STATE OF TEXAS

TWDB Contract No. 1800012264

COUNTY OF TRAVIS

General Revenue
ALLIANCE FOR WATER EFFICIENCY

This Contract, (hereinafter "CONTRACT"), between the Texas Water Development Board (hereinafter "TWDB") and **ALLIANCE FOR WATER EFFICIENCY** (hereinafter "CONTRACTOR"), is composed of two parts, SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO THE STANDARD AGREEMENT and SECTION II. STANDARD AGREEMENT. The terms and conditions set forth in SECTION I will take precedence over terms and conditions in SECTION II.

SECTION I. SPECIFIC CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT

ARTICLE I. DEFINITIONS

For the purposes of this CONTRACT, the following terms or phrases shall have the meaning ascribed therewith:

1. TWDB – The Texas Water Development Board, or its designated representative
2. CONTRACTOR – ALLIANCE FOR WATER EFFICIENCY
3. EXECUTIVE ADMINISTRATOR – The Executive Administrator of the TWDB or a designated representative
4. PARTICIPANT(S) – None
5. SERVICES – Developing the Municipal Water Conservation Planning Tool
6. DELIVERABLES – Municipal Water Conservation Planning Tool in MS Excel format and manual
7. DEADLINE FOR CONTRACT EXECUTION –September 15, 2018
8. CONTRACT START DATE – June 18, 2018
9. DRAFT DELIVERABLES DATE – October 31, 2018
10. CONTRACT EXPIRATION DATE – February 28, 2019

11. TOTAL COST OF SERVICES – $127,860

12. TWDB SHARE OF THE SERVICES – the lesser of $127,860 or 100.00 percent of the SERVICES or individual payment submission

13. PAYMENT SUBMISSION SCHEDULE – Monthly

14. OTHER SPECIAL CONDITIONS AND EXCEPTIONS TO STANDARD AGREEMENT OF THIS CONTRACT – None

SECTION II. STANDARD AGREEMENT

ARTICLE I. RECITALS

Whereas, on June 18, 2018, TWDB staff determined that the CONTRACTOR was the top ranked submission in response to RFQ 580-18-0057;

Whereas, the CONTRACTOR is the entity who will act as administrator of the TWDB's research grant and will be responsible for the execution of this contract;

Now, therefore, the TWDB and the CONTRACTOR, agree as follows:

ARTICLE II. PROJECT DESCRIPTION AND SERVICES TO BE PERFORMED

1. The TWDB enters into this CONTRACT pursuant to Water Code §15.404 as appropriate; Exhibit A, Statement of Qualifications, which is incorporated herein and made a permanent part of this CONTRACT; and this CONTRACT.

2. The CONTRACTOR will conduct these SERVICES, as delineated and described in Exhibit A, according to the Scope of Work contained in Exhibit B.

3. A progress report, including results to date, will be provided to the EXECUTIVE ADMINISTRATOR monthly, based on the State's Fiscal Year, throughout the project. Special interim reports on special topics and/or results will be provided as appropriate. Instructions for the progress report are shown in Exhibit E, TWDB Guidelines for a Progress Report.

ARTICLE III. CONTRACT TERM, SCHEDULE, REPORTS, AND OTHER PRODUCTS

1. The CONTRACTOR has until the DEADLINE FOR CONTRACT EXECUTION to execute this CONTRACT or the TWDB's SHARE OF THE SERVICES will be rescinded.

2. The CONTRACTOR shall begin performing its obligations hereunder on the CONTRACT START DATE and the CONTRACT shall expire on the CONTRACT EXPIRATION DATE. DELIVERABLES accepted by the TWDB prior to the CONTRACT EXPIRATION DATE shall constitute completion of the terms of this CONTRACT.

3. The CONTRACTOR will complete the Scope of Work and will deliver five (5) double-sided copies of the draft final product to the EXECUTIVE ADMINISTRATOR no later than the DRAFT DELIVERABLES DATE. The draft final product will include the draft final Uniform Costing Model (electronic Microsoft Excel copy) and the Uniform Costing Model User's Guide. The final product should be prepared according to Exhibit D, Guidelines for Authors Submitting Contract Reports to the Texas Water Development Board. After a 45-day review period, the EXECUTIVE ADMINISTRATOR will return review comments to the CONTRACTOR.

4. The CONTRACTOR will consider incorporating comments from the EXECUTIVE ADMINISTRATOR and other commentors on the draft final product into a final product. The CONTRACTOR will include a copy of the EXECUTIVE ADMINISTRATOR's comments in the final product.

5. Please do not include the TWDB logo on any of your deliverables. The CONTRACTOR will submit five (5) copies of the final product. The final product will include the final Uniform Costing Model (electronic Microsoft Excel copy) and the Uniform Costing Model User's Guide (five bound double-sided copies and one electronic PDF copy). The final product will be delivered to the EXECUTIVE ADMINISTRATOR no later than sixty (60) days after the DRAFT DELIVERABLES DATE. In compliance with Texas Administrative Code Chapters 206 and 213 (related to Accessibility and Usability of State Web Sites), the digital copies of the final product will comply with the requirements and standards specified in statute. After a 30-day review period, the EXECUTIVE ADMINISTRATOR will either accept or reject the final product. If the final product is rejected, the rejection letter sent to the CONTRACTOR shall state the reasons for rejection and the steps the CONTRACTOR need to take to have the final product accepted and the retainage released.

6. The CONTRACTOR will submit the most recent progress report with submittal of payments according to the PAYMENT SUBMISSION SCHEDULE. Progress reports shall be in written form and shall include a brief statement of the overall progress made since the last status report; a brief description of any problems that have been encountered during the previous reporting period that will affect the study, delay the timely completion of any portion of this CONTRACT, inhibit the completion of or cause a change in any of the study's products or objectives; and a description of any action the CONTRACTOR plans to take to correct any problems that have been encountered.

7. The EXECUTIVE ADMINISTRATOR can extend the DRAFT DELIVERABLES DATE and the CONTRACT EXPIRATION DATE upon written approval. The CONTRACTOR should notify the EXECUTIVE ADMINISTRATOR in writing within ten (10) working days prior to the DRAFT DELIVERABLES DATE or thirty (30) days prior to the CONTRACT EXPIRATION DATE that the CONTRACTOR is requesting an extension to the respective dates.

ARTICLE IV. COMPENSATION AND REIMBURSEMENT

1. The TWDB agrees to compensate and reimburse the CONTRACTOR in a total amount not to exceed the TWDB's SHARE OF THE SERVICES for costs incurred and paid by the CONTRACTOR pursuant to performance of this CONTRACT. The TWDB shall reimburse the CONTRACTOR for one hundred percent of each invoice up to ninety percent of the TOTAL COST OF SERVICES. Pending the CONTRACTOR's performance, completion of a Final Report, and written acceptance of said Final

Report by the EXECUTIVE ADMINISTRATOR, at which time the TWDB shall pay the retained ten percent (10%) to the CONTRACTOR.

2. The CONTRACTOR shall submit payments and documentation for reimbursement billing according to the PAYMENT SUBMISSION SCHEDULE and in accordance with the approved task and expense budgets contained in Exhibit C to this CONTRACT. The CONTRACTOR has budget flexibility within task and expense budget categories to the extent that the resulting change in amount in any one task or expense category does not exceed 35% of the total authorized amount by this CONTRACT for the task or category. Larger deviations shall require approval by EXECUTIVE ADMINISTRATOR or designee which will be documented through an Approved Budget Memorandum to the TWDB contract file. The CONTRACTOR will be required to provide written explanation for the overage and reallocation of the task and expense amount.

   For all reimbursement billings including any subcontractor's expenses, the EXECUTIVE ADMINISTRATOR must have determined that the contracts or agreements between the CONTRACTOR and the subcontractor are consistent with the terms of this CONTRACT. The CONTRACTOR is fully responsible for paying all charges by subcontractors prior to reimbursement by the TWDB.

3. The CONTRACTOR and its subcontractors shall maintain satisfactory financial accounting documents and records, including copies of invoices and receipts, and shall make them available for examination and audit by the EXECUTIVE ADMINISTRATOR. Accounting by the CONTRACTOR and its subcontractors shall be in a manner consistent with Generally Accepted Accounting Principles.

4. By executing this CONTRACT, the CONTRACTOR accepts the authority of the State Auditor's Office, under direction of the legislative audit committee, to conduct audits and investigations in connection with any and all state funds received pursuant to this contract. The CONTRACTOR shall comply with and cooperate in any such investigation or audit. The CONTRACTOR agrees to provide the State Auditor with access to any information the State Auditor considers relevant to the investigation or audit. The CONTRACTOR also agrees to include a provision in any subcontract related to this contract that requires the subcontractor to submit to audits and investigation by the State Auditor's Office in connection with any and all state funds received pursuant to the subcontract.

   The CONTRACTOR shall submit a signed and completed payment request using the current spreadsheet located at: :
   http://www.twdb.texas.gov/about/contract_admin/index.asp or you can contact Contracts@twdb.texas.gov for a personalized payment request spreadsheet and along with a progress report as described in Article II, Item 3.
   If no costs are incurred during a reporting period, the CONTRACTOR shall submit a progress report indicating that zero work was performed.

In addition, the following documentation which documents the SERVICES for the reporting period for reimbursement by the TWDB to the CONTRACTOR for the TWDB's SHARE OF THE SERVICES shall be submitted by the CONTRACTOR to the EXECUTIVE ADMINISTRATOR for reimbursement billing:

A. A completed Payment Request Checklist, or an invoice which includes the following information:
   (1) TWDB Contract Number;
   (2) Billing period; beginning (date) to ending (date);
   (3) Total Expenses for this period;
   (4) Total In-kind services, if applicable;
   (5) Total TWDB's share of the SERVICES for the billing period;
   (6) Total costs to be reimbursed by the TWDB for the billing period; and
   (7) Certification, signed by the CONTRACTOR authorized representative, that the expenses submitted for the billing period are a true and correct representation of amounts paid for work performed directly related to this CONTRACT.

B. Using the "Current Reimbursement" Worksheet, post all expenses for the period on the Invoice Ledger tab and Task Ledger tab for direct expenses incurred by the CONTRACTOR.
   (1) Salaries and Wages, Fringe, Overhead, and Profit.
   (2) Other Expenses: Copies of detailed, itemized invoices/receipts for other expenses (credit card summary receipts or statements are not acceptable).
   (3) Travel Expenses: Names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superceded. Receipts required for lodging; as well as copies of invoices or tickets for transportation costs or, if not available, names, dates, and points of travel of individuals.

C. Using the "Current Reimbursement" Worksheet, post all expenses for the period on the Invoice Ledger tab and Task Ledger tab for direct expenses incurred by all subcontractors.
   (1) Salaries and Wages, Fringe, Overhead, and Profit.
   (2) Other Expenses: Copies of detailed, itemized invoices/receipts for other expenses (credit card summary receipts or statements are not acceptable).
   (3) Travel Expenses: Names, dates, work locations, time periods at work locations, itemization of subsistence expenses of each employee, limited, however, to travel expenses authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superceded. Receipts required for lodging; as well as copies of invoices or tickets for transportation costs or, if not available, names, dates, and points of travel of individuals.

5. Incomplete requests will be returned to the CONTRACTOR if deficiencies are not resolved within ten (10) business days.

6. If for some reason the reimbursement request cannot be processed due to the need for an amendment to the CONTRACT, the CONTRACTOR will be required to resubmit the Payment Request Checklist dated after the execution of the amendment.

7. The CONTRACTOR is responsible for any food or entertainment expenses incurred by its own organization or that of its subcontractors, outside that of the travel expenses authorized and approved by the State of Texas under this CONTRACT.

8. A compliance report in accordance with Texas Administrative Code (TAC) Title 1, Part 5, Chapter 111, Subchapter B, Rule §111.14: The CONTRACTOR shall maintain business records documenting its compliance with the approved Historically Underutilized Business subcontracting plan in the format prescribed by the Texas Procurement and Support Services (Exhibit F). The compliance reports must include payment information on all HUB and non-HUB subcontractors. Submittal of these monthly compliance reports is required as a condition of payment.

   The TWDB will monitor the HUB subcontracting plan monthly to ensure the value of the subcontracts meets or exceeds the HUB subcontracting provisions specified in the contract. The CONTRACTOR who fails to implement the HUB subcontracting plan in good faith will be reported to Texas Procurement and Support Services. The TWDB may revoke the contract for breach of contract and make a claim against the CONTRACTOR.

ARTICLE V. INTELLECTUAL PROPERTY: OWNERSHIP, PUBLICATION, AND ACKNOWLEGEMENT

1. For purposes of this Article, "CONTRACTOR Works" are work products developed by the CONTRACTOR and Subcontractor using funds provided under this CONTRACT or otherwise rendered in or related to the performance in whole or part of this CONTRACT, including but not limited to reports, drafts of reports, or other material, data, drawings, studies, analyses, notes, plans, computer programs and codes, or other work products, whether final or intermediate.

   a. It is agreed that all CONTRACTOR Works shall be the joint property of the TWDB and the CONTRACTOR.

   b. The parties hereby agree that, if recognized as such by applicable law, the CONTRACTOR Works are intended to and shall be works-made-for-hire with joint ownership between the TWDB and the CONTRACTOR as such works are created in whole or part.

c. If the CONTRACTOR Works do not qualify as works-made-for-hire under applicable law, the CONTRACTOR hereby conveys co-ownership of such works to the TWDB as they are created in whole or part. If present conveyance is ineffective under applicable law, the CONTRACTOR agrees to convey a co-ownership interest of the CONTRACTOR Works to the TWDB after creation in whole or part of such works, and to provide written documentation of such conveyance upon request by the TWDB.

d. The TWDB and the CONTRACTOR acknowledge that the copyright in and to a copyrightable CONTRACTOR Work subsists upon creation of the CONTRACTOR Works and its fixing in any tangible medium. The CONTRACTOR or the TWDB may register the copyrights to such Works jointly in the names of the CONTRACTOR and the TWDB.

e. The TWDB and the CONTRACTOR each shall have full and unrestricted rights to use a CONTRACTOR Works with No Compensation Obligation.

2. For purposes of this Article, "Subcontractor Works" include all work product developed in whole or part by or on behalf of Subcontractors engaged by the CONTRACTOR to perform work for or on behalf of any CONTRACTOR under this CONTRACT (or by the Subcontractors' Subcontractors hereunder, and so on). The CONTRACTOR shall secure in writing from any Subcontractors so engaged:

a. unlimited, unrestricted, perpetual, irrevocable, royalty-free rights of the TWDB (and, if desired, of the CONTRACTOR) to access and receive, and to use, any and all technical or other data or information developed in or resulting from the performance of services under such engagement, with No Compensation Obligation; and either

b. assignment by the Subcontractor to the TWDB (and, if desired by them, jointly to the CONTRACTOR) of ownership (or joint ownership with the Subcontractor) of all Subcontractor Works, with No Compensation Obligation; or

c. grant by Subcontractor of a non-exclusive, unrestricted, unlimited, perpetual, irrevocable, world-wide, royalty-free license to the TWDB (and, if desired by them, the CONTRACTOR) to use any and all Subcontractor Works, including the right to sublicense use to third parties, with No Compensation Obligation.

3. "Use" of a work product, whether the CONTRACTOR Works, a Subcontractor Works or otherwise, shall mean and include, without limitation hereby, any lawful use, copying or dissemination of the work product, or any lawful development, use, copying or dissemination of derivative works of the work product, in any media or forms, whether now known or later existing.

4. "No Compensation Obligation" shall mean there is no obligation on the part of one co-owner or licensee of a work, whether a the CONTRACTOR Works, a Subcontractor Works or otherwise, to compensate other co-owners, licensees or licensors of the work for any use of the work by the using co-owner or licensee, including but not limited to compensation for or in the form of: royalties; co-owner or licensee accounting; sharing of revenues or profits among co-owners, licensees or licensors; or any other form of compensation to the other co-owners, licensees or licensors on account of any use of the work.

5. "Dissemination" shall include, without limitation hereby, any and all manner of: physical distribution; publication; broadcast; electronic transmission; internet streaming; posting on the Internet or world wide web; or any other form of communication, transmission, distribution, sending or providing, in any forms or formats, and in or using any media, whether now known or later existing.

6. The TWDB shall have an unlimited, unrestricted, perpetual, irrevocable, non-exclusive royalty-free right to access and receive in usable form and format, and to use all technical or other data or information developed by the CONTRACTOR and Subcontractor in, or otherwise resulting from, the performance of services under this CONTRACT.

7. No unauthorized patents. The CONTRACTOR Works and Subcontractor Works or other work product developed or created in the performance of this CONTRACT or otherwise using funds provided hereunder shall not be patented by the CONTRACTOR or their Subcontractor unless the EXECUTIVE ADMINISTRATOR consents in writing to submission of an application for patent on such works; and provided that, unless otherwise agreed in writing, any application made for patent shall include and name the TWDB (and, as applicable and desired by them, the CONTRACTOR) as co-owners of the patented work:

   a. no patent granted shall in any way limit, or be used by the CONTRACTOR or Subcontractor to limit or bar the TWDB's rights hereunder to access and receive in useable form and format, and right to use, any and all technical or other data or information developed in or resulting from performance pursuant to this CONTRACT or the use of funds provided hereunder; and

   b. the TWDB (and, if applicable, the CONTRACTOR) shall have No Compensation Obligation to any other co-owners or licensees of any such patented work, unless otherwise expressly agreed in writing.

8. The CONTRACTOR shall include terms and conditions in all contracts or other engagement agreements with any Subcontractors as are necessary to secure these rights and protections for the TWDB; and shall require that their Subcontractors include similar such terms and conditions in any contracts or other engagements with their Subcontractors. For the purposes of this section, "Subcontractors"

includes independent contractors (including consultants) and also employees working outside the course and scope of employment.

9. Any work products subject to a TWDB copyright or joint copyright and produced or developed by the CONTRACTOR or their Subcontractor pursuant to this CONTRACT or using any funding provided by the TWDB may be reproduced in any media, forms or formats by the TWDB or the CONTRACTOR at their own cost, and be disseminated in any medium, format or form by any party at its sole cost and in its sole discretion. The CONTRACTOR may utilize such work products as they may deem appropriate, including Dissemination of such work products or parts thereof under their own name, provided that any TWDB copyright is noted on the materials.

10. The CONTRACTOR agrees to acknowledge the TWDB in any news releases or other publications relating to the work performed under this CONTRACT.

ARTICLE VI. AMENDMENT, TERMINATION, AND STOP ORDERS

1. This CONTRACT may be altered or amended by mutual written consent or terminated by the EXECUTIVE ADMINISTRATOR at any time by written notice to the CONTRACTOR. Upon receipt of such termination notice, the CONTRACTOR shall, unless the notice directs otherwise, immediately discontinue all work in connection with the performance of this CONTRACT and shall proceed to cancel promptly all existing orders insofar as such orders are chargeable to this CONTRACT. The CONTRACTOR shall submit a statement showing in detail the work performed under this CONTRACT to the date of termination. The TWDB shall then pay the CONTRACTOR promptly that proportion of the prescribed fee, which applies to the work, actually performed under this CONTRACT, less all payments that have been previously made. Thereupon, copies of all work accomplished under this CONTRACT shall be delivered to the TWDB.

2. The EXECUTIVE ADMINISTRATOR may issue a Stop Work Order to the CONTRACTOR at any time. Upon receipt of such order, the CONTRACTOR shall discontinue all work under this CONTRACT and cancel all orders pursuant to this CONTRACT, unless the order directs otherwise. If the EXECUTIVE ADMINISTRATOR does not issue a Restart Order within 60 days after receipt by the CONTRACTOR of the Stop Work Order, the CONTRACTOR shall regard this CONTRACT terminated in accordance with the foregoing provisions.

ARTICLE VII. SUBCONTRACTS

Each Subcontract entered into to perform required work under this CONTRACT shall contain the following provisions:

a. This subcontract does not create any debt by or on behalf of the State of Texas and the TWDB. The TWDB's obligations under this CONTRACT are

contingent upon the availability of appropriated funds and the continued legal authority of the TWDB to enter into this CONTRACT.

b. a detailed budget estimate with specific cost details for each task or specific item of work to be performed by the Subcontractor and for each category of reimbursable expenses;

c. a clause stating that the Subcontract is subject to audit by the Texas State Auditor's Office and requiring the Subcontractor to cooperate with any request for information from the Texas State Auditor, as further described in Article X, Section 1, Paragraph D hereof;

d. a clause stating that payments under the Subcontract are contingent upon the appropriation of funds by the Texas Legislature, as further described in Article X, Section 1, Paragraph A hereof;

e. a clause stating that ownership of data, materials and work papers, in any media, that is gathered, compiled, adapted for use, or generated by the Subcontractor or the CONTRACTOR shall become data, materials and work owned by the TWDB and that Subcontractor shall have no proprietary rights in such data, materials and work papers, except as further described in Article V hereof;

f. a clause stating that Subcontractor shall keep timely and accurate books and records of accounts according to generally acceptable accounting principles as further described in Article X, Section 2, Paragraph G;

g. a clause stating that Subcontractor is solely responsible for securing all required licenses and permits from local, state and federal governmental entities and that Subcontractor is solely responsible for obtaining sufficient insurance in accordance with the general standards and practices of the industry or governmental entity; and

h. a clause stating that Subcontractor is an independent contractor and that the TWDB shall have no liability resulting from any failure of Subcontractor that results in breach of CONTRACT, property damage, personal injury or death.

ARTICLE VIII. LICENSES, PERMIT, AND INSURANCE

1. For the purpose of this CONTRACT, the CONTRACTOR will be considered an independent contractor and therefore solely responsible for liability resulting from negligent acts or omissions. The CONTRACTOR shall obtain all necessary insurance, in the judgment of the CONTRACTOR, to protect themselves, the TWDB, and employees and officials of the TWDB from liability arising out of this CONTRACT.

2. The CONTRACTOR shall be solely and entirely responsible for procuring all appropriate licenses and permits, which may be required by any competent authority for the CONTRACTOR to perform the subject work.

