Town of Johnstown

February 5, 2021 // Proposal

Professional Engineering Services for Expansion Design of the Town of Johnstown

WATER TREATMENT PLANT EXPANSION FROM 5 MGD TO 10

Carollo's treatment approach cost-effectively provides new capacity, reliable taste and odor control, and easy expandability within the available site footprint.

carollo

Engineers...Working Wonders With Water®

Engineers...Working Wonders With Water®

390 Interlocken Crescent, Suite 800, Broomfield, Colorado 80021
P. 303.635.1220 F. 303.635.1373

February 5, 2021

Mr. Marco Carani
Director of Public Works
Town of Johnstown
450 S. Parish Avenue
Johnstown, CO 80534

Subject: Design of the Town of Johnstown Water Treatment Plant Expansion

Dear Mr. Carani and Selection Committee Members:

Rapid demand growth and persistent taste and odor (T&O) concerns demand confidence in design solutions for the Town's Water Treatment Plant expansion. You simply don't have time for trial and error. Carollo's design approach will yield a cost-effective, reliable, operable system, rooted in the following success factors:

- **Immediate treatment capacity expansion.** Our team recognizes the need for increased capacity expansion of the Johnstown Water Treatment Plant. Our approach will fast-track the design while remaining collaborative to include your input in defining treatment drivers and goals, which will lead to the right process selection. Our team is well-versed in every project delivery method; we will help you choose the project delivery approach that best meets your needs. We can leverage established CMAR procurement documents to minimize contractor on-boarding time if CMAR is deemed best for this project, and we can help you identify funding options for the project.
- **Addressing water quality challenges.** We will quickly evaluate process alternatives in partnership with your operations team. We have data and experience (e.g., Greeley, Thornton, Centennial) showing that ozone and biofiltration can reliably address the persistent T&O issues as well as TOC reduction challenges, while fitting within the available site footprint and avoiding costly and operationally-intensive PAC feed. Especially when coupled with an oxidant, this process is far more effective than PAC, and membrane filtration is completely ineffective to address these water quality challenges.
- **Flexibility to accommodate future capacity increases.** Like you, we have our eye on the future and we'll build expandability into the design from day one. We've done this recently at plants in Greeley, Centennial, Colorado Springs, and across the Front Range. And we'll help you get the most out of your footprint – for example, we worked with CDPHE to gain approval of the state's highest filter loading rates in Colorado Springs, maximizing capacity in a set footprint.
- **Dedicated local resources.** With over 150 personnel in our three Front Range offices, we'll staff the project with a 100 percent local team covering all the necessary design disciplines. The depth and breadth of our local resources, with established working relationships, provides a team you can rely on.

We look forward to collaborating with you on innovative solutions to deliver a cost-effective and highly successful project that quickly addresses your customers' capacity and water quality needs.

Sincerely,

CAROLLO ENGINEERS, INC.

Jason Assouline, PE
Project Manager

Vincent Hart, PE
Principal-in-Charge

WATER
OUR FOCUS
OUR BUSINESS
OUR PASSION

SECTION 1 Identification of Proposer

Company Information

Since our founding in 1933, Carollo has been a leading expert in the planning, design, and construction management of water projects for municipalities across the country...**Water is all we do.**

Firm background

Carollo Engineers is an environmental engineering firm specializing in the planning, design, and construction of water and wastewater facilities and supporting infrastructure. Carollo's reputation is based upon exceptional client service and a continual commitment to quality. We currently maintain 49 offices throughout the U.S. During our 88-year history, Carollo has successfully completed more than 25,000 projects for public sector clients. We have provided engineering services for numerous water treatment plant designs for clients throughout Colorado with similar design challenges as the Town of Johnstown. Carollo is focused on client service, and values the interactive and collaborative relationships with the utilities with which we work.

Unlike the majority of our competitors, Carollo only provides water and wastewater engineering services. Our nationwide technical staff have an extensive background and training specific to this field. For that reason, the quality and professional standing of our core group of water and wastewater professionals equals or exceeds that provided by some of the largest engineering firms in the country.

Resources

Carollo's staff numbers more than 1,100 employees including more than 500 registered engineers. We are a full-service company with the experience and qualified professionals to successfully manage projects of any size. Our staff includes civil, sanitary, environmental, electrical, mechanical, chemical, structural, control system, and corrosion control engineers, as well as architects, planners, and specialists in other areas. Subconsultants are retained as needed in specialized fields depending on the specific needs of the project.

Identification of Proposer

Jason and Vincent as well as the rest of the project team are located in Carollo's Broomfield Office.

PROPOSER

Production Office:
Carollo Engineers, Inc.
390 Interlocken Crescent, Suite 800
Broomfield, Colorado 80021
P| 303.635.1220

PROJECT CONTACTS

Project Manager: Jason Assouline
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Principal-in-Charge: Vincent Hart
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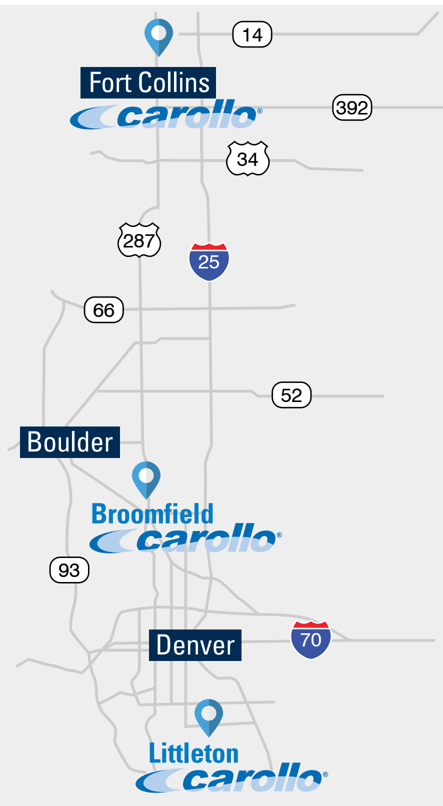
Carollo in Colorado

Carollo has been providing engineering services in Colorado for 25 years. Our Colorado operations started in Broomfield in 1996, followed shortly thereafter by offices in Littleton and Fort Collins. We continue to expand with highly motivated and talented personnel focused on providing engineering services to our municipal water and wastewater clients. Carollo's Colorado offices currently have over 150 employees including a professional staff of engineers, as well as additional personnel that provide technical and administrative support.

A Complete Colorado Team + National Subject Matter Experts for Johnstown

Our three local offices (Broomfield, Littleton, and Fort Collins) are the primary offices that will manage and execute this work for the Town. Our local offices house some of our firm's most well-known and respected water experts, not just at Carollo, but throughout our industry. We have the right local technical know-how backed by national support, and the necessary bandwidth and resources to support your projects for the long-term.



Carollo ranks number one among all design firms who work solely in water/wastewater, based on **ENR's "Top 500 Design Firms"** ranking.

Subconsultant firms on the core delivery team

As the prime consultant we selected the subconsultants on our team as a strategic partners in our team's success. There are a multitude of reasons that we value these subconsultants who we have worked with on several recent projects. Foremost, they each bring specific expertise that we know will add tremendous value to the project. The combined diversity of our experience and perspectives results in more robust solutions for you. Our collective team brings a keen understanding and unique perspective to your project, enabling us to tailor our approach and our deliverables to better serve your needs.

Lithos Engineering

LITHOS ENGINEERING

Lithos Engineering focuses on geotechnical, tunnel, trenchless, and geological engineering and design services through innovative, collaborative, client focused consulting uniquely tailored to suit the needs of their clients and projects. Lithos staff has provided geotechnical engineering and design services for hundreds of projects around Colorado and beyond, and is experienced in geotechnical design, feasibility studies, and contract document preparation. Steve Kuehr has supported more than 95 percent of Carollo's Front Range design projects. He continually proves himself as reliable and trustworthy for quality results and understand Colorado-specific geotechnical issues.

Lithos Engineering
Geotechnical Engineer
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Denver, CO 80227
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Subconsultant Contact:
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Precision Survey & Mapping, Inc.

PRECISION SURVEY & MAPPING
PROFESSIONAL LAND SURVEYING CONSULTANTS

Precision Survey & Mapping, Inc., is a full service professional land surveying company located in Denver, with specific experience on numerous WTP projects with Carollo. Precision is known for their reasonable rates and dedication to on-time completion of projects while maintaining the flexibility that's required to provide outstanding customized service. Precision utilizes only cutting edge technology including GPS, Robotics Total Stations, and the newest technology, High Definition Survey (HDS) or 3D Laser Scanning, allowing them to maximize their quality, productivity, and efficiency.

Precision Surveying & Mapping
Surveying
9025 E. Kenyon Ave., #150, Denver, CO 80237
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Subconsultant Contact:
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Short and Brennan Architects

SHORT AND BRENNAN ARCHITECTS

Short and Brennan Architects was founded in 1976, and is a professional design firm that offers comprehensive services in architecture, planning and programming, interior design, and project management. They have actively led and participated in community planning projects, and have designed and constructed projects on both new and existing water treatment plant sites. Their projects are successful because of their commitment to collaboration with the owner and the entire project team. Most recently, Short and Brennan has delivered water projects with Carollo for clients such as Greeley, South Adams County, and Centennial Water and Sanitation District (CWSD). Projects with Short & Brennan have been a mix of masonry structures and pre-fabricated metal buildings.

Short and Brennan Architects
Architectural
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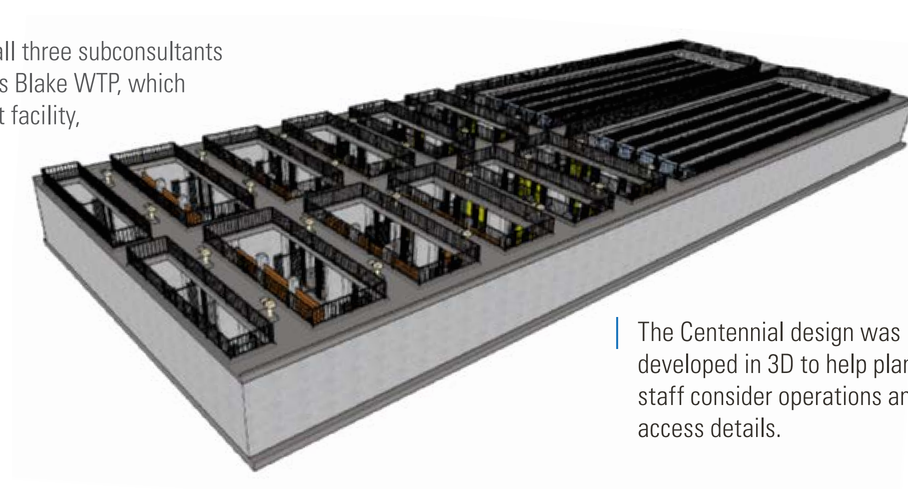
Examples of Carollo's recent collaboration with all three subconsultants include the Phase I Improvements at Centennial's Blake WTP, which focused on overhauling the 44-mgd pretreatment facility, designing a new chemical building, and determining a comprehensive site plan. This team also collaborated on the City of Greeley's Boyd Lake WTP, which focused on ozone, biofiltration, and a new chemical facility.



The Centennial design was developed in 3D to help plant staff consider operations and access details.

SECTION 2

Project Overview and Approach

We have carefully reviewed the RFP scope of services to devise solutions that will best meet the project objectives and priorities for the Johnstown WTP. The following pages outline our proposed approach and methodology to systematically address the goals of the project by cost-effectively increasing treatment capacity while improving water quality. The concepts present a unique approach that will cost-efficiently and effectively address your objectives for the project. Carollo's treatment approach directly removes taste and odor, reduces residuals production, and avoids the operational costs and headaches associated with PAC.

Project Understanding

Increasing the capacity of the Johnstown WTP (JWTP) is the cornerstone of this project. Inclusive of the plant expansion, there are several additional aspects of the project that cannot be overlooked. Based on our initial analysis of your system we have identified the following key success factors for your project:

Immediate capacity expansion

- Providing additional filter capacity
- Options for raw water and finished water conveyance to match the expanded treatment capacity
- Maintaining robust disinfection for the full range of plant flows and water qualities

Addressing water quality challenges

- Taste and odor (T&O) mitigation
- Additional TOC reduction
- Improving distribution residual chlorine stability

Flexibility to accommodate future capacity increases

- Modularity in capacity expansion and comprehensive site planning

Current treatment expansion must include flexibility for future projects

Each of these aspects are interrelated and a comprehensive solution to the JWTP expansion should include provisions which address all of the above. For example, increasing treatment capacity must be coupled with raw water and finished water pumping and conveyance infrastructure to reliably move water to and from the plant. TOC reduction is a fundamental treatment performance requirement which is essential for controlling disinfection byproduct formation. The current process does not consistently remove TOC, which could lead to elevated THM and HAA concentrations as well as presents challenges with maintaining chlorine residual within the distribution system. Increasing the capacity of the plant without providing additional TOC removal will further strain the ability of the DAF system to provide an effective pre-treatment barrier.

Although not directly capacity related, taste and odor is also at the forefront of the Town's treatment concerns. Increasing plant capacity without providing treatment processes capable of managing MIB and Geosmin in the source water will lead to additional customer complaints, which may impede the rapid growth in the system. A temporary PAC system is a logical near-term solution, however this should not be considered a feasible long-term solution due to the chemical costs as well as the increased residuals which will be generated with this process.

Our approach to solving these challenges is outlined in this proposal and will result in a project that holistically meets the project goal of increasing capacity while efficiently addressing a multitude of other treatment and capacity considerations. Equally important, our approach will not lose sight of capital cost or long-term operational costs, while maintaining operator friendly and low maintenance treatment processes, which build upon the familiarity of the existing treatment system.

Treatment Approach

Carollo's design will cost-effectively expand the JWTP capacity while enhancing water quality, with a particular focus on taste and odor removal. Neither Option 1 or 2 described in the RFP will reliably achieve both objectives. Expanding filtration capacity with filters similar to the existing filters (option 1) is feasible, but presents challenges for constructability adjacent to the existing filters and clearwell. Mimicking the existing filter design does not leverage the advancements in gravity filtration that have been established over the past decade, with higher filter loading rates that will allow increased capacity within the existing site.

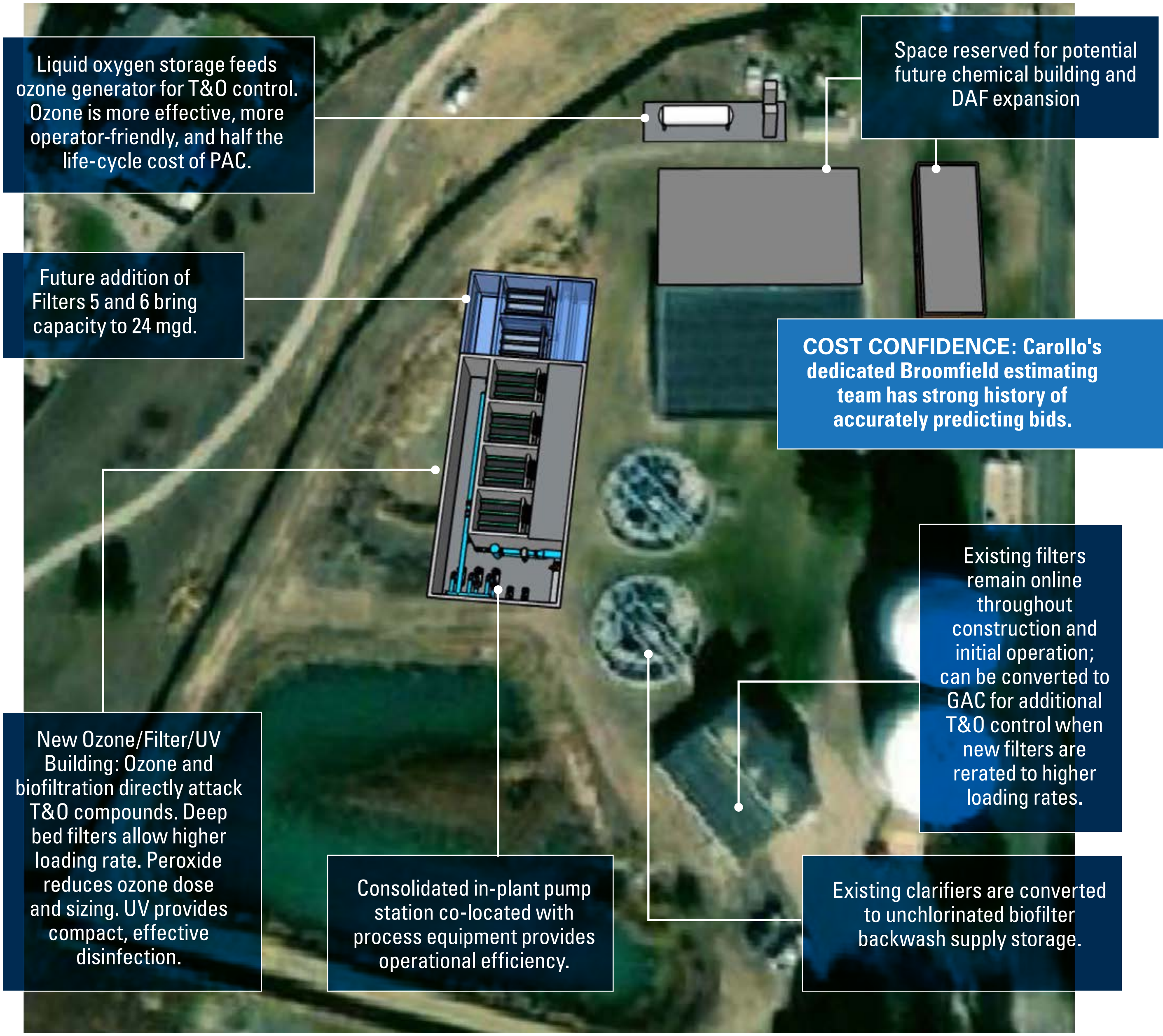
Membrane filtration has a wide range of applications and has been implemented in Colorado at several treatment plants. Carollo's team has experience with membrane filtration (option 2) and we understand the advantages and limitations of this approach for the Town. While membranes can address the capacity expansion needs of the plant, this approach will not achieve the Town's goals for water quality improvement.

Our approach builds upon the current treatment with gravity filtration, but would implement the latest technologies for high rate biological filtration, and equipment such as plastic filter underdrains, backwashing (with air scour), and media retaining backwash troughs.

Carollo's treatment approach cost-effectively provides new capacity, reliable taste and odor control, and easy expandability within the available site footprint.

After evaluating options for treatment processes and site layout, including Options 1 and 2 from the RFP, Carollo identified a path forward that cost-effectively expands capacity while addressing critical T&O issues and facilitates low-cost future expansions as the Town grows. The table below provides a summary of some of the key features of the three treatment options, demonstrating the advantages of Carollo's proposed "Option 3." These advantages are further highlighted in the site layout shown below and in the pages that follow.

Option	Effective T&O control and TOC removal	Expandable to 20+ mgd within site footprint?	Simple & familiar filter O&M	Requires new intermediate pumping	Sole source O&M parts	Existing filters online through construction	Fouling from PAC carryover
1: Duplicate existing filters	No	No	Yes	No	No	Potential	Potential
2: Membranes	No	Yes	No	Yes	Yes	No	Yes
3 (Recommended): Ozone / Biofiltration / UV	Yes	Yes	Yes	No	No	Yes	N/A (no PAC)



COST CONFIDENCE: Carollo's dedicated Broomfield estimating team has strong history of accurately predicting bids.

Immediate Capacity Expansion

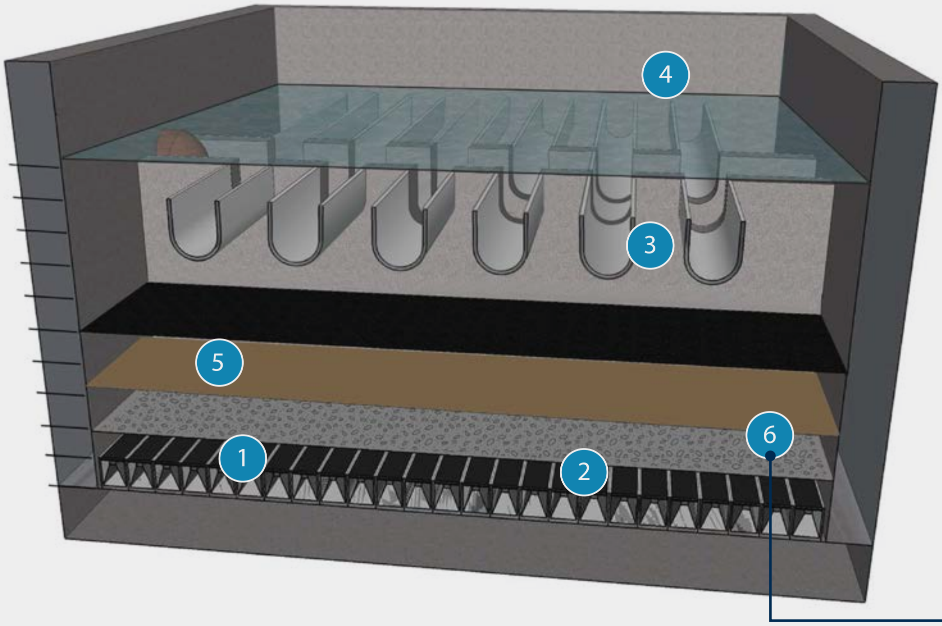
Addressing immediate capacity expansion needs

RFP Option 1 is to add two additional filters which match the existing filters at the JWTP. This option is a logical approach to expanding the capacity while maintaining the same treatment that the operations staff is accustomed to. Considerations for the location of the new filter and clearwell must take into account the limited space around the existing filter building, which impacts constructability and maintaining plant hydraulics. More importantly, while additional filters and an expanded clearwell may accomplish the immediate need for capacity expansion, this option will not address some of the additional critical success factors we have identified for the project such as additional TOC and T&O removal, nor will it provide a stepping stone for future capacity expansion beyond the current phase.

The pre-treatment at the JWTP is designed for 10 mgd and has proven itself capable of achieving this flow. While we agree that gravity filters are the best approach for expanding the capacity of the JWTP, matching the existing filter design does not leverage the numerous advancements in gravity filters that have been proven in the last 10-15 years. Carollo's concept for providing immediate filter capacity in a new filter building; the existing filters would provide supplemental capacity in the near-term and then repurposed as GAC contractors to augment T&O control after the new filters are re-rated at higher loading rates and the existing filters are no longer needed.

Expanding the existing filter building requires extensive modifications to the backwash holding pond or a clarifier.

Cutting-edge considerations for gravity filtration.



1 Plastic block underdrains allow for air scour and biological filtration. These underdrains are cost effective (compared to stainless steel or nozzle/plenum), easy to install, and require no maintenance.

2 Air scour is much more effective and water-efficient means of backwashing than surface wash.

3 Media retaining troughs allow for more rapid and efficient backwashing.

4 Instrumentation such as EchoSmarts, measure backwash turbidity and media expansion to further reduce the time and water required for backwashing.

5 Rinse-to-waste can provide low startup turbidity without capital expenditures and minimizes filter-to-waste time (and volume).

6 Deep bed filters allow for higher loading rates and longer filter runs.

Membranes offer a rapid and seemingly cost-effective solution to immediate capacity expansion, but beware of hidden costs and operational complexity

RFP Option 2 is to implement membranes as a filtration alternative. There are several ways which microfiltration or ultrafiltration membranes could be implemented at the JWTP. Membranes provide a robust protozoa (Cryptosporidium and Giardia) barrier, allowing the chlorine contact to focus on virus inactivation within the existing clearwell and finished water tanks. Although membranes offer the advantage of consistently low turbidity filtrate in a highly automated system, membranes are typically not effective as a barrier for TOC or T&O compounds.

Pressure membranes are often designed in vertical racks, which require an intermediate pump station to provide the necessary inlet pressure to drive the water through the strainers and membranes. In this configuration, a new slab on grade structure, as described in the RFP, would be constructed. An alternative approach to implementing membranes would be to retrofit the existing filters with submerged membranes. This approach has been used at other locations with either vacuum pumping or low pressure (gravity) applications. The lower the available pressure, the lower the flux that the membrane can operate at. Lower flux (analogous to filter loading rate) translates to more membrane area required and thus more equipment (higher capital cost, expected to be several millions of dollars for 10-12 mgd of capacity).

Typical membrane racks can provide significant treatment capacity in a compact footprint but will require significant valves, instruments, and ancillary equipment.

Carollo has worked with the City of Thornton over the past several years to improve the reliability of the operation of the initially challenging submersible membrane system at the Wes Brown WTP.

Membranes also present challenges that should be taken into account when considering this option. In particular:

- Significant change for operators.
- Intermediate pumping.
- Submersible gravity membranes will require additional equipment and higher capital cost for equipment.
- Recurring cost for membrane replacement (typically every 5-10 years) translate to recurring costs of approximately $2-3M.
- Reliance on a single vendor.
- Routine maintenance cleanings which require additional chemicals (sodium hypochlorite, citric acid, and/or sodium hydroxide), which must be stored on site and will be discharged to the WWTP on a regular basis in high concentration slugs.
- **Does not provide a barrier for TOC and T&O.**
- **Could be rapidly (and potentially irreversibly) fouled by PAC carryover.**

Raw water pumping and conveyance is key to expanding JWTP capacity

A solid understanding of the two raw water sources and the Town's needs and project drivers is critical to delivering smart raw water expansion solutions that align with long-term planning goals. While significantly more remote, the Lone Tree reservoir has a higher water quality and serves as the Town's primary raw water source. The Johnstown Reservoir is much closer in proximity, but has lower water quality contributing to taste and odor complaints, and is therefore used as a secondary peaking source during high demand periods.

With the planned JWTP improvements, it may be possible to reconsider source water usage and blending of the two sources to take advantage of existing raw water capacities. With new treatment options to address taste and odor at the JWTP, it may be possible to increase the blending percentage of Johnstown Reservoir, and defer some of the planned capacity improvements for the Lone Tree pumping and conveyance system.

Carollo will meet with plant and system operators early in the project to determine drivers for Lone Tree capacity expansion. Our approach will be to evaluate options that account for the key project success factors relevant to raw water expansion, including conveyance capacity, water quality, system operability, and fiscal alignment with other project priorities.

Carollo has developed some initial concepts and options for expansion of the raw water system.

Expand Lone Tree Reservoir conveyance capacity

This option would include expansion of the Lone Tree Reservoir pump station and conveyance pipeline, concurrent with the JWTP expansion. It would be implemented if blending with a higher percentage from Johnstown Reservoir would not result in an acceptable raw water source blend at the JWTP.

Expanded conveyance capacity could be done by paralleling the existing 10.6 mile, 16-inch pipeline, or direct removal and replacement of the existing line in the same alignment. Removal and replacement would add demolition and disposal cost to the project, but would not require acquisition of additional space for a parallel pipeline. This option would be considered if land acquisition and/or existing roadway right-of-way space were not available for a parallel pipeline.

