

Attachment A

EXHIBIT A

ENGINEERING AGREEMENT SCOPE OF SERVICES BIOLOGICAL NUTRIENT REMOVAL PROJECT

AMENDMENT No. 3

CITY OF LOVELAND (OWNER)
AND
CAROLLO ENGINEERS, INC. (ENGINEER)

PURPOSE

The purpose of this Amendment No. 3 is to provide additional services as requested by the City of Loveland (City) as an amendment to the original contract dated July 2, 2015, in connection with the City's Wastewater Treatment Plant (WWTP) Biological Nutrient Removal Project (BNR Project, or Project). The additional services are to 1) conduct additional hydraulic evaluation, 2) provide conceptual design of hydraulic improvements, 3) conduct additional design evaluation for the location of the RAS Anoxic Zone, 4) develop and submit a CDPHE Site Application to increase the rated treatment capacity of the Wastewater Treatment Plant (WWTP) to 12 mgd, 5) summarize chemical feed jar testing results, 6) conduct final design services for hydraulic improvements to the Aeration Lift Pump Station (ALPS) and Ultraviolet (UV) disinfection systems, 7) design a replacement to existing Manhole A, 8) replace and reroute scum piping from the secondary clarifiers to the Administration Building basement, 9) recoat the existing Influent Pump Station, and 10) provide additional monthly reporting and CMAR coordination to account for additional scope and schedule.

ENGINEER'S SERVICES

TASK 750 – ADDITIONAL HYDRAULIC EVALUATION

ENGINEER will extend the hydraulic model and profile developed under previous tasks for the secondary facility to encompass an entire plant hydraulic model (starting at Manhole A and extending to the downstream side of the effluent metering vault and manhole). The previously completed hydraulic model and profile under the preliminary design phase of the project was limited to the portion of the facility beginning at the aeration basin influent structure and extending to the UV disinfection system.

This task will include evaluation of the hydraulic capacity of the existing Influent Pumps and the ALPS, along with associated piping. Piping hydraulic constraints will be analyzed and summarized per pipeline segment in the model, profile, and Technical Memorandum (TM). Pump curves and pump station analyses of the two pump stations will be evaluated utilizing spreadsheet models developed based on the existing conditions. The model will incorporate hydraulic testing results for the ultraviolet (UV) disinfection system as scoped separately.

The OWNER will provide all available relevant data and past studies/designs regarding the hydraulic profile through the facility, including shop drawings and O&M manuals for the Influent Pumps and ALPS and record drawings of the associated piping and hydraulic structures. The ENGINEER will obtain hydraulic structure elevation data necessary for the hydraulic analysis via

survey as previously budgeted under Task 740 in the Final Design Amendment. No additional survey work is budgeted under this task.

The following flow conditions shall be evaluated in the hydraulic model:

1. Peak Instantaneous Flow - To Be Defined, 24.3 to 26.0 mgd
2. Peak Hour Flow (PHF) - 20.3 mgd
3. Rated Average Day Maximum Month Flow (ADMMF) - 12 mgd
4. Current Average Flow – 6.5 mgd
5. Future Flow Conditions - 16 mgd ADMMF and 27 mgd PHF.

The hydraulic model output before and after proposed modifications per Task 760 below shall be conveyed to the OWNER in an electronic format. Water surface elevations from the ADMMF and PHF flow conditions shall be shown on the Adobe™ (PDF) and CAD drawings. A Technical Memorandum summarizing the hydraulic evaluation will be prepared.

TASK 760 – CONCEPTUAL DESIGN OF HYDRAULIC IMPROVEMENTS

This task is optional, pending direction from OWNER after completion and review of Task 750 results.

Based on the evaluation of hydraulic capacity for the Influent Pumps, Aeration Lift Pumps, and UV system, ENGINEER will prepare conceptual design recommendations for improvements to pump station layout, pumping capacity, and piping configuration to meet peak flow capacity necessary to achieve plant hydraulic rating associated with ADMMF condition of 12 mgd. The conceptual design will include figures and concepts to allow consideration of up to two (2) conceptual design alternatives for each system. Narrative discussion of considerations for expansion to 16 mgd as a buildout ADMMF capacity will be included. The conceptual design will not include detailed design. Preliminary and final design of identified improvements will be separate.

