

City of Santa Rosa

Disinfection Improvements Project

SCOPE OF SERVICES

Revised April 3 2019

The following scope of services is provided for Engineering Services for Disinfection Improvement project at the Laguna Treatment Plant. The project will be completed in three phases: design development, Ultraviolet Light (UV) equipment selection/procurement and contract documents development phases. All work will utilize Santa Rosa standard construction contract documents and City of Santa Rosa Design Service Requirements for Capital Improvement Projects. The following is our task-based scope based on the original RFP and subsequent City requested changes to the Scope of Services.

Task 1 – Project Management

The Carollo team will provide project administration and management necessary to perform planning, execution, monitoring, and reporting of design tasks. Carollo will prepare a monthly progress letter report for attachment to the monthly invoice to track and report status of budget expenditures and key work products completed during that billing period.

The project management work will also include the following components: project setup; progress monitoring; project coordination; communication with the City; document control and management; development of Sub-consultant agreements and Sub-consultant management; and invoicing. The scope will include the coordination, chair, and preparation of agendas and minutes of the meetings.

At the start of the project the Carollo team will prepare a project management work plan that includes as a minimum: project team directory, communications plan, scope, schedule, budget, and QA plan.

The Carollo team will perform quality assurance reviews of the work performed through in-house peer reviews. This will include quality control reviews of project documents, specifications, and drawings by senior in-house staff.

The project was put on hold in April 2017, and delayed for a Value Engineering Review and Assessment. Ongoing updates of a revised implementation schedule have been prepared and submitted.

Deliverables:

- A draft work plan for review by City prior to the kickoff meeting.
- Monthly invoices and progress reports.
- Prepare regular weekly or monthly progress emails identifying previous week's activities, upcoming week activities, and any issues. The email will be sent to the City project manager and other stakeholders identified by the City project manager.
- Schedule updates as needed, as requested by City (Limited to 25 updates)

Status: Ongoing. Original project duration was estimated at 24 months starting in January 2016. New duration is approximately 48 months.

Design Development Phase

Task 2 – Background Information Review

Task 2.1 – Background Information Review

Carollo team will review existing project related studies, plans, and regulatory permits related to the project. Carollo team will review and confirm the existing site condition and background information and submit a list of additional information needs. Studies, plans, and permits may include, but are not limited to, the following:

- Sodium Hypochlorite and Ultraviolet Disinfection Facilities Plans
- Laguna WRF Disinfection Alternative Analysis Report

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- Disinfection Improvements Charrette Technical Memorandum.
- LTP Flood Protection Project – Geotechnical Investigation
- Technical Memorandum No. 1 – Ultraviolet Transmittance Analysis.
- Technical Memorandum No. 2 – Geysers Sodium Hypochlorite Disinfection Facility Feasibility.
- Technical Memorandum No. 3 – LTP Diversion Improvements.
- Technical Memorandum No. 4 – LTP UV Replacement

Task 2.2 – Field Investigations (Original Scope Completed May 2017, unless noted otherwise)

- **2.2.1 Surveying.** We will provide a request for surveying to be performed by City forces. Prior to the request we will conduct a meeting with the surveyors to review project issues and requirements.
- **Surveying Additional Scope:** The Carollo team provided marked up plans for identification of existing utilities. Two on-site meetings were conducted with plant staff and city staff to identify utilities for mapping. Due to the re-start after the VE study, additional surveying may be required. If so, the Carollo team will provide requested information to the City.
- **2.2.2 Geotechnical.** Geotechnical engineering services will include:
 - 2.2.2.1 Initial Site Visit and Site Exploration.**
Additional Scope: The Carollo team assisted plant staff in utility location and identification of boring locations.
 - 2.2.2.2 Laboratory Testing**
 - 2.2.2.3 Engineering Analysis and Report Preparation** (Completed June 2017)
 - 2.2.2.4 Contract Document Review** (To be completed)
- **2.2.3 Environmental.** The City has engaged the services of consultant to assist with the preparation of field investigations, CEQA documents, and resource agency coordination. Carollo will coordinate preliminary and detailed design project description with the environmental consultant and provide limited support. This task will be ongoing once the environmental consultant develops CEQA and permitting information.
- **2.2.4 Utility Pothole Investigation.** (Ongoing 2019) The City has requested that the consultant team provide pothole subcontractor and supervision for potholing and investigation of existing plant utilities that may conflict with new improvements, especially the diversion pipeline. The consultant will coordinate with plant staff during investigations and City survey staff to develop updates to the site plan and utility locations.

Task 2.3 – Kick-Off Meeting and Site Walk (Completed March 2016)

Following review of background information, we will conduct a kick-off meeting to confirm the project work plan, scope, project expectations, and goals. The City will conduct a site walk of key process areas at the LTP with our team immediately following the kickoff meeting.

