

**EXHIBIT A-2P**

**SCOPE OF SERVICES**

**CITY OF FRESNO**

**DEPARTMENT OF PUBLIC UTILITIES - WATER DIVISION**

**(CITY)**

**AND**

**CAROLLO ENGINEERS, INC.**

**(CONSULTANT)**

**SOUTHEAST SURFACE WATER TREATMENT FACILITY**

**RAW WATER DIVERSION AND CONVEYANCE PIPELINE**

**(PIPELINE PORTION)**

**PURPOSE**

CONSULTANT's scope of services, time of completion and compensation will be as set forth herein. Services shall generally be described as preliminary engineering, final design and bid phase services for the Southeast Water Treatment Facility Raw Water Conveyance Pipeline facilities.

This Scope of Services is hereby made a part of the above referenced "Agreement for Professional Services" dated June 24, 2013 and First Amendment dated July 21, 2014. Except as noted herein, Exhibit A and Exhibit A-1 remain unchanged.

The City of Fresno ("CITY") is in the process of designing a new 80 million gallon per day Southeast Water Treatment Facility ("SEWTF") to provide potable water to users throughout the CITY's water service area. The SEWTF will be located on a portion of CITY owned property between Fowler Avenue and Armstrong Avenue, just north of Olive Avenue. Raw water for the SEWTF will be supplied by the Fresno Irrigation District ("FID") via the Fresno Canal - located approximately 13-miles east of the SEWTF site. After an initial review of raw water conveyance alternatives, it has been determined that the preferred alternative will be to construct a raw water diversion facility and transmission pipeline from just west of the Fresno Canal Head gates to the SEWTF site.

This project will be completed in four Parts under one (1) single bid package as further described below:

- **Part One - Schematic Design Phase.** The schematic design effort will culminate in a 30-percent (30%) level of design and include:
  - Confirmation of pipeline routing.
  - Identification of pipeline design criteria.
  - Confirmation of pipeline hydraulics.
  - Engineering support tasks including surveying and geotechnical engineering.
  - Development of 30% plans.
  - Identification of anticipated separate Bid Packages.
  - Development of the Design Memorandum.
- **Part Two - Design Development Phase.** The design development effort will include design services through 60 percent (60%) level of completion, and continuation of engineering tasks necessary to support interagency coordination and project implementation. The design development effort will culminate in a 60 percent design review workshop with CITY staff.
- **Part Three - Construction Document Phase.** The construction document effort will include design services from 60 percent level through 90 and 100 percent design, and continuation of engineering tasks necessary to finalize interagency approval and project implementation. The design development effort will culminate in a 90 percent design review workshop with CITY staff and will culminate with a 100 percent design submittal (i.e. "Bid Ready" Contract Documents).
- **Part Four - Bidding Phase.** The bidding support effort will include answering questions from prospective bidders, and issuing addenda to answer questions on the Contract Documents. The bid period phase will culminate with issuance of Conformed Documents.

## **SCOPE OF SERVICES**

### **TASK 0 - PROJECT MANAGEMENT**

The purpose of this task is to establish and maintain effective project management and communication for the duration of the project for Parts One through Four.

#### ***Assumptions***

- Duration of Parts One through Four of the Contract is twenty-one (21) months starting in August 2014 and ending with the completion of Conformed Contract Documents in April 2016.

#### **Subtask 0.0 – Project Management and Work Plan**

CONSULTANT is responsible to lead and manage the efforts of the Project Team, and coordinate with CITY's Environmental Permitting and Property Acquisition Consultants.

CONSULTANT will develop the Project Management and Work Plan to define critical elements of the project, and the metrics to measure successful completion of these elements. The Project Management and Work Plan will define work breakdown structure, budget requirements, schedule and milestone requirements, quality control requirements, and internal and external

communication protocol. The plan will also include a graphical summary of project expenditures vs. projected/budgeted expenditures (i.e., “S-curve) throughout the project duration.

***Assumptions***

- All elements of the Project Management and Work Plan shall be developed such that they can be compatible and/or transferable to industry standard formats used for Program Management, so they can be incorporated and used by the CITY’s Program Manager.

***Deliverables***

- Draft and Final Project Management and Work Plan

**Subtask 0.1 - Project Kick-Off Meeting**

The project kick-off workshop will introduce key CITY, Environmental Permitting and Property Acquisition Consultants, and CONSULTANT team members to discuss the Project Management and Work Plan and acquaint participants with the purpose of, and expectations for the project, describe team member roles and responsibilities, describe project procedures, summarize scope and schedule, and review significant issues and project priorities. In particular, the meeting will include time critical elements for permit support and related interagency coordination, as well as property acquisition.

***Assumptions***

- None.

***Deliverables***

- Agenda and meeting minutes.

