stormwater systems, along with additional available data, as required, to complete the master planning evaluations. This includes, but is not limited to, land-based information, parcels, planning boundaries, surface features (parks, waterways, railroads, and streets), land use polygons, zoning polygons, special planning areas, economic development corridor boundaries, and water district boundaries (Salt River Project [SRP] on and off-Project areas).
D. CITY will provide the current water customer billing database for CONSULTANT to develop unit water demands and unit wastewater flows.

E. CITY will provide reports or documents related to the CITY's water supply, water systems, and current Designation of Assured Water Supply.

F. City will provide relevant drawings, design reports, plant operating data, water quality summaries, studies, master plan documents, and currently planned improvements to CONSULTANT to assist water and wastewater facility evaluations.

G. CONSULTANT will be responsible for in-system pressure measurements of the water system for model verification.

H. Cost opinions provided by CONSULTANT will be consistent with Class 5 Estimates as defined by the Association for the Advancement of Cost Engineering (AACE) International. This level of engineering cost estimating is generally made with limited information, including process block diagrams, preliminary equipment lists, and conceptual layouts. Typical accuracy for Class 5 Estimates is expected to be in the range of +100/-50 percent.

I. In providing opinions of cost, financial analyses, economic feasibility projections, and schedules for potential projects, CONSULTANT has no control over cost or price of labor and material; unknown or latent conditions of existing equipment or structures that may affect operation and maintenance (O&M) costs; competitive bidding procedures and market conditions; time or quality of performance of third parties; quality, type, management, or direction of operating personnel; and other economic and operational factors that may materially affect the ultimate project cost or schedule. Therefore, CONSULTANT makes no warranty that the CTY's actual project costs, financial aspects, economic feasibility, or schedules will not vary from the Consultant's opinions, analyses, projections, or estimates.

J. Three planning periods will be evaluated in the IWMP: 2025, 2030, and Buildout.

K. Project Management and project delivery are based on a 21-month schedule.

**SUBCONSULTANTS**

In support of the CONSULTANT, the following subconsultants will perform work on the Project, subcontracted to the CONSULTANT:

- Black & Veatch – Water Quality and Water Plans; Condition Assessment and Staffing Evaluations
- Primatech, LLC – Wastewater and Stormwater
- MTC – Advanced Metering Technologies
- Clear Creek Associates – Hydrogeology

**TASKS**

This Scope of Work is organized into the following major tasks:

1. Project Management
2. Scenario Planning
3. Planning Framework
4. Water Resources
5. Water Quality
6. Water System Master Plan
7. Wastewater System Master Plan  
8. Reclaimed Water System Master Plan  
10. Condition Assessment of Below Ground Assets  
11. Advanced Metering Infrastructure (AMI) Planning  
12. Integrated Water Master Plan Recommendations  
13. Staffing Evaluations  
14. Consolidated Deliverables

Task and subtask details are presented below.

1.0 PROJECT MANAGEMENT

1.1 Work Plan  
CONSULTANT will provide a finalized work plan that will be presented at the project kick off meeting and will include:

- Project goals and CONSULTANT team and CITY staff roles and responsibilities
- Contact information for CONSULTANT and CITY project team members
- Communication protocols
- List of deliverables
- Project schedule, including workshops and time required for CITY review of deliverables
- Quality management plan that identifies deliverables and QA/QC responsibilities in tabular form

1.2 Project Management and Meetings  
CONSULTANT will coordinate with the CITY’s designated project manager regularly to plan and review upcoming meetings/workshops, deliverables, the project schedule, and data transfer, as required.

Project progress meetings will be every other month.

CONSULTANT will provide the CITY’s designated project manager with an electronic copy of all completed or partially-completed reports, studies, forecasts, maps or plans at least seven calendar days before each project progress meeting.

The anticipated project progress meetings and workshops for the IWMP include:

- One kick-off and 11 progress meetings
- 13 workshops
  - Scenario Planning (three total)
  - Planning Framework
  - Water Resources
  - Water Quality
  - Water System
  - Wastewater System
  - Stormwater Maintenance and Utility Strategy
  - Condition Assessment of Below Ground Assets (two total)
- Integrated Recommendations and CIP
- Staffing Evaluations

Note that scope and effort associated with task-focused meetings and workshops are included in the individual Tasks to follow.

1.3 Monthly Invoices and Budget Status Reports

CONSULTANT will provide project progress reports to the CITY that will accompany monthly invoices. Project progress reports will include a summary of work completed in the period, schedule updates, and budget status reports, including cash flow projections.

Budget and schedule issues will be addressed formally with the CITY's designated project manager separate from invoicing.

TASK 1.0 Deliverables
- Progress meeting minutes and exhibits (electronic PDF)
- Monthly project progress reports, invoice and budget status report, including cash flow projections. (electronic PDF)

2.0 SCENARIO PLANNING

2.1 Scenario Planning Orientation and Workshops

CONSULTANT will facilitate scenario planning exercises with CITY to address strategic issues essential to the framework and overall direction of the IWMP. At the option of CITY, the following inter-related strategic issues may be addressed in the scenario planning exercise(s), but the issues identification and prioritization will be CITY staff-driven as part of the initial exercise:

- Central Arizona Project (CAP) and Salt River Project (SRP) water shortage scenarios and broader drought-related impacts to the CITY's water supplies.
- Groundwater pumping sustainability, aquifer recharge potential, underground storage credits recovery, and level of service commitments for CAP/SRP supply reduction conditions.
- Potential to optimize wastewater discharges to the multi-city Sub-Regional Operating Group (SROG) and the 91st Avenue Wastewater Treatment Plant (WWTP).
- Potential to maximize CITY retention and utilization of reclaimed water resources.

Scenario planning will include key CITY participants, and CONSULTANT will conduct a scenario planning process orientation with the participants at the beginning of the first workshop. The purpose of this orientation is to explain the scenario planning process and objectives.

Scenario planning will focus on:

- Identifying key driving forces critical to the IWMP and associated critical uncertainties.
- Developing a future scenario matrix and descriptive narratives combining four potential outcomes of the two most impactful critical uncertainties.
- Exploring scenario implications and potential adaptive actions.
- Identifying low-regret actions and strategies common to multiple future scenarios.

Three scenario planning workshops are included in this Scope of Work. Each workshop is anticipated to take four hours.
2.2 Scenario Planning Documentation

CONSULTANT will prepare a summary of the scenario planning results, including the final scenario matrix and future narratives, and provide to CITY at the conclusion of the scenario planning exercise(s). CONSULTANT will meet with the CITY to review comments on the scenario planning results and establish resulting impacts to the IWMP. The outcomes of the scenario planning process will be used to help guide the master planning analyses throughout the project.

**TASK 2.0 Deliverables**
- Three scenario planning workshops
- Workshop exhibits and minutes (electronic PDF)
- Scenario matrix and future narratives document (electronic PDF)

### 3.0 PLANNING FRAMEWORK

#### 3.1 Data Collection and Review

CONSULTANT will obtain pertinent data for the IWMP with the CITY's assistance and review this information for completeness, consistency, and application for this IWMP. Data to be gathered include:

- Geocoded customer billing data
- Zoning, pipe infrastructure, streets, property parcels, economic corridors, subdivision, and land use GIS data layers
- Service area boundaries for water and wastewater systems in GIS data
- Water production records including geo-located data
- Wastewater treatment flow records
- Locations of previous wastewater flow monitoring
- Near-term development plans
- Wastewater flow data metered in the collection system
- Historical and projected residential and employment population
- Records for water delivered to other entities that are served by Glendale
- Water conservation initiatives, including Low Impact Development (LID), objectives, and goals that will affect future water demands
- Reclaimed water production records and reclaimed water delivery
- Housing densities per land use type and average per capita per home
- General Plan

CONSULTANT will analyze this information to develop unit demands, flows, and loads; assign flows to the model; and project future flows.

#### 3.2 Population and Development Projections

CONSULTANT will work with CITY staff to develop updated growth and population projections for the planning horizons: 2025, 2030, and Buildout. In addition to population and employment population estimates, specific development plans in focused development areas will be used to refine growth estimates in the near-term.
3.3 Unit Water Demand Analysis
CONSULTANT will review CITY's historical water production and water billing data to develop unit water demand estimates by land use classification. This process will be completed using GIS tools and will result in a spatial aggregation of water use that will allow water demands to be summarized by region and pressure zone. CONSULTANT will coordinate with Water Services Department (WSD) staff on the zonal demand calculations and incorporate into the unit water demand analysis. Unit water demands will be prepared on a per-acre basis for residential and non-residential land use types. A per-connection unit water demand will also be developed for residential development for comparative purposes to determine if the per-acre basis is appropriate for all areas within Glendale's service area. Age of developments will also be factored into the unit water demand analysis.

3.4 Unit Wastewater Flow Analysis
CONSULTANT will develop a wastewater collection system flow monitoring plan in Task 7.4 for the purposes of developing unit wastewaster flows and to calibrate the wastewater hydraulic model. CONSULTANT will work with CITY to identify up to 25 locations (and within the budgeted allowance amount) for temporary flow monitoring throughout the wastewater collection system for up to six weeks to use for model verification. Unit prices (dollars per meter per month or per week, as appropriate) will be provided in the budget for subsequent authorization by the CITY if more than 25 flow monitoring locations are required or if a longer period is required to collect sufficient data for model calibration. CONSULTANT will retain a subcontractor to provide, calibrate, install and retrieve the flow meters. In addition, CONSULTANT will collect rainfall data at up to four locations. Data will be collected for up to six weeks. CITY will inspect the manholes that are proposed for flow monitoring and provide cleaning prior to metering, if required.

This flow data will be used in conjunction with Supervisory Control and Data Acquisition (SCADA) data for lift station and treatment plant flows and the SROG metering station to develop the existing system flow generation values. CONSULTANT will incorporate the population estimates and land use data to develop unit wastewater flows on a per-capita and per-acre basis in terms of average dry weather flow (ADWF).

As a check on wastewater flow estimates, geocoded water billing records will be adjusted by a factor to also calculate average daily wastewater flows.

3.5 Wet Weather Flow Factors
Work being completed under this task is to develop appropriate factors to apply to peak, dry-weather flows to reasonably represent inflow and infiltration in the collection system. These factors will be determined through a review of the City’s historical wastewater SCADA data to treatment plants collected during storm events. Any storm data collected as part of the wastewater collection system flow monitoring (Task 7.4) will also be used to validate wet weather flow factors.

3.6 Reclaimed Water Flow Analysis
CONSULTANT will develop reclaimed water flow projections based on the water demand and wastewater flow projections and an estimate of the portion of wastewater that becomes reclaimed water. CONSULTANT will review the City’s historical reclaimed water generation rates throughout the year. CONSULTANT will quantify the amount of reclaimed water that will need to be managed through recharge or direct reuse for each planning period.
3.7 Demand and Flow Projections
CONSULTANT will prepare water demand and wastewater flow projections for each planning year using the unit water demands and unit wastewater flows. Reclaimed water availability will be estimated for each planning year. Water demand forecasts will be prepared by pressure zone. Wastewater flow forecasts will be prepared by collection system sub-basin. Potential wastewater flows for areas that are currently served by septic systems will be quantified. Water demands, and flows will include a gallon per capita per day (gpcd) value to provide the CITY with a number to compare to previous studies and reports.

