



PROPOSAL | JUNE 2019

PROCUREMENT OF
PROFESSIONAL SERVICES FOR
**CESSPOOL CONVERSION
TECHNOLOGY RESEARCH**

SOLICITATION NO. WWB 19-01



PROPOSED SCOPE OF SERVICES

In 2017, the Hawai'i State Legislature passed Act 125, which required the replacement of all cesspools by 2050. Subsequent legislation (Act 132) was passed to form and fund the Cesspool Conversion Working Group (CCWG), and to set its objectives and timeline. This project led by the Department of Health (DOH), Wastewater Branch (WWB) is an initial step of the CCWG to begin to form the technology framework for cesspool conversions in the state.

PROJECT UNDERSTANDING

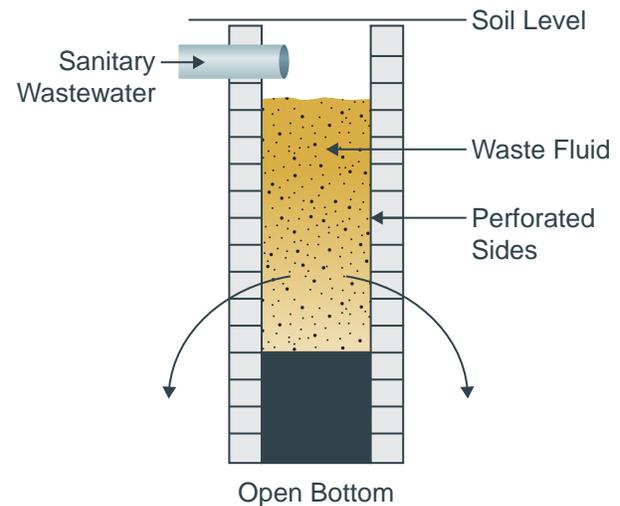
Cesspools are an antiquated method of disposing of wastewater. Raw wastewater flows directly to cesspools or below ground holes with no lining. The raw wastewater leaches into the surrounding ground and solids collect within the cesspool bottom. There are 88,000 cesspools in the State of Hawai'i, with 50,000 located on the Big Island of Hawai'i, 14,000 on Kaua'i, 12,000 on Maui, 11,000 on O'ahu, and 1,400 on Moloka'i. The equivalent discharge of these cesspools is estimated to be about 53 million gallons per day of raw sewage into the ground. Cesspools have been shown to have a potentially significant impact on drinking water quality, near shore and surface water quality, as well as the health of sensitive coral reefs. While there are many contaminants of concern in domestic wastewater, the primary contaminant of interest in Hawai'i is nitrogen.



Nutrients from cesspools can eventually flow to the ocean causing algae blooms, oxygen depletion, and damage to sensitive coral reefs in Maui.

Source: <http://mauicounty.us/community/marine-coral-reef-recoveryteam-to-address-council/>

Typical Domestic Cesspool



The State has already completed a study to “investigate the number, scope, and priority of cesspools Statewide that require upgrade, conversion, or connection based on each cesspool’s impact on public health.” The study categorized the cesspools into four priorities as presented on the following page.

Priority 1 areas were identified in Upcountry Maui and in the Kahalu'u area of O'ahu. A 2018 report prepared by the DOH on Upcountry Maui groundwater nitrate concluded that existing onsite disposal systems are significant contributors to nitrate concentrations loads in drinking water wells (2018, DOH).

Implementing cesspool conversion across the state will be no small feat. The key challenges and issues to be addressed are discussed in the following sections.

Balancing Costs and Risks to Develop Site-Specific Solutions

There is not a “one-size-fits-all” solution to this issue. The Carollo team will leverage our national experience as well as our local knowledge to research the technological and related financial options. Our team will work from the initial prioritization work completed for the Report to the 29th Hawai'i State Legislature Relating to Cesspools and Prioritization for Replacement, as well as other previous studies made available. Coordination between the technology and financial research is essential especially when it comes to developing site-specific solutions.

Addressing Public and Community Concerns and Feedback

While public outreach was not explicitly stated within the Request for Proposal (RFP), the Carollo team is prepared to engage the public on this topic should the CCWG deem it necessary as a part of this assignment. Some level of public engagement could prove helpful in vetting technology options.

Finding a Sustainable Solution

Besides the cesspool conversion issue, there are other various ambitious, state-wide, environmental goals, including attaining 100 percent renewable energy by 2045, increasing recycled water use by 30 mgd by 2030, providing for more locally produced agricultural products, as well as preparing for and mitigating the effects of climate change and sea level rise. The goals related to these other state-wide initiatives should be considered when assessing technology options for the cesspool conversion plan.

To find a sustainable solution, it is necessary to view the cesspool conversions plan with a long-term lens. Future considerations should include:

- **Life cycle cost analyses to account for long term on-going costs.** Besides the construction costs of cesspool conversions, there may be ongoing maintenance and repair costs that need to be addressed by homeowners. For example, septic

Priorities Identified by the State of Cesspool's Impact on Public Health

Priority 1: Significant Risk of Human Health Impacts, Drinking Water Impacts, or Draining to Sensitive Waters. Cesspools in these areas appear to contribute to documented impacts to drinking water or human health, and also appear to impact sensitive streams or coastal waters.

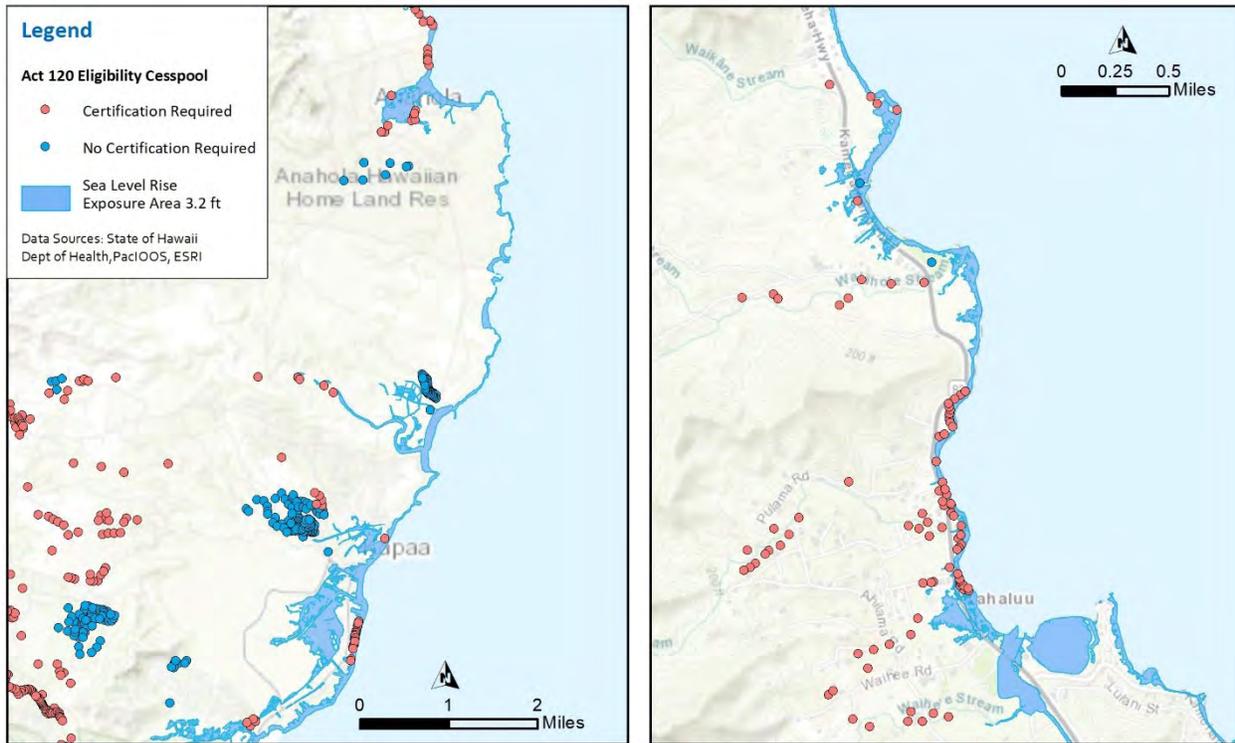
Priority 2: Potential to Impact Drinking Water. Cesspools in these areas are within the area of influence of drinking water sources, and have a high potential to impact those sources.

Priority 3: Potential Impacts on Sensitive Waters. Cesspools in these areas cumulatively represent an impact to an area that includes sensitive State waters or coastal ecosystems (coral reefs, impaired waterways, waters with endangered species, or other vulnerabilities).

Priority 4: Impacts Not Identified. Comprehensive health and environmental risks have not yet been assessed, or the risk of affecting public or environmental health currently appears low.

tank systems would need to be serviced, on-site wastewater treatment systems would need to be serviced and maintained, and composting toilets need to be emptied. These systems may also require periodic monitoring for compliance. There may also be institutional or organizational systems that need to be set up and funded, such as new special service districts. Our team will help to evaluate and consider these costs relative to technology options.

- Energy efficiency.** Given the high cost of energy in the State of Hawai'i, energy efficiency and potential energy cost of the proposed technologies is a concern. If there are opportunities for resource recovery, including renewable energy production with some of the technologies, these will be taken into account.
- Climate change impacts.** Some of the cesspools are located within coastal areas that will be subject to sea level rise. Rising sea levels will inevitably affect coastal groundwater conditions. Given the long-range timeframe of the cesspool conversions, the impacts of climate change should be considered. Plans to address some of the cesspool areas that will be affected by sea level rise should be coordinated with community plans to armor or retreat from coastal areas.



Plans to address some of the cesspool areas that will be affected by sea level rise should be coordinated with community plans to armor or retreat from coastal areas. Priority 1 and 2 areas that will be impacted by a 3.2 ft sea level rise are Kahalu'u, O'ahu (right), and Kapa'a, Kaua'i (left).

- **Future development or land use changes.** The cesspools are located in various land use areas ranging from urban to rural. Some of these areas may experience development changes and growth. Water and wastewater infrastructure availability could drive limited growth (e.g. decentralized treatment), or significant growth (e.g. centralized treatment). Future growth and development plans, if desired, may drive some communities towards decentralized or centralized treatment.
- **Future property transactions.** Another consideration is what to do when a cesspool property is bought or sold. If the cesspool has been converted to an onsite treatment system, the new owner would need to take over maintenance of the system. It may be necessary for the seller to include treatment system maintenance instructions, warranties, or guarantees. Inspection and/or operational compliance certification may be a condition of close of escrow.
- **Opportunities and applicability of water reuse.** Some of the proposed technologies may lend themselves to water reuse opportunities. Applications could include non-potable reuse for landscape or agricultural irrigation, indirect potable reuse (groundwater recharge), or potable reuse. Water reuse options may be desired by specific homeowners or communities, and may help to diversify water resource portfolios.
- **Infrastructure Challenges.** As part of the cesspool conversion analysis, we will address challenges we see before the DOH WWB and CCWP, such as cesspools that are either deep or difficult to access, to determine feasibility and options for conversion.

Planning for the Future and Meeting the 2050 Deadline

Of utmost importance is keeping on the path towards converting all cesspools by the stated, long-term 2050 deadline. With that in mind, we have program management experts available for this project that have experience in planning and



implementing large, long-term programs. Our team can help the CCWG think forward about implementation steps and institutional challenges and needs. We find that envisioning and talking through all the steps that accompany the future solutions helps agencies and communities to work through the decision-making process.

PROPOSED INTEGRATED APPROACH

Implementing the cesspool conversion across the state will be a challenge. However, with the long-range deadline of 2050, the CCWG is wisely proceeding with both the financial and technology framework and strategy development.

The Carollo team is pursuing both the financial and the technology research proposals because there are advantages to utilizing one, coordinated team:

- ▶ The treatment technologies and proposed technical solutions can impact the funding options and vice versa.
- ▶ There are cost and time savings and efficiencies for the CCWG in coordinating with one, consolidated team.
- ▶ A consolidated team will fully understand the longer term financial needs for the technical solutions.
- ▶ Provides a coordinated approach to public involvement and outreach.

Because we view the integration of the technology and financial research as advantageous, the following approach assumes some level of coordination between the two projects. Whether or not the CCWG entrusts our team with both projects, the following section applies as to how we would coordinate the finance research with the technology research.

Coordinate Financial Solutions with Technology Solutions

Close coordination between the financial and technical research teams could add overall project benefits. As the technology team identifies and shares potential technologies, the finance research team can start with initial steps, such as researching:

- Existing grants, loans, tax credits, rebates, and other funding mechanisms.
- Funding mechanisms utilized by communities facing similar issues (e.g. Rhode Island, New Jersey, and Florida).

This team may identify potential funding sources depending upon the proposed technology and potential benefits of the cesspool conversions. For example, economies of scale for cluster or shared technology solutions, potential provision of recycled water, green infrastructure, increased energy efficiency, or other community benefits of the proposed solutions may open doors for different funding opportunities.



Consider Integrating Community Feedback to Develop Site-Specific Solutions

Given that cesspool conversion is a very localized and personal issue mainly affecting homeowners in various locations across the state, community feedback is imperative to consider for the successful program implementation. Solutions that communities may view as undesirable may not be worth further investigation.

In addition, given the varying locations of the cesspools (urban, rural, coastal, inland, etc.) across the Hawaiian Island chain and within different counties, site specific solutions are needed for both the technology and financial pieces. We will account for these variable considerations.

Leveraging Local Knowledge and National Expertise with an Integrated Team

Many unique aspects about Hawai'i will need to be considered with both technology and financial solutions. Our team includes local, financial, technical, and public outreach expertise as well as a local project manager. Cari Ishida, our project manager, has over 14 years of diverse experience in long-range wastewater treatment and program planning, natural systems engineering, as well as water reuse and sustainability issues. She has worked on projects in Hawai'i, California, Arizona, Nevada, Illinois, and Florida. Prof. Roger Babcock of the University of Hawai'i has been researching wastewater issues in Hawai'i for over 25 years.

We are proposing the same technical advisory and project leadership team for both the financial and technology cesspool research projects, providing continuity and coordination between the two, intertwined issues.

He has recently completed a study of onsite wastewater treatment technologies for Upcountry Maui. John Katahira, our community and public outreach lead has over 24 years of local experience and performed public outreach services for some of the largest and challenging projects implemented in the state. Cari, Roger, and John are all deeply committed to helping the local communities in their home state of Hawai'i.

Our team also includes technical advisors Paavo Ogren and John Waddell, both of whom were instrumental in the septic tank conversion program for Los Osos in San Luis Obispo County, California. Paavo guided the County of San Luis Obispo through a decades long process and policy development to convert 14,000 septic tanks for Los Osos. John oversaw and managed the implementation of the septic-to-sewer conversion, including extensive public outreach, loan/grant funding pursuits, and planning/engineering/construction.