**Subtask 0.2 –Progress Meetings**

The CITY and CONSULTANT will meet weekly or bi-weekly (as needed) to discuss progress and development of the Project. The meetings will be held at the CITY offices, project site, other locations, or via teleconference as conditions dictate, and as determined to be needed for the benefit of the project. The meeting date will be maintained for a specific day of the week (e.g., each Monday at 9:00). CONSULTANT’S project manager or designee will be present for the meetings and will present a summary of the ongoing work, issues pending, action items, etc. Participants will discuss outstanding or upcoming project issues. CONSULTANT will prepare summary minutes of the progress meetings. An action item list and a decision log will be maintained during the course of the meetings and updated each week.

***Assumptions***

- 80 meetings (Progress Meetings only, all project phases)

***Deliverables***

- Final meeting minutes distributed electronically within seven (7) calendar days following each meeting.
- Decision log distributed within seven (7) calendar days following each meeting.
- Summary of Action Items.

### **Subtask 0.3 - Monthly Progress Reports**

CONSULTANT will prepare monthly project progress reports to summarize the project work progress, issues, and scope and budget status. Monthly progress reports will include:

- **Scope Report** - A narrative progress report of specific accomplishments during the reporting period, problems encountered or anticipated, and work scheduled for the next reporting period.
- **Cost Report** - A report that shows the current period and accumulated expenditures to date, the approved not to exceed fee, the estimated cost of completion, and a comparison of the latter two to show any variation. The cost information will not be more than one month old and include allowance for unbilled costs. The cost report will include design or task percent complete versus scope task. The cost report will include a separate accounting and detail of expenditures for any approved additional services.
- **Schedule Report** - A report that compares actual progress to planned performance. The report will include a description of known or possible impacts on the schedule, and a presentation of deliverable submittal dates. The schedule report will be updated monthly.
- **Invoices** - A summary of labor expenditures, direct costs, and billed subconsultant charges. Invoices, transmitted separately from the Progress Reports, will be organized such that the billing categories for scope of services tasks correspond with the four Parts identified in this Scope of Services.

#### ***Assumptions***

- CONSULTANT will prepare monthly progress reports. (submitted with invoice for previous month's work).

#### ***Deliverables***

- Monthly progress report (electronic file in MS Word and/or PDF).
- Monthly invoice.

### **Subtask 0.4 – Team Project Management**

CONSULTANT will lead and manage the efforts of the Project Team, including project schedule and budget for work tasks milestones during Parts One through Four.

#### ***Assumptions***

- None.

#### ***Deliverables***

- None.

### **Subtask 0.5 – Quality Management**

CONSULTANT will coordinate the quality management requirements and efforts of the Project Team, including interim deliverable submittals for work tasks during Parts One through Four.

#### ***Assumptions***

- Internal quality management procedures will be completed on all documents and design submittals.

### ***Deliverables***

- CONSULTANT shall maintain project records to document the internal quality management activities; this project record information shall be provided to the CITY upon request.

### **TASK 1 - SCHEMATIC DESIGN PHASE**

The purpose of the schematic design is to finalize the basis of the design for the raw water diversion/intake facility and conveyance pipeline, and finalize the recommended alignment for the conveyance pipeline. The schematic design efforts will culminate in a basis of design and 30 percent (30%) design level of effort for the diversion and pipeline facilities. Additionally, the number and delineation of the limits of each contract document/bid packages will be evaluated and defined, should it is determined that it is in the CITY's best interest to design and bid these facilities in more than one set of contract documents .

#### **Subtask 1.1 - Review Existing Information**

This task will include review of existing information, initial review of existing utility information, and any other pertinent documents associated with the project. This review will provide a baseline to confirm the pipeline alignment, utility conflicts, and right-of-way and easement considerations as necessary to support the basis of design.

### ***Deliverables***

- None. (All work completed in this task will be used to develop the final basis of design as described in Task 1.9 below)

#### **Subtask 1.2 - Diversion and Conveyance Design and Operating Criteria**

CONSULTANT will develop and finalize design and operating criteria for the raw water diversion/intake structure and conveyance pipeline facilities.

### ***Assumptions***

- CONSULTANT will use available information, CITY standards, operations and maintenance (O&M) requirements, in-house design standards from the NESWTF diversion and conveyance facilities, and applicable standards from similar projects to develop design and operating criteria. CONSULTANT will incorporate operating conditions and scenarios for the SESWTF in the operations of this conveyance facility.
- CONSULTANT will take lead responsibility to coordinate with FID and define operating scenarios and constraints, canal hydraulics, new canal check structures that may be required, new canal improvements that may be required, etc. CONSULTANT's level of effort and budget assumes information on the canal operation, hydraulic capacity and constraints is available from FID, and hydraulic analysis of the canal only between the canal head gates and point of diversion, including field survey to establish cross sections of the canal to be used as the basis for canal hydraulic modeling. CONSULTANT's level of effort does not include assessment of check structures or other canal improvements downstream of the point of diversion.