Construction of a parallel pipeline would provide the Town with a new asset capable of meeting conveyance capacity within the planning horizon. In addition, the Town would retain the existing pipeline as an asset that could be rehabilitated. The existing pipeline could serve 2 purposes:

- Operable parallel conveyance pipeline to supplement and reduce the required size of the new parallel pipeline.
- Backup, redundant pipeline to be used during new pipeline maintenance or outages.

Pumping expansion will be also be required at the Lone Tree Reservoir. The existing pump station is a buried package station, equipped with three vertical turbine pumps with a predicted maximum capacity of 4.7 mgd.

Pipeline routing will take into consideration existing pipeline condition, removal & replacement versus paralleling, and available corridor space with consideration to land acquisition needs.

The pump station is subjected to relatively harsh environmental conditions, including high heat and humidity, which impacted mechanical and electrical equipment longevity. Ideally, the buried pump station would be replaced entirely with an above grade pump station, designed to meet near-term capacity requirements, with proper configuration for inexpensive, phased expansions to keep pace with growth. A new pump station would also implement hydraulically efficient design to minimize long-term energy usage. The benefits of implementing an energy efficient design could be evaluated in a present worth analysis to determine the pay-back period of capital cost versus energy savings.

In addition to long-term energy savings realized from an energy efficient design, Carollo will look into the potential to take advantage of available power company energy rebates. Rebates may be available for power saving projects that result in a demonstrable power saving and return on investment. For Centennial Water & Sanitation District's new Zone 4C Pump Station, Carollo coordinated with Xcel to obtain a pre-approved rebate of approximately $220,000, in addition to an estimated $125,000 in annual energy cost savings. Carollo's design approach incorporated a number of energy efficient design elements to maximize pump station efficiency. The Contract Documents for bidding included Net Present Value (NPV) requirements and energy efficiency guarantees. These provisions assured that the Owner could receive the Xcel energy rebate and the return on investment over the 25-year NPV period. Carollo has proven and successfully implemented this design approach, and we are ready to do the same for Johnstown.

Defer Lone Tree conveyance and pumping capacity

It is possible expansion of the Lone Tree raw water infrastructure could be deferred by increasing usage of Johnstown Reservoir source during high demands. With the planned treatment improvements at the JWTP, particularly taste and odor treatment, it may be feasible to significantly increase the blending percentage from Johnstown Reservoir. The current capacities of the Lone Tree and Johnstown pump stations are 4.7-mgd and 6.7-mgd, respectively, resulting in a maximum raw water capacity of 11.4-mgd. If a larger portion of the Johnstown Reservoir source can be used during peak summer months, this could present a short-term solution that allows the Town to defer this significant capital investment.

If deferment is deemed an acceptable solution, the Town may consider phasing Lone Tree raw water expansion, with construction of some elements concurrent with the JWTP improvements, and deferment of other elements. For example, if the existing pipeline is determined to be in suitable condition, the Town may opt to construct a new Lone Tree pump station to replace the buried package station. The new pump station could be equipped with pumps to meet near-term capacities, and expanded in the future when conveyance capacity is increased with a new pipeline.

There are a number of phasing combinations if raw water expansion deferment is deemed a feasible option. Carollo is prepared to discuss all options with Town staff to determine a solution that meets Town goals and key success factors.

Energy efficient pump station layout results in long term energy savings and potential energy credits if offered by the power company.

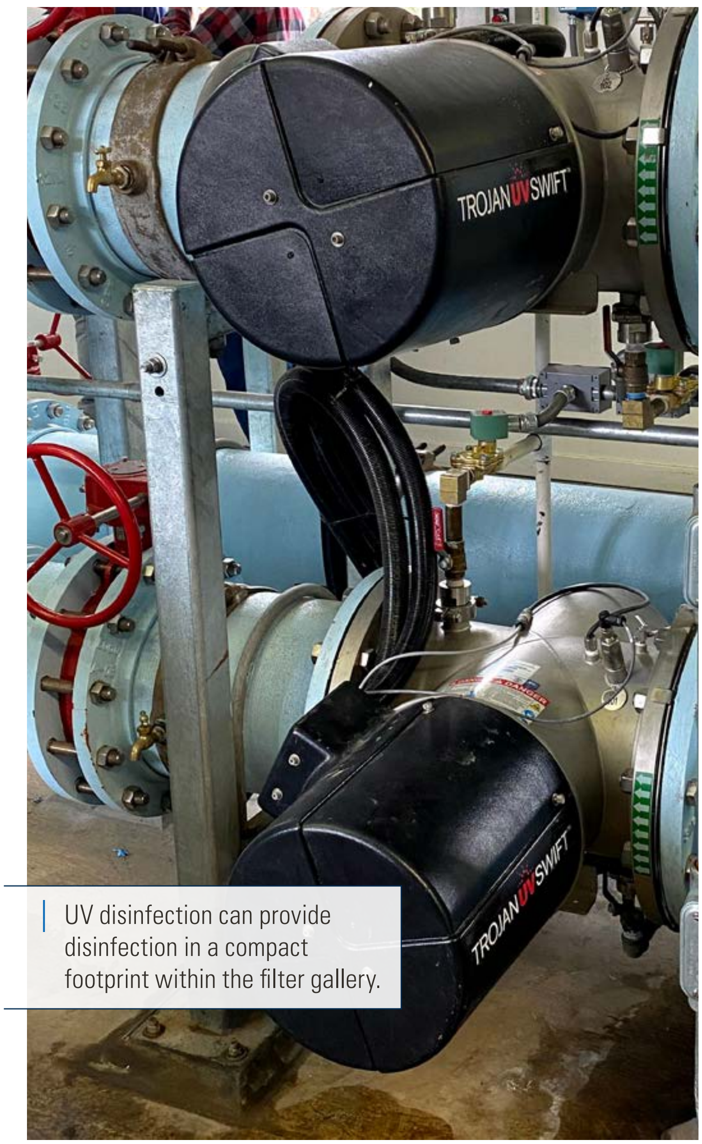
Additional considerations to address immediate capacity expansion

The Town indicated that the electrical system at the JWTP may require additional analysis during the design for the plant expansion. Carollo's electrical and I&C engineering hub is in the Denver area. This team not only supports design projects throughout the country, it also has specific expertise in electrical system analyses and arc flash studies. We are prepared to include an electrical system study as part of the preliminary design to evaluate how the electrical system can accommodate current and future plant expansion.

Carollo's electrical engineering team is experienced in performing electrical system studies and arc flash analyses.

Expanding disinfection capacity without increasing footprint

Providing additional CT for chlorine disinfection by expanding the clearwell or modifying/replacing the above ground tanks will require complicated and costly construction. A simple and cost effective approach to providing disinfection for the expanded capacity at the JWTP is with UV disinfection. Leveraging the combination of UV and free chlorine disinfection optimizes the benefits of both disinfection processes. UV is a robust and efficient barrier for Cryptosporidium and Giardia while chlorine is highly effective at virus inactivation. Either individual or combined filter effluent UV can be implemented efficiently within the filter building footprint. Carollo's team has extensive experience analyzing and implementing both UV and chlorine disinfection systems. A recent disinfection evaluation project in Colorado included the design of a 12 mgd UV system. Budgetary quotes for the two 12-mgd UV reactors (1 duty and 1 standby) ranged from $200,000 to $300,000 and included both medium pressure and low pressure high output options to balance power and maintenance considerations. The system was designed to provide 0.5 log Giardia inactivation with as little as 2 lamps per reactor and a maximum connected load per reactor of 22 kW, which is equivalent to a 30 hp motor.



UV disinfection can provide disinfection in a compact footprint within the filter gallery.

Biofiltration (TOC removal and distribution chlorine system stability)

Biofiltration provides multiple treatment benefits to the Town. Well-designed biofilters provide a robust treatment barrier for taste and odor compounds such as MIB and Geosmin and reduction of TOC without compromising the fundamental treatment goal of turbidity and particle removal.

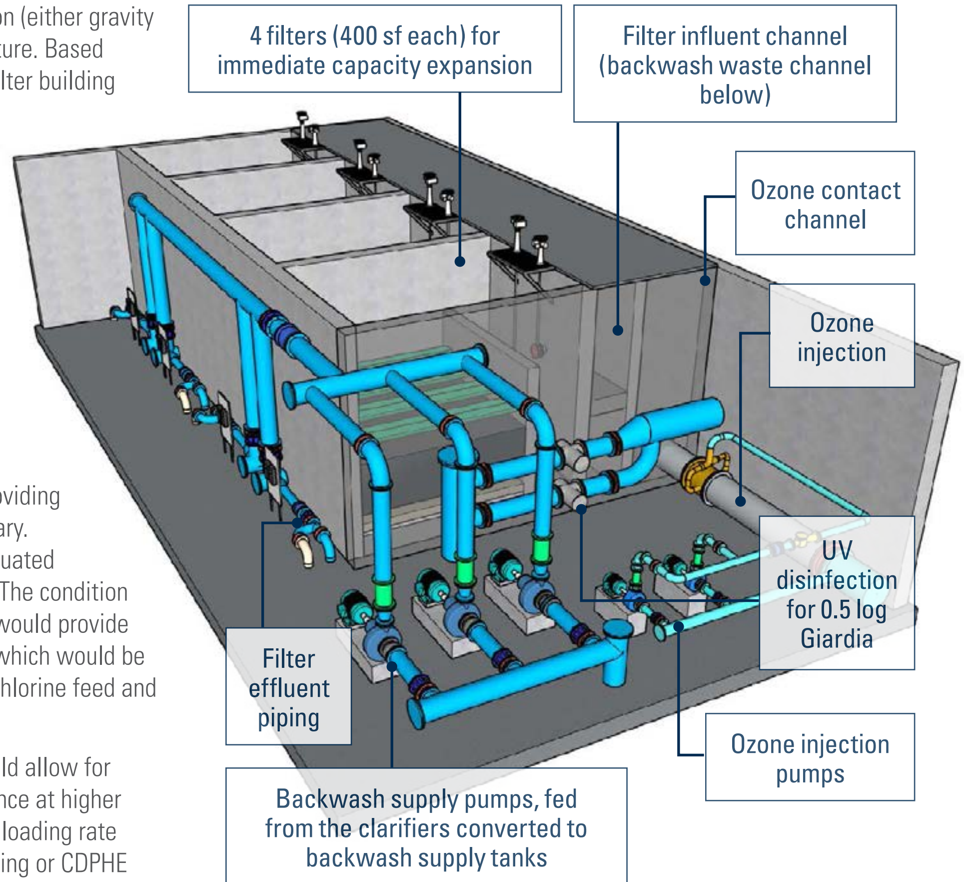
For any plant capacity expansion, additional filtration (either gravity filters or membranes) requires additional infrastructure. Based on our preliminary analysis of your system, a new filter building housing four new filters would provide a process able to reliably treat flows in excess of 12.5 mgd with flexibility to treat higher flows without additional infrastructure. An initial conceptual layout is presented with four filters, each 400 square feet in surface area.

These filters would be designed to operate at various loading rates to achieve near term treatment capacity objectives, expandability without additional infrastructure, and future additions to reach ultimate capacity goals.

In order to support the migration to biofiltration, providing a supply of unchlorinated backwash will be necessary. Repurposing the abandoned clarifiers, which are situated close to the new filter building may be the answer. The condition of the structures is unknown, however the volume would provide operational flexibility for backwash supply volume which would be independent of the clearwell and does not impact chlorine feed and disinfection.

To satisfy the rapid system growth, this design would allow for additional capacity based on proven filter performance at higher loading rates. Phase 1 is based on the current filter loading rate of 5 gpm/sf, which does not require additional piloting or CDPHE approval. The filters would be designed to operate at higher loading rates (7 gpm/sf or possibly higher), which could be proven by full-scale demonstration testing after the new filters have been commissioned (Phase 2). This allows the Town to address immediate capacity challenges, while allowing for additional capacity/growth without adding additional infrastructure. Phase 3 would add up to two additional filters to give the JWTP a firm filtration capacity (with one filter out of service) of at least 20 mgd.

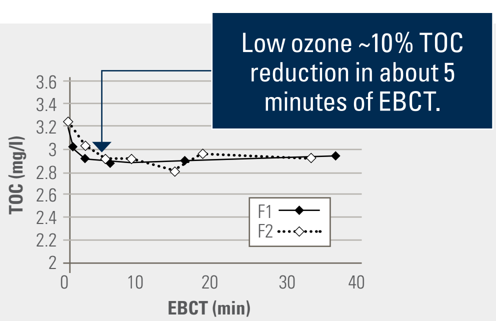
Carollo has implemented a similar filter design at the Colorado Springs Utilities Bailey WTP and other facilities across the country. Biofilters operate identically to conventional gravity filters, so this approach will be much more consistent with current operations compared to the membrane filtration approach options.

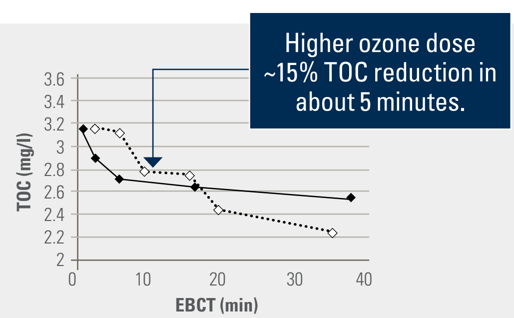


Carollo's initial concept for a new ozone, filtration, and UV disinfection facility.

TOC removal can challenge the existing DAF system, at times. Based on raw water TOC ranging from 3 to 4.6 mg/L, the ranges of TOC removal required is 15% to 35%, depending on alkalinity, to achieve the EPA's D/DBP Rule. Biological filtration provides a robust and consistent TOC removal barrier which can serve as a backstop for TOC removal through the DAF. There is a wide body of research and full scale biofiltration systems that demonstrates that an empty bed contact time of 5-10 minutes can provide 10-20% TOC reduction. Oxidation (i.e., ozone) upstream of the biofilters will further enhance the TOC removal through the biofilters.

TOC Removal profiles in biofilters with low and high ozone dose (Melin and Odegaard, 2006) demonstrate effective TOC removal.

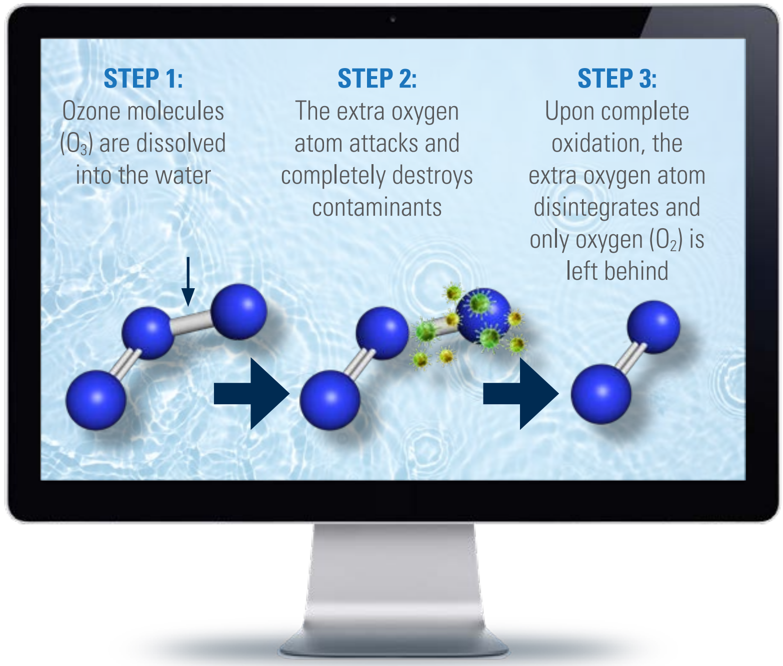




Ozone provides several water quality benefits and can be easily implemented to mitigate T&O and promote biofiltration

Raw water quality suggests a 2.0 log (99%) reduction of taste and odor compounds is necessary—this is not achievable with PAC alone. To address a variety of water quality and treatment challenges, we recommend considering ozone. Ozone is a strong oxidant that is highly effective at eliminating taste and odor events and will reduce residuals by eliminating the use of PAC. Combined ozone/peroxide systems can further enhance taste and odor oxidation in an even smaller contact basin footprint. Thornton's WTP (online) and Greeley's Boyd Lake WTP (in construction) utilize this approach, which ultimately reduced the size of their contact basins. We have designed many projects with ozone that have proven to provide an array of water quality benefits including:

- Oxidation of algal toxins (cyanotoxins, and microcystin).
- Oxidation of taste and odor compounds (Geosmin and methylisoborneol (MIB)).
- Oxidation of manganese.
- Reduction in color.
- Breakdown of natural organic matter—transformation of organic carbon (particularly recalcitrant organics) into assimilable organic carbon is beneficial for biological filtration. When dosed at sub-residual concentrations, it can provide effective oxidation with minimal to no byproduct formation (bromate) and no additional treatment solids/residuals that require dewatering and disposal. Carollo can conduct ozone and ozone/peroxide demand and decay testing as well as byproduct formation testing at our Water Applied Research Center (ARC®).



Schematic representation of how ozone attacks contaminants and organics.

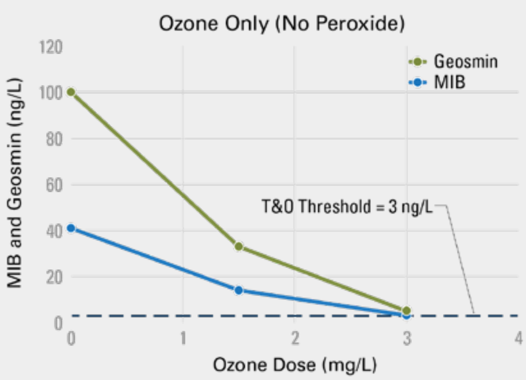
The fundamental chemical used in an ozone system is liquid oxygen (LOX). LOX is a very inexpensive and readily available chemical with numerous suppliers across the Front Range. Comparing the annual cost of treatment between ozone and PAC, ozone is significantly less expensive when looking at overall chemical and power costs.

Outdoor LOX Tank installation at the Colorado Springs Utilities Bailey (SDS) WTP.

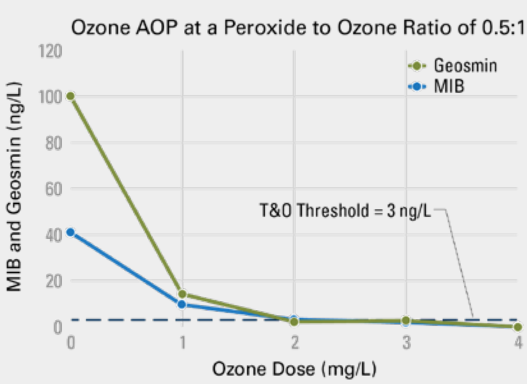
Parameter	Ozone	PAC	Notes
Cost per lb	$0.04	$1.00	PAC costs range from $0.80 to $1.20 per lb
Annual Chemical Cost	$10,100	$240,000	Assumes an ozone does of 2 mg/L and PAC dose of 20 mg/l
Annual Power Cost	$10,700	$15,900	Assume $0.10/kWh
Total O&M Cost	$95,800	$263,500	Assume 8 mgd for 180 days/year
Capital Cost	$1,500,000	$0 (assumed to be existing as of 2021)	LOX Tank and Ozone equipment only, ozone to be included in new filter building
Total Present Worth Cost	$1,810,000	$3,960,000	Based on 20 year life cycle cost at 3% interest rate

Factoring in capital costs and life-cycle costs, an ozone system will improve chemical handling and will be less expensive than operating PAC, with a return on investment of ~10 years.

At Greeley, ozone by itself required a dose greater than 3 mg/L to reach the T&O threshold.



By adding 0.75 to 1 mg/L of peroxide, the ozone dose for Greeley was reduced to 2 mg/L.



Optimizing the ozone system design provides cost-effective, robust treatment

As previously stated, ozone is a strong oxidant and it will serve the Town well for improving water quality, treatment reliability by producing a more filterable water, and residuals by eliminating the use of PAC (reducing plant O&M costs). While ozone alone has benefits, there are proven approaches that achieve water quality goals for this project.

Combined ozone/peroxide systems can further enhance taste and odor oxidation in an even smaller contact volume compared to ozone alone. Both Thornton and Greeley utilized this approach at their new facilities, which ultimately reduced their required ozone doses for T&O treatment by greater than 50 percent and shortened the required contact chamber detention time from 15 minutes to 5 minutes.

We have proven this concept with bench-scale testing at Carollo's industry-exclusive Water Applied Research Center (Water ARC®) facility at three Front Range utilities in the past three years. The ozone demand characteristics are unique for each water source and bench testing can be quickly completed to determine the right size of the new facility, such as ozone demand, dose optimization for taste and odor compound destruction, optimal peroxide-to-ozone ratios, and impacts on potential bromate formation. Based on our recent testing, ozone/peroxide is not only a more efficient taste and odor approach, but it effectively mitigates bromate formation compared to ozone only systems.

Recent bench testing we did for the City of Greeley and Centennial Water and Sanitation District showed that ozone by itself was less effective at oxidizing T&O compounds compared to ozone and hydrogen peroxide. The production of free radicals effectively and efficiently treats MIB and geosmin.

Expandability to accommodate future plant capacity increases

Capacity expansion and master planning the site is critical for near-term and long-term success

The Town is growing, and the added capacity of the current project will soon be outpaced by demand, requiring additional plant expansion. The current project must consider near-term and long-term capacity to address system demands with reliable treatment and provisions to make the next phase of expansion less costly and more efficient. Carollo has devised an approach that will support near term expansion of treatment capacity by adding a new filter facility which sets the Town up for flexible plant capacity increases. Incrementally, the first phase includes the addition of four new filters, which can be initially permitted at 5 gpm/sf, streamlining the regulatory approval process. The stand-alone new filter building would also allow for construction to occur with minimal disruption to plant operations. Full scale demonstration testing (as our team successfully conducted for Longmont's Nelson Flanders WTP) can provide additional filter capacity without additional infrastructure.

To meet the ultimate plant capacity of approximately 20 to 24 mgd, new pretreatment would be required with two additional filters. To fully master plan the site, we have also included considerations for a new chemical facility, however this is not something that would need to be included in the near-term. Our initial concept for the JWTP site is shown on the following page.

Parameter	Phase 1*	Phase 2	Phase 3
Total Number of Filters	4	4	6
Loading Rate (gpm/sf)	5	7	7
Flow per Filter (mgd)	2.9	4	4
Total Filter Capacity (mgd)	11.5	16	24
Empty Bed Contact Time (minutes)	8.2	5.9	5.9

*The existing filters could be maintained to supplement available filter capacity prior to rerating of the new filters in Phase 2.

Our approach includes addressing immediate plant capacity expansion and includes provisions for future expansions, when the time is right

Proposed concept for new biofilters. This all-in-one facility would include a new ozone system, biofilters, UV disinfection, and backwash supply pumps.

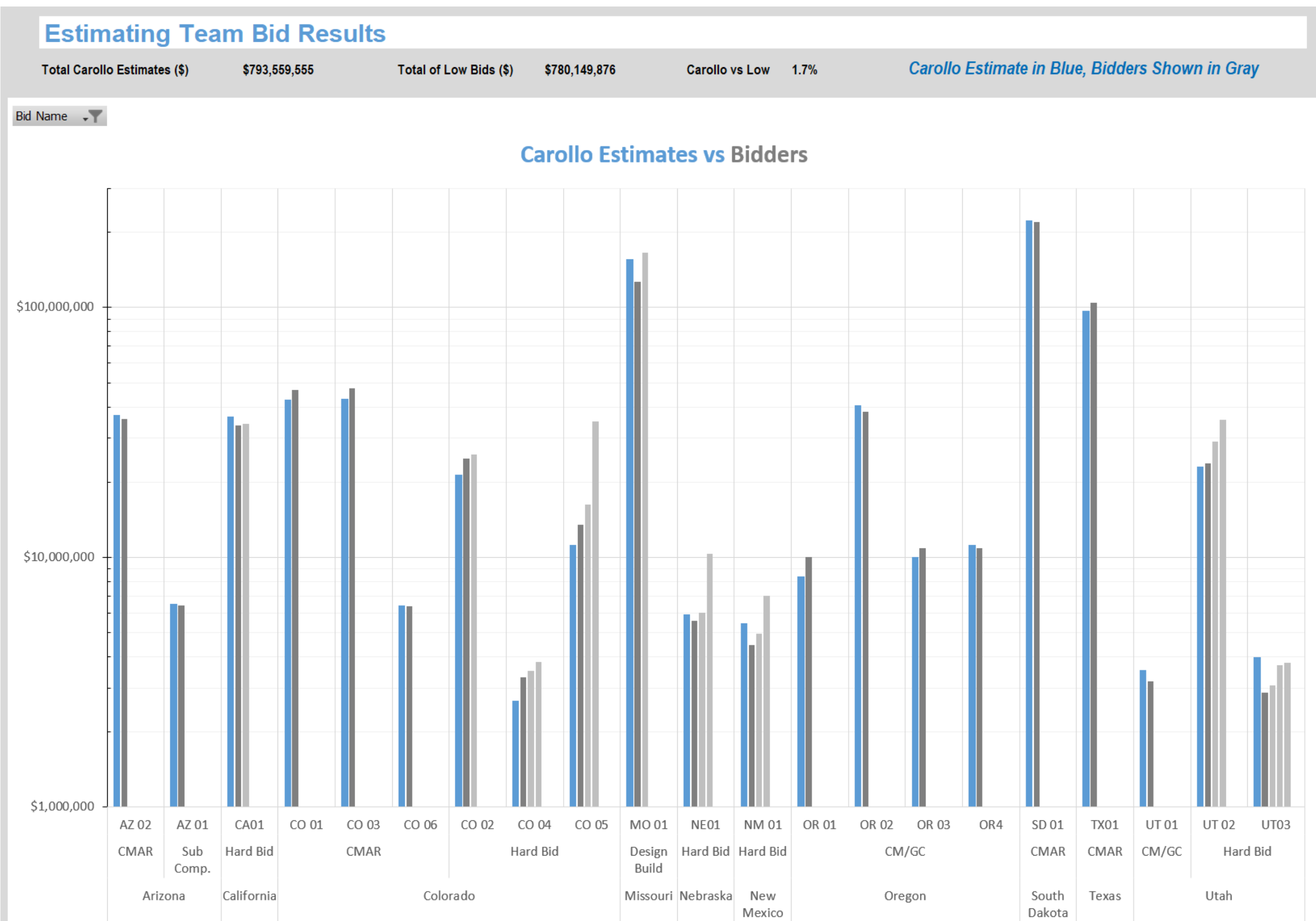
Confidence in cost estimating supports decision making and planning

Expansion of the JWTP includes many components that will likely exceed the project budget envisioned in the 2015 master plan. Early cost certainty will allow the Town to plan for and acquire project funding.