APPROACH TO CESSPOOL CONVERSION TECHNOLOGY RESEARCH

We have assembled a team of local and national wastewater experts to research cesspool conversion technologies for Hawai'i. The following sections describe our approach to this research.

Range of Possibilities for Onsite Technologies

Our team will start with compiling a list of a wide range of technologies for discussion and screening. We will leverage the previous studies completed and publicly available for the State

We have a jump start on this work as our team includes Dr. Roger Babcock from the University of Hawai'i. Roger has recently completed onsite technology comparisons for Upcountry Maui, one of the high priority cesspool conversion areas.

ONSITE NITROGEN REDUCTION TECHNOLOGIES

SOURCE SEPARATION

- Urine Recovery
- Wastestream Segregation
 - Graywater/Blackwater

PHYSICAL/CHEMICAL PROCESSES

- Membrane Separation
- RO/NF
- Ion Exchange
 - Cation or Anion
- Evaporation
 - Incineration, Solar, or Distillation

BIOLOGICAL NITRIFICATION/ DENITRIFICATION PROCESSES

- Mixed Biomass
 - Bacterial Cell Carbon/Sewage Carbon
- Two-stage Segregated Biomass
 - Nitrification/Denitrification

NATURAL SYSTEMS

- Soil Infiltration
 - Heterotrophic Nitrification/ Denitrification or Anammox
- Vegetative Uptake/Evapotranspiration
- Constructed Wetlands
 - Free Surface or Submerged

A wide range of technologies will be screened prior to further evaluations.

of Hawai'i, as well as other similar studies, such as those completed for Florida, Rhode Island, and New Jersey. The four primary categories of technologies are source separation, physical/chemical processes, biological nitrification/denitrification processes, and natural systems. Each of these categories can be broken down to subcategories and technologies. We will develop a complete list that will be screened and vetted with the CCWG.

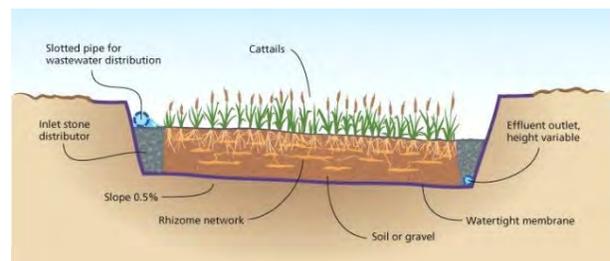
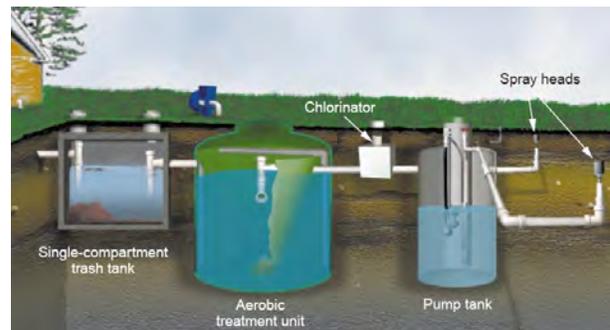


Onsite removal of nitrogen from wastewater can be complex and difficult to manage. It will be important for Carollo's team to use its extensive knowledge of treatment technologies to evaluate each option for complexity, treatment performance, reliability, and whether the technology is feasible for the proposed sites with regards to the monitoring and maintenance needed to maintain performance. After all, one technology will not fit all sites or owners. The costs of the system and the long-term maintenance needs must be considered with the treatment performance of the technology.

Key Site-Specific Criteria

It will be important to consider the following site-specific criteria:

- Is the cesspool located in an area with a high groundwater table?
- Does the soil have low permeability?
- Is there steep terrain?
- Is the cesspool located in a flood zone?
- What is the proximity of the cesspool to inland surface water and coastal waters?
- Is the local groundwater impaired?
- Is there lateral groundwater movement?
- Is there an existing sewer lateral within a reasonable distance?
- Is there a cluster of cesspools in this area?



Aerobic treatment units (top) will require regular maintenance, whereas passive systems, such as treatment wetlands (bottom) will require minimal maintenance.

In some cases, the advantages and disadvantages of passive and active treatment systems may be the deciding factor for feasibility at a site due to differences in operations and maintenance requirements. Carollo will work closely with the CCWG to ensure the weighting of technologies for the evaluation is adjusted by type of site with consideration of the stakeholder as well as investigating funding potential. A technical team with a local understanding of issues will be critical to developing feasible options that can be implemented by 2050.

Decentralized Treatment Options

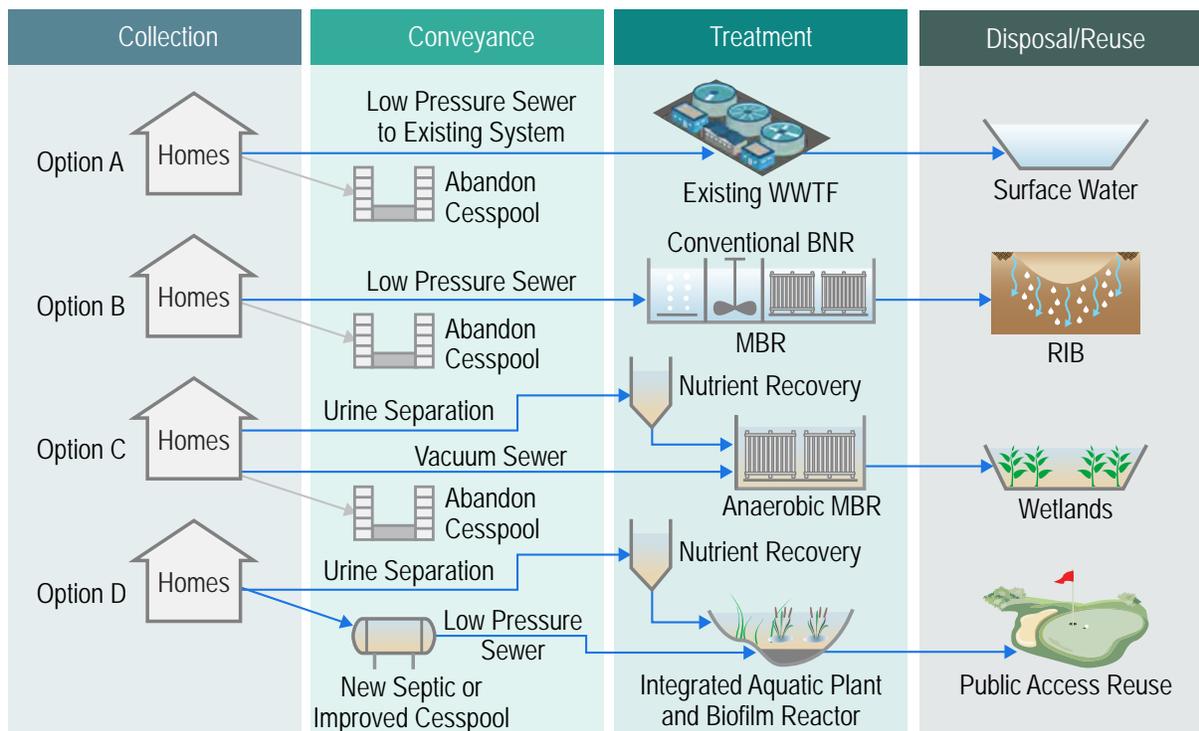
Decentralized treatment may be a viable option for clusters of cesspools and may be combined with source separation strategies. The figure below shows options of decentralized treatment (options B through C) compared to conventional, centralized treatment (option A).

Option B shows the existing cesspools are phased out and wastewater from the residences is conveyed to a small Membrane Bioreactor (MBR) facility serving the nearby residences. This provides a less expansive collection system is required as decentralized treatment allows small facilities to be located much closer to the residences they serve.

Option C shows a more innovative approach to decentralized systems than Option B, with urine separation implemented to capture this waste stream before it mixes with the remainder of the collected wastewater. This illustrates the opportunity to tailor the collection of the wastewater in the service area to simplify or improve treatment processes with the potential for resource recovery. The majority of the nutrients found in domestic

wastewater are found in urine, and separating this stream presents opportunities to simplify downstream treatment processes and conduct nutrient recovery. In Option C, this separation allows for the implementation of anaerobic MBR treatment to treat the main waste stream.

Option D presents the potential for a small-footprint, low-cost system with source separation and a decentralized treatment system. The nutrient recovery system removes the majority of the nutrient load upstream of the treatment system and anaerobic treatment of the remaining waste stream occurs within cesspools at the residences. Rather than the effluent of these tanks being piped to drain fields, it is piped to a second treatment stage. In this case, an Integrated Aquatic Plant and Biofilm Reactor operates as a more intensified version of a constructed wetland, with aquatic plants providing a substrate for the growth of biofilms to conduct removal of organics and nutrients. When combined with upstream anaerobic treatment and nutrient removal, such a system could produce high-quality effluent while requiring a small footprint and low operating costs.



Leverage Previous Studies on Decentralized Treatment

Carollo completed the industry’s most detailed evaluation of small scale and satellite water reclamation facilities. This evaluation, funded by the WaterReuse Research Foundation and the United States Bureau of Reclamation, is called “Low Cost Treatment Technologies for Small Scale Water Reclamation Plants”. The goal of the evaluation was to define the regulations, technologies, cost, and performance of small scale and satellite treatment plants with flows of less than 5 million gallons per day (mgd), with an emphasis on flows of 1 mgd and below. The project evaluated 242 constructed treatment plants, resulting in a rigorous understanding of costs as a function of treatment technology and flow.

The primary value of this research project is to provide utilities with an immediate understanding of the costs of satellite treatment with a minimum level of input and effort. Detailed construction and operational costs curves were developed for all major technologies, including membrane bioreactors (MBRs), sequencing batch reactors (SBRs), biological filtration processes, oxidation ditches, and many others. This construction cost comparison tool can be used to determine the feasibility of a decentralized system for cesspool conversions, where applicable.

Decision Support Tools

Our team has experience utilizing many methods and tools to support the decision-making process. One methodology that often works well for decisions involving many criteria and points of view is pairwise comparison. Identifying the criteria will involve coordination with the WWB and CCWG, Carollo’s team, and stakeholders. The stepwise procedure for applying pairwise comparison are as follows:

1. Decide upon the decision criteria (e.g. cost, complexity, long-term maintenance, site characteristics, etc.)
2. Rate the relative importance of each criterion when hedged against another criterion to develop weighting factors with special consideration to type of site and stakeholders.
3. Use the weighting factors and scores to rank technologies.
4. Review the results with the WWB and CCWG and adjust weighting factors if necessary.

Pairwise comparison or other decision-making tools can be applied to develop the evaluation matrices for the onsite technologies and decentralized treatment options.

EXAMPLE CRITERIA	CONSTRUCTION COST	O&M COST	LAND AREA REQUIREMENT	TOTAL NITROGEN TREATMENT EFFICACY	ENERGY REQUIREMENTS	OPERATION COMPLEXITY	CONSTRUCTABILITY	SITE CHARACTERISTICS	TOTAL	WEIGHT
Construction Cost	1.00	1.00	3.00	2.00	2.00	3.00	5.00	5.00	22.00	26.92%
Long Term O&M Cost	1.00	1.00	2.00	2.00	2.00	3.00	1.00	1.00	13.00	15.91%
Land Area Requirement	0.33	0.50	1.00	2.00	2.00	2.00	2.00	2.00	11.83	14.48%
Total Nitrogen Treatment Efficacy	0.50	0.50	0.50	1.00	2.00	1.00	2.00	1.00	8.50	10.40%
Energy Requirements	0.50	0.50	0.50	0.50	1.00	1.00	1.00	1.00	6.00	7.34%
Operation Complexity	0.33	0.33	0.50	1.00	1.00	1.00	3.00	1.00	8.17	9.99%
Constructability	0.20	1.00	0.50	0.50	1.00	0.33	1.00	1.00	5.53	6.77%
Site Characteristics	0.20	1.00	0.50	1.00	1.00	1.00	1.00	1.00	6.70	8.20%

An advantage of using a decision support method, such as pairwise comparison is that it provides a transparent method that can be shared with decision makers and stakeholders.

Pilot and Validation Testing

A key consideration throughout this assignment will be an awareness and maintaining a library of prior studies to leverage previous work. The purpose of pilot and validation testing would be to fill data gaps on performance efficacy and operations variables, and/or test site specific variables not available from past efforts.

Should we identify promising technologies with significant data gaps relative to performance and operating needs, a pilot test program may be implemented. Pilot testing can provide information on the response of a process to variations in flow and quality of wastewater, establish design criteria, better define operating and maintenance requirements, and provide better definition on the expected cost for full-scale facilities. For this project, testing may be completed at a bench-scale or pilot-scale with the combined resources and capabilities of the University of Hawaii (UH) and Carollo.

We will work with the WWB and CCWG to develop a proposed pilot testing plan and pilot design for each technology to be tested. For each pilot test, the plan will include a design, O&M protocols, a safety plan, and a schedule for operations. If the testing program is desired, our team can proceed with pilot testing, conduct workshops with the CCWG at the beginning and end of the pilot testing process, and a final report will be generated summarizing all pilot testing results and recommendations.

SCOPE OF WORK

Task 1 – Kickoff Meeting

In our experience in coordinating large, complex programs, we find it beneficial to conduct a kickoff meeting with key staff to set the course of the project. We will coordinate with the WWB project manager to determine attendees and agenda for the meeting. If members of the CCWG would like to provide their input on technologies evaluated to date, this would be a good time to engage them. This task will be led by Carollo.

Task 1 Deliverables:

- ▶ Project Kickoff Meeting Agenda
- ▶ Project Kickoff Meeting Minutes

Task 2 – Create an evaluation matrix of existing technology for onsite systems to replace cesspools at individual residences.

We will develop an evaluation matrix of existing, National Science Foundation (NSF) compliant technologies for onsite treatment systems, including septic tanks, aerobic treatment units, graywater/blackwater, recirculating sand filter, enhanced phosphorus removal, UV disinfection, evapotranspiration, and other passive systems.

Other technologies that may be evaluated include, but are not limited to low water/waterless toilets, constructed wetlands, elevated mound systems, and absorption fields.

The matrix will include benefits and challenges of implementing each technology, operations and maintenance considerations, life of the proposed system, capital cost, availability, and level of treatment provided. Site factors such as the occurrence of a high water table, soil permeability, slope of terrain, as well as proximity to a flood zone, surface, or coastal waters will also be considered.

Other factors and considerations that may be appropriate to include in the matrix include:

- Affordability and Accessibility to Funds
- Provides Reliability, Redundancy, and/or Resiliency
- Provides Energy Efficiency
- Provides Community Asset
- Supports Local Agricultural Production
- Recycled Water

This task will be led by Carollo and supported by UH and The Limtiaco Consulting Group (TLCG).