- CONSULTANT will consider ease of operation and maintenance, in development of design and operating criteria.

***Deliverables***

- Draft and Final Technical Memorandum (1 electronic copy and up to 10 hard copies) with initial recommendations.

**Subtask 1.3 - Conveyance Routing/Alignment Confirmation**

The CITY has identified a preliminary preferred pipeline alignment from the point of diversion along Trimmer Springs Road to Belmont Avenue, westward along Belmont Avenue to Armstrong Avenue, northward along Armstrong Avenue to Floradora, and westward to the entrance at the SEWTF. CONSULTANT will consider one alternative alignment, differing from the preliminary alignment only in its northward transition at Temperance Avenue rather than Armstrong Avenue.

In finalizing the conveyance alignment, CONSULTANT shall define key design and constructability requirements including land/easement requirements, right of way delineation, definition of staging areas, alternative routing for canal crossings, existing and/or future utility conflicts, etc.

***Assumptions***

- To finalize the route/alignment, CONSULTANT will consider only the two northward routing alternatives from Belmont Avenue to Floradora Ave, as described above.
- CONSULTANT’s level of effort is based on a reconnaissance level field assessment of the route alternatives to define the general areal conditions, land/easement requirements, and assessment of subsurface utility conflicts along the routes.

***Deliverables***

- Draft and Final technical memorandum (One (1) electronic and up to ten (10) hard copies), to confirm the conveyance routing/alignment, with summary discussion and recommendations regarding key design and constructability requirements including right of way delineation, land needs, definition of staging areas, alternative routing for canal crossings, existing and/or future utility conflicts, etc.

**Subtask 1.4 – Operational and Hydraulic Analysis**

The purpose of this work element is to establish operational requirements and associated hydraulic design considerations, including the following:

- Sediment load impact for the range of expected operating conditions, and associated pipe design/sizing and/or operational strategies for sediment flushing and mitigation.
- Surge analysis and associated considerations for air/vacuum release design.
- System isolation and access requirements/locations.
- Flow measurement, flow control, and system automation requirements.

### ***Assumptions***

- Sediment load impact will be based on actual sediment sampling as completed under the existing SEWTP contract and two (2) additional samples under this scope of work, recognizing that the sample set may be limited due to operational requirements in the 2014 water delivery season from FID. Existing turbidity information for the City's current deliveries to the NEWTF will also be used to assess the range of expected conditions.
- Operational strategies to mitigate sediment accumulation will be established to provide sufficient velocity in the pipeline to minimize sediment accumulation, and/or "first flush" type strategies that employ short-term increases in flow and high velocities.

### ***Deliverables***

- Draft and Final technical memorandum (One (1) electronic and up to ten (10) hard copies), to summarize operational and hydraulic requirements.

### **Subtask 1.5 – Traffic Control Analysis**

The purpose of this work element is to establish construction requirements and associated design considerations for traffic control, including the following:

- Summary of County and Caltrans traffic control requirements.
- Traffic control plans per latest edition of California MUTCD to show proper Temporary Traffic Control (TTC) zones, including limits of construction, traffic control/access, lane/work area delineation etc. for pipeline reaches.
- Possible traffic detour/re-routing options that would facilitate two-lane road closure for improved constructability and schedule reduction.

### ***Assumptions***

- CONSULTANT will meet with Fresno County ("County") and Caltrans to define traffic control requirements, and to identify detour alternatives or other options to minimize construction duration and/or traffic impact.

### ***Deliverables***

- Draft and Final Technical Memorandum (1 electronic and 10 hard copies) to summarize expected traffic control requirements, control strategies, possible diversion and/or detour routing, etc.
- Traffic Control Plans with construction notes (One (1) electronic and up to ten (10) hard copies), to summarize traffic control requirements and associated design and construction considerations.

### **Subtask 1.6 – Permits**

The purpose of this work element is to identify all non-environmental related permitting requirements, and to provide engineering support for the non-environmental and environmental permitting efforts, including the following:

- Permitting matrix to identify non-environmental permits (e.g., air quality control, County and/or Caltrans encroachment, FID encroachment for canal crossings, RWQCB dewatering discharge permit etc.), lead agency, information requirements, submittal and review requirements etc.
- Engineering support including meeting attendance and preparation of exhibits, calculations, design information etc. as required for permit approval of all non-environmental permits.
- Engineering support including meeting attendance and preparation of exhibits, calculations, design information etc. as required for permit approval of all environmental permits, including, but not limited to, ACOE 404 and CF&W Streambed Alteration Permits.