Carollo's approach to cost estimating is specifically designed to replicate the pricing methods used by general contractors. We estimate costs with confidence thanks to the establishment of a dedicated team of full-time estimators in our Broomfield office who have all gained the majority of their professional experience working for general contractors or specialty subcontractors that focus on the water/wastewater market. This experience allows our team to not only anticipate the proper level of effort based on the complexity of the work, but anticipates a contractor's procurement strategy, both of which are critical to predicting project costs. Our team also understands the importance of early cost certainty and works to not only price what is shown in the preliminary engineering documents but also what experience tells us will be required to construct the intent of the design.

Our team has implemented the use of industry-standard estimating software (Sage Estimating) and other quantity surveying tools that add quality and consistency to the cost estimating process. These tools allow us to more accurately identify project cost drivers and prioritize budgetary pricing requests from the market. Experience has shown that this approach is superior to relying on published pricing manuals created for the general construction industry. Carollo offers unique, construction-based cost estimating resources based in our Broomfield office that can provide you with reliable estimates that reduce bid day stress.

> Recent estimates by our Broomfield-based estimating team have been right in line with bids on bid day or CMAR pricing



Carollo's local team can provide the Town with early certainty and project funding alternatives

Early Cost Certainty

We understand there is limited funding as this project was not foreseen. Our team's commitment is to establish cost certainty early in the project. To achieve this we will:

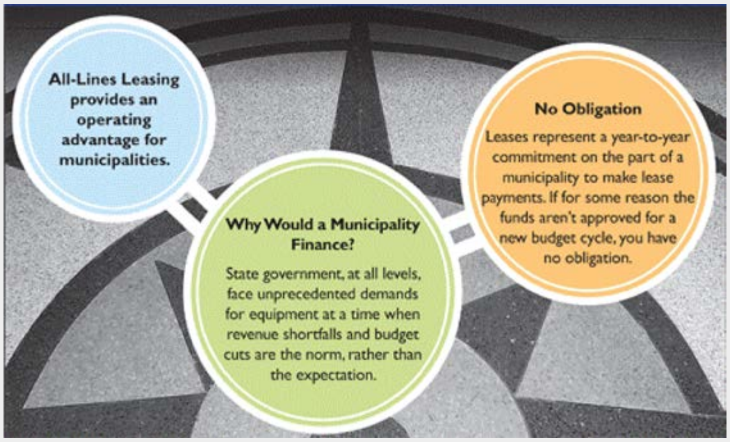
1. Provide Transparent Estimating – The Carollo Team embraces a true "open-book" cost process that develops a baseline early in planning, and documents any deviations. You will always know the budget, allowing you to make informed decisions on adding or deducting as needed. The most recent project costs are always at your fingertips!
2. Procure Equipment Early – Procuring the long-lead equipment with performance specifications following the process selection establishes equipment costs and allows design team to be more efficient.

Financing Approach

We will evaluate with you and document in the Basis of Design Report, the potential financial strategies to reduce or eliminate your up-front capital investments. Our team has established partnerships with a variety of funding providers and options for your considerations:

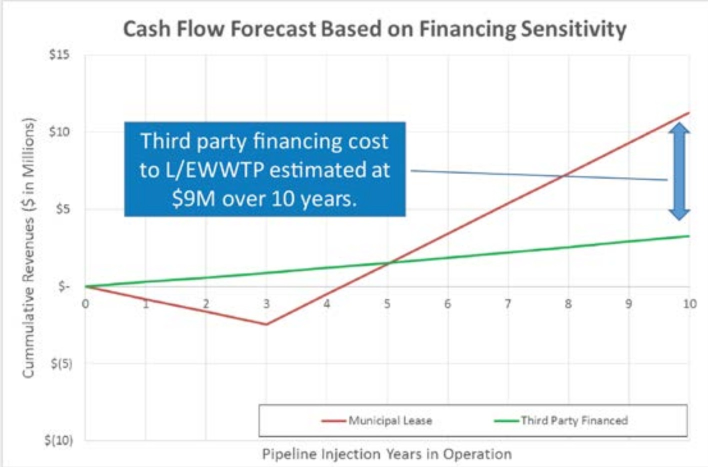
1. Private Equity Funding – Carollo has recent partnerships with Graham Financial and the Carlyle Group to provide private equity funding as needed. We realize this may be an opportunity for you to off-set the capital costs of the project. In our experience this type of financing adds a 15 to 25 percent premium to the long-term costs of the project.
2. Tax-Exempt Financing – Carollo has worked with David Clamage at Saulsbury Hill in evaluating tax-exempt financing options for Colorado projects. Outside of SRF funding or self-funded, this will be the least expensive option for financing the project.
3. Short-term equipment leasing – Depending on the technology evaluation, the equipment providers may have short-term leasing arrangements that could be considered.

Multiple Lease Financing Provides Best Value Solution With Optimal Risk Profile



- Common financing tool
  - State of Colorado
- No upfront capital $
- Annual lease payments
- Risk managed
- Termination w/o penalty

Third Party Financing Reduces Financial Benefit And Requires Long-Term Agreement



Saulsbury Hill and Carollo recommended tax-exempt financing to Englewood's South Platte Renew Treatment Facility to finance their $8 million dollar Biogas Project. Saulsbury Hill Financial is a finance company specializing in municipal leasing and energy performance contracting for Colorado municipalities.

Project delivery approach matters, and Carollo is prepared to guide the Town on alternative delivery options

Time is off the essence and Carollo's team has the necessary experience to collaborate with and advise the Town on deciding how to best delivery this project with an accelerated schedule. The 2015 master plan under-predicted the rapid growth the Town has experienced over the past couple of years. The implementation of plant capacity expansion must happen as quickly as possible, without losing sight of the important treatment considerations such as taste and odor, and TOC removal. Design-bid-build (DBB) is the typical project delivery approach, which relies on a close working relationship between the Town's project team and the engineer/designer. The owner maintains ultimate control in design decisions throughout the process and although this is the best way for the Town to maintain competitive bid-pricing for the project, it comes at a cost—the schedule. The DBB delivery approach takes the longest to complete from start of design to completing construction. Not only is there more time required during design, but there is also several months allocated for bidding and award.

Carollo understands that the Town is also considering ways to accelerate the implementation of the expansion project. Construction Manager-At-Risk (CMAR) is an alternative project delivery approach that is commonly implemented by many Front Range utilities. Our team has recently worked on CMAR projects for Greeley, South Adams County Water and Sanitation District, and Denver Water. This delivery approach provides the most benefit to the Owner when the project requires complicated retrofits of existing facilities where sequencing and constructability are critical success factors. Without active cost review oversight, this delivery approach may result in non-competitive pricing, challenges your ability to influence the design, and typically results in total project cost that is 5-7% higher than DBB. With the Town selecting an engineer at the onset of the project, this alternative approach would be the most straightforward option to pursue should you decide to accelerate the project schedule.

Design-Build (DB) and Progressive Design Build (PDB) are most commonly associated with alternative delivery and Carollo is also well versed in the many flavors of DB. Carollo has the in-house capability to lead a DB team on this project, should the Town decide at a later date to implement this approach (presumably in the PDB model). Fixed price DB is likely not a viable delivery option for this project since the scope of the project is not specifically defined. Fixed-price DB also does not offer the Town with the level of design input that you are interested in providing for the JWTP improvements.

Combined, your team leads, Jason Assouline and Vincent Hart, have experience in every type of delivery model. This kind of expertise and experience will benefit the Town in selecting the right delivery model for your needs.

Jason's Experience

Design-Bid-Build	**Aurora's Binney WPF** ($192 million) **Santa Fe's Canyon Rd. WTP** ($15 million) – Process Lead or Project Manager for numerous projects in the past 10 years
CMAR	**Greeley's Boyd Lake WTP** Upgrades ($16 million) – Project Manager **Denver Water's Northwater Treatment Plant** (through 30%) ($475 million) – Process Lead for floc/sed and chemical facility
Fixed Price DB	**Buckman Direct Diversion WTP** ($230 million) – Treatment Plant Operator **Davis-Woodland WTP** ($230 million) – Process Lead
CMGC	**Denver Water's Foothills** CCB and Chemicals Improvement Project ($35 million) – Process Lead

Throughout his career, Jason has gained experience in different project delivery models. In addition to many design-bid-build projects he has most recently worked with the City of Greeley on the Boyd Lake WTP Process Improvements project, which is being delivered as a CMAR.

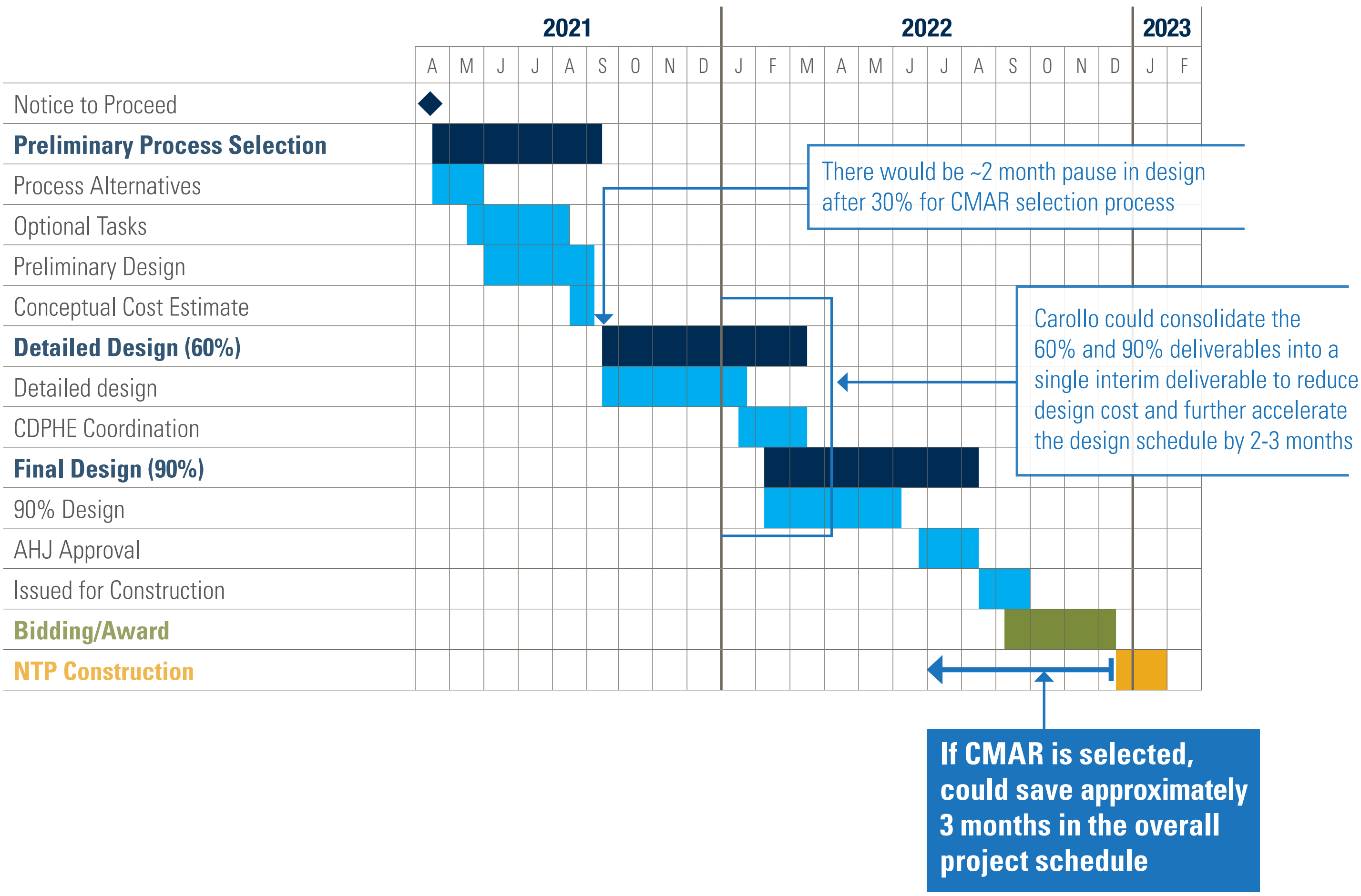
Vinnie's Experience

Design-Bid-Build	Project Manager on more than **$250 million in construction** in the past 10 years
CMAR	**South Adams Water and Sanitation District** Pellet Softening Project ($42 million) – Project Manager
Fixed Price DB	**City of Westminster Northwest WTP** ($22 million) – Project Engineer with another firm
Engineer Led Fixed Price DB	**Pinellas County, FL** FOG Project ($1 million) – Project Manager
30% GMP Progressive DB	**City of Olathe, KS Northwest WTP** ($22 million) – Project Manager
60% GMP Progressive DB	**Clifton Water District, CO** Microfiltration Project ($15.5 million) – Project Manager
100% GMP Progressive DB	**Colorado Springs, CO Bailey (SDS) WTP** ($124 million) – Project Manager
Owner's Advisor	**City of Houston, TX** Northeast WTP ($1,600 million) **City of Thornton, CO** Thornton WTP ($100 million) **East Cherry Creek Valley, CO North WTP** Phase 2 Expansion ($34 million)

Vinnie has been project manager on more than $200 million in alternative delivery projects that cover the range of delivery mechanisms. He can provide the Town with details of each type of project delivery allowing you to pick a mechanism that best meets your needs.

Project Schedule Considerations

Developing a realistic schedule is another important project consideration. We understand the urgency in implementing solutions that can expand the treatment capacity of the JWTP, however promising a schedule that does not fully account for feasibility to design solutions that will meet all of the Town's needs could ultimately lead to higher overall project costs, unanticipated delays, and a system that simply does not work. Below is our initially proposed schedule which sets the course for the project with rapid initial coordination and process selection with the Town. By the end of the summer, we could have a well thought out preliminary design and reliable cost estimate from which the Town can decide how to best proceed with the project (design-bid-build, accelerated design, or CMAR). Our team is flexible and prepared to support the Town in deciding how to best deliver the project.



SECTION

3 Management Approach

A Proactive Approach to Project Management

It All Starts with a Good Plan

In every project there are numerous details to address and decisions to be made. It's our job to deliver key information based on sound planning and analysis principles in accordance with the project schedule. By so doing, we put the entire project team—Johnstown and our Carollo Team—in the best position to finalize the details and make credible, defensible decisions for the WTP Expansion Project.

Managing a project is a lot easier when everyone works as a team, and the team works best when everyone understands the "game plan." To make sure that everyone knows the "game plan", the team works together at the onset of a project to develop a Project Management Plan (PMP). The PMP sets goals and expectations for the project, as well as defines assignments and responsibilities to Johnstown and Carollo project team members.

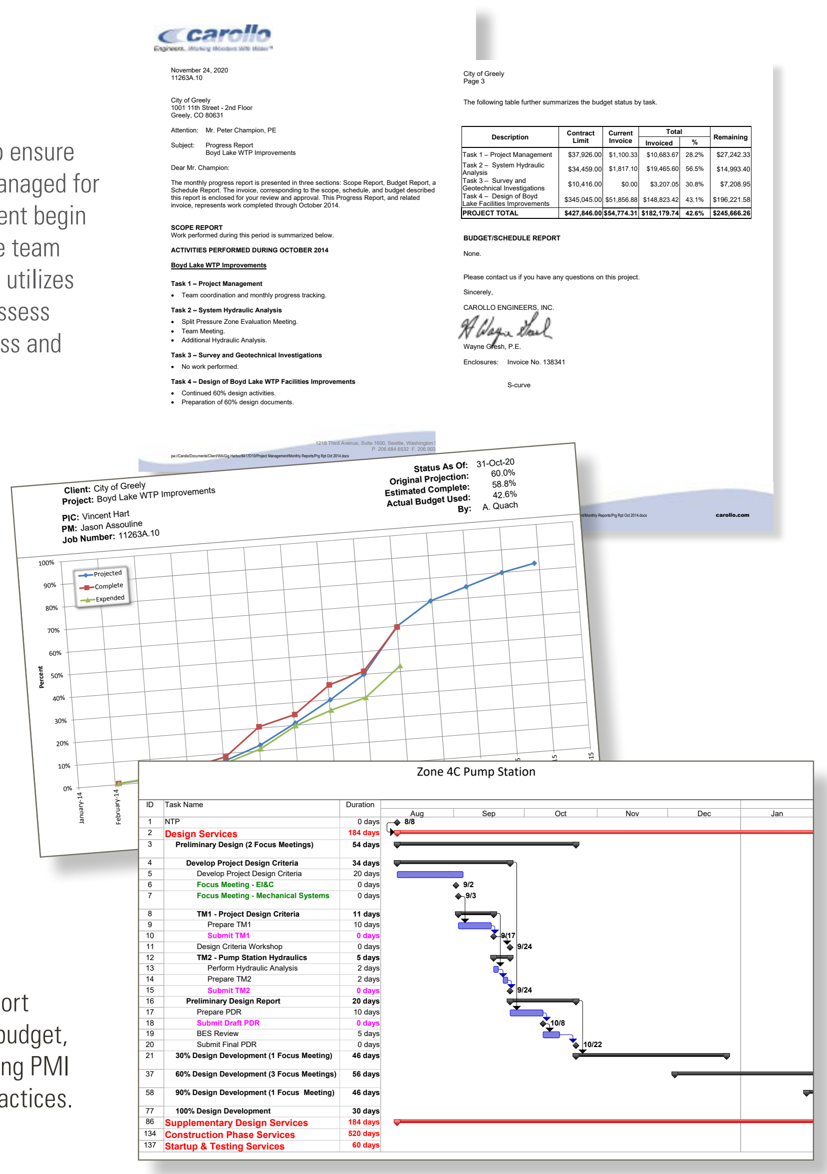
The PMP not only sets roles and responsibilities for the team, but also establishes the control measures to manage cost, schedule, and scope. The benefit to the Town is that everyone knows who, what, when, and the level of effort anticipated for each deliverable. The PMP will serve as our guide to develop the project on schedule, within budget, in a quality manner, and consistent with your goals and objectives.

1 Monitoring, Tracking, and Communicating Project Scope, Schedule Cost, and Progress

We bear the responsibility and accountability to Johnstown to ensure that our team's scope, budget, and schedule are effectively managed for this project. We understand that schedule and cost management begin from the first day of project initiation in order to make sure the team member's tasks are aligned with the approved budget. Carollo utilizes earned value management analytical methods to accurately assess project budget and schedule status, as well as monitor progress and take appropriate corrective action, if required.

We develop a monthly report with our invoice that includes:

- **Scope Report.** A progress report of accomplishments, problems encountered or anticipated, a project decision log, and work scheduled for the next reporting period.
- **Cost Report.** A report with information on the current period and accumulated expenditures to date, approved not-to-exceed fee, estimated cost for completion, and a comparison of the latter two to show any variation. This will include design or task percent complete versus project area as tracked by task order.
- **Schedule Report.** A report confirming 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.


carollo

November 24, 2020
11263A.10

City of Greely
1001 11th Street - 2nd Floor
Greely, CO 80631

Attention: Mr. Peter Champion, PE

Subject: Progress Report
Boyd Lake WTP Improvements

Dear Mr. Champion:

The monthly progress report is presented in three sections: Scope Report, Budget Report, a Schedule Report. The invoice, corresponding to the scope, schedule, and budget described this report is enclosed for your review and approval. This Progress Report, and related invoice, represents work completed through October 2014.

SCOPE REPORT
Work performed during this period is summarized below.

ACTIVITIES PERFORMED DURING OCTOBER 2014

Boyd Lake WTP Improvements

Task 1 – Project Management
- Team coordination and monthly progress tracking.

Task 2 – System Hydraulic Analysis
- Split Pressure Zone Evaluation Meeting.
- Team Meeting.
- Additional Hydraulic Analysis.

Task 3 – Survey and Geotechnical Investigations
- No work performed.

Task 4 – Design of Boyd Lake WTP Facilities Improvements
- Continued 60% design activities.
- Preparation of 60% design documents.

1218 Third Avenue, Suite 1600, Seattle, Washington
P. 206.684.6532 F. 206.903

City of Greely
Page 3

The following table further summarizes the budget status by task.

Description	Contract Limit	Current Invoice	Total		Remaining
			Invoiced	%	
Task 1 – Project Management	$37,926.00	$1,100.33	$10,683.67	28.2%	$27,242.33
Task 2 – System Hydraulic Analysis	$34,459.00	$1,817.10	$19,465.60	56.5%	$14,993.40
Task 3 – Survey and Geotechnical Investigations	$10,416.00	$0.00	$3,207.05	30.8%	$7,208.95
Task 4 – Design of Boyd Lake Facilities Improvements	$345,045.00	$51,856.88	$148,823.42	43.1%	$196,221.58
PROJECT TOTAL	**$427,846.00**	**$54,774.31**	**$182,179.74**	**42.6%**	**$245,666.26**

BUDGET/SCHEDULE REPORT

None.

Please contact us if you have any questions on this project.

Sincerely,

CAROLLO ENGINEERS, INC.

Wayne Gresh, P.E.

Enclosures: Invoice No. 138341
S-curve

carollo.com

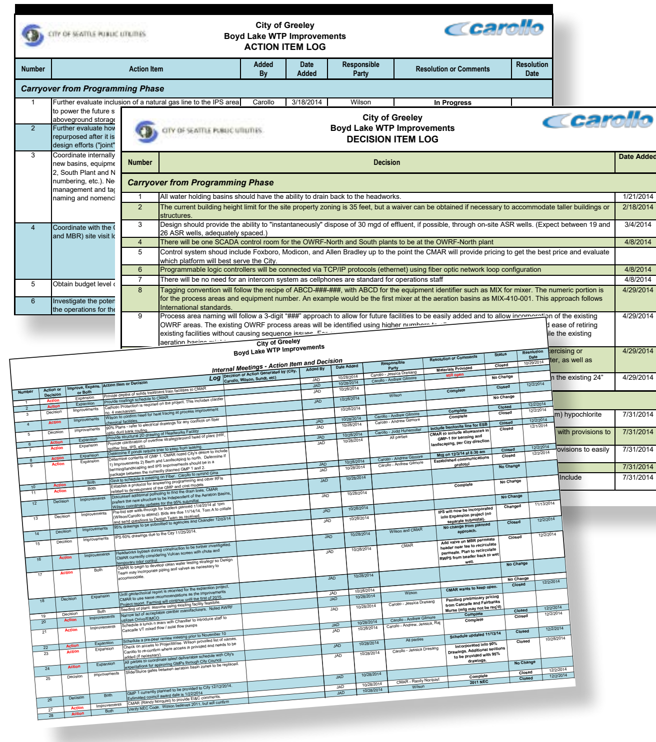
Zone 4C Pump Station

ID	Task Name	Duration
1	NTP	0 days
2	Design Services	184 days
3	Preliminary Design (2 Focus Meetings)	54 days
4	Develop Project Design Criteria	34 days
5	Develop Project Design Criteria	20 days
6	Focus Meeting - EI&C	0 days
7	Focus Meeting - Mechanical Systems	0 days
8	TM1 - Project Design Criteria	11 days
9	Prepare TM1	10 days
10	Submit TM1	0 days
11	Design Criteria Workshop	0 days
12	TM2 - Pump Station Hydraulics	5 days
13	Perform Hydraulic Analysis	2 days
14	Prepare TM2	2 days
15	Submit TM2	0 days
16	Preliminary Design Report	20 days
17	Prepare PDR	10 days
18	Submit Draft PDR	0 days
19	BES Review	5 days
20	Submit Final PDR	0 days
21	30% Design Development (1 Focus Meeting)	46 days
37	60% Design Development (3 Focus Meetings)	56 days
58	90% Design Development (1 Focus Meeting)	46 days
77	100% Design Development	30 days
86	Supplementary Design Services	184 days
134	Construction Phase Services	520 days
137	Startup & Testing Services	60 days

Our monthly progress report includes detailed scope, budget, and schedule updates using PMI and best management practices.

2 Monitoring, Tracking, and Resolving Issues and Concerns in a Timely Manner

Similar to the tracking, documenting, and resolution of scope, schedule, and budget concerns, tracking and resolving project issues in a timely manner will be critical to the overall success of this project. We will accomplish this effort by effectively using action, issue, and decision logs to track those elements that affect the progress of the project and will communicate any issues to Johnstown as part of our monthly status reporting.



Supplemental project logs (action items, decisions, etc.) are critical tools to deliver a successful project.

3 Ensuring accuracy of Project Status Reports

Our team believes in the importance of quality project status reports and deliverables, particularly as they relate to the large proportion of work being completed by a diverse team of specialists. Our approach to quality is based on defining our Quality Management (QM) expectations upfront and applying the right reviews at the right time to ensure that the project starts off correctly and ends successfully. We have defined our quality management goals as:

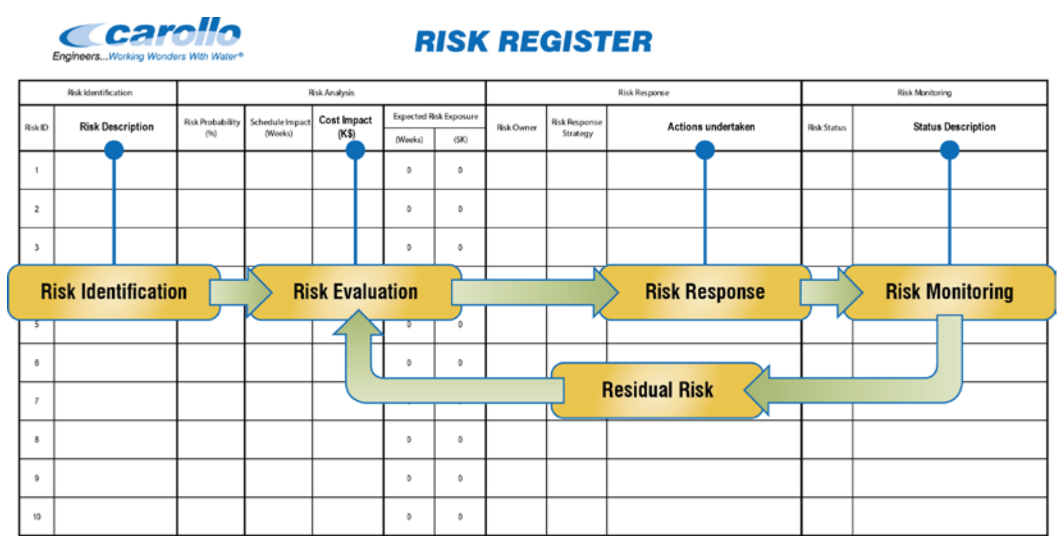
- Minimizing errors and omissions in all work products.
- Controlling design and construction costs by "doing it right the first time."
- Maintaining schedule and permit compliance through efficient delivery.