Task 2 Deliverables:

- ▶ Technology Evaluation Matrix

Task 3 – Establish a screening process for existing and emerging replacement technologies. (Partial Optional Task)

The Carollo team will create a summary of the existing and emerging onsite treatment technologies, including advantages and disadvantages of each, and a description of the process developed to vet these technologies. The technologies, screening process, and recommendations will be summarized in a DRAFT Technical Memorandum (TM).

We will conduct a meeting with the WWB and CCWG to review and discuss the DRAFT TM. Review comments will be incorporated into a FINAL TM.

This task will be led by Carollo and supported by UH and TLCCG.

Task 3 Deliverables:

- ▶ DRAFT Summary of Onsite Treatment Technologies TM
- ▶ Review Meeting agenda and minutes
- ▶ FINAL Summary of Onsite Treatment Technologies TM

Task 4 – Create a second evaluation matrix that is portrayed for the homeowner audience.

We will provide a second evaluation matrix that is geared toward homeowners to outline the different cesspool conversion technologies. The DRAFT Homeowner's Guide will be provided to the WWB and the CCWG for review and comment, then finalized. TLCCG will lead this task with support by Carollo and UH.

Additional public outreach/stakeholder workshops may be included if desired by the WWB.

Task 4 Deliverables:

- ▶ DRAFT Homeowner's Guide
- ▶ FINAL Homeowner's Guide

Task 5 – Review DOH's Onsite Wastewater Treatment Survey and Assessment of 2008 that outlines different types of wastewater systems and provide a write-up of any updates.

Our team will review the 2008 Onsite Wastewater Treatment Survey and Assessment (2008, DOH) and will provide updates. In particular, the underground injection control discussion will be updated to reflect recent regulatory changes, and other updates as needed. The proposed markups will be provided to the Group.

We will conduct an in-person meeting to discuss the proposed updates. This task will be led by Carollo, and supported by UH.

Task 5 Deliverables:

- ▶ Proposed markups to the 2008 Onsite Wastewater Treatment Survey and Assessment
- ▶ Meeting to discuss markups

Task 6 – Create an evaluation matrix of decentralized options.

We will create an evaluation matrix of decentralized treatment options. We will review and reference existing regulatory framework. Then, we will create a summary of the existing decentralized technologies along with the process developed for vetting these technologies. Based on the available research and screening process established, we will describe the best alternative decentralized treatment technologies evaluated and our reasoning in a DRAFT TM.

We will meet with the WWB and CCWG to review the DRAFT TM. We will incorporate review comments to the FINAL TM. This task will be led by Carollo and supported by UH and TLCCG.

Task 6 Deliverables:

- ▶ DRAFT Decentralized Treatment Technologies TM
- ▶ Meeting to discuss comments
- ▶ FINAL Decentralized Treatment Technologies TM

Task 7 – Develop the framework and procedures for performing pilot testing of new technologies such as new toilets and alternative sewage treatment alternatives. (Optional Task)

The Carollo team will develop the framework and procedures for performing pilot testing of new technologies. These technologies may include new toilets and other alternative sewage treatment technologies. This task will be led by Carollo and supported by UH.

Task 7 Deliverables:

- ▶ Pilot Testing Procedures

Task 8 – Reporting

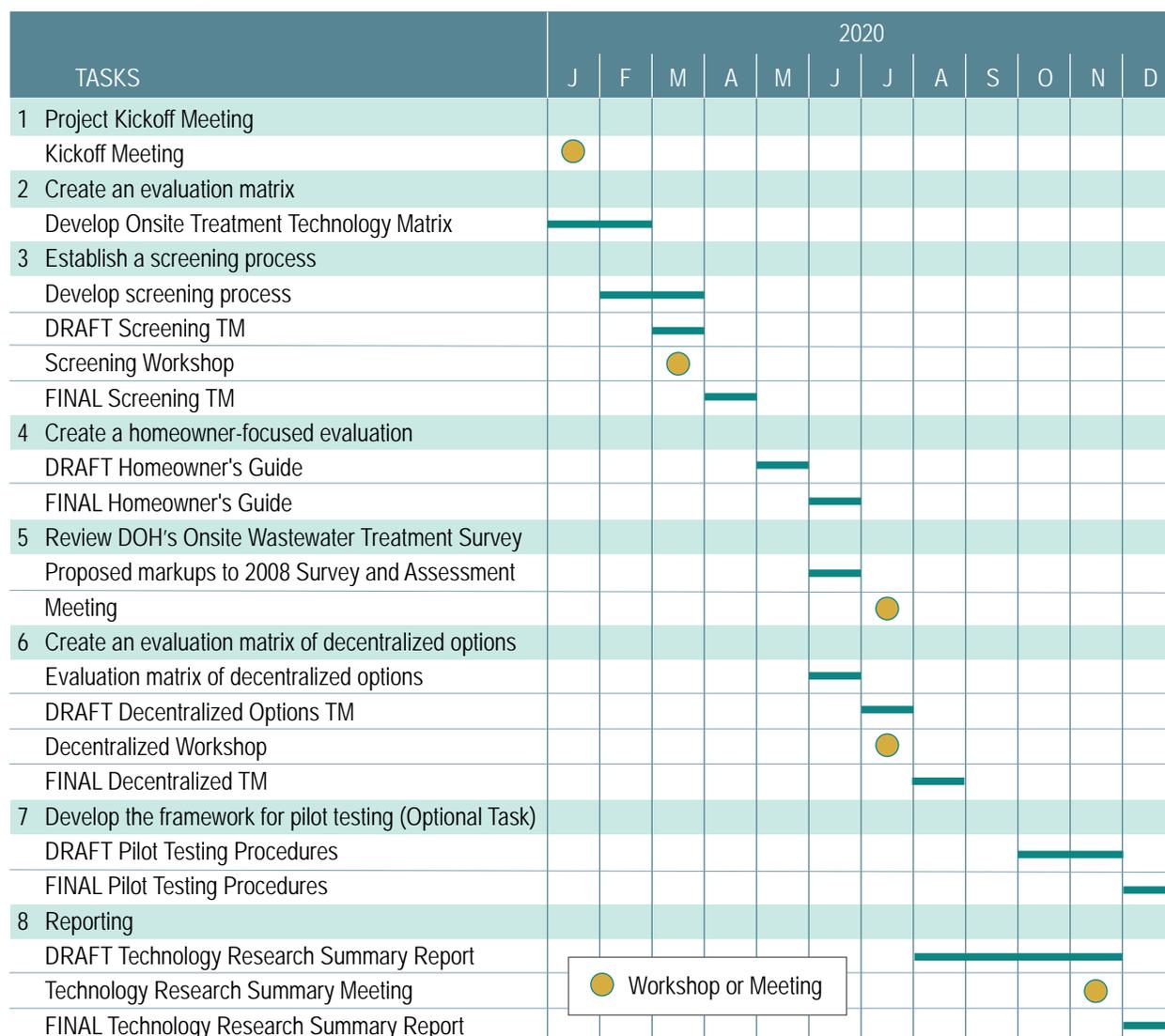
We will prepare a DRAFT and FINAL reports documenting all findings of the study.

Task 8 Deliverables:

- ▶ DRAFT Technology Research Summary Report
- ▶ FINAL Technology Research Summary Report

SCHEDULE

Our schedule is focused on delivering all scope of work items (including the optional task) within a 12 month period as listed in the RFP assuming a two week comment period on all deliverables.



SPECIAL QUALIFICATIONS AND EXPERIENCE

Carollo has provided wastewater expertise to clients nation-wide for 86 years, solving some of the most complex challenges in our industry. This background combined with our commitment to the local Hawai'i community is assurance that the Carollo Team will effectively assist the CCWP in the development of a long-range, comprehensive plan for statewide cesspool conversion by 2050.

GENERAL INFORMATION

The information presented herein has been prepared to summarize the qualifications of Carollo Engineers and our anticipated subconsultants to provide services to the Hawai'i State Department of Health, related to general wastewater engineering as well as specific to technology research associated with the comprehensive cesspool conversion plan. This section will include the following topics as required in the RFP:

- Principal Office and Point of Contact Information
- Firm Overview and Qualifications
- Relevant Experience and Project References
- Project Organization and Key Personnel
- Subconsultant Qualifications

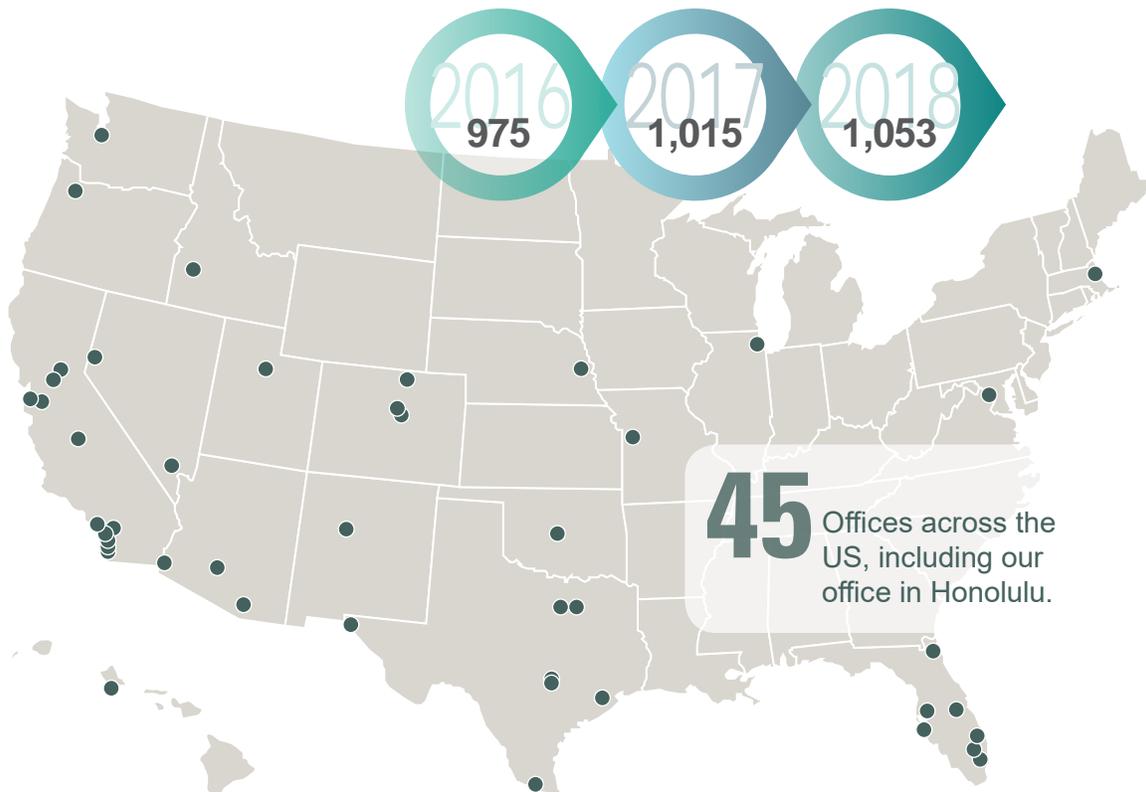
Principal Place of Business and Point of Contact

Carollo Engineers, Inc.
1003 Bishop Street, Suite 2700
Honolulu, HI 96813

Age of Firm: 86 years

Primary Point of Contact for
Proposal and Project:
Cari Ishida, PhD, PE, ENV SP
T: 808.524.0869
E: cishida@carollo.com

Number of Employees Over Last Three Years

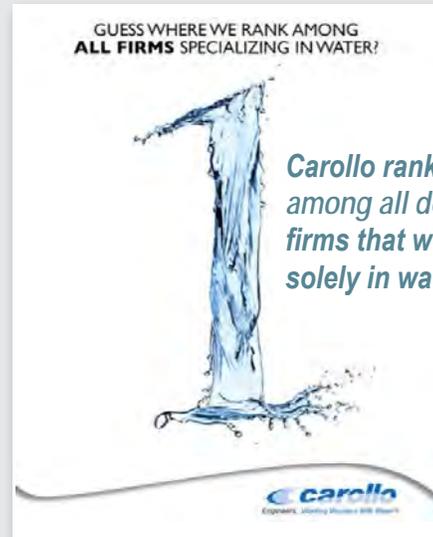


FIRM OVERVIEW

Water and Wastewater...It's All We Do

Carollo Engineers is the largest engineering firm in the United States focused solely on water and wastewater. For more than 86 years, we have specialized in the research, planning, design, and construction of water, wastewater, and water reuse treatment and infrastructure systems. With this singular focus, we attract the best and brightest technical staff with a passion for this industry, offering you the top experts with the skills and knowledge to deliver any project.

Within our industry we are sought after to deliver some of the largest and most complex wastewater conveyance and treatment systems, ranging small-scale service areas to populations exceeding 6 million citizens. These work efforts often involve complex technical, institutional, financial, and public outreach efforts to address aging infrastructure, capacity demands, water quality concerns, and new regulations. Our experience provides many lessons learned about how to meet our clients' long-term service needs while balancing the realities that come with high-profile



Carollo has provided planning and design services for wastewater treatment facilities with a combined treatment capacity of over 3 billion gallons per day.

projects. Consistently striking this balance is why so many of our client relationships are measured in decades.

Our specific wastewater experience is inclusive of the design of more than two million linear feet of wastewater pipelines, 500 wastewater pump stations, and hundreds of treatment facilities ranging in size from less than one to greater than 450 million gallons per day (mgd). We are experts in water reuse, and serve as a regulatory panelist for the National Water Research Institute, currently developing national regulatory guidance on potable water reuse.

Cesspool and Septic Tank Conversions

Our experience with the conversion of cesspool and septic tank systems spans more than 30 years. This expertise is inclusive of evaluation and demonstration testing of onsite treatment

units, gray water systems, decentralized treatment and reuse, as well as centralized collection (conventional gravity, STEP/STEG, vacuum, and low pressure systems) and treatment using a wide-range of technologies.

Representative Cesspool and Septic Tank Conversions		SERVICES PROVIDED				
CLIENT/AGENCY	CESSPOOL/SEPTIC TANK SERVICE AREA POPULATION	Planning	Design	Construction	Public Outreach	Project Funding
Elsinore Valley Municipal Water District, CA	30,000	✓				
City of Chico, CA	29,000	✓				
Hi-Desert Water District, CA	24,000	✓	✓	✓	✓	✓
San Luis Obispo County, CA (Los Osos)	14,000	✓	✓	✓	✓	✓
City of Modesto, CA	10,000	✓				
Washoe County, NV	9,400	✓				
Templeton Community Services District, CA	7,700	✓	✓	✓	✓	✓
Lost Hills Sanitary District, CA	2,400	✓	✓	✓	✓	✓
City of Redding, CA	1,500	✓				✓
Tulare County, CA (Delft Colony)	460	✓	✓	✓	✓	✓
Tulare County, CA (Tooleville)	390	✓	✓	✓	✓	✓
Tulare County, CA (Tonyville)	330	✓	✓	✓	✓	✓

Validation Testing of Onsite Technologies

Carollo has extensive experience in the validation and performance evaluation of many types of technologies including onsite and decentralized systems. The technologies we have validated in the past are often combined together to create full treatment trains to provide a multibarrier treatment approach. Our detailed technical knowledge

of each type of technology provides a unique perspective of the advantages, disadvantages, and potential conflicts of combining technologies. We also have a unique understanding on the operation and maintenance challenges as we have worked with the technologies in the field during the validations.

