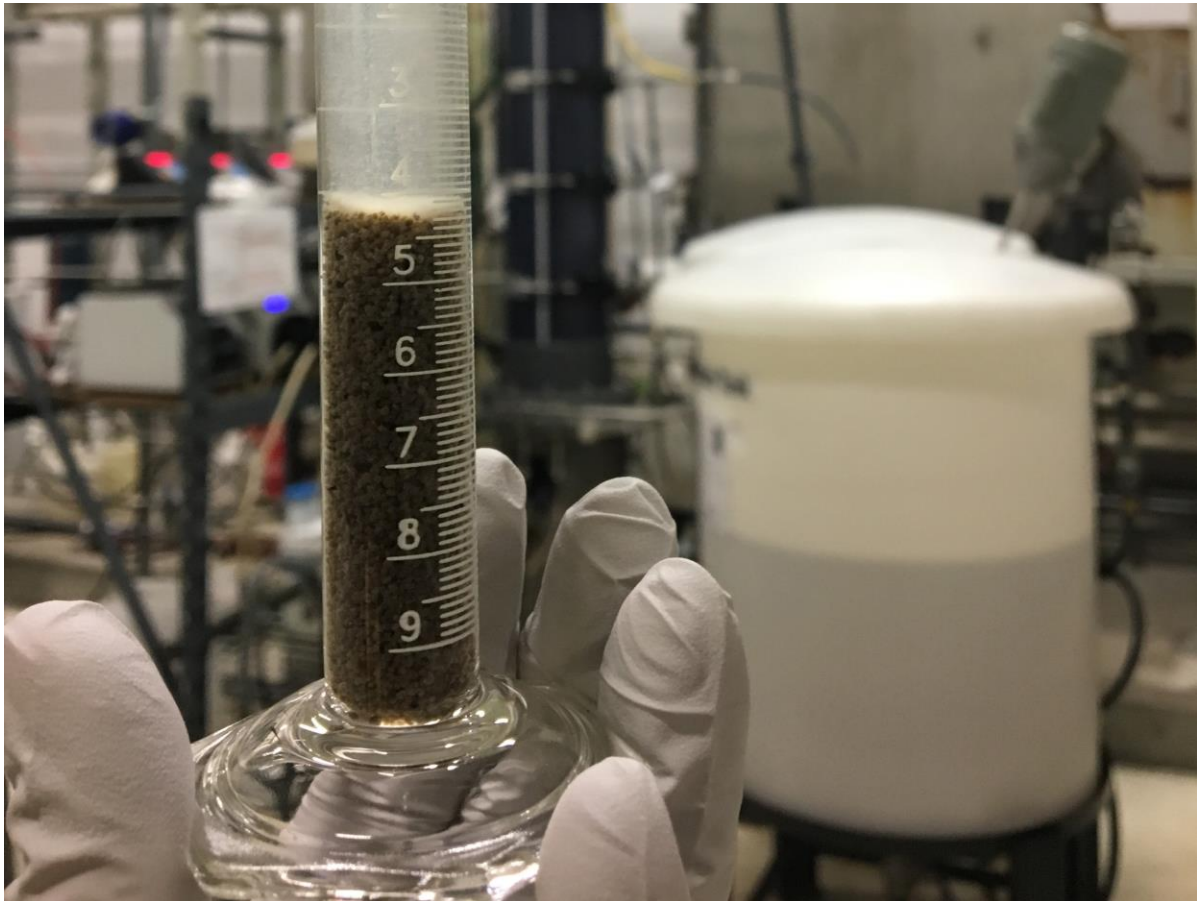# King County Technology Assessment and Innovation Program Strategic Plan 2018–2037

King County

Department of Natural Resources and Parks

Wastewater Treatment Division

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Introduction

The King County Technology Assessment and Innovation Program (TAIP) is a dedicated group within the Wastewater Treatment Division (WTD) that ensures that WTD takes full advantage of wastewater industry innovations. TAIP provides technical services to stimulate innovation, build a sustainable and resilient future, advance resource recovery, and maximize the cost-effectiveness of WTD services. TAIP plays a crucial role in helping WTD be strategic regarding evaluation and decision-making related to WTD's technology and innovation opportunities.

Indeed, the wastewater treatment industry is continually experiencing advances in science and technology as well as regulatory changes that correspond to these advances. Scientific and technological advances and regulatory changes in the industry most often relate to the following: improved treatment processes and efficiencies, process controls and treatment reliability, reducing the environmental footprint of wastewater treatment and its byproducts, and improvements in safety.

To stay current with science and technology innovations and corresponding regulatory changes, TAIP proactively and diligently monitors, evaluates, and adopts these innovations. TAIP also strives to anticipate regulatory changes that may affect WTD's permits and operations. In this 2018 to 2037 strategic plan, TAIP identifies WTD's technology and innovation-related goals and strategies as an integral part of WTD's vision to build a sustainable and resilient future and to advance resource recovery.

Program Needs

WTD recently updated its mission, vision, values, and goals to advance efforts to become a "Utility of the Future."[1] TAIP currently needs direction on WTD's technology and innovation-specific vision and goals and a framework for ensuring that TAIP's work is directed toward conquering near-term needs while preparing WTD for the future.

Strategic Plan Purpose

The TAIP Strategic Plan continues WTD's track record of excellence and charts a course for WTD to evolve into a Utility of the Future. This strategic plan provides information to:

- Help meet WTD's vision and goals of building a sustainable and resilient future and advancing resource recovery
- Provide a roadmap to ensure WTD's technology investigations and technology-related decisions are carried out in a strategic manner and integrated across the division
- Help guide decision-making on potential investments in wastewater technology innovation to ensure WTD's near- and long-term investments are smart investments

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[1] According to the National Association of Clean Water Agencies, the "Utility of the Future" concept is defined by clean water utility leaders pioneering innovative technologies and cutting-edge practices, with a focus on resource recovery, efficiency, and sustainability.