The hydraulic model will be modified to represent anticipated future modifications to these hydraulic conveyance facilities (Influent Pump Station, ALPS, piping hydraulic constraints, and UV Disinfection system) to achieve 12 mgd ADMMF capacity with associated peak flows.

A Project Memorandum (PM) summarizing proposed conceptual design recommendations in text and figures will be prepared.

TASK 770 – RAS ANOXIC ZONE LOCATION ANALYSIS

ENGINEER will evaluate an alternate location for RAS Anoxic Zone from the location defined in the Preliminary Design documents. Alternate location is at the head of the Aeration Basins, connected to or replacing the existing Aeration Basin Influent Splitter Structure. Reconsideration of the location and layout set by the preliminary design was directed by City and Owner's Advisor to maintain site space for future expansions. Evaluation will include recommendation as to the extent of demolition of the existing Aeration Basin Influent Splitter Structure, additional geotechnical analysis and assessment of geotechnical and foundation changes, layout of

alternate RAS Anoxic Zone orientation to fit in available space, and preliminary design of revised structural and mechanical components. The additional subconsultant geotechnical analysis is covered under the Task 740 geotechnical analysis previously scoped as sufficient subconsultant fees remained under that task.

ENGINEER will meet with City to review alternate location and design approach. The ENGINEER will provide a brief summary of the analysis of the alternate location in the previously scoped Final Design Report. Final design drawings will be based on the revised location and orientation.

TASK 780 – CDPHE SITE APPLICATION FOR 12 MGD

ENGINEER will prepare and submit a Site Location Application and Engineering Report for increasing the design capacity of the existing Loveland WWTP from 10 mgd to 12 mgd ADMMF. The Site Location Application and Engineering Report will include the rationale for capacity re-rating as well as a description of modifications to the liquid and solids facilities.

ENGINEER will prepare and distribute a draft Site Location Application and Engineering Report in accordance with the requirements of CDPHE Regulation No. 22, "Site Location and Design Approval Regulations for Domestic Wastewater Treatment Works," Section 22.5, "Application Procedures for Increasing or Decreasing the Design Capacity of an Existing Domestic Wastewater Treatment Works Where Construction Has Taken Place or Will Take Place." The Site Location Application and Engineering Report will include the Application Form, Checklists, and a brief, bullet-point executive summary Engineering Report that references information included in the Design Reports on each portion of the project in the Appendices. OWNER will support the preparation of the Engineering Report by providing information needed to satisfy CDPHE's requirements that may not yet be in ENGINEER's possession. OWNER will provide a summary Basis of Design Report from the Digester Project (Brown and Caldwell) that includes technical information confirming the capacity and compliance with CDPHE criteria.

ENGINEER will submit the Site Location Application and Engineering Report to the appropriate local governments and agencies for review and comment per the requirements of CDPHE. This submittal will be based on the preliminary effluent limits (PELs) that CDPHE developed for the City in January 2016 for an ADMMF capacity of 12 mgd. Based on City direction, the Engineering Report will define the WWTP hydraulic capacity based on PHF, with peak flows higher than PHF bypassing primary treatment and the aeration basins.

Upon receipt of comments from CDPHE on the draft report, the ENGINEER will incorporate comments as appropriate into a final Site Location Application and Engineering Report.

ENGINEER will attend one (1) meeting with CDPHE to discuss the project and review the Site Location Application and Engineering Report. This meeting will include discussion of all components of the project, including hydraulics and digester design. An attendee from Brown and Caldwell to respond to digester project design questions may be warranted.

TASK 790 – CHEMICAL FEED JAR TESTING ASSISTANCE

To expand on the chemical feed system evaluation scoped in Task 710, ENGINEER will provide a jar testing protocol for testing efficacy and performance of ferric addition for chemical

phosphorus removal at three process locations. Protocol shall evaluate necessary chemical dose and molar ratio, flocculation time, and necessary mixing energy at each location. ENGINEER will advise City staff who will perform testing. As an additional scope and budget amendment, ENGINEER will review jar testing results and prepare a summary Project Memorandum (PM) documenting the results and resulting design recommendations for chemical dose, chemical feed locations, and mixing energy requirements at chemical feed locations. The Chemical Feed Jar Testing PM will be submitted for City and Brown and Caldwell use in designing the chemical feed system.