LOS OSOS SEPTIC TANK CONVERSION PROJECT

San Luis Obispo County, California

The community of Los Osos, California is located on the coastline of Central California adjacent to the Morro Bay National Estuary and relies on the underlying groundwater for its potable water supply. Los Osos previously included privately owned septic tanks for wastewater treatment and disposal. Decades of use of the septic tanks caused a buildup of nitrate and other wastewater-derived contaminants in the groundwater. The California Regional Water Quality Control Board issued an order compelling the community of Los Osos to collect and treat its wastewater to prevent further degradation of the groundwater quality.

San Luis Obispo County retained Carollo to provide project management, including feasibility-level planning and preliminary design for the Los Osos Wastewater System Project. Carollo evaluated various options for Los Osos, including onsite treatment utilizing various technologies including aerobic treatment units (ATUs); decentralized treatment with multiple water reuse scenarios; natural treatment, including partially mixed facultative pond alternatives; centralized collection system alternatives (conventional gravity, septic tank effluent pumping/septic tank effluent gravity (STEP/STEG), vacuum, and low pressure collection systems); and centralized treatment plant siting and treatment technologies. Other services provided included wastewater flow and load projections, infiltration and inflow analysis, effluent disposal and reuse alternatives analysis, groundwater management including seawater intrusion analysis, and community outreach support.

The Los Osos wastewater project goal was to not only stop individual septic tank discharges, but also to balance groundwater supply and mitigate ongoing seawater intrusion. Ultimately, Los Osos opted to build a centralized wastewater collection and treatment system, including more than 230,000 linear feet of conveyance piping, 21 pump stations. Treatment was provided by a 1.2 mgd water



HIGHLIGHTS

- Total Program Value: \$170M
- Evaluated onsite treatment, decentralized treatment, and natural treatment options.
- Conversion from septic tanks to centralized collection and treatment system driven by regulatory requirements.
- Extensive public outreach, funding, and permitting support to garner stakeholder buy-in and Board approval.
- Water reuse, groundwater recharge, and seawater intrusion mitigation.

reclamation facility adhering to a total nitrogen limit of 7 mg/L and Class A unrestricted use water production for community recycled water use, groundwater recharge, and agricultural irrigation.

Financial assistance obtained by Los Osos to support the program included United States Department of Agriculture 504 Program (loan/grant), low income financial assistance programs for service charges, lateral connection grant programs, property tax postponement programs (loan), and PACE program (loan). Los Osos also provided homeowners with an instruction pamphlet on beneficial reuse options of their septic tank and disposal field, such as stormwater infiltration, and rainwater cisterns.

YUCCA VALLEY SEPTIC TANK CONVERSION PROJECT

Hi-Desert Water District, California

The Hi-Desert Water District (District) is located in the Town of Yucca Valley, California, approximately 30 miles north of Palm Springs. The District provides water service to Yucca Valley and a portion of the unincorporated area within the County of San Bernardino, with a total service area of 52 square miles, including 16 storage tanks, 17 wells, and 300 miles of transmission and distribution pipelines. The service area also included over 10,000 septic tanks. A number of drinking water wells were showing high nitrate concentrations as a result of these onsite wastewater systems.

Committed to providing dependable water supply and wastewater treatment to its customers, the District worked with the California Regional Water Quality Control Board (Board) to develop and implement a plan to prevent further degradation of the groundwater supply. An interim solution of the installation of nitrate removal systems to treat affected wells was implemented; however, the Board stated that a permanent wastewater treatment system was necessary to protect the groundwater quality. Ultimately a plan was put in place to phase out the use of septic tanks to protect the District's potable water sources.

As a result, the District constructed a regionalized wastewater conveyance and treatment system consisting of 77 miles of sewer collection piping, 3 lift stations, and a 6 mgd water reclamation facility (WRF). Carollo was retained as the owner's representative project manager for the \$150 million septic to sewer conversion program.

Carollo's role in the project included preparing funding applications, including SRF loan applications, and Expanded Use SRF Loans, which could be applied to non-point source pollution projects. Carollo also assisted with the procurement process during each element of the project, such as survey, hydrology study, and



HIGHLIGHTS

- Total Program Value: \$150M
- Funding support, including non-point source pollution loan funding options.
- Procurement and project management support of septic tank conversion program.
- Engineering support for collection system design.
- Established trust, familiarity, and working history with District, District Board, local consultants, regulators, SRF loan representatives, and Town staff.

collection system design services consultants, and acted as the project manager for the District during the collection system design, including providing review of consultant submittals.

WaterPod™ DEVELOPMENT, DEMONSTRATION STUDY, AND PERFORMANCE EVALUATION

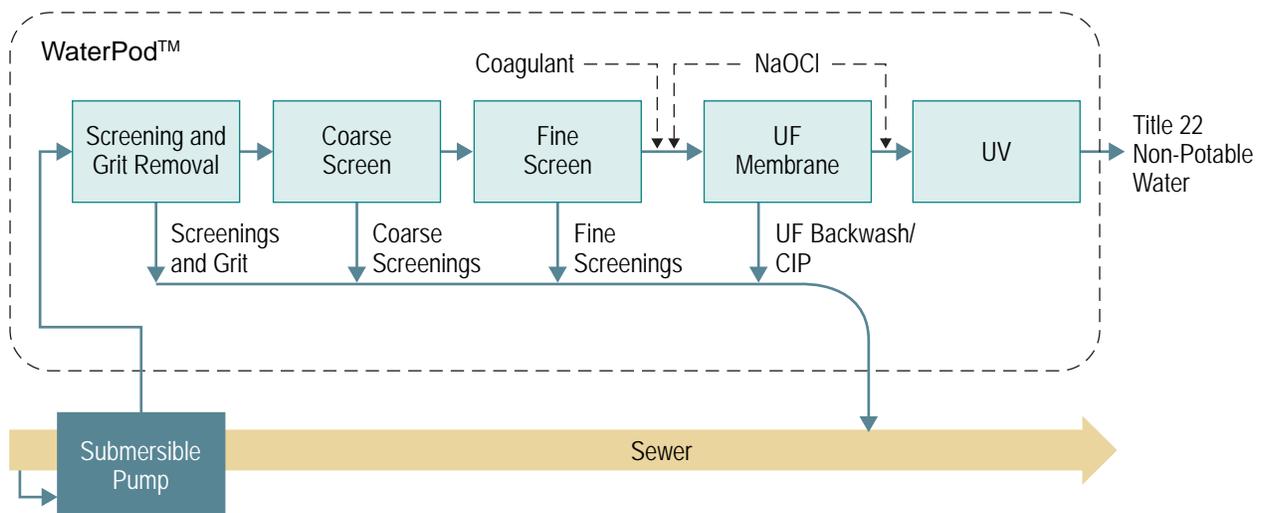
AquaTecture, LLC, Los Angeles, California

AquaTecture, LLC created a point-of-use onsite treatment system to produce recycled water from raw wastewater for a variety of non-potable uses, called the WaterPod™. Carollo was retained to perform overall evaluation and performance testing of the new technology. Phase I of the project consisted of developing a protocol to test demonstrate the WaterPod™ in order to obtain California State’s Division of Drinking Water’s (DDW) approval for equivalency of the water product with Title 22 Tertiary Disinfected Wastewater. Phase 2 involved the procurement, installation, commissioning, testing, adjusting, and operating of the WaterPod™ demonstration unit at the Inland Empire Utilities Agencies (IEUA’s) Regional Plant No. 4 (RP-4), in accordance with the details developed in the test protocol.



HIGHLIGHTS

- Development of validation protocol.
- Validation testing of an onsite technology.
- Treatment to Class A standards.



RURAL CESSPOOL AND SEPTIC TANK CONVERSION PROJECT

Tulare County, California

Tulare County is a primarily rural, agricultural area in the Central Valley of California. It is estimated that approximately 150,000 of the County's total population of 450,000 are served by onsite wastewater systems such as septic tanks and cesspools. Among the areas utilizing onsite systems are three small hamlets, referred to as Tooleville, Tonyville, and Delft Colony. The combined population and number of households in the three communities are 1,109 and 252, respectively. The County Health Department had documented numerous septic tank and cesspool failures in the area. In addition, nitrates were of concern relative to impacts to each community's potable groundwater well. Carollo was retained to provide overall project management, funding support, planning, design, and construction management to implement solutions to the community wastewater issues.

Due to the small lot size and highly impermeable soils, continued use of onsite systems was determined to be infeasible. As a result, a community sewage collection system and a small, decentralized wastewater treatment and disposal facility were implemented for each community. In all, the three community projects included approximately 2 miles of onsite sewer lateral, 4 miles of gravity sewer, and 3 treatment facilities ranging in capacity from 29,800 to 60,500 gallons per day. Due to the low income of the area, significant funding was required to assume project feasibility. Carollo worked collaboratively with Self Help Enterprises to secure a combination of Federal and State grants for the projects. Significant public outreach and involvement was also required. Self Help is a nationally recognized community development organization whose mission is to work together with low-income families to build and sustain homes and communities. The team also worked closely with the communities to provide technical assistance relative to the abandonment of onsite systems and connection of individual households to the new gravity sewer.

On-going operation, maintenance, funding, permitting, and reporting for each system is provided by Tulare County through the creation County Service Area No. 1.



HIGHLIGHTS

- Total Program Value: \$10M
- Converted existing cesspools and septic tanks to decentralized treatment system.
- Public outreach and permitting support.
- Financing support.
- Low income financing.

LOW-COST TREATMENT TECHNOLOGIES FOR SMALL-SCALE WATER RECLAMATION

WaterReuse Research Foundation, VA

Small-scale decentralized treatment facilities are often the most cost-effective approach to water reclamation efforts. In addition, decentralized treatment can be a viable alternative to failing onsite systems such as cesspools and septic tanks.

The overall goal for this Carollo-led project was to facilitate the implementation of small-scale water reuse projects by providing up-to-date information on the costs, capabilities, and operability of available small-scale decentralized treatment technologies. Specific objectives included:

- Identify a range of conventional and innovative unit treatment processes and package systems to be evaluated.
- Gather and synthesize cost and operability data from existing small-scale (1 mgd or less) water reuse facilities.
- Identify recommended treatment trains suitable for small-scale operation that will:
 - ▶ Minimize capital and operations and maintenance costs.
 - ▶ Minimize staffing requirements through automation and simplicity of operation.
 - ▶ Minimize waste streams while maintaining high product water quality.
 - ▶ Be readily exportable to developing countries.

Available technologies included conventional unit processes and treatment trains, as well as innovative combinations of conventional processes and proprietary package systems.

The level of treatment was based upon the public health/risk significance of the use. Many states have effluent requirements dictated by the type of reclaimed water use. These regulations were summarized alongside the technologies that can meet the use-specific water quality standards.

The project team disseminated the results of the study to as many users as possible, in particular those with limited financial and technical resources, such as communities in rural areas and in the developing world.



HIGHLIGHTS

- Evaluation of conventional and innovative decentralized wastewater treatment technologies.
- Focus on low cost technologies.
- Emphasis on small scale systems.
- Applications for local reuse.



ELSINORE VALLEY MUNICIPAL WATER DISTRICT WASTEWATER MASTER PLAN

Riverside County, California

Elsinore Valley Municipal Water District (District) is located in the southwestern portion of Riverside County, California and provides potable water, irrigation, sewer, and reclamation services to the City of Lake Elsinore, the City of Canyon Lake, portions of the City of Murrieta, and some unincorporated areas of Riverside County. Future growth and development plans showed that the District service area would grow from 96 to 137 square miles (88,100 acres) looking forward 20 years from 2008. The District retained Carollo to develop the 20 year wastewater master plan.

One of the District's challenges included the phased abandonment of over 8,500 septic tanks over a 25 year period. The septic tanks needed to be converted to protect the water quality of Lake Elsinore and other water resources. The additional wastewater flows due to septic tanks was 3.3 mgd, which represented a 60% increase in wastewater flows before accounting for additional flows due to growth. The septic tank abandonment was planned in five, prioritized phases from 2007 through 2030 based on the recommendations in a groundwater investigation report. Because a centralized wastewater collection and treatment system already existed, the District opted to connect the septic tank areas to the centralized system.

Carollo developed a detailed hydraulic model and identified the sewer system improvements required to accommodate the wastewater flows from the abandoned septic tank areas, including gravity pipelines, lift stations, and forcemains. The total estimated capital costs of the recommended 20-year sewer improvement program was \$207 million. Since completing the master plan, Carollo has continued to provide the District engineering support on other wastewater system improvement planning, design, construction management, and public outreach.

HIGHLIGHTS

- Total Project Cost: \$207M
- Phased implementation of septic tank conversion to centralized wastewater collection and treatment system.
- Long term program support on the septic tank conversion.
- Provided public outreach support.

PLEASANT VALLEY INTERCEPTOR ALTERNATIVES ANALYSIS AND DESIGN

Washoe County, Nevada

Washoe County Community Services Department (County) owns and operates a wastewater treatment and collection system in the South Truckee Meadows (STM) service area. The STM system covers 60.6 square miles near the southern tip of the County in Northwest Nevada. It consists of unincorporated land and a portion of the City of Reno. The current population of the service area is estimated to be 45,990. However, it is estimated that 36,580 people currently receive sewer service. The remaining 9,410 people within the service area are served by septic systems. STM treats an average of 5 million gallons of wastewater per day at three regional wastewater plants and manages the recovery of reclaimed water and biosolids from these waste streams.

Carollo has provided professional engineering services to Washoe County's STM area since the 1990's, and was retained to provide planning, design, and construction services for the Pleasant Valley Interceptor (PVI). The County is working with their service area communities to convert from septic systems to the centralized STM sewer system. As a part of the PVI planning phase, Carollo evaluated 9 different sewer collection system alternatives to accommodate wastewater flows from the converted septic systems. The total project costs for the alternatives ranged from \$29.5 to \$34.5 million.

Recognizing the need to financially assist property owners desiring to convert from a private onsite septic system to the STM sewer system, the Washoe County Board of Commissioners included in its 2009 Legislative Agenda a request for legislation enabling Washoe County to provide this needed assistance. Assembly Bill 54 of the 75th Legislative Session was written to provide this authority to Washoe County; it was signed into law on May 29, 2009. The legislation does not force septic system owners to convert over to the STM sewer system, but offers financial assistance to disconnect from a private sewer system, eliminate, decommission, or properly abandon a septic tank, and connect to a community sewer system.