Additional Scope: It is anticipated that a new kickoff meeting will be required to coordinate the project and review project status once the design is restarted.

Task 2 Meetings:

- Attend a survey coordination pre-meeting, kickoff meeting, and site walk.

Task 2 Deliverables:

- Prepare draft and final meeting minutes after receiving City comments.
- Prepare a survey request for the City to provide required survey information.

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- Provide input to the draft and final project description for CEQA documents.
- Prepare a draft and final geotechnical report prepared by our Subconsultant, Kleinfelder.

Assumptions:

- The City will provide topographic survey for use in the completion of the design, including any updates since the original survey was provided. Survey will be provided in AutoCAD electronic format.

Task 3 – Alternatives Analysis and Preliminary Design

The purpose of this task is to advance the design process for the project to the 10 percent level of completion. Four Preliminary Design Workshops will be conducted that define the project, finalize outstanding fundamental design decisions and design criteria, develop conceptual system schematics and layouts, and set the standards and conventions that will drive the design activities for the remainder of the design effort for the projects. Prior to preparing each draft Preliminary Design Memorandum (PDM) we will conduct workshops that will be facilitated by the Carollo team. Based on the workshop results we will develop and submit each PDM for City review. Activities to be considered during this phase include, but are not limited, to the following:

- Confirm the design criteria to clearly define the basis of the detailed design for the project.
- Selection of major equipment type and size. Selection process will include site visits by City staff of operating installations of the short-listed UV manufacturers (up to three manufacturers). Site visits are to be arranged through Carollo.
- Determination of the preferred procurement method of UV system: either pre-construction selection or procurement by the City through receipt of evaluated proposals or traditional bids.
- Development of conceptual schematics, conceptual site arrangements, control strategies, and process flow diagrams showing piping, equipment, and primary elements.
- Preparation of preliminary construction cost estimates and schedule for all facilities included in the project.
- Identify remaining design decisions that must be made for the design development phase to proceed and assist the City in making a determination on such decisions.
- Reviewed the site storm drainage system and developed a preliminary estimate of stormwater runoff from plant site. Prepared preliminary design memorandum in January 2017. Reviewed and compared to work by others in 2019.

Task 3.1 – Establish Design Criteria and Define Alternatives (Completed March 2017)

Our team will review City design criteria, define, and develop final design criteria for the alternatives to be analyzed with enough detail to evaluate performance and establish a probable construction cost estimate, and prepare outline diagrams of each alternative. This information will be reviewed at four preliminary design workshops.

Task 3.2 – Prepare Alternatives Comparison and Preliminary Cost Estimate (Completed March 2017)

Our team will complete the alternatives analysis including probable construction cost estimate and present preliminary findings and summarize recommendations in four preliminary design memorandums detailing the results of the evaluation. The scope of this phase includes the following:

- Carollo team will assist in selection major equipment, including sizing and identification of at least three acceptable manufacturers, whenever possible. We will discuss with the City their preferences for equipment selection.
- Hydraulic analysis of the existing UV channels, upstream conveyance channel, and diversion systems to confirm head loss allowances, establish reasonable flow splitting between the existing channels and any

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new channels, define the hydraulic approach, and exit conditions to the UV lamp banks. This will include computational fluid dynamics modelling of the proposed configurations and development of alternatives to improve flow split hydraulics.

- We will prepare construction phasing, identifying the provision of temporary systems to maintain plant operations during construction.
- Determine potential electrical upgrades required of the existing electrical equipment and system and prepare preliminary one-line diagram.
- We will prepare preliminary process and instrumentation diagrams (P&IDs) and define control system architecture and integration with existing system.
- We will prepare preliminary equipment list in consultation with the City.
- We will prepare a preliminary schedule for final design, construction, and commissioning of the project.
- We will prepare a preliminary estimate of probable construction cost for all facilities included in the projects.

Each PDM will provide the results of the alternatives analysis, and recommendations for the basis of design and details for the detailed design and construction of the proposed facilities. The four workshops and associated PDM's include:

LTP Disinfection Process: Water Quality and DDW/RWQCB Permit Issues Review: Permit issues for the disinfection process changes proposed for LTP will be reviewed and a strategy for the replacement of the existing UV system will be evaluated.

UV Disinfection Equipment Replacement Evaluation: Options for the replacement of the existing UV system will be evaluated and finalized. Different open channel UV system will be reviewed and the criteria for equipment selection will be reviewed and established.

While not identified in the RFP, we believe the following additional information will be important for a complete evaluation:

- Continued review of existing filtered secondary effluent UVT.
- Computational Fluid Dynamic (CFD) model of the flow split for new and existing UV channels.