### ***Assumptions***

- CONSULTANT will lead and manage the permitting effort for all non-environmental permits, and will serve as primary point of contact for agencies and other stakeholders.
- CONSULTANT will be responsible to provide all information required for permit approval (or otherwise secure the permits on behalf of the CITY).
- CITY's Program Manager will lead the permitting effort for environmental permitting. CITY's Program Manager will also lead all coordination efforts between the CITY, the County, and FID. CONSULTANT's role is limited to meeting attendance at up to four (4) meetings with environmental permitting agencies, and preparation of all supporting exhibits and documentation required for environmental approval.

### ***Deliverables***

- Draft and Final technical memorandum (One (1) electronic and up to ten (10) hard copies), to summarize non-environmental permitting requirements, and associated supporting engineering materials including calculations, exhibits, etc.

### **Subtask 1.7 – Outreach Support**

The purpose of this task is to provide engineering support that will allow the CITY and its Program Manager to complete outreach efforts for the Project.

### ***Assumptions***

- CONSULTANT will develop exhibits to illustrate project features and concepts to facilitate discussions with public and other affected stakeholders.
- CONSULTANT's level of effort and budget includes attendance at up to three (3) meetings with public and/or other affected stakeholders related to the CITY's overall public outreach effort.
- CITY's Program Manager and/or Public Outreach Consultant is responsible for preparation of electronic presentations or final presentation material for meetings (i.e., poster boards, handouts, meeting announcements, etc) but CONSULTANT will make available any previously completed work product (e.g., site plans, conceptual design information, etc.) as necessary to support the presentations.



### ***Deliverables***

- Facility descriptions, conceptual layouts, layout drawings, infrastructure descriptions and other related project concept information.
- Electronic files of all information used for presentations.

### **Subtask 1.8 Diversion Facility Site Security**

CONSULTANT will assess and define potential site security considerations, and recommended security systems. CONSULTANT will develop and present site security concepts and alternatives to CITY to compare/contrast alternatives and define the preferred alternative.

### ***Assumptions***

- CONSULTANT's level of effort will assume the security design for the diversion will be similar to the design for the SESWTF, with adjustments as necessary for the rural location of the diversion. CONSULTANT will use the threat assessment from the SESWTF as the basis, and create an amendment to the SESWTF document for the diversion facility.
- CONSULTANT will provide a complete listing of necessary and/or desired security features, using the chosen security design for the SESWTF as the basis.
- CONSULTANT will develop site security systems basis of design for the diversion facility site, including cost estimate.
- CONSULTANT is responsible only to define system security for the diversion facility.

### ***Deliverables***

- Meeting notes to document findings, conclusions, and key decisions.
- Draft and Final technical memorandum (1 electronic and up to 10 hard copies) to define recommended site security options and costs and basis of design.

### **Subtask 1.9 - Diversion and Conveyance Basis of Design**

The purpose of this work element is to summarize engineering details and establish the basis of design for the diversion and conveyance facilities.

CONSULTANT shall expand on the final diversion and conveyance routing/alignment, and include sufficient additional engineering to define the basis of design. The Diversion and Conveyance Basis of Design will include, but is not limited to the following:

- Final schematic for the raw water diversion and conveyance facilities.
- Site layout and preliminary plan drawings for the raw water diversion facilities, including canal check, coarse and fine screen structures or other features necessary to meet functional requirements for the diversion structure.
- Preliminary plan drawings for the raw water conveyance facilities.
- Hydraulic profile for the conveyance system.
- Final design criteria for all appurtenant systems, including any automation/instrumentation requirements.

- Identification of power requirements and electrical permits and services to diversion facilities.
- Recommendations for corrosion control and basis of design for same.
- Recommendations for surge control and basis of design for same.
- List of major equipment.
- Recommended pipeline materials.
- Multiple contract document/bid packages may be beneficial to the CITY to improve competition and/or pricing for construction, and or increased potential for participation of local contractors. CONSULTANT will evaluate the potential benefit of multiple contract document/bid packages.

### ***Assumptions***

None

### ***Deliverables***

- Recommendations for single or multiple contract packages.
- Basis of design package including drawings and supporting information to provide sufficient detail to serve as the basis for final design. The emphasis of the basis of design is to minimize supporting narrative text in favor of design drawings, equipment listings and cut sheets, etc. that can be used during the final design.

### **Subtask 1.10 - 30% Schematic Design**

CONSULTANT shall complete the thirty percent (30%) design documents based on the recommended alternative. Design services include preparation of design documents, internal design check, and updated construction cost estimate.