- Establish a prioritized list of near- and long-term wastewater technology innovation-related actions

The TAIP Strategic Plan will be used by WTD to:

- Provide information for the Systemwide Comprehensive Plan for King County's regional wastewater system
- Provide direction for future program activities and decision-making
- Prioritize resources for programs within the division
- Communicate with stakeholders about the program's direction

Strategic Planning Process

Strategic planning is a continuous, iterative process that involves envisioning a successful future, identifying where a program is in relation to that vision, developing goals to fulfill that vision, implementing strategies to achieve those goals, and monitoring progress toward implementation. Strategic plans are dynamic documents that need updates over time as conditions and situations change.

TAIP followed six steps to develop its strategic plan:

1) **Standardization of strategic planning elements** across the Biosolids, Recycled Water, and TAIP Programs
2) **Goals** and **objectives** development and development of targets and/or measures for tracking progress toward objectives
3) **Strategies** development
4) **Alternatives** identification, evaluation, and selection
5) Strategies **prioritization**
6) **Actions** development

TAIP staff participated in team meetings at each step of the strategic planning process, one workshop involving the Recycled Water and Biosolids teams, and regular check-ins with WTD management. The TAIP Strategic Plan was also informed by technical research conducted by the consultant-team subject matter expert.

Strategic Plan Overview

The following table summarizes all final goals, objectives, alternatives, strategies, and actions developed for the TAIP Strategic Plan.

GOALS[i]	OBJECTIVES[ii]	STRATEGIES[iii]	ACTIONS[iv]
1) Leaders in innovation – WTD is in the forefront of evaluating, catalyzing, and developing new technologies and innovative approaches to wastewater treatment.	**1.1)** WTD is prepared to integrate new wastewater research and technologies to resolve issues and improve performance.	**1a)** Participate in collaborative wastewater research of importance to WTD through academic and industry partnerships.	• Maintain active leadership roles on key wastewater industry organization (e.g., Water Environment & Reuse Foundation, Water Research Foundation, Water Environment Federation) committees and panels by team members participating in at least three wastewater industry research/technology conferences and three industry research/technology committees or workshops each calendar year. • Renew University of Washington three-year Fellowship Research Program Agreement by the end of quarter three, 2019. • Evaluate and document benefits and options for securing access to additional academic institutions to provide support for critical and/or strategic WTD issues by quarter four, 2019. If analysis is positive, seek funding approval in 2021 budget (2019 budget process).
		1b) Aggressively pursue the development and/or enhancement of new technologies with the potential to support WTD's vision.	• Seek input annually from the TAIP Internal Advisory Group and program managers or leads to assist formulation of a list of technology and research needs to support WTD's vision. • Develop and implement a plan to expand and update capabilities and equipment necessary to optimize utility of the West Point Treatment Plant pilot facility by 2020.
		1c) Formalize a process for evaluation of strategic value/merit of TAIP research and technology proposals.	• Develop screening criteria and documentation processes by quarter two, 2019, to assess potential new research focus areas to be considered. • Update and revise TAIP's "Technology Assessment & Screening Form" and "Technology Assessment Tracking Form" to reflect new initiatives and standards by quarter four, 2018. Must communicate the purpose of these forms to TAIP Internal Advisory Group (as necessary).
2) Resilient to changing conditions – TAIP proactively identifies and responds to potential regulatory changes.	**2.1)** TAIP understanding of technologies needed to adapt to future regulatory changes in time to support their implementation. **2.2)** TAIP understanding of the current and potential future technology challenges of WTD and other utilities, including potential points of failure in the implementation of new technology. **2.3)** TAIP has an accurate sense of future regulatory changes.	**2a)** Look to the future to anticipate technologies that WTD may need to implement to be flexible and adaptable to regulatory changes. **2b)** Conduct research in line with anticipated regulatory changes or industry trends to ensure that WTD is prepared for changing regulations from a process and equipment standpoint.	• Create an active list of key regulatory agency contacts to be communicated with biennially regarding potential future regulatory issues/actions. • Work with the internal National Pollutant Discharge Elimination System permit manager and internal permit staff to develop process(es) to track potential future regulatory actions and distribute within WTD every two years. • Create an active list of key wastewater/water quality program contacts to be communicated with biennially regarding current and potential future regulatory issues/challenges. • Work with WTD wastewater treatment plant management and staff every three years to identify potential impacts of anticipated regulatory changes on treatment processes and equipment and develop a plan to ensure that appropriate technology/process research has been completed to support implementation of the regulations.
3) Ready to conquer challenges – TAIP is prepared to pursue and bring forward new technologies and process innovations to address and support the resolution of challenges.	**3.1)** TAIP has internal support for ongoing leadership roles and involvement in national organizations. **3.2)** TAIP has the facilities needed to support future research. **3.3)** TAIP staff awareness of challenges facing WTD, and of current research relevant to the resolution	**3a)** Maintain TAIP presence at wastewater treatment facilities and administration offices to maximize awareness of current and potential technical and process issues and needs.	• Prepare a TAIP Staffing Plan identifying an optimum number and location of program staff necessary to fully support the needs of treatment plant and administrative staff by the end of 2019.