Geysers Hypochlorite Disinfection Evaluation: Options for the Geysers flow split and alternatives for hypochlorite storage and feed facility including on-site hypochlorite generation will be evaluated and finalized. The alternatives analysis for Geysers Hypochlorite Disinfection will be presented at one workshop.

Additional Scope: Storm water flow estimate: City requested that the Carollo team estimate the plant storm water flow, and develop a conceptual size for the storm water interceptor / pump station. The City has noted that it preferred the storm water pump station be included in the diversion pump station design, as part of the same structure.

While not requested in the RFP, we believe the following additional information will be necessary for a complete evaluation:

- Assistance with bench-top chlorine demand and dose response, Carollo will guide the City staff on this testing.
- Computational Fluid Dynamic (CFD) model of the existing chlorine contact basins, and as required by DDW, we can provide assistance with a tracer study of the existing chlorine contact basins.
- Review of the Geysers Pipeline operation issues including the need for prechlorination prior to operation.

The first two tasks above are included in a new task below. Only a full scale CT evaluation is required and CFD modelling of the existing CCB is included as an optional task.

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Diversion Evaluation: Options for the Diversion system including pumping and gravity diversion will be evaluated. ~~As discussed in our Approach section, an option to reduce costs using temporary portable pumps and piping as part of the diversion project, will be included.~~ The use of existing structures and piping including the existing UV influent clearwell, backwash piping for diversion to the Flow Equalization basin will also be included.

Diversion System Evaluation Update: ~~Diversion system Basis of Design was updated based on the 35 percent design submittal and latest input from the City on other disinfection improvements including UV system replacement. The scope of the diversion project was reviewed along with the last construction and project cost estimate developed for the project. An additional workshop was conducted to review the Diversion system update with the City and set the design criteria for final design.~~

UV Disinfection Design Criteria Evaluation Update: ~~UV Disinfection system design criteria was reviewed based on the 35 percent design submittal, VE review and the latest input from the City. The design process capacity, hydraulics capacity, design UVT, and redundancy requirements were reviewed along with the construction and project cost estimate developed for the project. An additional workshop was conducted to review the UV Disinfection system update with the City and set the design criteria for final design.~~

Task 3 Meetings:

- Conduct four preliminary design workshops:
 - Water quality and DDW/RWQCB permit issues review,
 - Geysers hypochlorite disinfection preliminary design review,
 - Diversion preliminary alternatives evaluation review,
 - UV system preliminary design and procurement strategies review,
 - Diversion system evaluation update.
 - UV Disinfection Design Criteria update

*Task 3 Deliverables: **Completed May 2017***

- Submit ~~five hard copies and~~ one electronic version to the City of the four Draft Preliminary Design Memoranda (PDM) for review by City prior to each preliminary design review workshop.
- Finalize each PDM and submit ~~five hard copies and~~ one electronic version to the City: including Executive Summary and Final PDM.
- Prepare draft and final minutes for each preliminary design workshops ~~after~~ receiving City comments.

Equipment Selection/Procurement Phase

Task 4 – UV Equipment Selection / Procurement

The purpose of this phase is to assist the City in selecting or procuring UV equipment. Carollo will provide assistance for UV equipment selection and assist in development of procurement documents, assist the City with issuing the Request for Proposal documents to prospective UV equipment supplier/manufacturers, evaluate the supplier proposals, and provide the listed deliverables.

Task 4.1 – Draft Procurement Documents **(Completed August 2016)**

Carollo team will provide preliminary design information for competitive selection/procurement documents based on the criteria identified in Task 3 for the preferred UV disinfection manufacturers who are believed to be capable of meeting sizing, layout, and support system requirements. Activities to be provided during this phase include but are not limited to:

- Additional Scope: The Carollo team was requested to attend the site visits with plant staff to review UV disinfection equipment. Site visits included separate trips to plants in St Louis and Independence MO.

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Tacoma WA, and Albany and Rensselaer NY. Site visits provided information on preferred vendors and helped to identify manufacturer evaluation criteria.

- Evaluation Criteria Development. Identify potential UV equipment evaluation criteria and conduct a meeting with City staff to identify the criteria that best achieves the City objectives. Criteria shall be both financial and non-financial. We will review and agree on the criteria and procurement process during the preliminary design workshop.
- Additional Scope: Evaluation Criteria was reviewed during multiple workshops with both plant staff and Purchasing Department.
- Document Preparation. Prepare documents for the competitive selection/procurement of UV equipment. Document shall include but not be limited to preliminary layout for the UV equipment, general ancillary facility requirements, UV equipment technical specifications, and contract documents prepared through the City CIP and Purchasing Departments. It is assumed that the front end procurement documents will be provided by the City. Carollo will coordinate technical documents with City documents.
- Additional Scope: Draft documents were developed and reviewed during an additional review workshop, then reviewed and edited by the Purchasing Department.