To achieve these goals and to meet our own quality expectations, we will regularly report in our project status report the status of the specific deliverables from each task, a log of review comments, changes made, and supporting documentation.

4 Managing and Communicating Risks to Johnstown

The PMP will include a Risk Management Plan that describes the risk management processes and approach we will use for this project. This guidance documentation is essential to proactively facilitate the resolution of challenges that need direction from Johnstown and the project team to control cost and provide schedule compliance. It will be accompanied by a collaboratively developed Risk Register that identifies and describes each risk, scores them for likelihood and consequence, and shows planned mitigation, avoidance, and monitoring measures.

Our approach will seek to identify and obtain consensus by project stakeholders on critical decisions at the earliest possible date. Throughout the project, the Carollo Team will continue to identify and evaluate the individual project risks associated with cost, schedule, quality, and/or safety.



5 Communication Plan – Ensuring Team Members Interact Effectively

Our communication plan is centered on avoiding surprises through effective communication. Carollo knows the value of listening to our clients and the community and recognizes that successful projects result from our staff working as an extension of your staff. This commitment to listening and valuing client input is the cornerstone of Carollo's 88 years of success. We take pride in the large number of clients with whom we have maintained continuing relationships. We have worked with some clients for over eight decades—validating the quality of our work, cost control, and ability to meet schedules.

Quality Control Procedures

Carollo's quality process begins at project initiation and continues through successful completion. Following task award, Carollo drafts a project-specific Quality Assurance/Quality Control (QA/QC) Plan and makes sure all project staff fully understand it, and in agreement with regard to implementation.

Adherence to QC checklists in our quality plan helps ensure that any non-conformances and deficiencies are identified, documented, corrected, and do not reoccur. In addition to review of work by senior engineers and professionals, our construction managers review and verify that the project team's construction documents are according to the requirements set forth in the contract and that construction constraints and sequencing is well defined.

Qualified specialists conduct routine internal audits on our project delivery. The audit process evaluates adherence to the QA/QC Plan and includes a review of how our staff and subconsultants are performing. They work with our project managers and technical leads to develop mentoring plans and/or provide more oversight when needed to improve quality.

Carollo's QA/QC process covers each phase of your project

The flowchart below summarizes key aspects of Carollo's QA/QC approach for each phase of the project.

PROJECTS START

- PM reviews Carollo's quality management manual
- PM reviews appropriate project flowchart
- PM prepares project management plan
- PM reports QA/QC milestones to quality manager

REPORT PHASE

- Technical experts perform baseline peer review
- PM reviews applicable past project examples
- PM reviews Carollo's guidelines for reports
- PEs and reviewers conduct reviews using checklists

DESIGN PHASE

- Technical experts perform peer review
- PM updates Carollo project management plan
- PM reviews Carollo's final design checking procedure prior to final check
- Quality manager performs 30%, 60%, and 90% checks and constructability check

CONSTRUCTION PHASE

- Quality Manager assigns staff to review submittal and RFI responses, as well as any design changes
- Design team performs walkthroughs of constructed facilities
- Process experts assist with start-up and commissioning

SECTION 4 Staff Qualifications

Staff Qualifications

The key driver behind any successful project is the project team. Our team comes equipped with the right design and alternate delivery experience and process expertise necessary for the Johnstown WTP Expansion Project. More importantly, our team understands the importance of open and interactive collaboration regardless of the project delivery approach selected, and will keep that as a top priority from day one.

TOWN OF JOHNSTOWN
"THE COMMUNITY THAT CARES"
EST. 1902
COLORADO

Principal-in-Charge
Vincent Hart, PE

Project Manager
Jason Assouline, PE

Design and Quality Lead
Tony Actis, PE

Technical Advisor
Vincent Hart, PE

Project Engineer
John Meyer, PE

PROJECT TEAM

Pipeline and Civil Lead
Jim Kriss, PE

Alternative Delivery Lead
Steve Lindemann

Cost Estimating
Jason Rozgony, PE

Project Funding
Cody Berg

Raw Water/Finished Water Pump Station Lead
Bart Giles, PE

Electrical/I&C Lead
Monte Richard, PE

Construction Support
Eric Gilmore, CCM

Structural Lead
Mark Keller, PE

Process Support - Biofiltration
Stephanie Riley, PhD

HVAC/Building Mechanical
Carter Biesemeyer, PE

Surveying
Chris Juliana[3]

Architectural
Greg Short[1]

Geotechnical
Steve Kuehr, PE[2]

ALL STAFF ARE LOCAL TO THE DENVER AREA

Key Team Member

Subconsultants
1- Short and Brennan Architects
2- Lithos Engineering
3- Precision Surveying & Mapping

Vincent Hart, PE

Principal-in-Charge
Technical Advisor

Broomfield, CO

With Vinnie as your principal-in-charge and the project's technical advisor, you are getting someone who has your best interest in mind from day one, and has the expertise and experience to help guide the team on the right solutions for your needs. He is known throughout the industry for his innovative and collaborative approach to cost-effective water treatment design solutions. If you tour facilities that Vinnie has supported and managed, you will notice something, they are all different and tailored to the client's needs—not a cookie-cutter design that is pulled off the shelf and recycled at different utilities. Vinnie brings 27 years of experience in the planning, design, and expansion of water supply, water treatment, and water distribution facilities. His areas of expertise include WTP design and operation, ozone and chemical feed, taste and odor, dual media filtration (including biological filtration) for drinking water, and Colorado regulations.

Relevant Experience

- Project director for 50-mgd Edward W. Bailey WTP Design – Colorado Springs Utilities, CO
- Project manager for the Boyd Lake 40-mgd WTP Process Improvements Design – City of Greeley, CO
- Technical advisor for the 44-mgd Joseph Blake WTP Phase I Improvements Design Services – South Adams County Water and Sanitation District, CO
- Quality reviewer for the CDPHE Technical Guidance Manual on CFD Modeling of Chlorine Contact Basins (Carollo prepared document).
- Owner's advisor technical expert for pre-treatment for the 320-mgd Northeast Water Purification Plant – City of Houston, TX

Professional Engineer

CO – PE.0034164
Also licensed in: KS, MO, MN, NC, NJ, TN

Certification

LEED Accredited Professional

Client References

Peter Bong | Water/Wastewater Superintendent
Centennial Water & Sanitation District
P| 303.791.0430 E| pbong@cwsdhrmd.org
Worked on the MGWWTP Phase I Improvements and JBWTP Phase I Improvement Projects

Peter Champion, PE | Water Systems Engineer
City of Greeley
P| 970.350.9319 E| peter.champion@greeleygov.com
Project manager for the Boyd Lake WTP Improvements and Boyd and Bellvue Residuals Study

Dan Dilts | Operations Superintendent
Colorado Springs Utilities
P| 719.668.4511 E| ddilts@csu.org
Worked on the Edward W. Bailey Southern Delivery System Water Treatment Plant Design-Build

Jason Assouline, PE

Project Manager

Broomfield, CO

Jason brings 17 years of experience and is a well-respected water treatment process engineer. With Jason as your project manager, you are getting someone who has the expertise and experience to help guide the team on the right solutions for your needs. He has particular expertise in the evaluation, design, and operation of flocculation/sedimentation, filtration, chemical systems, and solids handling systems, as well as advanced treatment for taste and odor and disinfection, including UV. Jason also brings invaluable experience relative to construction start-up and support, having served many roles on projects at Aurora's Binney Water Purification Facility (WPF) and Denver Water Foothills Treatment Plant.

Relevant Experience

- Design Manager and Technical Lead for the Boyd Lake 40-mgd WTP Process Improvements Design – City of Greeley, CO
- Project manager for the 44-mgd Joseph Blake WTP Phase I Improvements Design Services – Centennial Water and Sanitation District, CO
- Project manager and process lead for numerous design projects at the 80-mgd Wemlinger WPF, 80-mgd Griswold WPF, and 50-mgd Binney WPF – City of Aurora, CO

Professional Engineer

CO – PE.0041631
Also licensed in: FL, NM

Client References

Frank Alfone | General Manager
Mt. Werner Water and Sanitation District
P| 970.879.2424 E| falfone@mwwater.com
Worked on numerous projects for the District.

Kevin Linder | Treatment Plant Supervisor
City of Aurora
P| 303.739.6750 E| klinder@auroragov.org
Worked on numerous projects at the Binney Water Purification Facility and other City of Aurora projects

Peter Bong | Water/Wastewater Superintendent
Centennial Water & Sanitation District
P| 303.791.0430 E| pbong@cwsdhrmd.org
Worked on the MGWWTP Phase I Improvements and JBWTP Phase I Improvement Projects

Tony Actis, PE

Design and Quality Lead

Broomfield, CO

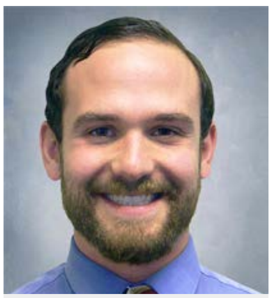
Anthony has nine years of versatile industry experience, with a primary focus on process and project engineering in water treatment. He has excellent communication skills and has adaptable technical aptitude. Anthony has acted as a project and process engineer on many water-focused projects. He also spent time working on process and facilities engineering and operations. He has demonstrated the ability to maintain positive working relationships with internal team members, clients, vendors, and construction subcontractors.

Professional Engineer

CO – PE.0054939
Also licensed in: FL

Relevant Experience

- Design manager/QC reviewer for the Red Mountain WTP Improvements – City of Glenwood Springs, CO
- Design manager for the 44-mgd Joseph Blake WTP Phase I Improvements Design Services – Centennial Water and Sanitation District, CO
- Project engineer and design manager for the Solids Separation Lagoon Improvements Study – Ute Water Conservancy District, CO



John Meyer, PE

Project Engineer

Broomfield, CO

John has worked on water treatment planning studies, benchtop and pilot testing, water treatment system designs, construction oversight, and treatment plant start-up and commissioning. John has recently served as process design engineer for the City of Greeley, Boyd Lake WTP Improvements project and brings a holistic understanding of facilities operation. As the project engineer, he will be responsible for the detailed design of all aspects of the project. He will work closely with Jason and the Carollo team to provide reliable, operations focused solutions.

Professional Engineer

CO – PE.0057176

Relevant Experience

- Project engineer for the Boyd Lake WTP Improvements – City of Greeley, CO.
- Project engineer for 50-mgd Edward W. Bailey WTP Design – Colorado Springs Utilities, CO
- Project engineer for the WTP Replacement – City of Thornton, CO

Jim Kriss, PE

Pipeline Lead

Broomfield, CO

Jim brings 28 years of infrastructure-related experience managing large pipeline design projects. He recently served as project manager for the $45 million Kings River Pipeline project for the City of Fresno, California, which consisted of 13 miles of 72-inch gravity flow pipeline through rural and urban areas. Jim also served as the design engineer for the Ute Water Conservancy District's Plateau Creek Pipeline Replacement near Clifton, involving 15 miles of 48/54 inch steel raw water pipeline along highway 65 and Plateau Creek. His experience includes more than 100 miles of pipeline design, all of which he helped guide the various permitting agencies and regulatory authorities to understand the nature of the project and potential impacts to the public and traffic control. Much of his experience has been right here in Colorado.

Relevant Experience

- Project manager for Eagle Bend Metropolitan District's Gun Club Raw Water Expansion.
- Project manager for Aurora's Segment 1E Interceptor Design.
- Project manager for Arapahoe County Water and Wastewater Authority's (ACWWA) Connecting Main and Control Vault Project.

Professional Engineer

CO – PE.0033808
Also licensed in: AZ, KS, NM

Client References

Denise Denslow | Project Manager
Eagle Bend Metropolitan District, CO
P| 303.903.9760 E| denise.denslow@claconnect.com
Worked on the Gun Club Raw Water Expansion Project

Kevin McBrien | Senior Project Manager
Arapahoe County Water and Wastewater Authority, CO
P| 303.790.4830 E| mcbrien@arapahowater.org
Worked on the Connecting Main and Control Vault Project

Chad Sell | Operations Superintendent
Colorado Springs Utilities, CO
P| 719.668.6504 E| csell@csu.org
Worked on the Edward W. Bailey Southern Delivery System Water Treatment Plant Design-Build

Steve Lindemann

Alternative Delivery Lead

Littleton, CO

Steve Lindemann is a knowledgeable and focused water professional who has been praised for his commitment to quality and efficiency. He has 30 years of experience with construction of water projects and more than 20 years of experience on design-build water projects throughout the United States and Canada. He brings a broad base of experience in all phases of project delivery.

Relevant Experience

- Superintendent for the Columbine (Wes Brown) WTP Renovation – City of Thornton, CO
- Deputy design-build manager for the Northern Treatment Plant – Metro Wastewater Reclamation District, CO
- Project engineer for the Marston WTP Filtration Improvements – Denver Water, CO

Professional Engineer

CO – PE.0043662
Also licensed in: CA

Bart Giles, PE

Raw Water/Finished Water Pump Station Lead

Broomfield, CO

Bart brings more than 15 years of experience in water and wastewater conveyance and treatment projects. His experience in various infrastructure planning and design is broad, including pipelines, lift and pump stations, and storage reservoirs. Bart is known for his hands-on, collaborative approach to project management. He has served on a number of small and large infrastructure projects across the Front Range for clients such as Aurora, CSU, Metro Wastewater Reclamation District (MWRD), and Centennial Water and Sanitation District.

Relevant Experience

- Project manager for the Zone 4C Pump Station – Centennial Water and Sanitation District, CO
- Project manager for the 80-mgd Wemlinger WPF CT Chamber Design – City of Aurora, CO
- Assistant project manager and lead civil engineer on the progressive design-build team for the Southern Delivery System Water Treatment Plant and Finished Water Pump Station – Colorado Springs Utilities, CO

Professional Engineer

CO – PE.0035713

Jason Rozgony, PE

Cost Estimating

Broomfield, CO

Jason has 25 years of experience in the water and wastewater industry, the majority of which has been full-time cost estimating for design, CMAR, design-build, and hard bid projects. He has been responsible for the development of corporate estimating standards, and has managed estimating staff across the United States. Jason has prepared discipline-level estimates and has led complete estimates for more than 150 design and fixed price construction projects requiring collaboration with design engineers, vendors, and subcontractor from preliminary through final design.

Relevant Experience

- Extensive resume of projects including lead estimator on 132 projects in the last three years.

Monte Richard, PE

Electrical/I&C Lead

Broomfield, CO

Professional Engineer

CO – PE.0042211
Also licensed in: AZ, CA, FL, HI, IL, ME, NY, OH, OR

Monte brings 17 years of experience in electrical and control system engineering and design. His focus is in electrical distribution systems, process control, and industrial instrumentation for water and wastewater facilities and infrastructure. Monte brings particular expertise in designing medium and low voltage power distribution, lighting, grounding, and electrical controls, as well as design of control systems. He works on a company-wide basis with plant operations and managers to test, start-up, optimize, and troubleshoot water treatment plants in Colorado and beyond. Monte was the project manager for the City of Aurora PLC conversion projects for the Griswold, Wemlinger, and Sand Creek facilities and played a primary roles in rewriting all of the process control narratives for these facilities.

Relevant Experience

- Lead electrical engineer for Denver Water's Northwater Treatment Plant (EI&C, Design Package 3), CO.
- Project manager for Aurora's Wemlinger WPF, Griswold WPF, and Sand Creek WRF PLC Replacement and Improvements Projects, CO.

Stephanie Riley, PhD

Process Support – Biofiltration

Broomfield, CO

Stephanie earned her Ph.D. in Environmental Engineering Science from the Colorado School of Mines. Her area of focus is ozone and biofiltration applied to drinking water and reuse with expertise in pilot operation and research studies. She currently serves as a technologist assisting in water, reuse, and wastewater projects.

Relevant Experience

- Investigator for the Water Research Foundation project 4719: A biofiltration Guidance Manual for Rapid-rate Filtration Facilities
- Investigator for ozone, biofiltration, and granular activated carbon pilot testing for Water Research Foundation project 4833: Understanding the Impacts of Wastewater Treatment Performance on Advanced Water Treatment Processes and Finished Water Quality.
- Investigator for WRF project 4958: New Techniques, Tools, and Validation Protocols for Achieving Log Removal Credit Across Nanofiltration (NF) and Reverse Osmosis (RO) Membranes.

Eric Gilmore, CCM

Construction Support

Broomfield, CO

Certifications

Certified Construction Manager

Eric is an advisor and construction manager with more than 28 years of experience building water and wastewater conveyance, storage, and treatment facilities. His responsibilities include all aspects of program management, construction management, and contract administration on behalf of the Owner. This includes oversight of contractors, issue resolution, change order review, and overall safety and quality assurance.

Relevant Experience

- Construction manager for the Bermuda 2538 Zone Pumping Station – Las Vegas Valley Water District, NV
- Construction oversight manager for the Northern Treatment Plant Progressive Design-Build Project – Metro Wastewater Reclamation District - Denver, CO
- Program construction manager for Southwest Water Reclamation Facility Project – City of Henderson, NV

Professional Engineer

CO – PE.0042976
Also licensed in: AZ, CA, TX

Certifications

LEED Accredited Professional

Carter Biesemeyer, PhD

HVAC/Building Mechanical

Broomfield, CO

Carter is a mechanical engineer with more than 17 years of experience in design of mechanical systems for water and wastewater projects. His background focuses on equipment facilities spanning the drinking water process from surface and ground water systems, to drinking WTPs up to 160 mgd. He also serves as Carollo's quality management lead for the Midwest region, putting him at the forefront of quality management procedures and coordination efforts. His HVAC design efforts on the Wemlinger WPF HVAC Improvements project, combined with his keen eye for quality and sound design deliverables, will set this project up for success from day one. Carter is located in Broomfield, Colorado.

Relevant Experience

- Project manager for Aurora's Wemlinger WPF HVAC Improvements project, CO
- Mechanical engineer/HVAC lead during start-up for Colorado Springs Utilities' (CSU) 50-mgd Bailey (SDS) WTP project, CO
- Mechanical engineer/HVAC for Eagle River Water and Sanitation District's Avon WWTP Upgrades, CO

Cody Berg

Project Funding

Littleton, CO

Cody is an associate vice president with Carollo with 14 years of extensive experience in municipal finance. As a consultant and former employee at Denver Water, Cody understands both sides of the utility business. He routinely conducts multi-year financial planning, impact fee, bond feasibility, and cost of service rate, and charge studies throughout the Western U.S. He is currently active in industry associations, including the American Water Works Association (AWWA) National Rates and Charges Committee.

Relevant Experience

- Financial lead for the Business Plan and Importation Study – Central Iron County Water Conservancy District, UT
- Project manager for the Water, Sewer, and Stormwater Financial Plan and Rate and Tap Fee Study – Dominion Water and Sanitation District, CO
- Project manager for the Cost of Service Study – Colorado City, CO

Professional Engineer

CO – PE.0034300
Also licensed in: AR, ID, MN, MO, NE, ND, OK, OR

Mark Keller, PE

Structural Lead

Broomfield, CO

Mark has more than 26 years as a structural engineer with experience in project management, planning and execution of design, detailing, and construction phase services of large projects. Past work includes condition assessments for master plans and feasibility studies for preliminary design direction.

Relevant Experience

- Quality manager for structural improvements at the Boyd Lake Water Treatment Plant – City of Greeley, CO
- Structural engineer for the Pellet Softening Disinfection Improvements Project – South Adams County Water and Sanitation District, CO
- Structural engineer for the McCullough Filter Rehabilitation – Colorado Springs Utilities, CO

Greg Short

Architectural

Denver, CO

Licensed Architect

CO – ARC.00400008

Certifications

AIA, LEED AP, PMP

Greg is a principal with Short & Brennan, bringing more than 21 years of experience in architectural planning and design. He has developed countless architectural plans and designs for water and wastewater facilities. He and Carollo have a successful history working together from his involvement on Carollo-led projects including CSU's Bailey SDS plant and most recently, South Adams County Water and Sanitation District's Pellet Softening Design, Centennial W&SD Phase 1 Improvements, and Greeley's Boyd Lake WTP Process Improvements project.

Relevant Experience

- Architect for Greeley's Boyd Lake WTP Process Improvements Project, CO.
- Architect for South Adams County Water and Sanitation District's Pellet Softening Design, CO.

Chris Juliana, PLS

Surveying

Denver, CO

Professional Land Surveyor

CO – PLS.0031158

Chris is the President and founder of Precision Survey & Mapping, Inc., and is a licensed Colorado Professional Land Surveyor and has been surveying professionally since 1986. Chris' experience is vast and solid and includes many aspects of the surveying profession including large civil mapping projects, boundary surveys, hydrographic surveying, high definition surveying, and many types of utility projects. He has worked on countless Front Range projects—many of those with Carollo and will bring invaluable Front Range survey expertise to this project.

Chris understands that most of our projects include referencing previous old drawing sets, and he helps us with datum conversions on every project (Aurora's Wemlinger project was challenging in terms of datum shift).

Relevant Experience

- Survey lead for Thornton's Wes Brown WTP Improvements project, CO.
- Survey lead for CSU's 50-mgd Bailey (SDS) WTP Design-Build project, CO.

Steve Kuehr, PE

Geotechnical

Denver, CO

Professional Engineer

CO – PE.0024369

Steve is trusted geotechnical expert along the Front Range, bringing more than 38 years of experience. He specializes in geotechnical and tunnel engineering as it relates to water supply, sewerage, water resources, commercial, industrial, highway, bridge and land development projects. He has technical expertise in tunnel engineering, foundation engineering, slope stability, expansive soils, ground modification, retaining walls, landslide evaluation and repair, embankment dam design and groundwater collection trenches and cutoffs constructed by the slurry trench method. His in-depth understanding of Front Range soils and applicable geotechnical considerations will be invaluable on this project.

Steve has been our geotechnical engineer on more than 95 percent Carollo's Front Range projects. Our mutual understanding of how we do work lends itself to a very efficient relationship focused on our client's needs.

Relevant Experience

- Geotechnical lead for CWSD's Zone 4C Pump Station, CO.
- Geotechnical lead for Greeley's Boyd Lake WTP Improvements Project, CO.

This local project team is solely based in Colorado and has been instrumental along the Front Range helping utilities solve unique water challenges. We are dedicated to this project through every phase, providing continuity and efficiency. Equally important, we bring established and successful working relationships with our subconsultants, enabling seamless project coordination and delivery.

SECTION 5 Related Project Experience

Relevant Experience

Carollo "walks the talk" when it comes to collaborating with our clients on their projects. We consider ourselves an extension of your staff—with you in the driver's seat.

The following pages provide just a sampling of Carollo's local experience with water treatment design challenges similar to the Town of Johnstown. Our team's relevant experience in the last 10 years, both inside and outside of the region, is extensive. All five of these projects are relevant to Johnstown and involve WTP improvements and associated pipeline infrastructure. We invite you to contact these references so they can attest to the value and level of service that we consistently provide.

ACCOMPLISHMENTS

- Relevant processes (pre-treatment, ozone, biofiltration, and finished water pumping).
- Delivered the engineering plans and specifications in one year.
- Team provided performance guarantees for the project including finished water quality.
- CDPHE review process had minimal comments
- Consolidated project approach that saved $35 million (compared to the original 30% design).
- 67 mgd of finished water pumping and 2,600 ft of 42-inch, and 2,300 ft of 60-inch transmission piping.

RELEVANCE TO JOHNSTOWN

Ozone/Biofiltration, Accelerated Alternate Delivery, High-Rate Filtration, Pump Stations

Edward W. Bailey Southern Delivery System Water Treatment Plant Design-Build

Colorado Springs Utilities, CO

Carollo Engineers was the designer, as part of the DB team, on a progressive design-build (PDB) project for the Colorado Springs Utilities 50-mgd Bailey Water Treatment Plant and Finished Water Pump Station.

The plant receives and treats surface water from Pueblo Reservoir to meet Colorado Springs Utilities' growing potable water needs and to provide resiliency. The fast-track DB project required significant planning and coordination between the design team and contractor to meet the schedule demands (including potential liquidated damages on engineering) and integrate with related raw and finished water conveyance projects.

Project Details

The treatment process included rapid mix, vertical flocculators, parallel plate sedimentation with hoseless solids collection, side-stream ozonation with an innovative ozone contactor design (minimizing footprint and maximizing contact time), deep-bed high-rate (10 gpm/ft2) biofiltration, unchlorinated backwash water, and a 7 million gallon finished water tank.

The chemical feed facility included coagulant, sodium hypochlorite, hydrogen peroxide, phosphoric acid, polymers, sulfuric acid, and a softened water system (for chemical dilution). The finished water pump station includes four 700-hp pumps, three 400-hp pumps, and two 350-hp backwash pumps. Design included surge mitigation measures, a major highway crossing, and temporary discharge facilities. Carollo provided startup and commissioning services and operated the plant for six months.

Client Reference

Dan Dilts, Operations Superintendent
P. 719.640.0807

Capacity of Project:

50 mgd

Completion Date:

April 2016

Design and Construction Cost:

Contract Value - $11.35M
Construction Cost - $124M

Firm's Role:

Design Engineer for final design and construction

Team Involvement

Vinnie Hart – Design Manager
Bart Giles – Project Engineer
Carter Biesemeyer – HVAC & Plumbing
Steve Kuehr – Geotechnical
Chris Juliana – Surveyor
John Meyer – Start up Assistance

ACCOMPLISHMENTS

- Use of ozone/hydrogen peroxide reduced costs (compared to ozone only) and reduced ozone generator capacity by 50 percent.
- Achieved T&O reduction from MIB and Geosmin from 100 ng/L to 3 ng/L with an ozone dose of 2 mg/L and a hydrogen peroxide dose of 1 mg/L.
- New chemical building will eliminate chlorine gas and alleviate the current sodium hydroxide storage and feed issues.

RELEVANCE TO JOHNSTOWN

Ozone+H2O2, eliminate 30 mg/L of PAC, Conversion to biofiltration, CMAR

Boyd Lake WTP Process Improvements Design

City of Greeley, CO

Innovative Project to Address SOURCE WATER without PAC, Ozone Oxidation of Taste and Odor, and New Chemical Facility

$16M
(phase funded)

Through a collaborative CMAR process with the City of Greeley and Hydro Construction, Carollo has developed process improvements that address the numerous project goals by implementing a source water aeration system, advanced oxidation with ozone and hydrogen peroxide, and conversion of conventional filters to biofiltration at this 40-mgd facility.

Extensive jar testing was conducted both at the Boyd Lake WTP as well as at Carollo's Water ARC® bench testing facility. Water ARC® performed ozone, ozone + peroxide, and disinfection byproduct testing to confirm the selected process modifications would achieve the project goals.