### ***Assumptions***

- Revisions to basis of design (if necessary) to document key design decision and changes from the preliminary design.
- CONSULTANT's level of effort, budget, and schedule assume the Contract Documents for the Project will be prepared in a single bid package. Additional level of effort for additional Contract Document package is not included in this scope of work.
- CONSULTANT will prepare the design drawings using MicroStation CAD software. Construction drawings will include general, civil, structural, mechanical, electrical, instrumentation, including pipe crossing and other typical detail drawings.
- Technical specifications will be prepared for the bidding package using CONSULTANT's standard specifications. General Conditions shall be based on CITY standard format.
- CONSULTANT will meet with and coordinate County and Caltrans review of the 30% design documents as necessary to facilitate approval of roadway and traffic control related elements, and Fresno Irrigation District to facilitate approval of diversion facility and canal crossing elements.
- CONSULTANT will meet with FID and coordinate review of the 30% design documents as necessary to facilitate approval of diversion facilities.

### ***Deliverables***

- Revisions to basis of design (if necessary) to document key design decision and changes from the preliminary design.
- Updated process schematic diagram for the diversion and conveyance systems.
- Control descriptions for diversion and conveyance systems.
- Process & Instrumentation Diagrams (PIDs) for diversion and conveyance systems including providing signal output for the Fresno Irrigation District.
- Updated hydraulic profile conveyance system.
- Plan and profile of raw water conveyance piping.(1"=40')
- Canal crossing(s) plan and detail drawings
- Updated drawing list.
- Updated civil site layout for diversion site.
- Updated structural plans and elevations for diversion facilities.
- Updated mechanical layouts for diversion facility.
- Updated electrical site layout for the diversion facility.
- Updated electrical single-line diagram with power sources for diversion facility.
- Updated electrical plan views for location of control panels for diversion facility.
- Preliminary specification list for major process equipment and pipeline elements.
- Updated construction cost estimate, all facilities.
- Diversion facility security design.
- Three (3) full size (22x34) drawing and specification sets, and electronic files (pdf) of all project elements.

### **Subtask 1.11 - Utility Location**

CONSULTANT shall complete field investigations to locate utility and infrastructure along the final conveyance pipeline alignment. It is anticipated that some of the work can be done using non-destructive methods. However, CONSULTANT shall acquire utility plats and maps from utilities and will develop a pothole plan to verify actual depths and locations of buried facilities. Potholing will be conducted using vacuum extraction methods where appropriate. The effort will be conducted to develop supplemental information to the survey deliverable.

### ***Assumptions***

- CONSULTANT shall secure special permits required for utility confirmation.
- This scope includes office time to research utility plats and field time for survey crew and utility location specialty subcontractor. Potholing budget assumes up to twenty-five (25) potholes and field survey to verify buried facilities.

### ***Deliverables***

- Utility spatial and depth location information provided in spreadsheet format.
- Utility plat maps

### **Subtask 1.12 - Surveying**

CONSULTANT shall provide topographic surveys for diversion facility and the final recommended pipeline route/alignment, as defined above. Survey will be developed by combination of aerial photography with one-foot contours supplemented with traditional field methods for survey control.

CONSULTANT will produce all deliverables in a format that is compatible with the CITY's GIS system. It is understood that the CONSULTANT is not creating any new GIS information for the CITY (e.g., graphical layers, GIS databases, etc.). The CONSULTANT will take lead role to secure information related to the existing easements, right of way, and existing utilities prior to starting any survey work.

#### ***Assumptions***

- Services provided by CONSULTANT in this task include completion of survey information and research of existing property ownership along the final diversion and pipeline conveyance route/alignment, where necessary to support the design for areas of construction outside County or City right-of-way.
- Temporary and/or permanent easements will be required to support the construction activity. CONSULTANT's scope is limited to preparation of up to fifteen (15) exhibits and legal descriptions as required for temporary and/or permanent easements. CONSULTANT will obtain up to 15 preliminary title reports, one for each easement
- Survey to cover a 150-foot swath centered over recommended alignment.
- Services not provided by CONSULTANT:
  - Engineering services necessary to secure right of entry, or new or additional rights of way and/or easements along the conveyance alignment.
  - Engineering services necessary to assess property value for additional rights of way and/or easements near the treatment plant property and along the conveyance alignments.
  - Construction staking or field marking of right-of-way limits

#### ***Deliverables***

- Stamped and signed topographic survey map, in MicroStation V8 or AutoCAD 2010.
- CONSULTANT shall furnish a design field survey including the following elements:
  - Scale 1"=40'.
  - Contour lines (at 1 foot intervals)
  - Trees (trunk diameter and type of tree)
  - Rock outcroppings
  - Fence lines
  - Canal and creek crossings
  - Property lines/ROW/easements
  - Boring locations
  - Utility manhole or valve box locations
  - Other utility locations (telephone, gas, power, water, sewer, etc.)
  - Power lines

- Irrigation standpipes, vents, and valve
- Rectified aerial orthophoto.
- Other features impacted by construction, (signs, mail boxes, etc.)