Task 4.2 – Final Procurement Documents (Completed September 2016)

- Final Request for Proposal (RFP) for bidding equipment suppliers offerings was proposed and issued in September 2016.

Task 4.3 – Bid Assistance and Proposal Review Completed in October 2016)

- Bid Assistance. Assist the City with responses to bid questions and addenda from UV equipment manufacturers and/or suppliers.
- Proposal Review and Recommendation. Evaluate proposals ~~or bids~~ received by the City by applying the criteria ~~set forth earlier in this scope~~ developed with City staff. Identify the UV equipment that best meets the criteria developed and provide a recommendation regarding selection/procurement of the UV equipment supplier that meets the City's needs.
- Attended a bid evaluation workshop and assisted with proposal review and answered staff question on submittal features.

Task 4.4 – Supplier Submittal Review (Completed March 2017)

- Submittal Review. (Completed) The selected vendor provided a complete submittal based on the preliminary submittal included in the equipment proposal. Consultant reviewed submittal including the proposal version and final version versus the requirements of the project. Submittal review comments and questions were generated for response by the supplier. Completed in March 2017.
- Submittal Review Workshop. (Completed) The selected vendor participated in a 2 day workshop in Santa Rosa at LTP to review the submittal review comments, and provide design assistance information. Details of the proposed equipment were reviewed and compared to the requirements for the project. Completed in March 2017.
- Updated Submittal Review. The selected vendor will be asked to provide an updated submittal based on the revised design criteria. Consultant reviewed submittal including the proposal version and final version versus the requirements of the project. Submittal review comments and questions will be reviewed and new comments generated for response by the supplier. To be completed
- Updated Submittal Review Workshop. The selected vendor will be asked to participate in a second 2 day workshop in Santa Rosa at LTP to review the submittal review comments, and provide design assistance information. Details of the proposed equipment were reviewed and compared to the requirements for the project. To be completed.

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Task 4 Meetings:

- Conduct a workshop to review the key evaluation criteria and the appropriate procurement method.
- Attended multiple procurement document review meetings and an evaluation criteria review meeting (Total 24 meetings). Two additional Meetings.
- UV Equipment Submittal Review and Control Workshop. (Completed) Attend a two day workshop with the selected equipment supplier at LTP. Plant staff including operations, maintenance and instrumentation will attend. Completed.
- Additional Scope: Updated UV Equipment Submittal Review and Control Workshop. Attend a two day workshop with the selected equipment supplier at LTP. Plant staff including operations, maintenance and instrumentation will attend. Will review the updated submittal and original submittal review comments and provide any additional comments based on the original and revised submittal.
- City will engage the Supplier to provide final design assistance.

Task 4 Deliverables:

- Submit five hard copies and one electronic version to the City of the Draft Preliminary UV procurement documents for review by City prior to the preliminary design review meeting. The procurement documents will provide technical basis for an equipment proposal and details for the UV system design and construction of the proposed facilities.
- After City review and receiving City comments, we will finalize the technical procurement documents and submit five hard copies and one electronic version to the City.
- Any addenda to the technical procurement documents for the City to issue as required to clarify the UV equipment bid package.
- Original submittal review comments for City and Supplier were provided.
- Updated Submittal review comments for City and Supplier will be provided.
- We will prepare draft and final meeting minutes.

Contract Document Development Phase

The purpose of the Contract Document Development Phase (35%, 75%, 90% and 100% Complete Design Development) task is to complete the detailed design of the project consistent with the City's Exhibit B-2 "Design Service Requirements for Capital Improvement Projects" and as outlined in the final preliminary design memorandum, including the preparation of contract documents including the contract drawings, technical specifications, and engineer's estimate of probable construction cost. Detailed design review packages are required at 35%, 75%, and 90% design and a final bid package at 100%. At this point, all major design decisions should have been documented clearly and agreed by the City and all outstanding issues from the preliminary design memorandum must be resolved. Activities to be considered during this phase include, but are not limited, to the following:

- Establish a project-specific QA/QC program.
- Prepare technical specifications.
- Prepare final equipment list.
- Prepare Process and Instrumentation Diagrams and Control narratives to cover the entire operation of the system.
- Prepare final drawings, including general sheets, demolition plans, hydraulic profile, process diagrams, site plans, structural, mechanical, electrical, and instrumentation and control drawings.
- Prepare a final schedule for construction, commissioning and post-construction services of the project.

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- Prepare estimates of probable construction cost for the project. This cost will be used as the engineers estimate.