3. Indemnification. The CONTRACTOR shall indemnify and hold the TWDB and the State of Texas harmless, to the extent the CONTRACTOR may do so in accordance with state law, from any and all losses, damages, liability, or claims therefore, on account of personal injury, death, or property damage of any nature whatsoever caused by the CONTRACTOR, arising out of the activities and work conducted pursuant to this CONTRACT. The CONTRACTOR is solely responsible for liability arising out of its negligent acts or omissions during the performance of this CONTRACT.

ARTICLE IX. SEVERANCE PROVISION

Should any one or more provisions of this CONTRACT be held to be null, void, voidable, or for any reason whatsoever, of no force and effect, such provision(s) shall be construed as severable from the remainder of this CONTRACT and shall not affect the validity of all other provisions of this CONTRACT which shall remain of full force and effect.

ARTICLE X. GENERAL TERMS AND CONDITIONS

1. GENERAL TERMS.

   1. No Debt Against the State. This CONTRACT does not create any debt by or on behalf of the State of Texas and the TWDB. The TWDB's obligations under this CONTRACT are contingent upon the availability of appropriated funds and the continued legal authority of the TWDB to enter into this CONTRACT.

   2. Independent Contractor. Both parties hereto, in the performance of this contract, shall act in an individual capacity and not as agents, employees, partners, joint ventures or associates of one another. The employees or agents of one party shall not be deemed or construed to be the employees or agents of the other party for any purposes whatsoever.

   3. Procurement Laws. The CONTRACTOR shall comply with applicable State of Texas procurement laws, rules and policies, including but not limited to competitive bidding and the Professional Services Procurement Act, Government Code, Chapter 2254, relating to contracting with persons whose services are within the scope of practice of: accountants, architects, landscape architects, land surveyors, medical doctors, optometrists, professional engineers, real estate appraisers, professional nurses, and certified public accountants.

4. Right to Audit. The CONTRACTOR and its Subcontractors shall maintain all financial accounting documents and records, including copies of all invoices and receipts for expenditures, relating to the work under this CONTRACT. The CONTRACTOR shall make such documents and records available for examination and audit by the EXECUTIVE ADMINISTRATOR or any other authorized entity of the State of Texas. The CONTRACTOR'S financial accounting documents and records shall be kept and maintained in accordance with generally accepted accounting principles. By executing this CONTRACT, the CONTRACTOR accepts the authority of the Texas State Auditor's Office to conduct audits and investigations in connection with all state funds received pursuant to this CONTRACT. The CONTRACTOR shall comply with directives from the Texas State Auditor and shall cooperate in any such investigation or audit. The CONTRACTOR agrees to provide the Texas State Auditor with access to any information the Texas State Auditor considers relevant to the investigation or audit. The CONTRACTOR also agrees to include a provision in any Subcontract related to this CONTRACT that requires the Subcontractor to submit to audits and investigation by the State Auditor's Office in connection with all state funds received pursuant to the Subcontract.

5. Force Majeure. Unless otherwise provided, neither the CONTRACTOR nor the TWDB nor any agency of the State of Texas, shall be liable to the other for any delay in, or failure of performance, of a requirement contained in this CONTRACT caused by force majeure. The existence of such causes of delay or failure shall extend the period of performance until after the causes of delay or failure have been removed provided the non-performing party exercises all reasonable due diligence to perform. Force majeure is defined as acts of God, war, strike, fires, explosions, or other causes that are beyond the reasonable control of either party and that by exercise of due foresight such party could not reasonably have been expected to avoid, and which, by the exercise of all reasonable due diligence, such party is unable to overcome. Each party must inform the other in writing with proof of receipt within two (2) business days of the existence of such force majeure or otherwise waive this right as a defense.

6. Does not Boycott Israel. As required by Texas Government Code section 2270.002, the CONTRACTOR certifies, by executing this CONTRACT, that the CONTRACTOR does not, and will not during the term of this CONTRACT, boycott Israel. The CONTRACTOR further certifies that no subcontractor of the CONTRACTOR boycotts Israel, or will boycott Israel during the term of this CONTRACT. The CONTRACTOR agrees to take all necessary steps to ensure this certification remains true during the term of this CONTRACT.

2. STANDARDS OF PERFORMANCE.

a. Personnel. The CONTRACTOR shall assign only qualified personnel to perform the services required under this CONTRACT. The CONTRACTOR shall be responsible for ensuring that any Subcontractor utilized shall also assign only qualified personnel. Qualified personnel are persons who are properly licensed to perform the work and who have sufficient knowledge, skills and ability to perform the tasks and services required herein according to the standards of performance and care for their trade or profession.

b. Professional Standards. The CONTRACTOR shall provide the services and deliverables in accordance with applicable professional standards. The CONTRACTOR represents and warrants that he is authorized to acquire Subcontractors with the requisite qualifications, experience, personnel and other resources to perform in the manner required by this CONTRACT.

c. Antitrust. The CONTRACTOR represents and warrants that neither the CONTRACTOR nor any firm, corporation, partnership, or institution represented by the CONTRACTOR, or anyone acting for such firm, corporation, partnership, or institution has (1) violated the antitrust laws of the State of Texas under the Texas Business & Commerce Code, Chapter 15, of the federal antitrust laws; or (2) communicated directly or indirectly the proposal resulting in this CONTRACT to any competitor or other person engaged in such line of business during the procurement process for this CONTRACT.

d. Conflict of Interest. The CONTRACTOR represents and warrants that the CONTRACTOR has no actual or potential conflicts of interest in providing the deliverables required by this CONTRACT to the State of Texas and the TWDB. The CONTRACTOR represents that the provision of services under this CONTRACT will not create an appearance of impropriety. The CONTRACTOR also represents and warrants that, during the term of this CONTRACT, the CONTRACTOR will immediately notify the TWDB, in writing, of any potential conflict of interest that could adversely affect the TWDB by creating the appearance of a conflict of interest.

CONTRACTOR represents and warrants that neither the CONTRACTOR nor any person or entity that will participate financially in this CONTRACT has received compensation from the TWDB or any agency of the State of Texas for participation in the preparation of specifications for this CONTRACT. The CONTRACTOR represents and warrants that he has not given, offered to give, and does not intend to give at any time hereafter, any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor or service to any public servant in connection with this CONTRACT.

e. Proprietary and Confidential Information. The CONTRACTOR warrants and represents that any information that is proprietary or confidential, and is received by the CONTRACTOR from the TWDB or any governmental entity, shall not be disclosed to third parties without the written consent of the TWDB or applicable governmental entity, whose consent shall not be unreasonably withheld.

f. Public Information Act. The CONTRACTOR acknowledges and agrees that all documents, in any media, generated in the performance of work conducted under this CONTRACT are subject to public disclosure under the Public Information Act, Government Code, Chapter 552. The CONTRACTOR shall produce all documents upon request of the TWDB within two (2) business days when the documents are required to comply with a request for information under the Public Information Act.

g. Accurate and Timely Record Keeping. The CONTRACTOR warrants and represents that he will keep timely, accurate and honest books and records relating to the work performed and the payments received under this CONTRACT according to generally accepted accounting standards. Further, the CONTRACTOR agrees that he will create such books and records at or about the time the transaction reflected in the books and records occurs.

h. Dispute Resolution. The CONTRACTOR and the TWDB agree to make a good faith effort to resolve any dispute relating to the work required under this CONTRACT through negotiation and mediation as provided by Government Code, Chapter 2260 relating to resolution of certain contract claims against the state. The CONTRACTOR and the TWDB further agree that they shall attempt to use any method of alternative dispute resolution mutually agreed upon to resolve any dispute arising under this CONTRACT if this CONTRACT is not subject to Chapter 2260.

i. Contract Administration. The TWDB shall designate a project manager for this CONTRACT. The project manager will serve as the point of contact between the TWDB and the CONTRACTOR. The TWDB's project manager shall supervise the TWDB's review of the CONTRACTOR's technical work, deliverables, draft reports, the final report, payment requests, schedules, financial and budget administration, and similar matters. The project manager does not have any express or implied authority to vary the terms of the CONTRACT, amend the CONTRACT in any way or waive strict performance of the terms or conditions of the CONTRACT.

ARTICLE XI. CORRESPONDENCE

All correspondence between the parties shall be made to the following addresses:

For the **TWDB**:

Contract Issues:
Texas Water Development Board
Attention: Contract Administration
P.O. Box 13231
Austin, Texas 78711-3231
Email: contracts@twdb.texas.gov

Payment Request Submission:
Texas Water Development Board
Attention: Accounts Payable
P.O. Box 13231
Austin, Texas 78711-3231
Email: invoice@twdb.texas.gov

Physical Address:
Stephen F. Austin State Office Building
1700 N. Congress Avenue
Austin, Texas 78701

For the **CONTRACTOR:**

Contract Issues:
Alliance for Water Efficiency
Attention: Mary Ann Dickinson
33 N LaSalle Street, Suite 2275
Chicago, IL 60602
Email: maryann@a4we.org

Payment Request Submission:
Alliance for Water Efficiency
Attention: Mary Ann Dickinson
33 N LaSalle Street, Suite 2275
Chicago, IL 60602
Email: maryann@a4we.org

Physical Address:
33 N LaSalle Street, Suite 2275
Chicago, IL 60602

IN WITNESS WHEREOF, the parties have caused this CONTRACT to be duly executed in multiple originals.

TEXAS WATER DEVELOPMENT BOARD

Jeff Walker
Executive Administrator

Date: 9.14.18

ALLIANCE FOR WATER

Mary Ann Dickinson
President and CEO

Date: 8/31/2018

EXHIBIT A

STATEMENT OF QUALIFICATIONS

EXHIBIT B
SCOPE OF WORK

The Contractor shall develop a municipal water conservation planning tool (Tool) to be used in the development of conservation plans and regional water plans. The primary users of the tool will be the staff or consultants developing water conservation plans for water suppliers and regional water planning technical consultants. The Scope of Work includes the proposed outline below.

A. Develop the Tool as a stand-alone Microsoft Excel workbook with multiple linked worksheets. The Tool will be user-friendly and focused on the needs and abilities of mid-size water utilities, while also being useful to small and large water utilities.

B. Estimates of water savings for water conservation activities.
   1. The list of conservation activities shall include all quantified and applicable activities from the following sources:
      a. the AWE Tracking Tool library,
      b. the 2017 Statewide Water Conservation Quantification Project by Averitt & Associates,
      c. the Freese & Nichols, Incorporated regression analysis of year-round watering restrictions, and
      d. any additional studies and sources of information.
   2. Water savings shall be presented in gallons and based upon existing studies and reports listed above.
   3. Water savings should be estimated on an annual basis for the base year and projected into the future for the years 2020, 2024, 2029, 2030, 2040, 2050, 2060, and 2070.
   4. The implementation level for each applicable conservation activity, which will determine the water savings estimate, will be blank as default and adjustable by the user.
   5. Water savings estimates shall be adjustable beyond the default by the user in case the user has different system-specific information.
   6. Water savings shall be adjusted by the future effects of plumbing/appliance standards, as provided by the TWDB from the regional water planning projections, so as not to double count savings.

C. Estimates of costs for conservation activities included in Section B.
   1. Costs shall be specified as capital, debt service, and operating and maintenance costs, as applicable, and described in Exhibit C, Section 5.52-9, pages.
   2. Costs shall be based on existing studies and reports as much as possible.
   3. Costs shall be estimated on an annual basis for the base year and projected into the future for the years 2020, 2024, 2029, 2030, 2040, 2050, 2060, and 2070.
   4. Costs for each applicable conservation activity will be dependent upon the implementation level selected by the user, as described in B4.
   5. Cost estimates shall be adjustable beyond the default by the user in case the user has better system-specific information.

6. Costs shall be as consistent as possible with applicable costs included in TWDB's contract Uniform Costing Model Update for Regional Water Planning.

D. Data for select water providers/water user groups

1. Data necessary to calculate water savings and cost estimates for all conservation activities listed in Sections A and B shall be pre-loaded into the tool for all water utilities/water user groups that have population and water demand projections approved for the 2022 state water plan and are currently required to submit a conservation plan to the TWDB.
2. Data provided by the TWDB to be pre-loaded into the tool by the CONTRACTOR will include:
   a. Service-area population, base-year
   b. Service-area population, projected 2020-2070 (2022 State Water Plan)
   c. Number of customer connections by customer class (SF, MF, institutional, commercial, industrial, agriculture), base-year
   d. Number of customer connections by customer class, projected through 2070
   e. Metered water sold by category, base-year
   f. Metered water sold by category, projected through 2070
   g. Volume of water projected to be saved due to the natural replacement of water efficient fixtures and appliances (2022 State Water Plan)
3. Any additional pre-loaded data necessary for each utility beyond the previously mentioned data sets (subsection a – g) shall be developed by the CONTRACTOR.

E. The tool shall include a 'blank' form for utilities without preloaded base data in which a user could enter the utility-specific base data and implementation levels for applicable conservation activities that will produce water savings estimates and costs.

F. The tool shall display all possible activities, their savings, and their costs (capital and non-capital, as appropriate) using default or user-substituted values.

G. A summary page in the tool shall display all of the selected potential conservation activities individually and as a package, including the total water savings, total activity costs, and the average cost per acre-feet of savings.

H. The CONTRACTOR shall develop a user-friendly User Guide for the Tool and an online training session for TWDB staff after the delivery and acceptance of the final product.

I. Testing and Delivery Milestones:

1. 'Alpha testing' (testing for internal consistency) with TWDB staff will take place during the month of September.
2. 'Utility beta testing' with utility volunteers will take place in the month of October.
3. Final product delivery 30 days following the DRAFT DELIVERABLES DATE.
4. Online training session for TWDB staff no later than 30 days following the DRAFT DELIVERBLES DATE.

EXHIBIT C

TASK AND EXPENSE BUDGETS

TASK BUDGET

TASK	DESCRIPTION	AMOUNT
1	Develop Municipal Water Conservation Planning Tool	$41,400
2	Customize Municipal Water Conservation Planning Tool	2,300
3	Alpha Testing	23,350
4	Beta Testing	47,533
5	Prepare outreach materials for rollout of model	13,277
TOTAL		**$127,860**

EXPENSE BUDGET

CATEGORY	AMOUNT
Salaries & Wages[1]	$15,150
Fringe[2]	2,230
Travel[3]	2,500
Other Expenses[4]	1,000
Subcontract Services	90,303
Overhead[5]	16,677
Profit	0
TOTAL	**$127,860**

[1] Salaries and Wages is defined as the cost of salaries of engineers, draftsmen, stenographers, surveymen, clerks, laborers, etc., for time directly chargeable to this contract.
[2] Fringe is defined as the cost of social security contributions, unemployment, excise, and payroll taxes, workers' compensation insurance, retirement benefits, medical and insurance benefits, sick leave, vacation, and holiday pay applicable thereto.
[3] Travel is limited to the maximum amounts authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superseded
[4] Other Expenses is defined to include expendable supplies, communications, reproduction, postage, and costs of public meetings directly chargeable to this CONTRACT.
[5] Overhead is defined as the costs incurred in maintaining a place of business and performing professional services similar to those specified in this contract.

EXHIBIT D

GUIDELINES FOR AUTHORS SUBMITTING CONTRACT REPORTS TO THE TEXAS WATER DEVELOPMENT BOARD

1.0 Introduction

The purpose of this document is to describe the required format of contract reports submitted to the Texas Water Development Board (TWDB). Our reason for standardizing the format of contract reports is to provide our customers a consistent, and therefore familiar, format for contract reports (which we post online for public access). Another reason for standardizing the format is so that we can more easily turn a contract report into a TWDB numbered report if we so choose. Remember that your report will not only be seen by TWDB staff, but also by any person interested in the results of your study. A professional and high-quality report will reflect well on you, your employer, and the TWDB.

Available upon request, we will provide a Microsoft Word template (used to write these instructions) that gives the fonts, spacing, and other specifications for the headings and text of the report. Please follow this template as closely as possible.

2.0 Formatting your report

The TWDB format is designed for simplicity. For example, we use Times New Roman for all text. We use 12-point, single-spaced text, left justification for paragraph text, 18 points bold for first-level headings, and 14 points bold for second-level headings. Page numbers are centered at the bottom of the page. Other than page numbers, please refrain from adding content to the document header or footer. Page setup should use one-inch margins on all four sides.

2.1 Text

The best way to format your document is to use the styles described and embedded in the template document (Authors_Template.dot) that is available on request from the TWDB. To use the Authors_Template.dot file, open it in Word (make sure *.dot is listed under Files of type) and save it as a .doc file. Advanced users can add the .dot file to their computers as a template. Make sure the formatting bar is on the desktop (to open, go to View→Toolbars→Formatting) or, to view all of the formatting at once, go to Format→Styles and Formatting and select Available Styles from the dropdown box at the bottom of the window. The formatting in the template document provides styles (such as font type, spacing, and indents) for each piece of your report. Each style is named to describe what it should be used for (for example, style names include Chapter Title, Body Text, Heading 1, References, and Figure or Table Caption). As you add to your report, use the dropdown list on the Formatting Toolbar or the list in the Styles and Formatting window to adjust the text to the correct style. The Authors_Template.dot file shows and lists the specifications for each style.

2.1.1 Title

Give your report a title that gives the reader an idea of the topic of your report but is not terribly long. In addition to the general subject (for example, "Droughts"), you may include a few additional

words to describe a place, methodology, or other detail focused on throughout the paper (for example, "Droughts in the High Plains of Texas" or "Evaluating the effects of drought using groundwater flow modeling"). Please capitalize only the first letter of each word except 'minor' words such as 'and' and 'of'. Never use all caps.

Use headings to help the reader follow you through the main sections of your report and to make it easier for readers to skim through your report to find sections that might be the most interesting or useful to them. The text of the report should include an executive summary and sections outlined in 4.4 of Attachment 1. Headings for up to five levels of subdivision are provided in the template; however, we suggest not using more than three or four levels of subdivision except where absolutely necessary. Please avoid stacked headings (for example, a Heading 1 followed immediately by a Heading 2), and capitalize only the first letter of headings or words where appropriate—never use all caps.

2.2 Figures and photographs

To publish professional-looking graphics, **we need all originals to be saved at 300 dots-per-inch** (dpi) and in grayscale, if possible, or in the CMYK color format if color is necessary. Excessive use of color, especially color graphics that do not also work in grayscale, will prevent us from publishing your report as a TWDB numbered report (color reproduction costs can be prohibitive). Preferred file formats for your original graphics are Adobe Illustrator (.ai), Photoshop (.psd), EPS with .tiff preview, .jpg, .png, or .tiff files. Refrain from using low resolution .jpg or .gif files. Internet images at 72 dpi are unacceptable for use in reports.
All graphics shall be submitted in two forms:

1. Inserted into the Microsoft Word document before you submit your report. Ideally, inserted graphics should be centered on the page. Format the picture to downsize to 6 inches wide if necessary. Please do not upsize a graphic in Word.
2. Saved in one of the formats listed above.

2.2.1 Other graphics specifications

It is easiest to design your figures separately and add them in after the text of your report is more or less complete. Graphics should remain within the 1-inch page margins of the template (6.5 inches maximum graphic width). Be sure that the graphics (as well as tables) are numbered in the same order that they are mentioned in the text. Figures should appear embedded in the report after being called out in the text. Also, remember to include a caption for each graphic in Word, not as part of the graphic. We are not able to edit or format figure captions that are part of the figure. For figures and photographs, the caption should appear below the graphic. For tables, the caption should appear above.

2.2.2 Creating publication-quality graphics

When designing a graphic, make sure that the graphic (1) emphasizes the important information and does not show unnecessary data, lines, or labels; (2) includes the needed support material for the reader to understand what you are showing; and (3) is readable (see Figures 1 and 2 for examples). Edward R. Tufte's books on presenting information (Tufte, 1983; 1990; 1997) are great references on good graphic design. Figures 1 through 3 are examples of properly formatted, easy to understand graphics. Do not include fonts that are less than 6 points.

For good-looking graphics, the resolution needs to be high enough to provide a clear image at the size you make them within the report. In general, 300 dpi will make a clear image—200 dpi is a minimum. Try to create your figures at the same size they will be in the report, as resizing them in Word greatly reduces image quality. Photographs taken with at least a two-megapixel camera (if using digital) and with good contrast will make the best images. Save the original, and then adjust color levels and size in a renamed image copy. Print a draft copy of your report to double-check that your figures and photographs have clear lines and show all the features that you want them to have.

Figures and photographs should be in grayscale. Color greatly adds to the cost of printing, so we are trying to keep it to a minimum. Also remember that your report may be photocopied, scanned, or downloaded and printed in black and white. For this reason, you should use symbols or patterns, or make sure that colors print as different shades in black and white. All interval or ratio data (data measuring continuous phenomena, with each color representing an equal interval) need to be displayed in a graded scale of a single color (Figure 3). This way your figures will be useful even as a photocopy.

If you need help with your graphics or have questions, please contact the TWDB graphics department at (512) 936-0129.

2.2.3 Using other people's graphics

Figures and photographs (and tables) need to be your own unless you have written permission from the publisher that allows us to reprint them (we will need a copy of this permission for our records). Avoid using any figures or photographs taken off the Internet or from newspapers or magazines—these sources are difficult to cite, and it is often time-consuming and expensive to gain permission to reproduce them.

2.3 Tables

Tables should be created in Microsoft Word (see Table 1). Tables should include a minimal amount of outlining or bold font to emphasize headings, totals, or other important points. Tables should be numbered separately from figures, and captions should appear above the text of the table.

Table 1: A sample table. Note caption above table.

Table text heading*

Table text	1940	1950	1960	1970	1980	1990	2000	%GW
Table text	15	441	340	926	196	522	83	97.4
Table text	64	944	626	173	356	171	516	99.9
Total	79	1385	966	1099	552	693	599	

* A footnote should look like this using 10 point Times New Roman.
%GW = percent groundwater
Be sure to describe any abbreviations or symbols, and, unlike in this table, be sure to note the units!