GOALS[i]	OBJECTIVES[ii]	STRATEGIES[iii]	ACTIONS[iv]
	of those challenges, is maximized.	**3b)** Include provisions in wastewater treatment facilities to allow for testing of new technologies as well as assessment and troubleshooting of process anomalies.	• Research, document, and purchase centralized process monitoring/sampling/analytical equipment for TAIP assessments by the end of 2019. • Purchase and support process and testing equipment to enhance process evaluation and troubleshooting capabilities at West Point, South Treatment Plant, and Brightwater Treatment Plant by the end of 2019.
		3c) Review challenges of other programs and identify innovations to address.	• Contact three to four innovative wastewater technology programs every five years (or more frequently as needed) to establish and document how they identify and evaluate new technologies and wastewater industry innovations.
4) Increase awareness of program activities and roles – The Technology Assessment and Innovation Program's activities and services are well known throughout the Wastewater Treatment Division.	**4.1)** More WTD staff are aware of TAIP, its work products, past support for the division, and how to engage the program.	**4a)** Actively promote TAIP activities by creating opportunities for WTD staff to be exposed to program activities and work products.	• Prepare and distribute a summary of previous year activities and an upcoming year work plan in quarter one of each year, including the status of ongoing projects and links to interim and final reports. • Where appropriate, provide poster board information at key locations regarding planned and ongoing pilot studies and research activities to encourage staff interest and questions. • Provide opportunities for TAIP staff, graduate students, and researchers to showcase TAIP activities/projects to WTD audiences via video or in person at "brown bag" presentations at WTD facilities.
		4b) Keep Management Team members aware of significant work plan items and issues.	• Post final TAIP Annual Work Plans and mid-year updates to TAIP website and distribute to key management team members.
5) Integrate activities across the division – Ensure Biosolids, Energy, Recycled Water, and TAIP planning and projects are synchronized across the division and within WTD's capital system.	**5.1)** TAIP staff review and understand the strategic plans and priorities of other WTD programs. **5.2)** TAIP staff plan projects in coordination with other WTD programs. **5.3)** TAIP research efforts align with goals and needs of other WTD programs.	**5a)** Establish an internal TAIP Advisory Group to provide input to draft and final TAIP Annual Work Plans.	• Work with appropriate WTD managers and supervisors to identify TAIP Advisory Group representatives from Brightwater, South Plant, West Point, Resource Recovery Section, and Comprehensive Planning workgroup on an annual basis before developing TAIP Annual Work Plans.

[i] Goals = broad, aspirational outcomes the organization wishes to achieve related directly to its values
[ii] Objectives = outcomes that represent progress toward goals and better define what success looks like for each goal. Objectives should be SMART—Specific, Measurable, Attainable, Relevant, and Time-Bound.
[iii] Strategies = specific types of actions taken to achieve goals and objectives. Strategies describe *how* goals and objectives will be achieved.
[iv] Actions = discrete, actionable tasks that implement one or more strategies

Alternatives Evaluation and Selection

Strategic planning alternatives are specific options for how strategies can be achieved. They are variations/iterations of strategies that require analysis and comparison and that determine different sets of actions for implementing a strategy and, ultimately, achieving a goal.

Alternatives Evaluation

TAIP considered many alternatives during the strategic planning process and evaluated them based on the following qualitative evaluation criteria:

- Advances goals of WTD facilities
- Advances goals of WTD programs
- Advances culture of innovation in WTD
- Efficient use of WTD resources
- Likely to result in a positive outcome

Selected Alternatives

The following were TAIP's highest-scoring alternatives based on the evaluation criteria above:

- Partner with highly regarded academic institutions to fund wastewater research of importance to WTD.
- Maintain membership and an active leadership role in major wastewater industry technology development, research, and funding organizations and foundations.
- Align research and technology development efforts with identified needs and a long-term vision of WTD programs and divisions.
- Include provisions in wastewater treatment facilities to allow for testing of new and innovative wastewater treatment processes and technologies.
- Establish processes for evaluation of strategic value and merit of research projects, grant proposals, and new technologies.
- Identify key contacts at pertinent regulatory agencies and maintain regular communications regarding potential future regulatory actions that could impact WTD's operations.
- Periodically review regulatory challenges of other wastewater and water quality programs that may become pertinent to WTD.
- Maintain adequate program staff and locate staff strategically to understand and support the needs and challenges identified by both treatment plant and administrative staff.
- Maintain a combination of (a) state-of-the-art testing and analytical equipment and capabilities at a central location and (b) smaller-scale analytical capabilities at all three of WTD's major wastewater treatment plants.
- Interview key staff/teams from high-performing wastewater technology and innovation programs to identify challenges and innovations.
- Establish a TAIP Advisory Group consisting of staff representatives from key internal clients.
- Prepare an annual summary of program activities.
- Provide up-to-date information regarding ongoing pilot studies and research activities.
- Provide information to key management team members when significant TAIP work plan issues arise.

These alternatives informed the final prioritization of strategies that led to TAIP's actions found in the Strategic Plan Overview section.

Goals, Objectives, and Strategies Background

The goals, objectives, and strategies of the TAIP Strategic Plan address TAIP's leadership, resiliency to changes and challenges, and integration with other WTD programs. This section describes how these goals, objectives, and strategies were developed.

Goals and Objectives

TAIP staff initially brainstormed a long list of goals and corresponding objectives. To refine the list, TAIP staff then conducted an analysis of the strengths, weaknesses, opportunities, and challenges associated with the program's goals. Further program discussion led to additional refinement down to TAIP's final five goals. These final goals comprise many of the ideas that were on the list of initially brainstormed goals.

Strategies

TAIP staff initially developed a long list of potential strategies to achieve the program's goals. Through extensive refinement and two rounds of prioritization, TAIP ended up with its final list of 11 strategies. The program's final strategies comprise many of the ideas that were on the list of initially brainstormed strategies.

Technical Research

Along with TAIP staff, the strategic planning consultant-team subject matter expert facilitated and participated in interviews with other wastewater utilities to understand wastewater industry technology trends, inform TAIP's processes for assigning effort and conducting research, and inform this strategic plan. Four utilities were interviewed by phone: Los Angeles County Sanitation Districts, Metro Vancouver, Metropolitan Water Reclamation District of Greater Chicago, and Orange County Sanitation District. Key assessment outcomes addressed communication, documentation, work with outside groups, dedicated funding, and staffing. The complete consultant assessment, including a summary of responses to all questions and lessons learned, can be found in Appendix C.