Task 5 – ~~Sodium Hypochlorite Disinfection (Deleted by City) and~~ Diversion Design - Plans and Specifications

The scope of work for this task is to prepare contract documents for the hypochlorite disinfection (Deleted by City) and diversion facilities portion of the project. ~~The final scope and fee shall be negotiated after completion of the design development phase of work.~~

Additional Scope: The following elements have been added to the scope of the diversion project:

- a. Storm drain relocation and re-alignment to new stormwater pump station.
- b. Relocation of temporary floodwall during construction.
- c. Widening and realignment of the plant entrance road.
- d. Gravity intertie between the new and existing diversion.
- e. Coordination with the permanent flood protection project
- f. Addition of a storm water pump station that will be incorporated into the diversion Wetwell and pump station facility. Design is based on preliminary design memorandum and final criteria accepted by City.
- g. Coordination with the flood protection project.
- h. Project will be bid as a separate bid package, and will be bid prior to the UV disinfection facility replacement construction project.

Task 5.1 – 35 Percent Design Submittal (35% Design Completed February 2017)

Carollo will prepare drawings and specifications suitable for review at an approximately 35 percent completion.

Task 5.2 – 75 percent Design Submittal (To be Completed)

Carollo will incorporate the City's 35 percent Design Submittal Review comments and prepare drawings and specifications suitable for review at approximately 75 percent completion.

Task 5.3 – 90 percent Design Submittal (To be Completed)

Carollo will incorporate the City's 75 percent Design Submittal Review comments and prepare drawings and specifications suitable for review at approximately 90 percent completion. Drawings will be suitable for submittal to City building department.

Task 5.4 – 100 Percent Bid Document Design Submittal (To be Completed)

We will incorporate the City's Final Design Submittal Review comments and prepare drawings and specifications suitable for bidding.

Meetings:

- Conduct one site visit for each submittal.
- Attend a pre-application meeting with the City Building Department
- Attend design review meetings

Deliverables:

- Design submittal in electronic format (Adobe pdf) with ~~five bound sets of~~ half-size plans and specifications table of contents for each submittal.
- Updated construction cost estimate and schedule at each design submittal.

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- Building Department submittal application review comments response and revisions. (Assumes that application will be prepared by the City).
- Bid documents in electronic format (Adobe pdf, and Microsoft Word) suitable for reproduction and archiving, in conformance with City guidelines.

Status: The 35% submittal completed as one project. Remaining submittals will be completed as separate projects.

Task 6 – Ultraviolet Disinfection Facility Replacement Design - Plans and Specifications

The scope of work for this task pertains to the UV Replacement portion of the project. ~~We have prepared a preliminary drawing list to better understand the full scope of work. The preliminary drawing list is shown below and the subtasks follow the drawing list.~~

Additional Scope: The following elements have been added and offset the improvements that have been deleted:

- a. Prepare Contract Documents on Construction Trailer replacement or relocation.
- b. Prepare Contract documents for replacement hypochlorite storage and feed system for filters and for UVT adjustment.
- c. Project will be bid as a separate bid package, and will be bid in the future (Time TBD) after the diversion construction project. Design will be coordinated with diversion project design and construction.

Task 6.1 – 35 Percent Design Submittal **(35% Design Completed February 2017)** Carollo will prepare drawings and specifications suitable for review at an approximately 35 percent completion.

Task 6.2 – 75 Percent Design Submittal (To be Completed)

Carollo will incorporate the City's 35 percent Design Submittal Review comments and will prepare drawings and specifications suitable for review at approximately 75 percent completion. Design will be updated based on the revised design criteria, developed after the VE Review, and finalized in Design Criteria review in 2019, including revised design flow and UVT.

Task 6.3 – 90 Percent Design Submittal (To be Completed)

Carollo will incorporate the City's 75 percent Design Submittal Review comments and will prepare drawings and specifications suitable for review at approximately 90 percent completion. Drawings will be suitable for submittal to City Building Department.

Task 6.4 – 100 Percent Bid Document Design Submittal (To be Completed)

Carollo will incorporate the City's 90 percent Submittal Review comments and prepare drawings and specifications suitable for bidding.

Meetings:

- We will conduct up to two site visits in conjunction with UV system design.
- Attend a pre-application meeting with the City Building Department
- Attend design review meetings

Deliverables:

- Design submittal in electronic format (Adobe pdf) with ~~five bound sets of~~ half-size plans and specifications table of contents for each submittal.
- Updated construction cost estimate and schedule.
- Building Department submittal application review comments response and revisions. (Assumes that application will be prepared by the City).

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Bid documents in electronic format (Adobe pdf, and Microsoft Word) suitable for reproduction and archiving.