3.8 Planning Framework Workshop
CONSULTANT will prepare and present the results of Task 3 – Planning Framework, to CITY staff.

3.9 Technical Memorandum – Planning Framework
CONSULTANT will prepare a Technical Memorandum documenting the Planning Framework for the IWMP. This memorandum will include a summary of the data provided by the CITY to complete the IWMP and how the data was applied to develop the planning framework. It will also include a summary of the growth projection assumptions, unit water demands, unit wastewater flows, and wet weather flow assumptions for the wastewater system modeling. The Technical Memorandum will contain tables, charts, maps with narrative text to explain the flow projections and associated assumptions. The Technical Memorandum will be provided to CITY after the Planning Framework Workshop for review and comment.

After CITY’s comments are received, necessary changes to the planning framework analysis will be made and confirmed with the CITY prior to water resources, water, wastewater, or reclaimed water system analysis. Full resolution of the CITY’s comments will be made when the information from this Technical Memorandum is incorporated in the final report.

TASK 3.0 Deliverables
• Workshop exhibits and minutes (electronic PDF)
• Planning Framework Technical Memorandum (electronic PDF)

4.0 WATER RESOURCES

4.1 Water Portfolio Review
CONSULTANT will review the CITY’s current water portfolio, including surface water, groundwater, and reclaimed water. CONSULTANT will summarize the average and dry-year yields, access (availability) issues, restrictions to use and regulatory constraints for the following specific sources:

• On-project (SRP entitlement lands)
• Off-project (non-SRP) lands
• CAP
• Groundwater (existing wells, unused wells, pre-1980 wells)
• Reclaimed water

4.2 Water Supply and Demand Balance
CONSULTANT will summarize the CITY’s water demands for 2020 (current), 2025, 2030, and Buildout and compare them to available supplies for normal conditions and up to two drought-year conditions.
CONSULTANT and CITY will collaborate to define drought years (i.e., frequency of occurrence, probable impacts to surface water allocations, etc.). Based on the results of this analysis, opportunities to mitigate shortfalls will be identified.

CONSULTANT will recommend an appropriate Long-Term Storage Credits (LTSC) goal for the CITY to attain for emergency planning. CONSULTANT will work with CITY to develop appropriate criteria for LTSC goals and Assured Water Supply purposes.

4.3 Source Water Contingency Planning
CONSULTANT will develop source water contingency plans for the CITY’s service area by identifying which areas in the CITY have access to the supplies in the CITY’s portfolio and developing solutions that increase or improve source reliability throughout the service area. CONSULTANT will develop a multi-criteria water resources utilization priority plan to assist the CITY in determining how water sources should be used to meet demands under normal and drought years. Criteria may include cost, source reliability (susceptibility to drought), treatment requirements, service areas, and seasonal operational limitations.

4.4 Recharge Evaluation and Aquifer Management
CONSULTANT will evaluate the CITY’s current recharge sites/operations and make recommendations for additional potential recharge applications, as appropriate. CONSULTANT’s recommendations will address potential long- and short-term water quality impacts as well as potential combined recharge/recovery activities of neighboring utilities.

4.5 Water Supply Analysis for Normal and Drought Years
CONSULTANT will use CITY’s current Designation of Assured Water Supply to perform a water supply and demand analysis for normal and drought years for each planning period. CONSULTANT will identify shortfalls where demands exceed the CITY’s renewable water resources and will quantify potential impacts to the CITY’s long-term storage credits (LTSC) account.

4.6 Water Conservation
CONSULTANT will evaluate CITY’s current water conservation practices, and provide recommendations for improvements. CONSULTANT will:

- Provide recommendations for the CITY to implement that will help measure the efficacy of the water rebate programs.
- Evaluate water conservation potential for rebates for Commercial, Industrial and Institutional (CII) customers and standards for new CII developments.
- Evaluate potential water savings from Low Impact Development (LID).
- Identify National and State Conservation programs for City’s consideration of implementation.

CONSULTANT will evaluate the CITY’s long-term water conservation potential and incorporate this potential into the water supply and demand balances.

4.7 Potential for Potable Reuse
CONSULTANT will identify the potential opportunity for implementing potable reuse and its associated impact on the CITY’s water portfolio. Available reclaimed water quantities will be compared to non-potable reuse commitments for each planning year. Reclaimed water available for potable reuse will be
quantified. Permitting, regulatory, and non-economic issues related to potable reuse within Glendale will be identified.

CONSULTANT will develop a conceptual technical assessment for developing an advanced water treatment facility (AWTF) at the West Area Water Reclamation Facility (WAWRF) based on concepts from the Guidance Framework for DPR in Arizona (National Water Research Institute, January 2018).

4.8 Drought Management Plan
CONSULTANT will review the CITY’s 2016 Drought Management Plan including:

- Quantifying the amount of water savings the City and customers can achieve through the established Drought stages 1 through 4.
- Estimating the impacts of shortages to be defined in the pending Lower Basin Drought Contingency Plan (LBDCP).
- Defining a strategy for outreach for City council, citizens and neighboring cities when drought stages are enacted.
- Policy for sewer appeals that are used to develop wastewater rates.

CONSULTANT will recommend additional drought management plan elements based on programs being implement by other Arizona cities.

4.9 Water Resources Workshop
CONSULTANT will prepare and present the results of Task 4 – Water Resources, to CITY staff.

4.10 Technical Memorandum – Water Resources
CONSULTANT will prepare a Technical Memorandum documenting the Water Resources Evaluation for the IWMP. This memorandum will include a summary of the existing water portfolio, water supply and demand balances for normal and drought years, recharge evaluation, safe yield analysis, and long-term sustainability of supplies and potential new water resources opportunities. The Technical Memorandum will be provided to CITY after the Water Resources Workshop for review and comment.

After the CITY’s comments are received, necessary changes to the water resources analysis will be made and confirmed with the CITY. Full resolution of the CITY’s comments will be made when the information from this Technical Memorandum is incorporated in the final report.

TASK 4.0 Deliverables
- Workshop exhibits and minutes (electronic PDF)
- Water Resources Technical Memorandum (electronic PDF)

5.0 WATER QUALITY

5.1 Potable Water System

5.1.1 Regulatory Overview and Potential Future Regulations
CONSULTANT will provide an overview of current and emerging Federal and State regulations and guidelines as they affect the CITY’s water system operations. The overview will include:
- Disinfection by-products (DBPs) & residuals
- Perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and other per- and polyfluoroalkyl substances (PFAS)
- Hexavalent chromium
- Carcinogenic volatile organic chemicals (CVOCs)
- Perchlorate
- Nitrosamines
- Contaminants of emerging concern, including personal care products (PCP), endocrine disrupting compounds (EDCs).
- Hexafluoropropylene oxide dimer acid and its ammonium salt (GenX Chemicals)
- Other EPA SDWA contaminant candidate list (CCL) substances.

For each major surface water related contaminant group, CONSULTANT will review the CITY’s WTP processes to identify what barriers exist now and what potential WTP modifications may be required in the future to meet new regulatory requirements. Since there is not sufficient well water quality data available for groundwater related contaminants on the future regulatory horizon, CONSULTANT will provide a listing of the contaminants that should be tested in future groundwater samples.

5.1.2 Stage 2 DBP Rule Compliance Update

The previous Draft TTHM study from February 2018 included treatment plant effectiveness evaluations up through the end of year 2016. Since that time the City has implemented changes to treatment protocols and distribution system operations. Using the 2017 and 2018 water treatment plant and distribution water quality data provided by the City, the CONSULTANT will quantify and summarize the effectiveness of these changes to achieve the CITY’s maximum TTHM level goal of 80% of the MCL by comparing the quarterly distribution system TTHM and chlorine data available at the time of this study to values prior to recent City implementation strategies.

CONSULTANT will review and summarize previous studies aimed to mitigate TTHMs in the CITY’s distribution system. Based on the results from the system operation effectiveness evaluations and the recommendations from previous studies, additional evaluations such as reservoir trace distribution modeling or active aeration at certain distribution reservoirs may be recommended.

5.1.3 Zone 3 Wells Future TTHM/Chlorine Residual Compliance

In Tasks 6.5.3 and 6.6.3, CONSULTANT will conduct 30-day EPS source trace and water age analyses of the distribution system for current and future conditions. In locations, where water quality is predicted to not meet the CITY’s chlorine and THM goals, CONSULTANT will make a determination as to the cause of the water quality issue (e.g. long residence time in tanks, low velocity in pipelines, dead-ends, etc.) and recommend alternative system improvements such as ASR wells in Zone 3 to improve water flow, reduce hydraulic residence time and reduce distribution system the water quality issues.

5.2 Wastewater Systems

5.2.1 Regulatory Overview

CONSULTANT will provide an overview of current and emerging Federal and State regulations and guidelines as they affect the CITY’s wastewater system operations.
5.2.2 Wastewater Strength Trends
CONSULTANT will obtain and review historical influent wastewater quality data (i.e., solids, carbon, nitrogen, and phosphorus species), operational data, and relevant physical data for the Arrowhead and West Area WRFs. The data will be used to evaluate trends in influent wastewater strength. The trends, along with industry guidelines, will be used to project future influent characteristics. Typical solids yields and aeration demands will be used to determine if and when capacity limitations may arise in the facilities' major process units. Operational schemes and expansion of the current process, if needed, will be recommended to effectively treat the projected wastewater loads. Parametric costs for the increase in capital and energy costs will be developed.

5.3 Water Quality Workshop
CONSULTANT will prepare and present the results of Task 5 – Water Quality, to CITY staff.

5.4 Technical Memorandum – Water Quality
CONSULTANT will prepare a Technical Memorandum documenting the Water Quality Evaluation for the IWMP. The Technical Memorandum will be provided to CITY after the Water Quality Workshop for review and comment.

After CITY's comments are received, necessary changes to the water quality section will be made and confirmed with the CITY. Full resolution of the CITY's comments will be made when the information from this Technical Memorandum is incorporated in the final report.

TASK 5.0 Deliverables
- Workshop exhibits and minutes (electronic PDF)
- Water Quality Technical Memorandum (electronic PDF)

6.0 WATER SYSTEM MASTER PLAN
6.1 Data Collection and Review
CONSULTANT will prepare a data request list and coordinate with CITY staff to obtain or collect the necessary information and data related to the existing water distribution system. Data collection includes, but is not limited to, the physical system components including wells, reservoirs, booster pump stations, distribution mains, transmission mains, treatment plants, GIS, data from SCADA, and operational control and performance data.