HIGHLIGHTS

- Total Project Cost: \$29-35M
- Evaluated sewer system alternatives to accommodate septic tank flows to centralized sewer system.
- Long term program support to an agency working on phasing out septic tanks.

REFERENCES

We encourage you to contact the following references as they will attest to the quality of service and responsiveness that Carollo brings to each project.

CLIENT REFERENCES

Mr. Jason Nikaido, Acting Chief, Collection System Maintenance*
City and County of Honolulu Department of Environmental Services
P: 808.768.7220 | E: jnikaido@honolulu.gov

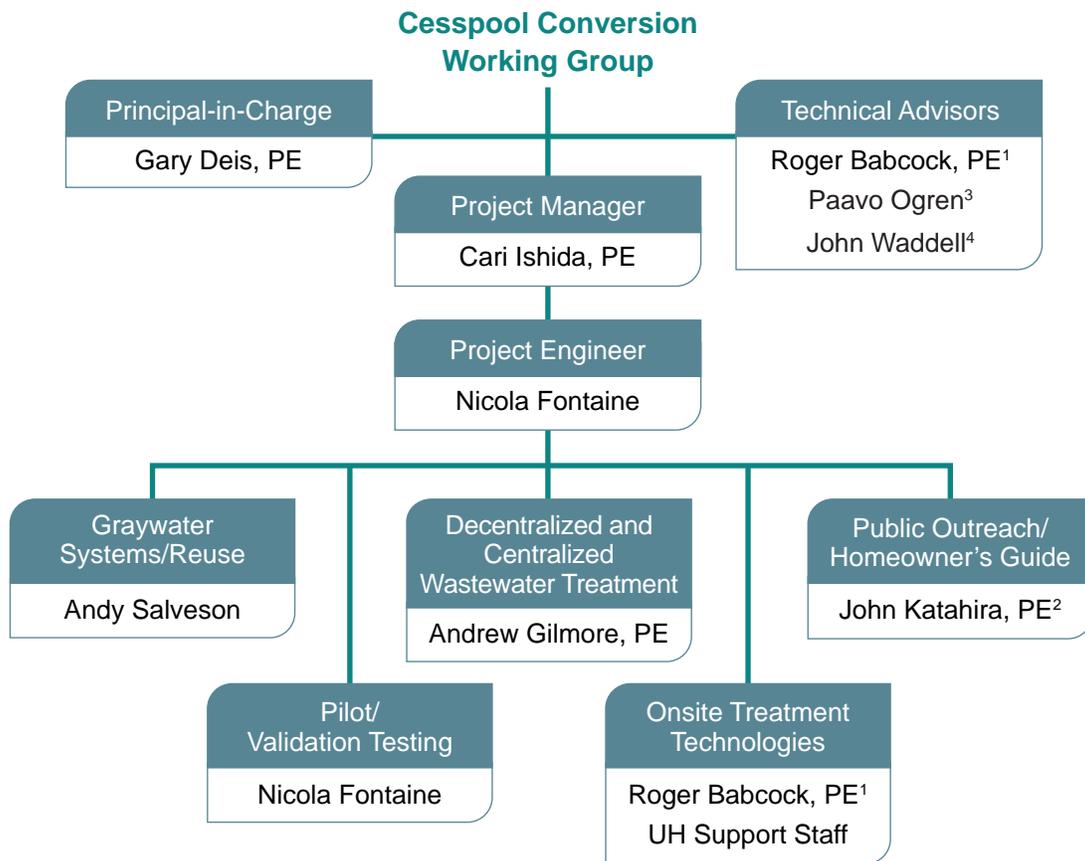
Mr. Wesley Yokoyama, Assistant Chief, DDC Wastewater*
City and County of Honolulu Department of Design and Construction
P: 808.768.8790 | E: wyokoyama@honolulu.gov

Mr. Tom West, Senior VP for Development
aquaTECTURE, LLC
P: 424.832.7017 | E: twest@aqua-tecture.net

Ed Muzik, General Manager
Hi-Desert Water District
P: 760.368.8333 | E: edm@hdwd.com

**Services have been provided to these clients within the last year.*

PROJECT ORGANIZATION AND KEY PERSONNEL



1. University of Hawaii
2. The Limtiaco Consulting Group
3. Former Public Works Director, San Luis Obispo County, CA
4. Construction Division Manager, San Luis Obispo County, CA

KEY PERSONNEL

Coupled with Carollo's extensive wastewater experience and our successful history of delivering effective solutions for cesspool/septic tank conversion programs, our team includes local and national wastewater experts and local public outreach support.



GARY DEIS, PE
Principal-in-Charge

EDUCATION:

*MS Sanitary Engineering, UC Berkeley;
BS CalState Fresno*

Gary is a senior vice president with Carollo. He has 44 years of experience in a wide range of complex wastewater projects and programs throughout the U.S., including projects for major utilities such as the Metro Wastewater Reclamation District, CO; East Bay Municipal Utility District, CA; and Sacramento Regional County Sanitation District, CA. He currently serves as project director for the evaluation of 20 wastewater pump stations and the construction management of the Pearl City Wastewater Pump Station Upgrade for the City and County of Honolulu. Gary has been responsible for the preparation of numerous wastewater rate studies and funding analyses, including projects for the East Bay Municipal Utility District, Orange County Sanitation District, and City of Sunnyvale, CA. He also served as project manager for the septic tank conversion project for several small communities in Tulare County, CA.



**CARI ISHIDA, PHD, PE,
ENV SP**
Project Manager

EDUCATION:

*PhD Civil and Environmental Engineering,
Northwestern University; MS Environmental
Engineering, Northwestern University; BS Environmental
Engineering, University of Southern California*

Cari has more than 14 years of experience in water and wastewater system planning and design. She has returned to her roots in Honolulu to expand Carollo's operations to Hawai'i. She was the project manager for several, long-range wastewater master plans, and has worked closely with agencies to develop financial and technology solutions. Cari also has expertise in natural systems treatment, including wetland systems, sustainability, and water reuse. Most recently, Cari was the project manager for the DuPage County Wastewater Master Plan and the Metropolitan Water Reclamation District of Greater Chicago's phosphorus removal feasibility studies. She also served as project manager for the Sand Island Wastewater Treatment Plant Primary Expansion, Phase 2 – Reconstruction Project. Cari is a registered Hawai'i Professional Engineer. **Cari is located in Carollo's Honolulu office and will be the primary point of contact for WWB regarding this RFP and project.**



ROGER BABCOCK, PhD, PE
Technical Advisor

EDUCATION:

PhD Civil Engineering, UCLA; MS Civil Engineering, California Polytechnic State University; BS Civil Engineering, UC Davis

Dr. Babcock is one of the preeminent experts in the State on Onsite Sewage Disposal Systems (OSDS) in Hawai'i, studying them since 1998. Most recently in 2018-2019, Dr. Babcock and his team of researchers have been working on the Investigation of cesspool upgrade alternatives for Upcountry Maui funded by Department of Health, Safe Drinking Water Branch. This investigation includes an evaluation of OSDS replacement alternatives, their site-specific costs, their environmental benefits, a cost/benefit decision-making analyses, and stakeholder engagement. This study will be completed in July 2019. In 2012, Dr. Babcock completed the Condition Assessment Survey of Onsite Sewage Disposal Systems (OSDS) in Hawai'i, which included an on-the-ground survey and assessment and sampling of OSDSs in Kaua'i, O'ahu, Moloka'i, Maui, and the Big Island of Hawai'i. This study found that 80% of the 181 OSDSs surveyed were not receiving basic maintenance, and 70% of effluent samples exceeded expected (EPA) values for total nitrogen and phosphorus. Roger's research team continues to study OSDSs including a current laboratory investigation of passive denitrifying absorption beds for cesspool and septic tank effluent. He also plans to conduct pilot testing of membrane bioreactor aerated treatment units, and field tests of various absorption bed materials. As a part of his research, Roger will be delving into issues of local conditions, locally sourced materials, low versus high technology options, operational costs versus reliability, and inspection/maintenance needs.



PAAVO OGREN
Technical Advisor

EDUCATION:

BS Business Administration - Accounting, California Polytechnic State University, San Luis Obispo

Over the course of PAAVO's 35 year career, he has led numerous technical, financial, and policy development efforts focused on compliance with state and federal environmental legislation. One of his legacy accomplishments was directing the solution for the conversion of septic tanks to a community wastewater system for Los Osos, CA. His leadership was paramount in successful project implementation, overcoming years of controversy. He also led the Integrated Regional Water Management Program for San Luis Obispo County and was instrumental in the formation of two special service districts. PAAVO's work in capital project management has resulted in several state and national awards from the American Public Works Association and the American Society of Civil Engineers.



JOHN WADDELL
Technical Advisor

EDUCATION:

BS, Environmental Engineering, Cal Poly State University, San Luis Obispo

John helped to guide the Los Osos septic tank conversion program for San Luis Obispo County (County) over the last 20 years. As the agency project manager, he led a comprehensive public outreach program, including a dedicated community liaison, website, social media, and phone hotline system. He also managed the program funding and procurement process, including a mixture of federal and state grants and loans. John also oversaw design and construction teams for \$130 million of new sewer infrastructure, including 50 miles of pipelines, lift stations, and a new 1.2 million gallon per day water recycling facility and recycled water distribution system. He currently leads a team of engineers and construction professionals in managing the County's construction projects.



NICOLA FONTAINE
**Project Engineer and
 Principal Technologist**

EDUCATION:
*MS Civil and Environmental Engineering
 BS Microbiology, University of New Hampshire*

Nicola is a principal technologist with 17 years of experience in disinfection, water reuse, and technology evaluation. Her experience with technology evaluations has consisted of bench-scale, pilot-scale, and full-scale testing and validation of disinfection technologies, filtration technologies, and decentralized systems. She has experience as a technologist, project manager, and project engineer supporting a variety of water, wastewater, and water reuse engineering projects (non-potable and potable), with a background in microbiology and ultraviolet (UV)/chemical disinfection of viruses, bacteria, bacterial spores, and protozoa.



ANDREW GILMORE, PE
**Decentralized and Centralized
 Wastewater Treatment**

EDUCATION:
*MS Water Engineering, California
 Polytechnic State University; BS
 Engineering Geology, State University of New York*

Andrew, a vice president and chief MBR technologist with Carollo, has 21 years of experience in wastewater treatment process and design, conventional and membrane technologies, activated sludge plants, and permitting for wastewater projects. Andrew will serve as the technical lead for centralized and decentralized treatment. He was involved in the first pilot test of an MBR on winery wastewater for Sutter Homes Winery (CA) in 2001. He also has experience with onsite treatment technologies such as E-One and Orenco. Andrew's experience extends to potable reuse as a member of the Steering Committee for Arizona Potable Reuse where he is specifically tasked with updating the Best Available Demonstrated Control technologies for use in DPR. Andrew is a registered Hawai'i Professional Engineer.



ANDY SALVESON
Graywater Systems/Reuse

EDUCATION:
*BS Civil Engineering, San Jose State University
 MS Water and Wastewater Engineering,
 UC Davis*

Andy has 24 years of environmental consulting experience serving public and private-sector clients in the research and design of water and wastewater treatment systems. He serves as Carollo's Chief Technologist for Water Reuse and is a nationally recognized expert in water reuse and disinfection. Andy provides guidance and expertise on state-of-the-art technologies on the latest industry issues regarding reuse, leading numerous planning, design, and research projects for various organizations, utilities, and corporations. Andy will provide technical advice and expertise on innovative treatment technologies and test protocol development. Andy is a licensed engineer in California, New Mexico, and Texas.



JOHN KATAHIRA, PE
**Public Outreach/
 Homeowner's Guide**

EDUCATION:
*MS Civil Engineering, UH Manoa;
 MBA Business Administration, UH Manoa;
 BS Civil Engineering, UH Manoa*

John Katahira specializes in the engineering of water, wastewater, recycled water and stormwater infrastructure. As president of The Limtiaco Consulting Group, Katahira's key responsibilities include business development, marketing, financial management, human resources, and information technology. He is the principal-in-charge for planning engineering and public outreach services. An active member of various nonprofit organizations, Katahira served as president of the American Council of Engineering Companies of Hawai'i and Hawai'i Water Environment Association. He also served as president of the Boys and Girls Club of Hawai'i Alliance Board. He is currently a corporate board member and executive committee member of the Boys and Girls Club of Hawai'i and executive committee member of the Engineering Alumni Association University of Hawai'i.

SUBCONSULTANTS

SUBCONSULTANT	GENERAL SCOPE OF WORK	APPROXIMATE PERCENT OF TOTAL EFFORT	CONTACT INFORMATION
University of Hawai'i 2540 Dole Street Holmes Hall 383 Honolulu, HI 96822	Technical Advisor for Technology Research Coordination	20%	Dr. Roger Babcock rbabcock@hawaii.edu 808.956.7550
The Lintiaco Consulting Group, Inc. (TLCG) 1622 Kananui Street Honolulu, HI 96817	Task 4 Lead, Community Outreach, and Local Issues	15%	John Katahira johntlcghawaii.com 808.596.7790
Paavo Ogren 3625 Maricopa Road Atascadero, CA 93445	Technical Advisor	< 5%	Paavo Ogren paavo.ogren@gmail.com 805.540.0887
John Waddell 2429 Ladera Court San Luis Obispo, CA 93401	Technical Advisor	< 5%	John Waddell john.i.waddell@gmail.com 805.459.5034



Dr. Roger Babcock and his UH Team are currently conducting a laboratory investigation of passive denitrifying absorption beds for cesspool or septic tank effluent. He also plans to conduct pilot testing of membrane bioreactor aerated treatment units, and field tests of various absorption bed materials. As a part of his research, Roger will delve into issues of local conditions, locally sourced materials, low versus high technology options, operational costs versus reliability, and inspection/maintenance needs.

Attestation Letters from each subconsultant can be found at the end of this section.

UNIVERSITY OF HAWAII AT MANOA

Department of Civil and Environmental Engineering

May 22, 2019

Cari Ishida, PhD, PE, ENV SP
Client Service & Project Manager | Associate
Carollo Engineers, Inc.
1003 Bishop Street, Suite 2700
Honolulu, HI 96813

Dear Ms. Ishida:

Roger Babcock of the University of Hawaii at Manoa [UHM] is pleased to provide this documentation to you regarding engineering support services to Carollo Engineers, Inc. in regards to the Procurement of Professional Services for Cesspool Conversion Technology Research Solicitation No. WWB 19-01. UHM is prepared to provide technical advisory services in support of the above mentioned contract as part of the Carollo Engineers Team. Proposed tasks to be performed by UHM are described in the enclosed proposal. The final scope of work for UHM will be negotiated upon contract award.

This is an exclusive agreement and UHM agrees not to partner with another firm on any project listed in the RFQ.

