

**FIRST AMENDMENT  
TO  
PROFESSIONAL SERVICES AGREEMENT  
[Reservoir 2A Survey and Geotechnical Monitoring Services]**

**THIS FIRST AMENDMENT TO PROFESSIONAL SERVICES AGREEMENT** (the “First Amendment”) is made and entered into as of \_\_\_\_\_, 2025, by and between the CITY OF ORANGE, a municipal corporation (“City”), and TETRA TECH BAS, INC., a California corporation (“Contractor”), with reference to the following:

A. City and Contractor entered into a Professional Services Agreement (Agreement No. 7322) dated as of January 1, 2022, which is incorporated herein by this reference (the “Original Agreement”); and

B. City and Contractor desire to amend the Original Agreement to modify, amend and supplement certain portions of the Original Agreement by revising the Scope of Services and increasing the compensation.

**NOW, THEREFORE**, the parties hereby agree as follows:

Section 1.     **Defined Terms.** Except as otherwise defined herein, all capitalized terms used herein shall have the meanings set forth for such terms in the Original Agreement.

Section 2.     **Cross-References.** City and Contractor agree that all references in this First Amendment are deemed and construed to refer to the Original Agreement, as implemented by this First Amendment.

Section 3     **Revised Scope of Services.** The Scope of Services, Section 1, Exhibit A of the Original Agreement, is hereby amended, modified and supplemented to include the services described on Exhibit A attached hereto and incorporated herein by this reference.

Section 4     **Compensation.** The total not-to-exceed compensation for the services to be rendered as set forth in Section 2.a of the Original Agreement is increased by NINETY-FIVE THOUSAND SIX HUNDRED FIVE DOLLARS and 00/100 (\$95,605.00) and Section 2.a is hereby amended in its entirety to read as follows:

“Contractor's total compensation for all services performed under this Agreement, shall not exceed TWO HUNDRED SEVENTEEN THOUSAND SIX HUNDRED EIGHTY-SEVEN DOLLARS and 00/100 (\$217,687.00) without the prior written authorization of City.”

Section 5.     **Integration.** This First Amendment amends, as set forth herein, the Original Agreement and, except as specifically amended hereby, the Original Agreement shall remain in full force and effect. To the extent that there is any conflict or inconsistency between

the terms and provisions of this First Amendment and the terms and provisions of the Original Agreement, the terms and provisions of this First Amendment shall control and govern the rights and obligations of the parties.

IN WITNESS of this First Amendment, the parties enter into this First Amendment on the year and day first above written.

**"CONTRACTOR"**

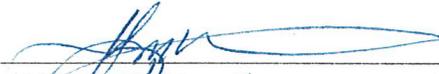
**"CITY"**

TETRA TECH BAS, INC., a California corporation

CITY OF ORANGE, a municipal corporation

\*By:   
Printed Name: Peter Skopek  
Title: Vice President

By: \_\_\_\_\_  
Daniel R. Slater, Mayor

\*By:   
Printed Name: GREGORY M. WILLIAMS  
Title: VICE PRESIDENT, CFO

ATTEST:  
\_\_\_\_\_  
Pamela Coleman, City Clerk

APPROVED AS TO FORM:  
\_\_\_\_\_  
Mike Vigliotta, City Attorney

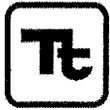
**\*NOTE:** If Contractor is a corporation, the City requires the following signature(s):  
-- (1) the Chairman of the Board, the President or a Vice-President, **AND** (2) the Secretary, the Chief Financial Officer, the Treasurer, an Assistant Secretary or an Assistant Treasurer. If only one corporate officer exists or one corporate officer holds more than one corporate office, please so indicate. **OR**  
-- The corporate officer named in a corporate resolution as authorized to enter into this Agreement. A copy of the corporate resolution, certified by the Secretary close in time to the execution of the Agreement, must be provided to the City.

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**EXHIBIT "A"**

**SUPPLEMENTAL SCOPE OF SERVICES**

[Behind this page.]



**TETRA TECH**

Project No. GEN 20-32

August 23, 2024

Mr. Tuan Cao, P.E., Senior Civil Engineer  
City of Orange Water Department  
Public Works Department – Water Division  
189 South Water Street  
P.O. Box 449  
Orange, California, 92866-1592

**Subject: PROPOSAL FOR CONTINUATION OF GEOTECHNICAL SERVICES  
INSTRUMENT MONITORING AND SURVEYING, STRUCTURAL  
EVALUATION, AND ENGINEERING COST ESTIMATES  
WATER RESERVOIR 2A  
2444 Vista Point Road  
Lot 192, Tract 10439  
Orange, California 92867**

Dear Mr. Cao:

## **INTRODUCTION**

Tetra Tech BAS, Inc. (Tetra Tech) is pleased to submit this proposal to perform continued geotechnical services for the evaluation of the Water Reservoir 2A located at 2444 Vista Point Road in Orange, California. These services will include continued geotechnical instrumentation and survey monitoring, reservoir tank shell structural evaluation, and preparation of engineering estimates for potential repair options.