Goals Rationale

This section summarizes TAIP's reasoning behind all five of its goals and strategies to achieve those goals. TAIP goals were developed to specifically address the TAIP needs and issues described in the Introduction section, including the need for TAIP to address near-term issues while also preparing WTD for the future.

Goal 1: Leaders in Innovation

WTD is currently a national leader in the successful development and implementation of wastewater treatment and resource recovery technology. Part of this success is attributable to WTD's close relationships with academic institutions and other industry stakeholders. TAIP's Goal 1 and related strategies maintain TAIP's leadership position as well as the importance of partnerships in maintaining that position.

Goal 2: Resilient to Changing Conditions

Goal 2 ensures WTD staff are well-positioned and have the resources they need to anticipate future regulatory changes, including those not directly related to wastewater treatment and discharge.

Goal 3: Ready to Conquer Challenges

Goal 3 and related strategies position TAIP to proactively identify and respond to challenges that may impact WTD operations, and to develop and share solutions to those challenges within WTD.

Goal 4: Increase Awareness of Program Activities and Roles

To be fully efficient and effective, it is important for WTD programs to not operate in a "silo" and independent from one another, but rather share information across programs. This is particularly important for TAIP given its role as an information resource to multiple programs. TAIP Goal 4 ensures that TAIP resources are understood throughout WTD so all WTD programs can take advantage of this resource.

Goal 5: Integrate Activities Across the Division

While TAIP and Biosolids and Recycled Water Program strategic plans include goals, objectives, and strategies for individual programs, there are commonalities and interconnections across all resource recovery programs and other programs within WTD. This common goal is shared among the Biosolids Program, Recycled Water Program, and TAIP. This common goal also ensures that the implementation of individual plan strategies is done in a way that increases the efficiency of implementation, draws from overlapping efforts across WTD, and considers how strategies affect other WTD programs.

Strategies Prioritization

Prioritization is a critical part of the strategic planning process where organizations compare strategies to one another in terms of their payoff/impact and the level of effort to implement. Prioritization helps programs determine the sequence of strategy implementation as well as where to focus their resources.

TAIP initially developed 75 strategies across all of its goals, and later refined this down to 11 strategies; however, many of its final strategies contained ideas and concepts addressed in the initial brainstormed list.

To identify its highest priority strategies, TAIP first conducted a voting dot exercise to prioritize its initial list of 75 strategies in which team members placed a limited number of colored dots next to their highest priority strategies. The priority order of strategies reflected in this strategic plan was initially informed by this voting dot exercise. Later, after significantly reducing the number of strategies, strategies were identified in their final priority order through consultant-facilitated team discussions.

TAIP Strategies Prioritization Exercise – August, 2017

Implementing Actions

Methods to implement TAIP actions will vary significantly depending on the type of action and its complexity. Actions will be incorporated into WTD's work planning process, and the following strategic planning details will be identified through that process:

- **Champions:** Strategic plan champions are individuals who advocate for and support an action or set of actions. Champions advocate for actions to program decision-makers and search for solutions to barriers to implementing actions. Often, the champion for an action is different from the individual(s) leading an action to completion.
- **Leads:** Action leads take responsibility to ensure an action is successfully implemented by tracking progress, monitoring the budget, and delegating work to complete an action during strategic plan implementation.
- **Costs:** During the strategic planning process, the budget for implementing an action may not be known. However, the program should be able to identify *types* of costs that may be required to implement an action, such as capital, operational, travel, membership, consultant, or other costs.
- **Measures and Milestones Refinement:** The program should identify specific measures and milestones for tracking progress toward targets it sets for each objective. This can be done through updates to the program's existing internal work planning processes.
- **Timeframe:** During the strategic planning process, it may not be feasible to identify specific milestones and deadlines for completing different parts of an action. However, the program should be able to identify the approximate *timeframe* for starting and completing an action. Also, to the extent possible, the program should identify the *sequence* for implementing actions (i.e., which actions should be started first, second, etc., and which actions must be completed before other actions can begin).
- **Stakeholder Engagement:** Key stakeholder groups will be consulted throughout implementation of the strategic plan.
- **Monitoring and Maintenance:** The program should develop a system for regularly monitoring progress toward achievement of strategic plan goals. Measures identified for each objective will be a useful guide in plan monitoring. Also, the strategic plan may occasionally be revisited and updated as conditions change.

Appendices

- **Appendix A**: TAIP Strategic Plan Charter
- **Appendix B**: WTD Strategic Planning Team Members
- **Appendix C**: TAIP Strategic Plan Interviews Summary

Appendix A

Project Charter

Project Identification
Name: WTD Strategic Wastewater Technology Assessment and Innovation Plan
Project Number: TBD
Project Sponsor: Gunars Sreibers

Need/Justification
The Wastewater Treatment Division's (WTD) technology innovation-related goals and decisions are an integral part of WTD's vision to build a sustainable and resilient future and advance resource recycling. Because of this, it is essential for the division to be strategic regarding evaluation and decision-making related to WTD's technology innovation opportunities. Development of a WTD Strategic Wastewater Technology Assessment and Innovation Plan (Plan) is needed to continue the division's track record of excellence and chart a course for WTD to evolve into the utility of the future.

The Plan is expected to provide information to:
- help meet WTD's vision and goals of building a sustainable and resilient future and advancing resource recovery;
- provide a roadmap to ensure WTD's technology investigations and technology-related decisions are carried out in a strategic manner and integrated across the division;
- help guide decision-making on potential investments in wastewater technology innovation to ensure that WTD's near and long-term investments are smart investments;
- establish a prioritized list of near-term and long-term wastewater technology innovation-related actions.

