LOTT Clean Water Alliance

LOTT Reclaimed Water Infiltration Study
Community Advisory Group

Third Phase of Work
Final Report

December 29, 2022

Introduction

This document summarizes the work of the Community Advisory Group during Phase 3, the final phase of LOTT's Reclaimed Water Infiltration Study. The study was a multi-year effort to learn about potential risks from infiltrating reclaimed water into groundwater because of chemicals that remain in the water from products that people use every day, and what can be done to reduce those risks. The Community Advisory Group was formed to assist the LOTT Board of Directors and the study team by helping to identify community concerns, act as a sounding board reflecting a variety of community perspectives, and to ensure that the science was clearly communicated.

During Phase 1 of the study, the role of the advisory group was to assist with preparations for public opinion research and development of a public involvement plan. For Phase 2, the role of the group shifted to serve as a sounding-board for the draft study framework, scope of work, and public outreach materials and activities. The group also played an active role in engaging the public in discussions about the draft study framework and proposed study activities.

During Phase 3 of the study, lasting from 2014-2022, the Community Advisory Group was briefed on the study as each of four key study tasks were completed. They continued their role of sounding board, providing feedback and asking questions about the science so that they could better understand the results, which in turn helped the study team better explain the results to others. The group also provided review and feedback on outreach materials designed to explain the study results to the public.

The LOTT Board recognized early on that serving on the Community Advisory Group represents a significant commitment of time and effort on the part of group members. For that reason, members of the advisory group were asked at each phase of the study if they are willing to continue their service. Twelve of the original sixteen members agreed to serve on the advisory group for Phase 3 of the study:

Maureen Canny
John Cusick
Holly Gadbaw
Lyle Fogg
Karen Janowitz
Bill Liechty
Scott Morgan
Pixie Needham
Tina Peterson
Ruth Shearer
Edward Steinweg
Richard Wallace

Community Advisory Group members were asked to participate in ten meetings during Phase 3; these meetings were also open to the public. Group members were also encouraged to participate in a Community Forum held in the fall of 2022. In general, meetings of the group followed this format:

- informational presentations by study team members,
- responses from staff or the study team to previous questions raised by the group, and
- feedback from Community Advisory Group members related to specific issues or public involvement efforts.
- Public comment (at the beginning or end of the meeting)

Members had the opportunity to ask questions and provide feedback at each meeting. (See Appendices for the meeting schedule, agendas, and meeting summaries.) Members also were periodically asked to review materials and provide feedback by email.

Phase 3 Work Plan and Products

The Community Advisory Group was asked to serve various roles during Phase 3, including to:

1) Act as a sounding board for the LOTT Board of Directors and the study team, providing feedback and input on materials and programs related to study tasks and public communications, including:
    - Draft work plans and reports for each study task
    - Presentations, website content, and informational materials about the study
2) Provide a critical eye for the study effort, questioning approaches and materials, and pushing the study team to effectively address public interests and concerns
3) Continue to recommend ways to effectively engage the public as each study task was completed
4) Support public involvement efforts by encouraging others to get involved in the study and by participating in public involvement activities
5) Continue to learn about wastewater treatment, reclaimed water production and use, LOTT's long-range Wastewater Resource Management Plan concepts, related water quality requirements and issues, and the regulatory context for wastewater management in Washington and the local area.

Act as a Sounding Board

During this final phase of the study, members of the Community Advisory Group played a key role, learning about and providing input as each of these study tasks were completed, over an 8-year period:

- Water Quality Characterization – to analyze quality of local groundwater, surface waters, drinking water, and reclaimed water
- Treatment Effectiveness Evaluation – to learn how reclaimed water that is infiltrated to groundwater travels and how the quality of that water changes over time
- Risk Assessment – to determine the relative risks of replenishing groundwater with reclaimed water for human and ecological health
- Cost Benefit Analysis – to calculate costs and benefits of various options for managing wastewater

Throughout the process, group members considered comments from the Science Task Force and Peer Review Panel. They also helped the study team anticipate questions that might be asked, and directed the team to explain the study clearly, using terms and visuals that most people could understand.

Provide a Critical Eye to the Study Effort

The Community Advisory Group members provided a critical eye for study work plans and reports, and for the information and outreach materials developed to engage the public in the study. As each study task progressed, the Community Advisory Group members reviewed work plans, results, and materials designed for public engagement.

The group encouraged looking at the study investigations within a larger context, asking questions about issues such as continued growth, sea level rise, the regulatory framework, and the changing chemical landscape. They also encouraged keeping a focus on source control, to limit residual chemicals at the source.

Recommend Ways to Effectively Engage the Public

The Community Advisory Group provided input on the plan for public engagement as the study progressed and as it reached its conclusion. Given the long timespan of this phase of the study, the study team recognized that it would be difficult to maintain public interest all along the way. Instead, outreach efforts focused on study milestones, as tasks were completed and new information became available, and on ensuring transparency and open access to study information. This included providing posting all study-related documents to the web page, and sending email updates to a distribution list with notice of study activities, upcoming meetings, and new publications. As the study concluded in 2022, communication and public involvement efforts were ramped up to present results to key audiences and stakeholders. These efforts included a Community Forum, an online Open House with survey, media releases, posting to social media and online calendars, paid advertising, presentations to jurisdictional partners and community groups, and a video production.

The Community Advisory Group gave input to help ensure the outreach was inclusive and that materials and presentations communicated concepts effectively. For example, they advised on choosing terms that would be commonly understood and selecting graphics to effectively illustrate the data. As the study was wrapping up, the group provided feedback on a presentation designed to explain how study results would be used in LOTT's master planning effort.

Support Public Involvement Efforts

The Community Advisory Group provided vital feedback to help the study team explain the study and results clearly and concisely. They provided input on how to reach key audiences and reviewed outreach materials, including each of the series of six study fact sheets. Several members of the Community Advisory Group participated in the Community Forum. For the feedback survey connected to online Open House, the group advised on what types of questions would be useful to ask the public. Two group members provided on-camera interviews for the video made to explain the study, and the entire group reviewed the draft video.

Continue to Learn about Study Related Topics

A portion of each Community Advisory Group meeting was dedicated to answering technical questions and learning more about scientific concepts related to the study. Topics addressed included:

- Production and use of reclaimed water for infiltration
- Selecting chemicals to test for in the study
- Learning about chemicals of emerging concerns, including PFAS
- Hydrogeology concepts and how they apply to proposed study activities
- Risk assessment concepts and how acceptable levels of exposure are defined
- Using data for groundwater modeling
- Understanding standard scientific methods

Recognizing Contribution of the Community Advisory Group

LOTT is extremely grateful to the Community Advisory Group members for their participation and thoughtful input throughout the process. These nine members participated for the entire 10-year duration of this study, making a substantial contribution on behalf of the community.

Maureen Canny
John Cusick
Holly Gadbaw
Karen Janowitz
Bill Liechty
Scott Morgan
Tina Peterson
Edward Steinweg
Richard Wallace

Appendices

Community Advisory Group

Third Phase of Work
Final Report

Community Advisory Group – Reclaimed Water Infiltration Study

Mission and Roles – Phase 3

Purpose and Mission Statement

The mission statement for the Community Advisory Group remains unchanged from the original statement developed in the previous phase of the group's work:

> The LOTT Clean Water Alliance is conducting a multi-year study, called the Reclaimed Water Infiltration Study, to help LOTT and the community understand how best to protect local water resources while treating and recharging reclaimed water. A Community Advisory Group has been formed for the study with a mission to assist the LOTT Alliance Board of Directors and study team to gain an understanding of community perspectives and questions and ensure the study is designed to address community concerns. The Community Advisory Group will also help identify effective ways to engage the public throughout the study.

Role of the Community Advisory Group Members

Community Advisory Group members were asked to:

- Act as a sounding board for the LOTT Board of Directors and the study team, providing feedback and input on materials and programs related to study scoping and public communications, including:
  - Draft work plans and task reports
  - Presentations, website content, and informational materials about the study
- Provide a critical eye for the study effort, questioning approaches and materials, and pushing the study team to effectively address public interests and concerns
- Continue to recommend ways to effectively engage the public both in the development of the scope for the scientific study and on a continuing basis throughout the study
- Support public involvement efforts by encouraging others to get involved in the study and by participating in public involvement activities, such as public workshops
- Continue to learn about wastewater treatment, reclaimed water production and use, LOTT's long-range Wastewater Resource Management Plan concepts, related water quality requirements and issues, and the regulatory context for wastewater management in Washington and the local area.

Meeting Frequency

For Phase 3, advisory group members were asked to attend evening meetings, each about three hours in duration, to complete the work required. Because this is the most complex phase of the study, there were ten meetings at varying intervals, scheduled to coincide with key milestones related to the four main study tasks. Members were also encouraged to participate in public involvement events, such as occasional public meetings or workshops.

Principles of Participation – Phase 3

Discussion Process

Community Advisory Group members agreed to abide by the following discussion process:

* Value all perspectives.
* Listen openly and actively to perspectives of others.
* Treat other group members with respect.
* Participate and encourage participation of other group members.
* Empower the facilitator to moderate discussions.
* Limit discussion to one person speaking at a time.
* Make every effort to present perspectives succinctly and avoid repetition.
* Use collaborative problem solving as the preferred deliberation process.
* Avoid lengthy discussions on items in which a majority consensus cannot be made or where differing positions impede the process of the group as a whole.
* Record alternative perspectives when the group does not reach consensus.

Meeting Attendance and Participation

In order for the process to work effectively, full participation of members was essential. Community Advisory Group members were asked to commit to attend meetings consistently, arrive on time, and remain for the scheduled duration of the meeting.

In addition to the Community Advisory Group meetings, members of the group were asked to volunteer to attend an occasional meeting of the LOTT Board of Directors as a representative of the group to provide updates on the group's activities and to participate occasionally in public involvement activities, such as public workshops.

Meeting Support

LOTT's Public Communications Manager facilitated all meetings. The role of the facilitator was to ensure all perspectives were heard through a collaborative discussion process. Study team members provided technical and logistical support, including making presentations, answering questions, researching questions raised by members, coordinating meeting logistics, and documenting meeting content. Meeting discussions were audio taped or video recorded to aid in the preparation of meeting summaries.

Meeting Agendas, Notes, and Material Review

Meeting agendas were distributed by e-mail in advance of each meeting. Draft summaries from the previous meeting were also distributed by email for review by advisory group members. Once members had an opportunity to review and revise draft meeting summaries, they were posted on the LOTT website for public review. Members of the advisory group were at times asked to review reference material or draft documents in preparation for upcoming advisory group meetings or other activities.

These materials were distributed to group members via email, with comments to be returned to the study team by email or discussed at the next advisory group meeting.

Observers

Observers were welcome at Community Advisory Group meetings. However, meetings were intended as working meetings of the advisory group, for the benefit of the group members to promote balanced, constructive interaction. Observers were asked to refrain from commenting during the proceedings. There was an opportunity for public comment at each meeting.

Sharing Opinions and Information Outside of Advisory Group Meetings

Members of the Community Advisory Group were welcome to share information about the Reclaimed Water Infiltration Study, the Community Advisory Group, and related topics outside of the advisory group meetings. In fact, one of the roles of advisory group members was to encourage other members of the public to learn about and get involved in the study.

Issues and Concerns

Members of the Community Advisory Group were encouraged to bring any issues or concerns to the attention of the study team as they arise. Study team members did whatever was possible to address concerns in a timely manner. The primary staff contact for the advisory group was Joanne Lind, LOTT's Public Communications Manager.

Community Advisory Group – Reclaimed Water Infiltration Study

Phase 3 Schedule

Advisory Group Meeting 1: July 29, 2014

- Update on Scope of Work
- Tour Martin Way Reclaimed Water Plant and Hawks Prairie Ponds and Recharge Basins

Advisory Group Meeting 2: June 9, 2015

- Update on field work and preliminary data
- Review quality assurance for study implementation
- Update on policy and state of the science

Advisory Group Meeting 3: October 11, 2016

- Review water quality characterization
- Update on public involvement activities
- Discuss data presentation
- Review tracer test preparations

Advisory Group Meeting 4: November 6, 2017

- Review Phase 3 implementation tasks
- Review local hydrology 101

Advisory Group Meeting 5: April 17, 2019

- Review tracer test results
- Review water quality results
- Discuss tracer test questions and feedback

Advisory Group Meeting 6: October 3, 2019

- Update on Phase 3 implementation tasks
- Review human health and ecological risk assessments
- Review groundwater modeling work plan

Advisory Group Meeting 7: June 14, 2021

- Review study progress to date
- Review fate and transport modeling
- Review human health and ecological risk assessments

Advisory Group Meeting 8: March 31, 2022

- Review Reclaimed Water Infiltration Study draft public presentation
- Discuss draft public presentation
- Updates on tasks 3 and 4
- Discuss next steps and public engagement

Advisory Group Meeting 9: July 11, 2022

- Review Reclaimed Water Infiltration Study draft public presentation – short version
- Review content of community outreach materials (online, print, and video)

Advisory Group Meeting 10: October 20, 2022

- Review master planning update & community presentation
- Discuss questions and feedback on master planning
- Review draft study video
- Celebrate completion of the study

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.1 Agenda
July 29, 2014
LOTT Board Room, 500 Adams Street NE, Olympia

5:30 pm	**Advisory Group Business/Logistics** (Light Dinner Provided) *Lisa Dennis-Perez, LOTT Public Communications Manager*
5:35 pm	**Public Comment** *Lisa Dennis-Perez, Facilitator*
5:40 pm	**Overview: Peer Review Panel Feedback and Adjustments to Scope of Work** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
6:00 pm	**Discussion: Scope of Work and Next Steps** *Lisa Dennis-Perez, Facilitator*
6:15 pm	**Break & Load Up for Field Trip**
6:30 pm	**Depart for Martin Way Reclaimed Water Plant** *6121 Martin Way E in Lacey*
6:45 pm	**Tour Martin Way Reclaimed Water Plant** *Eric Hielema, LOTT Senior Engineer*
7:30 pm	**Depart for Hawks Prairie Reclaimed Water Ponds and Recharge Basins** *3001 Hogum Bay Road NE in Lacey*
7:45 pm	**Tour Hawks Prairie Reclaimed Water Ponds and Recharge Basins** *Eric Hielema and Jeff Hansen*
8:30 pm	**Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.2 Agenda
June 9, 2015
LOTT Board Room, 500 Adams Street NE, Olympia

5:30 pm	**Informal Meet and Greet** (Light Dinner Provided)
6:00 pm	**Advisory Group Business/Logistics** *Lisa Dennis-Perez, LOTT Public Communications Manager*
6:05 pm	**Public Comment** *Lisa Dennis-Perez, Facilitator*
6:10 pm	**Presentation: Phase 3 Implementation – Field Work and Preliminary Data** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
7:30 pm	**Break**
7:45 pm	**Update: Quality Assurance for Study Implementation** *Ben McConkey, LOTT Project Manager*
7:55 pm	**Update: Potential Second Study Site** *Ben McConkey, LOTT Project Manager*
8:15 pm	**Update: Policy and State of the Science** *Karla Fowler, LOTT Environmental Policy Director* *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
8:35 pm	**Update: Public Involvement Activities** *Lisa Dennis-Perez, LOTT Public Communications Manager*
8:50 pm	**Discussion: Proposed Community Advisory Group Schedule** *Lisa Dennis-Perez, Facilitator*
9:00 pm	**Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.3 Agenda
October 11, 2016
LOTT Board Room, 500 Adams Street NE, Olympia

5:30 pm	**Informal Meet and Greet** (Light Dinner Provided)
6:00 pm	**Advisory Group Welcome and Initial Business** *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
6:15 pm	**Public Comment** *Lisa Dennis-Perez, Facilitator*
6:20 pm	**Presentation: Review of Phase 3 Implementation Tasks** *Wendy Steffensen, LOTT Project Manager*
6:30 pm	**Presentation: Water Quality Characterization** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
7:20 pm	**Update: Public Involvement Activities** *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
7:30 pm	**Break**
7:45 pm	**Discussion: Feedback on Data Presentation** *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
8:10 pm	**Presentation: Tracer Test Preparations** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
8:40 pm	**Update: Science Task Force, Peer Review, and More** *Wendy Steffensen, LOTT Project Manager*
8:50 pm	**Update: Community Advisory Group Schedule** ***Lisa Dennis-Perez, Facilitator***
9:00 pm	**Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.4 Agenda
November 6, 2017
LOTT Board Room, 500 Adams Street NE, Olympia

5:30 pm	**Informal Meet and Greet** (Light Dinner Provided)
6:00 pm	**Advisory Group Welcome and Initial Business** *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
6:15 pm	**Public Comment** *Lisa Dennis-Perez, Facilitator*
6:20 pm	**Presentation: Review of Phase 3 Implementation Tasks** *Wendy Steffensen, LOTT Project Manager*
6:30 pm	**Presentation: Local Hydrogeology 101** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
7:00 pm	**Presentation: Draft Tracer Test Work Plan** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
7:45 pm	**Break**
8:00 pm	**Discussion: Tracer Test Questions and Feedback** *Lisa Dennis-Perez, Facilitator*
8:20 pm	**Presentation: Next Steps for Task 2** *Wendy Steffensen, LOTT Project Manager*
8:30 pm	**Updates: News Notes** *Wendy Steffensen, LOTT Project Manager*
8:45 pm	**Update: Community Advisory Group Schedule** *Lisa Dennis-Perez, Facilitator*
8:55 pm	**Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.5 Agenda
April 17, 2019
LOTT Board Room, 500 Adams Street NE, Olympia

5:30 pm	**Informal Meet and Greet** (Light Dinner Provided)
6:00 pm	**Advisory Group Welcome and Initial Business** *Joanne Lind, Public Communications Manager*
6:15 pm	**Public Comment** *Joanne Lind, Public Communications Manager*
6:20 pm	**Presentation: Review of Phase 3 Implementation Tasks** *Wendy Steffensen, LOTT Project Manager*
6:30 pm	**Presentation: Tracer Test Results** *Ida Fischer, Hydrologist, HDR Engineering, Inc.*
7:00 pm	**Presentation: Water Quality Results** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
7:45 pm	**Break**
8:00 pm	**Discussion: Tracer Test Questions and Feedback** *Joanne Lind, Public Communications Manager*
8:20 pm	**Presentation: Next Steps for Task 2** *Wendy Steffensen, LOTT Project Manager*
8:30 pm	**Updates: News Notes** *Wendy Steffensen, LOTT Project Manager*
8:45 pm	**Update: Community Advisory Group Schedule** *Joanne Lind, Public Communications Manager*
8:55 pm	**Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.6 Agenda
October 3, 2019
LOTT Board Room, 500 Adams Street NE, Olympia

5:30 pm	**Informal Meet and Greet** (Light Dinner Provided)
6:00 pm	**Advisory Group Welcome and Initial Business** *Joanne Lind, Public Communications Manager*
6:15 pm	**Public Comment** *Joanne Lind, Public Communications Manager*
6:20 pm	**Presentation: Review of Phase 3 Implementation Tasks** *Wendy Steffensen, LOTT Project Manager* *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
6:45 pm	**Presentation: Human Health Risk Assessment** *Lisa Corey, Consultant, Intertox, Inc.*
7:10 pm	**Presentation: Ecological Risk Assessment** *Berit Bergquist, Consultant, Windward Environmental, LLC*
7:30 pm	**Break**
7:40 pm	**Presentation: Groundwater Modeling Work Plan** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
8:00 pm	**Discussion: Questions and Feedback** *Joanne Lind, Public Communications Manager*
8:30 pm	**Presentation: Next Steps for Task 2 and Task 3** *Wendy Steffensen, LOTT Project Manager*
8:45 pm	**Update: Community Advisory Group Schedule** *Joanne Lind, Public Communications Manager*
8:55 pm	**Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.7 Agenda
June 14, 2021, 5:30 PM
Held remotely

5:30 pm	**Advisory Group Welcome, Introductions, Agenda Review** *Joanne Lind, Public Communications Manager*
5:40 pm	**Presentation: Review of Study Progress to Date** *Wendy Steffensen, LOTT Project Manager*
5:55 pm	**Presentation: Fate and Transport Modeling** *Jeff Hansen, Lead Consultant, HDR Engineering, Inc.*
6:35 pm	**Presentation: Human Health Risk Assessment Update** *Gretchen Bruce, Consultant, Intertox, Inc.*
7:05 pm	**Break**
7:10 pm	**Presentation: Ecological Risk Assessment Update** *Kate McPeek, Windward Environmental, LLC*
7:40 pm	**PFAS Update** *Wendy Steffensen, LOTT Project Manager*
7:50 pm	**Discussion: Questions and Feedback** *Joanne Lind, Public Communications Manager*
8:15 pm	**Presentation: Study Schedule and Next Steps** *Wendy Steffensen, LOTT Project Manager*
8:20 pm	**Public Comment** *Joanne Lind, Public Communications Manager*
8:30 pm	**Wrap-up/Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.8 Agenda
March 31, 2022, 5:30 PM
Held remotely

5:30 pm **Advisory Group Welcome, Introductions, Agenda Review**
Joanne Lind, Public Communications Manager

5:40 pm **Presentation: Reclaimed Water Infiltration Study Draft Public Presentation**
I. Introduction, Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director
II. Study tasks and results, Jeff Hansen, Lead Consultant, HDR Engineering, Inc.
III. Where we go from here, Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director

6:10 pm **Discussion: Feedback on Public Presentation**
CAG members, facilitated by Joanne Lind, Public Communications Manager

6:30 pm **Presentation: Update on Task 3**
Jeff Hansen, Lead Consultant, HDR Engineering, Inc.

6:50 pm **Presentation: Update on Task 4**
Jeff Hansen, Lead Consultant, HDR Engineering, Inc.

7:10 pm **Break**

7:20 pm **Presentation: Next Steps and Public Engagement**
Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director

7:40 pm **Presentation: Study Schedule**
Wendy Steffensen, LOTT Project Manager

7:45 pm **Public Comment**
Joanne Lind, Public Communications Manager

8:00 pm **Wrap-up/Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.9 Agenda
July 11, 2022, 5:30 PM
Held remotely

5:30 pm	**Advisory Group Welcome, Introductions, Agenda Review** *Joanne Lind, Public Communications Manager*
5:35 pm	**Study Update** *Wendy Steffensen, LOTT Project Manager*
5:50 pm	**Presentation: Preview Community Presentation** (short version) *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director* *Wendy Steffensen, LOTT Project Manager*
6:10 pm	**Discussion: Feedback on Community Presentation** *CAG members, facilitated by Joanne Lind, Public Communications Manager*
6:50 pm	**Break**
7:00 pm	**Presentation/Discussion: Plans for Community Forum** *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
7:20 pm	**Content Review: Community Outreach** *I. Online engagement* *II. Fact sheets* *III. Project summary* *IV. Video project* *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director* *Joanne Lind, Public Communications Manager*
8:15 pm	**Public Comment** *Joanne Lind, Public Communications Manager*
8:30 pm	**Wrap-up/Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.10 Agenda
October 20, 2022, 5:30 PM
Held remotely

5:30 pm	**Advisory Group Welcome, Introductions, Agenda Review** *Joanne Lind, Public Communications Manager*
5:35 pm	**Update on Community Forum and Study Activities** *Wendy Steffensen, LOTT Environmental Project Manager* *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
5:45 pm	**Presentation: Master Planning Update & Community Presentation Preview** *Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director*
6:15 pm	**Questions and Feedback on Master Planning** *CAG members, facilitated by Joanne Lind, Public Communications Manager*
6:35 pm	**Break**
6:45 pm	**Review of Draft Study Video** *CAG members, facilitated by Joanne Lind, Public Communications Manager*
7:00 pm	**Celebrate Completion of the Study** *All*
7:15 pm	**Public Comment** *Joanne Lind, Public Communications Manager*
7:30 pm	**Wrap-up/Adjourn**

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.1 – July 29, 2014 – Summary

Welcome and Initial Business
The meeting opened at 5:30 pm with Lisa Dennis-Perez serving as the meeting facilitator. Lisa pointed out new binders for Phase 3, which contain materials for this meeting, along with an updated roster of Community Advisory Group participants, Mission and Principles of Participation, and a tentative schedule for Phase 3 meetings. She then asked for a volunteer from the group to attend the Board meeting on August 13, and
Pixie Needham volunteered.