Project Details

Carollo designed a new chemical facility to eliminate chlorine gas, improve operational safety and increase storage capacity for new and existing chemicals. The new chemical facility includes hydrogen peroxide for the advanced oxidation process, sodium hydroxide to replace the existing (outdoor) system, and sodium hypochlorite to replace the existing chlorine gas cylinder system. Modifications to the existing alum (outdoor) system was also included to improve the safety and increase storage capacity of the process-critical chemical.

The Boyd Lake WTP Process Improvements is a CMAR project with Hydro Construction. Carollo has completed the design and construction began in early 2020. Carollo delivered the project in close coordination and collaboration with both the City of Greeley and Hydro to incorporate input from all project participants. Carollo conducted evaluations of various process alternatives such as bulk sodium hypochlorite or on-site sodium hypochlorite generation and layout/siting options for the new facilities to best plan for future expansion and flexibility for future unknowns.

Client Reference

Peter Champion, PE
Water Systems Engineer / Project Manager
P. 970.350.9319

Capacity of Project:

40 mgd

Completion Date:

Design completed in 2019, construction is ongoing.

Design and Construction Cost:

Design and SDC fee - $2.1M
Construction cost - $16M

Firm's Role:

Design Engineering

Team Involvement

Vinnie Hart – Project Manager
Jason Assouline – Design Manager/ Technical Lead
John Meyer – Project Engineer
Bart Giles – Civil Lead
Jason Till – Structural Lead
Steve Kuehr – Geotechnical Lead
Greg Short – Architect

UNIQUE PROJECT REQUIREMENTS

- Narrative developed to maintain 12 alluvial wells to minimize surge to the pellet reactors which are sensitive to flow changes.
- Custom and constant head box to eliminate risk of underdrain blow-out.
- Cross-connection prevention with minimal backflow preventers (using air gaps).
- Largest pellet softening plant in the United States

RELEVANCE TO JOHNSTOWN

Filtration, CMAR project delivery, Expandability

Pellet Softening Design

South Adams County Water and Sanitation District, CO

Carollo was the design engineer for the $44.5 million dollar Construction Manager at-Risk South Adams County Water and Sanitation District's (SACWSD) Pellet Softening Design Project at the Klein Water Treatment Facility (KWTF). SACWSD's primary water source is a group of 12 alluvial wells with significant hardness in the water, which has caused customers to endure costs of frequent plumbing and water heater replacement as well as the addition of in-home water softeners. Carollo successfully pilot tested and designed pelletized softening and filtration. The project consists of pellet softening with sodium hydroxide, stabilization with carbon dioxide, chlorine contact for virus inactivation, dual media filtration. The building layouts were designed to include addition space for more pellet reactors and filters and the chemical feed and stabilization basin was designed for 18 mgd. The pellet softening system includes pellet reactors each with a diameter of 10 feet and an allowable flow range of 4 to 4.67 mgd.

This successful design project led to the construction of the 14 mgd pellet softening system, which is a full-scale, centralized process that is capable of treating up to 14 mgd to reduce calcium hardness in SACWSD's water supply. The project includes modifications to the existing plant as well as construction of new facilities.

Client Reference

Kipp Scott, Project Manager
7400 Quebec Street
Commerce City, CO 80037
P: 303.288.2646

Capacity of Project:

14 mgd (expandable to 18 mgd)

Completion Date:

Substantial completion - 3/10/2021

Design and Construction Cost:

Design & ESDC Costs - $6,966,000
Construction Costs - $44,525,000

Firm's Role:

Design and Construction Engineer

Team Involvement

Vinnie Hart – Project Manager
Jim Kriss – Civil
Jason Rozgony – Cost Estimating
Stephanie Riley – Startup & Commissioning
Carter Biesemeyer – HVAC/Building Mechanical
John Meyer – Piloting/Plumbing
Steve Kuehr – Geotechnical
Chris Juliana – Surveying
Greg Short – Architectural

Carollo designed horizontal directional drill crossings to minimize impacts to environmentally sensitive Piney Creek.

RELEVANCE TO JOHNSTOWN

- Planning, preliminary design, final design, and construction management.
- Pipeline routing analysis, design, permitting, and construction.
- Existing pump station improvements including pumps, valves, and transient control design
- Hydraulic modeling
- AACE Class 1 cost estimate.

Gun Club Raw Water Expansion

Eagle Bend Metropolitan District, CO

Carollo developed final design documents to expand the City of Aurora's raw water system to serve the Eagle Bend Metropolitan District's Heritage Eagle Bend Golf course. The new raw water source represents a renewable water supply for the golf course, eliminating its reliance on deep non-renewable groundwater sources. The raw water system expansion increased the maximum system capacity from about 800-gpm to 1,200-gpm, and required improvements to two significant conveyance elements: the Gun Club Pump Station and the raw water transmission pipeline.

Aurora's Gun Club pump station was equipped with two existing 50-HP pumps on across the line starters These pumps were replace with larger capacity 100-HP pumps, equipped with soft starters to help manage transients during pump startup and power failure. In addition, new pump control valves were programmed with slow opening and closing features to reduce pressure surges from rapid valve closure. Lastly, a surge anticipator valve was added from the pump discharge to suction side as a third pressure transient control measure.

The existing transmission pipeline delivers water to the City's Saddle Rock Golf Course. A new transmission pipeline and flow split vault was designed to split flow to also convey raw water to the Heritage Eagle Bend Golf Course. The new transmission pipeline designed as 12-inch PVC pipe, 8,200 feet in length, and included, two horizontal directional drills, pressure reducing and flow control vaults, and significant permitting including Aurora, Arapahoe County, E-470, and US Army Corps of Engineers.

Client Reference

John Bruneau
Project Manager
P: 303.328.7303

Capacity of Project:

1.73 mgd

Completion Date:

July 2020

Design and Construction Cost:

$584,000 Design & ESDC; $3.3M Construction

Firm's Role:

Planning, Preliminary Design, Design, and Construction Management

Team Involvement

Jim Kriss – Project Manager
Bart Giles – Project Engineer
Jason Rozgony – Cost Estimator
Steve Kuehr – Geotech

RELEVANCE TO THIS PROJECT

- Finished water pump station
- Variable frequency drives specifically designed for energy efficiency (rebate from Xcel received)
- 16 mgd capacity
- Less than 1% change orders

$7.7M
CONSTRUCTION

Zone 4C Pump Station

Centennial Water and Sanitation District, CO

Carollo performed a potable water distribution study for the District which recommended the installation of the Zone 4C Booster Pump Station. The station provides critical additional capacity to distribution zones 4, 5, and 6. When compared to similar stations within the District's system, the Zone 4C pump station increased efficiency by decreasing pump station headloss by over 90 percent. The efficiency of the new pump station qualified the District for large rebates from Xcel Energy, which provided significant offsets toward the capital construction cost as well as low long-term operating costs. As part of the study, a surge analysis was conducted for the pump station and distribution system. Based on the recommendations of the study, the District competitively procured design and construction management services and selected Carollo. The station was equipped with four (4) 350 HP horizontal split case pumps, steel pump manifolds (150 psi pressure rating), a surge tank for surge mitigation, and an emergency generator sized to power the entire pump station.

To achieve energy efficiency and minimize minor losses, Surge Buster tilted disc check valves and flow meters were installed on the discharge of each pump. The check valves rapidly close in the event of a power failure minimizing surge pressures as well. Individual pump discharge flow meters allow operators to periodically perform tests of each pump to determine installed curves and optimize pump efficiency without impacting pump station operation. The suction and discharge headers were designed to keep minor losses to a minimum and facilitate proper operation of the pumps for an energy-efficient design.

Client Reference

Ryan Edwards, Project Manager
62 W. Plaza Drive
Highlands Ranch, Colorado 80129
P: 303.791.0430 X: 4907

Capacity of Project:

16 mgd firm capacity

Completion Date:

Contract dates 2014 - 2016

Design and Construction Cost:

Design and ESOC costs - $1,327,000
Construction costs - $7,710,315

Firm's Role:

Prime Consultant for design

Team Involvement

Vinnie Hart – Project Manager (preliminary design) and Principal-in-Charge (design and construction)
Bart Giles – Project Manager (design and Construction)
Jason Assouline – Construction Support
Jim Kriss – QA/QC
Steve Kuehr – Geotechnical
Carter Biesemeyer – HVAC/Building Mechanical

Education

MS Hydrologic Science and Engineering, Colorado School of Mines, 2016

BS Chemical Engineering, Colorado School of Mines, 2011

Licenses

Professional Engineer, Florida

Professional Engineer, Colorado

Professional Affiliations

American Institute of Chemical Engineers

American Water Works Association

Anthony M. Actis, P.E.

Anthony Actis, a motivated and results-driven engineering professional, has nine years of versatile industry experience, with a primary focus on process and project engineering in water treatment. He has excellent communication skills and has adaptable technical aptitude. Prior to joining Carollo Engineers, Inc., Mr. Actis acted as a project and process engineer on many water-focused projects. He also spent time working on process and facilities engineering and operations, and has experience as a project engineer and field engineer for a variety of oil and gas projects. He has demonstrated the ability to maintain positive working relationships with internal team members, clients, vendors, and construction subcontractors.

Relevant Experience

→ Project engineer for the City of Glenwood Springs, Colorado, Red Mountain Water Treatment Plant Improvements. This project was an emergency fast-tracked design in response to the Grizzly Creek wildfire event of 2020. The design provided additional plant capacity and contingency unit processes to address increased turbidity and sediment removal from the Roaring Fork Source, No Name Creek, and Grizzly Creek. Additional design improvements included modernized and automated process equipment and controls to augment plant operations and ability to reach treatment objectives in emergency scenarios. Mr. Actis managed design team efforts and discipline coordination, designed and developed equipment configuration, developed technical specifications and contract documents, and coordinated vendor efforts. The overall design schedule for the project was limited to six weeks due to client schedule constraints; Mr. Actis led multiple internal QC review periods ensuring that design packages exceeded client expectations.

→ Project engineer for the Centennial Water and Sanitation District, Colorado, Joseph Blake Water Treatment Facility Phase I Design Services. This project entailed the evaluation and design of the replacement for rapid mix, flocculation, and sedimentation equipment, as well as a new chemical storage and feed facility. Mr. Actis served as design manager and coordinated design efforts across disciplines.

→ Project engineer and manager for Ute Water Conservancy District, Colorado, Solids Separation Lagoon Improvements Study. The goals of this project included assessing deficiencies and aging infrastructure associated with the District's earthen lagoons 1, 2 and 3, and examine retrofit options for lagoons 4 and 5 to allow for winter operation. Responsibilities included evaluation of historic plant data and record drawings to assess solids separation performance, investigate regulatory requirements for solids waste, and recommend plant infrastructure improvements and alternatives to improve plant operations.

→ Project engineer for the City of Tampa, Florida, David L. Tippin Water Treatment Facility (DLTWTF) Chemical System Improvements Progressive Design-Build. This project includes a new on-site sodium hypochlorite production facility, pipe/utility trench systems upgrades and additions, and a replacement ammonia system. Mr. Actis's responsibilities included design of a 300,000-gal sodium hypochlorite storage tank farm with 300+ gpm pressure loop to dose at multiple application points for plant production up to 140 mgd. His efforts included design team coordination between disciplines and management of storage and metering areas of the design. Mr. Actis developed hydraulic piping models for all systems; he sized and designed facility and equipment layout; and led specification and control narrative development for these systems.

→ Project engineer, task manager, and chemical systems design lead for the East Cherry Creek Valley Water, Colorado, Northern Treatment Plant Phase 2 Expansion. This project was an expansion of a 10 MGD 4-stage desalination drinking water treatment plant to 25 MGD. Mr. Actis was responsible for determining storage volumes and feed rates for a single facility that will also provide flexibility for additional future RO process phases. He led design efforts for the chemical systems and facility which included identifying design criteria and sizing equipment, drafting design reports for client submittals, equipment RFQ's and vendor communications, cross-discipline design coordination, specification writing, managing drafting efforts to create and revise PFD's, P&ID's, and mechanical sheets from conceptual design through 100% submittals and early construction. Mr. Actis coordinated chemical system design preferences and objectives at client meetings to ensure buy-in on design. He served as Resident Engineer through construction, which included submittal and RFI review, as well as construction oversight and inspection on behalf of the owner.

→ Project engineer and chemical systems discipline lead for the East Cherry Creek Valley Water, Colorado, 4-Stage RO Pilot System. This project was a RO pilot system in preparation for East Cherry Creek Valley's plant expansion from 10 MGD to 25 MGD. Mr. Actis was responsible for coordination of operations with plant operators, was regularly on-site to operate and troubleshoot the pilot system, and processed all operations data. Additionally, he drafted periodic status reports and provided successful recommendations for East Cherry Creek Valley to modify their full-size plant's chemical portfolio based on data analysis from the pilot system.

→ Project engineer and task manager for the City of San Jose, California, Bureau of Reclamation's Santa Teresa Water Treatment Plant's Raw Water Ozonation Alternative – 30-percent Design. This project entailed a 30-percent design of a raw water ozonation system at the Santa Teresa WTP. Mr. Actis was responsible for identifying unit processes, RFQ's and vendor communications, comparison of process equipment, and making recommendations to the project team. Additionally, he developed PFD's and P&ID's, as well as facility and site layouts, that integrated raw water ozonation into the existing treatment plant. He identified design criteria and sized equipment for chemical pumps, liquid oxygen storage and vaporizing units, ozone generators and power supplies, cooling water systems, and ozone contactor basins.

Jason Assouline, P.E.

Jason Assouline has more than 16 years of experience in drinking water and reuse treatment. His experience spans water treatment, reuse, and wastewater projects with expertise in large greenfield treatment plant design, design of upgrades to existing facilities, pilot plant operation, small scale package plant evaluation, full-scale operation, and engineering services during construction.

Education

MS Environmental Engineering, University of Iowa, 2004

BS Civil Engineering, University of Iowa, 2002

Licenses

Professional Engineer, Colorado, New Mexico

Professional Affiliations

American Water Works Association (member since 2004)

Water for People (member since 2005, committee chair from 2008-2010)

WaterReuse Colorado (member since 2011, Board member in various positions since 2016)

Water Experience

→ Design manager and process lead for the City of Greeley, Colorado, Boyd Lake Water Treatment Plant Process Improvements Project. This project included a new chemical facility and ozone improvements at a 40 mgd conventional treatment facility.

→ Start-up and commissioning support for the Centennial Water and Sanitation District, Colorado, Zone 4C Pump Station. Major elements of the project included four 350-horsepower horizontal split-case pumps, 1250-kW standby generator, two-story open pump room with bridge crane, and high to low pressure zone bypass line.

→ Project manager and process lead for the City of Greeley, Colorado, Residuals Improvements Project. This project analysis of the residuals systems at both the Bellvue and Boyd Lake Water Treatment Plants. Evaluated the current system at each facility, and developed alternatives and recommendations to improve and optimize the solids handling approaches.

→ Project manager for the Centennial Water and Sanitation District, Colorado, Joseph Blake Water Treatment Plant Phase I improvements project. The project entailed evaluation and design of replacement of all rapid mix, flocculation, and sedimentation equipment as well as a new chemical storage and feed facility. Bench top testing was also conducted for taste and odor mitigation with ozone. The bench testing was conducted at Carollo's Water ARC® lab.

→ Project manager and process lead for the City of Aurora, Colorado, Wemlinger Water Purification Facility (WPF) Chemical Study. The project included a detailed analysis of all chemical systems and a conceptual layout for a new flocculation and sedimentation facility to support long term site planning. Also included in the project was extensive jar testing of various source water blending scenarios to assess the impact on coagulation chemistry (and how that related to chemical doses and storage quantities required).

→ Process engineer for the City of Aurora, Colorado, Wemlinger WPF PLC Conversion and Improvements project. Project entailed complete replacement of the entire control and SCADA systems for this 80 mgd direct filtration water treatment plant. As the process lead, was responsible for guiding workshops with the operational staff to determine the preferred approach for each process to develop detailed control narratives.

→ Process lead for Denver Water, Colorado, NorthWater Treatment Plant, Denver, Colorado. Responsible for leading the flocculation/sedimentation, disinfection (combination of UV and free chlorine), as well as the chemical facilities for this greenfield 150-mgd water treatment facility.

→ Design manager for the City of Aurora, Colorado, Binney Water Purification Facility Solids Dewatering and Filter Additions project. Led the design effort for a $12 million project which included the addition of four biofilters, new chemical storage and feed, gravity thickener and pump station, and the conversion from lagoons to solids drying beds. Responsibilities included coordination of a multi-discipline team, as well as all process design for all components except the gravity thickener and pump station.

→ Design and construction manager for the City of Aurora, Colorado, Reservoir Aeration Project. Led the design for this $1 million project which included the addition of a LOX storage and feed system and linear diffuser in the reservoir. Responsibilities included coordination of a multi-discipline team, as well as all process design. The fast-tracked design was completed in 4 months to allow for construction to be completed before winter 2015. Led construction activities including inspection, submittals, RFIs, and contract modifications.

→ Project manager for Mt. Werner Water and Sanitation District/City of Steamboat Springs water projects. Led the treatment evaluation as part of the watershed wildfire protection plan to examine the impacts of a potential wildfire in the Fish Creek watershed and treatment mitigation strategies. Managed and led the technical evaluation for a corrosion control study (compliant with CDPHE and EPA guidance) and a facility master plan. The corrosion control study included a desktop analysis as well as pipe loop testing. The Facility Master Plan builds upon the recommendations in the wildfire plan and corrosion control study and also included a comprehensive evaluation and recommendations for near term and long range improvement projects at both the Fish Creek Filter Plant and the Yampa River Wells Filtration Plant. Conceptual improvements were developed and ranked based, and extensive cost estimating was conducted to support the capital outlay for the District and the City.

→ Project manager and process lead for the City of Santa Fe, New Mexico, Canyon Road Water Treatment Plant Improvements. The project included a comprehensive performance evaluation of all processes at the 8 mgd conventional water treatment plant. Detailed design included a hypolimnetic aeration system to control source water manganese and a new flocculation and sedimentation facility.

→ Project manager and lead engineer for the Arapahoe County Water and Wastewater Authority, Colorado, Joint Water Purification Plant (JWPP) Treatment Alternatives Study. Project entailed conceptual design of three treatment alternatives for the existing JWPP. This treatment facility currently has the ability to treat up to 4 mgd of alluvial groundwater through microfiltration membrane process. The alternatives analysis entails comparing restoration of the RO process currently on site (not used) which requires selenium treatment of the RO concentrate (2 alternative treatment options) as well as a pellet softening option.

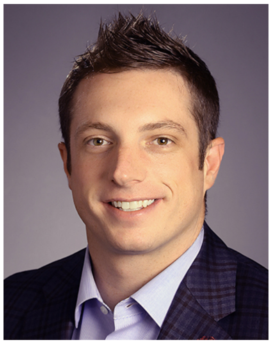
→ Process lead for the City of Park City, Utah, 3Kings Water Treatment Facility. Lead engineer for the filtration and adsorption treatment processes for the new 4.3-mgd potable water treatment facility. The source water is a combination of various mine tunnel discharges and the treatment process focuses on metals removal through pyrolusite filters and titanium oxide adsorption.

→ Project manager for the City of Aurora, Colorado, Binney Water Purification Facility UVAOP Chemical Cleaning System. Responsible for the evaluation, design, and construction of a chemical cleaning system for one of the largest UVAOP systems in the world.

→ Project manager for the City of Aurora, Colorado, Griswold WPF Disinfection and DBP Reduction Study. Responsible for the evaluation of chlorine and chlorine dioxide application at this 60-mgd facility to reduce/optimize the chemical doses and disinfection byproduct concentration in the facility.

→ Project manager for Denver Water, Colorado, Marston Treatment Plant Flocculation and Sludge Collection project. Served as project manager for the inter-disciplinary design team. Coordinated schedule, budget, and all activities related to the electrical and I&C design of the flocculation and sludge collection equipment replacement at this 210 mgd facility.

→ Project manager for Denver Water, Colorado, Foothills Treatment Plant Filter Building and Pump Station Lighting Improvements. Responsible for schedule, budget, and all activities related to the design of the lighting system modifications at this facility.



Cody Berg

Cody Berg is an associate vice president with Carollo with 14 years of extensive experience in municipal finance. As a consultant and former employee at Denver Water, Cody understands both sides of the utility business. He routinely conducts multi-year financial planning, impact fee, bond feasibility, and cost of service, rate, and charge studies throughout the Western U.S. He is currently active in industry associations including the American Water Works Association (AWWA) National Rates and Charges Committee.

Education

MS Finance, University of Colorado at Denver, 2010

BS Business Administration, Regis University, 2006

Professional Affiliations

American Water Works Association (AWWA)

Water Environment Federation (WEF)

Relevant Experience

→ Financial lead for the Business Plan and Importation Study for the Central Iron County Water Conservancy District, Utah. Project considered the financial impacts of a large water supply project to the District and other regional stakeholders. The Carollo team prepared a model to facilitate the analysis of multiple scenarios, including capital and operating costs and funding alternatives. The analysis projected cash flows for all stakeholder agencies, under multiple scenarios, to estimate the associated rate increases necessary for financial viability.

→ Project manager for the Water, Sewer, and Stormwater Financial Plan and Rate and Tap Fee Study for Dominion Water and Sanitation District (Colorado). He determined annual revenue requirements for 10-year period, cost of service by customer class, and recommended alternative rate structures. Study included full customer billing analysis, development of cost of service rate model, and presentations to elected officials and public stakeholders.

→ Quality review for the Inland Empire Utilities Agency, California Wastewater and One Water Rate and Fee Study. He is leading comprehensive rate and fee update encompassing potable, recycled, and recharge water service rates, and wastewater service rates, as well as wastewater and one-water connection fees.. He also leads the creation and delivery of presentations and workshops for an extensive outreach program aimed at garnering buy-in and support from the member agencies, builders association, and other stakeholders.

→ Financial lead for the City of Houston's evaluation of repairing and rehabilitating their existing plant versus utilizing the reserve capacity of the Northeastern Water Purification Plant Expansion. Managed a study that evaluated and compared the costs between the two alternatives, including multiple scenario analysis of each alternative.

→ Financial lead for the Chlorine Analysis Study, City of Odessa, Texas. Reviewed financial results of the Chlorine analysis and cost of potential processes to ensure accurate use of assumptions and calculations of net-present value.

→ Financial lead for the third-party review of Financial Planning and Cost of Service Study for San Diego County Sanitation District, California. Carollo reviewed the revenue requirement, allocations and unit costs to ensure appropriate industry cost of service and rate making standards were used in development of the financial model. Prepared a Technical Memorandum summarizing findings and recommendations for presentation to District staff.

→ Financial lead for the Wastewater Service Scenario Analysis Study for the Town of Sahuarita, Arizona. Developed a decision matrix to assist Town in identifying important considerations for Wastewater Service scenarios. Produced financial model evaluating unit costs for identified scenarios, ultimately leading the Town to a determination of best option for wastewater service.

→ Project manager for the Water and Wastewater Financial Planning Study for the City of Surprise, Arizona. Developed an interactive and dynamic model which provided the City with the ability to run multiple scenario analysis in real-time. Delivered model to client including a written manual and hands on training workshops with staff.

→ Project manager for the Wastewater Financial Planning, Cost of Service and Rate Design Study for the Town of Ruidoso, New Mexico. Conducted a comprehensive 10-year financial plan to meet EPA mandate requiring the town to upgrade its wastewater treatment plant due to its discharging of effluent flows into a river containing endangered Trout species. Through a combination of grants, state funds, and bonds, the Town successfully implemented rates sufficient to upgrade the plant, meeting the mandate.

→ Project manager for the Water and Wastewater Financial Planning, Cost of Service and Rate Design Study for Security Water and Sanitation District, Colorado. Developed a comprehensive financial plan that consistently met financial objectives and policies and successfully implemented annual increases which were unanimously approved by the Board of Directors. Transitioned to Cost of Service based rates over a three year period while ensuring enterprise funds were financially viable and self-sufficient. Conducted in depth analysis of customer billing data to assist the District in analyzing the existing rate structure and its ability to meet its objectives, which ultimately resulted in a rate structure change.

→ Project manager for the Water and Wastewater Rate Study for Benbrook Water Authority, Texas. Responsible for leading comprehensive rate and fee update encompassing potable, recycled, and recharge water service rates, and wastewater service rates, as well as wastewater and one-water connection fees. Also responsible for creation and delivery of presentations and workshops for an extensive outreach program aimed at garnering buy-in and support from other member agencies, builders association, and other stakeholders.

→ Project manager for the Wholesale Water Rate Study for Baytown Area Water Authority, Texas. He determined annual revenue requirements for 10-year period, cost of service by customer class, and recommended alternative rate structures. The Authority also provided water service to the City of Baytown and several other wholesale customers. Study included full customer billing analysis, development of cost of service rate model, and presentations to elected officials and public stakeholders.

→ Project manager for the Cost of Service Study for Colorado City, Colorado. Developed a comprehensive financial plan that assisted the City's financial advisor in issuing additional debt to pay for water and wastewater system capacity expansion. This study extracted the City's objectives and policies and resulted in successful implementation of proposed revenue increases which were unanimously approved by City Council.

→ Project manager for the Water and Wastewater Financial Planning, Cost of Service and Rate Design Study for the Town of Erie, Colorado. Developed a comprehensive financial plan that consistently met financial objectives and policies and successfully implemented annual increases which were unanimously approved by the Board of Directors. Implemented Cost of Service based rates which ensured enterprise funds were financially viable and self-sufficient. Conducted in depth analysis of customer billing data to assist the Town in analyzing the existing rate structure and its ability to meet its objectives, which ultimately resulted in a rate structure change.

→ Financial lead for the Cost of Service study for the City of Aspen, Colorado. Successfully implemented wholesale water rates that required modifications due to an extension of the City's airport runway. Study garnered City and staff support and resulted in rates that were unanimously approved by City Council. The runway extension also allowed the City to increase tourism and produce additional income for the City.

Education

BS Mechanical Engineer, University of Colorado, Denver, 2002

Licenses

Mechanical Engineer, Arizona, California

Professional Engineer, Texas, Colorado, Washington

Certification

LEED Accredited Professional, Green Building Certification Institute, 2009

Professional Affiliations

American Society of Mechanical Engineers

American Water Works Association

Tau Beta Pi

Carter P. Biesemeyer, P.E., LEED

Carter Biesemeyer is a mechanical engineer with 16 years' experience in design, construction management, and regulatory compliance for water and wastewater projects up to 300 mgd. Carter has experience with a variety of clients including private and municipal water/wastewater utilities and the U.S. Army Corps of Engineers (USACE). Design and construction management experience for water and wastewater treatment processes includes process air blower facilities, chemical storage and feed facilities, headworks facilities, arsenic treatment facilities, odor control facilities and pump stations. Non-process design and construction management experience includes HVAC, plumbing and compressed air systems. Areas of regulatory familiarity include hazardous material management planning, construction permitting, and surface water discharge permitting.