Project Audience
The Plan is being prepared as a WTD-internal planning document to provide guidance to internal decision-making. The primary audience is WTD management and WTD staff.

Project Objective
Develop a Plan that provides a roadmap to identify and define the Technology Assessment and Innovation Program's actions and goals that best support WTD's Vision. The Plan will focus on a 5-year planning horizon. The Plan will identify and prioritize actions through 2021 and identify potential longer-term (2022-2026) technology interests and concerns. The plan will articulate the Technology Assessment and Innovation Program goals as well as recommendations for next steps to achieve the identified actions and goals. The Plan will identify areas of possible future WTD technology investigation and consider criteria to use in evaluating wastewater technology innovation-related investments. In addition, the Plan will summarize key wastewater technology innovation-related achievements to date and related work that is currently under way. The Plan will serve as a "baseline" to be updated or revised on a five-year cycle. Development of the Plan will include coordination with other WTD strategic planning efforts under way.

Project Scope Statement
The major topics and questions that the project team will explore in the development of the Plan are as follows:
- What is the wastewater technology and innovation-specific vision that WTD is striving towards;

- Consider a framework for financial benefit/cost decision-making related to technology and innovation investments (where no such framework exists for the project client).

To help answer these questions, the project team will consider the list of more detailed questions/topics in Attachment A to this charter.

Other scope of work tasks will include the following:
- Highlight significant and noteworthy wastewater technology and innovation-related achievements to date;
- Document wastewater technology and innovation activities currently under way and how they help to fulfill WTD's mission and vision;
- Identify the most pressing priorities (current, near-term, long-term) to help determine where best to focus the efforts of WTD's Technology and Innovation Program;
- Identify opportunities for the Program to increase involvement in industry-wide (e.g. WEF, WERF) technology innovation forums and projects;
- Develop criteria to use in evaluating and determining alternatives to move forward;
- Develop a prioritized list of near-term actions, how they will be implemented, and an explanation of how they help meet WTD's goals;
- Develop a list of potential long-term technology interests and concerns and initial recommendations for long-term actions to consider, including next steps and preliminary resources needed to make final recommendations and prioritize future actions.

Project Cost Rough Estimate

Project Resources	Estimated Labor Hours	Estimated Cost
Project Manager – Smyth	80 hours	$11,000
Plan Writer – C. Scott	120 hours	$17,000
Office of Sustainability and Innovation Bucher, Sukapanpotharam, Grodnik	120 hours	$17,000
Treatment Plant O&M Staff (3 staff + Div Manager providing various levels of work and time)	64 hours	$10,000
Biosolids Program staff	16 hours	$2,500
WTD Finance staff	16 hours	$2,500
Total		**$60,000**

Project Schedule
A draft Plan is expected to be ready for the WTD Division Director's review by mid-September 2016. A goal is for a final draft to be available for DNRP Director's Office review by mid-November 2016. A final plan is expected to be complete by January 1, 2017.

Project Deliverables
The major deliverable is a final plan that charts a course for WTD to strategically implement wastewater technology innovation. The report will identify near-term and long-term actions, recommendations for

next steps, challenges and opportunities, and issues that need to be addressed in order to implement the Plan.

Initial Project Assumptions
The initial project assumptions are that: (1) the effort to complete the project is staff-driven and (2) that the staff needed to complete this project will be available and not have competing priorities.

Initial Project Constraints
Primary constraints include staff availability and budget availability.

Initial Project Driver
Schedule is the initial project driver.

Project Priority
Developing a WTD technology vision and priorities for the next 5 years is the project's priority.

I have reviewed and approved this Charter.

_____
Gunars Sreibers
Wastewater Treatment Division Director
Project Sponsor

_____4/21/16_____
Date

ATTACHMENT A
Questions and Topics to be Considered in the Development of WTD's
Strategic Wastewater Technology Innovation Plan*
(these are in addition to the major questions and topics outlined in the Plan's charter)

Overarching

- What are the current policies that guide WTD's Wastewater Technology Innovation Program (Program)? How is the guidance carried out? Are additional policies needed?
- How are Program goals and activities currently integrated into and defined in WTD's operational and capital program planning?
- What are the ways to communicate and promote WTD's technology innovation-related work?
- What are the potential opportunities, challenges, barriers, and resource needs related to implementing near-term and long-term recommendations/actions identified in the Plan?

Studies/Strategies to Consider

- Interview WTD Operating Divisions/Programs, Energy Program and Capital Program staff to identify near and long term issues, strategies, studies and opportunities that may need or benefit from technology innovation.
- Continue funding wastewater technology innovation research activities through partnerships with academic institutions.
- Continue to pursue active participation in wastewater technology innovation research and demonstration activities through partnerships with other wastewater agencies and/or wastewater/environmental industry federations/foundations.
- Pursue opportunities to take active leadership roles in national or regional wastewater industry federations/foundations.
- Continue to proactively seek out and assess new and innovative technologies that have the potential to improve the performance and/or minimize the costs and environmental impacts of wastewater treatment facilities and operations.
- Monitor potential future regulatory requirements that could require or benefit from wastewater technology innovations (e.g. new effluent nitrogen standards).

Lessons Learned to Investigate/Apply

- Wastewater Technology Innovation program staff participation on capital project teams
- Wastewater Technology Innovation program staff participation on operational project teams
- Wastewater Technology Innovation program staff participation on capital planning teams
- Lessons learned/what is working well, not so well, regarding assessment of existing technologies at WTD facilities

Relations to other King County/WTD Initiatives and Planning Efforts

- Coordination with WTD plans and studies under way or planned for the near-term (Biosolids Strategic Plan, Reclaimed Water Strategic Plan, Energy Program Strategic Plan, Combined Sewer Overflow Long-Term Control Plan, Conveyance System Improvement Plan Update, Treatment Plant Flows and Loadings study, etc.)