TASK 870 – FINAL DESIGN OF HYDRAULIC IMPROVEMENTS

Based on the evaluation of hydraulic capacity and conceptual design for the Aeration Lift Pumps and UV systems, ENGINEER will prepare final design documents for improvements to pump station layout and piping configuration of ALPS and the configuration of the UV system to meet peak flow capacity necessary to achieve plant hydraulic rating associated with ADMMF condition of 12 mgd.

ENGINEER shall prepare drawings on 22" x 34" sheet size (11" x 17" half-size) and deliver drawings in MicroStation v8 XM and AutoCAD (AutoCAD version at direction of City). Drawings will be based off existing as-built CAD files, to be provided by the OWNER. A list of anticipated drawings required for adequate representation of the project elements is included in Exhibit B. Mechanical, electrical, and instrumentation drawings shall accurately depict required building systems including connections to existing systems. Demolition drawings will include information related to structural, mechanical, electrical, and instrumentation components. This scope also includes additional work restrictions and sequencing to be defined in the work restrictions specification for coordination of elements to be demolished and to be constructed, and to be coordinated with the Owner's Construction Manager at Risk (CMAR).

Design drawings will include the following basic design elements as defined in the Conceptual Design phase:

- Demolition of piping, valves, and associated ancillary systems at the existing ALPS.
- Installation of new discharge piping, isolation valves, and check valves for the ALPS. Installation of ancillary systems related to these systems, including air release valves, heat tracing, and electrical and instrumentation components.
- Installation of new flow meters and control valve on primary effluent (PE) piping in the yard at the ALPS and at Aeration Basins 5 and 6 for measurement and control of PE from the ALPS. Installation of electrical and instrumentation components associated with these improvements.
- Demolition of the existing UV effluent weirs.
- Installation of new downward opening control gates for direct control of the water surface elevation at the UV system, including concrete channel extensions, level sensors, and associated electrical and instrumentation components.
- Electrical, instrumentation, and control modifications to power and control the new flow meters and control valve for PE flow distribution and to power and control the UV control gates.
- Demolition and installation of new isolation gates at Manhole J for isolation of Secondary Clarifiers 1 and 2.

Design of ALPS components will be included in Final Design submittals as defined in the Final Design schedule. An intermediate workshop for advancement of the UV design and one

Intermediate Design Submittal will be made for the UV system improvements. Final UV design documents will be delivered 6 weeks after receiving comments from Owner and CMAR Contractor on the Intermediate Design Submittal.

TASK 880 – MANHOLE A IMPROVEMENTS

Raw influent wastewater bypass pumping (designed by others) is proposed as part of the construction sequence for the implementation of influent screening and other project modifications. This bypass pumping presents an opportunity to improve the existing Manhole A structure, which serves as a junction box for 5 separate influent sewers with outflow via a 36-inch diameter pipe to the Headworks.

ENGINEER will prepare final design documents that will include the following basic design elements, to be fully defined at a design workshop:

- Replacement and reconstruction of the Manhole A structure, including connection to 5 influent interceptor feeds.
- Installation of high performance coating at the new Manhole A using a Raven 405 product or similar product at interior surfaces.
- Installation of provisions for sampling wells at all 5 interceptors.
- Installation of gates or stop plate provisions to accommodate future bypass, maintenance, or re-coating needs.
- Installation of plating or hatches for entry and isolation for odor control provisions to connect to existing Biofilter.
- Demolition of existing structures to be removed based on design direction.
- Consideration and indication of temporary construction modifications for structures to remain in service.
- Abandon and plug the old 24-inch plant flow (PF) line that is physically connected to Manhole A and daylights at the abandoned headworks structure/fish pond.
- No electrical or instrumentation modifications will be made or provided.

TASK 881 – INFLUENT PUMP STATION MODIFICATIONS

Raw influent wastewater bypass pumping (designed by others) is proposed as part of the construction sequence for the implementation of influent screening and other project modifications. This bypass pumping presents an opportunity to recoat the existing Influent Pump Station.