### **Subtask 1.13 - Geotechnical Report**

CONSULTANT shall provide geotechnical data required for diversion facility and the final recommended pipeline route/alignment, including but not limited to:

- Recommended site specific seismic spectral analysis and design criteria as required to meet Building Code seismic design.
- Soil stability and recommended measures for unstable soils as related to open trench excavation, open cut construction, and micro tunneling or directional drilling
- Pavement and roadway design recommendations, including R-values.
- Groundwater elevation.
- Recommended foundation type for diversion structures
- Expected structural settlement
- Recommended foundation sub-base
- Development of R-values for pavement design.
- E' recommendation for pipeline design.
- Corrosivity evaluation of soil

### ***Assumptions***

- CONSULTANT shall secure special permits required for field investigations required for geotechnical confirmation.
- Hazardous conditions explorations are not provided as part of this task. If hazardous conditions are suspected, or at the CITY'S request, these services shall be provided as part of a separate task order.
- Borings provided at 1,000 foot intervals along pipeline alignment and two borings on either end of trenchless locations. In locations of trenchless crossings (e.g., canal crossings), at the diversion location, and other locations where borings encounter high groundwater, piezometers will be installed and monitored to assess ground water level that could affect pipeline design and/or constructability.
- CITY to ensure site access available.
- This scope includes field time for specialty subcontractor to complete up to seventy (70) borings at up to twenty (20) feet in depth and six (6) borings at up to thirty (30) feet to identify soil conditions at the diversion structure facilities and along the recommended pipeline alignment, as required to support the structural design.
- The scope of work includes standard lab analysis to confirm soil type and grain size distribution, potential for settlement/liquefaction, and soil chemical properties including corrosion potential and recommended E' value.

### ***Deliverables***

- Draft and Final design level geotechnical report. (1 electronic and up to 10 hard copies).

### Subtask 1.14 – Corrosion Mitigation Design

Soil Corrosivity Evaluation & Report Soil samples taken in Task 1.13, will be analyzed for pH, chlorides, sulfates, saturated resistivity, total salts, and conductivity using EPA Standard methods and ASTM test methods as detailed in the table below. These soil samples will be tested by a state certified testing laboratory. The preparation of the soil samples for chemical analysis will be in accordance with the applicable specifications.

**Soil Chemical Analysis Test Methods**

Chemical Analysis	Test Method
Chlorides	SW9251
pH	SW904SD
Resistivity ( as-received and 100% saturation)	ASTM G57
Sulfate	SM4500-SO4-E
Redox Potential Conductivity	SW9050A
Total Salts	SM2540C

CONSULTANT will evaluate the results of the chemical analysis and determine the corrosivity of the soils along the pipeline alignments to the proposed materials of construction (i.e. dielectric coated steel, concrete cylinder pipe and mortar coated steel pipelines, etc.).

CONSULTANT will conduct in-situ soil resistivities at an approximate 1,000 ft. interval along the pipeline alignment using the Wenner 4-pin technique. In-situ resistivities will be measured at 2.5', 5', 7.5', 10' and 15' depths using an AMEC Resistivity Meter. Barnes layer calculations will be performed to determine the corrosivity of the different soil layers to the proposed pipeline materials.

CONSULTANT will summarize the field data and results of soil chemical analysis and define the potential for corrosion on the new raw water pipeline. CONSULTANT will recommend the long-term corrosion prevention options for all pipe material options.

CONSULTANT will review the proposed pipeline alignments to identify potential stray and AC induced voltage problems generated from utility crossings and parallel high voltage AC power lines. It is not expected that the pipeline will parallel any high voltage AC power lines that would generate induced current and require mitigation. However, utility crossings are expected and mitigation measures will be included in the design for cathodic protection and for protection of operations and maintenance personnel. AC induced voltage modeling and mitigation design for parallel high voltage AC power lines is not included in this task, but could be provided as an additional service task, if deemed necessary based on the field investigation.

CONSULTANT will perform stray current testing at selected locations along the pipeline alignment as warranted. This testing will be performed in the vicinity of any overhead high-voltage transmission towers and other utilities, such as PG&E. All potential stray current problems will be identified and mitigated in the cathodic protection design. CONSULTANT will provide a summary analysis to define findings of the stray current analysis and provide recommendations for combined stray current mitigation.

### ***Assumptions***

- CONSULTANT shall secure special permits required for field investigations required for corrosivity assessment.
- CITY to ensure site access available.
- The scope of work includes standard lab analysis to determine for pH, chlorides, sulfates, soil box resistivity, and conductivity.

### ***Deliverables***

- Corrosion Control Preliminary Design Report (one electronic and up to 10 hard copies) to summarize the findings of the soil corrosivity and stray current analyses, recommended mitigation strategies, and design criteria for the proposed corrosion control/stray current mitigation systems.

### **Subtask 1.15 - Conduct 30% PS&E Workshop with CITY**

CONSULTANT will conduct a thirty percent (30%) design submittal workshop with the CITY. The submittal review workshop will discuss comments on the 30% design and will be conducted at the end of the CITY review period. All comments will be documented in tabular format for formal response for inclusion into next submittal package.