Public Comment
Members of the public in attendance were invited to make comments, and none of the people in attendance chose to do so.

Overview: Peer Review Panel Feedback and Adjustments to Scope of Work
Jeff Hansen, Lead Consultant with HDR Engineering, provided an overview of the Peer Review Panel process and recent feedback. The Peer Review Panel met originally in February to review a draft Scope of Work for the study. At that time, one of the panel members, Dr. Richard Bull, a toxicologist, was unable to attend the meeting and missed some of the context that was shared with other members of the panel. Although he reviewed the scope remotely and provided initial feedback, it was decided that it would be beneficial to hold a special meeting with Dr. Bull and members of the study team to share context, clarify the proposed approach to human health risk assessment, and gather his feedback in person.

A meeting was held with Dr. Bull on June 20. Dr. Bull urged the study team to be realistic about what can be achieved regarding the human health risk assessment. He stated that the overall approach is good, but it will be primarily qualitative in nature. It cannot be a comprehensively quantitative risk assessment because the science simply is not developed enough to allow for that, and the study cannot include testing for every possible residual chemical. For those reasons, he suggested that the team not "overpromise" or raise unrealistic expectations about the nature of the risk assessment. It will have limitations. Dr. Bull also suggested expanding the list of analytes (residual chemicals to be monitored) to provide a full characterization of reclaimed water with respect to drinking water requirements and to include some chemicals that are of special interest.

Initial feedback from the Peer Review Panel also highlighted a need to bring together the hydrogeologists from the panel, Dr. Roy Haggerty, and from the study team, John Koreny, since Mr. Koreny had not been able to attend the original panel meeting. A meeting was held June 24 to discuss the proposed approach to the hydrogeologic assessment. Dr. Haggerty stated that the overall approach is sound, but suggested that the length of time that the tracer is added be extended beyond the originally proposed 2-week time period.

Karen Janowitz:
How is the tracer added? Is it injected once a day?

The tracer will be injected into the flow continuously for the time period selected, which may be as long as 6 weeks.

Dick Wallace:
Why did Dr. Haggerty want to see the tracer time extended? Is it because he thinks the time of travel will be shorter and that would make it easier to detect the tracer?
He wanted to make sure there would be sufficient mass of the tracer to facilitate good results. This is regardless of the time of travel.

Jeff then explained that the Peer Review Panel was still working on their Final Report and that is coming soon. He then went on to review how the original analyte list was developed and that it has been modified based on the feedback from the panel and others. Additional analytes include:

- Parameters that are generally monitored to characterize drinking water
    - Including disinfection byproducts, Cryptosporidium, and others
- Parameters of interest because they are persistent in environment and can be found in wastewater
    - PBDEs (fire retardants, different class than those in the original list)
    - Perfluorinated Compounds (PFOS, PFOA, etc.)
- Parameters that were commonly detected in prior Ecology/EPA studies of LOTT reclaimed water
    - Metformin (diabetes drug)
    - Thiabendazole (pesticide)

With these additions to the original residual chemical list, the revised list now covers the primary chemicals of interest that are being evaluated elsewhere in studies related to "direct potable reuse", which generally set a high bar for the study of residual chemicals. The Peer Review Panel is satisfied that the analyte list, with these additions, will provide a strong basis for the study.

Karen Janowitz:
Will those additions to the analyte list require additional test methods? You mentioned that the original list required only one test method, which helped contain costs.
Initially, we thought these additions would require additional test methods, but the laboratory staff did a lot of work to determine that they can use the same test methods originally identified. However, they will have to develop new thresholds for detection of some of these additional analytes. Therefore, the expanded list does increase costs.

Jeff then reviewed a number of adjustments to the scope of work and their impacts on the budget. Overall, the adjustments result in an anticipated Phase 3 cost of $3.4-$4.4 million, up from the original scope estimate of $3.2-$4.1 million.

Maureen Canny:

Can you explain more about the difference between a qualitative and a quantitative risk assessment? Does that mean that you wouldn't be able to say what risk a certain concentration of metformin means to human health?
No, it means there are many other diabetes drugs that were not tested for, so we cannot quantify the risk from all diabetes drugs or for residual chemicals overall, since we cannot test for all of them within the budget constraints of the Study. We can only quantify the risk from the specific analytes that are monitored for in the study.

Dick Wallace:
Has the Board of Directors reviewed this feedback?
At the July 9 Board meeting, the LOTT Board received the same update that was just presented to you.

Karen Janowitz:
Do you have maps of the Hawks Prairie site that can be taken on the tour to provide context?
Yes, we will bring maps from the draft scope that show locations of monitoring wells and other information that might help with the tour.

Holly Gadbaw:
The study is focused on the Hawks Prairie site, so how will this work be applied to other future recharge sites? Will all this work have to be repeated for each site?
There is room in the study to look at background water quality at one other site besides Hawks Prairie, and that will be helpful when assessing future sites. From this study, we are learning about time of travel and how long it takes for residual chemicals to degrade during soil aquifer treatment. That will also be helpful when assessing future sites. For each potential site, hydrogeologic assessment is completed as part of the site feasibility investigation. Based on that work, we would be able to model how long it takes for water that is infiltrated at the proposed site to reach nearby wells or water bodies. We would then apply what we learn from this study (in conjunction with information from other studies as documented in the literature) about time of travel and how long it takes for residual chemicals to degrade, and that way, understand the relative risks.
What is the next site?
The next planned site is Henderson Boulevard, but that is not certain because additional site feasibility work is needed there and there are pocket gophers on the site.
What is the infiltration capacity at Hawks Prairie?
Hawks Prairie was designed to infiltrate up to 5 million gallons a day, but LOTT is not currently producing that much reclaimed water, so actual infiltration is about 1 million gallons a day.

Dick Wallace:
This is a comment, rather than a question. You need to be clear in your communications, when you say things like "this is how this issue is studied in areas where direct potable reuse is planned", that the intention in our local area is not to have direct potable reuse. That will be confusing for people if you make references to it.
Yes, point well taken. That was brought up only to illustrate that in areas like California and Texas, where direct potable reuse is planned, they are setting a high bar for monitoring of residual chemicals and we are planning to meet that high bar here with this study, even though direct potable reuse is not planned here.

Karen Janowitz:

Referencing potable reuse is okay since some of this reclaimed water may end up in aquifers where drinking water wells are located.
True, but locally, infiltrated reclaimed water will go through soil aquifer treatment before it interacts with groundwater, so that is considered indirect potable reuse.

Maureen Canny:
Will you build out to 5 million gallons per day at the Hawks Prairie site before you develop the next infiltration site?
No, we have to develop reclaimed water production and infiltration capacity in areas of the system where there is enough wastewater flow to support them. There isn't currently enough wastewater that feeds the Martin Way Reclaimed Water Plant to produce 5 million gallons per day, and it will be years before there is enough, so we will need to develop an infiltration site in a different area of the system.

Lisa then explained that LOTT's Technical Sub-Committee would be reviewing the changes to the scope of work at their August meeting, and if they agree to make a recommendation to the LOTT Board, then the Board will consider authorization of the contract for Phase 3 work at their August 13 meeting. The meeting portion of the evening ended and group members prepared to travel to two sites for the tour portion of the agenda.

Tours: Martin Way Reclaimed Water Plant and Hawks Prairie Reclaimed Water Ponds and Recharge Basins
Eric Hielema, LOTT's Senior Wastewater Engineer, gave a tour of the Martin Way Plant. The group then traveled to the Hawks Prairie Site, where Jeff Hansen led the tour, pointing out the recharge basin that is being used for the study and several monitoring wells. The tour ended at about 8:30 pm, with the group returning to the LOTT Regional Services Center to depart.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.2 – June 9, 2015 – Summary

Welcome and Initial Business
The meeting opened at 6:00 pm with Lisa Dennis-Perez, LOTT's Public Communications Manager, as the meeting facilitator. Lisa began by asking for a volunteer from the Community Advisory Group to attend the July LOTT Board of Director's meeting to provide a brief summary of the meeting. Scott Morgan agreed to attend. She then asked if any members of the public wished to make comments; none wished to do so.

Presentation: Phase 3 Implementation – Field Work and Preliminary Data
Jeff Hansen, lead consultant from HDR Engineering, provided an update on field work that has taken place since Phase 3 study implementation began, most of which is related to water quality characterization. He explained that characterization of wastewater and reclaimed water involves four rounds of sampling and water quality testing. Three sampling rounds have been completed, and preliminary data is available for two of those rounds (results are not back yet for the most recent sampling round). Jeff shared some highlights from the data, and how results compare to findings from other studies related to wastewater and reclaimed water quality. He explained that it is too early to draw any conclusions about the data, but he shared several different trends regarding treatment effectiveness, which varied depending on the chemical.

Maureen Canny:
Why are some chemicals detected during one phase of treatment, and not the next, but then they are detected at the end of the process? *These samples are all taken on the same day but they do not represent the exact same drop of water as it moves from one stage of treatment to the next. Levels of these chemicals will fluctuate somewhat throughout the day. Some are very near their detection limits, meaning if they are slightly under the detection limit, the result will show as a "non-detect", but if the level of chemical fluctuates up just slightly for the next sample, that sample will show the chemical as detected.*

Jon Bennett:
Is there a control that represents water quality before infiltration started at Hawks Prairie Recharge Basins?
Since the study began after the Hawks Prairie site had been in operation, we don't have a true control that shows background water quality prior to the start of infiltration. We do have some samples from a point in time after the Hawks Prairie Recharge site had been off line for 15 months, but it doesn't represent true background.

Scott Morgan:
What is between the Class A Reclaimed Water output at the Martin Way Reclaimed Water Plant and the input at the Hawks Prairie Recharge Basins? *There is just pipe, about three and a half miles of pipe. It takes several hours for the water to travel from the plant to the recharge site, so some processes could be taking place during that travel time.*

Holly Gadbaw:

Are there harmful effects from sucralose? *Jeff indicated that at this point in the study, that question has not yet been addressed. It will be addressed later when we get into the risk assessment work. But in general, sucralose is looked at as an indicator of wastewater, not necessarily because of concern about its effects.*

Karen Janowitz:
Will you be accounting for differences in rainfall, temperature, and other factors? *Yes, we will be looking at the impact of those factors once we have all the data collected. That is why we are collecting samples at four different times of the year.*

Holly Gadbaw:
Will the impact of rainwater be more of a factor at the Budd Inlet Treatment Plant than at the Martin Way Reclaimed Water Plant? *It will likely be more of a factor, given the higher amount of combined stormwater that flows to the Budd Inlet plant.*

Dick Wallace:
Were there differences in the raw wastewater as a result of the different contributions from the different plants? *I'm not prepared to speak to that in detail tonight. We have noticed some difference, but it doesn't appear significant. There are not great differences in industrial influences in the wastewater between the two plants.*

Jeff then went on to explain the effort to characterize groundwater in and around the Hawks Prairie Recharge Basins. The approach involved identifying groundwater wells within two miles of the site. Well owners were contacted to ask permission to sample their wells. Sampling has taken place at 28 wells to date, at a variety of depths and in several aquifers, but data hasn't yet been received from the laboratory. This type of sampling will also be conducted around a second site in Tumwater later this summer.

Dick Wallace:
Did you get a good distribution of sampling points in the area? *It is not as good as we had hoped. There are not many wells immediately to the south of the site, and not many to the east either. However, we expect the groundwater moves predominantly to the west. There are a limited number of wells within a mile of the site to the west, and there are quite a few in the range of 1.5 to 2 miles to the west. The distribution of wells is not completely uniform, but we feel we have good coverage in the shallow aquifer.*

Kim Hawkins, field sampling staff for HDR, explained the process for sampling groundwater and showed the group some of the equipment used for sampling.

Lyle Fogg:
How do you measure the depth to groundwater? *We use the distance from the top of the well casing to groundwater, and account for the distance from the base of the measuring equipment to the top of the casement.*

Janine Unsoeld:
How long does it take to complete the full sampling visit at each well? *It takes about one hour for most visits; some take one and a half hours.*

Did you contact homeowners by mail or other? *We sent a letter by mail to ask for volunteers.*

What were some of the reasons people did not want to participate? *It is not clear why folks declined. Many just did not respond. Some people did share that they were concerned that use of their well might be at risk if we found contamination.*

Bill Gill:
Is it an issue that FedEx won't sign the chain of custody? *Kim indicated that it is not an issue. She includes the form in the cooler and seals the cooler, so the lab will know if the cooler seal has been broken. The lab is informed that the sample is on its way to them, so they will know if the cooler doesn't arrive in time, and then it can be tracked down. We had one instance where the cooler arrived one day late. The samples were just past the 48 hour threshold, but they were still within holding temperature standards, so the lab was confident the samples were still valid. The data from that sample was flagged and the circumstances noted*.

Ruth Shearer:
What lab are you using to test the water? *The lab we use is Eurofins in Monrovia, California, which specializes in testing for residual chemicals.*

Jeff then briefly reviewed the sampling plan for characterizing water quality in surface waters, specifically in the Deschutes River, Woodland Creek, and a few tributaries. This work includes four sampling events spread out over several seasons, to account for variability in flows and seasonal inputs to surface water.

Dick Wallace:
Are you going to be sampling above and below the trout ponds? Isn't it possible the trout farm could be introducing chemicals to the flow? *The sampling point at Beatty Springs is upstream from the trout farm to avoid that influence. The main stem sampling point is downstream from the trout farm, so those influences may show up, but that is okay since we are trying to characterize the existing water quality.*

Jon Bennett:
There are a lot of influences to Eagle Creek, including a large development and road runoff. *Yes, there are a lot of influences, and it would be great to sample up and downstream from these influences, but we are limited by budget*.

Jeff then reminded the group that the tracer study is the next piece of field work. Planning for this work is underway. The tracer field work will be conducted next year.

Dick Wallace:
Do you plan to put the tracers in next summer and track them for a year? *It is likely they would not be tracked for a full year. The standard is generally to track tracers for a maximum of six months.*

Maureen Canny:
Do you add the tracer continuously for six months? *Tracer would be added for a two week period and then tracked for six months.*

Updates: Quality Assurance for Study Implementation and Potential Second Study Site
Ben McConkey, LOTT Project Manager for the study, updated the advisory group on membership and activities of both the study Science Task Force and the Peer Review Panel. Both groups are involved in

reviewing and advising the scientific work of the study. He then explained that two sites in Tumwater were assessed as possible future recharge sites, with the potential to also serve as a second site for study activities. The original site in Tumwater was found to have less infiltration capacity than anticipated, but an alternative site was found to be promising. It was purchased by LOTT recently, and will serve as the second site for study activities, beginning with groundwater and surface water sampling to build on the study's characterization of background water quality conditions.

Holly Gadbaw and Dick Wallace:
Is there concern about the subdivision to the west of the site, which is lower in elevation than the site, or concern about stability in the steep bank toward the river? There is also a habitat enhancement project planned in that area. *Those things need to be considered when a more detailed evaluation of the site is completed. Ultimately, LOTT will need to have modeling done to determine how water travels below ground and where it might surface. The neighborhood next door would not likely be affected by recharge at this site, as the subdivision is well below the site and the homes are supplied by city water, not a shallow well.*

Karen Janowitz:
Isn't it a concern that the water would enter surface water that close to the river? *Again, that needs to be considered when a more detailed evaluation of the site is completed. Future modeling work will provide information about how long it would take for the recharge water to travel to the river and that will help determine what level of treatment would have taken place by the time the water reaches the river.*

Holly Gadbaw:
Does LOTT own the site? *Yes, LOTT purchased the site this month.*

Does the TMDL have the potential to require LOTT to stop discharging to Budd Inlet in the summer? *Yes, that is a possibility, but the Budd Inlet/Capitol Lake portion of the Deschutes TMDL has been delayed. We are in limbo as we wait to learn what will be required, but we do expect that LOTT will be asked to reduce nitrogen loading to Budd Inlet further or to do some other kind of mitigation.*

Could the Martin Way Reclaimed Water Plant treat some of the water from the Budd Inlet Plant if needed?
The Martin Way plant treats water from the Lacey area. We are not set up to send wastewater from the Budd Inlet Plant back uphill for treatment at the Martin Way plant.

Maureen Canny:
If Henderson does not work out, would Hawks Prairie be required to accept more water? *No, that is not likely, as treatment at the Martin Way plant is limited by the amount of flow that is generated in Lacey. We cannot increase reclaimed water production at the Martin Way plant until more flow is available in the Lacey area. It would likely be cost-prohibitive to send flow from the Budd Inlet plant uphill back to the Martin Way plant.*

Updates: Policy and State of the Science
Karla Fowler, LOTT's Environmental Policy Director, explained the status of the state's work to establish a new Reclaimed Water Rule and related guidance manual. There are very limited references to the topic of residual chemicals in both draft documents.

Dick Wallace:
What does Ecology mean when they say that compounds of emerging concern require more study? Does that mean they don't see a need for further regulation? *They haven't determined yet if further regulation is needed. They are leaving the door open to potentially require monitoring of these substances, if further study identifies that need.*

Jeff Hansen provided a brief update on the state of the science. There is a lot of attention being given to direct potable reuse in other parts of the country and also a lot of research evaluating different combinations of advanced treatment processes as alternatives to reverse osmosis.

Holly Gadbaw:
Aren't we doing some of these treatment processes already, like sand filtration and soil aquifer treatment? *Yes, LOTT does use some of those processes already.*

Update: Public Involvement Activities
Lisa Dennis-Perez, LOTT Public Communications Manager, shared plans for several new exhibits in the WET Science Center that touch on topics related to the Reclaimed Water Infiltration Study. One of the new exhibits focuses entirely on the study. Another illustrates the process of infiltration with reclaimed water. A third focuses on source control messages, allowing visitors to scan various personal care and household products, learn why it is not a good idea to flush those products down the drain, and see how to dispose of products properly. She also shared recent efforts related to source control, including free medicine take-back kits that are provided to WET Science Center visitors free of charge and a new smart shopping pocket guide produced in collaboration with Thurston County. Recent outreach has also included presentations about the study to many community and professional groups and a new "look" for study updates so they will be easily recognizable for those interested in following news about the study.

Karen Janowitz:
When will the new exhibits be installed? *We hope to have them installed this December.*

Can we have time at a future meeting to play with the new exhibits? *Yes, absolutely.*

Tina Peterson:
How many people go through your education facility each year? *We have about 17,000 visitors a year.*

Discussion: Proposed Community Advisory Group Schedule
Lisa then reviewed a revised schedule with the Community Advisory Group. She asked the group if they would be interested in meeting again in early December to review more data from the field work. They indicated that they would like to meet in December.

Karen Janowitz:
What data will be available for review in December? *We should be able, by December, to tell the full story about characterization for wastewater and reclaimed water. Data will likely be available regarding groundwater quality from the Hawks Prairie area and possibly also from the Henderson area site in Tumwater. It is possible that surface water background data will also be available by then. We will not yet have any data at that time from the tracer test.*

Lisa explained that the new exhibits would not be in place by early December, so they would not be available to explore at the next meeting. However, by December there will be a new video recording system installed in the Board Room that will make it possible to video record meetings. She then asked the group if they wish to video record future meetings of the advisory group, and the group indicated that they agree to have their meetings recorded. (Preferences were expressed after the meeting that the meeting videos not be streamed live, but rather recorded and posted on LOTT's website after the fact.)

The meeting adjourned at 9:00 pm.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.3 – October 11, 2016 – Summary

Welcome and Initial Business
The meeting opened at 6:00 pm with Lisa Dennis-Perez, LOTT's Director of Environmental Planning & Communications, as the meeting facilitator. Lisa first explained that there had been some staffing changes since the group last met.

- Karla Fowler, the past Director of Environmental Planning & Communications retired in July and Lisa has been promoted to the Director position.
- Ben McConkey has been promoted to Project Development Coordinator and is no longer the Project Manager for the Reclaimed Water Infiltration Study; he is now a member of the Science Task Force for the study.
- Wendy Steffensen has come on board as LOTT's new Environmental Project Manager, and will serve as the Project Manager for the study.
- LOTT is recruiting for a new Public Communications Manager who will eventually lead public involvement for the study.

Lisa then asked if any members of the public wished to make comments; none wished to do so.

Presentation: Phase 3 Implementation – Reorientation to Tasks and Timeline
Wendy Steffensen gave a presentation to reorient members to the study, with a brief overview of study tasks and status of completion. She explained that all of the water sampling and analysis needed for Task 1: Water Quality Characterization, has been completed. The presentation ended with a revised timeline, showing that the study is scheduled to end in the summer of 2019. The timeline has been extended due to difficulties securing easements and licenses to drill monitoring wells and because the tracer study cannot be run in the summer months due to competing needs for the water.

Holly Gadbaw:
Do you have customers for all of the reclaimed water you produce? *Yes- at each of the plants. At the Martin Way Plant, LOTT uses reclaimed water for cleaning and process water. Reclaimed water from that plant is also used to sustain LOTT's Hawks Prairie Ponds which have aquatic vegetation. The City of Lacey and Olympia have an infiltration site at Woodland Creek Community Park where they infiltrate reclaimed water as mitigation for drinking water rights. They use as much water as they can in the summer and that is why we are unable to run the tracer test in the summer.*

Reclaimed water from the Budd Inlet Plant is used at LOTT's offices and the Hands on Children Museum to flush toilets and irrigate landscaping and it is used in LOTT's decorative fountain and in the interactive stream at the East Bay Public Plaza. The Port irrigates its streetscape on Marine Drive up to North Point; the City of Olympia uses it for irrigation at Percival Landing and Percival Landing Park; and the State uses it for irrigation at Heritage and Marathon Parks. The City of Tumwater irrigates the Tumwater Valley golf course with reclaimed water and can use up to 600,000 gallons per day. The good news is that we have community uses for all of our water; the bad news is that we have no water to spare.