*NOTE: This does not represent an all-inclusive list of questions; they reflect general topics for consideration. More specific questions will be applied throughout the development of the Plan.

Appendix B

King County Wastewater Treatment Division 2017-2018 Strategic Planning Team Members

Biosolids Team	Recycled Water Team	Technology Assessment & Innovation Team
Ben Axt Rick Butler Henry Campbell Tony Chiras Dave Dittmar Scott Drennen Jake Finlinson Sharman Herrin Isaiah Langi Sekhar Palepu Alison Saperstein Rebecca Singer	Rick Butler Dave Dittmar Sharman Herrin Steve Hirschey Jacque Klug Sue Meyer Matt Nolan Alison Saperstein Kristina Westbrook	Bob Bucher Pedro de Arteaga John Smyth Curtis Steinke Andy Strehler Pardi Sukapanpotharam Bruce Tiffany

Oversight and Management Teams		Consultant Team	
Project Management Team Ashley Mihle Steve Tolzman **Oversight Team** Sue Kaufman-Una Sandra Kilroy Sarah Ogier Rebecca Singer Chris Townsend	**WTD Management Team** Tim Aratani Mark Isaacson Bruce Kessler Rebecca Singer Lisa Taylor Chris Townsend Robert Waddle	**Triangle Associates, Inc.** Betsy Daniels Shay Huff Evan Lewis Bob Wheeler	**O'Brien & Company:** Justus Stewart **Kennedy/Jenks Consultants, Inc.** Mark Cullington Dana Devin-Clarke Jean Debroux Heather Stevens Chris Stoll Stephen Timko

Appendix C

12 January 2018

Memorandum

To:	Bob Bucher, John Smyth, and Pardi Sukapanpotharam – King County WTD Plan Team
From:	Stephen Timko
Subject:	King County Technology Assessment and Innovation Program Strategic Plan Technical Task 2 Meetings Summary K/J 1797003*00

The King County Wastewater Treatment Division (WTD) Technology Assessment and Innovation Program (TAIP) is currently undergoing a strategic planning process to identify industry trends in wastewater treatment technologies and to inform TAIP's processes for assigning effort and conducting research. Members of TAIP participated in four conference calls with other utilities to discuss their research programs and methods of technology assessment. Calls were conducted between Los Angeles County Sanitation District (LACSD), Metro Vancouver (MV), Metropolitan Water Reclamation District of Greater Chicago (MWRD), and Orange County Sanitation District (OCSD).

Common themes among the four utilities were:

- **Communication** is key to the success of the research programs. Making research a part of every department leads to an ongoing discussion of the utility's needs, as well as buy-in from senior management and staff in different groups.

- **Documentation** of technology assessments and research projects leads to better project implementation, improved vendor relations, and increased support from staff.

- **Outside groups** such as the Water Environment & Reuse Foundation (WE&RF) Leaders Innovation Forum for Technology (LIFT) program and the Isle Utilities Technology Assessment Group (TAG) program were identified as key resources to consolidate knowledge and evaluate technologies without significant internal resources.

- **Dedicated funding** ensures that research projects can move forward without having to compete with capital improvement or maintenance projects.

Details from the four conference calls are discussed below.

Program Size and Staffing

The four utilities surveyed varied greatly in the size and scope of their research and technology assessment programs. The largest program was the Environmental Monitoring & Research Division of MWRD, which has over 80 staff members in five groups ranging from research scientists and engineers to aquatic ecologists and soil scientists. The Wastewater Research Group consists of 16 members, including 7 research scientists, 8 technicians, and 1

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administrative assistant. The large program size allows for the majority of research to be done by in-house staff, with minimal involvement of consultants (less than 10% of projects) or universities. MWRD operates seven water reclamation plants, ranging from 3 MGD to 680 MGD, for a total of approximately 1.4 billion gallons of wastewater per day.

The smallest group interviewed was at OCSD, and consists of one senior engineer. The research projects that OCSD conducts are therefore limited to investigating new processes/technologies that OCSD may want to implement in the future, rather than working on process optimization or troubleshooting on current systems, which is done by process engineers in a separate group. As staffing is limited, research and pilot projects are conducted by consultants, manufacturers, and universities. OCSD operates two wastewater treatment plants that receive approximately 184 MGD.

MV operates five treatment facilities that serve 2.5-3 million people, receiving approximately 320 MGD of wastewater. The Utility Research & Innovation group, which is approximately five years old, consists of five staff members. The group does some work on issues and problems within the treatment plants and collection system, but focuses most of their efforts on "opportunity projects" to explore new technologies and processes. This stems from MV's need to build three new treatment plants (two greenfield) in the coming years, and a desire to make these new plants, as well as existing facilities, as efficient as possible in the recovery of water, energy, and nutrients. The majority of pilot and research projects are conducted by consultants, with additional projects conducted by universities.

The LACSD research section is comprised of two groups located at different facilities, and consists of ten engineers total, with two technicians and one maintenance staff. The majority of projects (~80%) are problem-oriented to address current plant issues, while ~20% of the projects are more "forward thinking" projects looking at future technologies or processes to include in the plant. The in-house staff performs most of the research-related work, with little use of consultants or universities. LACSD operates 11 treatment facilities that receive approximately 500 MGD total.