6.2 Water System Performance Criteria
CONSULTANT will obtain and review existing water system performance, water quality, and operational criteria, including water storage requirements, pump station requirements, peaking factors, master planning fire flow volumes and durations, and distribution system pressure and velocity requirements. Reliability and redundancy criteria for facilities will also be developed. CONSULTANT will meet with CITY staff to review proposed criteria and arrive at a consensus on system performance criteria. These criteria will serve as the basis for performance evaluations and infrastructure planning.

6.3 Water Model Build
The purpose of Task 6.3 is to build the water model that will be used to complete the hydraulic and water quality analyses required for Task 6 and to identify future capital improvements for system
expansion. Prior to proceeding with 6.3 subtasks, CONSULTANT will recommend any model software changes and receive CITY approval.

6.3.1 GIS Review and Hydraulic Model Build
CONSULTANT will review the City's GIS data structure and make recommendations related to the order, formatting, and fields of information needed to align data needed for the model and allow the CITY to track updates. CITY will update and provide the GIS data required for CONSULTANT to develop the hydraulic model.

CONSULTANT will develop a geometric network of the distribution system using the updated GIS data received from the CITY. CONSULTANT will prepare a summary of the network topology violations and the changes made to the existing distribution system to prepare the data for the model import. Updates to GIS made by the CONSULTANT to prepare the hydraulic model will be provided to the CITY.

CONSULTANT will prepare a description of CITY distribution system facilities including water production facilities, wells, treatment plants, pumping stations, pressure/flow control stations, tanks and metering facilities that includes schematics, summary tables, pump curves, equipment capacity and operational descriptions. CONSULTANT will prepare the water system description using existing reports, plans, schematics and discussions provided by the CITY and/or thru facility site visits as necessary. CONSULTANT will create schematic versions of model facility elements (such as pump stations and tanks) for use in the model using the distribution system hydraulic model, facility drawings and details, and input from CITY staff.

CONSULTANT will develop the water distribution system model network to include network elements by importing the GIS geometric network and manually inputting the model facility elements. Facilities will include pump curves, booster pump station operating set points, active/inactive facilities, and PRV settings. Elevations will be assigned to model nodes using a digital elevation model (DEM) or contour shapefile provided by the CITY.

Roughness coefficients (C-factors) will be assigned to the new model pipes using C-factor information in the existing hydraulic model along with available pipe material and installation year information in the existing GIS. These initial C-factor assignments may be adjusted during the model calibration process.

CONSULTANT will prepare and submit a list of any remaining missing data information necessary for input and receive this data from the CITY before beginning the model calibration. CONSULTANT will conduct a meeting with the City to discuss options for addressing the data gaps.

6.4 Water System Hydraulic Model Calibration
CONSULTANT will develop a hydraulic model calibration plan including identification of needed system operations data (i.e., SCADA and remote pressure monitoring locations) and duration of data collection. The model calibration plan will include identification of strategic pressure monitoring locations based on input from CITY staff. It is assumed that the CITY will provide all required system monitoring equipment and be responsible for collecting the required system data. Field data collection, performed by the CITY, will be limited to data from CITY owned pressure loggers. The remaining field data shall be limited to the data available from SCADA. CONSULTANT will compile the data and use the data for model calibration. The calibration plan will be applicable to hydraulic calibration. Water quality (chlorine residual) modeling/calibration is not included in this scope of work. Existing (2018) winter and summer day
demands will be allocated to the model using the CITY’s billing data and GIS water meter points and estimated non-revenue water developed under Task 3. It is assumed that all customers in the billing records will have a unique GIS water meter point (x, y coordinate). Demands for up to 100 other large users will be point-loaded to specific model nodes and specifically identified in the model based on the location of the customer meter. Non-revenue water will be allocated to the model by pressure zone based on the percent of total pressure zone. Non-revenue water will also be allocated to model nodes such that the total demand allocation matches the quantity and distribution of system delivery for the time period for which billing data was provided by the CITY. The selected 24-hour calibration day hourly demand will be set using appropriate hourly peaking factors (diurnal demand patterns). Each pressure zone will be assigned an overall 24-hour diurnal demand pattern based on the information provided in Task 3. The CITY’s SCADA data will be used with the pressure transducer data to perform a 24-hour extended period simulation (EPS) water model calibration. The EPS analysis will be performed and the analysis results will be compared with the actual operational SCADA data for the selected 24-hour model calibration period. Comparative tables and/or graphs showing modeled and recorded pressures, flow and water levels will be prepared.

In addition to the temporary hydrant pressure loggers, CONSULTANT has assumed up to 10 fire flow tests will be used to compare with model results. Fire flow analysis will be performed using the hydraulic model that will be compared to the hydrant test data collected.

For areas of the system where the modeled output is significantly different than the SCADA data and pressure transducer data, CONSULTANT will attempt to adjust appropriate model input parameters to improve the correlation. Any remaining areas with significant discrepancies, as deemed by CONSULTANT, will be documented with possible reasons for the discrepancy. If it is determined after discussions with the CITY that any of these discrepancy areas could adversely impact the model results for the purposes of this master plan project, CONSULTANT will provide the CITY with recommended additional system data collection and/or field testing that would be needed to improve the model calibration in these areas. Estimates of additional budget and schedule requirements to incorporate will also be provided.

CONSULTANT will meet with the CITY to review and present the results of the model calibration. Focus will be on any areas of the system where the model does not closely reproduce recorded system behavior.

6.5 Existing Water System Evaluation
The primary focus of Task 6.6 is the use of hydraulic analyses to evaluate the existing distribution system against the system performance criteria. This will include evaluation of hydraulics and capacity, redundancy, and water quality. CONSULTANT will provide recommendations for distribution system improvements to address predicted deficiencies.

6.5.1 Existing Capacity Evaluation
CONSULTANT will complete a desktop evaluation to determine the adequacy of existing facilities to meet design criteria requirements for water supply, treatment, storage, and pumping based on the projected water demands. CONSULTANT will document the capacity of the existing system and recommended upgrades or modifications.
Using the updated and calibrated hydraulic model, CONSULTANT will evaluate CITY's existing water system, identify deficiencies, and make recommendations for improvements. The existing water system evaluation will include a 24-hour extended period simulation (EPS) under the maximum day demands to evaluate the existing system for hydraulic deficiencies such as low pressures, difficulty in maintaining or refilling tank levels, etc. CONSULTANT will identify required improvements, either capital or operational, to improve the existing level of service. CONSULTANT will prepare graphic and/or tabular exhibits of the model output for review with CITY personnel.

6.5.2 Pressure Zone Evaluation
CONSULTANT will evaluate the ability of the existing system pressure zone configuration to deliver water to system customers within the minimum and maximum pressure goals set by the performance criteria. The existing pressure zones are known to lead to some customers experiencing excessively high or excessively low pressures. CONSULTANT will evaluate shifting existing pressure zone boundaries and/or forming new pressure zones to minimize areas of the system that experience excessively high/low pressures through the distribution system.

This will initially be a “desktop” evaluation (no hydraulic modeling until later tasks). High pressure zone modification areas will be identified based on the nominal HGLs of the existing pressure zones and low pressure modification areas will be based on general head-loss assumptions. In addition to pressure considerations, all proposed zone modifications will be evaluated with respect to the impact on the facilities’ ability to deliver capacity to the modified zones.

CONSULTANT will review and discuss preliminary boundary modifications with CITY staff relative to current operations and future infrastructure planning. Pressure zone boundary modifications will be recommended as appropriate. If modifications to the boundary are accepted by the CITY, CONSULTANT will use the updated hydraulic model to evaluate pressures within individual pressure zones for the existing system as well as for the future maximum day conditions. Up to 3 hydraulic analyses (existing conditions, interim, and 2050 planning horizon) will be performed to evaluate pressure zone boundary changes and recommend boundary changes for implementation.

6.5.3 Existing Water Quality Analysis and Water Quality Optimization Strategy
CONSULTANT will meet with the CITY to discuss the appropriate water demand scenarios (average day, minimum day, winter day, etc.) and distribution operating parameters to be employed in the various water age modeling scenarios. Up to two demand scenarios are assumed for use in the water age evaluations.

Water quality sampling information (provided by the CITY primarily in the form of chlorine residual, THM, temperature, and pH) and water quality-related customer complaints will be reviewed and profiled, both spatially across the distribution system and temporally over time to identify and characterize reoccurring problem areas in the distribution system. The results of this data review may identify data “gaps” and will be the basis for recommending additional water quality sampling and analysis in the CITY's distribution system and for comparison with model simulation results in subsequent tasks.

CONSULTANT will conduct 30-day EPS source trace and water age analyses of the distribution system for the two agreed upon demand conditions. The water age analyses will be validated by performing the following:
• Identify highest water age storage facility and verify the model simulation time is long enough to ensure a consistent, repeating pattern of water age is eventually reached.

• Calculate 24-hour average water age throughout the distribution system for the last 24 hours of the simulation (first 24 hours that show a stable, repeating pattern in the storage tank with the highest water age).

Following verification of the water age models, CONSULTANT will prepare plots of water age. These results will be spatially compared with the water quality sampling data as a means of relating observed problems to distribution system water source and age modeling results. Water quality “concerns” will also be identified based on any water age criteria. CONSULTANT will review results with the CITY to assess the degree of correlation between simulated water age and the available water quality data to attempt to establish water age as a surrogate water quality parameter.

In locations where water quality is predicted to not meet the CITY’s goals (chlorine and THM), a determination will be made as to the cause of the water quality issue (e.g. long residence time in tanks, low velocity in pipelines, dead-ends, etc.) and potential alternative system improvements will be developed to mitigate the predicted deficiencies. Improvements may include: alternative pipeline materials, operational changes (e.g. operating tanks lower during periods of low demand or pumping strategies), reducing the size of hydraulic capacity projects (pipeline diameters, storage tank sizes) to reduce water age, tank mixing and other modifications, and other hydraulic device improvements (flushing stations, ASR wells) could improve water circulation and age.

6.5.4 Existing Fire Flow Evaluation

CONSULTANT will complete fire flow modeling for the existing system to evaluate fire flow adequacy versus the fire flow criteria under current demand conditions. CONSULTANT will develop (and map) system-wide available fire flows.

The software’s automated fire flow feature will be used to assess available fire flow at 20 psi residual pressure throughout the system. CONSULTANT will review the results with CITY and gather input with respect to any of the following that may be available:

• Available ISO hydrant flow summaries
• Land use
• Fire department input
• CITY’s identification of areas of concern

CONSULTANT will summarize the model results in graphical format and overlaid with shape files representing the available fire flow criteria for comparison purposes. CONSULTANT will provide figures to CITY for review. Based on feedback provided by CITY regarding significant areas of the system that should be addressed with fire flow improvements, CONSULTANT will evaluate pipeline projects to improve flow to these areas.