Relevant Experience

→ Mechanical engineer for the Colorado Springs Utilities, Colorado, progressive design-build of the Southern Delivery System Water Treatment Plant and the associated Transmission Mains. Recognized as the largest water project in decades in Colorado, the plant receives and treats surface water from Pueblo Reservoir to help meet Colorado Springs' growing potable water needs, with an initial capacity of 50 mgd and an ultimate build out capacity of 150 mgd. Responsibilities included engineering services during construction focused on HVAC and control systems coordination.

→ Mechanical engineer for the Arapahoe County Water and Wastewater Authority, Colorado, Connecting Main project. Services provided included mechanical design of HVAC systems, response to submittals and requests for information, field inspection of construction, and retrofit of a hypochlorite booster system consisting of a 300 gal tank and metering pumps into an existing control valve vault.

→ Mechanical engineer for the Centennial Water and Sanitation District, Colorado, Zone 4C Pump Station project. The pump station provides an interconnection between pressure zones in the District's drinking water distribution system pressure zones. The pump station is a 16 mgd firm capacity below grade structure with full standby power provided by a fixed diesel generator. Carter provided quality review of design documentation including HVAC systems.

→ Lead mechanical engineer for the City of Aurora, Colorado, Cherry Creek Well Field Controls Rehabilitation. The controls rehabilitation includes removal of back pressure valves and implementation of variable frequency drives for 6 alluvial well pumps in the well field. The purpose of the project was to allow automatic control of all the pumps in the well field and to save energy by lowering the pressure at which the well field operates. Energy savings are predicted to exceed $50,000 annually. Carter created a pumping system performance and control simulation model incorporating variable speed pump performance curves, and conveyance system hydraulic models. The performance and controls model was used to establish allowable pump speed ranges and on/off sequencing required to achieve any operator input flow set point over the entire flow capacity of the well field (from 1.0 mgd up to 10.1 mgd). The model allowed simulation of performance for the system of 6 different pumps operating at variable speeds singly and in any combination. The model outputs included allowable pump speed ranges correlated to the well field flow capacity. The allowable speeds were input directly into the SCADA programming to ensure pumps operate safely within the recommended flow and head range at all times. The model also tuned the operating speed versus flow capacity to maintain each pump near its' best efficiency point regardless of the combination of pumps running.

→ Mechanical engineer for the Metro Wastewater Reclamation District, Colorado, PAR 1088 Northern Treatment Plant - ESDC, This was a new 24-mgd (60 mgd ultimate capacity) regional facility. Responsibilities included pump station and hydraulic RFI assistance and HVAC construction coordination.

→ Mechanical engineer for the Clifton Water District, Colorado, Microfiltration / Ultrafiltration Water Treatment Plant project. Carter led the HVAC design including the retrofit of the existing building, which was repurposed to house new micro- and ultra-filtration equipment. This ENR award winning project included retrofitting the existing building with high-efficiency condensing gas-fired heaters, reducing fuel usage and providing a conditioned environment to protect the new water treatment equipment. While the high-efficiency equipment was more expensive than other options, the calculated payback period based on energy/fuel savings was less than three years.

→ Mechanical engineer for the Eagle River Water and Sanitation District, Colorado, Wastewater Treatment Plant Master Plan. Project includes evaluation of portfolios of different combinations of improvements for the District's three water reclamation facilities as part of a watershed-based approach to planning. The condition assessment comprised a multi-discipline investigation of existing wastewater process facilities including mechanical, electrical, instrumentation and structural components. Carter performed condition observations for mechanical and HVAC equipment, assessed facility compliance with NFPA 820, and created a condition assessment observation tracking system that captured in-situ commentary, photos, and equipment data on a personal tablet. The data collected was electronically imported into four discipline specific reports – structural, mechanical, HVAC, and electrical/controls – for each process facility at the three wastewater treatment plants.

→ Mechanical engineer for the City of Fort Collins, Colorado, Digester Building HVAC Replacement project. The project includes improvements needed in the Digester Building Control Room to accommodate new cogeneration facility equipment and controls. Carter's responsibilities included NFPA 820 requirements assessment, HVAC design, room layout modifications, and coordinating with regulatory authorities. Carter prepared a technical memorandum comparing the latest version of NFPA 820 requirements to the existing conditions and coordinated design with the authority having jurisdiction to implement improvements that maintain safety in the space that houses the new cogeneration electrical and controls equipment.

→ Mechanical engineer for the Colorado Springs Utilities, Colorado, $124 million Edward W. Bailey (SDS) Water Treatment Plant. The SDS has a non-proprietary control scheme for HVAC that allows direct control of HVAC equipment from the plant SCADA system including HVAC related set-points, monitoring, alarms, and emergency shut-downs. Carter provided engineering services during construction to coordinate HVAC installation, controls troubleshooting, and startup / commissioning. Carter wrote a narrative encompassing a comprehensive component-by-component functional matrix and controls description for evaporative coolers, air handling units, air makeup units, unit heaters, energy recovery units, variable volume fan-coils, and hydronic heating systems.

→ Mechanical engineer for the Clifton Water District, Colorado, Microfiltration / Ultrafiltration Water Treatment Plant project. The ENR award winning project included retrofitting the existing building with high-efficiency condensing gas-fired heaters, reducing fuel usage and providing a conditioned environment to protect the new water treatment equipment. Carter led the HVAC design including the retrofit of the existing building, which was repurposed to house new micro- and ultra-filtration equipment. While the high-efficiency equipment was more expensive than other options, the calculated payback period based on energy/fuel savings was less than three years.

Education

MS Civil Engineering, Utah State University, 2003

BS Civil and Environmental Engineering, Utah State University, 2003

Licenses

Civil Engineer, California

Professional Engineer, Colorado

Bart Giles, P.E.

Bart Giles experience includes the planning and design of water and wastewater pipelines, pump stations, storage reservoirs, infrastructure, and wastewater treatment. Some of his recent projects include:

Relevant Experience

→ Project manager for design of the Centennial Water and Sanitation District, Colorado, Zone 4C Pump Station. Led the design team that included structural, electrical, instrumentation and controls, mechanical, HVAC, architectural, and CAD disciplines for the 16-mgd potable water pump station. The pump station building was given architectural treatments to appear like a barn in order to minimize visual impact to surrounding neighborhoods. Major elements of the project included four 350-horsepower horizontal split-case pumps, 1250-kW standby generator, two-story open pump room with bridge crane, and high to low pressure zone bypass line.

→ Assistant project manager and lead civil engineer on the progressive design-build team for the Colorado Springs Utilities, Colorado, Southern Delivery System Water Treatment Plant and Finished Water Pump Station.). This project included consolidating the original 30 percent design from 19 different structures into one main process building. This approach reduced the project cost from $160 million to $124 million. The project included a 200-gpm cationic exchange system, two 12-ton salt saturators, design of a pump mix rapid mixing system, vertical mixer flocculation, parallel plate sedimentation, side-stream ozone, and engineered biofiltration. The project also included a 10-MG raw water tank, 7.5-MG finished water tank, and finished water pump station to two different pressure zones. The original design of the finished water pump station was overhauled to provide a conservative design that was also energy efficient. The preliminary/final design was completed in 365 days. The design also included sequencing of the raw water pumping system during off-peak hours to reduce the overall operating costs of the system and leverage the 10-MG raw water tank.

→ Project manager for the City of Aurora, Colorado, 80-mgd Wemlinger WPF CT Chamber Design project. The project consisted of a 2.5 mg buried concrete disinfection chamber with a serpentine channel and a baffling factor of 0.80 outside of the treated water reservoir at the Wemlinger WPF. The chamber is designed to operate at two water surface levels. The low level will minimize volume and associated disinfection by products at low flows, as well as maximize the allowable filter headloss. The high level allows a maximum depth during high flows when the filters can be operated at lower headloss. The design included chlorine and ammonia dosing and flash mixing to produce chloramines at both the beginning and the end of the CT Chamber, sodium hydroxide dosing to adjust pH, chlorine, ammonia, pH monitoring, and turbidity monitoring, and a supplemental chlorine boosting location part way through the CT chamber. Additional design elements included flow metering, pumped CT-to-waste to enable quick draining of the CT chamber, and the ability to bypass the treated water reservoir to two different pressure zones in order to allow the treated water reservoir to be maintained without taking the water treatment plant offline.

→ Design and cost estimating for the City of Fresno, California, $45 million Kings River Pipeline. The City of Fresno is currently designing a new 80 mgd surface water treatment and conveyance facilities as part of a decades long Metro Water Plan whose goal is to replace groundwater sources that have been experiencing over draft since the 1950s. The Kings River pipeline will convey raw water from the Kings River and associated irrigation canals to the surface water treatment and potable distribution. The design consists of 66,000 linear feet of 72-inch welded steel pipeline, a check structure and turnout to divert raw water to the pipeline, a flow meter vault, access manways, CAVs, blow-offs, and all associated electrical and instrumentation design.

→ Project engineer for the City of Aurora, Colorado, Wemlinger Treated Water Reservoir Rehabilitation. The project involves replacing roof access hatches; adding vents; demolishing piping and appurtenances inside and connecting to the existing 10-MG concrete treated water reservoir; installing multiple sections of piping, including tie-ins to existing piping; adding a valve to the reservoir drain pipe; and miscellaneous treated water reservoir concrete penetrations and repairs associated with piping and demolition. The bid price for the project was $2.5 million, and the fast-track project needed to be constructed during the winter/spring of 2017. The project was staged to prevent shutdown of the Wemlinger Water Purification Facility during construction of the disinfection contact basin.

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Provided detailed design for 3,100 feet of high-pressure, 36-inch and 42-inch water transmission main; 3,700 feet of 36-inch to 84-inch water transmission main; three large-diameter and three small-diameter trenchless crossings; and more than four miles total of plant process and yard piping ranging in size from 4 to 72 inches. Coordinated permitting through multiple agencies including county, city, airport, and Colorado Department of Transportation. Calculated plant hydraulics for the new 50-mgd water treatment plant to allow gravity flow of the process from the raw water tank through the finished water tank. Provided startup assistance, including running the treatment plant and pump station, troubleshooting mechanical and automated programming issues, and testing installed systems to verify proper performance.

→ Project engineer for the Thornton City of Thornton, CO, Water Project – Segment B Pipeline. The project involves designing 15 miles of 48-inch steel raw water transmission pipeline through 4 different municipalities, as part of an overall 70-mile pipeline that is being designed and constructed in phases. The alignment includes 16 tunneled crossings of irrigation ditches, roads, and water bodies. Additional design responsibilities are obtaining permits from multiple agencies, land owner easement coordination, air valve and blowoff design, and filling/draining sequencing with high volume PRV and blowoff structures.

→ Project engineer for preliminary design of the Passaic Valley Water Commission, New Jersey, Water Storage Improvements. Responsible for preliminary sizing and layout of two 20-MG, two 15-MG, and two 5-MG aboveground prestressed concrete water tanks, more than three miles of 10 to 48-inch water piping, and corresponding site improvements.

→ Design reviewer for the City of Manhattan, Kansas, Water Treatment Plant and Wellfield Expansion. Checked and reviewed plans for the expansion, which included approximately 13,000 feet of 30 and 24-inch raw water pipeline, as well as for new 1,800-gpm vertical wells. The project also included a new 4.2-mgd transfer pump and new 5-mgd high service pump. All of the motors in the high service pump station were replaced, and two new variable frequency drives were added to the project.

→ Project engineer for design and construction of the Contra Costa Water District, California, Elderwood Reservoir Rehabilitation. The project involved evaluating and rehabilitating an above-ground steel water storage tank for seismic reliability and improved water quality mixing, including a new water quality mixing system within the tank.

→ Project engineer for the California Department of Corrections and Rehabilitation, California, Men's Colony Water Distribution Replacement. The project included hydraulic modeling to identify capacity and pressure deficiencies, consideration of water quality issues, and design for replacement of more than 112,000 feet of distribution piping, improvements, two booster pump stations, reservoir modifications, and well replacement.

A. Eric Gilmore, CCM

Eric Gilmore is an advisor and construction manager with more than 26 years of experience building water and wastewater conveyance, storage, and treatment facilities. His responsibilities include all aspects of program management, construction management, and contract administration on behalf of the Owner. This includes oversight of contractors, issue resolution, change order review, and overall safety and quality assurance.

Education

BS Geological Engineering, New Mexico State University, 1992

Licenses

Certified Construction Manager, Construction Manager Certification Institute, 07/01/04

Certification

Certified, Environmental Compliance Assessment, Training, and Tracking System (ECATTS), International Center for Leadership Development, 2016

Professional Affiliations

Construction Management Association of America

Relevant Experience

→ Construction manager for the Las Vegas Valley Water District, Nevada, Bermuda 2538 Zone Pumping Station. The project consisted of the installation of six constant speed potable water pumps with a design capacity of 5,200 gpm each, at 143 feet total dynamic head, approximately 1,400 feet of 72-inch and 1,200 feet of 48-inch water pipeline, cathodic protection, a radio telemetry survey, technical drainage study, surge analysis, computational fluid dynamics (CFD) modeling, architectural rendering, geotechnical investigation, permitting support, and construction services.

→ Construction oversight manager for Metro Wastewater Reclamation District, Denver, Colorado, Northern Treatment Plant. This $475 million project was a progressive design-build project. Eric managed the construction oversight team with staff comprised of Carollo, sub-consultants, and the Owner for the construction of a 24-mgd (60-mgd ultimate buildout capacity) greenfield facility and regional interceptor system.

→ Program construction manager for the City of Henderson, Nevada, Southwest Water Reclamation Facility (SWRF). This project was a key element of the phased $160M improvements program to the City of Henderson reclaimed water storage and delivery system. The other program phases included site readiness contracts and effluent delivery facility contracts developed and administered before and after the SWRF construction period. The City selected Eric and team as a third party to lead a bidability and constructability Review of the 90 percent contract documents. This review included participation of the designer, city engineering and operations staff, and Carollo subject matter experts with a formal report presenting findings and recommendations for making the nearly complete design for the entire treatment, storage, and delivery system more bid-able and constructible.

→ Owner's advisor for the City of Houston, Texas, Northeast Water Purification Plant Expansion. This project includes planning, preparation, and preliminary construction of a $1.8 billion program. Eric was an advisor for the City's Project Management Team and the Project Advisor – Technical Consultant (PMT/PATC) team establishing project administration, safety & quality assurance, work flows, organizational approach, team roles & responsibilities, sub-consultant management, and communication. He also assisted in establishing formal protocol and technique in daily, weekly, and monthly coverage and reporting of the design-builder's work for the PMT/PATC team.

→ Construction oversight manager for Metro Wastewater Reclamation District, Denver, Colorado, PAR 1225 South Headworks and Grease Processing Improvements. The $53 million improvements project included addition and modification of all headworks components including screening, screening handling, grit removal and grit handling and replacement of the grease processing building with state-of-the-art equipment.

→ Construction manager for the Clark County Water Reclamation District, Nevada, Central Plant South Secondary Treatment Facility Phase 2, Site Preloading, Security Fencing, and Site Improvements Project. This project was one of three bid packages for the Phase 2 project which included site preloading for 40-mgd capacity of activated sludge and miscellaneous site improvements.

A. Eric Gilmore, CCM

→ Construction manager for the City of Las Vegas, Nevada, Lone Mountain Sewer Lift Station Modifications project. The project consisted of removal of the two existing pumps, electrical and controls, adding an electrical room, installation of three new 1,350 gpm pumps, power, controls, a standby generator, increasing wet well capacity, and 2,100 LF of 14-inch force main.

→ Project engineer for the City of Henderson, Nevada, On-Call Services. Services included plan reviews, and engineering services for design and construction support for public works projects.

→ Design engineer the City of Henderson, Nevada, for Sewer Lift Station Improvements to Armillaria, South Valley, and Stephanie Sewer Lift Stations. Project included preparation of plans for improvements as part of the On-Call Services for the City. Project included odor control facilities, site improvements, and piping modifications.

→ Process engineer for the Southern Nevada Water Authority, Nevada, Facility Operations Manual (FOM) Preparation for the South Valley Lateral Rate of Flow Control Stations (ROFCS). The FOM provides information on all of the valves, equipment and controls at the ROFCS, along with details on all of the modes of operation and control. The manuals are written for operating staff, first responders, maintenance staff, engineers, and information systems staff. They are designed as road maps to information through links to databases. They will also be used for training and development purposes.

→ Construction manager for numerous contracts for the Southern Nevada Water Authority, Nevada, $2.2 billion Capital Improvements Program, including:

- Construction manager for the IPS-2 to Alfred Merritt Smith Water Treatment Facility Bypass Pipeline, a $14 Million Design-Build Project consisting of 2,400 ft. of large diameter pipeline and an associated rate of flow control station to provide 365 million gpd of emergency by-pass ability from one of two intake pumping stations to the ozone facility at the water treatment plant.
- Construction manager for the East Valley Lateral, a $37 million fast track project consisting of two 150 ft. shafts and 1,400 ft. tunnel with 7 miles of 78 inch pipeline.
- Construction manager for the Raw Water Pumping System Project, a $109.4 million project constructing three major pumping stations and a series of large diameter pipelines including an emergency by-pass for the ozone contactor of the existing Alfred Merritt Smith Water Treatment ozone facility designed to move 385 million gallons of raw water per day from Lake Mead to a new water treatment plant on the southeast side of the Las Vegas Valley.

→ Acting construction manager for the Southern Nevada Water Authority, Nevada, Public Works Project - Lake Mead Intake No. 2. Project included final design stages, addendum drafting, bidding process, and start up activities.

→ Resident construction engineer for the Southern Nevada Water Authority, Nevada, System Facility Improvements Project - River Mountain Tunnel No. 2. $20 million project consisted of construction of a 4 mile 12 ft. diameter concrete lined tunnel.

Vincent S. Hart, P.E., ENV SP, LEED

Vincent Hart, an executive vice president with Carollo, has 27 years of experience in planning, design, and expansion of water supply, water treatment, and water distribution facilities. He has been involved with multiple bench and pilot studies involving design and expansion of water treatment facilities and has written various publications and given presentations on the subject. Mr. Hart has served as water supply engineer for design and operation of pilot plant facilities and water treatment plant expansion projects. His areas of expertise include flocculation and sedimentation of challenging to treat waters.

Education

MS Environmental Engineering, Virginia Polytechnic Institute, and State University, 1994

BS Environmental Engineering, Syracuse University, New York, 1992

Licenses

Professional Engineer, Colorado, Missouri, Minnesota, Kansas, New Jersey, North Carolina, Tennessee

Certifications

LEED Accredited Professional, Green Building Certification Institute, 04/18/2009

Envision Sustainability Professional, Institute for Sustainable Infrastructure, 12/2/18

Professional Affiliations

American Water Works Association

Water Environment Federation

American Society of Civil Engineers

National Association of Corrosion Engineers

Relevant Experience

→ Design manager for the Colorado Springs Utilities, Colorado, Southern Delivery Water Treatment Plant and Pump Station. The project included design of side-stream ozone, pump mix rapid mixing system, vertical mixer flocculation, parallel plate sedimentation, and engineered Biofiltration The ozone system utilizes injection equipment to dissolve up to 650 pounds per day of ozone into a small side-stream flow of settled water that is then flash mixed into the overall process stream.

→ Technical advisor for the City of Greeley, Colorado, Boyd Lake Water Treatment Plant Process Improvements project. The project included ozone, coagulant, hydrogen peroxide, sodium hypochlorite (including an evaluation of onsite versus bulk hypo) and sodium hydroxide chemical feed systems.

→ Project manager for the South Adams County Water and Sanitation District, Colorado, Pellet Softening Disinfection Improvements Project. The project consisted of the design of a full-scale pellet softening system at the Klein WTF for the removal of calcium hardness. This included a series a pellet reactors, a stabilization basin of pH adjustment, anthracite over sand filters for turbidity removal, a new chemical storage building, and all of the associated facilities required to implement the system. Also included in this project is the design of a temporary sodium hypochlorite feed system which allowed the District to continue operating the facility during construction after the existing chlorine system was demolished.

→ Technical advisor for the Centennial Water and Sanitation District, Colorado, Zone 4C Pump Station. Design team included structural, electrical, instrumentation and controls, mechanical, HVAC, architectural, and CAD disciplines for the 16-mgd potable water pump station. The pump station building was given architectural treatments to appear like a barn in order to minimize visual impact to surrounding neighborhoods. Major elements of the project included four 350-horsepower horizontal split-case pumps, 1250-kW standby generator, two story open pump room with bridge crane, and high to low pressure zone bypass line.

→ Project manager for the City of Aurora, Colorado, 80-mgd Griswold Water Purification Facility (WPF) Solids Study and Predesign and the 80-mgd Wemlinger WPF Chem Feed Study and CT Basin Design. This project included the planning of the conversion from direct filtration to flocculation/sedimentation with parallel plates (Wemlinger).

→ Project engineer for the City of Thornton, Colorado, Water Treatment Plant Replacement Owner's Advisor Services. The City elected to replace the 20-mgd Water Treatment Plant with a new 20-mgd plant through a design-build (DB) contract. Responsible for preparation of a Treatment Technology Study, which reviews historical raw water quality for three potential water sources, reviews current and anticipated drinking water regulations, and develops and evaluates treatment process alternatives. Upon selection of the preferred treatment process alternative, conceptual documents were developed for solicitation of the DB contract. Assistance with quality management during the design stage of the DB contract is ongoing.

→ Pretreatment process lead in the owner's advisor roles for the City of Houston, Texas, Northeast Water Treatment Plant (NEWTP)

320-mgd Expansion. Mr. Hart was responsible for helping establish the design criteria for the flocculation and sedimentation processes. This included a thorough investigation of plate loading rates and diurnal thermal effects on plate operation. Mr. Hart also served as a technical advisor for the pilot plant project, provided mechanical condition assessment of the existing NEWTP, and was the project engineer for the original treatability study, which included a finished water quality evaluation. This study recognized potential issues associated with finished

→ Project manager for the City of Aurora, Colorado, Wemlinger Water Purification Facility Improvements. The project involved $15 million of improvements to the existing 80-mgd facility, including chemical feed improvements, solids handling facilities, and emergency generators. The project construction timeframe corresponded to off-peak season for the treatment facility.

→ Project manager for the City of Aurora, Colorado, 80-mgd Wemlinger Water Purification Facility (WPF) Improvements. The $24.9 million project included construction of four new sand drying beds and a reclaim washwater pump station to return clarified water back to the Wemlinger WPF inlet, among other improvements. The project achieved 75 percent solids in 61 days of drying.

→ Project manager for the City of Thornton, Colorado, Alternative Coagulant and Ammonia Injection Relocation Study at the 50-mgd Wes Brown Water Treatment Plant. The project included identification, testing, analysis, and recommendation of alternative primary coagulants to reduce fouling on the plant's existing membranes, as well as evaluation of relocating the ammonia dosing further downstream in the existing clearwell and discontinuing pre-chlorination for primary disinfection.

→ Facilitator for the East Bay Municipal Water District, California, $30 million Sobrante and Upper San Leandro Ozone System Improvements. The project replaces aging ozone equipment with a new high-efficiency system providing increased reliability, redundancy, and safety at two 60-mgd surface water treatment plants.

→ Technical advisor for the Central Lake County Joint Action Water Agency, Illinois, Ozone System Upgrades Predesign. The project entailed an upgrade/replacement of a 50-mgd, 21-year-old ozone system.

→ Project engineer for the City of Oklahoma City, Oklahoma, Lake Stanley Draper Water Treatment Plant Expansion and Improvements. The project expanded the treatment capacity from 90 mgd to 150 mgd without the need for additional treatment basins or filtration facilities. The $35 million project involved redesign of the existing rapid mix, flocculation, and sedimentation basins to incorporate a pump mix system (first of its kind in the State of Oklahoma), walking beam flocculation equipment, and FRP baffle walls and concrete ported walls to promote a plug flow effect. The project also included a carbon dioxide and hydrated lime system for supplemental alkalinity addition due to historically low finished water alkalinity and associated red water complaints.

→ Process engineer for the City of Houston, Texas, 320-mgd North East Water Purification Plant Expansion Pilot Testing. This phase of the project involved 16 months of pilot testing to evaluate the effectiveness of alternative approaches to coagulation, plate settling, ozonation, biological filtration, and chlorine dioxide. Piloting was conducted to confirm that the new facilities can reliably and consistently treat a challenging raw water supply, demonstrate the effectiveness of ozone for disinfection and taste and odor control, and confirm that filter rates up to 8 gpm/sf could effectively treat the water.

→ Technical advisor for the Colorado Springs Utilities, Colorado, 80-mgd McCullough WTP Flocculation and Filters Evaluation. The project found that the flocculation baffle walls did not provide adequate head losses to get good distribution through the flocculation basins, plate loading rate was too high for the floc quality, and filter boxes could be retrofit to provide better filter performance.

Education

MSCE Structural Engineering, Auburn University, 1994

BSCE Structural Engineering, The Citadel, 1992

Licenses

Professional Engineer, Colorado, North Dakota, Oklahoma, Arkansas, Missouri, Minnesota, Oregon

Civil Engineer, Nebraska

Structural Engineer, Oklahoma

Professional Affiliations

American Concrete Institute – National and Rocky Mountain Chapters

American Society of Civil Engineers

Mark A. Keller, P.E.

Mark Keller has more than 25 years as a structural engineer with experience in project management, planning and execution of design, detailing, and construction phase services of large projects. Past work includes condition assessments for master plans and feasibility studies for preliminary design direction. Recent projects include:

Relevant Projects

→ Structural Engineer for the South Adams County Water and Sanitation District, Colorado, Pellet Softening Disinfection Improvements Project. The primary process building included numerous reactor and filter tankage, extensive associated access platforms, and two 200-ton pellet hoppers in a truck bay all housed in a pre-engineered metal building. Secondary facilities included a cast-in-place concrete stabilization basin for pH adjustment and a new chemical storage building.

→ Responsible for quality management of the structural improvements to the Boyd Lake Water Treatment Plant in Greeley, Colorado. The project includes alterations to the flocculation/sedimentation basins, adaptive reuse of a portion of the basins for conversion to a ozone facility, and new chemical storage and feed facilities.

→ Lead structural engineer for the Zone 4 Pump Station in Centennial, Colorado. The project included four 350-hp pumps and surge tank in a two-story open pump room with a bridge crane. Challenges included siting the project at a location prominently within the public view requiring the facility to be disguised as a barn.

→ Structural engineer responsible for the repair and rehabilitation of an ozone contactor at the David L. Tippin Water Treatment Facility in Tampa, Florida.

→ Lead structural engineer for new 1.2 MG AWWA D110 wire-wound, prestressed concrete clearwell at the Columbia Water Treatment Plant in Columbia, Idaho.

→ Provided assessment of structures at Ozark Point Water Treatment Plant in Little Rock, Arkansas. The assessment was performed to evaluate the condition of basins constructed in the 1880's through the 1930's to determine the feasibility of reuse for continued service as part of a forthcoming plant modernization.