Technology Assessment Process

Research Needs Identification

Research needs at the utilities fell into two general categories, referred to here as "reactive" projects addressing current system optimization and "proactive" projects identifying new technologies or trends for future plant expansions or upgrades. Conference attendance and participation in external technology assessment programs (see below), and potential changes in regulations were identified as drivers for proactive projects, while reactive projects are initiated from internal communications between departments at each utility. LACSD and OCSD have dedicated interdisciplinary meetings where the research groups can meet with other departments to identify current and upcoming needs throughout their facilities. These groups

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meet every 2-3 months at LACSD and every 4 weeks at OCSD. OCSD staff identified these meetings as being a significant outcome of their 2008 Strategic Plan, and are critical for maintaining an ongoing discussion of research needs and for disseminating information, making research a part of all departments. LACSD expressed that their meetings are less formal, and while meetings can be productive, the lack of documentation or identification of action items results in ideas or projects failing to move forward.

Technology Identification

All four utilities are currently members of the WE&RF LIFT program. MV and MWRD play active roles, with staff involved in focus group committees, while OCSD and LACSD are not as active and only use the program occasionally. OCSD and LACSD are also members of the Isle Utilities TAG program, which is a third party that organizes workshops throughout the year to bring vendors and utilities together to showcase new technologies and products. OCSD finds the TAG program extremely helpful, as limited staffing does not allow for extensive in-house evaluations of technologies, while LACSD staff do not find as much value from the program. MV participates in a similar program with outside consultants Bluetech Research. Additionally, each utility is often approached directly by vendors.

Technology Assessment

The degree of internal technology assessment at each utility is related to the amount of staff in the research groups. At OCSD, with one dedicated staff member, most of the technology assessment is performed by TAG, with the inter-department staff research committee performing some reviews. At LACSD, each potential project is handled on a case-by-case basis. A select few experienced staff members are relied on to review potential projects, and then the head of the technical services department must approve the project. Projects are then brought to each department, and process engineers, operators, and maintenance staff consulted. This can lead to a back-and-forth discussion between the research group and the operations group, and some projects fail to move forward due to a lack of communication, buy-in from the operations group, or approval of managers. LACSD is actively working to improve this process by formalizing documentation to ensure that projects do not fall through the cracks.

MV performs internal reviews of technologies, which include techno-economic evaluations. After this evaluation, MV may decide to move forward, keep the technology on a "watch list" for future investigation after more installations are demonstrated, or not pursue the technology. While this process is documented, the young program (5 years) has not developed an internal system for organizing this information for easy staff access. MWRD has a very formal, documented process, and all materials from internal evaluations, vendor handouts, etc. are stored on an internal database. A copy of MWRD's New Technology Evaluation Guideline is provided in Attachment A. MWRD staff indicated that in addition to improving efficiency in the review process and avoiding multiple evaluations of one technology, the formal review process

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improves vendor relations as definite answers can be provided about why a technology was not selected for further evaluation/piloting.

Overall, an emphasis was placed on applied research over fundamental research. LACSD has a policy of only pursuing fully developed, demonstrated technologies, as they have had negative experiences in the past resulting in wasted time and resources. MWRD staff indicated that while they conducted more fundamental research in the 1980s, current research focuses on applied, practical applications that can have a direct benefit to the District. One exception was the MV Annacis Research Center, discussed below, which provides space for various types of research to be conducted.

Funding

The vast majority of research projects at the utilities are funded with internal resources. The designation of research budgets as a separate line item in the capital budget was expressed as being critical to research funding, as research projects do not need to compete with capital improvement or maintenance projects for funding. Some projects that are in collaboration with universities have external funding from the university researchers, often with an in-kind contribution from the utility. MV has a unique research funding model, with a dedicated Sustainability Innovation Fund (SIF). The SIF receives around $1M per year from federal tax rebates in addition to surpluses from the general fund. Funds were deposited for the first ten years with no withdrawals, and now the SIF has ~$14M. Money from the SIF is used for pilot projects, as well as projects that may not always make economic sense, such as plant upgrades that do not have a significant economic return, will not break even, or exploratory technologies. One such technology was a collaborative WERF project on hydrothermal processing technology to convert sludge to crude oil (WERF LIFT6T14). MV also operates the Annacis Research Center, which has six test bays that can be rented out by private companies for pilot testing. Vendors will utilize this space to test their own equipment, as well as to demonstrate to MV the utility of their product.

University Relations

Relationships with universities varied significantly across the four utilities. LACSD has university professors "on retainer" to consult about technologies, research trends and ideas, or to review reports. Last year, LACSD began a research project with a professor at the University of California, Irvine, which is uncommon for the District's program. OCSD has conducted projects with a number of universities in the past, but the projects were initiated by the universities. There is an internship program for graduate students, although it was unclear how often this program is utilized. MWRD conducts research projects with universities, and has formalized Master Agreements with each university (three currently) to negotiate lower rates for projects and make projects easier administratively. MWRD also has an internship program, but it is for undergraduate students. They are currently evaluating a new program to hire postdoc research assistants through universities. MV collaborates with the University of British Columbia (UBC)

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through the Annacis Research Center. MV and UBC have a formal agreement, which professors use as leverage to receive federal funding for projects at a high success rate. These multi-year (2-5 years) projects can be conducted at the Annacis Research Center, where UBC has dedicated bench and laboratory space.

Other Notes

Current research projects and trends identified by the utilities included resource recovery, biosolids treatment, and mainstream deammonification.

OCSD developed a 5-year strategic plan in 2008. This plan focused heavily (over 80%) on specific research areas and projects over institutional organization and operation. Staff described this Plan as "out of date as soon as we finished it." TAIP should focus on developing tools or processes that can adapt to changing priorities as part of the strategic planning processes.

Summary

Based on the discussions with the four utilities, the following items should be considered to inform the strategic planning process:

- **Communication:** TAIP should involve other WTD departments in regular meetings to discuss needs and identify research priorities. This ongoing discussion can strengthen involvement and support of other departments and senior management.

- **Documentation:** TAIP should develop a system for documenting technology assessments and research reports for convenience/efficiency as well as internal and external relations.