3.0 Units

Measurements should be in English units. Metric units may be included in parentheses after the English units.

All units of geologic time should conform to the most recent geologic timescale (Gradstein and others, 2004). A summary of this timescale is available from the International Commission on Stratigraphy's website at http://stratigraphy.org/chus.pdf.

4.0 Citations and references

It is important to give credit where credit is due. Therefore, be sure to use the appropriate citations and include references in your paper.

4.1 In-text citations

Each piece of information you use in your report that comes from an outside source must be cited within the text using the author's last name and the year of publication. If there are two authors, list the last name of each followed by the year, and if there are more than two authors, list the last name of the first author followed by "and others" and the year. For example: the end of the Jurassic Period occurred approximately 145.5 million years ago (Gradstein and others, 2004).

4.2 References

All sources that are cited within the report should be listed at the end of the paper under the heading References. The references should follow the guidelines in "Suggestions to Authors of the Reports of the United States Geological Survey" (Hansen, 1991). These are available online at http://www.nwrc.usgs.gov/lib/lib_sta.html (a link to the chapter "Preparing references for Survey reports," p. 234-241, is found here). Several examples of complete reference citations are listed at the end of these guidelines. Be sure that any citations that appear in tables or figures are included in the reference list. Also, before submitting the report, please check that all the citations in the report are included in the reference list and all references in the reference list are cited in the report. If at all possible, avoid web-based citations. These materials are often transient and therefore useless to future readers.

5.0 Submitting your report

Before you submit your report, proofread it. Look for spelling and grammatical errors. Also, check to see that you have structured the headings, paragraphs, and sentences in your paper so that it is easy to follow and understand (imagine you are a reader who does not already know the information you are presenting!).

6.0 Conclusions

Following the instructions above and providing accurate and readable text, tables, figures, and citations will help to make your report useful to readers. Scientists may read your report, as well as water planners, utility providers, and interested citizens. If your report successfully conveys accurate scientific information and explanations to these readers, we can help to create more informed decisions about the use, development, and management of water in the state.

7.0 Acknowledgments

Be sure to acknowledge the people and entities that assisted you in your study and report. For example:
We would like to thank the Keck Geology Consortium, the American Society of Civil Alliance for Water Efficiencys, and the Texas Bar CLE for providing examples to use in developing these guidelines. In addition, we appreciate Mike Parcher for providing information on how to create publication-quality graphics, Shirley Wade for creating the data used in sample Figure 1, and Ian Jones for providing sample Figure 3.

8.0 References

Gradstein, F.M., J.G. Ogg, and A.G. Smith, eds., 2005, A geologic time scale 2004: Cambridge, Cambridge University Press, 610 p.

Hansen, W.R., ed., 1991, Suggestions to authors of the reports of the United States Geological Survey (7th ed.): Washington, D.C., U.S. Government Printing Office, 289 p.

Tufte, E. R., 1983, The visual display of quantitative information: Cheshire, C.T., Graphics Press, 197 p.

Tufte, E. R., 1990, Envisioning information: Cheshire, C.T., Graphics Press, 126 p.

Tufte, E. R., 1997, Visual explanations: Cheshire, C.T., Graphics Press, 156 p.

9.0 Examples of references

Arroyo, J. A., and Mullican, III, W. F., 2004, Desalination: *in* Mace, R. E., Angle, E. S., and Mullican, W. F., III, editors, Aquifers of the Edwards Plateau: Texas Water Development Board Report 360, p. 293-302.

Bates, R. L., and Jackson, J. A., 1984, Dictionary of geological terms: Anchor Press/Doubleday, Garden City, New York, 571 p.

Blandford, T. N., Blazer, D. J., Calhoun, K. C., Dutton, A. R., Naing, T., Reedy, R. C., and Scanlon, B. R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico–Numerical simulations through 2050: contract report by Daniel B. Stephens and Associates, Inc., and the Bureau of Economic Geology, The University of Texas at Austin to the Texas Water Development Board, variably paginated.

Fenneman, N. M., 1931, Physiography of Western United States (1st edition): New York, McGraw-Hill, 534 p.

Hubert, M., 1999, Senate Bill 1–The first big bold step toward meeting Texas's future water needs: Texas Tech Law Review, v. 30, no. 1, p. 53-70.

Kunianski, E. L., 1989, Precipitation, streamflow, and baseflow in West-Central Texas, December 1974 through March 1977: U. S. Geological Survey Water-Resources Investigations Report 89-4208, 2 sheets.

Mace, R. E., Chowdhury, A. H., Anaya, R., and Way, S.-C., 2000, A numerical groundwater flow model of the Upper and Middle Trinity aquifer, Hill Country area: Texas Water Development Board Open File Report 00-02, 62 p.

Maclay, R. W., and Land, L. F., 1988, Simulation of flow in the Edwards aquifer, San Antonio Region, Texas, and refinements of storage and flow concepts: U. S. Geological Survey Water-Supply Paper 2336, 48 p.

For more examples of references, see p. 239-241 of "Suggestions to Authors of the Reports of the United States Geological Survey" at http://www.nwrc.usgs.gov/lib/lib_sta.html.

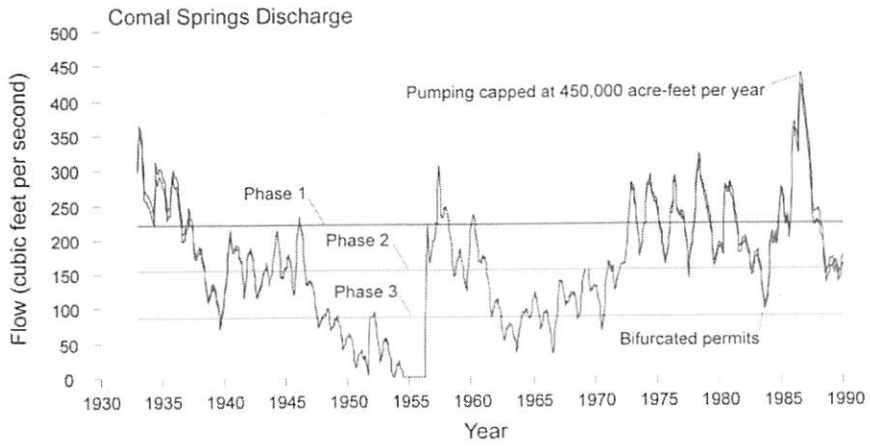

Figure 1. **A sample figure showing only the information needed to help the reader understand the data. Font size for figure callouts or labels should never be less than 6 point.**

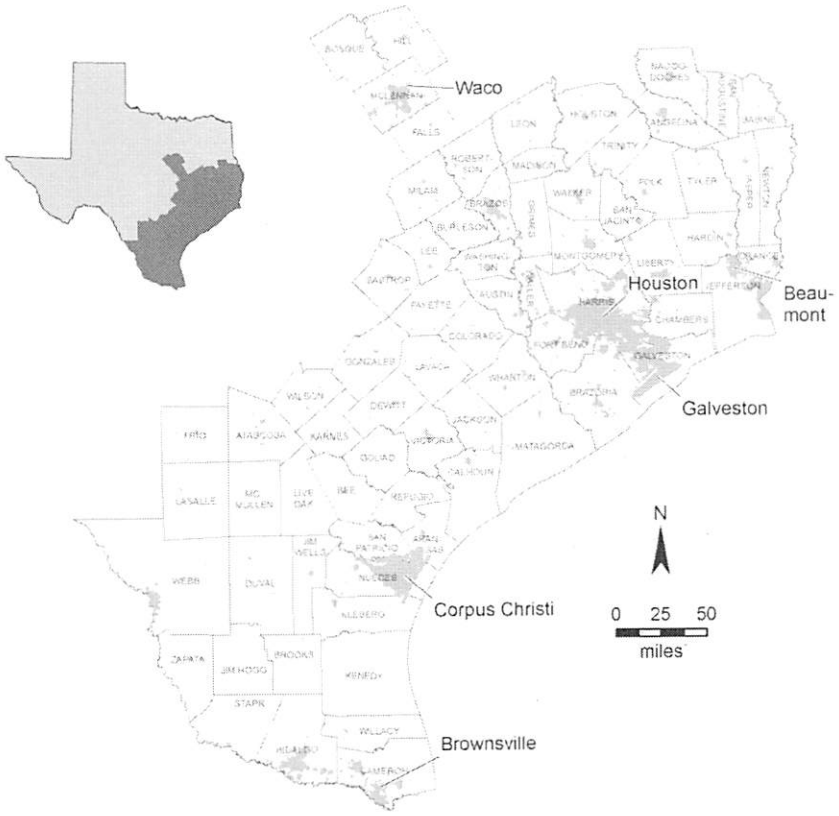

Figure 2. **A sample subject area map, giving the reader enough information to understand the location being discussed in this conference. For map figures, be sure to include a north arrow to orient the reader, a scale, and, if needed, a submap that places the figure in greater geographic context. Be sure that text is readable and that any citations listed on the figure or in the figure caption are included in the reference list. Font size should never be less than 6 pt.**

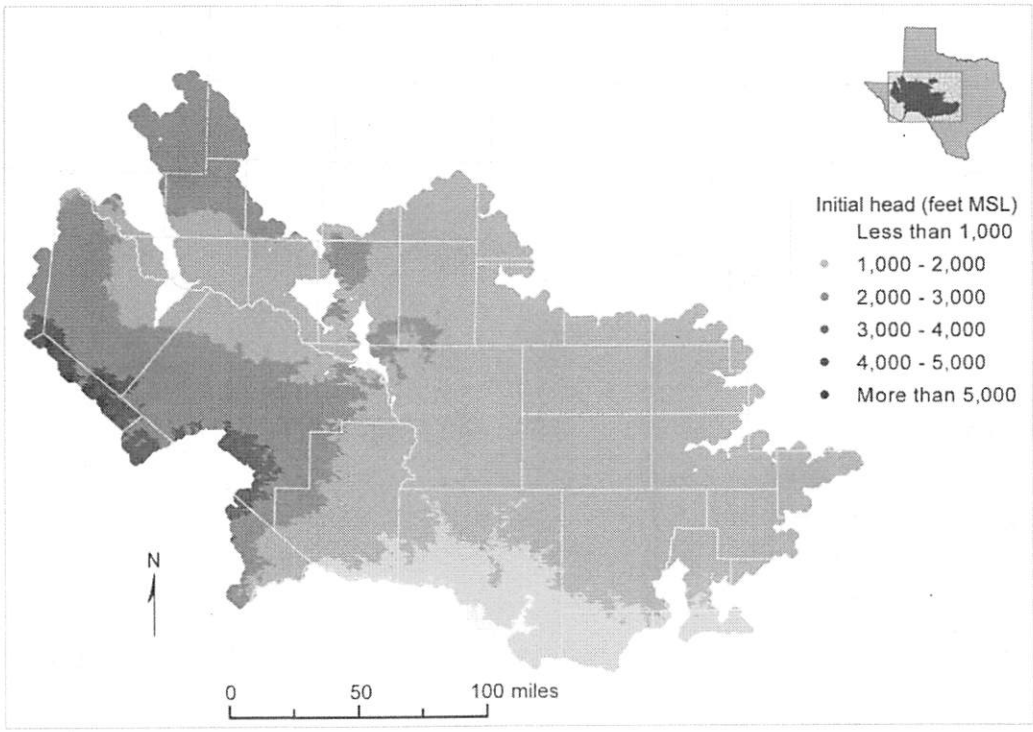

Figure 3. **Initial hydraulic heads used in model simulations for layer 1. Note the use of grayscale shading to show differences.**

EXHIBIT E

TWDB Guidelines for a Progress Report

Texas Water Development Board Contractors are required by their contracts to provide Progress Reports usually with the submission of an invoice/payment request.

The progress report should contain the following standard elements:

- Date: Date the memo is sent
- To: Name and position of the reader
- From: Name and position of the writer
- Subject: TWDB Contract Number and a clear phrase that focuses the reader's attention on the subject of the memo

Work Completed: *(The next section of a progress report explains what work has been done during the reporting period. Specify the dates of the reporting period and use active voice verbs to give the impression that you or you and your team have been busy). For Example:*

Task 1: Completed 3 draft chapters and all appendices. Met with sub consultants on their chapters.
Task 2: Completed sample collection throughout river reach.
Task 3: No work completed in reporting period.

Problems:
If the reader is likely to be interested in the glitches you have encountered along the way, mention the problems you have encountered and explain how you have solved them. If there are problems you have not yet been able to solve, explain your strategy for solving them and give tell the reader when you think you will have them solved.

DAVID MITCHELL

DISTINGUISHING QUALIFICATIONS

- Founder and principal of economic consulting firm, M.Cubed
- Director of Research for the California Urban Water Conservation Council: 1992-2007
- Twenty-eight years of experience developing integrated water management and water conservation plans for urban water suppliers
- Pioneered methods and analytical models now widely used to evaluate urban water conservation programs nationally and internationally
- Lead developer of Alliance for Water Efficiency's Conservation Tracking Tool

EXPERIENCE
28 years

EDUCATION
MS, Agricultural and Natural Resource Economics, University of California, Berkeley

BS, Political Economy of Natural Resources, University of California, Berkeley

RELEVANT EXPERIENCE:

David Mitchell has been deeply involved in urban water conservation planning and evaluation since he became the California Urban Water Conservation Council's first Project Manager and Director of Research back in 1993. Serving for over 15 years in this capacity, he has had a direct hand in shaping many of the policies and technical resources now used to guide urban water conservation, including revisions to existing and creation of new urban water conservation Best Management Practices (BMPs), development of BMP implementation guidebooks, cost-effectiveness guidelines and planning models, conservation rate guidelines and revenue simulation models, and design and oversight of numerous water conservation program evaluation studies.

He has assisted the California Department of Water Resources with its conservation projections included in the last two California State Water Plan Updates, advised the CALFED Water Use Efficiency Program, participated in the development of California's 2009 water conservation law, which requires urban water suppliers in California to reduce per capita water use by 20 percent by 2020, and assisted the state with the development of the technical methodologies urban water suppliers must use to demonstrate compliance.

Over the past several years, much of Mr. Mitchell's work has centered on the development of Excel-based models for quantifying water savings and economic performance of water conservation programs and regulations. Representative examples of this work are described below.

REPRESENTATIVE PROJECTS:

Alliance for Water Efficiency Water Conservation Tracking Tool

Alliance for Water Efficiency (2008-present)

The Water Conservation Tracking Tool, developed and maintained by M.Cubed, is an Excel-based model that can evaluate the water savings, costs, and benefits of conservation programs for a specific water utility or regional grouping of utilities. Using information entered into the Tool from the utility's system, it provides a standardized methodology for water savings and benefit-cost accounting. The model includes a library of pre-defined conservation activities from which users can build conservation programs. In addition to its economic analysis routines, the model includes an energy and GHG emissions impact module that tracks changes in energy use and GHG emissions associated with water conservation. The Tracking Tool is customizable to specific state water efficiency standards and currently customized versions are available for California, Georgia, and Texas.

Alliance for Water Efficiency Sales Forecasting and Rate Model

Alliance for Water Efficiency (2014)

The AWE Sales Forecasting and Rate Model is an Excel-based model developed for AWE's Financing Sustainable Water Project. The model deviates from traditional pro forma rate design models by explicitly incorporating sales variability due to weather, price, economic cycle, and drought management, into a risk-theoretic Monte Carlo simulation framework. The model's rate design and revenue simulation modules allow for a wide range of analyses and simulations of alternative water conservation rate designs.

Water Efficiency Simulation Tool (WEST)

Natural Resources Defense Council (2011)

The Water Efficiency Simulation Tool (WEST) is a model that simulate state-level water and energy savings of proposed water efficiency standards for residential and non-residential end uses of water. WEST includes the following water end uses: toilets (residential and commercial), bathroom and kitchen faucets, showerheads, clothes washers, evaporative coolers, graywater recovery, rainwater harvesting, multi-family metering, commercial dishwashers, and commercial kitchen pre-rinse spray valves. WEST generates state-level water and energy savings forecasts for all 50 states. WEST is developed in Excel and linked to a Microsoft Access database of demographic, housing, financial, climate, and water use data.

State and County-Level Projections of Residential Water Savings from Plumbing Codes and Appliance Standards

California Department of Water Resources (2016)

M.Cubed was retained by the California Department of Water Resources and State Water Board to project future reductions in indoor water use from plumbing codes and appliance standards. The projections were developed with Excel-based dynamic plumbing fixture inventory growth and replacement models and Department of Finance (DOF) forecasts of county-level population and housing growth. Forecasts were prepared for each of California's 58 counties in 5-year increments through 2040. Model performance was benchmarked against empirical estimates of average plumbing fixture efficiency and water use where such estimates were available.

TIMOTHY T. LOFTUS, PH.D.

EDUCATION

Ph.D. Geography, Southern Illinois University Carbondale

M.S. Forestry, Southern Illinois University Carbondale

B.S. Forestry, Southern Illinois University Carbondale

AFFILIATIONS

American Water Works Association

Alliance for Water Efficiency

Texas Rainwater Catchment Association

EXPERIENCE:

1 September 2015 – Present	Texas State University 601 University Drive San Marcos, TX 78666 - tloftus@txstate.edu

Title: **Professor of Practice in Geography and Meadows Endowed Chair in Water Conservation; Chief Water Conservation Officer, Meadows Center for Water and the Environment**

Duties:

1) Fulfill the role of a full-time, nontenure-line faculty member:
    a. Design and teach courses as needed (e.g. GEO 5393D – Water Resource Planning; Spring 2016, 2017, 2018)
    b. Serve on thesis, directed research, professional project (SUST program) and dissertation committees as requested
    c. Advise/mentor students as appropriate and involve students in funded research/project work.
2) Develop an externally funded program centered on water-resource problem solving, water-use conservation and efficiency, water conservation planning, and flood/drought planning. Funded research grants include:
    a. NEC Corporation, 2016, $81,000. "Estimating the Potential of Urban Water Use Conservation in Texas: A Pilot Study of Two Regional Planning Areas" (in progress)
        i. Utility water loss audit data analysis
        ii. Residential water-use conservation potential
        iii. Commercial/Institutional/Industrial water-use conserva. potential
    b. Lower Colorado River Authority, 2017, $20,000. "Garwood Irrigation Division Water Use, 2012-2016: Quantifying the Effects of Time, Field Characteristics, and Farmers on Purchased Water" (completed Oct. 2017)
    c. Communicate results via professional-conference presentations and peer-reviewed journal articles.
3) Participate in the life of the Department of Geography and support the mission of the Meadows Center for Water and the Environment.
4) Serve my appointment (through August 2021) by the Texas Water Development Board to the Water Conservation Advisory Council representing Higher Education.

16 August 2005 – 26 June 2015

Chicago Metropolitan Agency for Planning
233 South Wacker Drive, Suite 800
Chicago, IL 60606 - 312.454.0400

Title: **Senior Water Resource Planner**

Supervisor: Mr. Jason Navota, Principal - 312.386.8750

Duties:

1) Support Water 2050 implementation efforts emphasizing demand management, water loss control, and policy evolution.
2) Collaborate with Illinois Dept. of Natural Resources, Office of Water Resources and local communities to , a) enhance understanding of community water system management challenges/practices, b) provide support during transition to new rules governing permittees, c) convene team to develop a water system improvement plan guidance document for purposes of enabling permittees to meet water-loss compliance standard, and d) develop other tools as necessary to support local water system management efforts.
3) Collaborate with IDNR OWR and others to revise and update the state strategic plan for state/regional water supply planning, develop legislative initiatives to create sustainable funding and clarify authority for water supply program implementation;
4) Project/staff/budget management for federal Clean Water Act funded watershed planning efforts, and other water quality and natural resource planning activities;
5) Develop working knowledge / familiarity with relevant state and federal statutes and agreements pertaining to water resource planning and management, including, Clean Water Act, Safe Drinking Water Act, Great Lakes Compact, Great Lakes Water Quality Agreement;
6) Contribute to various policy and planning documents including CMAP Policy Updates via research, writing, and editing to communicate complex policy and technical issues;
7) Represent CMAP on technical and project advisory committees convened for regional, state, national, or international initiatives;
8) Member of Technical Advisory Committee, Northwest Water Planning Alliance (NWPA) – an outcome of *Water 2050*; working towards strategic plan implementation; water-use data analysis review and advise on storm-water management, green infrastructure, and other resource management plans, policies, and public documents produced by other agencies and organizations;
9) Conduct outreach and education via presentations given to elected officials, special groups, and members of the general public;
10) Review legislative proposals and recommend an agency position, and
11) Communicate with media (video, radio, print) upon request to communicate complex water resource issues for the general public.