Task 7 – Final Design Meetings

The following review workshop meetings will be conducted at the LTP. All meeting handouts and meeting minutes will be prepared by Carollo.

Task 7.1 – 35 Percent Design Submittal Review Workshop (35% Design Review Workshop Completed February 2017) Carollo conducted 35 percent review workshop at the LTP for the hypochlorite (On-hold) and diversion project, and UV Replacement projects.

Task 7.2 – 75 Percent Design Submittal Review Workshop (To Be Completed)

Carollo will conduct 75 percent review workshop at the LTP for the ~~hypochlorite and~~ diversion projects, and UV Replacement projects.

Task 7.3 – 90 Percent Design Submittal Review Workshop (To Be Completed)

Carollo will conduct 90 percent review workshop at the LTP for the ~~hypochlorite and~~ diversion projects, and UV Replacement projects.

Task 7.4 – 100 Percent Design and Bid Set Submittal Review Workshop (To Be Completed)

Carollo will conduct 100 percent review workshop at the LTP for the ~~hypochlorite and~~ diversion projects, and UV Replacement projects.

Task 7.5 – Building Department Review Meeting (To Be Completed)

We will meet with Building Department officials prior to Building Department submittal to establish project description and extent of review.

Task 7 Deliverables:

- We will prepare draft and final meeting minutes after receiving City comments.

Status: The 35% submittal as completed as one project. Remaining submittals will be completed as separate projects.

Task 8 – Bid Period Services (To Be Completed) Carollo will provide services during the bid period including

Task 8.1 Attendance at Prebid meeting,

Task 8.2 Assisting the City in answering questions from bidders

Task 8.3 Preparing addenda as required for distribution by the City (Assume 2 per project).

Task 8.4 Carollo will review bids and make recommendation to the City for award.

It is assumed for budget purposes that two separate projects will be bid by the City.

Meetings

- Carollo will attend a prebid meeting for each project (2 meetings total).

Deliverables:

- Responses to bidder questions.
- Up to two addenda for each project (4 total).
- Bid review (2 total).

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Other Miscellaneous Tasks

Task 9 – Regulatory Compliance (Ongoing)

Carollo will assist in obtaining pre-construction approval from regulatory agencies. The natural resource permitting will be provided by the City's Environmental consultant, GHD, and the Carollo team will provide assistance as necessary to the City's Environmental consultant. Additionally, the Carollo will assist the City with obtaining permit approval from the Division of Drinking Water (DDW) and the Regional Board (North Coast RWQCB). This will include:

- Preparation of a draft and final update to the original Engineers report to the DDW for approval of the ~~Geysers hypochlorite (Deleted)~~ and replacement UV disinfection system.
- Meetings with DDW and RWQCB to review project design criteria and approval requirements, up to 3 meetings. (One meeting completed)

Assumptions:

- The City will provide the original Engineers Report for use in developing the Engineering Report update. Update will cover the new UV disinfection and diversion system only, not the entire reclamation system operation.

Task 10 – Commissioning (No work to date)

Carollo will provide commissioning services after the completion of construction in conjunction with DDW and Title 22 requirements. This will include:

- Preparation of ~~separate a~~ testing and startup plan for the ~~hypochlorite and~~ diversion and UV disinfection systems.
- Prepare a bioassay plan and complete a bioassay for Engineers report.

Task 11– Operational and Maintenance Training (No work to date)

Carollo will provide operational and maintenance training to City staff. The training will include as a minimum the design intent; detailed focus on the major equipment, new UV system, and any features of the hydraulic improvements; and any operational issues or questions that occur after the facility has been operational.

Assumptions:

- Training will be based on vendor O&M information. Development of a new plant O&M manual is not included.

Optional Task 12 – Geysers Pipeline Prechlorination (Task Deleted)

~~Based on discussions with City staff during the preliminary design evaluation phase and as we described in our approach section of the proposal we believe there is merit to prechlorinating the Geysers Pipeline. However this item was not specifically requested in the RFP. Therefore, if requested, the Carollo team can provide operational assistance for the Geysers pipeline prechlorination.~~

Task 13 – Contingency (Budgetary task no scope)

Task 14 Value Engineering Review and Assessment (New Task Added by City/Completed)

A Value Engineering Review and Assessment Task was requested by the City as a follow up to the 35% design submittal in April 2017. This effort was billed under the Task 12 and 13 budgets. The scope of services is provided for Value Engineering (VE) Assessment / Peer Review Services for the Disinfection Improvement project at the Laguna Treatment Plant. The purpose of the VE assessment is to provide an independent assessment of disinfection project alternatives including conveyance, disinfection, diversion, electrical/instrumentation and other project elements. The

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assessment will include a review of the project purpose, capacity, capabilities and limitations/opportunities. Carollo Engineers proposes a two person VE review team made up of two senior principal engineers, separate for the Carollo design team. The team will have expertise in disinfection process design, water reuse requirements and design criteria, and extensive experience in project implementation. The existing design team will provide support including answering questions on background, and criteria, and will provide cost estimate information.