Dick Wallace:
If you are not able to infiltrate at Hawks Prairie in the summer months, will the results of the tracer test still be representative? Conditions in the summer and winter are different; groundwater levels will fluctuate for example. *Summer conditions at the Hawks Prairie site will not be captured by the tracer test, but the results will still be representative. There is not much difference between summer and winter conditions for the groundwater at the Hawks Prairie site. The differences, for example, are smaller than at the Woodland Creek facility where the cities infiltrate. At the Woodland Creek facility, the aquifer and unsaturated (vadose) zone are shallower than at the Hawks Prairie site. The fluctuations in groundwater levels are also smaller at Hawks Prairie. For those reasons, seasonal fluctuations at the Hawks Prairie site are considered minor and are not of concern. One of the benefits of conducting the study here is that our climate is colder and wetter than other areas where this type of work has been done, such as California and Arizona. Running the tracer test during the cooler time of year will help capture those differences and their effect on soil aquifer treatment.*

Maureen: How does the tracer test work? Will there be a need to take a big project off-line in order to do the tracer test? *We have a separate presentation on the tracer test tonight, so we'll talk more about that later. There is no need to take a project or customer off-line. Competing needs for the water occur in the summer months, and we are not conducting the tracer test during that time.*

Presentation: Water Quality Characterization
Jeff Hansen, lead consultant from HDR Engineering, gave a presentation on Task 1, Water Quality Characterization, showing the results from wastewater, reclaimed water, surface water, and groundwater analysis. The data showed that there were some chemicals that often showed up in all of the types of water, regardless of whether the samples were collected in an area influenced by reclaimed water infiltration (Hawks Prairie) or one that was not (Henderson). The most commonly seen residual chemicals were the artificial sweeteners (acesulfame and sucralose). Also fairly common were the flame retardants and some select medications like carbamazepine and metformin. Some residual chemicals were treated to a high level by LOTT's system and others were not. The concentrations and frequency of detection of the residual chemicals were also similar to those seen in other studies.

Jeff showed the data in several different ways and asked members to think about which methods were best for communicating the information. These included graphics showing percentages of residual chemicals reduced in reclaimed water from wastewater, scatterplots with three types of water on one graph for comparison purposes, detections located on maps, and tables of the RWIS data, along with other data for comparison.

Maureen Canny:
On the slide with the buckets, where are the rest of the chemicals? This slide only shows 14, but 34 were detected. *These slides just show the 14 residual chemicals that we saw in every sampling event. The other chemicals were not consistently detected in each event. We will continue to sample, however, for all of the chemicals and we will include all of the chemicals in the risk assessment.*

Holly Gadbaw:
All the wastewater that LOTT treats is not reclaimed water. What percent of reclaimed water is being produced? What percent is being infiltrated? Are you limited in the amount of reclaimed water you can

produce? *LOTT treats an average of 13 million gallons of flow a day and can produce up to 3 MGD of reclaimed water; 1.5 MGD at Budd Inlet and 1.5 MGD at Martin Way. At the Martin Way plant, production is currently limited by the volume of wastewater available in that part of the collection system that can be diverted to the facility. We are taking water out of one of our pump stations and because that flow is diurnal we are limited in the amount we can divert. That area of the wastewater system must grow before we can add more production capacity. At the Budd Inlet plant, we are limited by the treatment capacity of the reclaimed water plant. We would have to add more equipment to expand production there. Currently we have uses for all of the reclaimed water we produce.*

Dick Wallace:
You had detection frequencies for the unpublished data. Is that similar for the LOTT data and the published data? Will you show the range of the data, breaking out those that are detected all of the time, versus the others? I think it's fine to focus on ones you find most often but at some point, you need to display info on other chemicals too, and explain why the focus (highest risk, etc.) to create context. *For the table that showed detection frequencies, the chemicals listed were found in LOTT's reclaimed water 100% of the time. Information for the published data does not always show detection frequency; researchers generally look at these chemicals, however, because they are the ones frequently detected. Yes, we will work to show range and create context. At this point, all of the data is included in the technical memos, but we will work to display it in a way that shows context.*

Lyle Fogg:
You said that there was not much difference between reclaimed water from the two treatment plants in terms of detections and concentrations. What about Iohexal; were there differences between the two treatment plants, since medical facilities are located mostly downstream of the Martin Way plant? *Yes, there were slight differences, in part because most of the medical facilities are located downstream from Martin Way plant, but there are some medical clinics in Lacey also. We did see both iohexal and iopromide at the Martin Way plant. While most of these radiocontrast agents may be coming from medical hospitals or clinics, use of these compounds has changed recently. A person can be prescribed one of these agents and start taking it at home for an upcoming procedure. When the patient is not at the clinic, both before and after the procedure, the radiocontrast agent can be excreted at home.*

Dick Wallace:
It would be helpful on aerial maps to show direction of groundwater flow to provide context about which wells are upgradient and downgradient from the infiltration site. *Yes, we can definitely do that. We did not do that tonight because that relates to the next part of the study – the detailed tracer test – in which we will learn more about the direction of groundwater flow.*

Maureen Canny:
Did any of the wells have more than one type of chemical detection? Does the Hawks Prairie golf course use reclaimed water? *Where the maps show two or more diamonds touching, that means multiple residual chemicals were found in that well. The Hawks Prairie golf course does not use reclaimed water.*

Lyle Fogg:
Did you test for more than one flame retardant? Did you test for PFOAs? EPA has issued a health advisory for PFOAs for drinking water. *We sampled for 3 different types of flame retardants and for a number of PFOAS or perfluorinated chemicals. We detected some perfluorinated compounds in reclaimed water, but did not find any in groundwater or surface water.*

Lyle Fogg:
Did you see any difference in concentrations in areas influenced by septics? *You can see the concentrations in side by side comparisons in this series of slides – the Hawks Prairie area is the area potentially influenced by reclaimed water infiltration and the Tumwater/Henderson area is the area without influence by infiltration of reclaimed water. Both those areas are potentially influenced by septic systems.*

Ed Steinweg:
Did you say some of this groundwater data was from City wells? Do the cities test for these chemicals too? *Yes, the results from the cities' wells we sampled are included in the groundwater data. Cities generally do not test for these residual chemicals, with a few exceptions. Sometimes EPA has water utilities test for unregulated contaminants. Recently EPA had drinking water utilities test for the perfluorinated compounds. We did not get the cities' data for those.*

Bill Liechty:
Does DEET have any use other than as insect repellant? *We are not sure.*

Scott Morgan:
Is DEET used for stock? *We are not sure, but can look into it. [Research after the meeting revealed that there are few products for animals that include DEET; of those, most are focused on use with horses.]*

Maureen Canny:
When did you take the tests (for DEET in surface waters), before or after the Zika virus outbreak? *Our testing is from last fall (2015) and most of the other detections referenced in published and unpublished data is before that. Thus, the DEET detections do not appear associated with the rise in Zika virus.*

Dick Wallace:
How do you compare the number of samples in the different media, reclaimed versus groundwater samples? *The total number of groundwater samples is 57 versus 8 for reclaimed. It is hard to make a direct comparison. With reclaimed water we are sampling the same locations, whereas with groundwater we sampled 57 different locations.*

Maureen Canny:
The graph seems to suggest that groundwater treatment is not treating/ getting rid of acesulfame-K, (concentrations of acesulfame-K are similar in all three waters) but it is for sucralose (reclaimed water concentrations are higher in reclaimed water than in ground and surface water). *The data suggests that this might be true. We will be able to say more when we complete the tracer study.*

Update: Public Involvement Activities
Lisa Dennis-Perez gave an update on the public activities since the last meeting. Since the last meeting, one written study update was distributed, four community and five professional presentations were given. Data-sharing presentations have just started, with four being given within the last two months and three additional planned. New exhibits that deal with source control and the study have also been installed at the WET Science Center.

Bill Liechty
How many people are on the distribution list? *I don't know, but will find out. [There are 236 people on the email distribution list for the study.]*

Discussion: Public Involvement Activities
Lisa Dennis-Perez asked for feedback on the presentation and how the data is presented. What ways worked and what ways did not work?

Scott Morgan:
What's the message? What do you want them to know? This is a lot of information and it's going to overwhelm 90% of the people. *We don't have the complete story or message yet. We can't say what it means to have some of these chemicals in the environment yet because the tracer study and the risk assessment haven't been completed. We do have some pieces of the story and these messages are similar to the ones on the slides: 1) Some residual chemicals are found in wastewater and reclaimed water; 2) LOTT's treatment process removes many of these, but some still remain; 3) These residual chemicals are found in the environment, even in areas where there is no influence from infiltration of reclaimed water; and 4) There are multiple sources for these chemicals.*

Ed Steinweg:
Does infiltrated water influence the concentration of residual chemicals? *With the information we have so far, we cannot answer that question. We should be able to answer that question after we have done the tracer study.*

Ruth Shearer:
Keep in mind that many people do not understand the metric system and you are using metric units to share results.

Maureen Canny:
That is one reason the use of the bucket diagrams is good.

Maureen Canny:
Even though we do not know sources for all of these chemicals, we do know that people use these chemicals. One message that can be conveyed now is about source control.

Ed Steinweg:
There are good techniques for monitoring and detecting these chemicals. In the future some of these chemicals will not be used and newer ones will take their place. We need to have a system in place to monitor existing and new chemicals and keep people safe.

Maureen Canny:
It is hard to relate to the chemicals because their names are so foreign. For example, sucralose is a food additive. Can we put the identifying information next to the chemical name so people can better know what it is? *Yes.*

Maureen Canny:
Is there any pressure on manufacturers to stop making some of these chemicals? *Yes. For example, triclosan, an anti- bacterial in soaps, is being banned by EPA. Also, PFCs will be phased out, but something else will likely be manufactured to replace it.*

Lyle Fogg:
Some of the fire-fighting foam with PFCs has been phased out/ no longer manufactured. It is still present in the supply chain and sprinkler systems. It will take many years to phase these out completely.

Maureen Canny:
Is this work helping build a simulation/ model where we can put a chemical in one end and we will know how it will act without having to go out into the field? *Yes, there are some computer programs that can look at a chemicals structure and predict whether they will degrade or how toxic they will be. These are not completely accurate, however.*

Bill Liechty:
Is there anything that you found that you did not expect? *No. We found the chemicals that we thought we would find. We weren't exactly sure of the concentrations we would find. But those concentrations matched up with what other studies found, so that wasn't unexpected either.*

Bill Liechty:
Have you collected enough data for a baseline and for the next steps of the study? *Yes, we have good information now on what is in the water. We can use that information to focus and frame the risk assessment. We will still sample for all of the chemicals, however, because the analytical method we use will give us all of those results. We want to understand how quickly the residual chemicals degrade in the water infiltrated at Hawks Prairie before it mixes with other area waters.*

Lyle Fogg:
Throughout the presentation I found myself wondering what the point was. I was able to remember, but I think that you will need to remind any new audiences throughout the presentation of what the graphs and dots mean. *Agreed.*

Lyle Fogg:
Is there a way to predict loading? *Yes. The tracer study results will be put into a computer model of hydrogeology of the area. The purpose of the study is to refine and calibrate the model to local conditions and to be able to assess loading at certain points. For example, what is the loading from the Hawks Prairie site to Eagle Creek, two miles away etc.*

Scott Morgan:
For the presentation, I think you should start with the point: We are looking for these residual chemicals because we want to know about potential effects of reclaimed water infiltration. Start with a funnel.

These are the things we were looking for, these are the things we found, and these are the things we found consistently in different areas and types of water. Narrow down as you go.

Dick Wallace:
I think it is best to use the bucket graphic approach, showing 409 parameters tested, 127 chemicals unregulated. Summarize what we found and what we didn't find, generally (do not use long chemical names; speak in general terms) Do not use the word recalcitrant. Just say that some chemicals do not get treated/are not removed.

Maureen Canny:
Do not use the term 95 percentile. It's confusing. It wasn't defined.

Maureen Canny:
Can you put a label on a product attesting that it is safe for LOTT? Manufacturers would have an incentive to produce safer products. *This is difficult to do at the local level. There are national databases and apps for smart phones that you can use to show how safe products are for people and the environment. The Skin Deep database from the Environmental Working Group is a good one. We will send those references/tools to the group. [The SkinDeep Cosmetics safety database can be found here: www.ewg.org/skindeep. Other helpful information can be found on these sites: www.safecosmetics.org; www.saferchemicals.org; and www.toxicfreefuture.org. Two apps for smart phones that scan bar codes of products to help determine their safety include: GoodGuide and ThinkDirty.]*

Ed Steinweg:
People will want to know "What is the risk – is this going to hurt me?" If one or two chemicals are a problem, address those. *Agreed.*

Lisa Dennis-Perez:
At this point we only have part of the story, and our timeline has been pushed out further into the future. It is a challenge to get people excited about the study because it will be years before it is complete and we can share information about where the water goes or about potential risk. On the other hand, we don't want to sit on the data and not make it available. Ideally, we want to be able to have momentum when we do talk about the study, but it will be hard to keep up any momentum over a period of years. We do not want people to lose interest. Given this, our strategy has been to go out to groups when we are asked, but we have not been soliciting invitations. Is this the right approach? When should this data be released if we only have part of the story?

Bill Liechty:
People need to know that the data has been collected. The details are not that important. Let the community know that the data has been collected, but that you can't speak to health effects yet.

Dick Wallace:
And state when you will have answers. Putting it in a newsletter would be good. Don't wait until next May. Capture the big picture. Say something like: This is what we have looked at and we now have a better idea of how much reclaimed water treatment removes, how much is in the environment (surface and groundwater), and we are set up to start to answer bottom-line questions via the tracer study. But, it is important not to get folks excited about something that will take years.

Scott Morgan:
Stay with the categories, like artificial sweeteners, pesticides, etc. You need to have a progress report.

Lyle Fogg:
Stay visible. You don't want people to forget there is reclaimed water or that the study is being done. If that happens, people will forget that reclaimed water is even an authorized use.

Holly Gadbaw:
I don't want to raise undue concerns about reclaimed water. Explain why we are doing this in terms of the big picture. We should let folks know about our findings. Could we put an update into utility billings? What about people who do not have utility bills? How do we get information to septic and well owners? We could also update information here at LOTT. Perhaps update every 6 months, with a short insert.

Wendy Steffensen:
We showed you the data in a number of ways. It seems that the preferred method to show the data is in buckets or funnels. Is that correct?

Scott Morgan:
Yes. It is important to put the data in context. The rest is only interesting to people in the field.

Ed Steinweg:
I had no idea that we would find something in our surface waters and groundwater. That is what surprised me. Now the next questions for me are: What is the influence of LOTT's reclaimed water on a non-pristine environment? How different is what is coming out of LOTT from what is already there? And, is there a system in place to monitor new chemicals on the scene that might be bad actors? How can we mitigate those and what is the cost?

Holly Gadbaw:
The message is personal responsibility. Messaging like that for landfills or conservation has made a difference. Can we message around not putting some of these residual chemicals into the environment and how much of a difference might that make? The personal responsibility message especially resonates with kids.

Dick Wallace:
Reclaimed water is not necessarily the source of these chemicals. To reduce these chemicals in reclaimed water or the environment, the same action would be taken. We should be taking the same actions to reduce these contaminants, regardless of the use of reclaimed water.

Scott Morgan:
It would be good for people to understand where these residual chemicals come from as original products.

Bill Liechty:
Risk assessment had been done elsewhere on some of these same chemicals. Can we use data from elsewhere that we can apply here? How do our levels compare? *We do have risk assessments from other studies. On a chemical by chemical basis, our results are generally lower than where we might see an effect on human health. The question is much more difficult to answer for ecological endpoints. There is*

not as much data on this subject, for example on salmon spawning. It is likely premature to make risk determinations at this point; it will be clearer when we complete the risk assessment work specific to our area, using local data.

Bill Liechty:
One question we will need to answer is this: If this stuff is out there already why would we add more to the environment, knowing what we know about removal efficiencies?

Dick Wallace:
There is a field of risk communication expertise. These are complicated questions and you need some good help defining risk, and risk relative to what. *Yes. We have people on the team who are skilled in risk assessment, risk management and communication.*

Ed Steinweg:
We need this information to get to the legislators. Not necessarily from a reclaimed water perspective, but from the perspective of what is going down the drains and toilets, and what is being manufactured.

Scott Morgan:
It needs to be summarized in a page and a half with color pictures.

Presentation: Tracer Test Preparations
Jeff Hansen gave the group an update on the tracer test preparations. He shared that we have learned more about the direction of groundwater flow from the initial RWIS work and from a newly drilled Lacey monitoring well. The flow now seems to be potentially more to the southwest than previously thought. One to two more wells will be needed to more accurately identify flow direction. This is necessary to then place even more wells for the tracer study. The location of the wells is necessary to ensure that tracer will be detected in these wells and that travel time can be calculated.

Dick Wallace:
Does the Hawks Prairie site really straddle a groundwater ridge? This is a critical point: does the facility straddle the ridge, or is it located on one side or the other. *These are modeled contours based on well elevations. We do not know with exact precision the ridge location. There is a general consensus from prior work (1980's, 1990s) that the ridge runs north-south. We have located the ridge more precisely from prior work because we now have more data points. Prior findings and our findings confirm that the Hawks Prairie facility straddles the ridge or lies to the west.*

Dick Wallace:
The arrow heads on the flow trajectory are used to show a one year travel time in some graphs and not in others. The use of the arrow heads on the graphs should be consistent. *Agreed.*

Holly Gadbaw:
Is most of this property undeveloped? *Some is, some isn't. It doesn't show well on this aerial photo. There are developed properties around LOTTs perimeter and to the west.*

Holly Gadbaw:
Is this inside or outside the UGA? *It is inside. This area should be on city sewer and water in the future.*

Dick Wallace:
How many wells do you need in the pink area (the predicted zone of travel for the first 120 days)? Do you need some wells near the 120-day predicted time travel? *We intend to have four to five wells inside this area.*

Dick Wallace:
It appears that you have the same number of wells inside the predicted flow path and outside the predicted path*. This is to answer the question about where the groundwater goes after it mounds to the north. There have been questions about where this mounded water goes. This is an Iterative process. Each time we drill a well we get more information from the water level. This information will be used to further refine where the next wells should be drilled.*

Scott Morgan:
What is the tracer? *We will be using two tracers. One is bromide which we introduce as a salt, sodium bromide, into water flowing into the infiltration basins. There is some bromide in reclaimed water but it is at very low levels. Bromide is inert, safe and easy and inexpensive to test for. The secondary tracer is sulfur hexafluoride, which is a gas and will be introduced at one of the wells in or near the infiltration basins. We won't be able to trace this in the unsaturated zone, but in the groundwater. It is used because it can be detected at very low levels and is easy to test for. These two tracers have been commonly used. We have gotten the OK from Ecology to use them.*

Other Updates
Wendy Steffensen provided additional updates to the group about the study. The membership of the Science Task Force changed slightly with two people leaving and three new people joining the group. Recent news coverage of residual chemicals included a study that found residual chemicals in fish in Puget Sound and there was an announcement for an upcoming FDA ban on two anti-bacterial chemicals in consumer soaps.

Lyle Fogg:
Is there anybody looking at the stormwater flows in Olympia? I remember that one of the reasons LOTT produces reclaimed water and uses it for infiltration is to decrease flows to the main treatment plant and discharge to Budd Inlet. Given the potential for increased sea level rise, can LOTT handle potential increases in flows that could be coming in? *A portion of the stormwater system is combined with the wastewater collection system in the oldest parts of downtown Olympia. Years ago, the LOTT partners determined that a portion of the combined system could be separated and another portion was too cost-prohibitive to separate. The City of Olympia met their obligations under that former agreement to separate portions of the combined system, and the rest of the combined system will remain in place. LOTT is working with the City of Olympia on sea level rise planning, and the City is taking the lead on how to prepare downtown for sea level rise. There will likely be retrofits to some stormwater outfalls to prevent seawater from flowing back up into the stormwater system and into downtown streets.*

Ed Steinweg:
Regarding the Seattle Times article, did they look at groundwater? Is our reclaimed water cleaner than the wastewater they are discharging? *They did not look at groundwater. They looked at sediment, estuary water, fish tissue, and wastewater.*

Discussion: Revised Community Advisory Group Schedule
Lisa Dennis-Perez explained the new tentative study schedule. We expect one meeting of the Community Advisory Group in summer 2017, to discuss the tracer test, two meetings in 2018, and a number of meetings in 2019 when the risk assessment and cost benefit analyses are ramping up.

Scott Morgan:
The reclaimed water goes to the park at Woodland Creek for Olympia-Lacey infiltration. Does your modeling show the possibility of that water influencing what you have been sampling in Woodland Creek? *The Olympia-Lacey infiltration facility is in proximity to the creek, but modeling shows that groundwater flow from that site takes three years to reach the creek. Some of the infiltrated water reaches the creek and some of it goes deeper and does not intersect with the creek. We don't think infiltration from the Woodland Creek facility will impact, or confound, the tracer test.*

Maureen Canny:
Do any of these new results affect the decision to have the reclaimed water stream for kids to play in? *No. The water used in the stream does not pose any health concerns. We have not learned anything from the study that causes concern about this type of use or that would lead us to change the way the stream is managed.*

Holly Gadbaw:
It would be beneficial to do more Op-Ed pieces in The Olympian in the future. That was a good way to share messages about personal responsibility for what goes down the drain.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.4 – November 6, 2017 – Summary

Welcome and Initial Business

The meeting opened at 6:00 facilitated by Lisa Dennis-Perez, LOTT's Director of Environmental Planning & Communications. Lisa updated the group on staffing changes since the last meeting:

- Ben McConkey resigned from LOTT.
- Joanne Lind came on board as the new Public Communications Manager.

Each Community Advisory Group (CAG) member and attendee introduced themselves. Lisa then asked if any members of the public wished to make comments.

Bob Jacobs:
It seems the schedule is far behind where we thought it would be. Can you explain why?
The study is behind schedule for multiple reasons. One is the time it takes to sequence and complete many levels of review for each study task. There are many people involved – from the Community Advisory Group, to the Science Task Force, the Peer Review Team, LOTT's Technical Sub-Committee, and the LOTT Board of Directors. Also, our city partners need to have access to the reclaimed water in the summer for their Woodland Creek Groundwater Recharge Facility. They get credit for water rights from Department of Ecology for the water that is infiltrated at that site. We have had to delay some steps of the study to ensure that the cities had access to reclaimed water during the dry summer months. Finally, it took much longer than expected to identify willing landowners and get easements to drill wells for the monitoring well network.

Janine Gates:
Have the costs gone up as a result of these delays?
No, the project is still within budget. We have added some elements to the study, but shifted some costs to stay within budget.

Presentation: Reclaimed Water Infiltration Study - Review of Phase 3 Implementation Tasks

Wendy Steffensen gave a presentation to reorient members to the study, with a brief overview of study tasks and their status. Work completed included publishing and presenting results from Task 1: Water Quality Characterization to industry professionals. Wendy described progress on Task 2: the Tracer Test Work Plan, including describing the monitoring well network.

- Q. Was the Task 1: Summary Fact Sheet sent out to the group?
  - *Yes, it was sent electronically. It is also available on LOTT's website. Lisa provided the group with print copies at the end of the meeting.*

Presentation: Local Hydrogeology 101

Jeff Hansen, lead consultant from HDR Engineering, Inc., gave a presentation about local hydrogeology and previous studies of the Hawks Prairie site area. He described the study's recent field work, including installation of new wells in the shallow aquifer (75 – 170 ft.) and deep aquifer (220 – 330 ft.) and lysimeters at depths of 10, 25, and 50 feet into unsaturated soil at the recharge site. This work provided vital information about groundwater flow directions and travel times, which will be a foundation for the tracer test. Previously, we relied on computer models but field data has provided a finer level of detail and important information about movement of the groundwater in the area.