Accomplishments:

1) Executed the role of Project Director for the three-year, $1.14 million northeastern Illinois regional water supply planning initiative in response to gubernatorial Executive Order 2006-1; primary author and editor of Water 2050: Northeastern Illinois Regional Water Supply/Demand Plan (2010) addressing both current and future environmental and sustainability issues related to water supply solutions; evaluated the potential of proactive water conservation/efficiency as a new water supply and wastewater reuse; considered impacts of climate change on water demand;
2) Initiated a study of water-loss control practices and challenges in partnership with the IDNR, Office of Water Resources and in collaboration with the Center for Neighborhood Technology; primary author of final report: "An Assessment of Water Loss Among Lake Michigan Permittees in Illinois" (July 2014);
3) Undertook a formal support role and led a strategic planning process with the Northwest Water Planning Alliance; author of the final report: "Northwest Water Planning Alliance Strategic Plan: 2014-2016" (May 2014);
4) Developed a new agency water resource planning program to support *Water 2050* implementation efforts both within the agency and with other stakeholder groups throughout region;
5) Managed and mentored a diverse staff of scientists, planners, and other professionals within the Environment and Natural Resources group;
6) Practiced collaborative planning by directing numerous EPA-compliant watershed planning processes and authored or coauthored resultant watershed plans, most recently the "9 Lakes Watershed-Based Plan"; provided administrative guidance/technical support for Lower DuPage River Watershed planning process; project manager/editor for Fox River Basin watershed planning where I mentored staff new to watershed plan development 2010-2011; managed subcontractors to provide outreach and specific communication products, edited and approved work;
7) Pursued integrated water resource planning within water supply and water quality planning forums as reflected in resultant plans;
8) Administered pass-through grants and provide technical guidance and oversight on behalf of Illinois EPA to project partners engaged in water-resource planning; managed subcontractors / contracts;
9) Established effective working relationships with numerous locally-elected officials and public works staff via a variety of forums and discussions; established strong working relationships with many nongovernmental / nonprofit organizations;
10) Member of: a. The Institute of Environmental Science and Policy, University of Illinois at Chicago, External Advisory Board; b. Chicago Area Waterway System, Project Advisory Committee: Restoring the Natural Divide; c. State of Illinois Water Loss Accounting Program, Steering Committee.
11) Testified at a Hearing before the Subcommittee on Energy and Environment, Committee on Science and Technology, House of Representatives, 110th Congress (second session), July 23, 2008 on, "A National Water Initiative: Coordinating and Improving Federal Research on Water";

12) Participated by invitation in the *2009 National Dialogue on an Integrated Water Policy: Urban Water Sustainability* (Sept. 14-15) and *2010 National Dialogue, What's Water Worth?* (March 25-26) facilitated by the Clean Water America Alliance, Washington, DC; and
13) Featured in The Economist, "Liquid Gold: The Great Lakes' Water" May 20, 2010 < http://www.economist.com/node/16167886 >; featured in "Infrastructure 2012: Spotlight on Leadership" (Urban Land Institute and Ernst & Young, 2012).

1 August 2002 – July 2005 Heidelberg College, Water Quality Laboratory (WQL)
310 East Market Street
Tiffin, OH 44883 - 419.448.2000

Title: **Director**

Supervisor: 1st two years – Dr. Kathy Venema, Interim Vice President of Academic Affairs - 419.448.2059; 3rd year – Dr. Laura Niesen de Abruña, Vice President of Academic Affairs - 419.448.2216

Duties:

1) Provide strategic direction/vision for the WQL;
2) Lead administrator (for staff of seven) and fiscal manager for 100% soft-money funded research center;
3) Conduct water resources research;
4) Develop familiarity with Great Lakes water quality issues;
5) Primary point of contact for media relations and elected officials;
6) Primary point of contact for collaborative opportunities with other institutions: academic, state agency, federal agency, non-governmental organization, private sector; and
7) Former Chair of the Sandusky River Watershed Coalition (SRWC), and former Chairman of the Stream Flow and Habitat subcommittee, SRWC.

Accomplishments:

1) Fiscal management – under my administration, the WQL increased net assets by end of my third year as compared to the beginning of my tenure;
2) Revitalized private well-testing program as a fee-based public service;
3) Led staff in creating a 3-5 year strategic plan;
4) Renegotiated annual contracts with federal agency;
5) Worked with my elected officials to help secure:
    a. State funding for core program: Ohio Tributary Monitoring Program, and
    b. Federal funding via a congressional appropriation for upgrading analytical equipment to improve capability for metals analysis in surface and groundwater;

6) Produced (coauthored with WQL staff) Ohio Tributary Monitoring Program Annual Report;
7) Led effort to redesign WQL website;
8) Active member of the Sandusky River Watershed Coalition, Steering Committee (Sandusky River Basin is 84% agricultural land use);
9) Secured external funding for and led effort to produce the Honey Creek Watershed Action Plan for the Sandusky River Watershed Coalition that garnered public input and support, incorporated a Total Maximum Daily Load assessment, and will achieve State of Ohio endorsement by also addressing relevant Coastal Zone Management Program management measures;
10) Directed the WQL through first-ever move into new and expanded office and laboratory space, and
11) Authored and coauthored peer-reviewed publications and other reports including a paper featured in "Checking the Pulse of Lake Erie" edited by M. Munawar and R. Heath (2008).

8 June 2000 – 31 July 2002

Southern Illinois University Carbondale
Department of Geography and Environmental Resources
1000 Faner Drive, Room 4520
Carbondale, IL 62901-4514 - 618.536.3375

Title: **Post-doctoral Associate**

Supervisor: Dr. Christopher Lant, Professor - 618.453.6020

Duties:

1) Assist with research-project management;
2) Facilitate strategy meetings among principle investigators; write meeting notes;
3) Participate in presentations given at professional conferences/meetings;
4) Manage stream-gauging/water-quality sampling station; coordinate with Illinois State Water Survey on sample analysis and data generation; and
5) Assist with data collection for developing a supervised land-use classification scheme using geospatial tools.

Accomplishments:

1) Participated in and contributed to an interdisciplinary research project, funded by the US EPA/NSF/USDA Water and Watersheds Program, involving eight principle investigators spread across three universities and six departments;
2) Facilitated focus groups of various stakeholders to learn about perceptions and awareness of regional ecological restoration efforts and gain feedback about the utility of research output;
3) Developed and team taught a Department of Geography graduate-seminar course titled, "Landscape Conservation"; and
4) Co-author of peer-reviewed journal articles that have emerged from this work.

16 August 1998 – 15 May 2000

Eastern Kentucky University
Department of Geography and Planning
521 Lancaster Avenue
Richmond, KY 40475 - 859.622.1273

Title: **1st year - Visiting Assistant Professor**
2nd year - Assistant Professor

Supervisor: Dr. Wilma Walker, Professor and Chair (retired)

Duties:

1) Teach 12 credit hours of course work each semester;
2) Advise Geography and Planning majors (students);
3) Participate on departmental and campus committees, and
4) Finish writing my dissertation.

Accomplishments:

1) Prepared/taught seven courses over two academic years;
2) Promoted to Assistant Professor, a tenure-track post, after first year;
3) Contributed to campus deliberations concerning possible merger with other academic units (i.e., departments) as the university was undergoing considerable transformation of its institutional structure; and successfully defended and then finished writing my dissertation while meeting full-time faculty position obligations.

16 August 1994 – 31 July 1998

Southern Illinois University Carbondale
Department of Geography and Environmental Resources
1000 Faner Drive, Room 4520
Carbondale, IL 62901-4514 - 618.536.3375

Title: **Graduate Research Assistant**

Supervisor: 1st year- Dr. David Sharpe, Professor and Chair (retired)
2nd- 4th years – Dr. Christopher Lant, Professor

Duties:

1) Work towards fulfilling requirements of the doctoral program:
    a. Designed curriculum, earned a cumulative 3.87/4.00 grade-point avg.,
    b. Prepared / presented a research proposal,
    c. Prepared for / passed written and oral exams,
    d. Conducted research, and
    e. Wrote / defended dissertation;
2) Performed research duties as assigned by faculty; and

3) Taught a senior-level course for majors: Environmental Disaster Planning.

Accomplishments:

1) Developed expertise in environmental geography and landscape ecology;
2) Studied and wrote about sustainability and gained keen appreciation for social problems that have environmental consequences; picked from among many graduate students for assignment to a multi-disciplinary research project, funded by The Nature Conservancy, from which I derived my dissertation research;
3) Managed a number of graduate student workers involved with data collection/management efforts associated with preparations for administering a mail-survey questionnaire;
4) Developed solid working relationships with federal agency employees in several county USDA Service Centers such that I was given full access to agency reports and documents for purposes of data collection and survey preparations;
5) Administered the mailing of 1,300 survey questionnaires (four related, but somewhat different surveys);
6) Managed data (from returned surveys) organization efforts for input to statistical land-use models (predictive and explanatory) that served as key components of research work;
7) Employed a geographic information system (GIS) as a technique for giving spatial expression to an environmental outcome of land-use decisions as they are influenced by a combination of conservation-policy (i.e. the USDA Conservation Reserve Program) options and economics (i.e. farm-commodity prices);
8) Graduated / earned Ph.D. in May, 2000; and
9) Published research findings in two peer-reviewed professional journals: Land Use Policy v20 (2003), and Environmental Management v28(3) (2001) (Curriculum Vitae available upon request).

16 August 1992 – 31 July 1994

Southern Illinois University Carbondale
Department of Forestry
Carbondale, IL 62901-4411

Title: **Graduate Research Assistant**

Supervisor: Dr. Paul Roth, Professor (retired)

Duties:

1) Worked towards fulfilling requirements of the master of science program
   a. Designed curriculum and earned a cumulative 3.83/4.00 grade-point avg.
   b. Prepared / presented a research proposal,
   c. Conducted research,
   d. Wrote / defended thesis, and
   e. Presented research findings at departmental-graduate seminar;
2) National Atmospheric Deposition Program (NADP) site monitor, first year.

Accomplishments:

1) Gained in-depth knowledge of and first-hand experience in bald cypress–water tupelo swamp forest community dynamics;
2) Secured funding from the Illinois Department of Conservation (since renamed the Illinois Department of Natural Resources (IDNR)) to conduct forest management related research;
3) Managed graduate student workers involved with data collection efforts
4) Experienced the "Great Flood of 1993" along the Upper Mississippi River as it impacted my research site;
5) Graduated / earned M.S. degree in August, 1994; and
6) Presented final report (my master's thesis) to Illinois DNR.

PUBLICATIONS:

Adams, J., J. Beaulieu, D, Bennett, L. Duram, S. Kraft, C. Lant, T. Loftus, J. Nicklow, and J. Ruhl. 2002. Ecological restoration in multiple-ownership watersheds: The Case of the Cache River in Illinois – Insights from Multidisciplinary Research. *Proceedings of the 2001 Governor's Conference on the Management of the Illinois River System. The Illinois River: Partnerships for Progress, Restoration, and Preservation. Eighth Biennial Conference.* October 2-4, Peoria, Illinois.

Adams, Jane, Steven Kraft, J.B. Ruhl, Christopher Lant, Tim Loftus, and Leslie Duram. 2005. Watershed planning: Pseudo-democracy and its alternatives – the case of the Cache River Watershed, Illinois. *Agriculture and Human Values* 22(3): 327-338.

Baker, David B., R. Peter Richards, Timothy T. Loftus, and Jack W. Kramer. 2004. A New Flashiness Index: Characteristics and Applications to Midwestern Rivers and Streams. *Journal of the American Water Resources Association* 40(2):503-522.

Kraft, Steven E., Jane Adams, Timothy T. Loftus, Christopher L. Lant, Leslie A. Duram, and J.B. Ruhl. 2004. Case Study – Watershed Planning in Watersheds Dominated by Multiple, Largely-Private Owners: The Cache River of Southern Illinois in A.

W. Ewert, D.C. Baker, and G.C. Bissex (eds.) *Integrated Resource and Environmental Management: The Human Dimension.* Oxfordshire, UK: CABI Publishing.

Kraft, S., C. Lant, J. Beaulieu, L. Duram, J. Ruhl, D. Bennett, J. Adams, J. Nicklow, and T. Loftus. 2002. Planning in multiple-ownership watersheds: Social, agricultural, and hydrological factors (Abstract). *Journal of Soil and Water Conservation* 57(5): 286.

Kraft,S. C. Lant, J.Beaulieu, L. Duram, J. Ruhl, D. Bennett, J. Adams, J. Nicklow, and T. Loftus. 2001. Understanding the social context for ecological restoration in multiple-ownership watersheds: The case of the Cache River, Illinois. Proceedings, 2001 Water and Watersheds Progress Review. April 17-19, 2001. San Francisco, California. Washington, DC: U.S. Environmental Protection Agency, Office of Research and Development's National Center for Environmental Research. EPA/600/R-01/014.

Kraft, Steven E., Chris Lant, Leslie Duram, Jane Adams, Timothy Loftus, J.B. Ruhl, Bruce Hall, and Jayna Klauser. 2004. Watershed Planning and Legitimacy: Is Legitimacy Relevant for the Watershed Planning Process, pgs. 93-94 in *Book of Abstracts, 10th International Symposium on Society and Resource Management, June 2- 6, 2004. Keystone, Colorado.* Fort Collins, CO: Colorado State University.

Lant, C.L., S.E. Kraft, J. Beaulieu, D. Bennett, T. Loftus, and J. Nicklow. 2005. Using GIS- based ecological-economic modeling to evaluate policies affecting agricultural watersheds. *Ecological Economics* 55(4): 467-484

Lant, Christopher, Timothy Loftus, Steven Kraft, and David Bennett. 2001. Land-use dynamics in a southern Illinois watershed. *Environmental Management* 28(3): 325- 340.

Loftus, Timothy T. and Mary Ann Dickinson. 2016. Chicago (Monograph Summary) pgs. 42-45 in Water, Megacities, & Global Change: Portraits of 15 Emblematic Cities of the World. United Nations Educational, Scientific, and Cultural Organization, International Hydrological Programme, Paris, France. The full-length Chicago Monograph, "Chicago, Illinois, United States: City by the Lake and Centerpiece of America's Third Largest Metropolitan Region" is available here: http://eaumega.org/wp-content/uploads/2016/05/EN-Chicago-Monograph.pdf

Loftus, Timothy T. and R. Peter Richards. 2008. Water Use for Irrigation Agriculture in Ohio's Lake Erie Basin and its Potential Impact on Lake Erie Water Quality, pgs. 159-179 in M. Munawar & R. Heath (eds.) *Checking the Pulse of Lake Erie.* Ecovision World Monograph Series, Aquatic Ecosystem Health and Management. New Delhi: Goodword Books.

Loftus, Timothy T. and Steven E. Kraft. 2003. Enrolling conservation buffers in the CRP. *Land Use Policy* 20: 73-84.

Ruhl, J.B., Christopher Lant, Tim Loftus, Steven Kraft, Jane Adams, and Leslie Duram. 2003. Proposal for a Model State Watershed Management Act. *Environmental Law* 33(4): 929-947.

BOOK REVIEW:

Loftus, T.T. 2000. Quantifying Spatial Uncertainty in Natural Resources: Theory and Applications for GIS and Remote Sensing. H. Todd Mower and Russell G. Congalton (eds.) Chelsea, MI: Ann Arbor Press. 244 p. Reviewed for the *Journal of the American Water Resources Association.*

OTHER WRITTEN PRODUCTS:

For which I was project manager and one or more of the following: editor and/or primary author or coauthor.

Honey Creek Watershed Action Plan. 2005. Timothy T. Loftus, David B. Baker, and Josephine V. Setzler. Tiffin, OH: Heidelberg College Water Quality Lab.

Analysis of Enabling Legislation from a Multi-jurisdictional Watershed Perspective. 2005. Prepared by Timothy T. Loftus, Ph.D., Project Director and Henry G. Rennie, Ph.D., Project Associate. Submitted to Ohio Storm Water Task Force, Mr. Steve Broeder, Chairman. Tiffin, OH: Heidelberg College Water Quality Lab.

Guidance for Developing Watershed Action Plans in Illinois.* 2007. Chicago Metropolitan Agency for Planning.

Poplar Creek Watershed Action Plan.* 2007. Chicago Metropolitan Agency for Planning.

Beaver Creek Watershed Action Plan.* 2008. Chicago Metropolitan Agency for Planning.

Upper Kishwaukee River Watershed Plan.* 2008. Chicago Metropolitan Agency for Planning.

Lawrence Creek Watershed Plan.* 2008. Chicago Metropolitan Agency for Planning.

Model Water Use Conservation Ordinance. 2010. Chicago Metropolitan Agency for Planning.

Water 2050: Northeastern Illinois Water Supply/Demand Plan. ** 2010. Chicago Metropolitan Agency for Planning.

Ferson-Otter Creek Watershed Plan.* 2011. Chicago Metropolitan Agency for Planning.

Blackberry Creek Watershed Action Plan.* 2011. Chicago Metropolitan Agency for Planning.

Silver Creek and Sleepy Hollow Creek Watershed Plan.* 2011. Chicago Metropolitan Agency for Planning.

9 Lakes Watershed-Based Plan.* 2014. Chicago Metropolitan Agency for Planning.

An Assessment of Water Loss Among Lake Michigan Permittees in Illinois. 2014.

Chicago Metropolitan Agency for Planning.

Northwest Water Planning Alliance Strategic Plan: 2014-2016.*** 2014. Chicago Metropolitan Agency for Planning.

**Approved by Illinois Environmental Protection Agency, Bureau of Water*
***Approved by the Northeastern Illinois Regional Water Supply Planning Group*
****Approved by the Northwestern Water Planning Alliance, Executive Committee*

SPENCER SCHNIER, PH.D., P.E.

WATER RESOURCES PLANNING

Spencer Schnier is a Water Resources Engineer, who began working for FNI on regional water planning projects in 2009. After pursuing a doctorate at the University of Illinois, he returned to FNI at the end of 2014. He has taken the lead on several long-range water supply planning projects, especially when significant modeling is involved. Spencer has extensive experience with the Water Rights Analysis Package (WRAP) and water availability modeling (WAM) in Texas. Spencer has provided modeling support for Regional Water Plans in Regions A, C, G and I. He has also served as the Project Engineer for municipal long-range water supply plans, yield analyses and several conservation studies.

EXPERIENCE
8 years

EDUCATION
Ph.D., Civil Engineering, University of Illinois at Urbana-Champaign

M.S., Civil Engineering, Texas A&M University

B.A., Geography, University of Texas at Austin

REGISTRATIONS/ CERTIFICATIONS
Professional Engineer, Texas #126290

AFFILIATIONS
American Society of Civil Engineers

RELEVANT EXPERIENCE:

Effectiveness of Drought Measures | North Texas Municipal Water District | Project Engineer | Quantitatively assessed the effectiveness of NTMWD's drought response by estimating the water savings that resulted from the implementation of watering restrictions during drought. Developed a multi-linear regression model to predict raw water pumping as a function of historical pumping behavior, and rainfall and temperature variables.

Savings from Conservation Measures | San Antonio Water System | Project Engineer | Estimated the water savings that SAWS might expect to see by moving to year-round once-per-week watering restrictions. Developed a regression model to predict water use during periods with watering restrictions in place and applied to periods without restrictions to estimate what savings would have been had restrictions been in place.

Brazos G Regional Water Plan | 2016 & 2021 Rounds| Assistant Project Manager | Assisted HDR in the development of the 2016 Brazos G Regional Water Plan. Evaluated nine high profile water management strategies for incorporation into the Plan. Calculated the reliable supply of each strategy out to 2070 and developed cost estimates consistent with regional water planning guidelines. Serving in a similar capacity for the 2021 Brazos G Plan.

Region C Regional Water Plan | 2011, 2016 and 2021 Rounds | Project Engineer | The Dallas-Fort Worth Metroplex area is in Region C and consists of over 300 water user groups. Estimated the current firm yield

and projected future yield of the reservoirs and water supply systems that serve needs of Region C. Developed cost estimates for many of the water management strategies selected for the municipalities and water suppliers and wrote related parts of the Plan. Served in a Quality Control capacity on similar work by co-workers.

Panhandle Regional Water Plan (Region A) | 2011, 2016 and 2021 Rounds | Project Engineer | Reviewed population and demand projections for water users in Region A and coordinated with water user groups in the region to request changes from TWDB. Estimated reliable surface water supplies, allocated supplies and conducted needs analyses. Conducted trend analyses on key components of the hydrologic cycle for Lake Meredith for special study in 2011 round.

Operational Risk Model | Austin Water Utility | Project Engineer | Developed and implemented an analysis and decision support tool used to assess utility demand-to-capacity risk exposure during planned and emergency maintenance-related asset outage events. The tool identifies treatment and transmission capacity risks by pressure zone and determines the optimal mass balance routing to satisfy the maximum forecasted daily demand for a user-specified number of weeks in the future.

Contract Analysis Tool | Brazos River Authority | Project Engineer| Developed modeling tools that assist the BRA in evaluating future water sale contract decisions and water supply planning. The tool allows the BRA to run “what if” scenarios for contracting and other purposes.

JEREMY RICE

HYDROLOGIST

Jeremy Rice is a Hydrologist who has worked extensively with many retail and wholesale water providers across the state in developing water conservation plans and programs. His experience in municipal water conservation, includes water conservation and drought contingency plans, program development and cost-benefit analysis. Jeremy also has more than 10 years of experience in regional water planning including population estimates, demand estimates, water supply analyses and water conservation strategy evaluation for multiple regions.

EXPERIENCE

12 years

EDUCATION

M.S., Water Management and Hydrological Science, Texas A&M University

B.S., Renewable Natural Resources, Texas A&M University

RELEVANT EXPERIENCE:

Water Conservation Plan and Water Resource and Emergency Management Plan Update | North Texas Municipal Water District | Project Manager | Coordinate with the District and their customers in the update of the conservation plan and drought response measures. Included in the update is an analysis of the existing drought triggers and proposed new triggers using a RiverWare model developed for this purpose. The project also includes a review of existing and proposed water conservation best management practices (BMPs) with savings and costs. One project component includes the evaluation of savings from twice per week watering on an on-going basis using a multi-linear regression equation.

Drought Demand Reduction Study | San Antonio Water System | Project Manager | Provided oversight in the development of the multi-linear regression equation that looked at data from 2006-2015, to model pumping during periods with once-per-week watering restrictions in place. Savings were calculated as observed use without watering restrictions minus what water use was projected to be if watering restrictions were in place. Presented the results of the analysis to San Antonio Water System executive management and the San Antonio City Council Transportation, Technology and Utilities Committee.

Water Conservation Plan Update | City of Fort Worth | Project Manager | Update of the City's five-year water conservation plan to meet TAC Chapter 288 Requirements. This update included standard operating procedure for reporting to the state, landscape water management and coordination with regional providers and wholesale customers. Included coordination of and results from public outreach efforts to adopt year-round no more than twice per week watering restrictions.

Unified Costing Tool | Texas Water Development Board | Project Team | Developed unit cost tables used in estimating water management strategy cost for developing Texas regional water plans. Testing and debugging of costing tool to verify operating functionality.