Once again, UHM appreciates the opportunity to be included on the Carollo Engineers team for this upcoming contract.

Sincerely,



Roger Babcock, PhD, PE
Professor
(808) 956-7298
rbabcock@hawaii.edu



THE LIMTIACO CONSULTING GROUP
CIVIL ENGINEERING AND ENVIRONMENTAL CONSULTANTS

May 20, 2019

Cari Ishida, PhD, PE, ENV SP
Client Service & Project Manager | Associate
Carollo Engineers, Inc.
1003 Bishop Street, Suite 2700
Honolulu, HI 96813

Dear Ms. Ishida:

The Limtiaco Consulting Group is pleased to provide this documentation to you regarding engineering support services to Carollo Engineers, Inc. in regards to the Procurement of Professional Services for Cesspool Conversion Technology Research Solicitation No. WWB 19-01. The Limtiaco Consulting Group is prepared to provide technical advisory services in support of the above-mentioned contract as part of the Carollo Engineers Team. Proposed tasks to be performed by The Limtiaco Consulting Group are described in the enclosed proposal. The final scope of work for The Limtiaco Consulting Group will be negotiated upon contract award.

This is an exclusive agreement and The Limtiaco Consulting Group agrees not to partner with another firm on any project listed in the RFQ.

Once again, The Limtiaco Consulting Group appreciates the opportunity to be included on the Carollo Engineers team for this upcoming contract.

Sincerely,

A handwritten signature in black ink, appearing to read 'John H. Katahira', written over a circular stamp.

John H. Katahira
President
(808) 687-8723
john@tlcgohawaii.com

1622 Kananui Street • Honolulu, Hawaii 96817
(808) 596-7790 • tlcgohawaii.com

May 30, 2019

Cari Ishida, PhD, PE, ENV SP
Client Service & Project Manager | Associate
Carollo Engineers, Inc.
1003 Bishop Street, Suite 2700
Honolulu, HI 96813

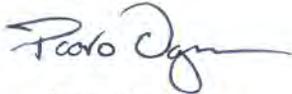
Dear Ms. Ishida:

I am pleased to provide this documentation to you regarding engineering support services to Carollo Engineers, Inc. in regards to the Procurement of Professional Services for Cesspool Conversion Technology Research Solicitation No. WWB 19-01 and the Cesspool Conversion Finance Research Solicitation No. WWB 19-02. I am prepared to provide technical advisory services in support of the above mentioned contract as part of the Carollo Engineers Team. Proposed tasks that I am to perform are described in the enclosed proposal. The final scope of my work will be negotiated upon contract award.

This is an exclusive agreement and I agree not to partner with another firm on any project listed in the RFQ.

Once again, I appreciate the opportunity to be included on the Carollo Engineers team for this upcoming contract.

Sincerely,



Paavo Ogren
Technical Advisor - Finance
805-540-0887
paavo.ogren@gmail.com

3625 Maricopa Road
Atascadero. CA 93422

May 31, 2019

Cari Ishida, PhD, PE, ENV SP
Client Service & Project Manager | Associate
Carollo Engineers, Inc.
1003 Bishop Street, Suite 2700
Honolulu, HI 96813

Dear Ms. Ishida:

I am pleased to provide this documentation to you regarding engineering support services to Carollo Engineers, Inc. in regard to the Procurement of Professional Services for Cesspool Conversion Technology Research Solicitation No. WWB 19-01 and the Cesspool Conversion Finance Research Solicitation No. WWB 19-02. As an independent contractor, I am prepared to provide technical advisory services in support of the above mentioned contracts as part of the Carollo Engineers team.

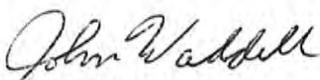
The tasks are expected to generally include any of the following, with the final scope of work depending on Carollo Engineers' negotiated agreement with the Hawai'i Department of Public Health.

- Provide input and guidance on the evaluation and screening of treatment technology alternatives
- Review and comment on draft reports, presentations, and other deliverables
- Participate in presentations and public meetings

This is an exclusive agreement and I agree to not partner with another firm on any project listed in the RFQ.

Once again, I appreciate the opportunity to be included on the Carollo Engineers team for this upcoming contract. I am looking forward to using my experience and background to help communities in Hawai'i improve their water quality.

Sincerely,



JOHN WADDELL, PE

Phone: (805) 459-5034
Email: john.i.waddell@gmail.com

JOHN WADDELL, PE
2429 LADERA COURT
SAN LUIS OBISPO, CA 93401

LABOR CATEGORY, PROFESSIONAL LEVEL, RATE SCHEDULE, AND PRICE LIST

The following section provides our team's labor categories, professional levels, and rate schedules.

CAROLLO ENGINEERS, INC.

POSITION	RATE**
Principal Engineer	\$287.00
Technical Advisor	\$287.00
Project Manager	\$262.00
Senior Engineer	\$222.00
Project Engineer	\$197.00
Staff Engineer	\$142.00
Admin/Document Processing/Graphics	\$112.00

OTHER DIRECT EXPENSES	
Travel and Subsistence	at cost
Mileage at IRS Reimbursement Rate	
Subconsultant	cost + 10%

THE LIMTIACO CONSULTING GROUP (TLCG)

POSITION	RATE*
Principal Engineer	\$200.00
Project Manager	\$170.00
Project Engineer	\$150.00
Senior Staff Engineer	\$125.00
Staff Engineer	\$110.00
Senior Env Planner	\$170.00
Env Planner	\$150.00
Staff Env Planner	\$110.00
CAD/Graphics	\$110.00
Admin	\$75.00

UNIVERSITY OF HAWAII (UH)

POSITION	RATE*
Technical Advisor/ Principal Investigator	\$128.00
Research Associate	\$35.00

OTHER

POSITION	RATE*
Technical Advisor	\$175.00

**Note: All rates exclude Hawai'i State General Excise Tax of 4.712%*

The table below presents a summary of the estimated total cost by task for the proposed scope of work. Optional tasks are broken out separately. The costs summarized below include our estimated labor, other direct expenses, and State General Excise Tax of 4.712%. The Carollo team is negotiable on the estimated costs and scope of work should you choose to entrust us to support you on this important project.

TASK AND DESCRIPTION	PROPOSED BUDGET FOR BASE SCOPE	OPTIONAL TASK BUDGET	TOTAL W/ OPTIONAL TASKS
Task 1 - Project Kickoff & PM	\$24,700	---	\$24,200
Task 2 - Create an evaluation matrix of existing technology for onsite systems to replace cesspools at individual residences	\$40,300	---	\$40,100
Task 3 - Establish a screening process for existing and emerging replacement technologies	\$57,400	---	\$56,700
Task 4 - Create a second evaluation matrix that is portrayed for the homeowner audience	\$26,500	---	\$26,000
Task 5 - Review DOH's Onsite Wastewater Treatment Survey and Assessment of 2008 that outlines different types of wastewater systems and provide a write-up of any updates	\$16,400	---	\$16,400
Task 6 - Create an evaluation matrix of decentralized options	\$46,100	---	\$45,900
Task 7 - Develop the framework and procedures for performing pilot testing of new technologies such as new toilets and alternative sewage treatment alternatives (Optional Task)	---	\$34,700	\$34,700
Task 8 - Reporting	\$52,600		\$52,600
Totals	\$264,000	\$34,700	\$298,700

CERTIFICATE OF VENDOR COMPLIANCE



**STATE OF HAWAII
STATE PROCUREMENT OFFICE**

CERTIFICATE OF VENDOR COMPLIANCE

This document presents the compliance status of the vendor identified below on the issue date with respect to certificates required from the Hawaii Department of Taxation (DOTAX), the Internal Revenue Service, the Hawaii Department of Labor and Industrial Relations (DLIR), and the Hawaii Department of Commerce and Consumer Affairs

Vendor Name: **CAROLLO ENGINEERS, INC.**

DBA/Trade Name: **CAROLLO ENGINEERS, INC.**

Issue Date: **02/12/2019**

Status: **Compliant**

Hawaii Tax#: W20173130-01
New Hawaii Tax#: GE198576537601
FEIN/SSN#: XX-XXX9222
UI#: XXXXXX2422
DCCA FILE#: 42560

Status of Compliance for this Vendor on issue date:

Form	Department(s)	Status
A-6	Hawaii Department of Taxation	Compliant
	Internal Revenue Service (Compliant for Gov. Contract)	Compliant
COGS	Hawaii Department of Commerce & Consumer Affairs	Compliant
LIR27	Hawaii Department of Labor & Industrial Relations	Compliant

Status Legend:

Status	Description
Exempt	The entity is exempt from this requirement
Compliant	The entity is compliant with this requirement or the entity is in agreement with agency and actively working towards compliance
Pending	The entity is compliant with DLIR requirement
Submitted	The entity has applied for the certificate but it is awaiting approval
Not Compliant	The entity is not in compliance with the requirement and should contact the issuing agency for more information



**STATE OF HAWAII
STATE PROCUREMENT OFFICE
CERTIFICATE OF VENDOR COMPLIANCE**

This document presents the compliance status of the vendor identified below on the issue date with respect to certificates required from the Hawaii Department of Taxation (DOTAX), the Internal Revenue Service, the Hawaii Department of Labor and Industrial Relations (DLIR), and the Hawaii Department of Commerce and Consumer Affairs

Vendor Name: THE LIMTIACO CONSULTING GROUP, INC.

DBA/Trade Name: THE LIMTIACO CONSULTING GROUP, INC.

Issue Date: 05/20/2019

Status: Compliant

Hawaii Tax#: W20473670-01
 New Hawaii Tax#: GE009674342401
 FEIN/SSN#: XX-XXX8608
 UI#: XXXXXX5070
 DCCA FILE#: 93694

Status of Compliance for this Vendor on issue date:

Form	Department(s)	Status
A-6	Hawaii Department of Taxation	Compliant
	Internal Revenue Service (Compliant for Gov. Contract)	Compliant
COGS	Hawaii Department of Commerce & Consumer Affairs	Compliant
LIR27	Hawaii Department of Labor & Industrial Relations	Compliant

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Gary C. Deis, P.E.

Gary Deis is a senior vice president with Carollo. He has 44 years of experience in a wide range of complex water and wastewater projects and programs throughout the U.S. His experience includes financial studies, master planning, design, and project delivery via conventional design-bid-build and alternative design-build concepts.

Education

MS Sanitary Engineering,
University of California,
Berkeley, 1975

BS Civil Engineering,
California State
University, Fresno, 1974

Licenses

Civil Engineer, California,
Kansas, Alaska, Michigan,
Utah, Oregon, Illinois,
Colorado, Missouri,
Nevada, Washington,
North Carolina, Arkansas,
Arizona, Idaho

Professional Engineer,
Texas, Hawaii

Professional Affiliations

American Water Works
Association

California Water
Environment Association

Water Environment
Federation

Relevant Experience

→ Project manager for the planning, design, and construction management of the septic tank and conversion project for three small rural communities in Tulare County, California. The project resulted in the construction of community sewage collection systems and small, decentralized wastewater treatment and disposal facilities.

→ Principal-in-Charge for comprehensive wastewater collection and treatment master plans for the City of Modesto, California. Planning efforts considered sewerage of areas currently served by onsite systems and the construction of decentralized wastewater treatment and disposal facilities.

→ Responsible for preparation of 12 wastewater rate studies and funding analyses, including projects for the East Bay Municipal District, City of Sunnyvale, Delta Diablo Sanitation District, and Orange County Sanitation District, California.

→ Project director for the evaluation of 20 wastewater pump stations for the City and County of Honolulu, Hawai'i. The project will assess compliance with National Fire Protection Agency requirements. All required improvements will be implemented via a design-build contract.

→ Project director for the construction management services for upgrade of the 36-mgd Pearl City pump station for the City and County of Honolulu, Hawai'i. The project involves the replacement of existing pumps and associated suction and discharge piping, surge tanks, as well as HVAC and EI&C improvements.

→ Project director for the Sacramento Regional County Sanitation District, California, EchoWater Project Tertiary Treatment Facilities, Nitrifying Sidestream Treatment, Return Activated Sludge Pumping, and Flow Equalization projects. Total construction value in excess of \$550 million.

→ Principal-in-charge for the Metro Wastewater Reclamation District, Colorado, PAR 942 North Secondary Complex Treatment Improvements. This \$65 million project involved modifications to the main influent channel to the plant while maintaining plant operations. Secondary improvements included modification to the BNR aeration basin layout, and secondary clarifiers to meet more stringent effluent nitrate and ammonia requirements while providing increased secondary treatment capacity.

→ Principal-in-charge for the Metro Wastewater Reclamation District, Colorado, PAR 1085 South Secondary Complex Treatment Improvements. This \$139 million project includes final design of a new 114-mgd secondary treatment complex.

→ Principal-in-charge for the City of Modesto, California, 15-mgd BNR/Tertiary Treatment Facilities. This \$120 million project involved final design of a primary effluent pump station, membrane bioreactors, membrane feed/WAS pump station, and UV disinfection to produce a high-quality tertiary effluent for reuse.

→ Principal-in-charge for design of the Napa Sanitation District, California, Soscol Water Recycling Facility. This project included a new headworks, primary clarifiers, and activated sludge processes. A tertiary filter complex treats wastewater to California Title 22 standards for unrestricted reuse.

→ Principal-in-charge for the North Valley Regional Recycled Water Program, California. Highlights of the \$80 million project include design of a retrofitted 30-mgd recycled water pump station with three - 1,000 horsepower pumps, 12 miles of 42-inch-diameter pipeline that includes more than 2,800 feet of horizontal directionally drilled construction beneath the San Joaquin River.





Cari K. Ishida, Ph.D., P.E., ENV SP

Dr. Cari Ishida has 14 years of experience in wastewater master planning and design, model development, treatment wetlands and nutrients removal strategies from surface water quality, and treatability studies. Recent projects include:

Education

PhD Civil and Environmental Engineering, Northwestern University, 2005

MS Environmental Engineering, Northwestern University, 2001

BS Environmental Engineering, University of Southern California, 2000

Licenses

Professional Engineer, Illinois, Hawaii

Civil Engineer, California

Certification

Certified, Envision™ Sustainability Professional, Institute for Sustainable Infrastructure, 2016

Professional Affiliations

Water Environment Federation

American Water Works Association

Relevant Experience

→ Project manager for the Sand Island Wastewater Treatment Plant (SIWWTP) Primary Expansion, Phase 2 – Reconstruction Project in Honolulu, Hawaii. The SIWWTP is a 90 mgd capacity primary treatment and disinfection facility, and is the largest plant in Hawaii. She oversaw the design and bidding process for this large primary expansion and rehabilitation project with a construction budget of \$67 million.

→ Project manager for the SIWWTP Secondary Treatment Membrane Bioreactor (MBR) Procurement, 3rd party review in Honolulu, Hawaii. Phase I of SIWWTP secondary treatment will include 20 mgd of MBR equipment. The project scope includes providing technical review of the MBR equipment procurement documents and process.