The study confirmed shallow groundwater is flowing to the southwest. There is a confining layer separating the shallow aquifer from the deep aquifer. The deep aquifer flows to the east. The goal of the upcoming tracer test is to measure travel distances in a one to six month time period. Later, we will use computer modeling to estimate where water moves after six months.

- Why does the slide show a question mark in the deeper confining layer?
  - *Since we only have a limited number of wells, we are working with limited data points. Question marks indicate where we do not know with great confidence what is happening. It appears the confining layer gets thinner as it moves to the southwest and it flattens out. That shallow water might have more interaction with the deeper aquifer in that area.*

- Given that the confining layer is thin, are there places where the aquifers meet?
  - *It is not entirely clear. We have shown the level of the water table and also the zone where there is pressure from the deep water. The levels are close. They may be thinly separated. However, the layer does not appear to be completely impermeable. Interaction between the two aquifers is more likely here. Some of the reclaimed water could be mixing with the deep aquifer. The tracer test may help us answer that question.*

- What deep well is going to answer the question whether reclaimed water is making its way into the deep aquifer?
  - *One of the limitations of study is that we will not be able to study the deep aquifer in great detail. It is expensive to drill deep wells and we have a limited number of deep wells in our network. We will not be able to fully characterize that potential off-site movement in the deep aquifer.*

- Why is the deep well near MW21 not a part of the tracer test monitoring plan? This well is located near where the shallow and deep aquifers potentially interact, so there is interest in knowing if tracer will appear in the deep aquifer there.
  - *We will take a look at that and reconsider adding that deep well to the monitoring plan.*

- Is there a gap in the monitoring well network to be able to answer questions about how the potential shallow/deep aquifer interaction affects water quality? There is no deep well to the east

(downgradient) of deep well MW21 to evaluate water quality in the deep aquifer downgradient of where the shallow and deep aquifers potentially meet.
    - *Yes, unfortunately, that is a gap. We were not able to obtain and easement and drill a deep well to the east of where the shallow and deep aquifers potentially meet.*

- Does the landfill have wells?
    - *Yes, and we have permission from the County to use them. We are getting data from those landfill wells. However, there are no deep wells there; they are in the shallow zone.*

- How deep are our drinking water wells?
    - *That is a complicated question to answer. The City of Lacey has a public well that is very deep in the aquifer. Private wells are not as deep; some are quite shallow, only 50 – 75 feet deep. There are not many drinking water wells near the site.*

- Are we worried about private shallow drinking water wells to the southwest?
    - *There are none nearby. There are some quite a distance away, but none within the map boundary.*

- Deepest lysimeters are 50 feet deep, and the deep aquifer at its shallowest point is how deep?
    - *The top of the groundwater table is about 80 feet down, but when LOTT starts infiltrating groundwater, that level may rise. It may mound up approximately 15 feet higher. The purpose of looking at the various depths is to understand whether the water quality is changing. We will be sampling water in Basin 4, 10 to 50 feet deep, and the top of the groundwater surface. This will provide information to design the tracer test.*

- Are you interested in whether there is any cleaning of the reclaimed water while it goes through the soil? And, will the tracer test look at that?
    - *We are definitely interested in how the subsurface is cleaning and effecting the water quality. The tracer test will measure water movement, but we will also be gathering data about water quality. Questions about how water quality changes and what can we attribute that to are at the heart of the study.*

- Is the deep aquifer connected to Puget Sound?
    - *Yes.*

- What about sea level rise? Does that effect the level of the aquifer?
    - *Impacts of sea level rise are not part of this study. However, sea level is likely to have an effect on the water table and water pressure. If sea level is changing, that is going to impart some change on the deep aquifer.*

- Does the movement make a difference if you are adding a million gallons per day vs. 100,000 gallons per day?
    - *It does make a difference. These values that we are using for the study are based on a million gallons per day of infiltration because that is the maximum LOTT has been infiltrating.*

- I do not understand. Why does it matter how long it takes the water to move? The tracer test is expected to tell us everything we need to know – is that correct?
    - *We do this work to understand how quickly the water moves so we will be looking in the right places at the right times. We need to hone in on where to look for tracer and measure for water quality. We study the water's movement to help design the tracer test. We need to figure out where and how frequently to sample the groundwater.*

- Previous information about cleaning effects on water found 20% of it is due to physical processes, and 80% is due to biological actions. We could be in for surprises in those areas where the water moves faster. I will be surprised if the estimated times of travel shown on the diagram are accurate for one month, let alone six.
    - *The examples provided are idealizations, calculated and modeled based on information we have. We expect that the field data were are collecting will be a lot messier than the modeled data for reasons you noted. This is why we are doing the tracer test – to see what actually happens rather than relying on modeling.*

Presentation: Draft Tracer Test / Water Quality Monitoring Work Plan

Jeff presented a draft work plan for the next year. The two primary components of the work plan are the tracer test and water quality monitoring.

One of the decisions that needs to be made is whether or not to bypass the constructed wetlands at the Hawks Prairie site during the tracer test and water quality monitoring. Three options are being considered:

- Allow the reclaimed water to flow through the five constructed wetlands before being infiltrated. This is the normal mode of operation.
- Bypass the wetlands and send reclaimed water directly into Recharge Basin 4. This option would better reflect how future infiltration sites would be operated.
- Bypass the wetlands for half of the test so that results with and without wetlands can be compared.

There are pros and cons of each option. The Peer Review Panel will help decide which approach to use.

Jeff also explained about the tracers to be used for the study. Two tracers are planned for redundancy; both are non-toxic, inert, and easily detected at low concentrations. The first is a salt, potassium bromide, and the second tracer is a gas, sulfur hexafluoride that would be bubbled into solution and mixed with reclaimed water.

Jeff explained the wells to be sampled for tracer and water quality and the sampling schedule. He indicated that the plan has flexibility and can be adjusted at key junctures depending on the results obtained along the way.

He also described one new addition to the study that is being considered. The water treatment industry is interested in the transport of pathogens throughout the sub-surface. LOTT's treated water does not have pathogens, due to their treatment processes. However, we have an opportunity to examine movement of pathogens at LOTT's site. We can introduce a bacteriophage – a virus that only infects bacteria, so it does not pose a human health risk. This will enable us to see how quickly it moves through the sub-surface.

- If the site is normally operated with the wetlands, why would you NOT use them in the study?
  - *As the regional wastewater system grows, additional reclaimed water infiltration sites will be developed to meet capacity needs. Those new sights most likely will not include constructed wetlands, so it is of interest to understand water quality issues in that scenario.*

- Reclaimed water is chlorinated. If the wetlands are bypassed, that chlorine could affect conditions in the subsurface. How long does it take for chlorine to dissipate? How long would the effect to groundwater last if you do not go through the ponds?
  - *We do not know the full answer to that question. Chlorine would probably remain present as it travels through the vadose zone and we could see some effect on the biology in that vadose zone.*

- Why not dechlorinate?
  - *That might be an option. To comply with the terms of LOTT's permit, we need to maintain detectable amounts of chlorine in the reclaimed water in the pipeline as it leaves the plant. However, we might be able to dechlorinate right before it goes into infiltration basin. We will discuss options with the Peer Review Panel.*

- We want to know happens in the infiltration system at it exists at the Hawks Prairie site, not what might happen under other conditions, like future sites that do not have wetland ponds.
  - *That is why we are proposing conducting the tracer test both ways, running some reclaimed water through the wetlands and evaluating the water quality, and then bypassing the wetlands and comparing the results. Again, this is something we will discuss further with the Peer Review Panel.*
- If you bypass the ponds and infiltrate reclaimed water with detectable chlorine, you could be altering the normal pattern.
  - *Yes, for that part of the test, but it would be interesting to see those results.*

- Is any water from the Martin Way Reclaimed Water plant used for irrigation?

- *It is used for irrigation only at the MW plant site and some at the Hogum Bay site. In the future, partner cities might want to use reclaimed water for irrigation. Currently, the cities are using reclaimed water from the Martin Way plant mostly for water rights mitigation.*

- Are there purple pipes in Tumwater and along the Deschutes Parkway where the water is used for irrigation? That water is from the Budd Inlet Treatment Plant – right?
  - *Yes, that is right. Reclaimed water from the Budd Inlet plant is used for irrigation in multiple places, including Heritage and Marathon Parks, Percival Landing Park, and the Tumwater Valley Golf Course.*

- What about purple pipes along Carpenter Road? Is reclaimed water being used to irrigate along that street?
  - *That is the City of Lacey's pipeline to take water from the Martin Way plant to their Woodland Creek recharge facility. They are not using it for irrigation yet.*

- Does reclaimed water have to be chlorinated to be put into Woodland Creek?
  - *It just needs to be chlorinated in the pipeline that carries the water to the point where it is delivered to the Woodland Creek site.*

- If you bypass the wetlands during the acclimation period, could you use the shallow lysimeters to see what the chlorination level is at 10 feet? My thought is there will not be much chlorine there.
  - *Right. We could look at that and do a little exploration. Initially, we might want to route water through wetlands during the acclimation process.*

- Do you expect to see tracer in the deep well?
  - *We do not expect to see it in the deep aquifer because of the confining layer. The deep aquifer is moving much slower than the shallow aquifer. All of the deep wells are within 3500 feet of Basin 4.*

- So, the purpose of the tracer is to confirm the hydraulic model we have right now. Is it for anything else?
  - *The tracer part of the study is to learn where the water goes and how quickly. It will provide data to improve the hydraulic model and improve our understanding of travel times. It will also help us understand reclaimed water's potential influence on water quality.*

- Is there another deep well, across Marvin, where the confining layer is thin? Why not check that?
  - *We could. We do not think tracer will get that far southwest, but we could check for it. Based on today's conversation, that information could be of value.*

- You may need to extend the study and look at the deeper well.

- *The reason for doing the field work is to be as confident as we can, but there are limitations to our sampling well network and the length of time that we can realistically expect to find the tracer, since it will become more dilute as it travels through the aquifer. Things in the field may change from what we have planned. Both tracers will be introduced over 7 days. The frequency of sampling will range from every other day to once a month, depending on location and month. If we find any anomalies, we will adjust the sampling plan.*

- I know you said potassium bromide is non-toxic, but could it change the osmotic pressure of the cells of the biota – could it shrink them by osmosis due to the heavy concentration?
  - *Not at that concentration – 50 mg/L. These are typical levels used in groundwater tracer tests.*

- When you put that sodium solution at the surface, it will be there for a while. Have you thought about wildlife possibly drinking it? What could that do to the birds hanging out on the water?
  - *We have not looked at whether there is a potential issue at these concentrations, but we will.*

- Will the plan change if the tracer test shows there is a different flow path than expected?
  - *Yes, it would. This is our starting point. If we find the water is moving differently than what we thought, we will change up the water quality sampling.*

- In the plan, are you going to be running the tests before the water goes into the infiltration basins? Where is the sampling point?
  - *Yes, the sampling point is in the pipe right before the water goes into basin. We are not sampling at the plant because we saw changes in water quality between the plant and the time it gets out to Hawks Prairie. We hypothesize that is due to biological growth in the pipe; we note interesting transformations occurring in the pipe. Our main charge is to look at water quality transformation in the subsurface, so we will look at it right before it goes into the subsurface. We will test on a seasonal basis at all of our chosen locations.*

- A lot of bacteria are good. Bacteria are one of the things that clean stuff in the soil. Are these phages going to disarm or kill bacteria? Or are they just going to hang out and not harm them?
  - *This will not adversely impact beneficial bacteria. The bacteriophage just introduces itself into bacterial cell, hangs out and is transported. The main question is how quickly it moves through the sub-surface. We can compare how quickly residual chemicals and viruses move; we think the viruses will move more slowly.*

- Have you considered what the action of the potassium bromide is in the bacterial constituents of the subsoil?
  - *We have not looked at that, but we can.*

- Is the bacteriophage effort a chance to collect some data to look at the 100 foot Sanitary Control Area (SCA)? Is Department of Health or County Health getting any input here on how this is being structured?
  - *They will next week. We discussed this at a high level previously, but it never came back to looking at the SCA. This is a great opportunity. They will be at the table and part of the discussion next week. This was not part of the primary objective of the study but it is an opportunity to look at this at very low cost and add to the value of the study.*

- I want to reiterate that for everything that is introduced, the bromides, the phages, etc., you need to look at what effects it might have when it is sitting in the water and when it is down in the vadose zone and further.
  - *Yes, that is a very good point. We cannot do this without regulatory approval and we are following formal steps. We need to follow protocols of Department of Ecology and secure their approval to inject the tracer chemicals. We have been in discussions and we are compiling that application.*

- You mentioned absorption. Are there going to be any efforts to quantify that?
  - *Not at this stage; it is not within scope of this study. We are scoped with figuring out what is in the water before infiltration and what is in the water after various amounts of time.*

- I am wondering if this is just a snapshot of how fast different constituents might be moving through.
  - *We will speak to that as we compile results and discuss it relative to what other studies have found. Other studies have evaluated to what extent you exhaust the absorptive capacity for certain chemicals. For instance, flame retardants have been looked at and they have seen the advancement of exhaustion, but it goes slowly. The study is not designed to fully answer that question, but to the extent we can draw comparisons, we will.*

- If you bypass the ponds and put the water directly into the basins for absorption, there will be chlorine in it. Will that affect the bacteria that break down residual chemicals?
  - *As we discussed the chlorine may off-gas, in which case it would not have a significant impact. We could also remove chlorine through a de-chlorination process.*

- Why do they need to put chlorine into the reclaimed water?
  - *For uses other than infiltration, where there is the potential for human contact chlorine is used for disinfection to maintain the level of safety. And chlorine is also introduced to maintain clean pipes. It prevents algal growth that can foul up the distribution system.*

- Chlorine does not completely kill the biofilm in the pipes, and the biofilm seems to reduce some of the contaminants in transport.
  - *That is correct, at these levels the chlorine does not completely kill biological growth.*

- If you do not know whether your predictions are correct about flow then you cannot properly monitor water quality. If it is going in a different pattern, there is no reason to test water quality while you figure that out.
    - *We get results back from the tracer test fairly quickly, so if things look radically different than what we expect them to, then we will adjust the water quality monitoring. We spent a lot of time over the past year to learn about the flow patterns to minimize potential for miscalculating where to test water quality. It is still possible for that to happen, but that is the nature of these hydrogeologic studies.*

- Are you going to put the potassium bromide tracer in one of the two sides of Basin 4?
    - *Yes. We want to concentrate the tracer as much as possible, so during that week-long period we will be infiltrating the 1 million gpd of water with the tracer addition into just half of the basin.*

- What if you put the water with tracer in one half and continued to infiltrate water into the other half? Then the lysimeters would give you an idea whether there were changes to the microbiology due to the tracer.
    - *We want to concentrate as much of this water as we can in one basin. At that site, the water moves quickly downward, so we do not get a lot of standing water. We want to be able to compare our results to results from studies that have been done elsewhere. So, we are trying to replicate conditions as much as possible so we can make those kinds of comparisons.*

- When you talked about not testing for estrogen because it was not showing up, you need to consider public trust. It might be worth testing to make results more believable to the public.
    - *For clarification, we are still looking at estrogen and other hormones. There are many ways to look for hormones, and we are not planning to use all of the ways. But we could, so we need to discuss this with the scientific team.*

- There are other types of pollutants that have been in the press and people are aware of that you might want to include.
    - *We are tried to include some of those key chemicals. For example, that is why we added perfluorinated compounds. Others may be added as we move ahead.*

Presentation: Next Steps: Task 2 and Beyond

Wendy Steffensen provided a recap of Task 2: the tracer test, water quality monitoring, and other updates on the study. She talked about the Science Task Force and their activities and provided information about the Peer Review Panel from the National Water Research Institute. She also provided an update on reclaimed water rule-making. The draft Rule now includes a new category of reclaimed water - Class A+ for direct potable re-use.

The study work products are being developed and reviewed on a tight schedule. When this current task (Task 2) of the study is complete, we will prepare a fact sheet and technical memo with the results.

These results are not expected until at least a year from now, due to the time required to complete the tracer test and water quality monitoring.

As we start getting results from Task 2, we will begin the risk assessment in mid-2018. By then, we will have a lot of information about what chemicals we should be tracking. The risk assessment will take 6 to 9 months and will have both a human health and ecological component.

The next meeting of the Community advisory group will be about a year from now. However, things are expected to ramp up in 2019, when we will have a lot of this data and will be engaging the advisory group and the public.

- Can we see the Peer Review Panel's comments from December? Are they public?
  - *Yes. We usually get a report, and that document is posted to our website. Responses to comments are also prepared and posted. All comments are evaluated and many will be advanced and incorporated into the work plan. There are some comments that are not incorporated for various reasons– there is a rational for those that are not used. Peer Review is meant to provide oversight and offer comments and constructive criticism, but not all of their suggestions are possible or appropriate.*

- Who makes the decision about which recommendations you take?
  - *The final decision would come from LOTT, heavily weighing the consultants' expertise, and what the Peer Review Panel and the Science Task Force suggest. If there is a serious discrepancy on how to proceed, the Technical Sub-committee for LOTT is the steering committee for the study. That group includes Public Works Directors from each of our four local jurisdictions, and from LOTT: the Executive Director, Operations Director, and Engineering Director. That group is advisory to the Board of Directors and the steering committee for the study. For example, if there was a decision that involved added costs, both the Technical Sub-committee and the Board might get involved.*

- Is that decision making process is documented?
  - *Yes. The Peer Review report will come out, then there is a response to comments document that is put together by the project team, and all of that information gets posted on the website. We will repeat that process every time there is a new report.*

- Is the new reclaimed water rule under the Department of Health?
  - *The rule was written by a rule-writer at Department of Ecology, and it is under Department of Ecology but both agencies have a role in the rule. Sometimes Department of Ecology is the lead agency and other times Department of Health is.*

- Is there currently any municipality or entity in Washington pushing for the option to use reclaimed water for potable use?

- *We do not know of any actively pushing for that. A few utilities have demonstration projects to brew beer using reclaimed water that has been further purified through reverse osmosis and other technologies. LOTT does not currently use those technologies.*

- Are you going to want us to help with public meetings?
  - *Yes, absolutely. In 2019, this group will be active in helping us develop ways to explain study results and engage the public in community conversations.*

- I am sure the Reclaimed Water Infiltration Study is not on most people's minds. Has there been an attempt to work with the media?
  - *Yes, we can be reaching out to the media and reminding people that the study is going on. The challenge is the length of the study; we may not have momentum to keep people interested year to year. We are going to ramp up that effort to engage the public when we have more results to keep people interested, so we will concentrate that effort in 2019.*

- Any chance that there could be quarterly updates on the preliminary 2018 data as it comes in? It would be useful to this group and the general public.
  - *We can certainly be looking at how to share information as it is gathered.*

- You have a check-in scheduled at 6 months, so maybe you could give an update sometime after that.
  - *Yes, we can certainly increase the frequency of our email distribution list updates.*

Wendy thanked the advisory group members for coming and let them know that if they had additional questions for the Peer Review Team, they could email her and they would be forward to the Team. The meeting was adjourned.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.5 – April 17, 2019 – Summary

Welcome and Initial Business
The meeting opened at 6:00 p.m. facilitated by Joanne Lind, LOTT's Public Communications Manager.

All Community Advisory Group members and attendees introduced themselves. Joanne acknowledged that the project team had experienced a loss. One of the lead project consultants, John Koreny, died unexpectedly earlier this year. John will surely be missed. To manage this loss to the project, two others from HDR will step in. They are Richard Walther, Hydrogeologist and Michael Murray PhD, Soil Scientist.

Joanne then asked if any members of the public wished to make comments. No comments were made.

Presentation: Review of Phase 3 Implementation Tasks
Wendy Steffensen gave a presentation to reorient members to the study, with a brief overview of study tasks and their status. Work completed since the last Community Advisory Group meeting included finalizing the hydrogeology report and the tracer study work plan. The tracer study was conducted in 2018 in accordance with the work plan. Two inert non-toxic tracers were added to reclaimed water at LOTT's Hawks Prairie Recharge Basins and a network of groundwater wells were sampled for both the tracers and residual chemicals. Data from these efforts are reflected in the draft tracer test and water quality monitoring report. The Science Task Force and Peer Review Panel were involved in reviewing and providing input for these work products, as well as the work plan for groundwater model development. Wendy also described completion of a water sharing agreement with the partner cities for the summer months; there were competing demands for reclaimed water in 2018 as the water was needed for both the study and the cities' water rights mitigation.

Bill Liechty: Tell me about the water rights mitigation.
The Cities of Lacey and Olympia have an agreement, approved by Department of Ecology, allowing infiltration of Class A Reclaimed Water at a city-owned site in the Woodland Creek Community Park in exchange for water rights. Replenishing groundwater at this site allows them to withdraw drinking water at other locations. Dick Wallace, formerly with Ecology, shared that he was part of the process, which took 15 years to get approved.

Bill Liechty: How common is it to use reclaimed water for water rights mitigation?
This was one of the first instances in Washington. It is more common in other parts of the country.

Bill Liechty: When we do cost/benefit analysis, will the water rights mitigation be taken into consideration?

- *Water rights mitigation is certainly recognized as a benefit of using reclaimed water for groundwater recharge, but the cost/benefit analysis that is part of this project does not focus on the relative merits/benefits of various use of reclaimed water. It focuses instead on exploring different levels of treatment that could potentially be employed and comparing this with benefits related to reducing risks of groundwater recharge posed by residual chemicals.*

Presentation: Tracer Test Results

Ida Fischer, Hydrologist with HDR, gave a presentation explaining results of the tracer test, including objectives, methods, results, and how the information will be used. Two inert non-toxic tracers, potassium bromide (bromide) and sulfur hexafluoride (SF_6), were added to reclaimed water. Both were introduced to the reclaimed water at Vault 5, where the tracers mixed with the reclaimed water and entered the recharge basins at the diffuser pipes at basins 4/5 from January 16 through February 3, 2018. Additionally, SF_6 was introduced into five monitoring wells near Basin 4 (MW- 1, 2, 7, 15 and 16) from February 7 through 14. A series of lysimeters, shallow wells, and deep wells were sampled to track movement of the reclaimed water. Results showed that in the Shallow Aquifer, water flows to the west, southwest, and south of the basins, while groundwater in the Sea Level Aquifer flows to the east. Some reclaimed water is reaching the Sea Level Aquifer, showing there is communication between aquifers. However, concentrations in the Sea Level Aquifer are very low compared to those observed in the Shallow Aquifer. Data were also shared regarding how fast the reclaimed water is moving. In the Unsaturated Zone the velocity was measured at 2-3 feet/day while in the Shallow Aquifer, it was measured at 7-35 feet/day. This information will help us understand aquifer characteristics for use in groundwater modeling.

Karen Janowitz: Can you show again where each of the lysimeters are?

- *One set of lysimeters (depths of 10, 25, and 50 feet) are installed in the west half of Basin 4 and another set are installed on the east half of Basin 4. The lysimeters are sampled through the yellow protectors on the side of the basin. The lysimeters are buried underneath the white PVC pipes that are visible above ground.*

Lyle Fogg: Concentration of tracer decreases as you move away from the point of introduction – is treatment occurring as it moves through the soil or is it just dilution?