Water Use Data Work Plan | Texas Water Development Board | Project Team | The purpose of this project was to research and develop the TWDB FY 15 Water Use Data Work Plan. The Plan included recommendations and the processes and tools to enable TWDB to collect more accurate and comprehensive water use data, and was used to apply for Federal funds, through USGS, to implement the recommendations. It will enable the State to better assess its consumptive water use as it plans for future supplies.

Regions A, B, C, E, F, G, H, and I 2011, 2016, and 2021 Water Plans| Project Team | Primary author of water supply strategies for regional water planning study. Project included development of strategies for water conservation, surface water reservoirs, reuse, groundwater development, brackish groundwater desalination, and conjunctive use.

JASON AFINOWICZ, P.E.

WATER RESOURCES PLANNING/ASSOCIATE

Jason Afinowicz is a Project Manager in FNI's Water Resources Group and a firm Associate. His background includes a wide variety of water resource planning projects, including management of the 2006, 2011 and 2016 Region H Water Plans, and the 2006 and 2011 Region P Water Plans. His technical experience includes the preparation of long-term demand projections for municipal, industrial and agricultural use; and development and evaluation of water management strategies, including water rights development, infrastructure, conservation and reclaimed water strategies. He has also assisted in the development of water conservation and drought contingency plans for various wholesale water providers and provided a long-range evaluation of potential water supply alternatives. His additional experience in water supply includes cost analysis, hydraulic modeling, and TWDB planning and infrastructure funding programs.

EXPERIENCE
14 years

EDUCATION
M.S., Biological and Agricultural Engineering, Texas A&M University

B.S., Agricultural Engineering, Texas A&M University

REGISTRATIONS/ CERTIFICATIONS
Professional Engineer, Texas #100102

RELEVANT EXPERIENCE:

Water Conservation Plan and Drought Contingency Plan Update | San Jacinto River Authority | Project Manager | FNI provided a comprehensive assessment of SJRA's water conservation and drought contingency plans to provide updates required for the addition of SJRA's Groundwater Reduction Plan Division, as well as the routine, State-required process. This project also included the use of a workshop process that included staff from SJRA's four operating divisions to assess and evaluate approaches to water conservation to identify reasonable five- and 10-year targets for demand reduction.

Regional Groundwater Study and Regulatory Plan Update | Harris-Galveston Subsidence District | Project Engineer | Prime consultant on the multiyear, multidiscipline Regional Groundwater Update for the Harris Galveston Subsidence District, Fort Bend Subsidence District and Lone Star Groundwater Conservation District. The project includes detailed population and water demand projections; groundwater model updates; development of a subsidence predictive model for five counties; and development of long-term regulatory plans for the reduction of groundwater pumping.

Region H 2021 Regional Water Plan | Region H Water Planning Group | Client Representative | This multiyear effort includes the characterization of water demands, supply analysis, water management strategy analysis and evaluation, and conceptual cost estimation.

2016 Region H Regional Water Plan | Region H RWPG | Project Manager/Client Representative | Water resources planning engineering for the Region H Water Planning Group, including water demands projections, supply analysis, water management strategy analysis and evaluation, and conceptual level cost estimation. As part of this effort, FNI developed assessments of current levels of water loss and prescribed an approach for reducing these losses to support the Goldwater study.

S.B.1 Water Supply Plan, Region H* | Texas Water Development Board | Project Engineer | Provided support for the 2006 regional water plan and managed the development of the 2011 regional water plan, including water supply project and water conservation recommendations.

S.B.1 Water Supply Plan, Region K* | Texas Water Development Board | Project Engineer | Provided support for the 2006 regional water plan, including the potential for municipal conservation as a management strategy.

S.B.1 Water Supply Plan, Region P* | Texas Water Development Board | Project Engineer | Provided support for the 2006 regional water plan and managed the development of the 2011 regional water plan.

JENNIFER J. WALKER, P.E., D.WRE, ENV SP, CFM, QSD

PRINCIPAL ENGINEER

Walker, President of Watearth, Inc. is one of the first engineers to receive the Diplomate, Water Resources Engineer certification. Walker has a Masters in Civil Engineering, is a Certified Flood Plain Manager, and is a licensed Professional Engineer in multiple states. Walker is Principal developer of a model on behalf of the Texas Water Development Board to evaluate water conservation Best Management Practices statewide. Walker's experience also includes developing a California statewide Low Impact Development (LID) modeling tool for Phase II communities in collaboration with California State Sacramento's Office of Water Programs, which is funded by the State Water Resources Control Board. Walker serves as LID technical expert on the San Francisco Bay Area Regional Green Infrastructure Tool and the San Francisco Bay Area Green Plan-It Master Plan in collaboration with the San Francisco Estuary Institute.

- Presented Integrated Water Resources Management to Address Climate Change Impacts on Water Infrastructure Short Course at EWRI Conference
- Adept at solving complex and politically-sensitive issues
- Highly sought-after national seminar instructor; trained tens of thousands through ASCE, CASQA, and FMA
- Guest lecturer for Re-inventing the Nation's Urban Water Infrastructure (ReNUWit) program at Stanford

REPRESENTATIVE NATIONWIDE STORMWATER RESOURCES COURSES (INSTRUCTOR)

- Advanced Low Impact Design
- Rainwater Harvesting
- Analysis of Green Infrastructure
- Bioretention and Rain Gardens
- Greywater Systems
- Integrating Stormwater Reuse into LID
- SWMM LID Modeling Bootcamp
- Stormwater Quality BMPs
- O&M for Green Infrastructure
- Sustainable Stormwater Hydrology
- Sustainable Sites for LEED
- Advanced Detention Routing

EDUCATION

Masters in Civil Engineering (Water Resources), University of Houston

B.S. Civil Engineering (Environmental + Water), Kansas State University

LICENSES/CERTIFICATIONS

Professional Engineer (P.E.), CA C77079 (issued: 7/2010; expires: 12/18)

Diplomate, Water Resources Engineer (D.WRE) (issued: 2009; expires: 12/18)

Certified Floodplain Manager (CFM), #0848-05N (issued: 2007; expires: 12/18)

Certified Envision Sustainability Professional (ENV SP) (issued: 2016; expires: 2019)

Permaculture Designer's Certificate (Sustainable Development + Water)

REPRESENTATIVE PROJECTS

Statewide Water Conservation BMPs Modeling Tool, Texas Water Development Board. Included demands, user classes, projected demands, conservation BMPs for indoor and outdoor use, and cost-benefit analysis. Developed user guide. Incorporated life-cycles, annual participation rates, incentive program costs, and potential cost-benefit to public agencies. Performed cost-benefit analysis. Incorporated climate adaptation and resiliency strategies.

Texas Water Development Board Reservoir Sedimentation and BMPs Study. Estimated sedimentation rates for statewide reservoirs. Developed Decision Support System (DSS) for ranking of at-risk and priority reservoirs. Developed watershed-level and site-level BMPs to reduce sedimentation and associated pollutants into at-risk reservoirs. Determined level-of-maintenance and associated cost requirements. Evaluated manufactured and constructed BMPs. Determined pollutant-removal rates. Estimated planning-level costs for various BMPs.

Texas Water Development Board Natural Channel Design Research Project. Researched applicability of Natural Channel Design for statewide locations. Based evaluation on published data as well as data collected from current experience throughout the State. Compared costs as well as ecological and water quality benefits from Natural Channel Design versus traditional design.

Texas Water Development Board Statewide Groundwater Availability Project. Performed groundwater modeling. Developed groundwater animations. Developed content (graphics and text) for groundwater video series discussing groundwater availability modeling, groundwater conservation districts, and fundamental concepts.

City of Houston Water Conservation Plan. Developed Water Conservation Management Plan. Incorporated water conservation, water efficiency, and irrigation reduction through vegetation management and high-efficiency systems. Included alternative supply sources (desalination, reclaimed water, greywater, and rainwater). Evaluated local historical and projected climate data and compared practices and BMPs to similar cities throughout U.S. and Hawaii. Coordinated with other Texas cities. Analyzed and evaluated historical data on water usage by year, customer classification, wholesale vs. retail customers, and other breakdowns. Developed AWE Tracking Tool model to estimate effectiveness of water conservation BMPs and cost-effectiveness for utility. Analyzed multiple scenarios with differing incentives. Evaluated greenhouse gas reductions.

University of Houston Conservation and Master Plan. Developed Master Plan for landscape-based water conservation and efficiency and stormwater BMPs for use within the existing campus landscape and future areas of development. Included multi-functional facilities for integrated water resources management. Included Green Infrastructure, greywater, a/c condensate, rainwater harvesting, and other alternative supply sources for irrigation. Estimated construction, O&M, and life-cycle costs. Incorporated CUWCC BMPs. Analyzed effectiveness of water conservation/efficiency BMPs using modified version of CUWCC Cost Models to estimate savings.

Water Conservation and Water Quality Services for Riverside County Flood Control and Water Conservation District. Provided on-call water quality, criteria, and permit-related services to the District. Provided services related to BMP demonstration project. Inspected and observed manufactured and constructed erosion control BMP performance during construction and monitoring period. Developed interpretive signage and educational walking brochure of demonstration project. Assisted with education and outreach to comply with MS4 permit. Emphasized water conservation and efficiency, reclaimed water, high-efficiency irrigation, and native vegetation (California Friendly Landscaping) in project.

Water Conservation and Integrated Water Demonstration Project. Analyzed, evaluated, and designed water conservation, sustainable stormwater management (quality and quantity) and water management features. Included native grasses/vegetation, high-efficiency irrigation system, automated greywater system, automated rainwater harvesting and pumped irrigation system, carbon sequestration, urban forest canopy, rain gardens, grassed filter strips, soil improvements, porous pavement, and phytoremediation. Managed O&M activities during transition from turf grass and after implementation of Green Infrastructure and native plants. Incorporated water filtration system.

Springwoods Village Water Resources Design Guidelines. Performed benchmark study of existing residential developments, regional incentives for water quality and sustainable water resources, and existing certification programs. Recommended sustainable water resources mandatory items and required reductions for 1,500-acre master plan community. Included reclaimed water, water efficiency/conservation, water quality, Green Infrastructure, rainwater harvesting, and greywater recommendations. Incorporated California Urban Water Conservation Council (CUWCC) Best Management Practices (BMPs). Analyzed effectiveness of water conservation/efficiency BMPs using CUWCC Avoided Cost Model and Cost-Effectiveness Model to estimate savings.

LA Metro Water Conservation and Sustainability Services, Los Angeles, CA. Performed water conservation, Low Impact Development, and sustainability services. Performed water conservation modeling. Analyzed existing water and sewer billing data. Identified water conservation BMPs. Performed cost-benefit analysis. Evaluated program costs based on water rates, grants, and benefits. Prepared reports and Board reports. Evaluated recycled water options, including reclaimed water, stormwater capture, greywater, and Green Infrastructure.

Los Angeles Zoo Master Plan, Los Angeles, CA. Prepared water resources and sustainability sections of the Master Plan for the Los Angeles Zoo. Participated in stakeholder involvement and outreach workshops. Estimated water demands, conservation, recycled water, and other conservation measures. Incorporated use of recycled water.

Los Angeles Department of Water and Power, Los Angeles, CA. Water Resources services implementing integrated water resources solutions and assessing water use and water conservation for public water systems and providing a long-term plan for water conservation for the Elsinore Valley Municipal Water district.

LAC+USC Medical Center Master Plan EIR. Prepared water resources (hydrology and water quality) sections of EIR for 84-acre redevelopment. Performed Low Impact Development modeling. Calculated water usage and water conservation savings and compliance. Developed O&M Plan.

Low Impact Development Demonstration Project for Riverside County Flood Control District. Included monitoring of LID facilities at demonstration site. Developed award-winning interpretive signage and walking brochure. Provided follow-up services for LID and water conservation demonstration site.

Water Quality, Hydromodification Management, and Low Impact Development Demonstration Projects, Citrus Heights, CA. Performed LID and BMP continuous simulation/design storm modeling in EPA SWMM5.0.022 hydrodynamic model. Recommended system design to approximate historical (pre-development) water budget. Evaluated water budget and statistical results for continuous simulation modeling. Included bioretention, rain barrels, vegetated swales, porous pavement, underground storage, and other BMPs. Developed interpretative signage. Prepared O&M Plan, including children's educational elements. Provided construction-phase services. Performed technical review and technical support for civil design of stormwater facilities. Evaluated plant palette and irrigation calculations to meet AB 1881 requirements and project goals. Emphasized water conservation and efficiency in project.

Water Resources Master Plan for Aspen 1 of New Brighton, Sacramento, CA. Recommended Green Infrastructure, stormwater BMPs, and water conservation practices for 233-acre mixed use project. Performed continuous simulation and design storm event modeling for project. Evaluated effect of BMPs on peak flows, runoff volumes, infiltration, evaporation, and flow durations. Developed water quality plan for project. Developed Operations & Maintenance (O&M) Plan for BMPs. Evaluated compliance with AB 1881 for landscape efficiency. Reviewed plant palette and proposed irrigation requirements to meet project goals. Emphasized water conservation and efficiency. Incorporated California Urban Water Conservation Council (CUWCC) Best Management Practices (BMPs). Analyzed effectiveness of water conservation/efficiency BMPs using CUWCC Avoided Cost Model and Cost-Effectiveness Model to estimate savings.

City of Oakland LID Demonstration Project. Developed O&M Plan for LID facilities at redeveloped Fire Station. Included maintenance requirements, checklists, and monthly tasks for Stormwater Planters and Porous Pavement. Performed peer review of civil and landscape design. Developed interpretive signage. Emphasized water conservation and efficiency and high-efficiency irrigation.

Nuview USD Stormwater Infiltration Project, Riverside County, CA. Designed stormwater infiltration (LID) features in parking lot retrofit to infiltrate 100% of annual runoff. Included LID modeling, landscape design, civil design, water conservation, O&M Plan, interpretive signs, monitoring plan, cost estimates, WQMP, & grant application assistance. Performed cost-benefit analysis. Evaluated risks from multiple hazards. Managed risk of flooding through design modifications. Incorporated resiliency and redundancy into system design with multiple design features.

Fontana USD DROPS Low Impact Development Project, Fontana, CA. Designed stormwater infiltration (LID) features throughout three campus sites. Included LID modeling, landscape design, irrigation design, civil design, water conservation, O&M Plan, monitoring plan, cost estimates, and WQMP.

Greywater System Sizing and Design. Estimated interior water demands for toilet flushing, sinks, laundry, and showers. Estimated greywater generation from sinks, showers, and laundry. Estimated irrigation demands for various plant palettes (high, medium, and low-use vegetation), irrigation efficiencies (high-efficiency to low-efficiency systems) and evapotranspiration values throughout California. Emphasized water conservation/efficiency with low-flow fixtures first, followed by high-efficiency irrigation and low water-use plans, then use of greywater.

Rainwater Harvesting for Toilet Flushing at the Presidio, Monterey, CA. Estimated water demand for non-potable toilet flushing. Performed monthly water balance calculations.

Rainwater Harvesting System Analysis for San Jose Soccer Field Irrigation and Toilet Flushing. Analyzed rainfall patterns, irrigation usage for artificial turf wash water, and toilet flushing demand at soccer complex. Performed monthly water balance calculations. Estimated toilet flushing, sink, and irrigation demands. Estimated greywater generation. Assessed potential for greywater use.

Kingwood Golf Course Reclaimed Water Irrigation System. Planned and permitted reclaimed water irrigation system for golf course.

Rainwater Harvesting System Analysis for Commercial Truck Washing Facility. Estimated monthly truck washing demand for non-potable use. Analyzed rainfall patterns and performed monthly water balance calculations. Performed cost-benefit analysis to size system.

City of Houston Raw Water GIS and Model Development. Compiled and analyzed raw water customer data. Developed GIS database for raw water customers, raw water canals, and key water supply facilities. Determined available water allocation. Performed field verification of raw water delivery points. Developed modeling information for hydraulic model of raw water system.

City of Houston Water Rights Services. Analyzed water rights, water availability, supply, demands, and allocations. Performed various water supply services as needed.

Austin Water West Rim Water Distribution System Modeling to Solve Pressure Issues. Developed water distribution system modeling. Calibrated model and evaluated system issues to pinpoint pressure problems. Performed demand and fire flow modeling. Sized water distribution system elements, groundwater wells, pumps, ground storage tanks, and elevated storage tanks. Developed system improvements to solve pressure issues.

Utility District Water Distribution System Modeling. Developed and performed water distribution system modeling for various utility districts. Analyzed land use, water usage data, projected land use, and projected populations. Estimated and projected water use demands. Performed demand and fire flow modeling. Sized water distribution system elements, groundwater wells, pumps, ground storage tanks, and elevated storage tanks. Included interconnections with adjacent systems/suppliers.

Water Distribution System Modeling and Master Plan for The Woodlands. Developed water and wastewater Master Plan. Developed and maintained water distribution system modeling. Analyzed land use, water usage data, projected land use, and projected populations. Developed GIS database. Estimated and projected water use demands for community with 100,000+ residents. Performed demand and fire flow modeling. Sized water distribution system elements, groundwater wells, pumps, ground storage tanks, and elevated storage tanks.

City of Houston Cottage Grove LID Green Street Pilot Project. Performed SWMM modeling of Green Infrastructure (rain gardens and tree boxes). Developed design details, specs, cost estimates, and O&M Plan, monitoring configuration and protocol and compliance with QAPPP. Designed landscape elements and selected vegetation. Performed construction inspection.

Halls Bayou Sub-Regional Detention Analysis. Performed HEC-RAS unsteady flow (dynamic) detention and stream routing for final design and construction documents. Designed outlet and inlet structure configurations. Performed XP-SWMM hydrodynamic storm sewer modeling. Incorporated water quality and LID features into sub-regional detention facility and adjacent park land. Integrated facility into Flood Control District's adjacent regional detention facility. Prepared specifications, design details, and interpretive signage for sustainable stormwater and water quality features. Developed construction, O&M, and life-cycle costs for sustainable stormwater features.

City of Houston Neighborhood Street Reconstruction Projects. Prepared construction drawings, specifications, quantity, and cost estimates.

Expert Consultant for the Harris County Flood Control District. Served as water resources expert for the Flood Control District in developing Green Infrastructure criteria.

Statewide LID Water Balance Tool for Phase II Areas, California State Water Resources Control Board. Performed modeling for range of events and sites in SWMM and performed optimization. Developed statewide water balance modeling tool.

Bay Area Regional Green Infrastructure Tool, San Francisco Estuary Institute/State Water Control Board. Provided technical input, support, and peer review for GIS-based Green Infrastructure sizing/site selection tool for the Bay area. Provided guidance and recommendations on depths to groundwater, depths to bedrock, slopes, liquefaction risk, soil type, land use, impervious cover, and buffers from contaminated sites related to applicability for Bioretention, Vegetated Swales, Porous Pavement, Stormwater Wetlands, and Wet Ponds. Assigned weighting and fuzzy logic weights for decision support system (DSS) analysis to determine suitable sites for these BMPs. Performed modeling of Sonoma Creek watershed to estimate the benefits of wide-scale Green Infrastructure implementation for various levels of impervious cover.

Green Plan-It Master Plan for San Francisco Bay Area, California State Water Resources Control Board. Developed Green Infrastructure Master Plan. Performed watershed-wide Green Infrastructure and water quality modeling. Performed cost optimization and cost-benefit analysis. Incorporated climate change adaptation and resiliency strategies.

American Water Baldwin Hills Calibration Project, Los Angeles, CA. Performed water distribution system modeling for pump stations and pipelines. Developed flow testing plan and performed flow testing. Calibrated model and evaluated system issues to pinpoint pressure problems. Developed system improvements to solve pressure issues including using altitude valves. Developed system curves to facilitate replacement of booster station. Revised Metropolitan Water District demand allocation in the model.

San Jacinto River Authority Water Transmission Line Design. Designed various water transmission lines to serve The Woodlands community. Prepared construction drawings and specifications. Performed field reconnaissance to determine optimal alignment and avoid conflicts with existing trees and utilities.

The Woodlands (Various Sections). Designed water distribution, wastewater, storm drain, paving, and detention for various sections within The Woodlands development. Prepared construction drawings and specifications.

Cinco Ranch Water Distribution System Modeling and Master Plan. Developed water distribution system modeling and Master Plan. Developed and maintained water distribution system modeling. Analyzed land use, water usage data, projected land use, and projected populations. Estimated and projected water use demands. Performed demand and fire flow modeling. Performed water distribution system modeling to optimize water system layout and design. Sized water distribution system elements, groundwater wells, pumps, ground storage tanks, and elevated storage tanks. Included interconnections with adjacent systems/suppliers.

Water Distribution System Modeling for Fremont High, Oakland, CA. Developed and performed water distribution system modeling for campus redevelopment project. Estimated water use demands. Modeled average demands, peak demands, and fire flows. Sized system components.

Buena Park Stanton/Orangethorpe Storm Drain CIP/LID Project to Solve Flooding, Buena Park, CA. Performed 1D and 2D flow modeling to solve flooding problems in the project vicinity. Performed LID modeling. Designed storm drain CIP project and LID/hydromodification management features. Prepared WQMP. Prepared O&M Plan. Performed construction inspection.

UCLA-Olive View Medical Center Master Plan EIR, Los Angeles, CA. Prepared water resources (hydrology and water quality) sections of EIR for redevelopment of urbanized site. Performed Green Infrastructure continuous simulation and design storm modeling in SWMM. Evaluated erosion potential and flood plain issues to canyon drain systems. Prepared water supply assessment based on existing and proposed campus plans and estimated demands.

Technical Support for Storm Drain Master Plan, Buena Park, CA. Provided peer review of comprehensive Storm Drain Master Plan developed for all watersheds in the City of Buena Park. Served as City's technical expert. Evaluated and reviewed hydrology and hydraulics models, stormwater water quality analyses, MS4 permit compliance recommendations, cost-benefit analysis, and recommended CIP projects and priorities.

BMPs O&M Manual, Santa Monica, CA. Developed BMPs Operations and Maintenance (O&M) Manual for City BMPs. Included summary sheets for types of BMPs and individual inspection sheets and checklists for each specific City BMP. Included structural, landscape and irrigation, and hardscape components.