## **SALIENT HISTORY**

Reservoir 2A has been in service since the mid-1980s and is an integral part of the City's water distribution system. Site development for the reservoir tank and improvements included both cuts and fills to create a level pad. Slopes were cut and filled at about 1-1/2:1 gradients. In response to reported ground movement and distress on the reservoir pad and adjacent slopes, geotechnical studies were performed by Agra Earth & Environmental, Inc. in the mid-1990s. Subsequently, several subsurface exploration programs were performed by Constant & Dickey, Inc. and GeoLogic Associates. Ground monitoring performed by these consultants since 1995 has included an array of surface monuments for optical survey measurements (i.e., elevation of the ring footing, concrete screen/retaining walls, etc.), vertical inclinometers, and groundwater monitoring wells. Data collected periodically through optical surveys and inclinometer readings documented several inches of ground tilting across the reservoir pad, and cumulative horizontal displacements at depth within the bedrock underlying the reservoir tank and adjacent slopes of less than 1 inch.

Tetra Tech recently prepared a second party review of geotechnical issues affecting Reservoir 2A (report dated March 5, 2021). The report concluded that fill settlement, lateral fill extension, and bedrock rebound were the most likely contributors to the observed and measured movement at the site.

Between April 2022 and April 2024, Tetra Tech also performed periodic monitoring and measurements of the on-site inclinometers, surveyed key target points on the reservoir foundation and adjacent access road, documented conditions of site improvements (e.g., privacy CMU wall, hardscape), and measured piezometers and crack monitors. The ground surveys included recording of x, y, and z coordinates that were tied to local benchmarks established in areas considered to be unaffected by the observed / measured movement at the tank site. The work also included LiDAR surveys of the reservoir tank and surrounding pad. To date, the monitoring from 2022 to 2024 included one baseline and 3 comparative surveys.

### **PROPOSED CONTINUED SCOPE OF WORK**

As requested by the City of Orange, Tetra Tech is presenting the following scope of work and estimated fees to provide continued geotechnical services; the tasks include: annual monitoring and evaluation of the ground conditions at the Reservoir 2A site, structural evaluation of the reservoir tank shell, and preliminary cost estimating of repair alternatives. Deliverable milestones for the tasks will include:

- Two monitoring reports for instrumentation and surveying, one for calendar year 2025 and one for calendar year 2026.
- One technical memorandum addressing a structural evaluation of the reservoir tank shell (early-2025).
- One combined report summarizing the structural evaluation, engineering estimates for repair options, and incorporating the planned 2025 monitoring results (mid-2025).

#### **Annual Monitoring**

Continued annual monitoring is planned for April in calendar years 2025 and 2026. Data collection will be conducted during one mobilization each year and will include the following:

#### **Ground Surveying**

A total of 4 local benchmarks have already been established in the proximity of the reservoir site. Vertical and horizontal control of the local benchmarks have been established based on NAVD'88 and NAD'83 state plane coordinate system, respectively.

The 2022-2024 surveys established target points on the existing ringwall footing of the tank, on the drainage swale at the base of the perimeter privacy CMU wall, and on top of the curb for the adjacent roads. Two supplemental ground surveys will be performed that will include x, y and z coordinates of all target points. It is anticipated that these surveys will be performed annually in April 2025 and April 2026. Vertical elevation and horizontal coordinates will be established for

each target to an accuracy of 0.01 feet. Data collection and presentation is based on the following assumptions:

- The City is responsible for providing clear access to the property for fieldwork to be performed by Tetra Tech.
- Survey control will be established on site prior to Tetra Tech’s mobilization (ground survey).
- All data will be registered to a State Plane Coordinate system using control points established on site.

### **Inclinometer and Piezometer Instrumentation Readings**

Instrument readings will be taken at 4 inclinometer installations, utilizing a Durham Geo Slope Indicator Company (SINCO) Digitilt AT System sensor. The system includes a dual-axis inclinometer probe with a 2-foot sensor length. Data is stored via a Bluetooth enabled datalogger and processed using SINCO DigiPro2 software. Field readings will be made during the same mobilization period as the ground survey, i.e., April of 2025 and April of 2026.

Groundwater measurements will be taken in all functioning piezometer casings that currently exist on the site using electrical water level sensors. Reading will be made consistent with the inclinometer readings.

### **Distress Mapping and Crack Monitoring**

Field reconnaissance of the property will be performed to document new or existing distress / indicators of movement, including cracking and separations in the following areas:

- Tank ringwall footing
- Perimeter privacy CMU wall
- Perimeter asphalt roadway
- Curbs and hardscape within the reservoir facility

In addition, existing crack monitors positioned on the CMU wall will be measured and documented. Replacement of damaged crack monitors or addition of new monitoring sites will be performed if considered appropriate based on observed distress and the historic record. Field readings will be made during the same mobilization period as the ground survey and instrumentation readings.

### **Report Preparation**

Information collected as part of the field monitoring program will be collated, processed, and presented in graphical and/or tabular form to facilitate interpretation of the data. An evaluation of the available data will be presented. A report will be submitted to the City three weeks following

the completion of each annual field monitoring program; currently planned for mid-May of 2025 and mid-May of 2026.