- *The tracer chemicals were selected to be inert/conservative (so they do not sorb or degrade), thus the reduction in their concentration is a reflection only of physical transport processes including dispersion and diffusion.*

Karen Janowitz: Is the gradient still the same?

- *Yes, we still see water flowing south and southwest in the Shallow Aquifer.*

Karen Janowitz: It looks like the elapsed time for the movement of the tracer is the same in the Shallow and Sea Level Aquifers. Is that correct?

- *We see a high degree of variability but generally the reclaimed water is moving faster in the Shallow Aquifer. Comparing the two paired sets of monitoring wells in the Shallow and Sea Level Aquifer:*
    - *At MW-3a in the Shallow Aquifer, tracer first arrived after 7 days and reached a peak concentration after 27 days.*
    - *At MW-14 in the Sea Level Aquifer, bromide was detected just once after 36 days, 29 days after the first arrival at MW-3a showing the delay caused by the Kitsap formation.*
- *At the other set of paired wells (MW-13 and MW-12):*
    - *At MW-13 in the Shallow Aquifer bromide first arrived after 22 days and the peak concentration was observed after 63 days.*
    - *At MW-12 in the Sea Level Aquifer bromide was first observed after 55 days, a delay of 33 days after bromide was first observed in MW-13.*
- *In both sets of paired wells bromide was first observed in the Sea Level Aquifer about 34 days after it was first observed in the paired monitoring well in the Shallow Aquifer. We see preferential flow laterally through the Shallow Aquifer rather than vertically between the aquifers and the semi-confining Kitsap formation.*

Dick Wallace: The slide comparing Shallow and Sea Level Aquifers shows that the concentration of tracer was low in the Sea Level Aquifer. Were you surprised how quickly tracer arrived there? Was the confining layer even confining the flow of tracer?

- *The confining layer could be defined as a leaky, semi-confining unit, allowing communication between the layers. There is an apparent variability in thickness and amount of fine grained sediments (sand and clay); in some areas, it might be thinner or contain more sand than we previously thought. However, the lateral flow dominates. We see preferential flow laterally through the Shallow Aquifer rather than vertically between the aquifers and the Kitsap formation.*

Dick Wallace: The confining unit should be called the "semi-confining" unit in order to be more accurate.

- *[Note added: In all previous documents, we refer to the Kitsap Formation as a confining unit. In geology terminology, confining units are units with a high degree of impermeability, but they are not necessarily completely impermeable or confining.]*

Maureen Canny: Could you talk more about the Sea Level Aquifer? Why wasn't the data for the Sea Level Aquifer in the table on the summary slide?

- *The velocity data for the Sea Level Aquifer was not included on the summary slide because we know less about the flow paths from the infiltration basins to the Sea Level Aquifer. The water takes a much more circuitous path and the exact flow path is unclear, so the velocity cannot be known with accuracy. Velocities were calculated by dividing the time of peak concentration by the travel distance from the point of infiltration. For the Sea Level Aquifer, we calculated a velocity as roughly 10 feet per day.*

Karen Janowitz: Is the Sea Level Aquifer connected to Puget Sound?

- *In the vicinity of the infiltration basins the Sea Level Aquifer flows to the east, and likely discharges to McAllister Creek and the Nisqually River, and from there, to Puget Sound.*

Presentation: Water Quality Results

Jeff Hansen, Project Manager from HDR, presented water quality results. The key question was, "How does water quality change as reclaimed water travels through the subsurface?" Jeff described water quality parameters, sampling schedule and locations, including an aerial photograph with locations of the shallow and deep monitoring wells. Reclaimed water quality was consistent throughout the study. Results showed fairly consistent dissolved oxygen, total organic carbon, and nitrate. Orthophosphate was more variable.

Of the 113 residual chemicals analyzed, 60 were detected at least once in reclaimed water (prior to entering the basins) throughout the four quarterly sampling events, and 24 of those residual chemicals were consistently detected in reclaimed water in all quarterly sampling events. For some chemicals, the concentrations found in 2018 were higher than the background sampling done in 2014 and 2015. One possible factor is that the Solids Retention Time (SRT) in treatment process was lower in 2018. In 2018, SRT was 21 days, while in 2015 it was 37 days. However, that is speculation at this point.

General summary:

- 24 of the same residual chemicals were detected in all sampling events in reclaimed water, prior to infiltration.
- Data indicates soil aquifer treatment is occurring through the unsaturated zone (reductions in total organic carbon, orthophosphate, and residual chemicals).
- Residual chemical attenuation is observed in downgradient flow paths to the south and west.
- Dilution is likely a strong factor, with more occurring to the south than to the west.
- Residual chemicals are observed in the Sea Level Aquifer, though at less frequency and at lower concentrations than in the Shallow Aquifer.

This information will be used to inform groundwater modeling of concentrations predicted beyond the extent of the tracer test. It will also serve as inputs to the risk assessment.

Maureen Canny: [Referring to slide 8] Why was the Solids Retention Time lower?
The treatment process is managed based on operational conditions that vary widely. The process is optimized for treatment of regulated chemicals and nutrients. Compared to traditional wastewater treatment facilities, LOTT has a much higher SRT than most.

Holly Gadbaw: Can the SRT and degradation of residual chemicals be related to pushing more flow through the system?
In part. If more flow is being processed through the treatment facility, SRT generally will decrease, but it is not a direct relationship. There are many other operational variables affecting SRT.

Lyle Fogg: I'm an engineer that works with operators. SRT is your gas pedal. In our plant, microbes are very sensitive to temperature and pH changes, and they are extremely affected by the seasons. Adjusting the SRT is one part of a system in delicate balance.

Maureen Canny: Would using a longer SRT reduce the amount of residual chemicals in reclaimed water?
SRT is associated in the literature with more degradation of residual chemicals. This does not mean, however, that increasing SRT would necessarily result in more degradation in this system. We do not have enough information to conclude that a lower SRT was the cause of some of the higher concentrations of chemicals. It was only one possible factor. Treatment plants are operated to meet permit requirements. The treatment process is very reliant on the biology of the microorganisms that help clean the water. Microbes like to live where they're comfortable. We operate the process to keep them comfortable and help them do their jobs with the best possible result. We can't make changes to SRT without affecting other aspects of plant operations, including potentially negatively impacting the microbes.

Bill Liechty: Is there any reason to think that optimizing nutrient removal is counter-productive to removing residual chemicals?
No, nutrient removal and less residual chemicals often go hand in hand. Other operational considerations (besides SRT) might be responsible for the observed increase in some residual chemical concentrations in 2018. For example, more inputs of residual chemicals could be a factor.

Audience member: Why are some of the concentrations of residual chemicals higher from 2015?
Some of the chemical concentrations are higher while others are lower. As noted earlier, there are many variables at play here. It's also important to remember that we are dealing with very low concentrations (parts per trillion). For some residual chemicals, fluctuations at these low concentrations are to be expected and it can be challenging to discern consistent trends.

Bill Liechty: Do we expect to find the reasons for the decreases in concentration (dilution, degradation, etc.)?
The next step in the study will help to discern this, but it's important to remember that the primary objective of the study is to understand what the concentrations of residual chemicals are predicted to be at key downgradient receptors (e.g., wells and streams), regardless of the specific mechanisms that cause changes in those concentrations. That being said, to the extent we can discern between various attenuation processes (e.g., dilution versus biodegradation versus sorption) given the data we have, we will do so. This will be done in conjunction with the groundwater modeling effort. But again, bottom-line, the primary focus of the effort is to identify those residual chemicals that are most persistent and

observed in the groundwater system at the highest toxicologically-relevant concentrations. One example is PFAS, which are persistent chemicals that don't break down, and accumulate in the environment. They come from non-stick cookware, firefighting foams, etc.

Dick Wallace: The color-coded bars in the graphs are different sampling dates. Why do the amounts go up in some cases?
We sampled on different dates, and we're not looking at the same slug of water, so variability is to be expected. Some chemicals have a wider swing than others. For example, sucralose has a large swing.

Scott Morgan: You mentioned dilution as a factor for decreasing concentrations of residual chemicals over time and distance. Where is the dilution coming from? Is it just rainwater?
Rainwater is part of it, but it is mostly the mass of existing "native" groundwater, fanning out, which in turn is a function of regional recharge which is a result of precipitation.

Karen Janowitz: You have mentioned that both dilution and treatment are causing the concentrations of residual chemicals to decrease. Dilution doesn't mean that chemicals have been treated.
Treatment is still at play. Subsequent steps of the study will attempt to answer questions about the relative contributions of treatment and dilution as reclaimed water moves through the soil. For some of these chemicals, laboratory studies have been done. This information will be used in combination with our monitoring data to speak to this question.

Lyle Fogg: Will the models that are going to be built extend over large periods of time and space? What is the scope?
The model is 30 square miles in size, defined by geological formations and natural boundary conditions (e.g., streams and Puget Sound). The study's overall intent is to use empirical data to calibrate the model. We will combine all of this information to create a representative model. Then, the model will be used to explore transport of reclaimed water over long periods of time (multiple years) and under various conditions (e.g., different infiltration loading rates at LOTT's facility).

Bill Liechty: You have been looking at specific chemicals. How does the study evaluate for the decay products of these chemicals?
The risk assessment will look at the risks of various families of chemicals.

Scott Morgan: There were two tracers used, but the results only focused on one, did the information agree? You haven't shown results of the tracer sulfur hexafluoride. What did results from that tracer say?
The two tracers were not a perfect match. However, our senior hydrogeologist and others reviewed the data and all have concluded that the two tracers were supportive of one another. In general SF_6 agrees with the bromide results, however it appeared to be delayed in transport. This may be due to partitioning into trapped oxygen in the sediments or because SF_6 was also introduced directly into the monitoring wells for a period after tracers were introduced into the basins. The general trends and breakthrough

curves between the two tracers agree. It was important to use two tracers to corroborate detections – such as at MW-14 where bromide was detected only once, but the SF_6 detections corroborated that some reclaimed water arrived at MW-14 or at MW-11 where SF_6 was not detected but bromide was. Both tracers are presented and discussed in the report. The bromide tracer shows cleaner results and it is far simpler to focus on one tracer for discussion purposes. Data from both tracers will be used in the modeling effort.

Presentation: Next Steps for Task 2

Wendy Steffensen outlined the work ahead, including groundwater modeling, and determining residual chemicals of interest for risk assessment. The risk assessment will begin mid-2019 and evaluate risks to both human health and ecology. The next meeting of the Community Advisory Group will be held in the fall, likely in September or October of 2019. By then, a number of documents will be available to review: the DRAFT Technical Memo: Groundwater Modeling, DRAFT Technical Memo: Residual Chemical Loading, and DRAFT Technical Memo: Screening Risk Evaluation. The group will discuss work to select residual chemicals to focus on in the refined risk evaluation.

Wendy also provided several regulatory updates:

- New Reclaimed Water Rule 246-219 was made effective February 2018.
- New guidance "Purple Book" was published February 2019.
- LOTT and its partners are working to update our series of reclaimed water agreements for compliance with new guidance.
- Budd Inlet/Capitol Lake TMDL is not final, but more stringent nutrient requirements for LOTT are anticipated.
- Ecology is working with wastewater utilities that discharge to Puget Sound on a potential basin-wide strategy for reducing nutrient discharges.

Wrap-up

Joanne thanked the Community Advisory Group for their continued participation and opened it up for any remaining questions.

Karen Janowitz: When some of these reports come out, can we get these ahead of time, before the next meeting?
Yes, we will send them out ahead of time so you will have time to look at them.

Bill Liechty: Are you going to bring any scientists in to talk about the results with the Community Advisory Group? It would be really interesting to learn about what the scientists are discussing. Several of us would enjoy that.

We are planning to bring in the risk assessment experts, and possibly the academic advisors that are on the study team. We will look for ways for Community Advisory Group members to interact with these senior-level experts.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.6 – October 3, 2019 – Summary

Advisory Group Welcome and Initial Business

The meeting opened at 6:00 p.m. facilitated by Joanne Lind, LOTT's Public Communications Manager. Joanne announced that Lyle Fogg will no longer be serving on the Community Advisory Group, because LOTT recently hired Lyle as their new Asset Manager. This is great news for LOTT but means Lyle is not eligible to serve on the advisory group.

Joanne asked if any members of the public wished to make comments. One person asked whether the audience could ask clarifying questions after presentations and Joanne affirmed that.

Presentation: Review of Phase 3 Implementation Tasks

Wendy Steffensen, LOTT's Environmental Project Manager, presented a brief overview of the four key study tasks and provided an update on work completed in the six months since the last Community Advisory Group. Accomplishments included:

- Completion of two DRAFT work products for Task 2, Treatment Effectiveness Evaluation.
    - Documentation of the Task 2 tracer and water quality monitoring test
    - A work plan that outlines how the groundwater model will be used to predict groundwater flow and residual chemical concentration at various locations
- The Study moved into Task 3, Risk Assessment, which will occur in two parts - the screening-level and the refined risk assessment.

After the Risk Assessment is completed, Task 4 will address the question, "What are the costs and benefits of various approaches for treating and using reclaimed water?"

Jeff Hansen, Project Manager from HDR, provided more information about the Risk Assessment. The key questions are:

- What compounds could pose a health risk?
- How likely is exposure? To whom and through what routes?
- What information is available to assess toxicity? How do risks compare to other sources?

Jeff explained the two-tiered approach. Tier 1 is the screening-level, which focuses on all chemicals detected as least once in reclaimed water, focusing on the maximum concentration, and comparing it against established toxicity thresholds. Those chemicals will be included in Tier 2, the refined risk assessment. Chemicals that are persistent or bio-accumulative will also be included.

Holly Gadbaw: What does it mean when a chemical is bio-accumulative?
Bio-accumulative means the chemical accumulates in the tissue of the organism and can move up the food chain.

Jeff introduced the two expert toxicologists:

- Human Health Risk – Lisa Corey, Intertox
- Ecological Health Risk – Berit Bergquist, Windward Environmental

Presentation: Human Health Risk Assessment
Lisa Corey presented information on the human health risk assessment goals and process. She discussed screening level methods, including hazard and exposure assessment, toxicity assessment, and risk characterization. Screening-level results were discussed, as were next steps for refined risk assessment.

Lyle Fogg: There is currently no regulation of PFAS in drinking water, but there was a PFAS health advisory put out by EPA a few years ago. What value are you using?
We are using the EPA value from the health advisory, which is 70 parts per trillion.

Maureen Canny: You showed two lists of chemicals for further evaluation, and the second list shows lower concentrations of pharmaceuticals and other chemicals.
The first list are chemicals with concentrations greater than or equal to the Drinking Water Equivalent Level (DWEL) and the second list are those chemicals with a maximum concentration higher than 10% of the DWEL. Ordinarily, chemicals with these concentrations would be screened out, but this risk assessment is more conservative than is typical. So, we are including all chemicals with a concentration above 10% of the DWEL in the refined risk assessment. This conservative approach is to make sure we are being protective of human health and the environment.

Maureen Canny: To clarify, the first list was greater than or equal to the DWEL, and the second list was lower concentrations, but still greater than 10% of the DWEL?
Yes, and all of these residual chemicals will move forward into the refined risk assessment. We have the 15 listed on the first slide that are greater than the DWEL, and an additional 14 that were greater than 10% of the DWEL. One of the things we are concerned with, particularly with the hormones and potentially the PFAS chemicals, is that these might have the same effect on the body - an additive or synergistic effect. So, we are moving forward all the hormones and PFAS chemicals, even if they did not meet the threshold criteria. That was an additional 16, so we are moving forward with a total of 45 compounds for the refined human health risk assessment.

Bill Liechty: What did you use for baseline toxicity levels to base your calculations?
It involved quite a few different things. Our first step was to look for data from any authoritative body, whether another state, governmental, or possibly European source. There were many sources we looked at to see if they had defined any acceptable dose of these chemicals in a day, or over a lifetime. If we didn't find that information, we derived our own. That started with a full scientific literature review, looking for basic studies, whether in humans or animals. Then we used a standard process, following a hierarchy of steps to develop our own acceptable daily intake level. We also looked at therapeutic levels

for some of the pharmaceuticals. For antibiotics, we looked at how well they worked with bacterial populations and extrapolated from that information.

When looking at sources of toxicity information, in some cases, there were multiple sources of data for the acceptable daily intake (ADI). In those cases, for this purpose, we chose the most conservative value, meaning the lowest number.

To account for the fact that some of these toxicity values have not been updated in a long time, we took extra steps to look at background information to make sure it was derived based on current values and risk assessment parameters. Rather than simply trusting the data, we double-checked the data to make sure it was valid and scientifically sound.

Bill Liechty: Is the process that you use a standard methodology? Or is it something that you thought made sense?
It is a standard methodology, used by EPA and by Washington State. We have references for the methods followed. They are documented in our report.

Dick Wallace: You mentioned that you want to look at synergistic effects. Has there been much study completed to evaluate those synergistic effects?
There is good information for some chemicals, but not for others. For example, certain hormones have received a lot of study and some have not. The estrogenic chemicals will have better information because they receive a lot of attention.

Ruth Shearer: The expression "the dose makes the poison" doesn't apply to cancer-initiating chemicals. There is no safe dose for chemicals that initiate cancer. For instance, dimethylnitrosamine shown on one of the lists is a strong cancer initiator. Those don't fit the pattern.
Excellent comment – that is why we treated carcinogens differently. We used a similarly well-defined and documented method to come up with a drinking water level. It is based on assuming a one in a million risk.

Maureen Canny: Which chemicals are the carcinogens?
They are 1-4 dioxane, estradiol, quinoline, TCEP, TCPP, thiabendazole. We used the cancer factor for these. NDMA is also a carcinogen, however, we used a Washington clean-up value for that chemical because that was a lower number.

Bill Liechty: It sounds like when faced with choices, you have consistently taken the most conservative choice to quantify risk.
Yes, which can result in an overly conservative screening, but that is appropriate for the screening-level assessment.

Maureen Canny: Can I make sure I understand? If you took a sample from the bottom of a well, you took the highest dose that you found, even if you found it only once, and you assume that water with that

concentration is being consumed by a baby weighing 10 kilograms, every day – that is the level you are assessing.
Our approach is even more conservative – it operates on the assumption, even though this is not the case, that the baby is drinking the reclaimed water without any dilution or mixing with groundwater.

Maureen Canny: Like straight out of the LOTT "tap"?
Correct. We will talk later about how we will estimate what concentrations of residual chemicals may actually be found in a well.

Presentation: Ecological Risk Assessment
Berit Bergquist presented information on the ecological risk assessment process and screening-level methods, including toxicity benchmarks from empirical data, toxicity benchmarks from modeled data, and identification of persistent and bio-accumulative chemicals. She also discussed screening-level results, and next steps for refined risk assessment.

Maureen Canny: What do you mean by the "20% effect level"?
When you do a toxicity test, you have a dosed group and a control group and the 20% effect level is the point at which you have a 20% difference in response between the two groups.

Dick Wallace: When you look at toxicity to fish and invertebrates, how well do those actually match the kinds of fish and invertebrates that would actually be in the local system?
The fish tests tend to be done with laboratory organisms, like fathead minnows. They are not usually done with salmon or fish that you are going to find out in local waters. The laboratory organisms are typically sensitive organisms that adequately represent wild species.

Audience member: Hats off to everyone for doing this! This is cutting edge for the state, and way ahead of Ecology. My question has to do with methodology and future applicability. This is not my field, but from what I understand, you are analyzing this on an individual chemical basis, using analytical chemistry as your main tool, which is expensive. There is a constantly changing target; the suite of chemicals we have now is not going to be the same as those we see ten or twenty years from now. So with this analytical approach, it would require constantly re-doing it. Papers I've been reading showing toxic effects on amphibians and fish in very low parts per trillion levels with mixtures where none of the constituents would show up at a toxic level. Because of additive or synergistic effects they are showing negative impacts on reproductive behavior of fish and amphibians. The analytical chemistry approach is not going to evaluate this. Use of bioassays is the only way to look at the effects of hundreds of chemicals at very low concentrations. Comments from public utilities say that reclaimed water is not a problem because residual chemicals are at parts per billion or less, so there are no effects. Those comments don't appear to be lining up with the research papers I've seen. What do you think about that?
From an ecological perspective, you raise some good points. A lot of these studies are done on single chemicals and they're not done as mixtures because there are so many mixtures. Bioassays are one way,

as you mentioned, to see what's going on with mixtures you have at your site. That is an expensive way to go. Right now we're doing screening-level on single chemicals to see where we can narrow things down. But, you are right that they are based on single chemical exposures. There's a lot of uncertainty there. There are so many emerging chemicals.

Early on in this study, six years ago, when the approach was being developed, the concept of using bioassays was considered. In the realm of the reclaimed water world, the challenge is there's no standardized approach. Project team members recently attended the national WateReuse Symposium. There were discussions and presentations about the bioassay approach. Even those experts currently working on that approach admit that the challenge is still a lack of standardization. There is continued movement in that direction. Our choice on this study is to use accepted and standardized analytical methods that you can "hang your hat on".

Audience member: Wouldn't one bioassay be more cost effective than 100 chemical analyses?
Not necessarily. I can't speak to the cost of bioassays. To get to that analytical chemistry question, the approach we took was to start with a list of 135 chemicals. 90+ of those chemicals are run with one analytical method, using standards that have been previously developed by the lab. So, for the cost of one test, we get results on 90+ of those chemicals. Tests utilize liquid chromatography and mass spectrometry. California is on the front end of a lot of reclaimed water work. Even in California, where there are a lot of discussions about the bioassay approach, they are still using an analytical chemistry approach focusing on a limited number (roughly a dozen) of chemicals as key indicators of potential health concerns. So, in this realm and in the near term, I think we are going to see continued use of analytical chemistry until the bioassay methods mature.

Presentation: Groundwater Modeling Work Plan
Jeff Hansen gave an overview of the Groundwater Modeling Work Plan. The model is built and calibrated and the project team will begin using it to:

- Predict flow paths and travel times of reclaimed water
- Determine how much reclaimed water reaches potential downgradient receptors (wells, streams)
- Predict exposure point concentrations of residual chemicals, which will be inputs to the refined risk assessment

This information will then be plugged into the risk assessment to model various scenarios, including possible future conditions.

Dick Wallace: If you increase the volume of water to 5 mgd (future operation, year ~2050), I assume that could change things like travel times.

Correct. When we run the model you will find that when we apply more water to the basins, the groundwater level under the basins will rise, and that will change the hydraulic gradient, which could impact travel time to specific points of interest downgradient.

Maureen Canny: As the volume increases, will the absorptive capacity and bio-capacity change? Will it become saturated and less effective?
Jeff Hansen: In terms of the physical ability to take on water, you are correct there is a physical site capacity. We don't know exactly what that capacity is at that site. Our models will help us evaluate that.

Maureen Canny: What about the biological properties?
We talked about when the reclaimed water courses through the sub-surface, there are various mechanisms at play. Filtration, sorption, and biodegradation are occurring. The sorptive capacity of the soils will be most impacted. The majority of chemicals that we are looking at typically do not sorb to soils. There are some exceptions, such as flame retardants which are known to sorb. Will the site reach sorptive capacity? Potentially, but it would take a long time for this site, based on what other studies indicate. The majority of the chemicals we are looking at will be more susceptible to the biodegradation processes, such as decomposition by bacteria in the groundwater system. We do not anticipate a limiting capacity to biodegradation relative to the flows and chemical concentrations that we're talking about.