→ Project manager for the Windward Facilities Condition Assessments of various pump stations in Hawaii.

→ Project manager for the planning and design phases of the Heeia Wastewater Pump Station Improvements in Kaneohe, Hawaii. The pump station was over 40 years old and required extensive upgrades to improve reliability, reduce maintenance, and improve overall pump station performance.

→ Deputy project manager for the Metropolitan Water Reclamation District of Greater Chicago Phosphorus Removal Feasibility Studies for Kirie and Egan Water Reclamation Plants. Developing the capital improvement plan recommendations to meet 1.0, 0.5, and 0.1 mg/L total phosphorus effluent limits.

→ Project manager for the DuPage County Public Works (DCPW) Wastewater Master Plan (Master Plan). The Master Plan serves as a road map for DCPW, providing the capital improvement projects for the next 20 years. Major drivers for the Master Plan are

planning for phosphorus removal, addressing aging infrastructure, and financial sustainability.

→ Project engineer for the San Jose/Santa Clara, California Wastewater Master Plan. She coordinated directly with the client to develop standby/design criteria for future wastewater treatment processes, and subsequently performed capacity-rating analyses based on process data for existing facilities.

→ Conducted full-scale experiments in constructed wetlands as part of her thesis dissertation research at Northwestern University in Evanston, Illinois. The site of research was part of a wetlands mitigation bank supervised by The Wetlands Initiative.

→ Co-project manager for an advanced water treatment study of endocrine disrupting compounds (EDCs) and pharmaceuticals and personal care products (PPCPs) removal from California Delta source waters.

→ Project engineer for a research project that resulted in the validation of a specific ozone dissolution technology for wastewater reuse in California.

→ Project engineer for the Title 22 validation testing of Calgon Carbon's UV Disinfection Reactor. Completed a detailed testing protocol in order to achieve approval from the California Department of Health for reclaimed water use.

→ Project engineer for the commissioning of two UV disinfection systems at Los Angeles County Sanitation Districts in California. Developed a testing protocol for a flow/UVT, and sensor-based approaches.



Roger Babcock Jr.

Professor - Department of Civil Engineering and Water Resources Research Center
University of Hawaii at Manoa
2540 Dole Street - Holmes Hall 346
Honolulu, Hawaii 96822 (808) 956-7298, rbabcock@hawaii.edu

Degrees

B.S., Civil Engineering, University of California, Davis, 1987
M.S., Civil Engineering, California Polytechnic State University, San Luis Obispo, 1989
Ph.D., Civil & Environmental Engineering, University of California, Los Angeles, 1991

Experience

24 Years at current position (Professor = instructor, researcher, mentor, advisor, consultant)
1992-93 Project Engineer, John Carollo Engineers, Walnut Creek, California

Registration: California, P.E. in Civil Engineering, No. 51325, Hawaii No. 12133

Research Group:

4,500sf Environmental Engineering Laboratory and 800sf Water Quality Analytical Laboratory enable bench-scale wet lab process experimentation and analyses of all conventional and trace contaminants in water, sludge and soil. Research areas include biological wastewater treatment, on-site wastewater treatment, water recycling, membrane bioreactors, bioremediation, stormwater runoff management, and green roofs. Currently supports three PhD students, four MS students, two visiting international MS students and three BS students. Since 1995, a total of 4 PhD and 69 MS students have been advised to degree completion after conducting research in this group.

Research Funding

56 grants from agencies including NSF, USGS, EPA, DOD - Army COE, DOD-ESTCP, U.S. Dept. of Agriculture, Hawaii Department of Health, Hawaii DOT, Hawaii DBED, Honolulu Board of Water Supply, Honolulu Environmental Services, County of Maui, County of Kauai, County of Hawaii, WaterReuse Foundation, National Fish & Wildlife Foundation, Hawaii Sea Grant, and private companies including Reynold's Metal Company, URS Greiner Woodward Clyde, Best Industries USA Inc., Brown and Caldwell Inc., AECOM, R.M. Towill Corp., Environet Inc., Yogi Kwong Engineers, Kennedy Jenks, and International Wastewater Technologies. Total Funding: \$3,500,000.

Selected Related Publications

1. **Babcock, R.W.Jr.** (March, 2001) Experimental evaluation of on-site treatment and reuse of domestic wastewater. Presented at the 23rd Annual Hawaii Water Environment Association Conference, Honolulu, Hawaii.
2. **Babcock R.W.Jr.**, McNair, D., Edling, L., and Nagato, H. (October, 2001) Potential for decentralized residential treatment and reuse of domestic wastewater in Hawaii. Proceedings of the 74th annual conference of the Water Environment Federation (WEFTEC), Atlanta, Georgia.
3. **Babcock, R.W.Jr.** and Engineering Solutions Inc. (2008) Onsite wastewater treatment survey and assessment. University of Hawaii, Water Resources Research Center Report, 135 pp. Available at Hawaii State Department of Health website: <https://health.hawaii.gov/wastewater/home/forms/>
4. Ogata, S., and **Babcock, R.W.Jr.** (2009) Development of a Permitting, Maintenance, and Inspection Program for Onsite Sewage Disposal Systems in Hawaii. University of Hawaii, Water Resources Research Center Report No. WRR-2010-02, 109 pp.
5. **Babcock, R.W.Jr.** and Shoji, S. (March 2010) Design for graywater reuse in Hawaii: The new DOH guidelines. Presented at the 32nd Annual Hawaii Water Environment Association Conference, Honolulu, Hawaii.
6. **Babcock, R.W.Jr.** (October 2010) Comprehensive efforts to facilitate safe decentralized residential wastewater treatment and recycling in Hawaii. Proceedings of the 83rd annual conference of the Water Environment Federation (WEFTEC), New Orleans, Louisiana.
7. Chan T and **Babcock, R.W.Jr.** (May 2013) Master of Civil Engineering, Plan B. Major research report: "Diagnostic method to select onsite treatment and disposal systems," 25pp.
8. **Babcock R W Jr**, Lamichhane K M, Cummings M J, and Cheong G H (2014) Condition Assessment Survey of Onsite Sewage Disposal Systems (OSDS) in Hawaii. Water Science & Technology Journal **70 (6)**: 1083-1089. Source report/thesis available at Hawaii State Department of Health website: <https://health.hawaii.gov/wastewater/home/forms/>
9. Spirandelli D, Dean T, **Babcock R W Jr** and Braich E (2018) Policy gap analysis of decentralized wastewater management on a developed pacific island. Journal Environ Plan & Mgmt, doi: 10.1080/096640568.2019.1565817.
10. **Babcock, R.W.Jr.** (August 2018) Onsite wastewater treatment and disposal. Presented at the 2018 Hawaii Department of Health Joint Government Water Conference, Wailuku and Hilo, Hawaii.

Past Directly Related Projects

Each of these projects were conducted by graduate students with faculty mentoring.

1. Hawaii Source Water Assessment and Protection Plan – Supplement Onsite Sewage Disposal Inspection Study, funded by Hawaii Department of Health, Safe Drinking Water Branch, \$85,000, 2010-12. This project aimed to find the distribution of existing OSDS conditions statewide, to obtain better transport model inputs, to feed inspection findings into risk analyses, and to help develop the OSDS management program. Masters student Michael Cummings asked homeowners for voluntary OSDS inspections statewide. We provided free inspections using the protocols and sheets developed previously, we collected water samples, we distributed homeowner education fact sheets, we described maintenance requirements. Approximately 200 systems were inspected and evaluated/scored on five islands. The study found that 80% of OSDSs are not receiving basic maintenance, 2/3 are rated as passing, 1/6 are in need of service and could fail, and 1/6 are failing. The study also found that the existing "honor system" is not effective and a more managed program is needed. Additional results can be found in the final report which is available on-line at the HDOH-WWB website: "Condition Assessment Survey of Onsite Sewage Disposal Systems (OSDS) in Hawaii."

2. Diagnostic Method to Select Onsite Treatment and Disposal Systems, unfunded MSCE study, 2012-13. The aim of this study was to develop a step-by-step process tool for selecting an OSDS system in Hawaii for engineers and for homeowners to understand the process. Masters student Terry Chan documented a four-step process including preliminary site analysis, site condition assessment/measurements, wastewater characterization, and estimation of costs. Tables were created for applicability/constraints, for costs, and examples were provided.

3. Certification Testing of Four Hawaii-Manufactured Aerobic Treatment Units (ATUs). Four different manufacturers provided grant funding and treatment units for testing from 1998-99, 2004-05, 2013-14, and 2015-16. The City & County of Honolulu provided sites and wastewater at Sand Island WWTP and Honouliuli WWTP to conduct the testing. A large number of graduate and undergraduate students collected and analyzed composite and grab samples five-days-per-week over the years. The ATUs were tested according to the NSF Standard 40 protocol (for BOD and TSS) and later the NSF Standard 245 protocol (for N-removal). This testing takes approximately 10 months for each unit. ATU systems tested and subsequently certified by HDOH-WWB for use in Hawaii include: Best OESIS 400 (1998-99), International Wastewater Technologies CBT 800 (2004-05), Envirocycle ECR 600 (2013-14), and WaiponoPure 800 (2015-16).

Current Directly Related Projects

1. Investigation of cesspool upgrade alternatives for Upcountry Maui. This project is funded by Hawaii DOH SDWB, June 1, 2018 to July 31, 2019, \$99,609. This study is guided in part by a 28-member Upcountry Maui Stakeholder Group that includes State regulators, water/wastewater utilities, ranchers, farmers, large landowners, environmental groups, and elected officials. We have held 5 interactive webinars during this project with this group. The overall objective of the project is to determine costs and environmental benefits of various potential on-site treatment and disposal upgrade options for the 7,000 cesspools in Upcountry Maui. Conventional technologies, available but less common technologies, and emerging technologies are all being considered. A previously developed groundwater flow and transport model designed to simulate the movement of nitrate from various sources to receptor well locations was calibrated to predict actual measured data. An initial task of our project, was to refine that model with better estimates of inputs. This project involves determining the total installed costs (equipment, installation, sitework, design, permitting, etc) for six treatment options and eleven disposal options for each of the 7,000 properties. The site constraints (slope, soil permeability, available area, setbacks, etc) were used to screen for feasible alternatives at each property. Other options such as installing sewers and WWTPs and wellhead treatment of contaminated water are also considered. Operation and maintenance costs were determined and 60-year life cycle costs with replacements were determined. The flow and transport model was then used with the reduced nitrate inputs (due to upgraded treatment options) to simulate the reductions in groundwater nitrate concentrations (benefits) that would be achieved. A cost-benefit decision science model is being used to analyze a set of 36 alternative scenarios designed to meet one or more objective functions such as minimize cost, minimize aquifer nitrate, maximize cost-effectiveness, maximize fundability, minimize risk, meet existing design criteria, etc. The draft report will be issued on May 30, 2019 and the community presentation will be held on June 26, 2019.

2. Passive nitrogen removal (PNR) via denitrifying leachfield laboratory study. We are currently operating a set of experimental columns simulating a denitrifying leachfield. There are This study was begun by a CE undergraduate as a Research Award from Hawaii Water Environment Association for 2019 and is continuing as a summer internship project for a visiting Masters student from France. We are operating a set of fourteen 4-inch diameter columns containing different media (gravel, coral sand, basalt sand) to simulate an 18-inch deep absorption bed, followed by either a saturated or unsaturated bed of 4-in or 8-in depth containing a mixture of sand and sawdust. Influent is raw wastewater. Unpublished results indicate that all absorption beds achieve nitrification and that both saturated and unsaturated sawdust layers are feasible and highly effective for denitrification. Work is ongoing to determine loading rate ranges and potential design guidelines.

Paavo Ogren

3625 Maricopa Road Atascadero, CA 93445 | 805-540-0887 | paavo.ogren@gmail.com

Objective

To provide technical advice on the Cesspool Conversion Technology and Finance Research for the State of Hawaii Department of Health Wastewater Branch – Solicitation No, WWB 19-02

Education

BACHELOR OF SCIENCE, BUSINESS ADMINISTRATION – ACCOUNTING - 1984
CALIFORNIA POLYTECHNIC STATE UNIVERSITY, SAN LUIS OBISPO

- Other Major Coursework: Math & Physics (Freshman); City & Regional Planning (Sophomore)
- Economics (Junior); Business Administration – Accounting (Junior & Senior)

Skills & Abilities

LEADERSHIP

Over the course of my 35 year career, I have been provided numerous opportunities to lead technical financial efforts, policy development, management, project management, and local efforts associated with state and federal legislation. Leading the solution, after decades of controversy, for the conversion of septic tanks to a community wastewater system for Los Osos, California, is a legacy accomplishment directly applicable to the Cesspool Conversion provisions established in Act 125 of July 2017.

MANAGEMENT & PROJECT DEVELOPMENT

- Managed a staff of approximately 200 including engineers, construction managers, surveyors, environmental specialist, fiscal and administrative staff.
- Led efforts resulting in approval for an environmental division within county public works, which has markedly improved its environmental stewardship.
- My experience in private industry included project and program management and developed my understanding of consultant and contractor business models.
- Managed teams on federal and state funding, including the largest funding program approved by the United States Department of Agriculture’s Rural Development Program for the conversion of septic tanks to a community wastewater system in Los Osos, CA.
- Managed teams that obtained funding from private bond markets, and state and federal programs including the US EPA SRF program, the USDA Rural Development program, Community Development Block Grants and other state and federal programs.
- I have been actively engaged in diverse management capacities involving capital projects totaling approximately \$1 billion.

Professional Development

CALIFORNIA CERTIFIED PUBLIC ACCOUNTANT #48914 (INACTIVE STATUS)

CREDENTIALLED SENIOR EXECUTIVE – CALIFORNIA STATE ASSOCIATION OF COUNTIES

CALIFORNIA STATE CUCCAC COMMISSIONER – PUBLIC CONTRACT CODE 22010

CONFERENCE SPEAKER & PANEL MEMBER:

- Plenary speaker on California’s drought – NOAA’s Coastal Forum Conference, Charleston SC (2016)
- Pre-legislative conferences leading to the Sustainable Groundwater Management Act (CA) (2013/2014)
- International Conference – American Public Works Association – Boston, MA – (2010)
- Extensive public presentations, public hearings and meetings with legislators, county and local agency elected officials, community groups, business and property owners, and residents



John Waddell, PE

Construction Manager/Project Manager/Civil Engineer

Professional Experience

Construction Management – Public Infrastructure and Facilities

Leads a team of engineers and construction professionals in managing more than \$15 million per year of public construction projects. Projects include roadway improvements, bridge replacement and retrofit, water and wastewater utilities, correctional facilities, and other public facilities.