### **Structural Evaluation**

A structural analysis of the existing tank to evaluate the potential stress conditions within the tank shell as the result of observed foundation deformation is planned and will include the following tasks:

- Perform a site visit to visually inspect the exterior of the reservoir tank and its concrete ring foundation and measure tank shell thickness utilizing an Ultrasonic Wall Thickness Gauge.
- Provide structural evaluation of the steel tank shell using the RISA 3D finite element program to analyze the tank shell under hydrostatic loading, seismic hydrodynamic loading, and foundation deformation. Six scenarios will be modeled to determine the stress in the steel tank shell and compare it to the allowable stress.
  - Scenario 1: Hydrostatic from Normal Operations
  - Scenario 2: Hydrostatic from Normal Operations with current foundation settlement
  - Scenario 3: Hydrostatic from Normal Operations with maximum foundation settlement
  - Scenario 4: Hydrostatic and Hydrodynamic from Design Level Earthquake
  - Scenario 5: Hydrostatic and Hydrodynamic from Design Level Earthquake with current foundation settlement
  - Scenario 6: Hydrostatic and Hydrodynamic from Design Level Earthquake with maximum foundation settlement
- Preparation of a Technical Memorandum in early-2025 summarizing the findings from the analysis.

### **Preliminary Engineering Estimates of Repair Options**

Preliminary cost estimates (Engineer's estimate) will be prepared for 3 potential reservoir pad/slope repair consideration:

- Grade Beam and Underpinning
- Secant Pile Wall / Tie-Back System.
- Re-Grading of the Descending Slope and Retaining Wall.

The cost estimates will be based on conceptual schematic drawings of proposed repair design and are intended for the purpose of assisting the City with its planning and preliminary budgeting efforts.

**Combined Structural Evaluation and Engineering Estimates Report**

A written report containing the results of the structural evaluation of the reservoir tank and the preliminary engineering estimates for the proposed repair alternatives will be prepared for the City. The report will include the conclusions and recommendations from the previous and the planned 2025 annual monitoring period. If requested by the City, draft information regarding the preliminary cost estimates and the structural evaluation can be provided in advance of the report.

**FEE AND TIME FRAME**

Tetra Tech entered into a Professional Services Agreement with the City of Orange on January 1, 2022. The contract amount was \$122,082.00 and pertained to a scope of service that included one baseline and 4 comparative surveys that included total station survey, LiDAR survey, distress mapping and instrumentation readings. To date the baseline and 3 comparative surveys have been completed. Tetra Tech has performed these services to date under the City Purchase Order number 115193, dated April 15, 2022, for \$100,000.00. A summary of the cost of work performed to date and the estimated fees for the currently proposed supplemental work are presented in Table 1.

**Table 1  
 Accrued Cost To-Date and Proposed Supplemental Scope / Fee Estimate**

<b>Task</b>	<b>Amount</b>
<b>(A) Accrued Cost To-Date (8-16-2024)</b>	<b>\$109,560</b>
<b>Proposed Continuation of Work</b>	
Site Monitoring and Survey (April 2025)	\$15,300
Site Monitoring and Survey (April 2026)	\$16,065
Structural Evaluation and Technical Memorandum (late-2024 to early-2025)	\$26,500
Preliminary Engineering Cost Estimate of Repair Alternatives (early- to mid-2025)	\$12,680
Summary Report (mid-2025)	\$15,500
<b>(B) Estimate for Supplemental Work</b>	<b>\$86,045</b>
<b>(C) Total Estimate for Work Completed to Date and Continuation of Work {A+B}</b>	<b>\$195,605</b>
Currently Authorized Amount (Purchase Order 115193, dated April 15, 2022)	(\$100,000)
<b>Requested Budget Adjustment</b>	<b>\$95,605</b>

The scope and fees are subject to review and approval by the City. Should the City desire to modify the scope and/or effort, the fees will be modified in concert with City staff input.

**TERMS AND CONDITIONS**

Tetra Tech’s services will be governed by the current Professional Service Agreement with the City dated January 1, 2022.

**CLOSURE**

If you have any questions or comments, please contact us at (909) 860-7777 at your convenience. Please sign and return this work authorization form so that we can setup the project and initiate the work on the subject scope.

**Prepared by:**

**Tetra Tech BAS, Inc.**



Peter Skopek, Ph.D., G.E.  
Principal

**Prepared for:**

**City of Orange**  
Mr. Tuan Cao, P.E.  
City of Orange  
Public Works Department – Water Division  
189 South Water Street  
Orange, California 92866-1592

Filename: 2024-08-23 Continued Geotechnical Work Reservoir 2A - Orange.Docx

**BUDGET APPROVAL FOR PROFESSIONAL SERVICES AS SPECIFIED**

Accepted this \_\_\_ day of \_\_\_\_\_, 2024 On behalf of: \_\_\_\_\_  
City of Orange

\_\_\_\_\_  
Title Print Name Authorized Signature