ENGINEER will prepare final design documents that will include the following design elements:

- Installation of high performance coating using a Raven 405 product or similar product at Influent Pump Station wet well.
- During bypass period, construction shall include provisions for TV Inspection of 30" pipe from IPS to Primary Clarifier Splitter Box.
- No other demolition, mechanical, structural, electrical, or instrumentation modifications will be made or provided.
- Existing as-built drawing will be used as the basis for recoating modification drawing with limited adjustment as the intent is to create a basis for CMAR Contractor cost estimate.

TASK 882 – SECONDARY SCUM PIPING REPLACEMENT

The existing secondary scum piping is deep (~15 feet below grade) and emergency repairs are costly. Two leaks have been repaired on this line in the last two years. ENGINEER shall design an improved routing and replace the pipe from just inside the Secondary Clarifier 1 and 2 Pump Room, including the wye fitting found in the yard, (where Secondary Clarifier 3 scum line ties in) to inside the Administration basement.

ENGINEER will prepare final design documents that will include the following design elements:

- Installation of a new scum pipe with appropriate bury depth from just inside Secondary Clarifier 1 and 2 Pump Room, including the wye fitting found in the yard (where Secondary Clarifier 3 scum line ties in), to inside the Administration Building basement RAS Pump Station.
- Pipe will penetrate the Administration Building foundation wall through a new core hole with piping modifications inside the basement to tie back into the existing.

TASK 883 – MONTHLY REPORTING FOR SCHEDULE EXTENSION

For additional schedule of project beyond December 31, 2016, until March 31, 2017, ENGINEER shall prepare monthly progress reports, and maintain and monitor project scope, budget, and schedule. ENGINEER shall maintain and distribute Action Item and Decision Logs. ENGINEER shall provide administrative guidance and supervision of staff, including project planning.

TASK 884 – CMAR ADDITIONAL DESIGN COORDINATION

ENGINEER will coordinate with CMAR Contractor to review design progression and progress submittals for additional scope tasks including ALPS modifications, UV modifications, Manhole A modifications, and Influent Pump Station modifications, including responding to and implementing suggestions and recommendations. It is assumed that the CMAR Contractor will conduct constructability and sequencing reviews and offer timely recommendations. ENGINEER's Project Manager and appropriate design and discipline engineers will attend six (6) additional coordination meetings with CMAR Contractor.

DELIVERABLES

The ENGINEER'S additional deliverables for the Project will include:

- Technical Memorandum documenting hydraulic analysis and restrictions.
- Hydraulic model in Excel, PDF, and resultant hydraulic profile in CAD.
- Conceptual Design Project Memorandum summarizing recommendations for Influent Pumps, ALPS, and the UV system.
- 3D PDF of RAS Anoxic Zone in revised location and layout.
- Summary of RAS Anoxic Zone location analysis in previously scoped Final Design Report.
- Site Location Application and Engineering Report (Draft and Final).

- Chemical Feed Jar Testing Project Memorandum.
- Work Restrictions specification section sequencing and coordination for elements added under this amendment.
- Control Strategies specification section for elements added under this amendment.
- Coordination with CMAR for scheduling, sequencing, and general understanding of the new elements incorporated under this amendment.
- UV Disinfection System modifications specification section.
- Additional drawings as part of Final Design Deliverables scoped in the Final Design Amendment dated April 11, 2016. Additional drawings as follows:

Drawing No.	Drawing Name
Task 750	
01G07	HYDRAULIC PROFILE - MANHOLE A TO AERATION BASINS
Task 870	
10D05	AERATION BASIN INFLUENT SPLITTER BOX DEMOLITION PLAN & SECTIONS
50D01	AERATION LIFT PUMP STATION DEMOLITION PLAN & SECTION
60D01	ULTRAVIOLET DISINFECTION DEMOLITION PLAN
60D02	ULTRAVIOLET DISINFECTION DEMOLITION SECTIONS AND DETAILS
50SM01	AERATION LIFT PUMP STATION PLAN
50SM02	AERATION LIFT PUMP STATION SECTION & DETAILS
60SM01	ULTRAVIOLET DISINFECTION PLAN
60SM02	ULTRAVIOLET DISINFECTION SECTIONS
60SM03	ULTRAVIOLET DISINFECTION DETAILS
50E01	AERATION LIFT PUMP STATION POWER AND CONTROL PLAN
50E02	AERATION LIFT PUMP STATION HEAT TRACE
50E03	MCC-6 PLAN AND PANELBOARD SCHEDULE
60E01	ULTRAVIOLET DISINFECTION POWER AND CONTROL PLAN
60E02	ULTRAVIOLET DISINFECTION ELECTRICAL SEQUENCE PLAN
60E03	ULTRAVIOLET DISINFECTION PANEL ELEVATION
60E04	ULTRAVIOLET DISINFECTION ONE LINE
50N01	ALPS PUMPS P&ID
60N01	ULTRAVIOLET DISINFECTION P&ID 1
60N02	ULTRAVIOLET DISINFECTION P&ID 2
Task 880	
05C14	PAVING AND GRADING PLAN 4 (MANHOLE A Area)
05C15	PAVING AND GRADING DETAILS 3 - MANHOLE A
05C25	YARD PIPING PLAN 4 (MANHOLE A Area)
05C28	YARD PIPING DETAILS 3 - MANHOLE A
05D01	MANHOLE A DEMOLITION PLAN
05D02	MANHOLE A DEMOLITION SECTIONS AND DETAILS
05SM01	MANHOLE A MODIFICATIONS PLAN
05SM02	MANHOLE A MODIFICATIONS SECTIONS
05SM03	MANHOLE A MODIFICATIONS DETAILS
Task 881	
35SM01	INFLUENT PUMP STATION RECOATING PLAN AND SECTION

Task 882	
05C29	YARD PIPING DETAILS 4 - SCUM PIPING ROUTING

ASSUMPTIONS

No analysis upstream of Manhole A will be conducted (Manhole A invert elevations and hydraulic evaluations will be included). OWNER will provide best available existing information on pump station capacity, design, and drawings of pump station and hydraulic components.

A single round of comments from Owner will be addressed on the CDPHE Site Application prior to submittal as Final to CDPHE.

Subsequent tasks including value engineering, engineering services during construction, development of training and operations and maintenance materials, conformed and record drawings, and construction administration will be scoped, budgeted, and negotiated as a contract amendment upon the completion of final design.

TIME OF PERFORMANCE

ENGINEER shall complete all services identified in this Amendment by March 31, 2017, in accordance with the schedule outlined below:

- Technical Memorandum - Full Plant Hydraulic Analysis and Modeling September 30, 2016
- Additional Hydraulic Model Drawing Per Final Design Schedule
- Conceptual Design Project Memorandum September 30, 2016
- Preliminary design 3D PDF of RAS Anoxic Zone September 30, 2016
- Site Location Application and Engineering Report - Draft December 23, 2016
- Site Location Application and Engineering Report - Final 3 Weeks after comments received
- Chemical Feed Jar Testing Project Memorandum September 30, 2016
- Additional Final Design Drawings - Task 870 (ALPS) Per Final Design Schedule
- Intermediate Design Submittal - Task 870 (UV) 4 Weeks after Design Workshop
- Final Design Submittal - Task 870 (UV) 6 Weeks after comments received
- Final Design Drawings - Intermediate Submittal Tasks 880, 881, & 882 January 27, 2017
- Final Design Drawings - Final Submittal Tasks 880, 881, & 882 March 31, 2017

This schedule assumes written authorization to proceed by November 9, 2016; schedule dates will be adjusted accordingly if authorization is issued after this date. Exact dates for interim deliverables, meetings, and site visits will be identified and adjusted in consultation with the OWNER as the project progresses.

PAYMENT

ENGINEER will perform the additional services described herein for a not-to-exceed amount of \$245,222 inclusive of all labor, expenses, and subcontract work on the project. The cost associated with each Task is summarized in the attached table and will be billed monthly per the Fee Schedule in the Agreement. Actual expenditures may vary from the task-level budgets, but in no case will the total fee for the project exceed the total not-to-exceed amount for all tasks unless specifically authorized in writing by the OWNER. The total amount for the project will be increased from the previous \$1,387,466 to a revised total of \$1,632,688.