6.5.5 Existing System Reliability / Redundancy Evaluation

In order to evaluate the ability of the existing distribution system to meet minimum service levels under stressed conditions, the CONSULTANT will utilize the updated hydraulic model to determine whether adequate redundant hydraulic capacity exists to provide acceptable service during stressed conditions. CONSULTANT will develop, model, and recommend system improvements to improve redundant service
capabilities to an acceptable level. Three (3) existing system reliability/redundancy analyses are included in this task which may include but are not limited to:

- Facility outages
- Transmission and distribution system outages

6.5.5 Zone 3 Redundancy Plan

The CITY provides potable CAP water to Zone 3 from the Pyramid Peak Water Treatment Plant (PPWTP). The back-up supply to Zone 3 is limited and currently depends on sending potable SRP water from Zone 2 utilizing the Cholla Water Treatment Plant and the Hillcrest Ranch Booster Station to pump water into Zone 3. To achieve supply redundancy for Zone 3, the CONSULTANT will evaluate additional sources of potable water supply such as groundwater wells, aquifer storage and recovery wells, system interconnections with other providers, and recommend locations for transfer of Zone 2 water into Zone 3.

CONSULTANT will use updated demand and development trends for Zones 2 and 3 from Task 3 to develop redundant supply requirements. The initial redundancy requirements will be submitted to the CITY for review and comment prior to subsequent evaluations and analyses. It is anticipated that redundancy requirements will be developed for the following demand conditions under existing and 2050 planning horizon projections:

- Full PPWTP Outage under average day conditions.
- Partial PPWTP Capacity (20% reduction in capacity) under maximum day conditions.

The CITY has begun discussions with the City of Phoenix and the City of Peoria/New River Water Company personnel to identify potential connection locations to the CITY's distribution system. The CONSULTANT will utilize information provided by the CITY regarding these meetings (connection locations and flow rates) and will use the hydraulic model to evaluate the feasibility of these potential connections. The CONSULTANT will identify any improvements needed in the CITY's system to connect the provider interconnections to the CITY's distribution system.

Previous recommendations for supplying Zone 3 during a PPWTP outage included using the existing Hillcrest Ranch Booster Pump Station (HRBS) to supply water from Zone 2 to Zone 3. As part of this IWMP the CONSULTANT will re-evaluate the optimal location and sizing of a pump station to convey water from Zone 2 into Zone 3 during an outage.

CONSULTANT will develop recommended hydraulic improvements, budgetary costs developed under Task 12, and schematic layouts for the interconnection and pump station improvements. Costs for purchase of land for new ROW acquisition for connections will not be included.

Recommended improvements will be presented to the CITY at a meeting where the recommended hydraulic improvements (including those developed in the separate Zone 1-4 Redundancy Study) will be evaluated and prioritized. Based on the results of the meeting the CONSULTANT will recommend additional studies/assessments that are recommended prior to connecting the new sources to the system (i.e., detailed well assessments including water quality assessments, IGA with other providers).
CONSULTANT will include the results from the evaluation including data assumptions, alternatives evaluations and infrastructure recommendations in the Water System Evaluation Technical Memorandum.

6.6 Water System Improvements Evaluation
The primary focus of Task 6.7 is the use of hydraulic analyses to evaluate the future planning years distribution system improvements required to meet system performance criteria goals. This will include evaluation of hydraulics and capacity, redundancy, and water quality. Recommendations for distribution system improvements will be identified to address predicted deficiencies.

6.6.1 Planning Years Water System Scenarios
CONSULTANT will meet with the CITY to discuss the demands and distribution operating parameters to be employed in the various future system EPS modeling scenarios. CONSULTANT will create modeling scenarios for each planning year: 2025, 2030, and Buildout. Scenarios will include average day (AD), maximum day (MD), peak hour (PH) and maximum day plus fire flow (MD+FF). Demands for planning year scenarios will be developed during Task 3 and allocated to model junctions using system growth polygons developed during Task 3, GIS land use, known new development locations, and proposed pipeline infrastructure locations to serve new growth areas for each planning period. All model scenarios will be EPS.

6.6.2 Planning Years Capacity Analysis
Based on these discussions during Sub-task 6.7.1 the CONSULTANT will update the model operational controls based on current control setting information to reflect the anticipated conditions during the selected future scenarios. Using the updated hydraulic model, beginning with the furthest out, the CONSULTANT will develop and conduct 24-hour EPS analyses under future maximum day demands conditions to evaluate and identify capital improvements needed to meet capacity and expansion of the system. The CONSULTANT will use the two intermediate scenarios (2025 and 2030) to establish the phasing of improvements and any phasing options. CONSULTANT will evaluate and make recommendations for the distribution system for each planning year. These evaluations will include:

- Incorporating improvements to resolve existing system deficiencies
- Infrastructure improvements needed to supply pending developments, including water supplies, storage, pumping, PRVs and distribution mains over the planning horizon.

CONSULTANT will present the results of the future system modeling to the CITY. The purpose of this meeting will be to confirm future capital improvements needed to position the CITY for growth.

6.6.3 Planning Years Water Quality Analysis and Water Quality Optimization Strategy
CONSULTANT will perform water age analyses for the future demand scenarios to assess whether the sizing of future improvements could have adverse impacts on water age/quality. An overview of distribution system water quality data will be performed and discussions with CITY staff will be conducted to determine seasonal water quality issues and concerns similar to Sub-task 6.6.4. Based on the findings of this review, CONSULTANT will conduct 30-day EPS source trace and water age analyses of the distribution system for agreed upon demand conditions.
CONSULTANT will prepare plots of water age to determine areas of the system where water age may increase in the future and areas of the system where water age may decrease in the future. In locations where water age is predicted to be increasing in the future and not meet the CITY's goals, CONSULTANT will make a determination as to the potential causes of the water quality issue (e.g. long residence time in tanks, low velocity in pipelines, dead-ends, etc.) and potential alternative system improvements will be developed to mitigate the predicted deficiencies. Improvements may include: alternative pipeline materials, operational changes (e.g. operating tanks lower during periods of low demand or pumping strategies), reducing the size of hydraulic capacity projects (pipeline diameters, storage tank sizes) to reduce water age tank mixing and other modifications or other hydraulic device improvements. CONSULTANT will review information about the water quality and determine if a change in a pump station design or other hydraulic system (flushing practices, ASR injection, etc.) could improve water circulation and age.

6.6.4 Planning Years Fire Flow Evaluation

CONSULTANT will complete fire flow modeling for all future system recommendations to ensure that the distribution system will meet fire flow criteria in the future. In addition to developing (and mapping) system-wide available fire flows, water modeling for specific large users can also be included (up to three locations).

The software's automated fire flow feature will be used to assess available fire flow at 20 psi residual pressure throughout the system. CONSULTANT will review the results with CITY and gather input with respect to any of the following that may be available:

- Available ISO hydrant flow summaries
- Land use
- Fire department input
- CITY's identification of areas of concern

The model results will be summarized in graphical format and overlaid with shapefiles representing the available fire flow criteria for comparison purposes. CONSULTANT will provide figures to CITY for review. Based on feedback provided by CITY, CONSULTANT will evaluate projects to improve flow to areas of the system that have deficient fire flow.

5.6.5 Planning Years System Reliability / Redundancy

In order to evaluate the ability of the distribution system to meet minimum service levels under stressed conditions in the future, the CONSULTANT will utilize the hydraulic model to determine whether adequate redundant hydraulic capacity exists to provide acceptable service during stressed conditions with all improvements in previous sub-tasks. The CONSULTANT will develop, model, and recommend system improvements additional improvements to improve redundant service capabilities to an acceptable level under future demands. Up to three existing system reliability/redundancy analyses are included in this task which may include but are not limited to:

- Facility outages.
- Transmission and distribution main outages.
6.7 Water Treatment Facilities Evaluation
CONSULTANT will prepare a summary of current capacities and describe the treatment processes for the CITY’s water treatment facilities:

- Pyramid Peak Water Treatment Plant (PPWTP)
- Cholla Water Treatment Plant
- Oasis Surface Water Treatment Plant
- Oasis Groundwater Treatment Plant

Where not previously provided or in CONSULTANT’S possession, CONSULTANT will request and obtain from the CITY the following information relative to existing water treatment facilities:

- Drawings and design reports
- Plant operating data and water quality summary reports for the past five years
- Operational data (SCADA), as available
- Previously completed reports, studies and master plan documents
- Currently-planned plant improvements

CONSULTANT will develop an inventory of recommended upgrades and/or additional studies needed for the CITY’s existing water treatment plants. This evaluation will identify potential technologies or operational changes that may benefit the CITY. However, no process or evaluations will be performed for those technologies or operational changes.

6.8 Water Production and Distribution Facilities Phasing Strategies
CONSULTANT will identify strategies to phase each water treatment facility to its ultimate capacity as well as water distribution facilities (wells, reservoirs, booster pump stations, and pipes). This task will incorporate the results of previous tasks including Task 3 (Planning Framework), Task 4 (Water Resources), Task 5.0 (Water Quality), and Task 6.0 (Water System Hydraulic Modeling)

6.9 Water System and Facilities Evaluation Workshop
CONSULTANT will prepare and present the results of Task 6 – Water System Master Plan, to CITY staff.

6.10 Technical Memorandum – Water System Evaluation
CONSULTANT will prepare a Technical Memorandum documenting the Water Distribution System Evaluation for the IWMP. This memorandum will include a summary of the existing system evaluation and identified deficiencies as well as the future system evaluation and infrastructure planning for growth. The Technical Memorandum will be provided to CITY after the Water System Workshop for review and comment.

After CITY’s comments are received, necessary changes to the water system analysis will be made and confirmed with the CITY. Full resolution of the CITY’s comments will be made when the information from this Technical Memorandum is incorporated in the final report.

TASK 6.0 Deliverables
- Model Calibration Plan (electronic PDF)
- Meeting and workshop exhibits and minutes (electronic PDF)
- Water System Evaluation Technical Memorandum (electronic PDF)
7.0 WASTEWATER SYSTEM MASTER PLAN

7.1 Data Collection and Review
CONSULTANT will prepare a data request list and coordinate with CITY staff to obtain and review the necessary information and data related to the existing wastewater collection system. Data collection includes, but is not limited to, the physical system components including gravity sewer lines, manholes, cleanouts, siphons, sewer interconnection structures, lift stations, force mains, treatment plants, and operational performance data.

7.2 Wastewater System Performance Criteria
CONSULTANT will obtain and review existing wastewater system performance and operational criteria, including pipe capacity, velocities, peaking factors, wet weather capacity criteria. Reliability and redundancy criteria for lift stations and force mains will also be developed. CONSULTANT will meet with CITY staff to review proposed criteria and arrive at a consensus on system performance criteria. These criteria will serve as the basis for performance evaluations and infrastructure planning.

7.3 Temporary Wastewater Flow and Rainfall Monitoring
In collaboration with the CITY and in conjunction with Tasks 3.4 and 3.5, CONSULTANT will prepare a flow and rainfall monitoring plan (GIS map showing proposed flow monitoring and rain gauge locations and table of manholes to place flow meters) to collect data at key points in the collection system to support the unit wastewater flow development and hydraulic model calibration. Flow monitoring data will be used to characterize existing system flows, develop diurnal flow patterns for the hydraulic model, support dry and wet weather calibration of the hydraulic model, and calculate system peaking factors.