City of Santa Monica BMPs O&M Manual. Developed O&M Plan for City BMPs ranging from permeable pavement and LID BMPs to manufactured BMPs. Performed site reconnaissance of BMPs.

Los Angeles Venice Auxiliary Pumping Plant EIR, Los Angeles, CA. Prepared water resources (hydrology and water quality) sections of EIR for 0.5-acre redevelopment in urbanized area. Performed Green Infrastructure continuous simulation and design storm hydrology and water quality modeling in SWMM. Developed mitigation plan.

Alameda County Flood Control District Zone 12 Storm Drain Master Plan, Oakland, CA. Performed peer review of hydrologic and hydraulic analyses. Identified and analyzed water quality projects for closed conduits and open channels. Defined CIP projects.

Stonestown Galleria Green Infrastructure Feasibility Study, San Francisco, CA. Performed SWMM modeling of Green Infrastructure features for redevelopment of 42-acre commercial site. Included permeable pavement, green roofs, cisterns, disconnected impervious cover, reduced impervious cover, and bioretention.

Newcomb Roadway Green Infrastructure Project, San Francisco. Served as technical expert for San Francisco Estuary Institute. Performed hydrologic (SWMM) and water quality modeling for continuous simulation and design storms. Calibrated model to collected monitoring data. Incorporated climate change adaptation and resiliency strategies.

Design of Green Infrastructure Elements for 36" Water Line. Incorporated Green Infrastructure components into 36-inch water transmission line project.

CONTENT ITEM 4: HISTORICALLY UNDERUTILIZED BUSINESSES SUBCONTRACTION PLAN

HUB Subcontracting Plan

Starts on Next Page

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HUB Subcontracting Plan (HSP)

QUICK CHECKLIST

While this HSP Quick Checklist is being provided to merely assist you in readily identifying the sections of the HSP form that you will need to complete, it is very important that you adhere to the instructions in the HSP form and instructions provided by the contracting agency.

➤ **If you will be awarding all of the subcontracting work you have to offer under the contract to only Texas certified HUB vendors, complete:**

- ☐ Section 1 - Respondent and Requisition Information
- ☐ Section 2 a. - Yes, I will be subcontracting portions of the contract.
- ☐ Section 2 b. - List all the portions of work you will subcontract, and indicate the percentage of the contract you expect to award to Texas certified HUB vendors.
- ☐ Section 2 c. - Yes
- ☐ Section 4 - Affirmation
- ☐ GFE Method A (Attachment A) - Complete an Attachment A for each of the subcontracting opportunities you listed in Section 2 b.

➤ **If you will be subcontracting any portion of the contract to Texas certified HUB vendors and Non-HUB vendors, and the aggregate percentage of all the subcontracting work you will be awarding to the Texas certified HUB vendors with which you do not have a *continuous contract** in place for more than five (5) years *meets or exceeds* the HUB Goal the contracting agency identified in the "Agency Special Instructions/Additional Requirements", complete:**

- ☒ Section 1 - Respondent and Requisition Information
- ☒ Section 2 a. - Yes, I will be subcontracting portions of the contract.
- ☒ Section 2 b. - List all the portions of work you will subcontract, and indicate the percentage of the contract you expect to award to Texas certified HUB vendors and Non-HUB vendors.
- ☒ Section 2 c. - No
- ☒ Section 2 d. - Yes
- ☒ Section 4 - Affirmation
- ☒ GFE Method A (Attachment A) - Complete an Attachment A for each of the subcontracting opportunities you listed in Section 2 b.

➤ **If you will be subcontracting any portion of the contract to Texas certified HUB vendors and Non-HUB vendors or only to Non-HUB vendors, and the aggregate percentage of all the subcontracting work you will be awarding to the Texas certified HUB vendors with which you do not have a *continuous contract** in place for more than five (5) years *does not meet or exceed* the HUB Goal the contracting agency identified in the "Agency Special Instructions/Additional Requirements", complete:**

- ☐ Section 1 - Respondent and Requisition Information
- ☐ Section 2 a. - Yes, I will be subcontracting portions of the contract.
- ☐ Section 2 b. - List all the portions of work you will subcontract, and indicate the percentage of the contract you expect to award to Texas certified HUB vendors and Non-HUB vendors.
- ☐ Section 2 c. - No
- ☐ Section 2 d. - No
- ☐ Section 4 - Affirmation
- ☐ GFE Method B (Attachment B) - Complete an Attachment B for each of the subcontracting opportunities you listed in Section 2 b.

➤ **If you will not be subcontracting any portion of the contract and will be fulfilling the entire contract with your own resources (i.e., employees, supplies, materials and/or equipment), complete:**

- ☐ Section 1 - Respondent and Requisition Information
- ☐ Section 2 a. - No, I will not be subcontracting any portion of the contract, and I will be fulfilling the entire contract with my own resources.
- ☐ Section 3 - Self Performing Justification
- ☐ Section 4 - Affirmation

***Continuous Contract**: Any existing written agreement (including any renewals that are exercised) between a prime contractor and a HUB vendor, where the HUB vendor provides the prime contractor with goods or service, to include under the same contract for a specified period of time. The frequency the HUB vendor is utilized or paid during the term of the contract is not relevant to whether the contract is considered continuous. Two or more contracts that run concurrently or overlap one another for different periods of time are considered by CPA to be individual contracts rather than renewals or extensions to the original contract. In such situations the prime contractor and HUB vendor are entering (have entered) into "new" contracts.*

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HUB Subcontracting Plan (HSP)

In accordance with Texas Gov't Code §2161.252, the contracting agency has determined that subcontracting opportunities are probable under this contract. Therefore, all respondents, including State of Texas certified Historically Underutilized Businesses (HUBs) must complete and submit this State of Texas HUB Subcontracting Plan (HSP) with their response to the bid requisition (solicitation).

NOTE: Responses that do not include a completed HSP shall be rejected pursuant to Texas Gov't Code §2161.252(b).

The HUB Program promotes equal business opportunities for economically disadvantaged persons to contract with the State of Texas in accordance with the goals specified in the 2009 State of Texas Disparity Study. The statewide HUB goals defined in 34 Texas Administrative Code (TAC) §20.284 are:

- ***11.2 percent for heavy construction other than building contracts,***
- ***21.1 percent for all building construction, including general contractors and operative builders' contracts,***
- ***32.9 percent for all special trade construction contracts,***
- ***23.7 percent for professional services contracts,***
- ***26.0 percent for all other services contracts, and***
- ***21.1 percent for commodities contracts.***

- - Agency Special Instructions/Additional Requirements - -

*In accordance with 34 TAC §20.285(d)(1)(D)(iii), a respondent (prime contractor) may demonstrate good faith effort to utilize Texas certified HUBs for its subcontracting opportunities if the total value of the respondent's subcontracts with Texas certified HUBs meets or exceeds the statewide HUB goal or the agency specific HUB goal, whichever is higher. When a respondent uses this method to demonstrate good faith effort, the respondent must identify the HUBs with which it will subcontract. If using existing contracts with Texas certified HUBs to satisfy this requirement, only the aggregate percentage of the contracts expected to be subcontracted to HUBs with which the respondent **does not** have a **continuous contract*** in place for **more than five (5) years** shall qualify for meeting the HUB goal. This limitation is designed to encourage vendor rotation as recommended by the 2009 Texas Disparity Study.*

SECTION 1: RESPONDENT AND REQUISITION INFORMATION

a. Respondent (Company) Name: Alliance for Water Efficiency State of Texas VID #: _____

Point of Contact: Mary Ann Dickinson Phone #: 773-360-5100

E-mail Address: maryann@a4we.org Fax #: 773-345-3636

b. Is your company a State of Texas certified HUB? ☐ **- Yes** ☑ **- No**

c. Requisition #: 580-18-RFQ0066 Bid Open Date: 04/25/2018 **(mm/dd/yyyy)**

Enter your company's name here: Alliance for Water Efficiency Requisition #: 580-18-RFQ0066

SECTION 2: RESPONDENT's SUBCONTRACTING INTENTIONS

After dividing the contract work into reasonable lots or portions to the extent consistent with prudent industry practices, and taking into consideration the scope of work to be performed under the proposed contract, including all potential subcontracting opportunities, the respondent must determine what portions of work, **including contracted staffing, goods and services will be subcontracted**. Note: In accordance with 34 TAC §20.282, a "Subcontractor" means a person who contracts with a prime contractor to work, to supply commodities, or to contribute toward completing work for a governmental entity.

a. Check the appropriate box (Yes or No) that identifies your subcontracting intentions:

☑ - *Yes*, I will be subcontracting portions of the contract. (If *Yes*, complete Item b of this SECTION and continue to Item c of this SECTION.)

☐ - *No*, I will not be subcontracting any portion of the contract, and I will be fulfilling the entire contract with my own resources, including employees, goods and services. (If *No*, continue to SECTION 3 and SECTION 4.)

b. List all the portions of work (subcontracting opportunities) you will subcontract. Also, based on the total value of the contract, identify the percentages of the contract you expect to award to Texas certified HUBs, and the percentage of the contract you expect to award to vendors that are not a Texas certified HUB (i.e., Non-HUB).

Item #	Subcontracting Opportunity Description	HUBs		Non-HUBs
		Percentage of the contract expected to be subcontracted to HUBs with which you do not have a continuous contract* in place for more than five (5) years.	Percentage of the contract expected to be subcontracted to HUBs with which you have a continuous contract* in place for more than five (5) years.	Percentage of the contract expected to be subcontracted to non-HUBs.
1	Beta test Texas Tool with municipal utilities	15 %	0 %	0 %
2	Review needed Texas tool modifications	8.7 %	0 %	10 %
3	Revise AWE Tracking Tool to create Texas Tool	0 %	0 %	20 %
4	Pre-load Texas utility data into Texas Tool	0 %	0 %	5 %
5		%	%	%
6		%	%	%
7		%	%	%
8		%	%	%
9		%	%	%
10		%	%	%
11		%	%	%
12		%	%	%
13		%	%	%
14		%	%	%
15		%	%	%
	Aggregate percentages of the contract expected to be subcontracted:	23.7 %	0 %	35 %

(Note: If you have more than fifteen subcontracting opportunities, a continuation sheet is available online at https://www.comptroller.texas.gov/purchasing/vendor/hub/forms.php).

c. Check the appropriate box (Yes or No) that indicates whether you will be using **only** Texas certified HUBs to perform **all** of the subcontracting opportunities you listed in SECTION 2, Item b.

☐ - *Yes* (If *Yes*, continue to SECTION 4 and complete an "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed.)

☑ - *No* (If *No*, continue to Item d, of this SECTION.)

d. Check the appropriate box (Yes or No) that indicates whether the aggregate expected percentage of the contract you will subcontract **with Texas certified HUBs** with which you **do not** have a **continuous contract*** in place with for **more than five (5) years**, **meets or exceeds** the HUB goal the contracting agency identified on page 1 in the "**Agency Special Instructions/Additional Requirements**."

☑ - *Yes* (If *Yes*, continue to SECTION 4 and complete an "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed.)

☐ - *No* (If *No*, continue to SECTION 4 and complete an "HSP Good Faith Effort - Method B (Attachment B)" for **each** of the subcontracting opportunities you listed.)

***Continuous Contract**: Any existing written agreement (including any renewals that are exercised) between a prime contractor and a HUB vendor, where the HUB vendor provides the prime contractor with goods or service under the same contract for a specified period of time. The frequency the HUB vendor is utilized or paid during the term of the contract is not relevant to whether the contract is considered continuous. Two or more contracts that run concurrently or overlap one another for different periods of time are considered by CPA to be individual contracts rather than renewals or extensions to the original contract. In such situations the prime contractor and HUB vendor are entering (have entered) into "new" contracts.*

Enter your company's name here: Alliance for Water Efficiency Requisition #: 580-18-RFQ0066

SECTION 3: SELF PERFORMING JUSTIFICATION **(If you responded "No" to SECTION 2, Item a, you must complete this SECTION and continue to SECTION 4.)** If you responded "No" to SECTION 2, Item a, in the space provided below **explain how** your company will perform the entire contract with its own employees, supplies, materials and/or equipment.

SECTION 4: AFFIRMATION

As evidenced by my signature below, I affirm that I am an authorized representative of the respondent listed in SECTION 1, and that the information and supporting documentation submitted with the HSP is true and correct. Respondent understands and agrees that, if awarded any portion of the requisition:

- The respondent will provide notice as soon as practical to all the subcontractors (HUBs and Non-HUBs) of their selection as a subcontractor for the awarded contract. The notice must specify at a minimum the contracting agency's name and its point of contact for the contract, the contract award number, the subcontracting opportunity they (the subcontractor) will perform, the approximate dollar value of the subcontracting opportunity and the expected percentage of the total contract that the subcontracting opportunity represents. A copy of the notice required by this section must also be provided to the contracting agency's point of contact for the contract no later than ten (10) working days after the contract is awarded.
- The respondent must submit monthly compliance reports (Prime Contractor Progress Assessment Report – PAR) to the contracting agency, verifying its compliance with the HSP, including the use of and expenditures made to its subcontractors (HUBs and Non-HUBs). (The PAR is available at https://www.comptroller.texas.gov/purchasing/docs/hub-forms/ProgressAssessmentReportForm.xls).
- The respondent must seek approval from the contracting agency prior to making any modifications to its HSP, including the hiring of additional or different subcontractors and the termination of a subcontractor the respondent identified in its HSP. If the HSP is modified without the contracting agency's prior approval, respondent may be subject to any and all enforcement remedies available under the contract or otherwise available by law, up to and including debarment from all state contracting.
- The respondent must, upon request, allow the contracting agency to perform on-site reviews of the company's headquarters and/or work-site where services are being performed and must provide documentation regarding staffing and other resources.

Signature	Printed Name	Title	Date (mm/dd/yyyy)
Mary Ann Dickinson	Mary Ann Dickinson	President and CEO	05/23/2018

Reminder:

- If you responded "**Yes**" to **SECTION 2, Items c or d**, you must complete an "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed in SECTION 2, Item b.
- If you responded "**No**" **SECTION 2, Items c and d,** you must complete an "HSP Good Faith Effort - Method B (Attachment B)" for **each** of the subcontracting opportunities you listed in SECTION 2, Item b.

HSP Good Faith Effort - Method A (Attachment A)

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Enter your company's name here: Alliance for Water Efficiency Requisition #: 580-18-RFQ0066

IMPORTANT: If you responded "***Yes***" to **SECTION 2, Items c** or **d** of the completed HSP form, you must submit a completed "HSP Good Faith Effort - Method A (Attachment A)" for **each** of the subcontracting opportunities you listed in **SECTION 2, Item b** of the completed HSP form. You may photo-copy this page or download the form at https://www.comptroller.texas.gov/purchasing/docs/hub-forms/hub-sbcont-plan-gfe-achm-a.pdf

SECTION A-1: SUBCONTRACTING OPPORTUNITY

Enter the item number and description of the subcontracting opportunity you listed in SECTION 2, Item b, of the completed HSP form for which you are completing the attachment.

Item Number: 1-2 **Description:** Beta test Texas Tool with municipal utilities; and Review needed Texas tool modifications

SECTION A-2: SUBCONTRACTOR SELECTION

List the subcontractor(s) you selected to perform the subcontracting opportunity you listed above in SECTION A-1. Also identify whether they are a Texas certified HUB and their Texas Vendor Identification (VID) Number or federal Employer Identification Number (EIN), the approximate dollar value of the work to be subcontracted, and the expected percentage of work to be subcontracted. When searching for Texas certified HUBs and verifying their HUB status, ensure that you use the State of Texas' Centralized Master Bidders List (CMBL) - Historically Underutilized Business (HUB) Directory Search located at http://mycpa.cpa.state.tx.us/tpasscmblsearch/index.jsp. HUB status code "**A**" signifies that the company is a Texas certified HUB.

Company Name	Texas certified HUB	Texas VID or federal EIN Do not enter Social Security Numbers. If you do not know their VID / EIN, leave their VID / EIN field blank.	Approximate Dollar Amount	Expected Percentage of Contract
Watearth, Inc.	☑ - Yes ☐ - No	1263679313000/02194	$ TBD	23.7 %
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%
	☐ - Yes ☐ - No		$	%

REMINDER: As specified in SECTION 4 of the completed HSP form, if you (respondent) are awarded any portion of the requisition, you are required to provide notice as soon as practical to all the subcontractors (HUBs and Non-HUBs) of their selection as a subcontractor. The notice must specify at a minimum the contracting agency's name and its point of contact for the contract, the contract award number, the subcontracting opportunity they (the subcontractor) will perform, the approximate dollar value of the subcontracting opportunity and the expected percentage of the total contract that the subcontracting opportunity represents. A copy of the notice required by this section must also be provided to the contracting agency's point of contact for the contract no later than ten (10) working days after the contract is awarded.

CONTENT ITEM 5: OWNERSHIP OF BUSINESS ENTITY

Name & SSN of Each Person with at Least 25% Ownership of the Business Entity Submitting the RFQ

n/a

Name:

n/a

Name:

n/a

Name:

n/a

Name:

CONTENT ITEM 6: TECHNICAL APPROACH

The project team proposes to adapt the Alliance for Water Efficiency's Water Conservation Tracking Tool for this project. The existing tool is an Excel-based model with open source code that can be used to evaluate the water savings, costs, and benefits of conservation programs for a specific water utility. Using information entered into the Tracking Tool from the utility's system costs, it provides a standardized methodology for calculating water savings and benefit-cost accounting, and includes a library of 31 pre-defined and pre-loaded conservation activities from which a utility staffer can build conservation programs for their conservation plan. The existing Tool can do the following:

- Develop long-range conservation plans. Construct conservation portfolios containing up to 50 separate conservation program activities, which can include the 31 pre-defined activities as well as new ones created by the water utility.
- Quickly compare alternative conservation measures in terms of their water savings potential, impact on system costs, and potential benefits to utility customers.
- Track the implementation, water savings, costs, and benefits of actual conservation activities over time.
- Evaluate a utility's changing revenue requirement with conservation.
- Count the savings achieved from national fixture and appliance standards, and individual state codes such as that passed by the Texas Legislature.

The Tracking Tool was first released in 2009, and is now in Version 3.0 with nearly 400 users nationwide. It has proven to be a very successful water conservation planning tool. Our project team is planning to modify the existing Tool and its User Guide to provide a Texas-specific product that will satisfy all of the requirements listed in the RFQ Scope of Work.

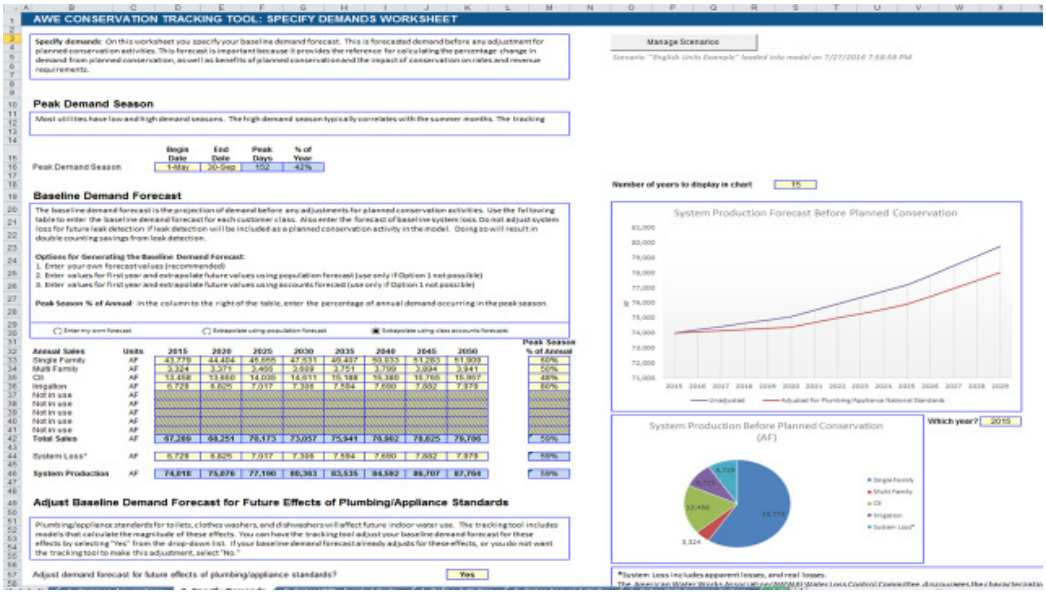


Figure 1. *Tracking Tool Screen Shot of the Specify Demand Worksheet*

Details on how we will address the Scope of Work are as follows:

A. Include estimates of water savings for water conservation activities

The Tracking Tool currently has a comprehensive library of 31 water conservation programs with pre-loaded information on savings and costs. This information collected in the library covers over two decades of studies on water conservation programs. The project team of AWE, FNI, TSU and Watearth will supplement this library with Texas specific studies, as well as weed out those that might not be relevant to Texas. The additions to the library will include the Water Conservation Advisory Council (WCAC) Best Management Practices (BMPs); the conservation activities contained in the 2017 Statewide Water Conservation Quantification Project; studies recently undertaken in Texas (such as TSU's water conservation potential study and FNI's multi-linear regression analysis on year-round watering restrictions for utilities like the San Antonio Water System and the North Texas Municipal Water District); and project team work on determining the savings from the implementation of various BMPs. Lastly, because the project team currently works in eight of the sixteen regional planning regions, we have experience in assessing water conservation as a water management strategy in regional plans with estimated savings and costs.

The modified Tool will allow adjustments by the utility user on conservation program adoption rates and other data, and will provide water savings in annual increments with long-term summaries of water savings. The tool currently has the Texas passive plumbing code savings already embedded in the calculations, but since the TWDB has also developed its own passive plumbing code savings for regional water planning, it may be preferred to have those assumptions pre-loaded into the tool.