Task 14.1 – Background Information Review (Completed May 2017)

Carollo design team provided the VE review team all existing project related studies, plans, and regulatory permits related to the project. Carollo team will review the background information. Studies, plans, and permits may include, but are not limited to, the following:

- Sodium Hypochlorite and Ultraviolet Disinfection Facilities Volume 3 of 3 Drawings March 1997 CH2MHill
- Laguna WRF Capacity and Alternatives Technology Analysis Rev 1 Final October 2012 Carollo Engineers (CE)
- CaDPH Correspondence, Laguna Water Reclamation Facility, UV Checkpoint Bioassay Results, August 29, 2012 (Capacity Rerating)
- CA RWQCB NPDES NO. CA0022764, November 2013
- Laguna WRF Disinfection Alternative Analysis Report October 2013 CE
- Disinfection Improvements Charrette Power Point Slides and TM. April 2014 GHD
- LTP Disinfection Improvements Study November 2015 CE
- LTP Disinfection Improvements Pre-Design Report March 2017 CE
- Disinfection Improvements RFP for Disinfection Equipment September 2016 CE
- Disinfection Equipment Proposals October 2016 (Four Suppliers)
- Board of Public Utilities Presentation on Equipment Selection (City)
- LTP Disinfection Improvements 35 Percent Contract Document Submittal 2017 CE
- LTP Disinfection Improvements Meeting Notes and Design Presentations Various 2015 to 2017 CE
- LTP Disinfection Equipment Supplier Workshop – Calgon Carbon March 2017. CE
- LTP Disinfection Improvements Project – UV Disinfection Criteria May 16, 2017 CE (attached)
- LTP Disinfection Improvements Project – California Effluent Discharge - UV Disinfection Requirements May 16, 2017 CE (attached)

Task 14.2 – Kick-Off Meeting and Site Walk (Completed June 2017)

Following review of background information, VE team conducted a kick-off meeting with City Department Director and Project Manager to confirm the VE / Peer review scope, purpose, expectations, and goals. The City team conduct a site walk of key process areas at the LTP with the VE team immediately following the kickoff meeting.

Task 14.3 – Alternatives Development and Assessment (Completed July 2017)

The purpose of this task was to summarize the disinfection project elements in an alternatives assessment matrix and provide multiple approaches to consider for implementation of the project.

Activities included during this phase include, but are not limited, to the following:

Summarize the current project component drivers, including but not limited to; key assumptions (e.g. design flow for UV system, dose rate, permit language for disinfection requirements, useful life of existing system, level of compliance risk, current and future discharge and reuse options), project approach (e.g. Hypo for geysers or not, need to disinfect

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geyser flows, approach and timing of storage), and various approaches to the design (e.g. stainless steel lined channels, operability of two disinfection system, ability to split flows, etc.). The alternative assessment to the current project drivers included, but was not necessarily be limited to, an evaluation with criteria such as life-cycle cost of the options, operability considerations (including staffing levels) and mitigations, useful life, compliance risk and mitigations, and long-term flexibility.

Task 14.3.1 – Establish Design Criteria and Define Alternatives (Completed July 2017)

The VE team developed various project implementation scenarios that may include phasing the project over time as well as a range of integrated project concepts going from lower cost and higher risk to presumably higher cost and lower risk.

Task 14.3.2 – Prepare Alternatives Matrix and Preliminary Cost Estimate (Completed August 2017)

VE team completed the alternatives analysis including probable construction cost estimate and present preliminary findings and summarized recommendations in a workshop presentation.

Task 14.3 Meetings:

- Attend a kickoff meeting, and site walk.

Task 14.3 Deliverables:

- Prepare meeting minutes.

Task 14.4 – Value Engineering Assessment and Review Workshop and Documentation (Completed August 2017))

The VE team presented the findings to City Department Director, Project Manager and City staff at a one day workshop. The results of the workshop will provide documentation for review and decision making regarding the direction for the disinfection project.

Task 14.4.1 – VE Assessment Workshop (Completed July 2017)

Carollo conducted a VE review workshop at the LTP for the Disinfection Improvements project. The review workshop was intended to be an interactive review of the disinfection alternatives matrix and development of a direction for the disinfection project. The review will include:

- Background Summary
- Review of project drivers and design criteria. Focus will be placed on impact of drivers and criteria on the project implementation costs.
- Value Engineering Alternatives Assessment Matrix.