→ Lead structural engineer for the City of Norman, Oklahoma, Water Treatment Plant Improvements Project. The scope includes design and construction of new ultraviolet (UV) building, ozone generation building, ozone contactor/destruct facility, and a new chemical storage and feed facility. Challenges included structures founded on soils consisting of deep, unconsolidated fills.

→ Structural engineer for the Colorado Springs Utilities McCullough Filter Rehabilitation, Colorado Springs, Colorado. Evaluated leaking filter basins at a water treatment plant. Leakage was observed at numerous locations, including at backwash troughs, through walls to adjacent gallery spaces, and at pipe penetrations. Alternative repair options were evaluated and formal recommendations were presented to the client.

→ Completed technical specifications for the procurement of a new, multi-legged, 400,000 gallon elevated storage tank for the City of Shelton, Washington. Work included development of specifications for the structural design criteria, design and detailing of foundations for bidding the work.

→ Performed a condition assessment of eleven, covered potable water storage reservoirs, totaling more than 25 million gallons of storage capacity, for the City of Westminster, Colorado. The tanks included one prestressed, concrete reservoir, two elevated, welded steel storage tanks, and eight ground-supported, welded steel storage tanks.

→ Project structural engineer for the Altamont Tank Repairs for the City of Livermore, California. Developed technical specifications and provided engineering services during construction for repairs to a 3 million gallon, ground-supported potable water storage tank that had deteriorated due to corrosion of the roof structure. In addition to the repairs, the City elected to upgrade the tank with the replacement of the roof vent with a vandal-deterrent style vent and installation of a sample tap and new cathodic protection system. The previously applied bituminous-based lining was removed and a new two-part, high-solids epoxy lining was applied.

→ Project manager and structural engineer for the Repairs and Improvements to the Northwest Water Treatment Facility clearwell for the City of Westminster, Colorado. Developed detailed bid documents and provided full construction management services for the restoration and rehabilitation of the 2 million gallon clearwell for the City's Northwest Water Treatment Facility. The tank, constructed only 11 years earlier, suffered from premature lining failure and corrosion. In addition to the bid documents, the tank was removed from service and a vertical survey was conducted to determine if foundation settlement had occurred.

→ Lead structural engineer for the design of a new sewer lift station with grit settling basins and screening channels in Omaha, Nebraska. The project is located entirely within the critical zone of the Missouri River levee system under the jurisdiction of the Corp of Engineers and includes deep excavation in an area of poor soils and requiring driven piles.

→ Developed bid documents and provided construction management services for restoration and modifications to a 2 million gallon fluted shroud, elevated water storage tank (Hydropillar) in Westminster, Colorado.

→ Provided an out-of-service evaluation of two, 2 million gallon ground supported water storage tanks (Gregory Hill) for the City of Westminster, Colorado. The work consisted of both visual inspection and non-destructive testing, including magnetic flux leakage testing of the floor plates and mapping of the roof framing for reconstruction.

→ Lead structural engineer and project manager for the Repairs and Improvements to the Wandering View Tanks project for the City of Westminster, Colorado. The project consisted of improvements to a 3 million gallon and a 5 million gallon, welded-steel, potable water storage reservoirs. Repairs involved removal and replacement of structural elements damaged due to corrosion. Improvements included replacement of manways in the tank shells, improvements to overflow weirs and piping, installation of new check valves, and application of new interior linings and exterior coatings.

→ Performed a condition assessment of eleven, covered potable water storage reservoirs, totaling more than 25 million gallons of storage capacity, for the City of Westminster, Colorado. The tanks included one prestressed, concrete reservoir, two elevated, welded steel storage tanks, and eight ground-supported, welded steel storage tanks.

→ Lead structural engineer for the Second Creek Interceptor Segment IE Design, City of Aurora, Colorado. The pipeline is saving Aurora $14 million that would have otherwise been invested in a temporary increase to their lift station. The project includes 5,000 linear feet of 36-inch pipe, and involves trenchless technologies.

→ Structural engineer for the Colorado Springs Utilities McCullough Filter Rehabilitation, Colorado Springs, Colorado. Evaluated leaking filter basins at a water treatment plant. Leakage was observed at numerous locations, including at backwash troughs, through walls to adjacent gallery spaces, and at pipe penetrations. Alternative repair options were evaluated and formal recommendations were presented to the client.

→ Project manager and structural engineer for the Repairs and Improvements to the Northwest Water Treatment Facility clearwell for the City of Westminster, Colorado. Developed detailed bid documents and provided full construction management services for the restoration and rehabilitation of the 2 million gallon clearwell for the City's Northwest Water Treatment Facility. The tank, constructed only 11 years earlier, suffered from premature lining failure and corrosion.

James J. Kriss, P.E.

Jim Kriss has 27 years of experience in infrastructure and environmental engineering and has served as both project manager and project engineer on a wide variety of projects. Project delivery for various designs has included traditional design bid build and alternate deliveries including both design build and CM at risk. Mr. Kriss' design and construction experience includes mechanical pumping and piping systems, raw and potable pipelines, sanitary and storm sewer pipelines, sanitary forcemains, hydraulic design and modeling, general civil site development, disinfection and dechlorination systems, geomembrane liner systems for primary and secondary containment, and solid waste permitting and design.

Education

BS Geological Engineering, Colorado School of Mines, 1992

MS Engineering Systems, Colorado School of Mines, 1998

Licenses

Professional Engineer, Colorado, Kansas

Professional Affiliations

American Society of Civil Engineers

National American Society for Trenchless Technology

Pipeline and Pump Station Design

→ Project manager for the City of Aurora, Colorado, Gun Club Raw Water Expansion. The project involved design and construction of raw water system improvements to expand the City's existing raw water deliveries to Heritage Eagle Bend golf course. The existing raw water pumps were undersized for the expanded service, and replaced with higher capacity pumps, including soft starters, pump control valves, and surge anticipator valves for transient control. A new 1.6-mile, 12-inch raw water transmission pipeline was designed to tie into the existing raw water pipeline for conveyance to Heritage Eagle Bend. The new pipeline alignment is routed through both urban and open space areas and includes environmentally sensitive areas in the floodplain, wetlands construction, and two horizontal directional drill sections. In addition, a very complex flow split and flow control system was designed to deliver raw water to the two end users at varying flow rates.

→ Project manager for the Arapahoe County Water and Wastewater Authority, Colorado, Chambers Reservoir Connection Pipeline. Managed the raw water transmission pipeline connecting a raw water storage reservoir pump station to the Authority's reuse distribution system. The pipeline design consisted of approximately 4,400 lf of 24-inch PVC pipe. Multiple routes were evaluated to minimize impacts to landowners' developable properties and to minimize the cost of a required tunneled crossing for the E-470 Public Highway Authority. The tunnel crossing consisted of approximately 435 lf of 42-inch steel casing and was designed to meet E-470 crossing requirements. The project was permitted through the State Engineers Office, E-470, Town of Parker and Douglas County jurisdictions, which included a grading, erosion, and sediment control (GESC) permit, Douglas County Location and Extent public hearing process, Douglas County floodplain permit, and Town of Parker Use by Special Review public hearing process.

→ Project engineer for the East Cherry Creek Valley Water and Sanitation District (ECCV), Colorado, Western Water Transmission Pipeline and Pump Station. The project included construction of a new 14-mile 48/54-inch steel water transmission pipeline and 15 trenchless crossings totaling 3,493 lf, including highways (C-470, E-470, and I-70) and various roadways. In addition, a 30-mgd pump station was designed to convey potable water to ECCV's existing water storage reservoirs. The pump station was designed for an initial operating flow of 15 mgd, expandable to 30 mgd, and included sodium hypochlorite disinfection systems. Specific tasks included pipeline design, tunneled crossings of various roadways, and multiple stream crossings. Mr. Kriss was responsible for hydraulic analyses, pipeline alignment, thrust analysis, wall thickness design, and tunnel casing design. Also responsible for pump station process piping design, pump station layout, and civil/site development.

→ Project manager for the City of Fresno, California, $45 million Kings River Pipeline. The City of Fresno is currently designing a new 80 mgd surface water treatment and conveyance facilities as part of a decades long Metro Water Plan whose goal is to replace groundwater sources that have been experiencing over draft since the 1950s. The Kings River pipeline will convey raw water from the Kings River and associated irrigation canals to the surface water treatment and potable distribution. The design consists of 66,000 linear feet of 72-inch welded steel pipeline, a check structure and turnout to divert raw water to the pipeline, a flow meter vault, access manways, CAVs, blow-offs, and all associated electrical and instrumentation design. Preliminary design included routing analysis, hydraulic evaluations, development design and operating criteria, traffic control analysis, utility potholing, geotechnical investigation, and corrosion investigation and design.

→ Project manager for the East Cherry Creek Valley Water and Sanitation District (ECCV), Colorado, Northern Water Supply project. Served as project manager for design of the District's Northern Water Supply Project Water Transmission Pipeline, involving 31 miles of 48-inch steel pipeline and 15 trenchless crossings totaling 2,000 lf, including highways (E-470 and I-70), railroads (BNSF and UPRR), and various roadways. Project delivery was CM at Risk with a guaranteed maximum price contract. Multiple procurement packages were assembled to expedite construction, including pipeline materials, valves, tunnel installation contractor, and pipeline installation contractor. Various alternatives were evaluated during design, including a phased approach with two pipelines. Each alternative was designed in sufficient detail to provide accurate cost estimating along with power consumption and present worth evaluations to allow the District to make prudent decisions on final system configuration. Ultimately, a single 48-inch pipeline was designed and constructed. Also functioned as a technical advisor and design engineer for two 9-mgd booster pump stations, performing hydraulic evaluations and pump selection along with preliminary pump station layout. Specific tasks included managing multiple subconsultants including geotechnical, surveying, cathodic protection design, and land acquisition; managing multiple design tasks including pipeline alignment routing, system hydraulic analysis, power consumption and present worth evaluation, pipeline design, material/equipment selection, tunnel design, appurtenance selection and sizing, pump selection, and pump station layout; procurement of materials and equipment including pipeline, valves, pumps, and tunneling contractor; and coordination with multiple jurisdictions across five cities and three counties.

→ Design engineer for the Ute Water Conservancy District, Colorado, Plateau Creek Pipeline Replacement Preliminary and Final Design. The project involved replacement of an existing 15-mile, 24-inch diameter raw water RCCP pipeline with a 48- and 54-inch welded steel pipeline to convey raw water from the District's surface water reservoirs to their water treatment plant. The existing pipeline alignment followed the environmentally sensitive Plateau Creek, and a parallel replacement alignment was not possible for most reaches. The new alignment included 2.5 miles of hard rock tunneling to allow the existing pipeline to remain in service during construction of the new pipeline. Responsible for pipeline alignment, pipeline wall thickness and thrust analysis, downstream flow control and valving facilities, air and vacuum protection, blowoff and surge control valve configurations, and hydraulic analyses.

→ Design engineer for the Tucson Water, Arizona, Treated Water Transmission Main. Performed preliminary alignment design for the Northeast "D" Zone treated water transmission main. The project involved 5.9 miles of 30- and 24-inch ductile iron pipe. Alignment routing was established to minimize crossings of existing utilities and reducing impacts to traffic and associated traffic control to the extent possible. Survey information was available for planimetric features and surface evident of underground utilities. Final design would be developed using supplemental utility survey information to establish vertical control. The horizontal alignment was designed using station and offset relative to an alignment control line.

Steven P. Lindemann

Steve Lindemann, is a knowledgeable and focused water professional who has been praised for his commitment to quality and efficiency. He has 30 years of experience with construction of water resource projects and more than 20 years of experience on design-build water resource projects throughout the United States and Canada. He brings a broad base of experience in all phases of project delivery.

Education

B.S. (Hons) Construction Technology, North Dakota State University, 1990

AAS Architectural Drafting, North Dakota State College of Science, 1987

Certifications

Board of Certified Safety Professionals

Relevant Experience

→ Deputy design-build manager for the Metro Wastewater Reclamation District, Colorado, Northern Treatment Plant. The Northern Treatment Plant is a 24-mgd greenfield wastewater treatment plant that encompasses primary, secondary and tertiary treatment processes, along with solids handling, gas conditioning, cogeneration, and odor control. Mr. Lindemann was the lead for all construction project engineering and was directly responsible for process equipment, including procurement assistance and scope definition, submittal review, delivery and installation of equipment, submittal of operation and maintenance information. He also interfaced with the commissioning team for equipment startup. The process equipment for the Metro NTP project included 77 separate packages, with a total cost of $28 million.

→ Construction manager for the Colorado Springs Utilities, Colorado, Fountain Creek Recovery Project. This project consisted of the construction of an 18.5 million gallon spill pond, an exchange pond, creek diversion and intake structure, and a pump station. Mr. Lindemann developed a project budget and schedule along with tools for tracking self-perform crew production and unit costs. Mr. Lindemann was also responsible for the procurement of equipment, materials and leasing of earthmoving equipment. He assisted with sub-contractor management, and implementation of the safety program.

→ Superintendent for the City of Thornton, Colorado, Columbine (Wes Brown) WTP Renovation. This was a WTP remodeling and expansion project to convert from conventional filtration to submerged membrane treatment for potable water. The project also included construction of a high service pump station, chemical building, administration building, vehicle storage facility, and water quality testing laboratories. Mr. Lindemann supervised construction of the administration building, vehicle storage facility, and water quality testing laboratories. He was responsible for manpower, equipment and material planning, and execution of self-perform and subcontractor work. He delivered the administration building, vehicle storage facility, and water quality testing laboratories four weeks ahead of schedule and with zero recordable or lost time injuries.

→ Construction manager for the City of Longmont, Colorado, Longmont WWTP Digester Rehabilitation and Odor Control Improvement. This project consisted of an anaerobic digester remodeling project that included replacement of two digester covers, sludge heating and mixing system replacement, and digester gas scrubbing. The project also included odor control system improvements in solids handling processes and construction of a biofilter. Mr. Lindemann was responsible for client communication, schedule development and progress tracking. He oversaw budgeting to ensure the scope of work was delivered in accordance with the guaranteed maximum price agreement. Mr. Lindemann also procured all equipment and wrote and negotiated all subcontractor scopes of work. He jointly managed contingency assignments with the City of Longmont and returned over $40,000 in shared savings to the City of Longmont.

→ Project engineer for Denver Water, Colorado, Marston WTP Filtration Improvements. This project consisted of filtration facility demolition, and a replacement project that also included backwash system replacement, chemical facility upgrades, and construction of a new administration building. Mr. Lindemann was responsible for the procurement of equipment and materials, shop drawing review, delivery of material to

Steven P. Lindemann

meet the construction schedule, self-perform crew management, and implementation of the safety program. He also developed equipment and process system startup plans. Mr. Lindemann received commendation from Denver Water inspection group for commitment to quality.

→ Design-build manager for the City of Midland, Texas, Midland Water Pollution Control Plant Upgrades. The $136M project includes design, permitting, construction, and commissioning of new secondary treatment, tertiary treatment, dewatering facilities, and a SCADA system for an existing wastewater plant. The project also includes extensive upgrades to existing primary treatment facilities. Responsibilities included project management during design preconstruction and construction. Design phase management focused on alignment between the engineering team, client, and stakeholders to ensure project performance requirements, budget, and schedule could be met. Preconstruction phase project management included building the site construction team, budget development, schedule development, bidding and award, safety planning, and detailed client cash flow analysis.

→ Project engineering manager for the City of Santa Fe, New Mexico, Buckman Direct Diversion (BDD) Project. The BDD project consisted of the construction of a raw water intake structure, raw water pump stations, an advanced water treatment plant, and 27 miles of raw water and finish water pipelines. Mr. Lindemann was responsible for procurement and installation of mechanical equipment and systems, startup and commissioning of mechanical systems including micro filtration, granular activated carbon, ozone, and pumping equipment. He developed a membrane module installation plan that contributed to saving three weeks on the schedule and allowed system testing and production of potable water to occur.

→ Project engineer for the City of Fort Bliss, Texas, Temporary Unit of Action and Underground Utilities. This project was for the installation of 27 miles of underground utilities (water, sanitary sewer and storm sewer) as part of a Temporary Unit of Action program on the Fort Bliss Army Base. Also included, were two sewage pump stations, installation of a 3-million gallon above ground storage tank, and a booster pump station. Mr. Lindemann was responsible for procurement of equipment and materials, self-perform crew management, and implementation of the safety program. The CH2M Hill Engineers team included six underground utility crews and 85 craft personnel.

→ Commissioning engineer for the City of Hamilton, Ontario, Woodward Avenue WWTP Biogas Enhancement and Digester Upgrade Project. The project consisted of construction of a new sludge thickening facility, upgrades to an existing digester facility, installation of a new bio filter odor control system, and installation of a gas conditioning system for purifying digester gas and introducing it into the municipal natural gas grid. Mr. Lindemann was responsible for development of commissioning plans and startup, and commissioning of mechanical equipment, treatment processes, and instrumentation systems. He operated the sludge thickening facility during acceptance testing period. He also completed acceptance testing for the project without significant interruption to any system and turned over the facility to the client three weeks ahead of the contractually required date.

John A. Meyer, P.E.

John Meyer joined Carollo in 2016 and has experience working on both water and wastewater treatment projects. He has worked on water treatment planning studies, benchtop and pilot testing, water treatment system designs, construction oversight, and treatment plant start-up and commissioning.

Education

MS Civil Engineering, University of Colorado, Boulder, 2016

BS Environmental Engineering, University of Colorado, Boulder, 2014

Licenses

Professional Engineer, Colorado

Professional Affiliations

American Water Works Association

Engineers Without Borders-USA, Rocky Mountain Professional Chapter

Water

→ Project engineer for the City of Greeley, Colorado, Boyd Lake WTP Improvements project. Served as the primary design process design engineer for a new chemical storage and feed facility to house caustic soda, hydrogen peroxide, and sodium hypochlorite equipment. Also provides design support for the conversion of an existing sedimentation basin into an intermediate ozone facility, and the addition of a liquid oxygen system for hypolimnetic lake aeration of the facility's source water body.

→ Project engineer for the South Adams County Water and Sanitation District, Colorado, Pellet Softening Disinfection Improvements. The project consisted of the design of a full-scale pellet softening system at the Klein WTF for the removal of calcium hardness. This included a series a pellet reactors, a stabilization basin of pH adjustment, anthracite over sand filters for turbidity removal, a new chemical storage building, and all of the associated facilities required to implement the system. Also included in this project is the design of a temporary sodium hypochlorite feed system which allowed the District to continue operating the facility during construction after the existing chlorine system was demolished. Preliminary design work for the layout of the facility was completed using Sketchup modeling.

→ Project engineer for the City of Aurora, Colorado, Griswold Water Purification Facility Solids Study and Preliminary Design. Developed hydraulic models of the facility's backwash, filter-to-waste, and washwater recycle systems. Performed bench scale tests to characterize residual sludge and the condition of the existing lagoon sand. Responsibilities also included analyzing solids dewatering alternatives including engineered lagoons, sand drying beds, and mechanical dewatering systems. Developed two Blue Plan-it® models to evaluate the various solids handling alternatives. The first was a dynamic model which simulated solids drying in a lagoon or sand drying bed to evaluate how lagoon size and loading rate impacted long term operations and cost. The second model was used to evaluate how different solids handling alternatives would be impacted by operational changes, energy consumption, drying time, and disposal cost.

→ Project engineer for the City of Thornton, Colorado, Water Treatment Plant Replacement Owner's Advisor. The City elected to replace the 20-mgd Water Treatment Plant with a new 20-mgd plant through a design-build (DB) contract. Assisted in the development of a conceptual design for a new treatment plant to replace the existing Thornton Water Treatment Plant. Evaluated historical data to establish treatment process design criteria and goals.

→ Project engineer for the City of Aurora, Colorado, Wemlinger Treated Water Reservoir Rehabilitation. The project involves replacing roof access hatches; adding vents; demolishing piping and appurtenances inside and connecting to the existing 10-MG concrete treated water reservoir; installing multiple sections of piping, including tie-ins to existing piping; adding a valve to the reservoir drain pipe; and miscellaneous treated water reservoir concrete penetrations and repairs associated with piping and demolition. The bid price for the project was $2.5 million, and the fast-track project needed to be constructed during the winter/spring of 2017. The project was staged to prevent shutdown of the Wemlinger Water Purification Facility during construction of the disinfection contact basin.

→ Project engineer for the Willmar Municipal Utilities, Minnesota, Master Plan and Preliminary Design Report for Conversion to Biofiltration. Researched and

John A. Meyer, P.E.

Awards

Distinguished Senior in Environmental Engineering, University of Colorado, College of Engineering and Applied Science, 2014

Best Student Paper Award, "Assessing Population Weighted Risk Reduction Implications for Centralized vs. Distribution System-Based DBP Control Strategies." AWWA Water Quality Technology Conference, 2016. Indianapolis, Indiana.

Other Accomplishments

Open for Quote

evaluated several alternative treatment plant and point-of-use technologies to reduce salty discharges from domestic water softeners to the wastewater treatment system. Developed hydraulic models for the Northeast Water Treatment Plant and Southwest Water Treatment Plant which incorporated process changes from green sand filtration to Biofiltration. Estimated project construction, operations, and maintenance costs.

→ Project engineer for the City Aurora, Colorado, 80-mgd Wemlinger WPF CT Chamber Design. The project consisted of a 2.5 mg buried concrete disinfection chamber with a serpentine channel and a baffling factor of 0.80 outside of the treated water reservoir at the Wemlinger WPF. The design included chlorine and ammonia dosing and flash mixing to produce chloramines at both the beginning and the end of the CT Chamber, sodium hydroxide dosing to adjust pH, chlorine, ammonia, pH monitoring, and turbidity monitoring, and a supplemental chlorine boosting location part way through the CT chamber. Additional design elements included flow metering, pumped CT-to-waste to enable quick draining of the CT chamber, and the ability to bypass the treated water reservoir to two different pressure zones in order to allow the treated water reservoir to be maintained without taking the water treatment plant offline. The preliminary design work through the 30 percent deliverable for this project was completed using Sketchup modeling to develop an initial layout of the CT Chamber and the associated pipe galleries.

→ Project engineer for the City of Greeley, Colorado, Boyd Lake WTP and Bellvue WTP Solids Study. Evaluated the existing solids handling systems for the City's two water treatment plants. Developed conceptual designs for several alternatives at each facility to improve those systems in order to produce better recycled water quality and enhance solids dewatering. Provided cost estimates for the preferred alternatives and made recommendations to the City on which technologies would be best suited to meet their unique needs.

→ Project engineer for the South Adams County Water and Sanitation District, Colorado, Pellet Softening Study. This project consisted of a month-long pilot skid operation to evaluate the feasibility of pellet softening as a viable hardness removal strategy at the Klein Water Treatment Facility. During this study, various testing was conducted to determine the impact of adjusting pH, reactor loading rate, source water wells, and seed bed characteristics to determine the optimal operating parameters required to achieve the District's hardness removal goals. The results of this pilot study were used to develop alternative treatment schemes, site layouts, and cost estimates for various full-scale pellet softening systems which would potentially be implemented at the site.

→ Project engineer for the City of Aurora, Colorado, Wemlinger Water Purification Facility Disinfection Evaluation and Alternatives Analysis. Evaluated computational fluid dynamics data and historical water quality data to create several alternatives for improving disinfection contact time at the facility. Developed cost estimates for each of the proposed alternatives and created a preliminary design and 3D model of the preferred CT Chamber alternative.

→ Project engineer for Colorado Springs Utilities, Colorado, Edward W. Bailey Water Treatment Plant Water Quality Testing. Performed bench scale experiments to help optimize coagulation and flocculation processes upon plant start-up. Investigated water quality monitoring issues related to manganese.

→ Project engineer for the City of Thornton, Colorado, Wes Brown Water Treatment Plant Alternative Coagulants and Ammonia Injection Relocation Study. Responsibilities included analyzing data from bench and pilot scale experiments with different coagulants to determine the most viable approaches for increasing membrane production rates. Assisted in developing process train modifications, which could be implemented at full scale to enhance treatment capacity while achieving established water quality goals.

Monte K. Richard, P.E.

Monte Richard brings more than 17 years of experience in electrical and control system engineering and design. His focus is in electrical distribution systems, process control, and industrial instrumentation for water and wastewater facilities and infrastructure. He works on a company wide basis with plant operations and managers to test, start-up, optimize and troubleshoot water and wastewater treatment plants. His experience includes:

Education

MS Electrical Engineering, Colorado School of Mines, 2009

BS Electrical Engineering, Colorado School of Mines, 2003

Licenses

Professional Engineer, Colorado, Hawaii, Oregon, Washington, Illinois, Florida, Ohio, New York, Maine

Electrical Engineer, Arizona, California

Professional Affiliations

Institute of Electrical and Electronic Engineers

Illuminating Engineering Society of North America

Relevant Experience

→ Lead electrical and instrumentation design engineer for the Arapahoe County Water & Wastewater Authority (ACWWA), Colorado, flow connecting main. This project involved the design of the control and instrumentation for a new metering vault. Strict coordination with ACWWA's radio and communications standards was followed in order to establish communications with the overall distribution SCADA network. The control system allowed for automated flow control based on operations selection of either set point flow or set point level in distribution tanks.

→ Project manager and lead electrical and instrumentation engineer responsible for providing electrical upgrades at the City of Aurora, Colorado, Griswold Water Purification Facility. The project included the design of a new service entrance medium voltage switchgear, replacement of the existing faulty Automatic Transfer Controller, and generator breaker trip unit modification to reduce arc flash incident energy.

→ Project engineer responsible for providing a Flow Control Center for the City of Aurora, Colorado. The project included the design for the relocation of the City of Aurora Flow Control Center. Design included 3D modeling of room layout options, SCADA console development, and network routing required to provide desired monitoring and control to the Flow Control Center Staff.

→ Lead electrical and instrumentation design engineer for the City of Boulder, Colorado, Betasso Water Treatment Plant improvements. The project included various upgrades to the water treatment plant including flash mix, sludge-drying beds, and a new powdered activated carbon system design.

→ Performed electrical and instrumentation condition assessment reports for the City of Boulder, Colorado, Betasso Water Treatment Plant and the 75th Street Wastewater Treatment Plant. The project included site investigations and a condition assessment report. The condition assessment report addressed the timeline and cost for asset replacement/ rehabilitation. The purpose of the report was to provide guidance for asset management planning over a 20-year period.

→ Project manager and lead electrical and instrumentation design engineer for various projects for the City of Fort Collins, Colorado. This series of design-build projects required on-site construction services and a close working relationship with the contractor. The projects included the design and construction of a new chemical storage facility, pump station, fluoride, mag, and polymer chemical feed system, emergency generator, powder activated carbon system improvements, an odor control system, septage receiving, several motor control center replacements, uninterruptible power supply (UPS) support systems, and several other plant improvements.