Bill Liechty: What are those risk thresholds and how are they determined?
As discussed earlier, in the screening-level analysis, we look for chemicals above the maximum concentration. Then, we look at how those chemicals are changed downgradient, and whether they are still at a level above established thresholds, after the dispersive processes that occur in the groundwater. If they are still above thresholds, then we look at the other processes at play, primarily biodegradation and sorption.

Dick Wallace: In the flowchart for exposure point concentrations, it looks like all of the arrows point to inclusion in the refined risk assessment. It doesn't look like you're screening anything. Is that right?
These chemicals have already been selected in the screening-level risk assessment. The point of this is to define the concentrations to look at in the refined risk assessment.

Lyle Fogg: So, in step 2 is the exposure point concentration being adjusted? You're indicating that something more happens if it goes above the thresholds.
Right. We are taking a closer look at the exposure point concentration to factor in biodegradation and sorption. The reason for doing this is that we have a total of 50 residual chemicals that have passed either the human health or ecological screening-level step in the risk assessment. To look at all of those in a biodegradation and sorption analysis would be extremely time consuming. It's not like there's a database to look up the information for each of those. So, we want to focus in on which ones are of most concern at concentrations downgradient.

Bill Liechty: This would be another conservative decision, then?

Correct. If the concentration does not exceed that threshold, I'm going to use the given concentration and not factor in sorption and biodegradation. We are limiting our assumptions.

Bill Liechty: Is there a well-defined process to quantify biodegradation and sorption? Does it entail a literature review? How do you account for our specific type of soil relative to the literature review?
We must conduct a full literature data review specific to each chemical. A lot of studies have been done for biodegradation but not for every chemical in our list. There is not known to be a great deal of difference in the biodegradation in different soils, but to the extent that there is, we will consider that and match it up with soils from our area where we can. Biodegradation is largely a function of time. Prior studies have determined what the degradation, or decay curves, are for various chemicals. That is the significance of understanding travel time for each of these locations downgradient.

Bill Liechty: Is this type of groundwater modeling commonly done? Would an outside expert know this approach?
Yes. On our team we have Dr. Peter Fox, from Arizona State University, who has done this work throughout the country. This is a standard approach.

Maureen Canny: You said earlier that during the LOTT wastewater treatment process, some biodegradation occurs, but some chemicals are not broken down. Why would we not assume the residual chemicals also slip through in the soil at the Hawks Prairie site? Is there a difference between biodegradation that occurs at the plant and in the soil at the site?
The big variable is time, especially with biodegradation. The bugs are in contact with the wastewater at the Martin Way plant for about 20 days – that's the amount of time the bugs have to work on a particular molecule of water in the treatment plant. These residual chemicals are not being full degraded in that amount of time. Over more time, continued degradation occurs in the soil and the aquifer. These results appear in the literature, based on laboratory and field tests.

Maureen Canny: Then you'll extrapolate the information on how degradation occurs to where the well is?
Right.

Bill Liechty: Is temperature as important as time? Is temperature a significant factor? Do you account or adjust for that?
Yes, temperature is very important with biodegradation processes. However, we find that groundwater temperatures recorded in other studies are not radically different from what we find here, even though air temperatures vary. But, we can make adjustments in the modeling of biodegradation if we are basing the approach for a given chemical on literature information related to groundwater of significantly different temperature.

Scott Morgan: Are there any seasonal variations to pH of the groundwater?
We would not expect pH fluctuations, but we would have to look back at the data to say for sure.

Maureen Canny: Is that dispersion amount 25% considered conservative?
The 25% value in the presentation is just an example. We will determine the percent values for each downgradient receptor based on a number of factors. Dispersion is a function of the aquifer properties in our local area. We saw the effects of those properties when we did the tracer test. We saw the trend for how tracer arrived at the test wells; it doesn't arrive all at once; it arrives in a low concentration, it builds, then it tails off. That characteristic at a particular well defines dispersion. Tracer tests helps us define what that dispersion range should be. It's not constant throughout that entire area around Hawks Prairie. Dispersion is going to be different along different flow paths. The model helps us understand those kinds of details. You will see mapping of the results, showing flow paths and dispersion.

Dick Wallace: Will you be able to estimate the benefit of the recharge to instream flows, such as how long groundwater takes to get to the stream, what time of year it gets there, and how much water is contributed to the instream flow?
Yes you could use the model to answer that question because it will speak to where, when, and how much groundwater is entering the stream. We will have to be careful with how far we go to answer the question with the model as it is built. We have some information on stream flows and where there is continuity with the groundwater at certain points along stream routes, but we have limited information to calibrate that interaction. The model is built to show what the groundwater is composed of where it enters the stream.

Dick Wallace: Some people might want to look at the benefit of being able to use reclaimed water as a mitigation tool for water withdrawal.
Yes, that's right.

Scott Morgan: Going back to biodegradation and sorption, you need to consider that every system has its limits. For example, with sorption, what proportion of residual chemicals could be released from the soil? It's going to be important to clarify and support your assumptions.
That is a good point. There are a lot of factors to evaluate, such as temperature for biodegradation, pH and redox conditions with respect to sorption.

Holly Gadbaw: Is the reclaimed water being produced at the BITP treated the same way as the water at the Martin Way Reclaimed Water Plant?
The two plants use different processes, but both plants produce Class A Reclaimed Water. Both plants rely on biological processes, but the BITP uses sand filters, and the Martin Way plant uses membrane bioreactor technology in the final filtration step.

Maureen Canny: Are we concerned about chemicals left in reclaimed water coming out of BITP? Are we looking at that?
We looked at residual chemicals in treated water from BITP in the earlier tasks when we characterized the water quality of LOTT's reclaimed water. At that point, we looked at reclaimed water from both

plants. For most, but not all of the chemicals, there were similarities in the removal efficiencies between the two facilities.

Maureen Canny: Are we using any of the reclaimed water for irrigation?
The reclaimed water produced at the BITP is used for irrigation of parks downtown and the Tumwater Valley Golf Course.

Maureen Canny: What about the East Bay Plaza stream? I know the health department requires testing but do they know what to test for? Should kids be playing in the water?
In the next step of the study, the refined risk assessment, we will look at comparative risk of residual chemicals in the groundwater system vs. other routes of exposure such as dermal exposure. So, we will be looking at routes of exposure which will apply to more than just the stream. When we get to the refined risk assessment, then we will also look at how that risk compares if LOTT's treatment processes were modified to include additional or different types of treatment at the reclaimed water plants. That will be part of the refined risk assessment.

The Community Advisory Group was asked for feedback, and especially any comments or questions about the current plan and approach that they would like to have carried forward to the Peer Review Panel. The Peer Review Panel, managed by The National Water Research Institute (NWRI), is made up of a team of six nationally renowned researchers and technical experts. The panel includes experts in areas related to the infiltration of reclaimed water, including water reuse and public health criteria, toxicology, environmental geology, environmental health, and other relevant fields. The role of the Peer Review Panel is to review the study as an independent third party and ensure the study is based on sound, up to date scientific methodologies and practices.

Audience member: Has the Peer Review Panel looked at and reviewed the methodologies and approach that got you to this point?
They have been involved throughout, starting from the development of the study and scope of work. Every step along the way we've had a general approach and then it's gotten refined as we learn more. We continue to engage the Peer Review Panel at each step of the study, informing them of results found and the plan for moving forward. They are scheduled to meet here October 23 in a joint meeting with the Science Task Force.

Audience member: Is NWRI being reimbursed or what is LOTT's financial relationship with the Peer Review Panel?
LOTT has a contract with the National Water Research Institute (NWRI) for their independent peer review. NWRI engages with the experts so we do not have any direct financial relationship with the panel members. Our financial relationship is with NWRI for the contract to provide the peer review for this project, but we don't have any relationship with the reviewers.

Audience member: What kind of funds are we talking about for the peer review?

The contract has gone on for quite a while; we don't have that number in front of us, but we can get it for you. Follow up email:

What is NWRI being paid for the peer-review work? Has NWRI been audited?
The contract between LOTT and NWRI is approximately $344,000, extending for approximately seven years, and allows for the Peer Review Panel to meet on an as-needed basis.
NWRI is a 501c3 organization and is audited annually. The results of each audit are presented to the NWRI Board of Directors at the annual organizational meeting and then released to the public. The 2017-2018 fiscal year audit report is publicly available at the NWRI website. The 2018-2019 fiscal year audit report is in progress. It will be presented to the Board of Directors in 2019 and then posted to the NWRI website.

Holly Gadbaw: How much has the study has cost, to date?
So far, the study has cost about 3.5 million dollars.

Holly Gadbaw: Where does that money come from?
Most of the money comes from hook-up charges because those connection charges pay for projects related to new capacity. As our communities grow and more wastewater needs to be treated, the long-range plan is to meet that capacity need by producing more reclaimed water. A portion of the funds for the study also comes from monthly service charges.

Holly Gadbaw: Has LOTT had to increase rates for hook-up charges to pay for the study?
No.

Bill Liechty: I have a couple of questions for the Peer Review Panel: If your budget got increased by 25%, what would you do differently? What are their biggest concerns about the study approach?
When we were scoping the study, there was robust discussion with the Peer Review Panel on the risk assessment approach. They were supportive of the decisions; I don't remember anything that was significantly changed based on peer review. There were other parts of the study where we did make modifications based on their input. For instance, the list of chemicals that we looked at was informed, in part, by the Peer Review Panel.

Bill Liechty: If you were going to re-scope this today, what would you do differently?
We would not have done it differently. However, we can pose that question to the Peer Review Team.

Question: You mentioned that you found 83 chemicals of concern. Is that a lot more than you expected?
We did not mean to imply that. There are a total of 50 residual chemicals that have passed the human health or ecological screening-level risk assessments. At the outset, we didn't know what results to expect.

Holly Gadbaw: How up to speed are elected officials in this area? This information is complex and sometimes when I talk to people about it, their eyes glaze over. There may be controversial, significant, and possibly expensive decisions to make based on this study.
Increasing understanding of elected officials and the public will be a big challenge. The information is very technical and this is the tip of the iceberg since we haven't gotten all the way through to the results. In your future meetings, we will want your advice and counsel on how to present this information to the public and how to get people engaged and interested when we begin related community conversations.

Scott Morgan: When was the last briefing about the Reclaimed Water Infiltration Study to LOTT's Board?
There was one in May of this year and we are planning to give them a briefing in November after we have the meeting with the Peer Review Panel. We do those during the Board business meeting so that it will be recorded and available for the public.

Audience member: Why is the public not invited to meetings of the Peer Review Panel?
The meetings have not been made public because the panel has such a limited amount of time, with the experts coming from across the country, meeting only rarely, and having so much information to get through. So, they spend a good portion of their day in closed session, to focus on their independent review.

Audience member: Why can't the public come just to observe? If they are not included in the discussion and do not ask questions, they wouldn't interfere with the panel. The public is likely to be suspicious of secrecy.
That is a fair question. We have tried to make this process as open and transparent as possible. This is one part that has not been as open. We are working with NWRI who does this peer review work for different studies and projects around the country and we're following their processes and suggestions. [This decision was later changed and the meeting was opened up to the public, with approval from NWRI. Invitations were sent to the Community Advisory Group and the Reclaimed Water Study email list, and the information was posted to LOTT's website].

Aucience member: Are their reports and comments posted?
Yes. When the Peer Review Panel meets here, they get briefings from the project team, then they have closed door sessions. They develop a report of their findings. Their report and project team responses are posted on LOTT's website, on the Reclaimed Water Infiltration Study pages.

Audience member: Is groundwater modeling changed in summer compared to winter, due to changes in water volumes?
The groundwater model is calibrated to a May/June timeframe. The decision was made to use that as one point of calibration. This is called a steady-state groundwater model, which doesn't look at seasonal fluctuations. The tracer test sampling was conducted over the course of a ten-month period, January through October. During that time, groundwater was monitored at all of the sampling wells. We did look at differences in groundwater elevations over the course of sampling; there are differences in

groundwater elevations between summer and winter, but they were not deemed significant enough to warrant recalibration.

Next Steps

Wendy Steffensen highlighted next steps in the study:

- For Task 2, we are working on groundwater modeling for both flow and residual chemicals.
- For Task 3, we are moving into the refined risk assessment.
- There will be a joint meeting of the Peer Review Panel and Science Task Force on October 23.
- The study is on track according to the most recent version of our schedule.

We plan to finish the study by the end of 2020. The next meeting of the Community Advisory Group is expected to take place in March of 2020.

Community Advisory Group – Reclaimed Water Infiltration Study

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Meeting 3.7 – June 14, 2021 – Summary

Advisory Group Welcome, Introductions, Agenda Review

The meeting started at 5:30 p.m., conducted virtually and facilitated by Joanne Lind, LOTT's Public Communications Manager. Participants introduced themselves and the agenda was reviewed.

Presentation: Review of Study Progress to Date

Wendy Steffensen, LOTT's Environmental Project Manager, presented a brief overview of the four key study tasks and provided an update on work completed in the year and a half since the last Community Advisory Group meeting. Accomplishments included:

- **Field Activity:** In response to recommendation from the Peer Review Panel, and after discussion and assessment, we drilled six new wells to fill in knowledge gaps and refine the groundwater model. The wells were paired wells, with one in the shallow aquifer and one in the deep aquifer.
- **Modeling Activity:** We gathered data from those new wells and incorporated the new information into the groundwater model, and made other refinements to make the model run more efficiently.

In addition, a number of reports were finalized in this time period, including:

- Final work plan for Groundwater Modeling Predictive Simulations (Task 2.1.4 continued) and Residual Chemical Fate and Transport (Task 2.1.5); Feb 20, 2020
- Final Ecological Health Screening Evaluation; May 28, 2020
- Final Human Health Screening Evaluation; May 29, 2020
- Final Ecological Risk Assessment Work Plan; Feb 20, 2020
- Final Human Health Risk Assessment Work Plan; Jan 26, 2021

PFAS Update

Wendy Steffensen gave a summary update of per- and poly-fluorinated chemicals (PFAS) because this class of chemicals became a focus in the risk assessment and they receive a lot of media and regulatory attention. PFAS are a class of man-made chemicals used in a variety of common products, including non-stick cookware, waterproof apparel, take-out containers, and firefighting foam. They are very stable and do not degrade, so they are sometimes called "forever chemicals". There is no uniform regulation for PFAS, but some states have established standards for PFAS in drinking water. The Washington State Department of Health has proposed draft state action levels. This is, and will continue to be, a fast moving field in terms of new science and regulations. EPA is recommending that municipal wastewater treatment facilities sample for PFAS in wastewater where it is likely to occur. The Washington State Department of Ecology is providing a variety of information to the public about how to limit their exposure to PFAS. New regulations, new chemical substitutes, and new methods of treatment are expected in the coming years.

Presentation: Fate and Transport Modeling

Jeff Hansen, Lead Consultant, HDR Engineering, Inc. explained the groundwater flow modeling, residual chemical fate and transport modeling, and exposure point concentration estimation that feeds into the risk assessment work.

Groundwater Modeling Objectives:

- Predict flow paths and travel times of reclaimed water
- Determine how much reclaimed water reaches potential downgradient receptors (wells, streams)
- Predict exposure point concentrations of residual chemicals, which are then inputs to the risk assessment

Audience member: Are biodegradation and sorption expected to change over time?
Short answer is "yes" - calculations show chemical concentrations dropping due to dispersion, and calculated attenuation factors.

Audience member: Do these modeled outcomes include the increased water reclamation rates discussed earlier?
Yes, the model assumes no increase or decrease in chemical concentration, but infiltration flow rates are increasing and that is reflected in the data.

Presentation: Human Health Risk Assessment Update

Gretchen Bruce, the consultant from Intertox, Inc., provided an update on the Human Health Risk Assessment (HHRA), showing how the exposure point concentration data is used in the HHRA. She reviewed the screening process for the chemicals of interest for the HHRA.

- Started with 122 chemicals detected in reclaimed water
- From those, 45 Chemicals of Interest (COIs) were identified
- Of those, 27 chemicals were below screening benchmarks
- That leaves a refined list of 18 chemicals for the HHRA
    - These include six perfluorinated compounds, four hormones, a handful of pharmaceuticals, and some industrial chemicals such as flame retardants.

For this refined list of 18 chemicals, we are applying standard and accepted risk acceptance methodologies to determine if there is risk to people under different exposure scenarios involving well water or surface water. This includes eight different population scenarios and potential routes of exposure - touch, inhalation, or ingestion, and comparisons to benchmarks for toxicity and cancer. Initial

findings show 9 chemicals exceed toxicity benchmarks, but all pharmaceuticals are far below benchmarks. The HHRA will continue to refine assumptions and characterize relative risks.

Audience member: How applicable are the results from this study and model of this one infiltration site to other sites that LOTT is considering or may consider for infiltrating reclaimed water in the future? Would the modeling, sampling, and analysis need to be repeated for other sites?
The assumptions we used in the risk assessment to this point could be applied elsewhere. We looked at a number of standard risk assessment scenarios that are often recommended for sites of this type. These scenarios could be applied elsewhere with adjustments for site specific considerations. We also have toxicity criteria that we have developed for the screening level evaluation for dozens of compounds, which could be used for other assessments.

Audience member: There are some studies showing cumulative effects in fish and amphibian models from a combination of pharmaceuticals. Has that been taken into account?
The Peer Review Panel recommended we not look at cumulative risk at this point. One of the reasons is that we are only looking at a sub-set of chemicals, so adding up that sub-set would not give an accurate assessment of total risk. Also, when you look at mixtures of compounds, they often interact with each other in different ways (some synergistic, some antagonistic). For most of the chemicals we are looking at, they fall well below toxicity benchmarks, so even if you summed the risk, it would not change the picture by much. There are only a few chemicals that rise above the thresholds.

Audience member: Are there human health risks other than cancer worthy of consideration?
For all of the chemicals, we looked at both cancer and non-cancer risks. The toxicity criteria used is associated with the effect that occurs at the lowest dose, so for non-cancer that could be a reproductive effect, a developmental effect, or immune-toxicological effect.

Audience member: An in vivo approach of bulk sample effects would sidestep those concerns about various combined effects in comparison to single chemical analysis.
That is the type of analysis that may be used more and more. Currently, it is more experimental and not part of the standard risk assessment approach.

Presentation: Ecological Risk Assessment Update

Kate McPeek, Windward Environmental, LLC, gave a progress update on the Ecological Risk Assessment (ERA), explaining the ERA process and the screening-level evaluation methods and results, the risk characterization methods and interim results.

- Started with 122 chemicals detected in reclaimed water
- From those, 18 Chemicals of Interest (COIs) were identified
- Of those, 12 chemicals were below screening benchmarks
- That leaves a refined list of 6 chemicals for the ERA

- These include four perfluorinated compounds, a surfactant (4-nonylphenol), and a pesticide (fipronil)

Preliminary results showed maximum modeled concentrations of the pesticide fipronil in groundwater greater than toxicity benchmarks, so this chemical may be a potential risk. Our next step is to consider how much mixing takes place when groundwater discharges into the creek and is diluted with surface water. PFAS concentrations in fish tissue and wildlife prey (modeled from groundwater concentrations) were extremely low compared to toxicity benchmarks, indicating there is negligible risk from PFAS. Additional steps to complete the Ecological Risk Assessment will examine dilution/mixing of groundwater with surface water, uncertainty analysis, and the relative risks and ecological significance of potential risks. If potential risks are identified, we will discuss those risks relative to other sources of COIs as well as the ecological significance for Woodland and McAlister Creeks.

Discussion: Questions and Feedback

Community Advisory Group members were asked to comment on these discussion questions:

- What stood out for you in today's presentations?
    - What is your impression of the approach used for this work?
    - Any thoughts or reactions to the preliminary results?

Tina Peterson: What surprised me is how much things are being diluted. It also surprised me to see what happened over time with the reclaimed water; I was anticipating to see the concentration of residual chemicals to be much higher than they were.

Dick Wallace: Today we heard a lot about methodology and I think as we look forward it would be good to start out with the bottom line to communicate to the public. The methodology is important, but getting right to the results and risks is going to be important as we try to explain this to the public. [Holly Gadbow and Scott Morgan agree.])

Dick Wallace: The southern edge of the aquifer movement seems to parallel I-5. Is there a relationship there?
No, there is not a specific relationship (it is a coincidence), although there is lower resolution along I-5 due to a lack of wells.

Holly Gadbaw: Have the wastewater flows to the Hawks Prairie Reclaimed Water Plant increased much since it came into use? What's the capacity there?
The plant can currently treat about 1.5 million gallons per day (mgd), and it has not increased since we started the plant because we are limited by the amount of wastewater flow that goes through the Martin Way pump station, which has not significantly increased since we started operation of the plant.

Holly Gadbaw: How about flows overall?
Overall, the Budd Inlet Treatment Plant has had some increase, but it varies by year because at the Budd Inlet Plant, we have a portion of the system that is combined sewer and stormwater, so it is dependent on precipitation. We have not seen a big jump in flows as a result of population increases because of successes in water conservation measures over the last couple of decades. As a result, we have not seen big increases in wastewater flows. Our average for the whole system is still about 12.5 mgd.

Holly Gadbaw: What is the limit at the Budd Inlet Treatment Plant?
It depends on the time of year. Our permit allows a maximum flow of up to 28 mgd, but in dry season that limit is 15 mgd.

Maureen Canny: I was surprised at the 100 year projection and I was wondering how changing hydrogeologic conditions might change the degree to which chemicals are attenuated. As bio-organisms break down residual chemicals, and chemicals sorb to particles, does that change over time? How can you predict a hundred years into the future how the chemicals will continue to react?

There are two very different processes – biodegradation and sorption. Another way to ask this question is: can Mother Nature continue to act on these chemicals at these concentrations unabated? The short answer is yes, and other long term studies have shown that, especially at the very low concentrations that we're talking about. When we are talking about nanograms per liter, there is capacity within the microbial community in the groundwater system to support that.

Sorption can be different. There is limited sorptive capacity of soil particles and there can be breakthrough. With these chemicals that do sorb (and that isn't very many of them, mostly flame retardants) the concentrations are very small. In other places where they have done long term studies, they don't see the soil maxing out its sorptive capacity at such low chemical concentrations. We do not predict that would be a limiting factor over time here.

Additional discussion questions:

- What do you think about how the information was presented?
- Any suggestions for how to present this information to make it more clear or easier to understand?

Holly Gadbaw: In the Ecological Risk Assessment, you included information about what types of products the chemicals are in and that was more helpful than just giving the chemical name.

Scott Morgan: I appreciate the technical details, but when talking to the public, you need to start with the impacts, give the context and be prepared to answer questions. You really need to give the presentation a completely different look and focus for the community.

Ed Steinweg: I also appreciated that the 100-year flow was more limited than I would have expected and that was reassuring. I felt underwater in detail much of the time, but appreciated that the study is creating a methodology for what is going to be a changing landscape of chemicals in the next hundred years. This is the tip of the iceberg; in another ten years there could be many more chemicals that are being watched. The study team is creating a great framework for moving forward to evaluate new chemicals much more readily and efficiently in the future.

Bill Liechty: When presenting to the public, spotlight where you made conservative assumptions and put that in layman's terms so people can wrap their heads around what it really means. That will help people understand that when you made a choice on risk, you took the conservative path.