CONSULTANT will prepare flow monitoring data summaries showing the site installation sheets, flow, depth and velocity time series graphs for the flow monitoring period. CONSULTANT will prepare depth versus velocity scatter graphs as part of the data quality/review process to assess the reasonableness of the data. CONSULTANT will prepare a system flow mass balance using the flow monitoring data and accounting for the upstream – downstream relationships between basins. Flow monitoring data will be reviewed with CITY staff in a progress meeting prior to incorporating it into the unit wastewater flow calculations or hydraulic model calibration. At this meeting, CONSULTANT will present and review the available storm event data collected during the monitoring period, and in conjunction with the CITY determine whether there is sufficient data to complete a wet weather calibration of the hydraulic model. CITY and CONSULTANT will collectively determine at this point whether to extend the monitoring period to capture storm event data or to use only dry weather flow data for model calibration.

7.4 Wastewater Model Build
The purpose of Task 7.4 is to build the wastewater model that will be used to complete the collection system capacity evaluation and identify capital improvements for system expansion. Prior to proceeding with 7.4 subtasks, CONSULTANT will recommend any model software changes and receive CITY approval.

7.4.1 GIS Review and Hydraulic Model Build
CONSULTANT will review the City's GIS data structure and make recommendations related to the order, formatting, and fields of information needed to align data required for the model and to allow the CITY
to track updates. CITY will update and provide the GIS data required for CONSULTANT to develop the hydraulic model.

CONSULTANT will develop a geometric network of the collection system using the updated GIS data received from the CITY. CONSULTANT will prepare a summary of the network topology violations and the changes made to the existing collection system to prepare the data for the model import. Updates to GIS made by the CONSULTANT to prepare the hydraulic model will be provided to the CITY.

CONSULTANT will prepare a description of CITY collection system facilities including collection basins, lift stations, interconnects with other utilities including the SROG connection, and treatment facilities using schematics, summary tables, pump curves, equipment capacity and operational descriptions. CONSULTANT will prepare the wastewater system description using existing reports, plans, schematics and discussions provided by the CITY and/or thru facility site visits as necessary. CONSULTANT will create schematic versions of model facility elements (such as lift stations and outfalls) for use in the model using the collection system model, facility drawings and details, and input from CITY staff.

CONSULTANT will develop the wastewater collection system model network to include network elements by importing the GIS geometric network and manually inputting the model facility (lift station) elements. Facilities will include pump curves, wet well dimensions and operational settings (on/off set points), active/inactive facilities. Manhole rim and invert elevations are assumed to be populated in the GIS. Spot checks of invert elevations will be performed using as-builts for key interceptors.

Pipe roughness coefficients (Manning's n values) will be assigned to the new model pipes based on assumed pipe material. Pipe roughness coefficients for existing pipes will be adjusted during the model calibration process.

CONSULTANT will prepare and submit a list of any remaining missing data information necessary for input and receive this data from the CITY before beginning the model calibration. CONSULTANT will conduct a meeting with the City to discuss options for addressing the data gaps.

7.5 Wastewater System Hydraulic Model Calibration
CONSULTANT will calibrate the collection system hydraulic model to dry weather conditions for depth, velocity and flow to a one-week period for each flow monitoring site selected. For wet weather conditions, if CITY and CONSULTANT agree at the end of Task 7.3 that sufficient storm event data was collected, CONSULTANT will calibrate the model for one storm event, as well as a continuous calibration period. Wet weather calibration will not be completed if it is mutually agreed upon by CITY and CONSULTANT at the completion of Task 7.3.

Model calibration will be evaluated using agreed upon guidelines that apply both quantitative (percent difference, model vs. observed scatter graphs, etc.) and qualitative (visual comparisons of observed and modeled hydrographs, comparisons of model predictions to available operations or customer complaint records, etc.) metrics. Interviews and review of model results with operations staff will also be completed to confirm the model calibration.

7.6 Existing Wastewater System Evaluation
CONSULTANT will perform a capacity analysis of the existing collection system and identify pipes that do not have sufficient capacity to convey peak, dry weather flows. CONSULTANT will perform a capacity
analysis for the lift stations. This analysis will also include a review of reliability and redundancy for unexpected system emergencies.

CONSULTANT will perform a capacity analysis of the existing collection system to accommodate peak, wet weather flows using the calibrated model from Task 7.6 and either the design storm parameters established in Task 3.5, or agreed upon peaking factors (if wet weather calibration was not completed). CONSULTANT will identify sewers that require additional capacity to accommodate storm events (or flows associated with agreed upon peaking factors) and will prepare capital improvement and/or operational recommendations to provide the required capacity.

CONSULTANT will use the hydraulic model to identify areas in the collection system where odor could be a problem due to low velocities or structures (i.e., wet wells, diversion structures, and locations with potential hydraulic jumps). CONSULTANT will incorporate the CITY’s odor complaint data, as available in an electronic sortable/searchable format in this analysis.

CONSULTANT will use the hydraulic model to develop recommendations for long-term flow monitoring sites. CONSULTANT and CITY will collaborate on criteria used to identify suitable sites. CONSULTANT will identify up to three potential flow metering technologies the CITY may use to collect long term data. CONSULTANT will provide advantages/disadvantages and estimated costs for equipment, installation and long terms operations and maintenance of permanently installed flow meters.

7.7 Wastewater System Improvements Evaluation
The purpose of Task 7.8 is to perform future wastewater system analyses to identify capital improvements needed for system expansion.

7.7.1 Planning Years Modeling Scenarios
CONSULTANT will create modeling scenarios for each planning year: 2025, 2030, and Buildout. Scenarios will include dry weather flow parameters (average daily flow, peak dry weather flow) as well as wet weather parameters (for predicting peak wet weather flow for a given design storm or other condition). Flows for planning year scenarios will be set using results from Task 3.2 and Task 3.4, as well as from the model calibration. CONSULTANT will evaluate and make recommendations for the collection system for each planning year. These evaluations will include:

- Incorporating improvements to resolve existing system deficiencies
- Short-term infrastructure improvements needed to support pending developments, including new gravity sewers, lift stations and force mains.
- Potential need for an Arrowhead Ranch Water Reclamation Facility (ARWRF) emergency bypass.

CONSULTANT will present the results of the future system modeling to the CITY. The purpose of the meeting will be to confirm the future capital improvements needed to position the CITY for growth.

7.7.2 Southwest Area Conveyance Plan
CONSULTANT will develop a wastewater collection and conveyance plan for the area between Camelback Rd. on the south, Northern Ave. on the north, 107th Ave. on the west and 83rd Ave on the east. This analysis will build upon the recent wastewater analysis completed by the CITY for this area and will:
- Identify performance criteria for new and existing mains to be used for the analysis
- Establish existing occupancy rates for residential and non-residential development
- Estimate flows for near and long-term conditions
- Maximize capacity of existing collection system infrastructure
- Identify infrastructure needed to convey flow through all phases of development to the 2050 planning horizon
- Identify development/growth triggers for new infrastructure

CONSULTANT will review historical flow monitoring records to establish a basis for current flows for this area. CONSULTANT will collaborate with the CITY to understand development potential and growth projections for the planning years 2025, 2030, and Buildout.

CONSULTANT will use the CITY's existing wastewater model to complete the modeling evaluations for the Southwest Area to meet the CITY's schedule for an early deliverable for this task. CONSULTANT will review the existing wastewater model and compare the model results with operational data to determine if the model provides a reasonable representation of the collection system. CONSULTANT will not perform a calibration of the existing wastewater model to complete this evaluation.

CONSULTANT will develop infrastructure alternatives that optimize the use of the CITY's existing infrastructure and SROG capacity. This will include an evaluation of the potential to discharge sewage flow to the existing abandoned sewer system along 83rd Avenue on the south side of Camelback Road as one alternative to prevent sewer surcharging in the 95th Avenue sewer north of Camelback Road due to new growth and potential ARWRF emergency bypass needs in the future. CONSULTANT will develop conceptual cost opinions for infrastructure required for each alternative.

CONSULTANT will prepare a technical memorandum documenting the Southwest Area Conveyance Plan that outlines the data assumptions, alternatives evaluations, infrastructure recommendations including estimated costs for review and comment.

After CITY's comments are received, necessary changes to the analysis will be made and the Technical Memorandum will be finalized as a standalone document (also to be included as an appendix in the IWMP).

7.8 Wastewater System Emergency Operations Evaluation
CONSULTANT will perform an emergency operations analysis for the CITY's lift stations. This will include a wet well capacity analysis to estimate the time it would take for an overflow event to occur assuming there was a mechanical or power failure at each lift station.

CONSULTANT will evaluate alternatives for the CITY to beneficially use capacity in the SROG system for emergency routing of wastewater flows.

CONSULTANT will develop emergency operations alternatives for the CITY's wastewater reclamation facilities (WAWRF and ARWRF) for emergency discharge of reclaimed water. This will include an analysis of recharge options and the advantages and disadvantages for each alternative.
7.9 Wastewater Treatment Facilities Evaluation
CONSULTANT will prepare a summary of capacities and major process descriptions for the CITY's wastewater treatment facilities: ARWRF and WAWRF. CONSULTANT will request and obtain from the CITY the following information relative to existing wastewater treatment facilities:

- Drawings and design reports
- Plant operating data and water quality summary reports for the past five years
- Asset database
- Previously completed reports, studies and master plan documents
- Currently planned plant improvements

CONSULTANT will review the CITY's wastewater treatment operating and water quality data with respect to the Regulatory Review performed in Task 5.2 and provide recommendations to meet the CITY's short and long-term water quality goals.

CONSULTANT will complete a site visit to WAWRF and conduct interviews with plant operations and maintenance personnel to understand the current state of conditions and identify areas that may need additional evaluation, improvements, rehabilitation, or replacement due to asset condition or operational and maintenance challenges.

7.10 Wastewater Collection and Treatment Facilities Phasing Strategies
CONSULTANT will identify justification and projected phasing for expansion of the ARWRF and WAWRF to its ultimate capacity and wastewater collection facilities (i.e., lift stations). This task will incorporate the results of previous tasks including Task 3 (Planning Framework), Task 4 (Water Resources), Task 5.4 (Water Quality), and Task 7.0 (Wastewater System Hydraulic Modeling). Recommendations will also be coordinated with Task 6.3, recognizing the inter-relationship of water supply and reclamation options.

7.11 Wastewater System Workshop
CONSULTANT will prepare and present the results of Task 7 – Wastewater System Master Plan and Task 8 – Reclaimed Water System Master Plan, to CITY staff.

7.12 Technical Memorandum – Wastewater System Evaluation
CONSULTANT will prepare a Technical Memorandum documenting the Wastewater System Evaluation for the IWMP. This memorandum will include a summary of the existing system evaluation and identified deficiencies as well as the future system evaluation and infrastructure planning for growth. The Technical Memorandum will be provided to CITY after the Wastewater Workshop for review and comment.