- **Outside Groups:** TAIP should continue involvement in the WE&RF LIFT program, and encourage WTD staff outside of TAIP to participate as well. Third party programs such as the Isle Utilities TAG program and Bluetech Research could provide additional resources for identifying industry trends and technologies, but the costs of participation would need to be evaluated by TAIP.

- **Dedicated Funding:** TAIP should maintain funding from the County budget and not actively pursue grant funding.

- **Staffing:** TAIP should consider staff additions to have capacity to pursue more "proactive" research projects. Based on the utilities surveyed, the size of WTD justifies one to two full time employees working on proactive projects.

Guidelines for the Review of New Technology Proposals

The goal of the review of new technologies is to determine if the District should pursue pilot-scale testing or adoption of technologies proposed by vendors. The new technologies are proposed either through unsolicited proposals from vendors, Current NFP, or through District staff such as the Director or Assistant Directors of M&R. The review and tracking protocol will help the District to respond to vendors in a timely manner, and to ensure that each proposal is properly reviewed and the results of the reviews are communicated to the vendor, Current, and relevant staff and departments. The review of new technologies will be administered as follows:

- The Monitoring and Research Department (M&R) will be the lead department and the Environmental Monitoring and Research (EM&R) Manager will serve as the New Technology Coordinator (NTC).

- The Engineering and the Maintenance and Operations Departments will designate staff from their respective departments, based on expertise needed in the technology area, to serve on the technology review team on an as-need basis.

- The members of M&R review team will be designated through the respective Section Heads as we receive new technology proposals for review.

- The M&R NTC will prepare a quarterly update on the status of new technology reviews and transmit them to the M&R Director via a memorandum.

- The M&R NTC will maintain a log of the vendor and technology information in the new technology evaluation database. The database and all relevant information will be stored in the new technology evaluation folder located on Hawk/M&R/Other_Depts_SHARE/Technical_Shared and will be accessible to all members of the review team.

Steps for New Technology Review

The new technologies are proposed either through unsolicited proposals from vendors, Current NFP, or through District staff such as the Director or Assistant Directors of M&R. Unsolicited proposals will be subject to a pre-screening to qualify for further review.

1. Pre-screening of unsolicited proposal.

    a. The M&R (lead) NTC will do a quick review of the proposal and in consultation with relevant technical staff will determine if further review is warranted. The evaluation will include a determination of the time scale in which the District would be actively interested in pursuing the technology (one, less than or greater than five years) and whether the nature and cost of the technology aligns with the District's current priorities and interest. At least one of these criteria would be used to

determine if the technology warrants further evaluation. The NTC will log the vendor and technology information in the new technology evaluation database.

    b. The NTC, or designee, will respond to the vendor within one week of the initial contact with the following guidelines:

        i. Indicate that the District has a review process for evaluating technology proposals.

        ii. If no further review is possible or warranted, inform the vendor and provide explanation.

        iii. If further review is needed, inform the vendor that a more detailed evaluation will be undertaken and provide an estimated timeframe for completion.

        iv. Request additional information as, and update review completion timeframe as necessary.

2. Initial review.

    a. Assignment – The NTC will assign the technology for review by an EM&RD staff (or a task force leader, where applicable) through their supervisor. The NTC and EM&RD reviewer will determine if assistance is needed from the Maintenance and Operations (M&O) and Engineering Departments to perform a joint review. If needed, the NTC will a submit request to Engineering and M&O via memo for staff to participate on the evaluation team. If a joint review is conducted, the M&R staff will serve as lead reviewer.

    b. Schedule – Review should be completed within three months (depending on staff availability and schedule) of initial contact. The review team will determine if additional assistance or more information from the vendor is needed to complete the review.

    c. Report on Findings - The lead reviewer prepares a review report to the NTC. The template for the information that should be included in the review report is attached.

    d. Communication – The NTC, or the lead reviewer, will communicate with the vendor via email to request additional information or meeting if needed. The outcome of the initial review will be communicated to the vendor (or Current together with evaluation report, where applicable) via a letter from the M&R Director. The entire evaluation report will be sent to the vendor only if requested.

3. Comprehensive review – A comprehensive review will be undertaken if warranted by the initial review and may include bench or pilot-scale testing. This level of review may include some type of testing in the lab or field. If comprehensive review is desired, the format for conducting the review and reporting the findings and the schedule for completion of the comprehensive review will be determined on a case-by-case basis.

4. The NTC will prepare a monthly update on the status of new technology reviews together with any new review reports for transmittal to the M&R Director via memo. Comments addressed on any of the previous month's review reports will be also transmitted.

It is important to note that not all new technology proposal may follow this review guideline, based on circumstances such as urgency of the review.

Information to be Filed for each New Technology/Vendor and Included in Review Report

1. Technology Name

2. Technology Vendor

3. Source of Proposal (Unsolicited, Current, District staff)

4. Vendor Contact

5. Principle of Technology and Application to District Operations

   a. Briefly describe how the technology works;
   b. Applicability of, the technology to District operations and whether it will meet a current priority or future need;
   c. Provide a list of general advantages and/or disadvantages of the product.

6. Safety Concerns

7. Generalized Cost Information

8. Case Studies – Evaluation of each case study should include the following:

   a.   Title
   b.   Background identifying problem
   c.   Objective
   d.   Technical application
   e.   Cost
   f.   Results
   g.   Comments

9. Summary and Assessment of Technology Based on Case Studies/Literature Review

10. Recommendations. This should designate the technologies as "pursue further evaluation or testing," "revisit at a later date," or "do not pursue." A decision to pursue the technology further should be supported by the following:

   a.   We know how the technology works
   b.   There is a potential for significant operational and/or environmental benefit from adopting the technology
   c.   The adoption of the technology will result in a net cost savings to the District
   d.   If the operational and/or environmental benefit or cost savings might not be immediate, there is a business case that is potentially beneficial to the District in the future