→ Project manager and lead engineer responsible for providing an Electrical Master Plan to the City of Fort Collins, Colorado, Water Treatment Facility. The plan detailed the electrical distribution system along with vulnerability studies and suggested improvements. An improvement plan was provided to assist the client in budgeting construction and improvement efforts.

→ Lead instrumentation design engineer for the City of Ute, Colorado, Ute Water Treatment Plant Filter Upgrades project. This design-build project included an addition of four media filters and the rehabilitation of four existing filters. The project involved upgrades to the existing supervisory control and data acquisition (SCADA) and programmable logic controller network, as well as a new plant fiber optic backbone. In order to give flexibility during a backwash, a new automated control strategy was implemented, allowing operators to select an automated filter-to-waste, scour wash, rinse-to-waste, and filter resting.

→ Lead electrical and instrumentation design engineer for a new diversion structure and metering vault for the City of Fresno, California, King's River Pipeline. This project included an evaluation of communication options, a technical memorandum was delivered comparing radio versus fiber. This design project required working in conjunction with the general contractor to provide efficient design and on-site construction services. The project included the design of the diversion structure Rubicon automated gates and associated control as well as the control and instrumentation for a new metering vault. The project required interconnection with the City's existing SCADA network, security network, as well as the Fresno Irrigation District SCADA network. Virtual path studies were performed to prove feasibility of radio paths during design.

→ Project manager and electrical, instrumentation, and control design engineer for the City of Aurora, Colorado, Prairie Waters Pump Station No. 1, No. 2, and No. 3 relay improvements. The project included the study and design for the replacement of 9 protective relays in existing medium voltage switchgear. The project also included the update of the electrical system study including updating the protective relay settings.

→ Project engineer responsible for providing a system wide Uninterruptable Power Supply (UPS) study and recommendation for the City of Aurora, Colorado. The project included the investigation, analysis, cost estimate, and recommendation for replacement of over 200 UPS systems located throughout the City's water treatment and transmission and distribution systems.

→ Electrical and instrument design engineer for the Metropolitan Water District of Salt Lake and Sandy, Utah, Point of the Mountain Water Treatment Plant. This project involved the implementation of a new filtration plant and raw water pumping station. The pumping station required medium-voltage variable frequency drives to run 1,250- and 2,000-horsepower motors.

→ Lead electrical and design engineer for a new nanofiltration (NF) plant for Miami Dade County, Florida. The project included the electrical, instrumentation, and control design for 20 trains of NF skids, clean-in-place, various chemical feed systems, and ultraviolet disinfection reactors. The project involved implementing various electrical safety by design concepts including arc-flash-resistant gear, remote breaker control and racking, and reducing transformer sizes to limit the arc flash energy. The design included the addition of a distributed programmable logic controller and supervisory control and data acquisition (SCADA) network with a redundant fiber optic communication backbone. The control network included the implementation of communications with 15 remote well sites using Ethernet radio.

→ Lead instrumentation design engineer for the filter plant expansion for the Kern County Water Agency, California, Henry C. Garnett Water Purification Plant expansion. The project involved doubling the filter plant capacity by designing a second treatment train including a raw water and treated water pump station, filters, flocculation and sedimentation basins, various metering vaults, and chemical systems. The project included the design of a new plant-wide supervisory control and data acquisition (SCADA) system, programmable logic controller system, and redundant fiber communications backbone. Electrical, instrumentation, and control construction management services were provided. Start-up and control optimization services were provided for all plant processes.

Stephanie M. Riley, Ph.D.

Stephanie M. Riley earned her Ph.D. in Environmental Engineering Science from the Colorado School of Mines. Her area of focus is water reuse with expertise in pilot operation and research studies. She currently serves as a technologist assisting in water, reuse, and wastewater projects.

Education

Ph.D. Environmental Engineering Science, Colorado School of Mines, 2018

MS Environmental Engineering Science, Colorado School of Mines, 2015

BS Biology, Newman University, 2013

Relevant Experience

→ Lead investigator for Water Research Foundation (WRF) project 4833: *Understanding the Impacts of Wastewater Treatment Performance on Advanced Water Treatment Processes and Finished Water Quality*. Led ozone (O_3), biofiltration (BAF), and granular activated carbon (GAC) pilot testing to investigate removal of per- and polyfluoroalkyl substances (PFAS) and contaminants of emerging concern (CECs).

→ Lead investigator for WRF project 4958: *New Techniques, Tools, and Validation Protocols for Achieving Log Removal Credit Across Nanofiltration (NF) and Reverse Osmosis (RO) Membranes*. Project included evaluation and testing of membrane integrity methods on nanofiltration (NF) and reverse osmosis (RO) systems. Led coordination and preparation of pilot testing.

→ Lead investigator for Bureau of Reclamation Desalination and Water Purification Research Project: (BOR DWPR): *Evaluation of Novel Integrity Tests for Reverse Osmosis and Nanofiltration and Performance Comparison to Non-membrane-based Systems for Potable Reuse*. Developed test plan to investigate novel surrogates and tracers (e.g., conductivity modeling, charged aerosol detection, sucralose) for online monitoring of membrane integrity (i.e., log removal).

→ Lead investigator for WRF project 4719: *A Biofiltration Guidance Manual for Rapid-rate Filtration Facilities*. Project included the development of operator toolkits, checklists, and chapters in the published manual.

→ Lead investigator for WRF/California State Water Board Direct Potable Reuse Grant #4 (DPR-4): *Treatment for Averaging Potential Chemical Peaks (Experimentation to Address Knowledge Gaps)*. Led the experimental plan and round-robin study at California utilities and total organic carbon (TOC) manufacturers to evaluate the ability of TOC meters to detect volatile organic compounds (VOCs).

→ Co-investigator for the City of Ventura, California, DPR Pilot Testing. Led rapid bench-scale testing of O_3/BAF/UF/RO and UF/RO process trains to assess the toxicity of RO brine.

Publications/Presentations

→ Verdugo, E. M., Kumar, P.S., Riley, S.M., Gifford, M., Glover, C., Dickenson, E.R.V. "Removal of Disinfection Byproducts and Trace Organic Contaminants in Treated Wastewater using Pilot-scale Ozonation, Biofiltration, and Granular Activated Carbon. *Environmental Science: Water Research & Technology*, 2019.

→ Vatankhah, H., Riley, S.M., Murray, C.C., Quinones, O., Steirer, K.X., Dickenson, E.R.V., Bellona, C. "Simultaneous Ozone and Granular Activated Carbon Treatment of Micropollutants During Potable Reuse of Municipal Wastewater Effluent." *Chemosphere*, 234, 845-854, 2019.

→ Riley, S.M., Ahoor, D.C., Cath, T.Y. "Enhanced Biofiltration of O&G Produced Water Comparing Granular Activated Carbon and Nutrients. *Science of the Total Environment*, 640, 419-428, 2018.

→ Riley, S.M., Verdugo, E., Dickenson, E.R.V. "Assessment of Ozone, Biofiltration, and GAC Pilot Studies for Removal of Trace Organic Contaminants and DBP Precursors." Proceedings of the Water Quality Technology Conference (WQTC), Dallas, TX, Nov. 3 – 7, 2019.

→ Riley, S.M., Verdugo, E., Dickenson, E.R.V. "Pilot Demonstration of Ozonation, Biofiltration, and Activated Carbon Systems." Proceedings of the 34th Annual WateReuse Symposium, San Diego, CA, Sept. 8 – 11, 2019.

Education

BS Civil Engineering, South Dakota School of Mines and Technology, 1995

Licenses

Professional Engineer, Colorado

Professional Affiliations

Invited Member of the Sage Timberline Industry Advisory Board

Jason Rozgony, P.E.

Jason Rozgony has more than 24 years of experience in the water and wastewater industry, the majority of which has been full-time cost estimating for engineering projects and "at-risk", CMAR, design-build, and hard bid projects. He has been responsible for the development of corporate estimating standards, and has managed estimating staff across the United States. Jason has prepared discipline-level estimates and has led complete estimates for more than 250 design and fixed price construction projects requiring collaboration with design engineers, vendors, and subcontractors from preliminary through final design.

Relevant Experience

→ Estimator for the Pellet Softening, Disinfection, and Facility Improvements Project, South Adams County Water and Sanitation District, Colorado, $42 million.

→ Cost estimator for the City of Westminster, Colorado, North Huron Interceptor. Jason was responsible for AACE cost estimating consistent with design level submittals for the detailed design and routing of the under-capacity sections of sewer interceptor, resulting in approximately 7,400 linear feet of new interceptor piping.

→ Estimator for the Water Quality Improvements – Phase III, City of Odessa, Texas, $154 million.

→ Estimator for the Northwood Water Treatment Plant – Phase II Improvements, City of North Miami Beach, Florida, $30 million.

→ Estimator for the Wemlinger CT Chamber Project, City of Aurora, Colorado, $19 million.

→ Estimator for the City of Sunnyvale, California, Water Pollution Control Plant Secondary Treatment Facilities Design.

→ Estimator for the City of Richmond, California, Veolia Wastewater Treatment Plant Critical improvement project.

→ Estimator for the Avon Wastewater Treatment Facility Nutrient Upgrades, Eagle River Water and Sanitation District, Colorado, $43 million.

→ Estimator for the Blue River Wastewater Treatment Plant Biosolids Upgrades, City of Kansas City Water, Missouri, $215 million.

→ Estimator for the Treasure Island Wastewater Treatment Plant, San Francisco Public Utilities Commission, California, $139 million.

→ Estimator for the Northeast Water Purification Plant Expansion Owner's Advisor Services, City of Houston, Texas. As part of the project advisory task, Jason provided estimates for the design-build project. His primary responsibilities included reviewing GMPs from the other program consultants, McCarthy and Balfour Beatty.

→ Estimator for the South Mesquite Regional Wastewater Treatment Plant Solids Handling Improvements, North Texas Municipal Water District, $20 million.

→ Estimator for the Filtration Building Improvements, City of Las Vegas, Nevada, $20 million.

→ Estimator for the City of Cape Coral, Florida, Southwest Water Reclamation Facility Biosolids Facility. Project included the construction of a Biosolids Thermal Drying Facility at the Southwest Water Reclamation Facility (WRF). Responsibilities included cost estimate development, subcontractor and vendor solicitation and evaluation, and final project cost determination.

→ Lead estimator for the City of West Palm Beach, Florida, South Florida Water Management District L-8 Pump Station and Reservoir Project. Responsible for estimating the cost of the work and evaluation of subcontractor and vendor bids in preparation of the fixed price bid.

→ Cost estimator for the City of Salem, Oregon, Geren Island WTP Improvements. Provided cost estimating for a $39 million project delivered through a CM/GC method to construct a new ozone facility.

Jason Rozgony, P.E.

→ Water Treatment Facility Expansion, Town of Eagle, Colorado, $23 million. CMAR project.

→ Hillcrest Reservoirs and Pump Station, Denver Water, Colorado, $100 million. CMAR project.

→ PAR 1225 South Headworks and Grease Processing Improvements, Metro Wastewater Reclamation District, Colorado, $52 million.

→ Wastewater Treatment Plant Expansion, City of Louisville, Colorado, $27 million.

→ Estimator for the Water Reclamation Facility Improvements, City of Niles, Ohio, $51 million.

→ Estimator for the Lancaster Water Reclamation Plant Expansion – Phase I, County Sanitation Districts of Los Angeles County, California, $120 million.

→ Estimator for the West Seattle and Maple Leaf Reservoirs, Seattle Public Utilities, Washington, $66 million.

→ Estimator for the Peace River Reservoir Expansion, Peace River Manasota Regional Water Supply Authority, Florida, $45 million.

→ Estimator for the Point of the Mountain Water Treatment Plant, Metropolitan Water District of Salt Lake and Sandy, Utah, $81 million.

→ Ft. Polk North and South Wastewater Treatment Plants, American Water, Florida, $64 million. Design-Build project.

→ Rio Tinto Holden Mine Reclamation and Water Treatment Facility, Washington, $23 million. Design-Build project.

→ Water Reuse Facility, Pueblo of Santa Ana, New Mexico, $17 million. Design-Build project.

→ Central Treatment Plant Upgrade and Expansion, City of Tacoma Department of Public Works, Washington, $74 million. Design-Build project.

→ Lead estimator for the Berl L. Handcox, Sr. Water Treatment Plant (formerly Water Treatment Plan No. 4), City of Austin, Texas. While with a previous firm, Jason served as the lead construction cost estimator for the $150 million project located in located in Austin, Texas. Major elements of work included construction of clarifiers, gravity filters, sludge facilities, maintenance and administration buildings, pump stations, and clearwells. Jason collaborated with procurement staff to prepare the subcontractor scopes of work and solicitation documents, led the internal estimating effort, and completed all of the bid evaluations and GMP development. CMAR project.

→ Southeast Treatment Plant Biosolids Improvements, San Francisco Public Utilities, California, $1.1 billion. CMAR project.

→ Next Level Treatment, City Spokane, Washington, $126 million. CMAR project.

→ Wastewater Pollution Control Center, City of Fremont, Ohio, $57 million. CMAR project.

→ Phase A Expansion, Upper Blackstone Water Pollution Abatement District, Massachusetts, $23 million. CMAR project.

→ Estimator for the Thomas P. Smith Water Reclamation Facility Expansion, City of Tallahassee, Florida, $170 million. Responsibilities included managing the estimating team during the internal cost estimates preparation for the all of the work and completing subcontractor and vendor bid analysis, risk analysis, and other pricing reviews. In addition to traditional estimating, prepared Value Engineering (VE) estimates at multiple locations throughout the facility. Several of the VE concepts were actualized resulting in a significant savings to the overall project costs. CMAR project.

→ Wastewater Treatment Plant Expansion, North Davis Sewer District, Utah, $90 million. CMAR project. Hard-Bid project.

→ Wastewater Treatment Facility, Trinity River Water Authority, Texas, $196 million. Hard-Bid project.

→ Lake Texoma Water Treatment Plant Expansion, City of Sherman, Texas, $24 million. Hard-Bid project.

→ Water Storage Improvements, City of Avon Lake, Ohio, $23 million. Hard-Bid project.

STEVEN C KUEHR, PE

SENIOR CONSULTANT

Years of Experience: 40

Education

MS, Civil Engineering, Purdue University, 1985

BS, Civil Engineering, Purdue University, 1980

Professional Registration

Professional Engineer:

CO (0024369) & CA

Professional Societies

American Water Works Association

American Society of Civil Engineers

Colorado Association of Geotechnical Engineers

Rocky Mountain Water and Environment Association

Colorado Stone, Sand and Gravel Association

Mr. Kuehr is a Senior Consultant at Lithos Engineering. Mr. Kuehr specializes in geotechnical and tunnel engineering as it relates to water supply, sewerage, water resources, aggregate mining, roadway and bridge projects. He has technical expertise in tunnel engineering, foundation engineering, slope stability, expansive soils, ground modification, retaining walls, landslide evaluation and repair, embankment dam design and groundwater collection trenches and cutoffs constructed by the slurry trench method. He has 40 years of progressive engineering experience. He has performed and managed geotechnical engineering investigations for storm drain outfall projects, treatment plants, interceptor sewers, water transmission pipelines, water storage reservoirs, intake structures and pump stations.

RELEVANT PROJECTS

Griswold WPF Raw Water Structure – Phase 2, Aurora, Colorado

Principal-in-Charge and Project Manager for the new raw water vault at the Griswold Water Purification Facility. The subsurface conditions consist of eolian deposits and claystone/siltstone bedrock. Due to the presence of swelling claystone, a minimum 5 feet deep overexcavation with select fill backfill was recommended for the lower portions of the vault. There was a 72-inch raw water line adjacent to the vault. Provided geotechnical consultation including specification language and instrumentation recommendations regarding this issue. Reviewed Contractor’s submittals for shoring and instrumentation.

Wemlinger WPF Sediment Drying Beds, Aurora, CO

Served as Principal-in-Charge and Project Manager. This project involved replacing the existing sediment drying beds with new, engineered sediment drying beds. The new concrete lagoons were constructed within the same footprint of the existing earthen lagoons. Provided recommendations for a permanent dewatering system which will operate as the water levels in nearby Quincy Reservoir approach the high-water level. Also provided foundation design recommendations for various structures and considerations for a tunneled waterline crossing beneath Quincy Avenue.

Colorado Springs Utilities SDS Water Treatment Plant, Colorado Springs, CO

Principal-In-Charge for Colorado Springs Utilities (CSU) Southern Delivery System’s (SDS) 50 mgd water treatment plant and finished water pump station. The surface geology in the project area consists primarily of eolian soils extending to depths as much of 60-ft below existing ground surface. The eolian soils are hydro-collapsible and exhibit a collapse potential up to 6.3 percent. Design, construction and operation measures were necessary to mitigate the potential for water to collect below grade or to pond above grade. To mitigate the collapsible soils, the design-build team implemented Deep Dynamic Compaction techniques for ground improvement.

East Cherry Creek Valley Water & Sanitation District (ECCVWSD) Northern Water Supply Project, Reverse Osmosis Treatment Plant and Booster Pump Stations, Adams, Denver and Arapahoe Counties, CO

The ECCV Northern Supply Project includes a Reverse Osmosis Treatment Plant, High Service Pump Station, and North and South Booster Pump Stations and a 35-mile transmission line. The treatment plant, which includes a water storage tank, is located in the Beebe Draw geographic area which contains thick and soft clayey soils; a condition that is unusual for the Denver area. Consolidation testing and settlement analyses indicated that approximately six inches of settlement could occur beneath the heavily loaded storage tank. Designed a temporary site surcharge to preload the tank area; this will preconsolidate the site such that settlement under the plant will be minimal. The surcharge consisted of compacted soil constructed to a height of 20-ft and included settlement monitoring platforms. Settlement monitoring indicates that settlement is occurring. The surcharge will be removed when settlement is complete so that the tank can be constructed.

Bellvue Water Treatment Plant Residuals Handling Facility, Bellvue, CO

the Firm performed subsurface geotechnical investigations and provided design recommendations for this project, which involved rehabilitation of existing sedimentation basins, construction of a thickening tank, a new pump station, and a new flow-equalization basin. Site conditions consisted of saturated fine- and coarse-grained alluvium overlying siltstone and sandstone bedrock. Mr. Kuehr served as Project Manager for this project.

Public Wholesale Water Supply Project Water Treatment Plant and Pipeline, Ellis and Russell Counties, KS

Performed geotechnical investigations and provided design recommendations for construction of a new water treatment facility in Russell County, Kansas. The proposed facility consisted of tanks and structures for administration, treatment, and pump housing, and residuals handling ponds. Mr. Kuehr evaluated the potential for collapse or dissolution within soils with high calcium carbonate content. He also provided recommendations for the residuals handling pond liners and for the on-site proposed pavements. Evaluated subsurface conditions and identified potential high groundwater and soft soils along the proposed pipeline alignment. Mr. Kuehr provided recommendations for trenchless and open cut crossings of streams and local drainages, paved county roads, highways, and existing active railroad. He also performed in-situ resistivity testing during site investigation to provide the corrosion engineer with design parameters.

87th Avenue and Wadsworth Boulevard Lift Station, Westminster, CO

Provided geotechnical engineering recommendations for a lift station, overflow storage tank and for several trenchless roadway crossings. The lift station required a deep excavation in a congested urban environment. Recommendations included over-excavation and replacement of expansive bedrock. Trenchless engineering recommendations were provided for the roadway crossings.

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Christopher P. Juliana, PLS
Precision Survey & Mapping, Inc.
Colorado PLS No. 31158

Professional Experience

Precision Survey & Mapping, Inc.
7/1997 to Present
9145 E. Kenyon Ave., Suite 101
Denver, CO 80237

Position: Principal, Professional Land Surveyor
Mr. Juliana is the founder and Principal of Precision Survey & Mapping, Inc. He has a wide breadth of experience covering many types of land surveying projects. His responsibilities include oversight and management of all surveying efforts at PSM. He is experienced in the determination of boundary lines, the preparation of GPS control networks, property descriptions for the acquisition of real property and easements, ground control for aerial photogrammetry projects, ground surveys in support of civil engineering design projects including field cross-sections, utility and improvement locations. He is responsible for developing, training and implementing standards and processes for PSM's LiDAR Surveying Methodology.

Key points include:
- Responsible for Business Development
- Estimating and Bidding of Projects
- QA/QC
- Project Oversight and Project Management
- Survey Office Technician
- Field Crew Chief

Work History
- 10 years with other firms

Education
- Mercer County Community College, Trenton, New Jersey
  A.A.S., Concentration in Civil Engineering/Surveying

Qualifications
- Registered Professional Land Surveyor, State of Colorado-PLS No. 31158
- 31 years of experience in the Land Surveying Profession.

Professional Affiliations
- Member Professional Land Surveyors of Colorado-Central Chapter

Additional Proficiencies
- Proficient with Mobile/UAV LiDAR Data Collection and Post Processing

Commercial Drone Pilot
- FAA Part 107 Drone Pilot Certification

Recent Design Experience

WATER

City of Greeley, Boyd Lake WTP Process Improvements
New and expanded treatment facilities at the existing plant including a new chemical building storing hazardous chemicals, retrofitting existing exterior chemical tanks to be enclosed, and repurposing portions of an existing wet well to contain ozone operations. New structures are constructed of pre-engineered metal buildings for economy and efficiency.

South Adams County Water and Sanitation District, Pellet Softening Water Treatment Plant
New treatment and support spaces at the existing Klein Water Treatment Plant in Commerce City, including process facilities, control room, office space and training room. Pellet reactors and filters, designed to provide softened water to the district's customers, along with electrical and mechanical rooms, are housed in a 23,000 SF process building. Adjacent to this is the 3,500 SF administrative area. A separate building contains the hazardous chemicals. Site layout includes vehicle circulation, parking, transformers and generator.

City of Westminster, Big Dry Creek WWTP Dewatering Facility
New dewatering facility at the existing Big Dry Creek treatment plant. Two story building contains centrifuges and truck bays for the processing and removal of solids via semi-truck. Additional space is provided for chemical storage. Another feature of the facility is an elevator for ease of personnel movement. A control area, small open office area, and lockers are also provided for the staff.

Metro Wastewater Reclamation District, Biosolids Dewatering and Storage Facility
A large new treatment facility at the Robert W. Hite plant, this four-story dewatering and storage building includes 12 centrifuges and four hoppers feeding into semi-trucks in one of four truck bays. Stair towers and a freight elevator provide access throughout the building. A mezzanine level provides access to the top of the hoppers. In addition to the process areas, several electrical and mechanical rooms are interspersed through the building. A control room is located at the top floor and, due to the proximity to gas and oil production, is designed as a shelter-in-place room. Large expanses of translucent panels on either end of the hoppers provide diffuse natural daylight to enhance staff performance and safety.

City of Black Hawk, Colorado, Dory Hill Water Treatment Plant
New water treatment facilities for a historic mining town in the Colorado mountains, including new and upgraded structures for process, maintenance, administration and staff support. This challenging project made use of existing concrete water basins as the foundation for a new superstructure, containing treatment equipment and office areas. Architecture of the buildings emulates historic mining structures found nearby.

Colorado Springs Utilities, Southern Delivery System Raw Water Pump Stations
Responsible for 30% Design through Construction Administration of Bradley Pump Station, Williams Creek Pump Station, and Juniper Pump Station. As components of the Southern Delivery System the Raw Water Pump Stations move water 1,500 feet in elevation from Pueblo Dam to El Paso County. Major materials include brick veneer, metal wall panels, and translucent wall panels.

City of Boulder, 75th Street Wastewater Treatment Plant Upgrades
New and expanded treatment and support facilities at the existing plant included office space and lab. The design of these new structures matches the original plant's architectural vocabulary.

City of Longmont, Nelson Flanders Water Treatment Plant
Multi-structure plant located on a historic rural farm site adjacent to neighboring park and farm land, with wildlife corridors, public access to trail heads and historic structures. One of the goals of the design of the plant is to use siting, forms and materials to integrate the plant into the landscape. The Plant includes structures to house filters, chemical storage, pump stations, maintenance bays and administration and staff support facilities.

Arapahoe County Water and Wastewater Authority, Lone Tree Creek Water Reuse Facility
Design of five new structures at the existing plant's site. Design of the expansion unifies and upgrades the

plant's architecture and better integrates it into the developed residential and commercial neighborhood. New structures include Headworks, Blower, RAS, AWT, and Dewatering Buildings.

Denver Water, Williams Fork Reservoir Small Hydro/Outlet Works Building
Design of an outlet works structure addition housing a turbine for power generation. New construction blends with the historic structure while accommodating current operational needs, such as a bridge crane, monorail and vehicle bay, and the function of the turbine and associated piping. Design of a maintenance and office facility for the site

Metro Wastewater Reclamation District, Northern Treatment Plant Design Definition
As the architect on the Owner's Advisor team, headed by Carollo Engineers and in cooperation with process and civil engineers and landscape architects, we developed drawings and renderings to a 30% level in order to provide design definition for the project. Spearheading the programming effort on the Visitors' Center and Facilities Support Building, we conducting workshops and coordinated with staff to establish schematic design requirements. One of the design goals for the plant was to use building locations, grading and materials to integrate the plant into the landscape, working with existing topography and vegetation, rather than imposing the facilities on the site.

PUBLIC

Bureau of Land Management Fire Facilities
Site analysis, master planning and architectural design for several fire and hotshot facilities throughout the Western states. Campus designs include living quarters, maintenance and operations buildings, staff support and recreation facilities. Buildings designed using LEED guidelines.

Bureau of Land Management, Kanab Office Building
Overall design combines numerous functions from public facilities to office, laboratory and warehouse uses, as well as pedestrian and vehicular circulation, storage and other site amenities such as parking, landscaping and recreational areas. The public and administrative components are located in the 16,000 SF office building while the laboratory and warehouse components have been combined into the 5,000 SF warehouse building.

Professional Experience

Short and Brennan Architects, Principal, Project Manager, Designer
As Principal, Greg's responsibilities include project management and design, client coordination, project planning and budget analysis, selection of project team, technical information and code conformance, and other necessary tasks depending upon each individual project.

Licensed Architect: States of Colorado, Arizona, NCARB Certificate

Years at Short and Brennan: 19
Years of Professional Experience: 20

Education: Master of Architecture, University of Wisconsin-Milwaukee

Awards

Gold Hard Hat Award 2009 - SILVER, Outstanding Higher Education / Research Project: Sun Microsystems Data Center and Laboratory Conversion

Design-Build Institute of America - 2006 National Design-Build Awards - Best Project, Water Over $15 M: Nelson-Flanders Water Treatment Plant, Longmont, Colorado

Professional Organizations

American Institute of Architects, Colorado Chapter

LEED Accredited Professional

Project Management Institute

Engineers...Working Wonders With Water®

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