After CITY's comments are received, necessary changes to the wastewater system analysis will be made and confirmed with the CITY. Full resolution of the CITY's comments will be made when the information from this Technical Memorandum is incorporated in the final report.

**TASK 7.0 Deliverables**
- Flow Monitoring Plan (electronic PDF)
- Workshop exhibits and minutes (electronic PDF)
- Southwest Area Conveyance Plan Technical Memorandum (electronic PDF)
- Wastewater System Evaluation Technical Memorandum (electronic PDF)
8.0 RECLAIMED WATER SYSTEM MASTER PLAN

8.1 Data Collection and Review
CONSULTANT will prepare an information request list and coordinate with CITY staff to obtain and review the necessary information and data related to the reclaimed water system served from the WAWRF. In addition, for documentation purposes only, information for supply of reclaimed water from the Arrowhead Ranch WRF to the Arrowhead Ranch amenities will also be summarized. Information collection includes, the physical system components such as pipelines, pump stations, reservoirs, recharge facilities, along with reclaimed water delivery history and operational performance data.

8.2 Recharge and Recovery Strategies
In coordination with Task 4.4, CONSULTANT will develop reclaimed water management strategies that identify opportunities the CITY has to optimize use of reclaimed water resources. This evaluation will include quantifying both recharge and direct reuse potential, including identifying potential new reuse customers within a limited proximity to the non-potable reuse distribution system from the WAWRF.

CONSULTANT will develop recharge and recovery strategies that account for seasonal reclaimed water supply and demand variations. This analysis will develop a system-wide seasonal production/demand curve for a typical year. This curve will present in graphical format the times of the year when reclaimed water production is greater or less than demand. This analysis will quantify operational storage needs and short- and long-term recharge capacity requirements. This analysis will include a review of the impact of the Sunset Clause on reclaimed water recharge credits and define a strategy for managed recharge.

8.3 Existing Reclaimed Water Distribution System Evaluation
CONSULTANT will develop a reclaimed water distribution system spreadsheet model to reflect the current infrastructure system served from the WAWRF. The spreadsheet model will be used to complete a mass balance of the reclaimed system. CONSULTANT will evaluate the existing reclaimed water delivery system. CONSULTANT will work with the CITY to develop system performance criteria for evaluating the system. CONSULTANT will evaluate the reclaimed water distribution system against the criteria, identify system deficiencies and make recommendations for improvements, upgrades or modifications, if any.

CONSULTANT will review the ARWRF reclaimed water delivery system and identify those components that are owned by the City and which are owned by developers. CONSULTANT will compile a list of the City’s current reclaimed water commitments at ARWRF.

8.4 Reclaimed Water Recharge System Improvements Evaluation
CONSULTANT will evaluate the recharge and recovery needs for each planning year and develop recommendations to achieve an acceptable level of drought protection through underground storage and recovery, as well as a water balance approach. The quantity and timing of recharge and recovery needs will be determined. An assessment will be made as to the capacity of existing recharge facilities, and, if appropriate, recommendations will be made aimed at increasing recharge capacity.
Recharge needs will be projected for each planning year, considering the increase in reclaimed water production with growth but also accounting for potentially reduced demands due to improved water conservation techniques. CONSULTANT will evaluate the adequacy of the CITY’s recharge facilities with respect to short- and long-term recharge and recovery needs. CONSULTANT will determine the need for additional facilities based on the level of recharge redundancy and reliability desired by the CITY.

3.5 Reclaimed Water Policy Evaluation
CONSULTANT will collaborate with the CITY to identify rules, guidelines, policies that are currently in place that regulate reclaimed water use in the CITY, along with efforts underway in the State to change some of the rules. A needs assessment will be conducted to identify critical issues and concerns of CITY staff regarding reclaimed water use. CONSULTANT will provide examples of reclaimed water policies in use for other municipalities and identify elements of these policies that are applicable and may be advantageous to the CITY.

CONSULTANT will draft an outline of a water reuse policy and provide to CITY for review and comment. Once comments are received, CONSULTANT will draft a water reuse policy that will be included in the Reclaimed Water System Evaluation Technical Memorandum.

3.6 Technical Memorandum – Reclaimed Water System Evaluation
CONSULTANT will prepare a Technical Memorandum documenting the Reclaimed Water System Evaluation for the IWMP. This memorandum will include a summary of the existing system evaluation and identified deficiencies, the future system evaluation, recommended reclaimed water policy and summary of potential for potable reuse at the West Area WRF. The Technical Memorandum will be provided to CITY after the Reclaimed Water System Workshop for review and comment.

After CITY’s comments are received, necessary changes to the reclaimed water system analysis will be made and confirmed with the CITY. Full resolution of the CITY’s comments will be made when the information from this Technical Memorandum is incorporated in the final report.

TASK 3.0 Deliverable
- Reclaimed Water System Evaluation Technical Memorandum (electronic PDF)

9.0 STORMWATER MAINTENANCE PLAN AND UTILITY EVALUATION
9.1 Data Collection and Review
CONSULTANT will prepare a data request list and coordinate with CITY staff to obtain and review the necessary information and data related to the stormwater system. Data collection includes the physical system components, previous studies and reports, and maintenance-related data.

CONSULTANT will obtain from the CITY (or other sources defined below) the following data for the area within the City limits:
- 2011 City of Glendale Area Drainage Master Plan Studies
- Drainage improvement as-built plans and land use changes since year 2011
- CITY stormwater system GIS
- Stormwater CIP and commercial/residential planned and on-going development that includes storm drains and other stormwater infrastructure from:
  - The City
  - Maricopa County Development Services One Stop

CONSULTANT will compile available data and work with the CITY to resolve any data gaps. Appropriate assumptions will be established for system maintenance planning projections for review by the City.

9.2 Stormwater Maintenance Plan
CONSULTANT will review CITY stormwater maintenance and operations procedures. This assessment will include:

- Tabulating maintenance department assets and resources
- Assessing current management methods and methods of tracking work completed, inspections performed, and monitoring activity required for MS4 permit compliance.
- Evaluating staffing and equipment capability to perform routine maintenance and emergency services of drainage facilities
- Developing stormwater drainage system maintenance cost opinions for current and recommended alternative system improvements
- Evaluating current CITY’S maintenance operations assets and labor availability to provide coverage of newly annexed areas.

9.3 Stormwater Utility Evaluation
CONSULTANT will complete the analysis previously initiated under the Stormwater Utility Concept – Initial Technical Support work. CONSULTANT will complete the review of the survey data obtained and CITY-provided data related to stormwater system operating and maintenance costs and projections, appropriate staffing levels, capital costs and projections. CONSULTANT will prepare a range of potential options for stormwater utility concept revenue models for review and consideration by the CITY.

9.4 Stormwater Maintenance and Utility Evaluation Workshop
CONSULTANT will prepare and present the results of Tasks 9.2 & 9.3 – Stormwater Maintenance Plan and Utility Evaluation, to CITY staff.

9.5 Technical Memorandum – Stormwater Maintenance and Utility Evaluation
CONSULTANT will prepare a Technical Memorandum documenting the work the Stormwater Maintenance Plan and Utility Evaluation for the IWMP. This memorandum will include a summary of findings and recommendations for Stormwater Utility implementation. The Technical Memorandum will be provided to CITY after the Stormwater Maintenance and Utility Evaluation Workshop for review and comment.

After CITY’s comments are received, necessary changes to the analysis will be made, and the Technical Memorandum will be finalized as a standalone document (also to be included as an appendix in the IWMP).

**TASK 9.0 Deliverables**
- Meeting and Workshop exhibits and minutes (electronic PDF)
- Stormwater Maintenance and Utility Evaluation Technical Memorandum (electronic PDF)
10.0 CONDITION ASSESSMENT OF BELOW GROUND ASSETS

This task includes risk-based assessment and Rehabilitation & Replacement prioritization for distribution mains and transmission mains and sewer force mains.

10.1 Distribution Mains and Transmission Mains

The purpose of this task is to develop a prioritized plan for main replacements or rehabilitation using relevant data specific to the CITY’s distribution system and transmission mains. CIP development in support of executing the prioritized plan is included in Task 12.

10.1.1 Data Collection and Review

CONSULTANT will perform data collection and review for distribution mains and transmission mains. CONSULTANT will compile/request the following data to support the risk-based prioritization: GIS data including water distribution and transmission network data, break data by pipe segment, work order history by pipe segment, water complaint locations, model flow and pressure data by pipe segment (based on updated model data as part of Task 6.0), pressure data, critical customer locations (from Task 11), population densities, parcel data, and GIS background data (such as service area, roads, railroads, water bodies, etc.). CONSULTANT will review the distribution and transmission system GIS network and pipe attribute data provided by the CITY for consistency and completeness appropriate to support the risk-based prioritization analysis. At a minimum, the following pipe attribute data will be required to support the risk prioritization: unique ID, installation date, material, and diameter. CONSULTANT will provide a summary of the findings and provide a list of the pipe records where the attribute data should be reviewed and/or updated. One teleconference meeting will be conducted with the CITY to review the findings. Findings will be summarized in figures and tables depicting existing system information, as made available from the CITY. Additional data may be requested to support development of the likelihood and consequence of failure (COF) criteria. Requested data should be provided in a geodatabase, shapefile, or spreadsheet format (as applicable).

CONSULTANT will develop a methodology to populate pipe attribute data gaps for unique ID, installation date, material, and diameter, where this information is not complete in the GIS for pipe segments that are to be included in the analysis.

Main break data will be used to support likelihood of failure criteria (LOF) as a count per pipe or determination of a break rate. CONSULTANT will perform a cohort analysis to determine a break rate per defined cohort to review trends in material types. In coordination with the CITY, cohorts will be defined based on pipe material, diameter, and/or installation years. If a pipe ID is not associated with the main break data and an address is available, CONSULTANT will geocode each main break location and determine the best pipe match for the main break. A confidence match level will be assigned to each main break for selection of higher quality data for use in the risk criteria. One teleconference meeting will be conducted with the CITY to review finalize the cohorts and findings.

10.1.2 Main Replacement and Rehabilitation Evaluation

In coordination with the CITY, CONSULTANT will develop initial LOF and COF criteria used to determine the risk and respective scoring methodology (e.g. pipe size, work history, water complaint history, break history, age, proximity to critical customer, max/min operating pressures, soil corrosion, remaining useful life based on industry standard guidelines for estimated life expectancy, etc.). The same LOF and COF criteria and methodology will be used for both distribution and transmission mains.
CONSULTANT will conduct one onsite meeting with the CITY to review initial results and finalize the LOF and COF criteria to be used in the risk prioritization. In coordination with the CITY, CONSULTANT will define the foundation for how the risk model will be set-up and delivery of results including review of risk classifications/management strategy groups for planning level replacement/rehabilitation (R&R) needs, typically set-up as a 5x5 matrix with defined groupings. Additional data may be requested to support development of the likelihood and consequence of failure criteria. Requested data should be provided in a geodatabase or shapefile format or spreadsheet format.