Project Management – Los Osos Wastewater Project

Project manager and project engineer for the implementation of a large septic-to-sewer project. Responsible for project planning, permitting, funding, design and construction phases.

- Agency project manager for design and construction teams for \$130 million of new infrastructure, including 50 miles of pipelines, lift stations, 1.2 MGD water recycling facility and recycled water distribution.
- Planned and led a comprehensive public outreach program for the project construction phase which included a dedicated community liaison, project website, social media, and phone hotline system. The program resulted in over 6,000 direct contacts and responses to individual members of the public.
- Managed procurement and performance of consultant planning, design, and construction management teams through \$28 million in consulting contracts.
- Managed the application process to secure more than \$173 million in Federal and State funding, including more than \$20 million in grants for the project.
- As the agency’s representative, planned and held large community meetings, managed technical advisory committees, and presented at public hearings which resulted in approval of the environmental documents and permits.

Education

- BS, Environmental Engineering, Cal Poly State University, San Luis Obispo

Certifications

- Registered Civil Engineer, CA No. 66846
- California OES - Safety Assessment Program Evaluator

Associations

- Construction Management Association of America
- American Public Works Association
- American Society of Civil Engineers

Contact Information

Phone:
805.459.5043

Email:
john.i.waddell@gmail.com

Technical and Peer Review Panels

- Morro Bay, CA Water Reclamation Facility project alternatives peer review panel – evaluated treatment facility and water reclamation master plans for a new treatment and water reclamation facility.
- High Desert Water District, CA Wastewater Project construction alternatives review panel – evaluated new collection system contracting alternatives for septic-to-sewer project.

Professional Papers and Conference Presentations

- APWA National Congress 2012: Presented and participated in panel discussion for education session titled “How Did Selecting a Project Delivery Method Get So Complicated?”
- Water Environment Federation (WEF) Collection Systems 2013 Conference: Presented paper titled “Septic to Sewer Finally Becoming Reality.”
- Construction Management Association of America Capital Project Symposium 2015: Presented paper “How GIS and Project Management Data Improves Project Control and Provides a Better Deliverable to the Client.”
- California Water Environment Association Annual Conference 2015: Presented paper titled “Los Osos Wastewater Project Septic to 100% Reuse.”



Nicola A. Fontaine, P.E.

Nicola Fontaine is a principal technologist with 17 years of experience in disinfection, water reuse, and technology evaluation. She has experience as a technologist, project manager, and engineer supporting a variety of water, wastewater, and reclaimed water engineering projects (non-potable and potable), with a background in ultraviolet (UV)/chemical disinfection of viruses, bacteria, bacterial spores, and protozoa in water, reclaimed water, wastewater, and biosolids.

Education

MS Civil and Environmental Engineering, University of New Hampshire, 2004

BS Microbiology, University of New Hampshire, 1997

Licenses

Civil Engineer, California

Professional Affiliations

American Water Works Association, Standards Committee on Reclaimed Water

American Water Works Association, Disinfection Systems Committee

American Water Works Association Microbiological Contaminants Research Committee

Central Valley/Sierra Foothills WaterReuse California Chapter, Vice President

Water Environment Federation

WaterReuse Association

Relevant Experience

→ Technologist for the demonstration study/performance evaluation of the water-POD by AquaTecture for satellite treatment for the production of non-potable recycled water. The demonstration study was run for seven months. The project included extensive sampling of pathogens, surrogates, and monitoring parameters throughout the unit processes.

→ Technical support and project manager for the San Francisco Public Utilities Commission (PUC), California, PureWaterSF project. The effort includes design, operation, testing, and reporting of a demonstration-scale direct potable reuse system installed at PUC headquarters.

→ Engineering services for a joint feasibility study for addition of a 4-mgd Class A compliant advanced water treatment facility to produce reclaimed water for non-potable unrestricted reuse at the City of Daly City, California, Wastewater Treatment Plant.

→ Technologist and project manager for the Santa Clara Valley Water District, California, Membrane Bioreactor (MBR) Study. The project included extensive sampling of pathogens, surrogates, and monitoring parameters at four full-scale MBR facilities in California looking at MBRs for indirect potable and non-potable reuse.

→ Technical support for a performance evaluation of the Econity Membrane Bioreactor (MBR) for reclaimed water. Results were analyzed and a Performance Evaluation Report was prepared to support use of MBR in wastewater non-potable reuse.

→ Project manager/engineer for the Great Circle Industries i50 Reactor Title 22 (Class A) Testing. The goal of the project is to test this novel treatment technology for compliance with non-potable reuse requirements.

→ Technologist and project manager for the City of Riverside, California, Chlorine Contact Basin Tracer and CT Study. Work included full-scale tracer testing at 46 mgd and bench-scale free chlorine studies with indigenous coliforms and seeded virus to determine the lowest free chlorine level to meet permit requirements and Title 22 (Class A) requirements for tertiary recycled water.

→ Technologist and project manager for the City of Santa Rosa, California, Chlorine Contact Basin Tracer and CT Study. Work included full-scale tracer testing at 10 mgd and bench-scale free chlorine studies with indigenous coliforms and seeded virus to determine the lowest free chlorine level to meet permit requirements and Title 22 requirements for tertiary recycled water.

→ Technologist for the Clark County Sanitation District, Nevada, Facilities Master Plan. Services included evaluation of two tertiary treatment facilities that each included conventional filtration and UV disinfection.

→ Project manager for the City of Santa Rosa, California, UV Capacity Analysis and Operations and Maintenance (O&M) Plan Revisions.

→ Project controls lead and QA/QC contributor for the Sacramento Regional County Sanitation District, California, EchoWater Project Tertiary Treatment Facilities Project.

→ Project manager for performance evaluation of the Parkson DynaSand EcoWash system. Services included full-scale Title 22 testing, data analysis, and technical writing of a report to obtain approval for its use in recycled water applications from the California Division of Drinking Water.





Andrew T. Salveson, P.E.

Andrew Salveson has 24 years of environmental consulting experience serving public and private-sector clients in the research and design of water and wastewater treatment systems. He serves as Carollo's Chief Technologist for Water Reuse and is a nationally recognized expert in water reuse and disinfection. Mr. Salveson provides guidance and expertise on state-of-the-art technologies and the latest industry issues regarding reuse. He has led numerous planning, design, and research projects for various organizations, utilities, and corporations. In recognition of his contributions to the industry, Mr. Salveson was honored with the 2007 WaterReuse Person of the Year Award for bringing innovative technologies to market. Mr. Salveson was also named to a national panel of 7 experts to develop national guidance on direct potable reuse (DPR) and was named to a panel of experts to develop potable water reuse for the World Health Organization.

Education

MS Water and Wastewater Engineering, University of California, Davis, 1994

BS Civil Engineering, San Jose State University, San Jose, California, 1993

Licenses

Civil Engineer, California, New Mexico

Professional Engineer, Texas

Professional Affiliations

Water Environment Foundation Disinfection and Public Health Committee

Water Environment Foundation Water Reuse Committee

Water Environment Foundation Technical Practice Committee

Relevant Experience

→ Principal investigator for the WaterReuse Research Foundation Project 006-008 – Small Scale Treatment Technologies, which investigated the ability of various decentralized, small-scale treatment systems to produce economical reclaimed water.

→ Principal investigator for the WaterReuse Research Foundation Project 10-06 – Challenge Projects on Low Energy Treatment Schemes for Water Reuse. Work includes evaluation of emerging treatment technologies for low-energy treatment for water reuse.

→ Principal investigator for the WaterReuse Research Foundation Project 10-10 – Filtration and Disinfection Compliance through Soil Aquifer Treatment. Work included detailed water quality monitoring pre- and post-SAT to prove treatment to Title 22 standards.

→ Co-principal investigator for the WaterReuse Research Foundation Project 11-02 – Equivalency of Advanced Treatment Trains for Potable Reuse. Work includes a search for lower energy and lower cost treatment technologies that meet the public health objectives for potable water reuse.

→ Regulatory and process engineer for the predesign of indirect potable reuse for Pismo Beach, California. This work effort includes a 9-month pure water demonstration with conventional and emerging technologies.

→ Process and regulatory engineer for the City of Altamonte Springs, Florida, Direct

Potable Water Demonstration Center project.

→ Technical advisor for the Toho Water Authority, Florida, Indirect Potable Reuse Feasibility Analysis. This study evaluated the use of TWA's 160-acre RIB site as a component of a future 5 mgd potable train utilizing SAT.

→ Process engineer for the design and regulatory approval of the Phase 1A (2.3 mgd) project and the Phase 2 (12.6 mgd) project for the Jennings Road Secondary Treatment Facility Project for the City of Modesto, both of which were MBR/UV designs for non-potable water reuse.

→ Principal investigator for Water Research Foundation Project 14-16 "Pathogen Risk Evaluation of Treatment and Monitoring System Performance for Potable Reuse."

→ Project engineer for the WaterReuse Research Foundation (WRRF) study "Feasibility of Establishing a Framework for Public Health Monitoring" (WRRF-14-14).

→ Co-principal investigator for the study "Testing Water Quality in a Municipal Wastewater Effluent Treated to Drinking Water Standards" for the Texas Water Development Board and the Colorado River Municipal Water District in Big Spring, Texas.

→ Principal investigator for the Water Environment Research Foundation Project CEC4R08, which examines the most cost efficient method to reduce microconstituents.





Andrew C. Gilmore, P.E.

Andrew Gilmore, a vice president with Carollo, is an accomplished civil engineer with 22 years of consulting experience including professional experience in project management, wastewater treatment process and design, construction administration, water system process and design, civil site design, and cost estimating. Mr. Gilmore's experience also includes permitting for water and wastewater projects.

Education

MS Water Engineering,
California Polytechnic
State University, San Luis
Obispo, 2001

BS Engineering Geology,
State University of New
York, Stony Brook, 1996

Licenses

Civil Engineer, Arizona,
California, Nevada

Professional Engineer,
New Mexico, Hawaii

Professional Affiliations

Arizona Water
Association

Arizona Public Works
Association

Water Environment
Federation

- Professional
Development
Committee
- Municipal
Wastewater
Treatment Design
Committee

Relevant Experience

→ Technical lead for the Hi-Desert Water District, Yucca Valley, California - Wastewater Reclamation Owner's Advisor project. The California Regional Quality Control Board adopted a resolution to eliminate the use of septic systems in the Town of Yucca Valley. The project provides a means to collect residential and commercial wastewater discharges and apply a level of treatment suitable for discharging back into the District's aquifer for future extraction.

→ Design manager for the East Central Recycled Water Facility, City of Fresno, California. This project involves design and construction of a new 5-mgd decentralized Membrane Bioreactor (MBR) facility. The new facility is designed as a scalping plant, with solids being returned to the sanitary sewer. Infrastructure includes a sewer lift station and approximately 5,000 LF of force main.

→ Project manager for the Victor Valley Wastewater Reclamation Authority, California, Decentralized Water Reclamation Scalping Plants using MBRs project. This project includes two decentralized MBR wastewater treatment plants for the City of Hesperia and Town of Apple Valley, California. Both facilities have an initial phase of 1-mgd capacity, with capabilities to expand with two subsequent phases to 2 mgd and later 4 mgd capacity.

→ Project manager for the City of Chandler, Arizona Ocotillo Water Reclamation Facility Expansion Design. Project involves permitting, public outreach, and preliminary and detailed design for the initial 5-mgd plant expansion.

→ Process lead engineer City of Surprise, Arizona Special Planning Area 2 (SPA 2) Regional 2.0 mgd Membrane Water Reclamation Facility Phase 1 project. Phase I is a 4

mgd wastewater reclamation facility that includes fine screening, biological treatment, filtration, and disinfection. Reclaimed water is to be used for open space irrigation and groundwater recharge.

→ Process engineer for the Ak-Chin Indian Community, Maricopa, Arizona Wastewater Reclamation Facility planning and design project that involved development of infrastructure including water production, storage, and transmission facilities, wastewater collection system upgrades, and expansion of the existing reclaimed water system. The project also included construction of a new 0.6 mgd initial phase water reclamation facility designed for an ultimate capacity of 1.2 mgd.

→ Process engineer for the Pascua Yaqui Tribe, AZ, Water Reclamation Facility design which included a new 0.5-mgd (2.0-mgd ultimate) GE/Zenon MBR facility.

→ Project engineer for the City of Sedona, Arizona Effluent Injection Well Permitting Phase 1. Project involved an investigation of obtaining recharge water credits for the effluent; evaluating the wastewater reclamation plant to determine necessary upgrades to produce Class A+ effluent; and evaluating various effluent management alternatives including constructed wetlands, surface recharge, direct injection of effluent, and direct discharge to the Verde River.

→ Project engineer for the City of Peoria, Arizona – Butler WRF Improvements. Improvements include an aeration upgrade, basin drain pump, recharge wells (ASR) and WRF system expansion.

→ Project engineer for the San Francisco Public Utilities Corporation, California – Treasure Island Recycle Water Plant Expansion. Carollo was retained to address aging infrastructure, ensure regulatory compliance and to satisfy wastewater and recycled water needs for future development.





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Formal Education:

- MBA, Business Administration, University of Hawaii at Manoa (1999)
- MS, Civil Engineering, University of Hawaii at Manoa (1995)
- BS, Civil Engineering, University of Hawaii at Manoa (1993)
- University High School (1988)

Business:

- The Limtiaco Consulting Group, Inc., President and Majority Owner (2001-current)
- TLCG Ventures LLC, Co-Founder and Managing Member (2013-current)
- TLCG Energy LLC, Co-Founder and Managing Member (2013-current)
- Katahira Properties LLC, Co-Founder and Managing Member (2001-current)
- Aloha Niseko Properties Kabushiki Kaisha, Co-Founder and Director (2017-current)
- Underground Services, Inc., Co-Founder and Vice President (2006-2009)
- Contractors Choice LLC, Co-Founder and Managing Member (2007-2011)

Professional Affiliation:

- American Council of Engineering Companies of Hawaii, President (2010) and National Director (2012-2013)
- WEF/Hawaii Water Environment Association, President (2008)
- American Water Works Association/Hawaii Section, Legislative Committee Chair (2005-2006)

Community and Civic Involvement:

- Boys and Girls Club of Hawaii, Executive Committee (2017-current), Safety Committee Chair (2017-current), Corporate Board (2011-current)
- Engineering Alumni Association University of Hawaii College of Engineering, Director (2010-current), Treasurer (current)
- Maemae Elementary School PTSA, Treasurer (2014-2017)
- Maemae Elementary School PTSA Summer School, Founder (2016-2017)
- Ka Makani Anu O Ke Akua Athletic Club Hawaii, Board of Director (2017)
- Boys and Girls Club of Hawaii Alliance Board, Co-Founder, President (2002-2006)
- ASCE Hawaii Section Young Members Forum, Co-Founder (1995)
- ASCE Pacific Southwest Conference, Chair (1994)
- UH ASCE Student Chapter, President (1993)