### ***Deliverables***

- Workshop agenda.
- Workshop handouts.
- Meeting minutes to document findings, conclusions and key decisions.
- Updated Decision Log.
- Corrosion Control Final Design Report

## **TASK 2 - DESIGN DEVELOPMENT PHASE**

The purpose of the design development phase is to complete engineering services through sixty percent (60%) design. Design services include preparation of updated design documents, internal review, and updated construction cost estimates.

### **Subtask 2.1 - 60% Design**

#### ***Assumptions***

- CONSULTANT's level of effort, budget, and schedule assume the Contract Documents for the Project will be prepared in a single bid package. Additional level of effort for additional Contract Document package is not included in this scope of work.
- CONSULTANT will prepare the design drawings using MicroStation CAD software. Construction drawings will include general, civil, structural, mechanical, electrical, instrumentation, including pipe crossing and other typical detail drawings.
- Technical specifications will be prepared for the bidding package using CONSULTANT'S standard specifications. CONSULTANT shall use CITY standard format for Div 0 and Div 1 Front Ends and provide mark-ups where appropriate.

- CONSULTANT will meet with and coordinate CITY inter-departmental review of the 60 percent design documents as necessary to facilitate approval by Building Department and Public Utilities.
- CONSULTANT will meet with FID and coordinate review of the 60 percent design documents as necessary to facilitate approval of diversion facilities.
- CONSULTANT will prepare detailed installation drawings and technical specifications for corrosion control for each pipe option including appropriate stray current corrosion control suitable for bidding purposes.

### ***Deliverables***

- Updated control descriptions for diversion and conveyance systems.
- Updated Process & Instrumentation Diagrams (PIDs) for diversion and conveyance systems.
- Updated hydraulic profile conveyance system.
- Updated plan and profile of raw water conveyance piping.
- Updated canal and pipe crossing plan and detail drawings
- Updated drawing list.
- Updated civil site layout for diversion site.
- Updated structural plans and elevations for diversion facilities.
- Updated mechanical layouts for diversion facility.
- Updated electrical site layout for the diversion facility.
- Updated electrical single-line diagram with power sources for diversion facility.
- Updated electrical plan views for location of control panels for diversion facility.
- Updated specifications for major process equipment and pipelines.
- Updated diversion facility security design.
- Updated construction cost estimate, all facilities.
- Three (3) full size (22x34) drawings and electronic files (pdf) all project elements.

### **Subtask 2.2 – Permitting Coordination**

CONSULTANT will provide continued coordination related to the permitting requirements detailed in Sub-Task 1.6

### **Subtask 2.3 - Conduct 60% PS&E Workshop with CITY**

CONSULTANT will conduct a sixty percent (60%) design submittal workshop with the CITY. The submittal review workshop will discuss comments on the 60% PS&E submittal packages and will be conducted at the end of the CITY review period. The objective of the workshop is to discuss changes from the 30% design, and solicit CITY review comments. All comments will be documented in tabular format for formal response for inclusion into next submittal package.



### ***Deliverables***

- Workshop agenda.
- Workshop handouts.
- Meeting minutes to document findings, conclusions and key decisions.
- Updated Decision Log.

### **TASK 3 - CONSTRUCTION DOCUMENT PHASE**

The purpose of the construction document phase work is to complete engineering services through ninety (90) and one hundred (100) percent design. The construction document phase work will include a ninety percent (90%) design review workshop with the CITY and will culminate in one hundred percent (100%) design level submittal of bid-ready contract documents.

#### **Subtask 3.1 - 90% Design**

##### ***Assumptions***

- CONSULTANT's level of effort, budget, and schedule assume the Contract Documents for the Project will be prepared in a single bid package. Additional level of effort for additional Contract Document package is not included in this scope of work.
- CONSULTANT will prepare the design drawings using MicroStation CAD software. Construction drawings will include general, civil, structural, mechanical, electrical, instrumentation, including pipe crossing and other typical detail drawings.
- Technical specifications will be prepared for the bidding package using CONSULTANT's standard specifications. General Conditions shall be based on CITY standard format.
- CONSULTANT will meet with and coordinate CITY and County and Caltrans inter-departmental review of the 90 percent design documents as necessary to facilitate approval by Building Department and Public Utilities.
- CONSULTANT will meet with FID and coordinate review of the 90 percent design documents as necessary to facilitate approval of diversion facilities.

##### ***Deliverables***

- Final control descriptions for diversion and conveyance systems.
- Final Process & Instrumentation Diagrams (PIDs) for diversion and conveyance systems.
- Final hydraulic profile conveyance system.
- Final plan and profile of raw water conveyance piping.
- Final canal crossing plan and detail drawings
- Final drawing list.
- Final civil site layout for diversion site.
- Final structural plans and elevations for diversion facilities.
- Final mechanical layouts for diversion facility.
- Final electrical site layout for the diversion facility.