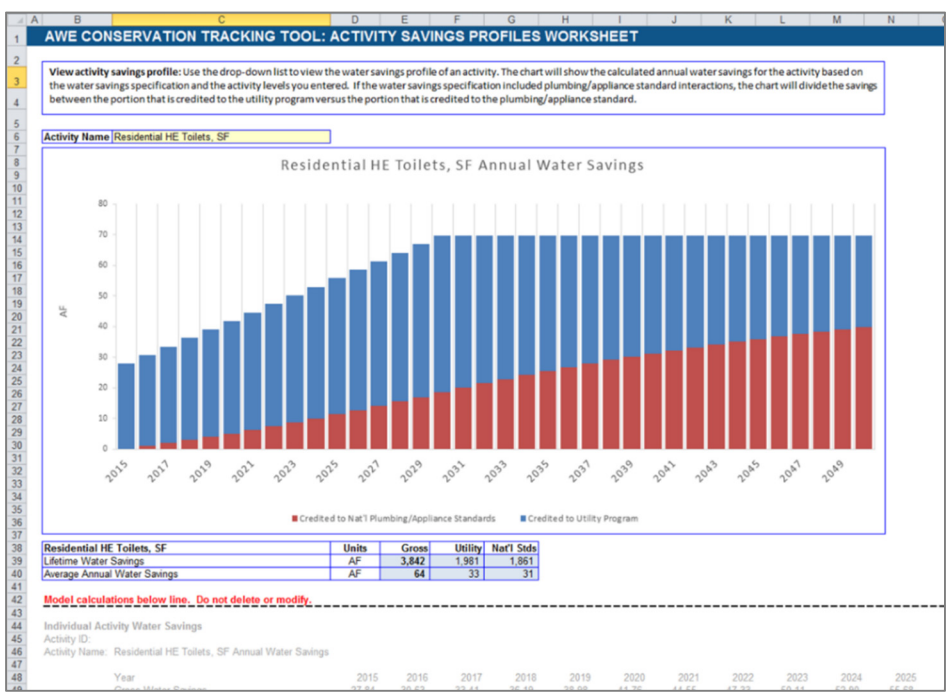


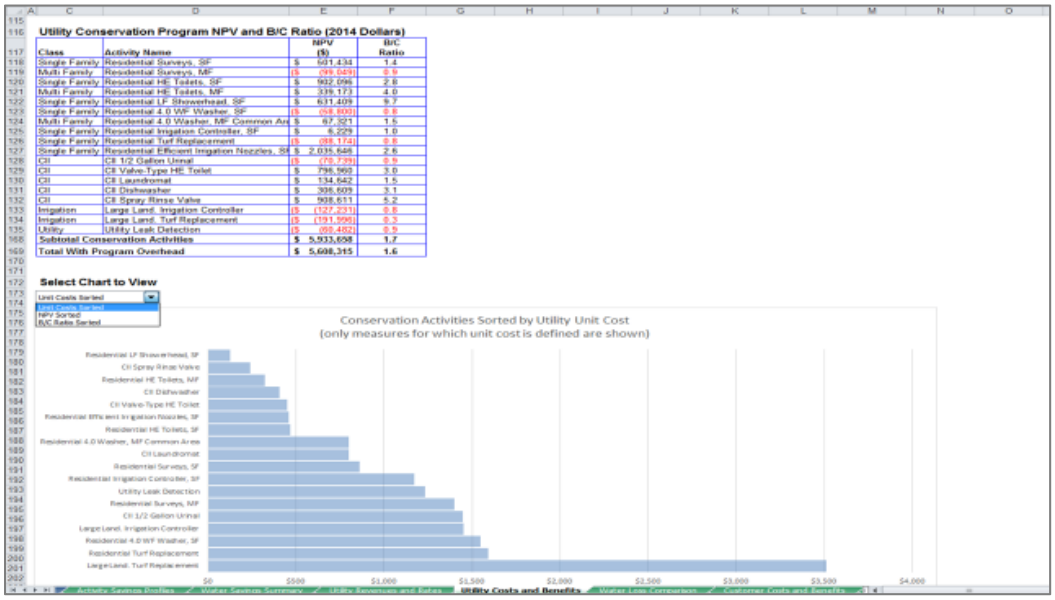
Figure 2. *Tracking Tool Screen Shot of Active and Passive Savings*

Every water conservation activity scripted in the modified Tool will have tabular as well as graphical savings profiles, which will feature and differentiate the active savings from programs as well as the passive savings from codes and standards. One example of such a savings profile is shown below in **Figure 2** for residential single family high efficiency toilets. Note that the passive water savings coming from codes is shown in red and the active savings from active water conservation programs is shown in blue.

B. Include cost estimates for conservation activities included in Section A.

The Tracking Tool currently includes cost estimates for conservation activities embedded in the Tool's Library. These estimates are well documented and are based on peer-reviewed studies and utility program evaluations that have documented the costs of various conservation programs over a two-decade period. The project team has also gathered water conservation cost estimates from utilities throughout Texas through the regional planning activities described above. FNI has been a part of the team developing the TWDB unified costing tool, and has significant experience with developing planning level costs for regional water planning. This experience will be utilized in developing state-wide costs that can be scaled to urban or rural setting or by utility size.

The project team will incorporate any new Texas cost data into the Tracking Tool. The cost data in the Tool can also be adjusted by the utility user to be more specific than the pre-loaded values. Using the cost estimates -- and the savings estimates collected under Part A above -- the Tool will then calculate the total cost of the program on a unit basis ($ per AF saved or $ per MGD saved) and compute the benefit/cost ratio. Once computed, the tool can then rank the conservation programs by unit cost, net present value, or benefit cost ratio. This is illustrated in **Figure 3** below, where both the benefit cost ratios of the various programs are shown along with the program rankings by unit cost.



Utility Conservation Program NPV and B/C Ratio (2014 Dollars)

Class	Activity Name	NPV ($)	B/C Ratio
Single Family	Residential Surveys, SF	$ 601,434	1.4
Multi Family	Residential Surveys, MF	($ 99,049)	0.9
Single Family	Residential HE Toilets, SF	$ 902,096	2.8
Multi Family	Residential HE Toilets, MF	$ 339,173	4.0
Single Family	Residential LF Showerhead, SF	$ 631,409	9.7
Single Family	Residential 4.0 WF Washer, SF	($ 68,803)	0.8
Multi Family	Residential 4.0 Washer, MF Common Are	$ 67,321	1.5
Single Family	Residential Irrigation Controller, SF	$ 6,229	1.0
Single Family	Residential Turf Replacement	($ 88,174)	0.8
Single Family	Residential Efficient Irrigation Nozzles, SF	$ 2,035,646	2.6
CII	CII 1/2 Gallon Urinal	($ 78,739)	0.9
CII	CII Valve-Type HE Toilet	$ 796,992	3.0
CII	CII Laundromat	$ 134,642	1.5
CII	CII Dishwasher	$ 306,609	3.1
CII	CII Spray Rinse Valve	$ 908,611	5.2
Irrigation	Large Land, Irrigation Controller	($ 127,231)	0.8
Irrigation	Large Land, Turf Replacement	($ 191,996)	0.3
Utility	Utility Leak Detection	($ 68,402)	0.9
Subtotal Conservation Activities		$ 5,933,608	1.7
Total With Program Overhead		$ 5,698,315	1.6

Figure 3. *Tracking Tool Screen Shot of Benefit Cost Calculations and Program Rankings*

C. Pre-load data for select water providers/water user groups.

The project team will process and format the necessary data for water supplier/water user groups provided by the Texas Water Development Board. The project team members have significant experience working with TWDB data, and will provide quality review of this data, as well as input into the organization of the data for incorporation into the Tool. Where data gaps exist or where data is determined to be inaccurate, the project team will work with the TWDB to revise the dataset.

D. The tool must include a 'blank' form for utilities without preloaded data in which a user could enter their utility-specific data, utilize the default savings and cost functions, and use the appropriate adoption-rate adjustments and system-specific substitutions.

The Tracking Tool currently already has this ability. It is designed to allow a user to enter their utility specific data, utilize the default savings and cost data that are preloaded into the library, and also to allow the addition of new conservation program options. **Figure 4** below is a screen capture which shows how the Tool can add new program activity through the use of a dialog box. This functionality will be retained within the Texas-specific tool developed under this contract.

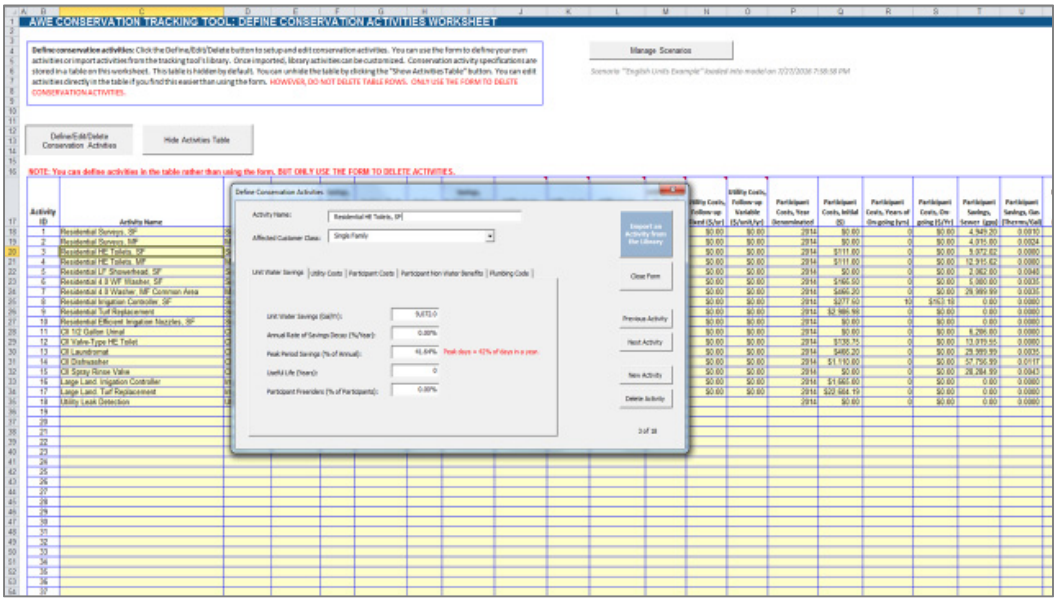


Figure 4. *Tracking Tool Screen Shot Showing Adding and Creating Conservation Program Options*

E. The tool must display all possible conservation activities, their savings, and their costs (capital and non-capital) using default or user-substituted values.

The Tracking Tool currently displays all selected conservation activities, their savings and their costs, using default or user-substituted values. The data are calculated for both the water utility and also for the customer. See **Figure 5**, a Tracking Tool screen capture which shows this display for the customer participant. A similar display occurs for the utility. The Tool computes and uses this information to calculate the Benefit Cost ratios for both utility and customer, as the perspective of the customer must also be evaluated in order to ensure adequate uptake in the conservation program. Once all of the information is calculated, the Tool can display the water conservation programs in multiple formats: sorted by unit cost, sorted by net present value, and sorted by benefit-cost ratio. (See **Figure 3**.)

The project team will further refine this display and will provide testing and debugging of the Tool to verify that the results are appropriate and applicable for Texas water conservation and regional water planning. Beta testing by selected utilities will be undertaken.

AWE CONSERVATION TRACKING TOOL: PARTICIPANT COSTS & BENEFITS WORKSHEET

Planned conservation cost benefit analysis, customer participant: This worksheet summarizes costs and benefits of planned conservation from the perspective of the customer participant. Costs include conservation program costs paid by the participant. Benefits include water, sewer, gas, and electricity bill savings realized by the participant. Costs and benefits are expressed in terms of present value and unit cost.

Customer Program Participant Costs (2014 Dollars) — **Annual Program Participation Costs**

Class	Activity Name	Unit Cost ($/AF)	Discounted Cumulative Water Savings (AF)	Present Value Cost	2015	2016	2017	2018	2019	2020
Single Family	Residential Surveys, SF	$ -	1,498	$ -	$0	$0	$0	$0	$0	$0
Multi Family	Residential Surveys, MF	$ -	480	$ -	$0	$0	$0	$0	$0	$0
Single Family	Residential HE Toilets, SF	$ 233	1,048	$ 244,352	$111,000	$11,100	$11,100	$11,100	$11,100	$11,100
Multi Family	Residential HE Toilets, MF	$ 162	352	$ 56,834	$55,500	$111	$111	$111	$111	$111
Single Family	Residential LF Showerhead, SF	$ -	568	$ -	$0	$0	$0	$0	$0	$0
Single Family	Residential 4.0 WF Washer, SF	$ 1,162	187	$ 216,679	$16,650	$16,650	$16,650	$16,650	$16,650	$16,650
Multi Family	Residential 4.0 Washer, MF Common Are	$ 909	167	$ 151,675	$11,655	$11,655	$11,655	$11,655	$11,655	$11,655
Single Family	Residential Irrigation Controller, SF	$ 5,592	185	$ 1,034,594	$13,875	$21,534	$29,193	$36,852	$44,511	$52,170
Single Family	Residential Turf Replacement	$ 3,179	306	$ 971,795	$74,675	$74,675	$74,675	$74,675	$74,675	$74,675
Single Family	Residential Efficient Irrigation Nozzles, SF	$ -	2,831	$ -	$0	$0	$0	$0	$0	$0
CII	CII 1/2 Gallon Urinal	$ -	449	$ -	$0	$0	$0	$0	$0	$0
CII	CII Valve-Type HE Toilet	$ 205	881	$ 180,566	$13,875	$13,875	$13,875	$13,875	$13,875	$13,875
CII	CII Laundromat	$ 909	334	$ 303,350	$23,310	$23,310	$23,310	$23,310	$23,310	$23,310
CII	CII Dishwasher	$ 406	356	$ 144,452	$11,100	$11,100	$11,100	$11,100	$11,100	$11,100
CII	CII Spray Rinse Valve	$ -	899	$ -	$0	$0	$0	$0	$0	$0
Irrigation	Large Land. Irrigation Controller	$ 1,052	515	$ 541,697	$41,625	$41,625	$41,625	$41,625	$41,625	$41,625
Irrigation	Large Land. Turf Replacement	$ 7,027	84	$ 588,330	$45,208	$45,208	$45,208	$45,208	$45,208	$45,208
Utility	Utility Leak Detection	NA	NA	NA	$0	$0	$0	$0	$0	$0
Total		**$ 380**	**11,666**	**$ 4,434,323**	**$418,473**	**$270,843**	**$278,502**	**$286,161**	**$293,820**	**$301,479**

Customer Water Bill Savings (2014 Dollars) — **Annual Water Bill Savings**

Class	Activity Name	Unit Benefit ($/AF)	Discounted Cumulative Water Savings (AF)	Present Value Benefit	2015	2016	2017	2018	2019	2020
Single Family	Residential Surveys, SF	$ 974	1,498	$ 1,459,125	$7,733	$37,860	$63,074	$84,293	$102,264	$114,801
Multi Family	Residential Surveys, MF	$ 898	480	$ 431,028	$923	$10,173	$17,909	$24,413	$29,917	$34,274
Single Family	Residential HE Toilets, SF	$ 947	1,048	$ 993,079	$22,679	$24,694	$26,734	$28,800	$30,895	$33,018
Multi Family	Residential HE Toilets, MF	$ 854	352	$ 300,428	$14,853	$14,688	$14,529	$14,377	$14,231	$14,091
Single Family	Residential LF Showerhead, SF	$ 1,038	568	$ 589,720	$5,155	$9,886	$14,237	$18,250	$21,962	$25,405
Single Family	Residential 4.0 WF Washer, SF	$ 1,053	187	$ 196,373	$1,250	$2,486	$3,711	$4,926	$6,135	$7,339
Multi Family	Residential 4.0 Washer, MF Common Are	$ 915	167	$ 152,765	$1,725	$3,365	$4,933	$6,439	$7,894	$9,307
Single Family	Residential Irrigation Controller, SF	$ 1,022	185	$ 189,045	$1,313	$2,679	$4,099	$5,575	$7,108	$8,700
Single Family	Residential Turf Replacement	$ 1,142	306	$ 348,909	$1,057	$2,157	$3,300	$4,488	$5,722	$7,004
Single Family	Residential Efficient Irrigation Nozzles, SF	$ 975	2,831	$ 2,759,012	$37,498	$76,497	$117,040	$159,175	$202,948	$207,007
CII	CII 1/2 Gallon Urinal	$ 913	449	$ 409,563	$1,241	$2,532	$3,874	$5,268	$6,717	$8,221
CII	CII Valve-Type HE Toilet	$ 769	881	$ 677,387	$2,604	$5,225	$7,866	$10,527	$13,211	$15,918
CII	CII Laundromat	$ 796	334	$ 265,651	$3,000	$5,852	$8,578	$11,197	$13,727	$16,184
CII	CII Dishwasher	$ 894	356	$ 318,358	$1,155	$2,356	$3,605	$4,903	$6,251	$7,651
CII	CII Spray Rinse Valve	$ 835	899	$ 750,748	$5,656	$10,962	$15,948	$20,643	$25,073	$29,262
Irrigation	Large Land. Irrigation Controller	$ 940	515	$ 484,291	$3,364	$6,863	$10,501	$14,281	$18,208	$22,287

Water Savings Summary | Utility Revenues and Rates | Utility Costs and Benefits | Water Loss Comparison | **Customer Costs and Benefits** | GHG Reduction Benefits

Figure 5. *Tracking Tool Screen Shot of Customer Costs and Savings*

F. A summary page in the tool must display all of the selected potential conservation activities individually and as a possible combination of activities, including the total water savings, total activity costs, and the average cost per acre-feet of savings.

As shown in **Figure 5** above, the Tracking Tool already has this capability, for both the water utility and the customer participant. The tool further has the capability to save an infinite number of conservation program scenarios, where a water supplier can then compare one scenario of conservation program costs and savings to one or more other scenarios. This functionality will be preserved in the Texas version of the Tool that will be created.

G. Conservation Program Roll up into Planning Regions

The project team is offering additional functionality not currently required in the Scope of Work. We are offering to program the capability to roll up the costs and savings of individual municipal conservation programs in a utility to a Planning Region. Such an aggregated rollup has been programmed before in the Tracking Tool for the State of Georgia, and the project team can customize this approach for the State of Texas as well. This will provide a way for the TWDB to evaluate whether the conservation goals will be met in each of the Planning Regions.

Alliance for Water Efficiency

EXHIBIT B
SCOPE OF WORK

The Contractor shall develop a municipal water conservation planning tool (Tool) to be used in the development of conservation plans and regional water plans. The primary users of the tool will be the staff or consultants developing water conservation plans for water suppliers and regional water planning technical consultants. The Scope of Work includes the proposed outline below.

A. Develop the Tool as a stand-alone Microsoft Excel workbook with multiple linked worksheets. The Tool will be user-friendly and focused on the needs and abilities of mid-size water utilities, while also being useful to small and large water utilities.

B. Estimates of water savings for water conservation activities.
   1. The list of conservation activities shall include all quantified and applicable activities from the following sources:
      a. the AWE Tracking Tool library,
      b. the 2017 Statewide Water Conservation Quantification Project by Averitt & Associates,
      c. the Freese & Nichols, Incorporated regression analysis of year-round watering restrictions, and
      d. any additional studies and sources of information.
   2. Water savings shall be presented in gallons and based upon existing studies and reports listed above.
   3. Water savings should be estimated on an annual basis for the base year and projected into the future for the years 2020, 2024, 2029, 2030, 2040, 2050, 2060, and 2070.
   4. The implementation level for each applicable conservation activity, which will determine the water savings estimate, will be blank as default and adjustable by the user.
   5. Water savings estimates shall be adjustable beyond the default by the user in case the user has different system-specific information.
   6. Water savings shall be adjusted by the future effects of plumbing/appliance standards, as provided by the TWDB from the regional water planning projections, so as not to double count savings.

C. Estimates of costs for conservation activities included in Section B.
   1. Costs shall be specified as capital, debt service, and operating and maintenance costs, as applicable, and described in Exhibit C, Section 5.52-9, pages.
   2. Costs shall be based on existing studies and reports as much as possible.
   3. Costs shall be estimated on an annual basis for the base year and projected into the future for the years 2020, 2024, 2029, 2030, 2040, 2050, 2060, and 2070.
   4. Costs for each applicable conservation activity will be dependent upon the implementation level selected by the user, as described in B4.
   5. Cost estimates shall be adjustable beyond the default by the user in case the user has better system-specific information.

6. Costs shall be as consistent as possible with applicable costs included in TWDB's contract Uniform Costing Model Update for Regional Water Planning.

D. Data for select water providers/water user groups

1. Data necessary to calculate water savings and cost estimates for all conservation activities listed in Sections A and B shall be pre-loaded into the tool for all water utilities/water user groups that have population and water demand projections approved for the 2022 state water plan and are currently required to submit a conservation plan to the TWDB.
2. Data provided by the TWDB to be pre-loaded into the tool by the CONTRACTOR will include:
   a. Service-area population, base-year
   b. Service-area population, projected 2020-2070 (2022 State Water Plan)
   c. Number of customer connections by customer class (SF, MF, institutional, commercial, industrial, agriculture), base-year
   d. Number of customer connections by customer class, projected through 2070
   e. Metered water sold by category, base-year
   f. Metered water sold by category, projected through 2070
   g. Volume of water projected to be saved due to the natural replacement of water efficient fixtures and appliances (2022 State Water Plan)
3. Any additional pre-loaded data necessary for each utility beyond the previously mentioned data sets (subsection a – g) shall be developed by the CONTRACTOR.

E. The tool shall include a 'blank' form for utilities without preloaded base data in which a user could enter the utility-specific base data and implementation levels for applicable conservation activities that will produce water savings estimates and costs.

F. The tool shall display all possible activities, their savings, and their costs (capital and non-capital, as appropriate) using default or user-substituted values.

G. A summary page in the tool shall display all of the selected potential conservation activities individually and as a package, including the total water savings, total activity costs, and the average cost per acre-feet of savings.