Task 14.4.2 – VE Assessment Technical Memorandum (Final Issued October 20187)

Carollo prepared a VE Assessment Review Executive Summary TM for use by the City in planning the Disinfection Improvements project scope, budget and implementation.

Task 14.4 Meetings:

- Conduct Value Engineering Assessment workshops: A total of two workshops were conducted to discuss the VE Assessment and Review

Task 14.4 Deliverables:

- Carollo team prepared draft and final meeting minutes after receiving City comments.
- Workshop presentation materials including PPT slides.

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- VE Assessment Executive Summary Technical Memorandum. A VE Review and Assessment TM was finalized in October 2017.

Task 14.5 –VE Assessment and Review Project Management (Completed)

The Carollo team will provide project administration and management necessary to perform planning, execution, monitoring, and reporting of design tasks. Carollo will prepare a monthly progress letter report for attachment to the monthly invoice to track and report status of budget expenditures and key work products completed during that billing period.

The project management work will also include the following components: project setup; progress monitoring; project coordination; communication with the City; document control and management; development of Sub-consultant agreements and Sub-consultant management; and invoicing. The scope will include the coordination, chair, and preparation of agendas and minutes of the meetings.

Deliverables:

- Monthly invoices and progress reports. Reports were sent to Santa Rosa PM and Capital Improvements Engineer.

Task 15 Supplemental Hypochlorite Disinfection Implementation Assistance: Contact Time, Dose and Disinfection Effectiveness Testing Protocols and Testing Assistance (New Task Added by City/Completed)

The Santa Rosa disinfection alternatives outlined in the VE Assessment and Review included the use of supplemental hypochlorite for peak wet weather flows and backup disinfection process. The following work was completed and is proposed to assist in implementation of the supplemental hypochlorite disinfection system based on evaluating reduced Contact Time (CT) to meet Title 22 objective, and evaluation of disinfection efficiency at reduced CT. This would support the “One Water” concept that was discussed in the VE Assessment and Review Technical Memorandum. Ultimately the City decided to not complete the full scope of this task, as noted below.

Task 15.1 Implementation Plan Overview (Draft completed January 2018)

An overall implementation plan for CT and chlorine dose testing was developed to provide an overview of the steps needed to evaluate alternative CT values to Title 22 CT of 450mg-min/L.

Task 15.2 Testing Protocol Development (Draft completed April 2018)

Testing protocols for LTP staff to complete contact time (CT) and chlorine dose testing will be developed to provide data for proposed alternative CT values to Title 22 CT of 450mg-min/L. Carollo will prepare a contact time testing protocol (modal and t10). Contact time will be determined using a conservative tracer. Contact time will be determined based upon peak flow conditions.

Task 15.3 Full Scale Contact Time Testing Assistance (Completed in September 2018)

Assistance with full scale contact time testing at peak flow conditions will be provided on an on-call basis, as needed to evaluate alternative CT value to Title 22 CT of 450mg-min/L. The City will perform the contact time demonstration (flow control/modulation), with assistance from Carollo on tracer dosing, sample collection and analysis. Carollo will subcontract to provide pumping and piping to allow for testing of a single chlorine contact basin up to 10 mgd in capacity.

Task 15.4 Chlorine Dose and Disinfection Effectiveness Testing Assistance (Completed in October 2018)

Assistance with bench scale contact time testing will be provided on an on-call basis, as needed to evaluate chlorine dose and disinfection efficiency testing for alternative CT values to Title 22 CT of 450mg-min/L. Carollo will evaluate

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water quality, chlorine demand, and chlorine residual under current operational conditions and recommend a chlorine "dose" necessary to meet the disinfection criteria under Title 22 for tertiary recycled water applications (5-log virus and 2.2 MPN/100mL total coliform). The resulting dose, known as *Ct*, is the combination of *free chlorine residual* and contact time, with units of mg-min/L. The use of free chlorine residual is paramount, as the State of California's DDW has now stated that they are willing to consider reduced free chlorine Ct values as low as 15 mg-min/L, and to do so without extensive virus bioassay efforts.

Task 15.5 Report on Contact Time, Chlorine Dose Testing and Disinfection Effectiveness (Completed in December 2018)

Carollo will prepare and submit a draft technical engineering report documenting the results of the testing.

Assumptions:

- Carollo will take the lead on CT testing, including provision of temporary pumps and piping for testing.
- City will be responsible for operation of the chlorine contact basins including temporary pumping system provided by consultant.
- City will take a lead on laboratory testing for chlorine dose, and disinfection effectiveness (coliform testing) testing assistance including all laboratory testing and analysis including microbiological and virus testing.

Task Deliverables:

- Draft Implementation Plan.
- Draft Test Protocols.
- Draft Report documenting the testing results.