- Final electrical single-line diagram with power sources for diversion facility.
- Final electrical plan views for location of control panels for diversion facility.
- Final specifications for major process equipment and pipelines.
- Final diversion facility security design.
- Final construction cost estimate, all facilities.
- Final corrosion protection and cathodic protection design.
- Three (3) full size (22x34) drawings and electronic files (pdf) all project elements.

### **Subtask 3.2 – Permitting Coordination**

CONSULTANT will provide continued coordination related to the permitting requirements detailed in Sub-Tasks 1.6, 2.2, and 3.2

### **Subtask 3.3 - Conduct 90% PS&E Workshop with CITY**

CONSULTANT will conduct a ninety percent (90%) design submittal workshop with the CITY. The submittal review workshop will discuss comments on the 90% PS&E submittal packages and will be conducted at the end of the CITY review period. All comments will be documented in tabular format for formal response for inclusion into next submittal package. Response to the 60% review comments will be discussed. All 90% review comments will be documented in tabular format for formal response for inclusion into next submittal package.

#### ***Deliverables***

- Workshop agenda.
- Workshop handouts.
- Response log of 60% review comments.
- Meeting minutes to document findings, conclusions and key decisions.
- Updated Decision Log.

### **Subtask 3.4 - Develop 100% PS&E Submittal Package.**

CONSULTANT will complete a one hundred percent (100%) “bid ready” design package to incorporate comments and changes from the 90% review.

#### ***Assumptions***

- CITY will advertise the Project, and will be responsible for sale of bid documents.

#### ***Deliverables***

- Final 100% PS&E bid package submittal documents.
- Response log of 90% review comments.
- Updated Decision Log.
- Three (3) full size (22x34) drawings (including specifications) and electronic files (pdf) of all project elements.
- One (1) electronic copy of the drawing files in MicroStation CAD software or AutoCad 10 and their corresponding plot configuration files.

- One (1) electronic copy of specifications.
- Final cost estimate.

#### **TASK 4 - BID PHASE SERVICES**

The purpose of the bid phase services is to complete engineering bid period services, including response to bidder questions, and bid document addenda. The bid phase services will culminate with the development of the Conformed Documents.

##### **Subtask 4.1 - Pre-bid Meeting and Site Tour**

CONSULTANT will assist the CITY in meeting with potential bidders at a site tour and providing an understanding of the project requirements. CONSULTANT will develop a preliminary outline for the CITY's use in conducting the pre-bid conference and site tour. CONSULTANT will prepare and distribute meeting notes to the CITY and to pre-bid conference attendees.

##### ***Deliverables***

- Preliminary outline for pre-bid conference and site tour and attendance at both.
- Meeting minutes for the pre-bid conference and site tours which will include questions and answers discussed at the conference.

##### **Subtask 4.2 - Bid Period Technical Assistance**

CONSULTANT will answer bidder technical questions regarding the design during the bidding process. CONSULTANT will receive bidder questions via e-mail from CITY Purchasing Department. Responses to questions will be conveyed via addendum.

##### ***Assumptions***

- Scope and budget for this task is an allowance based on CONSULTANT'S efforts on past projects for a single bid package.
- The scope and budget assumes three (3) addenda will be prepared during the bidding phase. The scope and budget assumes approximately one hundred fifty (100) bidder total questions will be logged and answered by referencing bidder to the appropriate drawings or specifications at one (1) hour engineering per question.
- The effort required to respond to bidder's questions is beyond CONSULTANT's control. Additional effort required for this task is not included in the CONSULTANT's level of effort or estimated budget.

##### ***Deliverables***

- Up to three (3) addenda distributed to all plan holders.
- Bid period question and answer log.

##### **Subtask 4.3 - Bid Opening and Evaluation**

CONSULTANT will attend bid opening, and will subsequently review bids for general conformance to Contract Document requirements.

***Deliverables***

- Brief summary memorandum to delineate low-bidder's conformance (or non-conformance) with Contract Document requirements and recommendation for award.

**Subtask 4.4 - Conformed Drawings and Specifications**

CONSULTANT shall prepare conformed drawings and specifications (updated design drawings and specifications to include revisions contained in the addenda).

***Assumptions***

- The scope of work and budget assumes one hundred ten (110) drawings need to be modified at two (2) hours of CAD time per drawing, and one (1) hour of engineering time per drawing.
- The scope of work and budget also assumes approximately fifty (50) specification sections will need to be modified at one (1) hour word processing per section, and one (1) hour engineering time per section.

***Deliverables***

- Three (3) bound set of specification originals.
- Three (3) full size (22x34) drawings and specifications, and electronic files (pdf) of all project elements.