CONSULTANT will develop the risk-based prioritization model to determine LOF and COF scores for each individual GIS pipe segment. Using the LOF and COF scores, CONSULTANT will calculate overall risk scores and assign the risk classification per water main pipe segment in the GIS. Using the unit costs developed in Task 12, CONSULTANT will estimate a replacement cost per pipe segment. Costs will be calculated based on pipe shape length and diameter provided in the GIS. An estimated replacement value (planning level of investment) will be determined for each defined grouping in the risk matrix. CONSULTANT will prepare figures and tables to depict and summarize total miles of pipe within the various management strategy groups. CONSULTANT will use its own software/tools to develop the risk model. The risk model is not anticipated to be provided to the CITY.

In coordination with the CITY, CONSULTANT will develop a decision tree to support rehabilitation improvement planning for the distribution system. The decision process will identify priority groups of water mains (distribution and transmission) based on the risk classification and additional selected criteria to determine appropriate management strategies including replacement, inspection activities, and/or recommended monitoring. Results from the risk prioritization model will be used to support the decision tree development. For each management strategy, a planning schedule will be defined in alignment with the CIP planning periods. Where replacement strategies are recommended, planning level replacement costs will be provided. Costs will be estimated based on pipe shape length provided in the GIS. CONSULTANT will facilitate two teleconference meetings to support development of the decision tree and review results. This task will be performed in coordination with the CIP development included as Task 12.

10.1.3 Failure Mode Analysis (Allowance)
Pipe Sample Collection, Testing, and Analysis (Allowance): At the direction of the CITY, CONSULTANT will collect pipe samples for analysis of failure mode, remaining useful life estimation, and general condition. Samples are envisioned to be collected from main breaks, taps, or other related construction activity. Testing will be determined based on the pipe material, circumstances surrounding sample availability, and goal of the testing. CONSULTANT will obtain CITY approval of testing methods prior to proceeding. Test results will be used to validate the model developed for Task 10.1. Because this task does not have a clearly defined quantity of pipe that will be tested, it is scoped and budgeted as an allowance that may be authorized at the option of CITY.

10.1.4 Distribution and Transmission Main Workshop
CONSULTANT will conduct one on-site workshop with the CITY to review the final risk rankings, prioritization, and recommendations for both the distribution and transmission mains. Discussions from this workshop will be incorporated into the development of the Technical Memorandums included in Task 10.3.
10.2 Force Mains

The purpose of this task is to develop a prioritized plan for assessing the City’s force mains using relevant data specific to the CITY’s force main system. CIP development in support of executing the assessment plan is included in Task 12.

10.2.1 Data Collection and Review

CONSULTANT will compile/request the following data to support risk based prioritization: GIS data including force main network data, break data by pipe segment, work order history by pipe segment, model flow and pressure data by pipe segment (based on updated model data as part of Task 7.0), pressure data, in-line valve history, air/vac valve history, critical customer locations, population densities, parcel data, and GIS background data (such as service area, roads, railroads, water bodies, etc.). CONSULTANT will review the force main system GIS network and pipe attribute data provided by the CITY for consistency and completeness appropriate to support the risk-based prioritization analysis. At a minimum, the following pipe attribute data will be required to support the risk prioritization: unique ID, installation date, material, and diameter. CONSULTANT will provide a summary of the findings and provide a list of the pipe records where the attribute data should be reviewed and/or updated. One teleconference meeting will be conducted with the CITY to review the findings. Findings will be summarized in figures and tables depicting existing system information, as made available from the CITY. Additional data may be required to support development of the LOF and COF criteria. Requested data should be provided in a geodatabase shapefile, or spreadsheet format (as applicable).

CONSULTANT will develop a methodology to populate pipe attribute data gaps for unique ID, installation date, material, and diameter, where this information is not complete in the GIS for pipe segments that are to be included in the analysis.

10.2.2 Force Mains Evaluation

CONSULTANT will prioritize the force mains for future assessment. It is assumed that each force main will be comprised of the pipe between the corresponding lift station/pump station and the transition point to the gravity collection system. The goal of the prioritization is to establish and implement a relative prioritization for force mains in the program. The prioritization will include LOF and COF factors developed by the CONSULTANT and vetted with CITY staff. Preliminary LOF factors are expected to include break or leak history (if any); operating factors such as surges, proximity to pump stations, and high operating pressure relative to design pressure. Preliminary COF factors are expected to include redundancy and diameter, location-specific or environmental factors, and valve age and operating history. Each force main will be prioritized separately for assessment. Any exceptionally high-priority assets within the CITY’s force main network may be identified in this phase for future program development.

CONSULTANT will conduct a workshop with the CITY to review initial results and finalize the criteria to be used in the risk prioritization. In coordination with the CITY, CONSULTANT will define the foundation for how the risk model will be set-up and delivery of results. Additional data may be requested to support development of the likelihood and consequence of failure criteria. Requested data should be provided in a geodatabase or shapefile format or spreadsheet format. Based on the results of the meeting, CONSULTANT will develop the risk-based prioritization model to determine the LOF and COF scores for the force mains. CONSULTANT will use its own software/tools to develop the risk model. The risk model is not anticipated to be provided to the CITY.
CONSULTANT will identify management strategies (inspect, monitor, run to failure) for the force mains identified in Task 10.2.2. For the highest priority force mains, CONSULTANT will identify preliminary methods for completing assessment of each force main. Unit costs will be developed and used to estimate cost per pipe grouping to implement the transmission main assessment plan. Plan implementation costs will be estimated based on pipe shape length and diameter provided in the GIS. This task will be performed in coordination with the CIP development included as Task 12.

10.2.3 Force Mains Workshop
CONSULTANT will conduct a workshop with the CITY to review the final risk rankings, prioritization, and recommendations for the force mains. Discussions from this workshop will be incorporated into the development of the Technical Memorandums included in Task 10.3.

10.3 Condition Assessment: Technical Memoranda
CONSULTANT will document the results of Task 10 activities in a separate Technical Memorandum for Task 10.1 - Distribution Mains and Transmission Mains and Task 10.2 - Force Mains.

10.3.1 Technical Memorandum — Water Distribution and Transmission Mains — Pipeline Prioritization
CONSULTANT will document the risk-based prioritization criteria development, results, and recommendations in a Technical Memorandum. System maps and figures to illustrate the results and support the recommendations will be provided. An electronic copy of the draft Technical Memorandum will be provided to the CITY for review and comment. CONSULTANT will facilitate one meeting with the CITY to present the draft Technical Memorandum and receive comments. CONSULTANT will incorporate comments from the review workshop. Necessary changes to the Technical Memorandum will be made and confirmed with the CITY. Full resolution of the CITY's comments will be made when the information from this Technical Memorandum is incorporated in the final report.

10.3.2 Technical Memorandum — Force Mains Assessment Plan
CONSULTANT will document the results of the prioritization and assessment approaches for the highest priority force mains in a Force Main Assessment Plan. System maps to illustrate the force mains and recommendations will be provided. An electronic copy of the draft Assessment will be provided to the CITY for review and comment. CONSULTANT will facilitate one workshop with the CITY to present the Force Main Assessment Plan and receive comments. Necessary changes to the Force Mains Assessment Plan will be made and confirmed with the CITY. Full resolution of the CITY's comments will be made when the information from this Force Main Assessment Plan is incorporated in the final report.

TASK 10.9 Deliverables
- Summary of the findings from Distribution System and Transmission Main GIS Data Evaluation
- Summary of the findings from Force Main GIS Data Evaluations
- Meeting and Workshop exhibits and minutes (electronic PDF)
- Water Distribution and Transmission Mains — Pipeline Prioritization Technical Memorandum (electronic PDF)
- Force Mains Assessment Plan — Technical Memorandum (electronic PDF)
11.0 ADVANCED METERING INFRASTRUCTURE (AMI) PLANNING
(allocation)

Within the budgeted allowance provided, CONSULTANT will collect and review information provided by CITY and provide AMI planning consultation with CITY staff, as described in the subtasks below.

11.1 Information Collection and Review
CITY will provide CONSULTANT the following information:

- Water meter inventory, including size and type, manufacturer, endpoint manufacturer and type, register manufacturer and type, installation date, cumulative flow through the meter, performance record, and accuracy test results.
- CITY meter repair and replacement procedures and policies, meter testing and repair facilities and capabilities, and procurement specifications.
- CITY’s Automated Meter Reading (AMR)/AMI installation history, equipment type, models, locations and performance records.
- CITY’s most recent water rate study and rate schedule and any currently anticipated rate schedule modifications
- Other relevant metering information identified during performance of this task.

Where available, CITY will also provide CONSULTANT with its most recent information for:

- Water meter replacement, cost of water meter reading differentiated by manual versus drive-by AMR.
- Number and cost of monthly turn on/turn off events, high bill complaints, and meter reads.
- Monthly vehicle travel costs, differentiated by manual versus drive-by costs.
- Meter reader lost time and cost.
- Hardware/software maintenance costs.
- Radio/software licensing costs.
- Monthly costs for service line leak detection, distribution system leak detection, customer leak detection, meter tampering/theft detection and response, and customer-specific daily water use evaluation costs.

CONSULTANT will review and organize information provided by CITY as the basis for subsequent AMI planning consultation under Subtask 11.2.

11.2 AMI Planning Consultation
CONSULTANT will provide consultation with CITY staff for AMI-related planning on subjects that may include:

- Meter reading and database functional requirements.
- Identification and prioritization of near- and long-term requirements and desires for hardware and software functionality.
- Definition of meter reading alternatives and functional requirements.
• Conceptual cost opinions/comparison tables for:
  - Maintaining the existing meter reading mix, with recommended meter replacement.
  - Optimization of the mix of AMR and AMI meter reading (hybrid system).
  - Total system AMI.
• Meter reading and database functional requirements.
• Alternative customer web portals, functionality, and costs.
• AMR/AMI technology benefits and risks.
• Impacts on CITY’s existing organization.
• Procurement and implementation issues.
• Summary of consultation results and recommendations to include in the IWMP.

TASK 11.0 Deliverables
• AMI Planning Consultation Summary and Recommendations Memorandum (electronic PDF)

12.0 INTEGRATED WATER MASTER PLAN RECOMMENDATIONS

12.1 System Improvements Needed for Existing Customers
CONSULTANT will prepare capital project recommendations to provide water and wastewater service to existing customers. These projects will include repairs, rehabilitation, and capacity improvements where operation of the current water and wastewater systems do not meet the CITY’s performance criteria. These are the projects that would most likely be funded by current rate payers.

12.2 System Improvements Needed for Growth
CONSULTANT will prepare capital project recommendations to serve additional customers due to growth. These projects will supply water to new areas and increase the capacity for water supplies, water treatment, and wastewater treatment. These projects would most likely be funded from impact fees and from developer.

12.3 Conceptual Unit Cost Development
CONSULTANT will prepare planning level unit costs for pipelines, storage, pumping, wells, treatment, and reclaimed water facilities. Unit costs will be developed from bid tabs, CONSULTANT’s unit price catalog, and the CITY’s experience.