Maureen Canny: Conservative means safer – you took the safer path. [Heads nodding in agreement – that would be the better term to use.]

Scott Morgan: I agree. My first thought when you said "conservative" was that you were measuring smaller amounts, but in actuality you are assuming a larger exposure. Conservative has different meanings. Give it context.

Tina Peterson: I agree with the comment that you can't just give the chemical names. You need to give some kind of context (cleaning, non-stick pans, etc.). And the methodology is interesting but the public wants to know if residual chemicals in reclaimed water will affect their kids, whether it will affect the fish they eat, or the birds they like to watch. If the audience is scientific, you can give them the back-story offline, but not as part of a public presentation.

Pixie Needham: Are you going to release the preliminary results or are you waiting until a final version?
We are waiting to get through the rest of the risk assessment. Then the study team will take all of this input and put our heads together about how to better communicate this to a public audience. Then we can come back together again and go through what we have come up with. After we get feedback on the presentation materials, we will start sharing all of this information with the public.

Maureen Canny: Will you be looking at legislative changes to regulate some of these compounds, like the fipronil to get them out of our waste stream?
That is something that could come out of this study. If we get to the point where there are chemicals that have risen to the top and we feel it is important to advocate for more source control, that might be something that our Board of Directors may do.

Maureen Canny: Good, I hope they do.

Discussion question:

- Do you have questions you would like us to forward to the Science Task Force and Peer Review Panel and report back on?

Scott Morgan: How does this infiltration rate compare relative to the amount of flow through the aquifer naturally? Do you have any kind of measure?
Jeff: I don't have that number off the top of my head but it is very small. When we look at the overall recharge in this area, it is much larger. That being said, you saw movement over 100 years that represents replacement of native groundwater by reclaimed water.

We expect that conditions will change over 100 years, like climate change, land use, and other things that impact the natural recharge. For that reason, we are running sensitivity analyses with the groundwater model to explore wetter or drier conditions. With climate change, there is a good chance that there will be periods of wetter weather. So we are doing the analysis with both 25% more and 25% less recharge and we will be able to speak to how sensitive the model results are to that. We are not ignoring that things are not going to be the same 100 years from now.

Presentation: Study Schedule and Next Steps

Wendy Steffensen gave a preview of draft and final documents anticipated to be completed by the end of 2021. She also gave an overview of the schedule going forward, including completing Task 2: Groundwater Modeling and Task 3: Risk Assessment, as well as Task 4: the Cost/Benefit Analysis. Final stages will include reporting out and community outreach, starting this year.

Public Comment Period

Audience member: How will you catch new chemicals before they get through to the wastewater treatment plant and into the aquifer?
We are learning a lot through this study effort and we will continue to follow the research after the study is complete. There is always information coming out in the industry about chemicals that may be of concern. We will continue to pay attention and we expect regulations to change and requirements for monitoring could also change. There's a lot of unknowns, but this is a certainly a topic that will continue beyond the study.

Audience member: When one thinks about what this area looked like 50 and 100 years ago, we have made substantial changes and impacts to our environment and our society. So, when you model 100 years into the future, there are many other factors at play that cannot readily be modeled today, such as population change, land use changes, social changes, consumer products, climate, etc. that may also impact the results.

We recognize that, too. With respect to the groundwater modeling, that's why we are doing sensitivity analysis regarding one of the key factors - changes to recharge from precipitation. We have also been talking about changes in chemicals coming into usage. Some chemicals we are looking at now may not be in use in the future, although we are not assuming that right now.

Audience member: Gretchen mentioned that in vivo analysis is experimental. Granted it is non-regulatory at this point, but in vivo methods are used to experiment but are not experimental. Please clarify.
Yes, that's true. In vivo is when you test a chemical in an animal in a laboratory setting. Those methods are rather standardized. What's not often done is to look at mixtures of chemicals. Partly, that is because mixtures can be highly variable in constituent concentrations. There is a lot of discussion in the scientific community about how to do those kinds of tests and how to interpret them broadly across different types of exposure situations. The methods are not experimental, but questions remain about how to interpret test results.

Audience member: There have been several questions about changes over time, and this is necessarily a point-in-time study. It's all about current chemicals, currently known information about effects on organisms, human and natural, currently known information about drug interactions – every bit of that is going to be changing and going to be changing rapidly in the future, so this study is going to have to be re-done over and over again. What is a reasonable timeframe for the current study? How soon do we have to re-do it to pick up all of those new chemicals and all of that new knowledge?
We may not have an immediate answer to that question. We will continue to monitor what's coming to the fore in terms of other research and in terms of chemicals of concern, as they come on the scene, and determine from there what's needed in terms of additional work in the future.

The conundrum of applied science is that you continue to learn more and adapt with what you learned. This study is different than a standard academic study because it is applied research, but it is similar in the sense that it looks at a point in time. The body of reclaimed water infiltration research has been ongoing since construction of the Montebello Forebay Facilities in California, upwards of fifty years ago. It is correct that future study will be needed, but that doesn't mean that this study is invalidated by future changes. We just need to build upon it. It becomes part of the broader research and information available to help guide decisions.

Audience member: That means putting someone on staff to do the constant monitoring. With so many different factors, that's a big job.

Holly Gadbaw: Will the study come to some conclusions and make recommendations about ongoing monitoring? How regularly would that have to be done? Is there a standard for how much ongoing monitoring needs to be done?

That is not directly part of the work we are doing, but if those questions are being raised, presumably the study could address that. There is evolution on that point. For example, in California, since this study began, regulations for reclaimed water infiltration have changed and there is more guidance on what to monitor for and with what regularity. We don't see that yet in Washington regulations.

Dick Wallace: My take-home on this is that the study was very thorough, very sensitive to multiple exposures and even looking 100 years out, there was minimal but not zero risk. This will be a dynamic system with new chemicals coming in, and Ecology's efforts to reduce them in the waste stream, as well as climate change impacts. When you look at the role of science, it's to help frame that risk and it's up to managers to manage that risk. Risk is never going to be zero, so we need some idea of how we can move forward with what we have, while being aware of and sensitive to new information and new chemicals. The study points out a very high potential for this kind of use of highly treated wastewater with fairly minimal risk. In other sites, you are going to have different hydrology, other changing conditions, but this study has been very successful at accomplishing what we wanted to accomplish.

Audience member: Part of science is validating what we thought was going to be true, and to see if it is still true in the future. More monitoring, maybe running the models from time to time with new information, is something that we should expect at certain intervals.

Audience member: Are you concerned that Washington State has no drinking water or recharge regulations with regard to pharmaceuticals and other micro-constituents?
The HHRA used very conservative risk thresholds when looking at all of those chemicals, and everything seemed to drop out to below 10% of the toxicity threshold. So, at this point it doesn't look like we need those regulations. For PFAS, Department of Health is looking at chemicals that are of concern and when PFAS levels are set, those drinking water standards will likely inform other standards. Science is slow, and regulation-making is slow, but the state is doing due diligence in coming up with these regulatory standards. Even so, it will be important to monitor chemicals over time as new types of drugs come on the market, especially those that can cause a response at very low levels.

Audience member: With respect to public presentations, I agree that a higher level summary is needed for them, but in my experience we have a highly educated and experienced citizenry here, so a more detailed run-through should also be made. It's a good idea to have both a summary level and a detailed level.

Tina Peterson: When we started this process, there were not very many studies available for reclaimed water and a lot of them were in desert areas – not areas that get a lot of rain, like us. Are there new studies that are worthwhile for us to be aware of as we're winding this down to help understand things differently or better?
Jeff: To my knowledge, there are not a lot of new sites that have resulted in new studies. There has been continued study at existing sites. Five years ago, we were presenting some case study information where

similar facilities have been studied in the desert southwest, Colorado, and Florida – those sites all have seen continued study. I am not aware of any new information over the past five years that shifts the fundamental understanding of fate and transport of these residual chemicals.

Holly Gadbaw: 20 years ago when the LOTT partners made the choice to begin infiltrating reclaimed water, there were a lot of advantages to groundwater recharge, stream flows, etc. I like Dick's comment – maybe the study has shown that this method is sound and we just have to make sure it's safe because there are a lot of advantages to doing it this way.
This is one reason we undertook the study. It was a major undertaking, but LOTT is looking at the long range plan for the future and it depends heavily on expanding production and use and potentially infiltration of reclaimed water in the future. And we have learned a lot along the way.

Holly Gadbaw: I think the local governments need to be congratulated for doing the study, even though we're not sure what the results are yet.

Audience member: That raises the question if we are going to be adding more sites, and that was the idea to add numerous sites to infiltrate, those sites will have different characteristics. Will a study like this have to be done for each site?
No, not every component done here will need to be replicated. The study was designed to understand the local hydrogeology of the site. That part needs to be understood at every location – the groundwater flow model we developed that predicts where reclaimed water goes is very site specific. The other elements of the study in terms of chemical attenuation, much of that is transferrable to other sites. The fundamental hydrogeology has to be looked at and it is required to be looked at by state law. To permit a new infiltration site, you have to understand the local hydrogeology.

Maureen Canny: Jeff said that nothing has really changed with the hydrogeology modeling for the last five years. Has anything changed with the toxicity levels? Have other sites found increasing toxicity of those kinds of chemicals? Have they found a lot more chemicals of concern due to a study like this somewhere else?
There are a lot of similarities among studies. There is a lot of similarity in LOTT's reclaimed water and that from other facilities doing infiltration. Rephrased, what do other facilities see in reclaimed water? The constituents are very similar to LOTT's. What do other facilities see in the groundwater once it is infiltrated? Very similar to what LOTT sees.

Audience member: In fish, do chemicals accumulate through water exposure rather than from the prey they consume?
The dietary exposure route is significant for some of these chemicals. When we are calculating fish tissue concentrations, we use bioaccumulation factors which take into account the exposure from water as well as their intake through diet.

Wrap-up/Adjourn

Community Advisory Group and members of the public were thanked for contributing their thoughts and suggestions, and the meeting was adjourned at 8:30.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.8 Summary – March 31, 2022

Advisory Group Welcome, Introductions, Agenda Review
The meeting started at 5:30 p.m., conducted virtually and facilitated by Joanne Lind, LOTT's Public Communications Manager. Participants introduced themselves and the agenda was reviewed.

Presentation: Reclaimed Water Infiltration Study Draft Public Presentation (A-Z)
The Community Advisory Group was given a draft presentation designed for a public audience, providing an overview of the study start to finish. Following the presentation, the group was asked to provide feedback for the study team to use to improve the presentation.

The presentation was given in three parts:

IV. **Introduction**, Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director
V. **Study tasks and results**, Jeff Hansen, Lead Consultant, HDR Engineering, Inc.
VI. **Where we go from here**, Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director

Discussion: Feedback on Public Presentation
Question: What are your general impressions?

Bill Liechty: I feel like I just watched a pretty engaging TV documentary. You guys did a great job of taking a lot of years of research and data and turning it into a story that we can understand.

Dick Wallace: I echo Bill's comments. I thought it was really well done.

Ed Steinweg: It seems like a lot of loose ends have been brought together since our last meeting and it was very reassuring to see those things brought together with a list of options. Overall, excellent.

John Cusick: I agree with that assessment. It was a very good, high level overview of what's been done. I think it would be well understood by the public.

Questions: What were the take-aways from what you just heard? How was the sequencing of the information?

Tina Peterson: I thought it was great!

Maureen Canny: I thought it was good, too. Thank you very much for all of your work.

Bill Liechty: Lisa and Jeff are both very credible and that's important.

Karen Janowitz: Yes, both of you are fantastic presenters. It was a little odd to start at the end and go to the beginning, but I think it works. However, the points Jeff had at the end should be included up front

also. I wasn't sure at the beginning that you would be looking for recommendations – it sounded like it was a done deal and LOTT already knows what they are going to do. I would say up front this is what we're doing, and that we're going to be looking for recommendations.

Dick Wallace: Regarding the sequence, tell them what you are going to tell them, tell them, and then tell them what you told them. For example, on the front end you didn't mention the Master Plan, and the challenges with Budd Inlet water quality, and the opportunities to realize the advantages of reclaimed water. Start by giving the summary, walk through the details, then circle back to the Master Plan and the summary points.

Questions: Was anything confusing? Was anything missing? What could be better?

Karen Janowitz: What was missing was the context that we can't keep putting wastewater into Budd Inlet. We don't want residual chemicals, but there was a much bigger context that was missing. Putting it into context is the main thing. Also, the residual chemical charts were too busy with all of the dots – maybe separate them out for individual chemicals.

Maureen Canny: I got lost in the graph showing testing each quarter with different colored bars. And, over and over again it said there were two chemicals found to be of concern, but somewhere I saw a chart that listed three chemicals - the solvent, x-ray contrast agent, and flame retardant. So I was confused – are there two or three chemicals of concern?

Karen Janowitz: In Lisa's talk I didn't hear about the PFAS and the NDMA, and that felt like a disconnect because that was a big focus of Jeff's presentation, so it might be good to mention something about that in the beginning as well. The other thing is you need to simplify some of the language, the word "attenuate" for example. Find simpler words when you're bringing this out to the public. Also, be aware that a lot of people may criticize this because of PFAS, and the PFAS are pretty scary. Some people may say there is nothing safe about that. Regarding the slide with treatment options, it seemed there were some treatments that were really promising, even for the PFAS and NDMA and I don't know if you brought that up.

Maureen Canny: There was a chart showing the safe level as 1.0 and ours came out at 2.9 and that was mentioned to be only slightly higher, when you could say it is three times higher (2.9 compared to 1), so I was confused about that chart.

Scott Morgan: Regarding "recalcitrant" – they're not belligerent chemicals, they just aren't treated with the systems you have in place. In those charts that Maureen just mentioned, one has a single threshold and the other had a threshold range and that presents two very different pictures.

Question: What about the overall length? Was it too long? Too much?

Maureen Canny: For the general public, I thought Lisa's presentation was about right. For people who need more information, Jeff's presentation takes more time.

Holly Gadbaw: For people who have been involved in this over the years, it didn't seem too long; it was nicely condensed. However, the chart with the dots and triangles was very confusing and I don't know if the public would understand it. The other thing is that we spent a lot of money on this study and I don't know if people have keyed in on how much this cost and whether it was worthwhile. When the study started it was the worry about these chemicals and whether they could be treated. People were ready to go to a higher level of treatment right away. It is important to note that we've spent a lot of money, but maybe we saved money in the long run. That's my take-away from that. Hopefully, this will relieve community concerns. I am also concerned about community forums. We haven't had very good luck at getting people to come to those. I would recommend articles in the local press and things like that might be more helpful for getting information out. People are not used to going to meetings anymore.

Scott Morgan: The City of Olympia did a story board project with their transportation plan a couple of years ago. They did a really nice job, it was online, and it got a lot more response than they were accustomed to getting, and different demographics, compared to in-person, live, evening presentations. I might be an outlier here, but I did feel the presentation was too long. If you have a committed audience that wants to know all of the details, it was very nicely shaped. But, if you're dropping in on the Chamber of Commerce, or a City Council, or a business group, you're going to need something a lot more condensed. You need to get people interested, to get them to want to ask you for the additional details.

Question: Would the little nutshell presentation at the beginning be sufficient for the Chamber of Commerce and that type of audience?

Karen Janowitz: I really liked some of the pictures, like the nutshell, because it lightens it up a little bit. Lisa's part would need to be expanded to talk about PFAS and be clear what you want from people – do you just want to inform them or do you want recommendations? That needs to be up front.

Maureen Canny: Maybe we could use study results at a federal/national level to influence getting rid of PFAS and NDMA sources. There is some conflicting information in the presentation: In one breath you're saying reclaimed water is not going to hurt you and maybe we don't need to do anything. Then it suggests we might spend $18 million or $218 million on new treatment technology. It was giving me mixed messages about whether it is safe or whether it needs a higher level of treatment, or whether we just need to monitor it for the next 100 years. Give some parameter to judge that and make it clear what you want people to provide input on. There is a whole lot of time spent minimizing the danger of these two chemicals, and a lot will change in the next 100 years, so continued monitoring needs to be considered. Where it said if a 6-year old drank this for 6 years, 350 days per year, a liter per day, it could cause harm – that applies to a lot of people. I have been in this house for 30 years, drinking the water. I wouldn't want my kid drinking that stuff. It might help to explain that further – is that reclaimed water from the source, or after is has mixed with groundwater?

Holly Gadbaw: When you get to the part about what happens next, you're going to need a couple of different approaches because some audiences, like League of Women Voters, are going to want more detail. Use local news sources, like Jolt and put it on your website, to give people a warmup before you go out to talk about it.

Bill Leichty: At the front end, when Lisa was doing her summary, the term "exposure above average" was brought out, and I don't know what that means. Somewhere, someone brought up that Class A Reclaimed Water is approved for any use except drinking, but I can think of a lot of uses that Class A wouldn't be appropriate for. In general, regardless of who the audience is, and the content you decide to use, the speakers need to be introduced so people understand who they are and try to establish credibility for each speaker at the front end. We talked a lot about messy data and giving a lot of information but only talking about a few of the data points. Jeff, you need a brighter pointer, so if you're going to talk about something in the data that's on the screen, try to direct the viewer to the data you're talking about. Another point – we started out talking about monitoring 409 chemicals of concern but when we started going through the filtering process, it showed starting with 134 and working down to two. What happened to the 409? Be sure to explain - were there 409 tested and 134 detected? A new term thrown out – hazard index. I don't know what that is and you seem to use that to evaluate health risk. That needs to be explained in a little more detail.

John Cusick: Regarding the cost/benefit analysis, Jeff you heard this the other day at the Task Force meeting, putting the cost in a per rate payer number would make more sense to the public.

Maureen Canny: I thought we actually started with like 1200 chemicals. Then, something like 409 parameters, and then down to the 134 chemicals of concern. Is that true we started with over a 1000 chemicals that you considered looking at and then narrowed it down?
In the earlier stages, we mentioned there are thousands of chemicals. I don't know if we ever had a number close to what you're saying. The distinction is the 409 was the total number of parameters, not residual chemicals, including things like nitrates or calcium. The 134 residual chemicals is a subset of the 409, and these are unregulated chemicals.

Maureen Canny: I would mention that this has taken nine years to work on plus the planning before that. And, highlight your science team that is in the background for all of this.

Presentation: Update on Task 3
Jeff Hansen, Lead Consultant of HDR Engineering, Inc. presented an update on the Human Health Risk Assessment and the Ecological Risk Assessment, including a refresher on the process and a summary of results.

The key findings were:

- Risks to human health from using reclaimed water to replenish groundwater as done at Hawks Prairie are quite low. Out of 134 residual chemicals studied, two were slightly above the minimum level of concern in scenarios involving exposure levels well above average.
- No risks to ecological health were identified. None of the residual chemicals were predicted to pose a risk to wildlife in watersheds influenced by reclaimed water.
- The Peer Review Panel (national experts) indicated the assessments were well designed and protective of human and ecological health.

Bill Liechty: Have any communities reacted (i.e. spent money for treatment) at comparable risk levels that we're seeing with the two chemicals of concern?
Some communities are engaging in treatment on these chemicals but it's in the context typically of direct potable reuse. This is where communities are treating water coming out of a wastewater treatment plant to an advanced level and then that water is going directly into treatment at a drinking water plant. For reclaimed water being recharged into groundwater, it varies. Earlier in the study we did some case studies on other places doing groundwater recharge. Some communities treat water to a level like LOTT does and others employ more advanced levels of treatment. The concentrations we are seeing of these PFAS chemicals are similar to or less than what other communities are finding in their reclaimed water. This trend was evident at the recent National Water Reuse Symposium. And, there's a range of what communities are doing in response.

Bill Liechty: Any idea why PFAS was lower with LOTT than in general?
It's hard to say. There's less industrial input into the wastewater stream here in the Lacey/Olympia/Tumwater area compared to other areas that might have a larger industrial component. Also, LOTT's reclaimed water process involves a fairly high SRT (solids retention time). The way the biology in the wastewater treatment system works, this is more effective at removing some of these trace organics than other forms of biological treatment with a lower residence time and where the age of the bacteria is less. There are multiple factors.

Holly Gadbaw: For the chemicals that are slightly above the minimal level of concern, are those the ones that would be suggested for monitoring and when does it become a level of concern? How do you determine that?

One of the reasons we are talking about this is because for NDMA, we didn't consistently see it in samples. It was only detected a couple of times in groundwater, so rather than saying we need to invest in higher levels of treatment, maybe we need to understand better what the degree of risk is from that particular compound. In the realm of PFAS, we know there is a lot of activity right now around regulation and that we are really likely to see regulations at the state and federal level soon. So, that is another reason why it seems advisable to monitor that suite of chemicals, so we'll be better prepared to respond when regulations come out.

Holly Gadbaw: I think the point to emphasize is that LOTT has been on the cutting edge. We even had to pay to develop rules for reclaimed water, so LOTT has been acting responsibly. And, we've asked the ratepayers for a lot. I don't know if they understand that. Going back to Tina's point, I don't think this is on anybody's screen anymore.

Dick Wallace: We talk about the Hawks Prairie area and Tumwater area, one with reclaimed water, one without, and we did some sampling. Is there any way to capture the incremental difference between a groundwater area that did not receive reclaimed water and one that did and what are the risks of each? What is the incremental difference if you add reclaimed water into an area?
We are limited in our ability to speak to that. The sampling that was done looking at Tumwater vs. Hawks Prairie was only one sample point at each of those groundwater sites. So, that was good data to understand certain things, but only a snapshot in time. In comparison, we did quarterly sampling at thirteen wells condensed around Hawks Prairie to really profile that specific location. So, with respect to the PFAS chemicals, we don't have the data to compare the two sites. We have the more conventional water quality data, such as nutrients like nitrogen, and when we do that, we see a similar picture between both sites. There is really no difference in water quality. So, we're limited in what we can do to answer that question with the data we have.

Dick Wallace: It seems like a good thing to acknowledge that even where reclaimed water isn't introduced to the system, you still find these chemicals because they are coming through septic systems or other pathways.
One of the options to be considered is expanded monitoring elsewhere to better understand contributions from other sources, such as septics.

Dick Wallace: That gets to Holly's point that we're on the cutting edge and we have invested a whole lot of money to try to do the study right, but LOTT's reclaimed water is just part of the picture. The other part is residual chemicals from other sources. We need to understand what the incremental improvement would be for the money we'd spend on enhanced treatment.

Holly Gadbaw: I think the monitoring is important, but there are things polluting the groundwater other than LOTT's reclaimed water. Where is money best invested? For example, is it more important to get more people off of septic systems onto sewer?

Presentation: Update on Task 4
Jeff Hansen, Lead Consultant, HDR Engineering, Inc. presented an update on the Cost Benefit Analysis, describing focus chemicals, advanced treatment trains, cost/benefit comparisons, and other strategies for addressing risks.

Holly Gadbaw: Early on, LOTT thought of using ozone and abandoned it. Is ozone dangerous? And, I thought we already use carbon filtration for the reclaimed water.