H. The CONTRACTOR shall develop a user-friendly User Guide for the Tool and an online training session for TWDB staff after the delivery and acceptance of the final product.

I. Testing and Delivery Milestones:

1. 'Alpha testing' (testing for internal consistency) with TWDB staff will take place during the month of September.
2. 'Utility beta testing' with utility volunteers will take place in the month of October.
3. Final product delivery 30 days following the DRAFT DELIVERABLES DATE.
4. Online training session for TWDB staff no later than 30 days following the DRAFT DELIVERBLES DATE.

EXHIBIT C

TASK AND EXPENSE BUDGETS

TASK BUDGET

TASK	DESCRIPTION	AMOUNT
1	Develop Municipal Water Conservation Planning Tool	$41,400
2	Customize Municipal Water Conservation Planning Tool	2,300
3	Alpha Testing	23,350
4	Beta Testing	47,533
5	Prepare outreach materials for rollout of model	13,277
TOTAL		**$127,860**

EXPENSE BUDGET

CATEGORY	AMOUNT
Salaries & Wages[1]	$15,150
Fringe[2]	2,230
Travel[3]	2,500
Other Expenses[4]	1,000
Subcontract Services	90,303
Overhead[5]	16,677
Profit	0
TOTAL	**$127,860**

[1] Salaries and Wages is defined as the cost of salaries of engineers, draftsmen, stenographers, surveymen, clerks, laborers, etc., for time directly chargeable to this contract.
[2] Fringe is defined as the cost of social security contributions, unemployment, excise, and payroll taxes, workers' compensation insurance, retirement benefits, medical and insurance benefits, sick leave, vacation, and holiday pay applicable thereto.
[3] Travel is limited to the maximum amounts authorized for state employees by the General Appropriations Act, Tex. Leg. Regular Session, 2017, Article IX, Part 5, as amended or superseded
[4] Other Expenses is defined to include expendable supplies, communications, reproduction, postage, and costs of public meetings directly chargeable to this CONTRACT.
[5] Overhead is defined as the costs incurred in maintaining a place of business and performing professional services similar to those specified in this contract.

EXHIBIT D

GUIDELINES FOR AUTHORS SUBMITTING CONTRACT REPORTS TO THE TEXAS WATER DEVELOPMENT BOARD

1.0 Introduction

The purpose of this document is to describe the required format of contract reports submitted to the Texas Water Development Board (TWDB). Our reason for standardizing the format of contract reports is to provide our customers a consistent, and therefore familiar, format for contract reports (which we post online for public access). Another reason for standardizing the format is so that we can more easily turn a contract report into a TWDB numbered report if we so choose. Remember that your report will not only be seen by TWDB staff, but also by any person interested in the results of your study. A professional and high-quality report will reflect well on you, your employer, and the TWDB.

Available upon request, we will provide a Microsoft Word template (used to write these instructions) that gives the fonts, spacing, and other specifications for the headings and text of the report. Please follow this template as closely as possible.

2.0 Formatting your report

The TWDB format is designed for simplicity. For example, we use Times New Roman for all text. We use 12-point, single-spaced text, left justification for paragraph text, 18 points bold for first-level headings, and 14 points bold for second-level headings. Page numbers are centered at the bottom of the page. Other than page numbers, please refrain from adding content to the document header or footer. Page setup should use one-inch margins on all four sides.

2.1 Text

The best way to format your document is to use the styles described and embedded in the template document (Authors_Template.dot) that is available on request from the TWDB. To use the Authors_Template.dot file, open it in Word (make sure *.dot is listed under Files of type) and save it as a .doc file. Advanced users can add the .dot file to their computers as a template. Make sure the formatting bar is on the desktop (to open, go to View→Toolbars→Formatting) or, to view all of the formatting at once, go to Format→Styles and Formatting and select Available Styles from the dropdown box at the bottom of the window. The formatting in the template document provides styles (such as font type, spacing, and indents) for each piece of your report. Each style is named to describe what it should be used for (for example, style names include Chapter Title, Body Text, Heading 1, References, and Figure or Table Caption). As you add to your report, use the dropdown list on the Formatting Toolbar or the list in the Styles and Formatting window to adjust the text to the correct style. The Authors_Template.dot file shows and lists the specifications for each style.

2.1.1 Title

Give your report a title that gives the reader an idea of the topic of your report but is not terribly long. In addition to the general subject (for example, “Droughts”), you may include a few additional

words to describe a place, methodology, or other detail focused on throughout the paper (for example, "Droughts in the High Plains of Texas" or "Evaluating the effects of drought using groundwater flow modeling"). Please capitalize only the first letter of each word except 'minor' words such as 'and' and 'of'. Never use all caps.

Use headings to help the reader follow you through the main sections of your report and to make it easier for readers to skim through your report to find sections that might be the most interesting or useful to them. The text of the report should include an executive summary and sections outlined in 4.4 of Attachment 1. Headings for up to five levels of subdivision are provided in the template; however, we suggest not using more than three or four levels of subdivision except where absolutely necessary. Please avoid stacked headings (for example, a Heading 1 followed immediately by a Heading 2), and capitalize only the first letter of headings or words where appropriate—never use all caps.

2.2 Figures and photographs

To publish professional-looking graphics, **we need all originals to be saved at 300 dots-per-inch** (dpi) and in grayscale, if possible, or in the CMYK color format if color is necessary. Excessive use of color, especially color graphics that do not also work in grayscale, will prevent us from publishing your report as a TWDB numbered report (color reproduction costs can be prohibitive). Preferred file formats for your original graphics are Adobe Illustrator (.ai), Photoshop (.psd), EPS with .tiff preview, .jpg, .png, or .tiff files. Refrain from using low resolution .jpg or .gif files. Internet images at 72 dpi are unacceptable for use in reports.
All graphics shall be submitted in two forms:

1. Inserted into the Microsoft Word document before you submit your report. Ideally, inserted graphics should be centered on the page. Format the picture to downsize to 6 inches wide if necessary. Please do not upsize a graphic in Word.
2. Saved in one of the formats listed above.

2.2.1 Other graphics specifications

It is easiest to design your figures separately and add them in after the text of your report is more or less complete. Graphics should remain within the 1-inch page margins of the template (6.5 inches maximum graphic width). Be sure that the graphics (as well as tables) are numbered in the same order that they are mentioned in the text. Figures should appear embedded in the report after being called out in the text. Also, remember to include a caption for each graphic in Word, not as part of the graphic. We are not able to edit or format figure captions that are part of the figure. For figures and photographs, the caption should appear below the graphic. For tables, the caption should appear above.

2.2.2 Creating publication-quality graphics

When designing a graphic, make sure that the graphic (1) emphasizes the important information and does not show unnecessary data, lines, or labels; (2) includes the needed support material for the reader to understand what you are showing; and (3) is readable (see Figures 1 and 2 for examples). Edward R. Tufte's books on presenting information (Tufte, 1983; 1990; 1997) are great references on good graphic design. Figures 1 through 3 are examples of properly formatted, easy to understand graphics. Do not include fonts that are less than 6 points.

For good-looking graphics, the resolution needs to be high enough to provide a clear image at the size you make them within the report. In general, 300 dpi will make a clear image—200 dpi is a minimum. Try to create your figures at the same size they will be in the report, as resizing them in Word greatly reduces image quality. Photographs taken with at least a two-megapixel camera (if using digital) and with good contrast will make the best images. Save the original, and then adjust color levels and size in a renamed image copy. Print a draft copy of your report to double-check that your figures and photographs have clear lines and show all the features that you want them to have.

Figures and photographs should be in grayscale. Color greatly adds to the cost of printing, so we are trying to keep it to a minimum. Also remember that your report may be photocopied, scanned, or downloaded and printed in black and white. For this reason, you should use symbols or patterns, or make sure that colors print as different shades in black and white. All interval or ratio data (data measuring continuous phenomena, with each color representing an equal interval) need to be displayed in a graded scale of a single color (Figure 3). This way your figures will be useful even as a photocopy.

If you need help with your graphics or have questions, please contact the TWDB graphics department at (512) 936-0129.

2.2.3 Using other people's graphics

Figures and photographs (and tables) need to be your own unless you have written permission from the publisher that allows us to reprint them (we will need a copy of this permission for our records). Avoid using any figures or photographs taken off the Internet or from newspapers or magazines—these sources are difficult to cite, and it is often time-consuming and expensive to gain permission to reproduce them.

2.3 Tables

Tables should be created in Microsoft Word (see Table 1). Tables should include a minimal amount of outlining or bold font to emphasize headings, totals, or other important points. Tables should be numbered separately from figures, and captions should appear above the text of the table.

Table 1: A sample table. Note caption above table.

Table text heading*

Table text	1940	1950	1960	1970	1980	1990	2000	%GW
Table text	15	441	340	926	196	522	83	97.4
Table text	64	944	626	173	356	171	516	99.9
Total	79	1385	966	1099	552	693	599	

* A footnote should look like this using 10 point Times New Roman.
%GW = percent groundwater
Be sure to describe any abbreviations or symbols, and, unlike in this table, be sure to note the units!

3.0 Units

Measurements should be in English units. Metric units may be included in parentheses after the English units.

All units of geologic time should conform to the most recent geologic timescale (Gradstein and others, 2004). A summary of this timescale is available from the International Commission on Stratigraphy's website at http://stratigraphy.org/chus.pdf.

4.0 Citations and references

It is important to give credit where credit is due. Therefore, be sure to use the appropriate citations and include references in your paper.

4.1 In-text citations

Each piece of information you use in your report that comes from an outside source must be cited within the text using the author's last name and the year of publication. If there are two authors, list the last name of each followed by the year, and if there are more than two authors, list the last name of the first author followed by "and others" and the year. For example: the end of the Jurassic Period occurred approximately 145.5 million years ago (Gradstein and others, 2004).

4.2 References

All sources that are cited within the report should be listed at the end of the paper under the heading References. The references should follow the guidelines in "Suggestions to Authors of the Reports of the United States Geological Survey" (Hansen, 1991). These are available online at http://www.nwrc.usgs.gov/lib/lib_sta.html (a link to the chapter "Preparing references for Survey reports," p. 234-241, is found here). Several examples of complete reference citations are listed at the end of these guidelines. Be sure that any citations that appear in tables or figures are included in the reference list. Also, before submitting the report, please check that all the citations in the report are included in the reference list and all references in the reference list are cited in the report. If at all possible, avoid web-based citations. These materials are often transient and therefore useless to future readers.

5.0 Submitting your report

Before you submit your report, proofread it. Look for spelling and grammatical errors. Also, check to see that you have structured the headings, paragraphs, and sentences in your paper so that it is easy to follow and understand (imagine you are a reader who does not already know the information you are presenting!).

6.0 Conclusions

Following the instructions above and providing accurate and readable text, tables, figures, and citations will help to make your report useful to readers. Scientists may read your report, as well as water planners, utility providers, and interested citizens. If your report successfully conveys accurate scientific information and explanations to these readers, we can help to create more informed decisions about the use, development, and management of water in the state.

7.0 Acknowledgments

Be sure to acknowledge the people and entities that assisted you in your study and report. For example:
We would like to thank the Keck Geology Consortium, the American Society of Civil Alliance for Water Efficiencys, and the Texas Bar CLE for providing examples to use in developing these guidelines. In addition, we appreciate Mike Parcher for providing information on how to create publication-quality graphics, Shirley Wade for creating the data used in sample Figure 1, and Ian Jones for providing sample Figure 3.

8.0 References

Gradstein, F.M., J.G. Ogg, and A.G. Smith, eds., 2005, A geologic time scale 2004: Cambridge, Cambridge University Press, 610 p.

Hansen, W.R., ed., 1991, Suggestions to authors of the reports of the United States Geological Survey (7th ed.): Washington, D.C., U.S. Government Printing Office, 289 p.

Tufte, E. R., 1983, The visual display of quantitative information: Cheshire, C.T., Graphics Press, 197 p.

Tufte, E. R., 1990, Envisioning information: Cheshire, C.T., Graphics Press, 126 p.

Tufte, E. R., 1997, Visual explanations: Cheshire, C.T., Graphics Press, 156 p.

9.0 Examples of references

Arroyo, J. A., and Mullican, III, W. F., 2004, Desalination: *in* Mace, R. E., Angle, E. S., and Mullican, W. F., III, editors, Aquifers of the Edwards Plateau: Texas Water Development Board Report 360, p. 293-302.

Bates, R. L., and Jackson, J. A., 1984, Dictionary of geological terms: Anchor Press/Doubleday, Garden City, New York, 571 p.

Blandford, T. N., Blazer, D. J., Calhoun, K. C., Dutton, A. R., Naing, T., Reedy, R. C., and Scanlon, B. R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico–Numerical simulations through 2050: contract report by Daniel B. Stephens and Associates, Inc., and the Bureau of Economic Geology, The University of Texas at Austin to the Texas Water Development Board, variably paginated.

Fenneman, N. M., 1931, Physiography of Western United States (1st edition): New York, McGraw-Hill, 534 p.

Hubert, M., 1999, Senate Bill 1–The first big bold step toward meeting Texas's future water needs: Texas Tech Law Review, v. 30, no. 1, p. 53-70.

Kunianski, E. L., 1989, Precipitation, streamflow, and baseflow in West-Central Texas, December 1974 through March 1977: U. S. Geological Survey Water-Resources Investigations Report 89-4208, 2 sheets.

Mace, R. E., Chowdhury, A. H., Anaya, R., and Way, S.-C., 2000, A numerical groundwater flow model of the Upper and Middle Trinity aquifer, Hill Country area: Texas Water Development Board Open File Report 00-02, 62 p.

Maclay, R. W., and Land, L. F., 1988, Simulation of flow in the Edwards aquifer, San Antonio Region, Texas, and refinements of storage and flow concepts: U. S. Geological Survey Water-Supply Paper 2336, 48 p.

For more examples of references, see p. 239-241 of "Suggestions to Authors of the Reports of the United States Geological Survey" at http://www.nwrc.usgs.gov/lib/lib_sta.html.

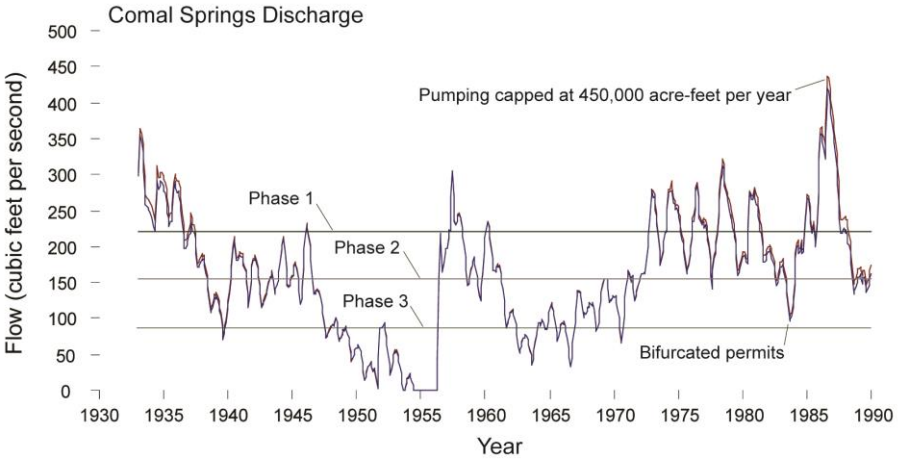


Figure 1. A sample figure showing only the information needed to help the reader understand the data. Font size for figure callouts or labels should never be less than 6 point.

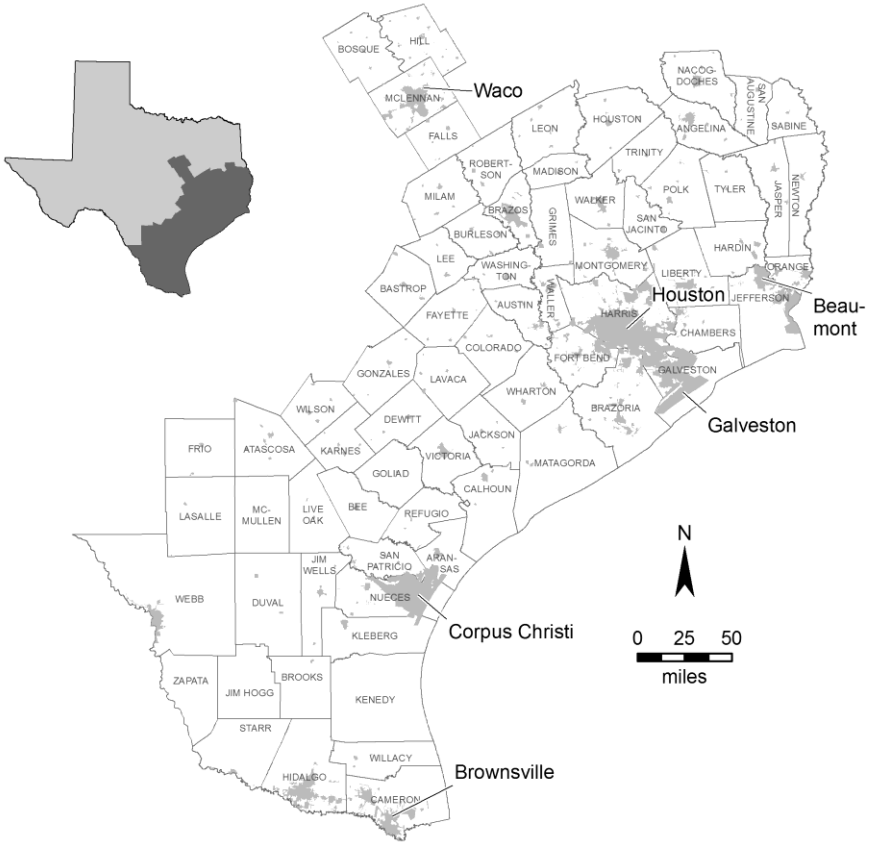


Figure 2. A sample subject area map, giving the reader enough information to understand the location being discussed in this conference. For map figures, be sure to include a north arrow to orient the reader, a scale, and, if needed, a submap that places the figure in greater geographic context. Be sure that text is readable and that any citations listed on the figure or in the figure caption are included in the reference list. Font size should never be less than 6 pt.

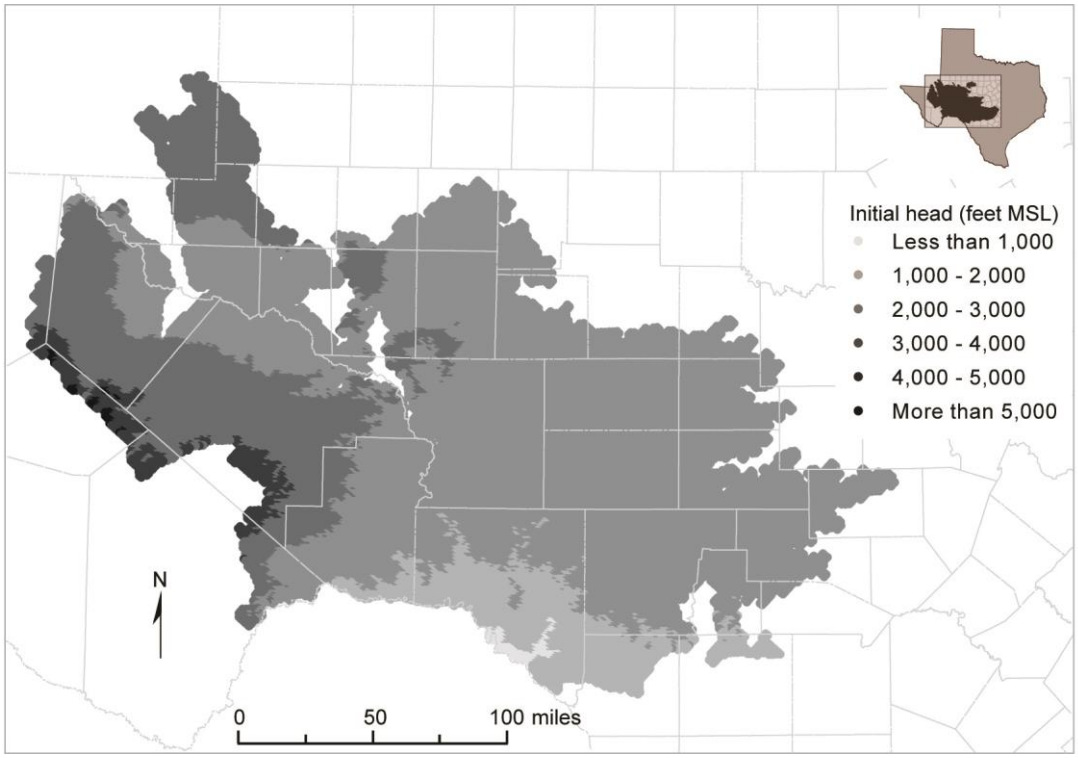


Figure 3. Initial hydraulic heads used in model simulations for layer 1. Note the use of grayscale shading to show differences.

EXHIBIT E

TWDB Guidelines for a Progress Report

Texas Water Development Board Contractors are required by their contracts to provide Progress Reports usually with the submission of an invoice/payment request.

The progress report should contain the following standard elements:

- Date: Date the memo is sent
- To: Name and position of the reader
- From: Name and position of the writer
- Subject: TWDB Contract Number and a clear phrase that focuses the reader's attention on the subject of the memo

Work Completed: *(The next section of a progress report explains what work has been done during the reporting period. Specify the dates of the reporting period and use active voice verbs to give the impression that you or you and your team have been busy). For Example:*

Task 1: Completed 3 draft chapters and all appendices. Met with sub consultants on their chapters.
Task 2: Completed sample collection throughout river reach.
Task 3: No work completed in reporting period.

Problems:
If the reader is likely to be interested in the glitches you have encountered along the way, mention the problems you have encountered and explain how you have solved them. If there are problems you have not yet been able to solve, explain your strategy for solving them and give tell the reader when you think you will have them solved.