12.4 Phased Capital Improvements Plan
CONSULTANT will prepare a capital improvement plan that assigns the timing of capital projects identified in the master planning analysis based on City Fiscal Years, growth targets, or both. Projects will be correlated across water systems and synchronized in a logical sequence. This capital improvement plan will consist of a table of projects by category (water, wastewater, storm water, reclaimed water), estimated capital and project costs, timing of project (based on master planning analysis identified need), and justification or project. System maps will be provided to correlate with the table to show the locations where projects are recommended in the master plan.

12.5 Integrated Planning Recommendations Workshop
CONSULTANT will conduct a workshop to present the draft CIP projects and implementation plan. The CITY will have the opportunity to review the projects and provide feedback needed to refine the projects and the implementation plan.
12.6 Technical Memorandum – Integrated Recommendations

CONSULTANT will prepare a technical memorandum that will document the capital improvement projects organized by project type and sequence. Costs will be summarized so that the CITY has the information needed to prepare a funding plan. Maps and descriptions of projects will be provided, along with the unit costs.

TASK 12.0 Deliverables

- Workshop exhibits and minutes (electronic PDF)
- Integrated Planning Recommendations Technical Memorandum (electronic PDF)

13.0 STAFFING EVALUATIONS

The CONSULTANT’S staffing evaluations include the following areas:

- GIS
- Water Treatment Plants
  - Pyramid Peak
  - Oasis
  - Cholla
- Water Reclamation Facilities
  - West Area
  - Arrowhead Ranch
- Central Systems Maintenance (CSM)
  - CSM Mechanics
  - CSM Instrument Techs
  - CSM SCADA
- Operations (Collections, Distribution, Remote Sites)
  - Central Systems Coordination (Control Room Operators)
  - Water Distribution
  - Wastewater Collections
  - Stormwater
  - Water Services Public Service Representatives

13.1 Data Collection and Review

CONSULTANT will request water treatment plant and distribution system maintenance programs (standard operating procedures), staffing schedules, annual overtime hours, and related job descriptions. Staffing schedules will include the plant supervisors, operators, operator trainees, and maintenance, electrical, and instrumentation and control staff at the treatment plants. The distribution staff will include supervisory, maintenance, electrical, trainees, and instrumentation and control personnel. CONSULTANT will review the request data to become familiar with the operation and maintenance of CITY’s treatment facilities and distribution system. Additional data may be requested after this review.

CONSULTANT will request water reclamation plant and collection system maintenance programs (standard operating procedures), staffing schedules, annual overtime hours, and related job...
descriptions. Staffing schedules will include the plant supervisors, operators, operator trainees, and maintenance, electrical, and instrumentation and control staff at the reclamation plant. The collection system staff will include supervisor, maintenance, electrical, trainees, and instrumentation and control personnel. CONSULTANT will review the requested data to become familiar with the operation and maintenance of CITY's treatment facilities and collection system. Additional data may be requested after this review.

CONSULTANT will request CSM programs for the mechanics, instrumentation techs, and SCADA administrator plus public service representatives programs (standard operating procedures, where applicable), staffing schedules, annual overtime hours, and related job descriptions. Staffing schedules will include the central system maintenance supervisors, industrial maintenance mechanics and industrial Sr. maintenance mechanics, instrumentation technicians and Sr. instrumentation technicians, SCADA administrator. The public service representatives' staff will include the supervisor, utility locators, and public service representatives. CONSULTANT will review the requested data to become familiar with the central maintenance and public service programs. Additional data may be requested after this review.

13.2 Site Tours

CONSULTANT will schedule a meeting and site tours with the CITY to discuss the current operation and maintenance activities at the water treatment/distribution and water reclamation/collection facilities, along with activities not being performed. CONSULTANT will also schedule meetings with the CSM divisions and public service representatives to discuss current activities and any activities not being performed. CONSULTANT will provide a meeting agenda and prepare meeting minutes.

CONSULTANT will schedule and coordinate the meetings and site tours of the facilities prior to the meeting. It is anticipated that the onsite meetings will take one to two hours per division, while completion of the site tours is two to three days. CONSULTANT may request additional data during these tours.

13.3 Benchmarking and Staffing Evaluations

CONSULTANT will benchmark the current staffing to industry levels for systems of similar size, with emphasis on utilities in the western United States (up to three comparable). CONSULTANT will also seek input from other utilities within the local region. CONSULTANT will compare existing water treatment facility and distribution staffing levels with benchmark of similar size and complexity, summarize differences and develop recommendations based on previous task findings.

CONSULTANT will compare existing water reclamation plant and collection staffing levels with benchmark of similar size and complexity, summarize differences and develop recommendations based on previous task findings.

CONSULTANT will compare the public service representatives staffing levels with benchmark of similar size and complexity, summarize differences and develop recommendations based on previous task findings.

CONSULTANT will compare the CSM staffing levels with other utilities within the local region and summarize differences and develop recommendations based on previous task findings.
13.4 Staffing Evaluations Workshop

CONSULTANT will prepare and present the results of Task 13.0 –Treatment Plant and Distribution Staffing Level Evaluation, to CITY staff.

13.5 Technical Memorandum – Staffing Evaluations

CONSULTANT will prepare a Technical Memorandum documenting the water treatment and water reclamation plants, distribution and collection systems, central system maintenance divisions, and public service representatives staffing level evaluation, for the Glendale Integrated Water Master Plan. The Technical Memorandum will be provided to CITY after the Staffing Level Workshop for review and comment. After CITY’s comments are received, necessary changes will be made and confirmed with the CITY. Full resolution of the CITY’s comments will be made when the information from this Technical Memorandum is incorporated in the final report.

TASK 13.0 Deliverables

- Meeting and Workshop exhibits and minutes (electronic PDF)
- Technical Memorandum – Staffing Evaluations (electronic PDF)

14.0 CONSOLIDATED DELIVERABLES

14.1 Integrated Water Master Plan Report

Executive Summary – CONSULTANT will prepare a color brochure style (11 x 17-inch stock, folded to 8.5 x 11-inch booklet) executive summary of the IWMP that will be suitable for distribution to the CITY Council, CITY Leadership, stakeholders and the general public. The Executive Summary will contain color graphics, charts, and pictures explaining the IWMP. CONSULTANT will provide an electronic copy of the draft Executive Summary for CITY review prior to issuing the final document. CONSULTANT will prepare and deliver up to 30 copies of the final printed Executive Summary and an electronic copy in PDF format that the CITY can use to produce additional copies.

Integrated Water Resources Master Plan – CONSULTANT will prepare the IWMP document by incorporating the CITY’s comments on the technical memoranda in a single, tabbed, 3-ring binder. Appendices will be included in a separate, tabbed, 3-ring binder. The footer of each page of the document will contain the CONSULTANT’s file name, date the page was created, and the page number. Map figures shall indicate the month and year in which they were created, and the source of the information provided therein. The CONSULTANT will provide a draft report in PDF format for CITY review prior to issuing the final document. CONSULTANT will deliver up to 15 printed copies of the final document and an electronic version in PDF format to the CITY.

14.2 Hydraulic Models and Documentation (Allowance)

CONSULTANT will document update processes developed for the water and wastewater system models developed in the IWMP. CONSULTANT will deliver the final water and wastewater system models and update documentation as an electronic file in PDF format to the CITY. This task is an allowance that may be authorized at the option of CITY.
14.3 Council Presentation Technical Support (Allowance)
CONSULTANT will prepare a PowerPoint presentation summarizing the key findings of the IWMP to support CITY staff in presenting the IWMP to CITY Council. CONSULTANT will collaborate with CITY staff to develop content for the presentation that may include graphs, tables, figures, and maps. This task is an allowance that may be authorized at the option of CITY.
EXHIBIT C
Professional Services Agreement

SCHEDULE

INTEGRATED WATER MASTER PLAN
CIP Project No. 171845

The attached schedule table dated 3/25/2019 (1 page) is incorporated herein to Exhibit C.
ATTACHMENT TO EXHIBIT C
Professional Services Agreement

INTEGRATED WATER MASTER PLAN
Project No. 171845

SCHEDULE.

Professional services defined in Exhibit B shall be provided within the term set forth in Article 15 of the Professional Services Agreement. Target completion times by Scope of Work task are listed below. Multiple tasks will run concurrently. All target completion times are expressed in months after Notice-to-Proceed with the Agreement’s Scope of Work in Exhibit B.

<table>
<thead>
<tr>
<th>TASK</th>
<th>Target Completion (in months after Notice-to-Proceed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project Management</td>
<td>21</td>
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<tr>
<td>2. Scenario Planning</td>
<td>3</td>
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<tr>
<td>3. Planning Framework</td>
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<td>4. Water Resources</td>
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<tr>
<td>5. Water Quality</td>
<td>12</td>
</tr>
<tr>
<td>6. Water System Master Plan</td>
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<tr>
<td>7. Wastewater System Master Plan</td>
<td>14</td>
</tr>
<tr>
<td>8. Reclaimed Water System Master Plan</td>
<td>11</td>
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<tr>
<td>10. Condition Assessment of Below Ground Assets</td>
<td>16</td>
</tr>
<tr>
<td>11. Advanced Metering Infrastructure Planning</td>
<td>9</td>
</tr>
<tr>
<td>12. Integrated Water Master Plan Recommendations</td>
<td>18</td>
</tr>
<tr>
<td>13. Staffing Evaluations</td>
<td>14</td>
</tr>
<tr>
<td>14. Consolidated Deliverables</td>
<td>21</td>
</tr>
</tbody>
</table>
EXHIBIT D
Professional Services Agreement

COMPENSATION

METHOD AND AMOUNT OF COMPENSATION
Compensation shall be hourly rates plus allowable reimbursable expenses as set forth in Section 4 of the Agreement on a time and materials not-to-exceed basis.

NOT-TO-EXCEED AMOUNT
The total amount of compensation paid to Consultant for full completion of all work required by the Project during the entire term of the Project must not exceed $2,432,358.

DETAILED PROJECT COMPENSATION
The attached Detailed Project Compensation table dated 3/25/2019 (1 page) is incorporated herein to Exhibit D.
**ATTACHMENT TO EXHIBIT D**  
Professional Services Agreement  

**INTEGRATED WATER MASTER PLAN**  
Project No. 171845  

**DETAILED PROJECT COMPENSATION**

<table>
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<th>Integrated Water Master Plan</th>
<th>FEE SCHEDULE</th>
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<tr>
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<td>4. Water Resources</td>
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<td>9. Stormwater Maintenance Plan and Utility Evaluation</td>
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<td>10. Condition Assessment of Below Ground Assets</td>
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<td>11. Advanced Metering Infrastructure Planning (Miscellaneous Allowance)</td>
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<td><strong>Reimbursable Expenses Allowance (per Agreement Paragraph 4.4)</strong></td>
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<td><strong>SUBTOTAL:</strong></td>
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**Miscellaneous Allowances (per Agreement Paragraph 4.3)**

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<tr>
<th><strong>TASK</strong></th>
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