Ozone technology has advanced quite a bit in the past couple of decades. I can't speak to all of the decision points early on with LOTT regarding ozone, but it is challenging and there are risks with its

operation. If it was considered early on, it was probably not for removing residual chemicals but as a disinfection process. LOTT currently employs UV disinfection at the Budd Inlet plant and hypochlorite disinfection at Budd Inlet and at the Martin Way Plant. Carbon filtration is not currently being used at either plant. There is a sand filtration system at Budd Inlet. Granulated activated carbon (GAC) is carbon in a vertical vessel, very different from LOTT's current system.

Holly Gadbaw: But we wouldn't consider these advanced treatments until we get above a certain minimum level of risk. Are we going to go into this with the public?
We are wrestling a little bit with how to talk about this because of course we didn't know what was going to come out of the study. If we had different results and there were higher risks indicated, then we probably would be talking more actively about these different treatment levels and what should be considered. When we scoped out the study originally, we said we would look at these treatment levels and what they cost. Now we're in a situation where it seems advisable to fill in some data gaps around these chemicals before jumping to a major investment in additional treatment. That's one reason why we want to fold this conversation into the broader Master Plan because there are other options out there for how we might manage our entire system capacity into the future that are different than when we looked at things back in 1990.

Holly Gadbaw: That's the whole reason we did the study, because some people thought we needed to go to some higher level of treatment at the beginning. We looked at reverse osmosis when considering which treatment options to use, and we were overwhelmed by the cost of that. So, the basis of the study was to see what the risks were from reclaimed water.

Bill Liechty: Can someone speak to what's going on with acceptable level of risk in the regulatory community for both cancer causing and non-cancer causing chemicals? Is that the same threshold that's been there for years and years or is it moving in a more conservative direction?
I would really need my risk assessors to answer that question, especially with regard to any changes in stability of risk thresholds. In Peer Review, it was brought up that some states have guidelines for acceptable levels of risk and how that translates into regulatory action. I don't think Washington State is on that list. The concept of 1 in a million cancer risk is a standard threshold, but it doesn't drive all decisions. When EPA sets safe drinking water maximum contaminant levels (MCLs), there's the health risk that weighs into it and that's not always one in a million risk. Sometimes it's less than that, but then other factors weigh into it, like cost effectiveness, and what level of cost is needed to get to certain levels of chemical. That's the challenge with respect to the study - all of these chemicals we are looking at don't have that regulation set. LOTT's trying to be careful, but LOTT is not a regulator – they can't set that level, but is interested in community input on what level of risk is acceptable.

We are just trying to present the facts from the study and rely on our Science Task Force and Peer Review experts to help us interpret what this really means in terms of level of risk and degree of safety and convey that to the community.

Scott Morgan: I would like to suggest there's a slightly different narrative here, and you're all touching on it. Maureen said earlier that we started with 1200 chemicals, and we did start with about 1200 chemicals of emerging concern. Many were taken off the list because they were not identified in reclaimed water or there wasn't even a methodology to determine the presence of those chemicals at the concentrations in reclaimed water. You've gone through this very intensive process of identifying what's there now and what's the concern now. But, we know that is going to change in many ways – the regulatory structure, and when PFAS is phased out something else will come into place. So, this narrative is that we need to pay attention. At this moment in time, there is a very low level of concern on these particular chemicals. But when you start asking for advice and comments on the future plans, you need to think about not just addressing those two chemicals, as if it's a static situation. The future plans need to allow us to pay attention and stay on top of the changes that will come down the road. Everything leading up to it is great, but your final little bit says these are the only two things we need to address and I think that is relatively short term.

Dick Wallace: In the same vein, we start out with a large number of chemicals, we boil it down to the two that popped out with the sampling. Now we're looking at alternative treatment methods, and cost vs. risk centered on those two, while theoretically those various alternative treatments and the cost vs. risk would apply to all of the ones we looked at that didn't necessarily pop out and ones that might be coming down the pike. So, it would be good to try to characterize those alternative treatment methods not just for those two chemicals that popped out of our study. And, we need to consider the other pathways to exposure. For instance, bacon and beer as a source of NDMA is pretty depressing to me, if I am exposing myself even when I'm not drinking the groundwater.

Maureen Canny: Now you have the wells drilled, you have the strategy, the methodology, the experts, so it's not going to be as expensive to continue to monitor evolving chemicals.

Tina Peterson: Through this whole thing, I've been thinking at this point it doesn't necessarily make sense to do reverse osmosis, when you look at the cost and what happens. But, realistically with climate change and needing water, at some point maybe we'll have to drink the reclaimed water, so we need to keep looking at different options as time goes on because 20 years from now, we may need to drink this stuff.

Holly Gadbaw: Who makes the final decision?
The idea behind folding this into the Master Plan is that then we will look at this issue in that broader context. We're not just talking about reclaimed water, but how do we manage water resources across our community, as our community continues to grow, and as conditions continue to change. I believe it has been LOTT's intent, since we put this long range management plan together, to build a plan for the future that is very flexible. So, all we learned from the study helps inform the process, and we can make sure as we revisit and refresh that long term plan that we continue to have options that are flexible. There will be future LOTT Boards of Directors who will look at how conditions change, who could be in a position of saying we need to do things differently. And, as Tina said, there may be other drivers to cause

the community's need for water to change and we might want to treat all of the way to potable standards. That is certainly a possibility for the future. The decision could come from various different places.

Presentation: Next Steps and Public Engagement
Lisa Dennis-Perez, LOTT Environmental Planning & Communications Director provided a summary of next steps, and a public engagement process, including a series of community forums. Community Advisory Group members were asked to comment on the proposed process, to provide ideas for building interest and participation, and to suggest key questions to ask.

Karen Janowitz: What is the timeframe?

We are hoping we can get all of this public engagement material ready to go by the middle of this year and potentially have the first community forum in June. Then have the additional forums in the summer and early fall, so before we get to the end of the year we have a final version of the draft master plan. There is an end point, a finish line, and we are really close.

Holly Gadbaw: I think you need to warm the community up and get it back on their screen because I don't think a lot of people are paying attention or even know this is happening. I don't know how many people read the Olympian anymore, but we need to get information into the media and on LOTT's website. Warm up the community before you have forums.
There is a lot going on in the world, and a lot of competing topics. The idea of getting out in front with some media coverage is a great suggestion. We will try to get it out there so that people know that we've been doing this study, then introduce this opportunity to engage.

Bill Leichty: One question is whether people are willing to financially support further work.

Holly Gadbaw: Thank the community for supporting the work to date. I don't think they know what they've been buying.

Bill Leichty: The historical perspective Holly has is really valuable. I don't think too many people appreciate where LOTT has been over the years. That's good information to put out there if you're going to work with the Olympian or other news outlets.

Presentation: Study Schedule
Wendy Steffensen, LOTT Project Manager, showed a list of documents recently completed or anticipated to be completed within the next few months. She also showed the schedule for the Reclaimed Water Infiltration Study through completion at the end of 2022, concurrent with master planning.

Public Comment Period
Joanne Lind, LOTT Public Communications Manager, opened up the meeting for public comment, but no comments were offered.

Thanks again for your time. You saw on the schedule we have one or two more meetings of the Community Advisory Group. It is amazing that you have stuck with us for this long. Thank you so much! We really appreciate it.

Wrap-up/Adjourn

Community Advisory Group and members of the public were thanked for contributing their thoughts and feedback and the meeting was adjourned at 8:20.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.9 Summary
July 11, 2022, 5:30 PM

Advisory Group Welcome, Introductions, Agenda Review
The meeting started at 5:30 p.m., conducted virtually and facilitated by Joanne Lind, LOTT's Public Communications Manager.

Presentation: Study Update
Wendy Steffensen, LOTT's Project Manager, gave an update on recent study activities, including recent documents completed, recent and upcoming presentations, and regulatory updates.

Presentation: Preview Community Presentation (short version)
Lisa Dennis-Perez, LOTT's Environmental Planning & Communications Director, and Wendy Steffensen gave a preview of the presentation designed for partner jurisdictions and public outreach and requested feedback. The purpose of the presentation is to orient people to the study and encourage participation in the Community Forum and online Open House.

Discussion: Feedback on Community Presentation
Holly Gadbaw: A little bit about the history…. I would like to think that LOTT made decisions for all of the reasons you mentioned, replenishing groundwater, augmenting streamflows, etc., but the real motivating factor for choosing reclaimed water was because Department of Ecology told LOTT they could not put any more effluent into Budd Inlet. And, I think it is important for the public to understand that.
We want to convey that, so we will look at the presentation and clarify that point.

Karen Janowitz: I agree with Holly that we should point out that we're not allowed to put more treated wastewater into Budd Inlet according to the TMDL from Ecology.

Dick Wallace: I'm on board. This presentation is an improvement, because the other presentation didn't start out with long range planning. As Holly said, this is something we have to do in order to accommodate growth in the area. And, that's what led to reclaimed water infiltration and that's why we're looking at it for the future. That's the context for why we're doing this and for the "so what?" after we're done.

Holly Gadbaw: I don't think this committee is familiar with the Master Planning process.
That's one reason we hope that you will all participate in Community Forums coming up, so you can learn about that process as well. We'll explain issues addressed in Master Planning, and as you said, that one of the motivating factors for reclaimed water was the limitation on putting more flow into Budd Inlet. We are learning, through some of our Master Planning analysis that with new technologies for

treatment, it's possible we will be able to improve our performance with new technologies, so that we could put more water into the inlet without exceeding our discharge limits. We are excited about that and it is a more cost effective option than building more recharge facilities way up in the watershed - transporting the water great distances is very costly. We'll talk more about that at the second forum.

Holly Gadbaw: The other thing I am not clear on is the new legislation. Does it require that LOTT remove PFAS chemicals or are the manufacturers of products with PFAS required to reduce them?
LOTT is not required to increase their treatment to reduce PFAS. PFAS are not currently regulated in water or wastewater at the federal or Washington State level, and are not part of discharge limits at this time. New legislation will require phasing out some PFAS chemicals in consumer products by 2025. At the time this legislation was passed, it was the most ambitious legislation of that type in the country. The other piece is new toxicity thresholds for PFAS chemicals which have not been established in regulations, but are in an interim step. We do not know what the future holds.

Holly Gadbaw: It is important to emphasize what is happening with PFAS chemicals, because that is probably what worries people the most.

Audience member: I appreciate Holly's comments. I was involved when this was first set up. We were both members of the City Council. At the time, Ecology said no more water into Budd Inlet, but that was no more water at the current level of treatment. The decision to infiltrate was about the money; another option would have been to put another treatment plant someplace else, but that would have been far more expensive. At the time, there was no discussion of the risks. The expression was that the infiltrated water would "lose its identity" after it went into the ground.

Maureen Canny: Weren't leaking septic systems in rural parts of the county another factor? And did you also say the federal EPA is also limiting PFAS?
That is correct. EPA is looking at the toxicity thresholds for PFAS chemicals. They have some interim guidelines that need additional vetting and review, but they would be developing rules that would apply to the whole country, which could lower the thresholds for what is considered safe.

Maureen Canny: Will changing PFAS regulations be considered in the Master Planning process? And, will Sea Level Rise be taken into account?
Yes, both of those issues – treatment levels and sea level rise/climate change - are built into the Master Planning process.

Dick Wallace: The other point to keep in mind is that our Cities are using reclaimed water infiltration as mitigation in exchange for water right withdrawals, which they otherwise would not be able to do.

Holly Gadbaw: I do think that risks were considered at the outset. If you go back and look at the original study, you'll find some risk assessment. Cost was a consideration, because these other treatments are much more expensive, but I don't think we were oblivious to what the risks might be.

Scott Morgan: One thing that stood out for me in the presentation is the comment that the chemicals of concern are found where reclaimed water is infiltrated and where it is not. I think you need to say "also" to make it come across strongly enough.

Maureen Canny: That brings up a good question. Is it correct to think of the study area with no infiltrated water as the control? In comparison, are the residual chemicals found at higher concentrations in the Hawks Prairie area?
That is not always the case. The concentration of residual chemicals is only higher in the area of infiltration some of the time. When we looked at the Tumwater area (control area) vs. the Hawks Prairie area, these are 16 square mile areas and the Hawks Prairie area is centered on the reclaimed water infiltration site. Sometimes there was a difference, sometimes there wasn't. Sometimes Hawks Prairie was higher, sometimes Tumwater was higher. We would be hard pressed to say that reclaimed water was making a difference in residual chemical concentrations in the Hawks Prairie area at the time we sampled.

Joanne asked the group to anticipate what questions we might be likely to get when we roll this out to the public.
Karen Janowitz: People are going to want to know what chemicals were found, and how you know they're safe.

Scott Morgan: I agree. And, you're going to get questions about specific chemicals, such as levels of caffeine in Puget Sound salmon.

Maureen Canny: They're going to want to know how eminent is advanced treatment, to what degree, and what it will cost in their bills. They might also be interested to hear how industry peers from other parts of the country have responded to the study results, since you have been presenting the information at national conferences.

Karen Janowitz: Because you mentioned the advanced treatment alternatives, they might want to know more about that and what it would cost.
Maureen Canny: You mentioned upcoming newer technologies that might be less expensive or better, maybe people will want to hear more about what's coming and how far out there it is.

Ed Steinweg: It might be helpful to have a more clear slide or graph showing before and after for some of the chemicals of concern, to show the effects of infiltration.

Scott Morgan: We had really good conversation about some of the history and background, including constraints on the discharge limits. Those are really important because many people jump to solutions that don't really fit the constraints. And it would be useful to have a sense of the scale of this – how much wastewater is running through LOTT in a given timeframe? How does that compare to when that first Master Plan was made, and how much is being diverted to reclaimed water?

Karen Janowitz: And, what's the best way to illustrate how much water that is – so many lakes, swimming pools, or …?

Holly Gadbaw: Has the study been completed? Some of the fact sheets say to be completed in 2021, others say 2022. And is the public process that's coming up part of the study or is it a reaction to the study?
The scientific portion of the study has been completed. We're not quite through the final reporting phase of the scientific portion of the study. We're working on the public engagement portion of the study and all of it we expect to have complete in 2022. We'll go back and look and make sure the materials are consistent.

Maureen Canny: People will also want to know what kind of monitoring will be done and can they feel safe drinking water from wells in the area. They'll want to know someone is watching out for residual chemicals. How often will testing be done and will it be ongoing?

Dick Wallace: It might be good to sprinkle some dates in there, like when the limits on the discharge occurred, when the master plan update occurred, when the study started, to give people an appreciation that this has been going on a long time and has been given a lot of thought.

Audience member: When I raised the question some years ago about why don't we purify this water to drinking water standards, the answer I got was a question: Would you like to have your sewer bill tripled? There was no interest in doing an analysis, and thank goodness we are finally doing an analysis. Also, we did not study all of the chemicals in the water; we studied a very small number of chemicals in the water. You couldn't possibly do them all. They were chosen by experts, but there is a chance for error in all of these decisions. If we are going to fully inform the public, that needs to be said.

Presentation/Discussion: Plans for Community Forum
Lisa Dennis-Perez, gave a brief presentation about plans for a Community Forum, online Open House and other planned public engagement opportunities. This included discussion of the sort of feedback we would be asking people to provide.

Holly Gadbaw: There needs to be some level of monitoring going into the future, so we can make good decisions about whether we need a higher level of treatment. Also, how much will continued monitoring cost and how will it be paid for?
Great point! We will be asking for feedback on proposed near term actions, including continued monitoring and generally what that looks like. We didn't think we would go so far as to scope that out and provide some projected costs, but that might be something we need to do.

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Holly Gadbaw: The public needs to understand that LOTT needs to make decisions about monitoring and that there are cost implications. They will want to know how much the study cost, how much continued monitoring will cost, and whether it is built into the budget such that LOTT rates can cover that.

Tina Peterson: I want to see data that says that we can't keep discharging to Puget Sound, and what changed such that maybe we can put more out there.
Yes, and that is very involved technical information about the treatment process at the Budd Inlet Treatment Plant, how that's changed over time, and how we've been able to perform better than our permit requirements. And, we've learned about additional technologies that might be able to improve that ever further in the future. That's the kind of information we would be sharing out at that second forum, when we get into Master Planning.

Tina Peterson: It's a cost / benefit analysis to see whether it's better to do better treatment and keep discharging to Budd Inlet, and how much would that cost vs. infiltration. I feel I don't have enough information to figure this out.

Maureen Canny: Another related question is whether LOTT is still planning to expand to more infiltration sites.
Again, that is all part of the Master Planning process. We have struggled to decide how much information we can throw at people all at once. That's why we came up with the structure of three forums, focusing first on the study, sharing out what we did and what we learned specific to the topic of reclaimed water and residual chemicals. As we get into Master Planning, we will be discussing decisions about the other aspects you just mentioned – our treatment performance at the BITP, what we've learned operating our reclaimed water facilities for the last ten years, how technologies have changed over time, and the benefits of infiltrating and recharging groundwater. These are all bigger picture context pieces that we will provide as we get into Master Planning.

Karen Janowitz: One thing that keeps coming up for me is what triggers which decisions? How will decisions be made? The alternative approach, for example, the public will have thoughts on it but they are not going to make that decision. What triggers the decision to go for more advanced treatment? How are decisions made? At what point and what triggers them?

Dick Wallace: The whole idea is there is only so much pollution that Budd Inlet can absorb and still maintain beneficial uses. And, there are alternatives for treatment. The permit comes up every five years for renewal that includes technology standards and water quality capacity of the water body. So it will be a multi-step process in Master Plan, future permitting, future TMDL – and that is a whole other can of worms. A lot of what's driving a lot of this is the dynamic between the Clean Water Act, and LOTT's discharges to Budd Inlet.
Regarding how these decisions get made, we are also getting questions about what we are going to do with feedback received. These questions about the approach moving forward are key. We need to take the temperature of our community members. Do they agree that we should be cautious and not jump to advanced treatment because we don't yet have all of the information? We don't know what the regulations of residual chemicals are going to look like. So, if we start planning right away for advanced treatment, what if we choose the wrong technology? Or what if we're treating the reclaimed water, but there are other sources of the residual chemicals in the environment and that's not going to solve the issue? The feedback will tell us if community members want to take that step sooner rather than later, without having all of the information. That will inform options we look at as part of the Master Planning

process. There is opportunity, through the Master Planning process to do a business case evaluation regarding whether it makes more sense and is more cost effective to invest in improving treatment performance at the BITP vs. building new reclaimed water infiltration sites and pipelines to carry that water to those sites.

Holly Gadbaw: That's a whole new study. My question is what are the future issues, what decisions need to be made, and what further information is needed to make those decisions? Back when the study first got started, there were concerns from elected officials and members of the public that infiltrating reclaimed water to groundwater was not safe. I think we've answered that question with this study. When we completed the first long range plan, we decided on groundwater infiltration, and we decided against a higher level of treatment. Now we know that right now we don't need a higher level of treatment. I don't think this is on most of the public's screen right now, so you need to give them basic information. There are two types of people following this – people who don't know very much about it and aren't very concerned, and there are LOTT followers. That's a very small number of people. So, when you give these presentations, you need to consider who is in the audience.

Scott Morgan: What I'm hearing is that you're starting with this summary of this long term scientific study. The immediate response might be "so what?". What does this mean? Does this mean we have to invest in new technology? Those are reasonable responses. Be prepared to tell people the "so what" means we're redoing our Master Plan, we are reconsidering the change parameters, considering changes looming on the horizon, and we want you to come to the Community Forum to talk about the Master Plan and help us work through those decisions. Because I think you'll get a lot of "so what" – does this mean my bill is going to go up? We all have to acknowledge that everything has a cost. Either we take the health risk or we spend the money for the extra treatment. Most people don't want to hear that costs will go up, but we have to acknowledge that.

Karen Janowitz: Regarding questions you might get….Even though it might be years and years away, how does removal of the 5th Ave. dam effect this?

Holly Gadbaw: I think we should state the recommendation that we continue to infiltrate, and to monitor, but I don't think the public has enough information to decide whether we continue or go right away to advanced treatment. Those are things we need to think about in the future, but I don't think you should ask the public to evaluate the options, without more information. I wouldn't frame the question like that.
We lay out the approach, and then ask for feedback as to whether the approach is appropriate – on a scale of not appropriate to very appropriate. There are two questions. The first one is: Based on the low level of risk, LOTT plans to continue the current practice of infiltrating, and to monitor for chemicals, and then to reevaluate in the future as needed. What do you think of that approach? The follow on question is: As an alternative approach, we could start planning for advanced treatment right away.

Holly Gadbaw: I don't think you should go there.
We have been struggling with this, wondering if we don't present the alternative, are we just dancing around the question?

Tina Peterson: You're just not giving people enough information to make that judgement.

Holly Gadbaw: How are they going to evaluate that? We're fairly knowledgeable, and we don't know enough to decide. I would characterize these as future decisions that are down the road. And, you need more information in order to evaluate.
For the Community Forum and online Open House, we will be giving the more in depth version of the presentation, like we gave you last time, and we'll be drawing on information in the fact sheets, so there will be a lot more information than you've seen tonight. Even with that, do you feel that we should keep our questions more general and pertaining to future decisions?

Holly Gadbaw: I think you should discuss possibilities for the future, but I don't think people have enough information, nor do I, to make an intelligent decision about alternatives.

Maureen Canny: I agree with Holly that we don't have enough information to know which is better – to go to advanced treatment at this point or to continue monitoring for the time being. You can ask general questions about proposed next steps, but not a survey asking the public to rate the options. What if they say you should do the highest level of treatment possible, no matter the cost? There are so many factors involved with new technologies, new treatment, new regulations, etc., it's not easy to give the options a rating.

Holly Gadbaw: The whole reason we did the study was to determine whether it was safe to infiltrate reclaimed water to the ground. We've answered that question, so why are we bringing up advanced treatment, until we have more information?

Maureen Canny: I do think it should be mentioned that there are ways to mitigate, but not to ask the public to make a decision after only getting an hour or two worth of getting information. Tell them this is what we're considering, there are a lot of options… what do you think? But not, ask for a rating. It's hard to quantify at this point.
Okay, we will reconsider how we do that. The advisory group's input is very helpful.

Content Review: Community Outreach
New and draft outreach materials were shown to the Community Advisory Group for their review and comment. These included online engagement tools, fact sheets, the project summary, and information about the video project.

Holly Gadbaw: In addition to issuing a press release, I would suggest meeting one-on-one with the editorial boards.

Scott Morgan: Are you able to get an insert into utility bill mailings?
We can try to do that, but sometimes it is tricky because of the cities' billing cycle. We can look into that but the timing might not fit.

Holly Gadbaw: Are you going to reach the Thurston Climate Action Team, and groups like that? I encourage reaching out far and wide.

Maureen Canny: ….and, Olympia Indivisible, and League of Women Voters, because they're doing a water study.

Lisa asked Community Advisory Group members to send their comments on the draft Task 4 Cost/Benefit and summary fact sheets, by Wednesday, July 13, in order to get them finalized and available as we go out and do community presentations. The last meeting of this group is anticipated in September of October.

Public Comment
At this point in the meeting, there were no members of the public in attendance and no public comment.

Wrap-up/Adjourn
Joanne thanked the Community Advisory Group for their perseverance, and the quality of their input.

Dick Wallace: I really appreciate not only what this group has put in, but also, the staff, and the engineering support. This has been a long effort, but it's worthwhile and it's good. We're taking that next step and I want to thank everybody.

The meeting adjourned at 7:20 p.m.

Community Advisory Group – Reclaimed Water Infiltration Study

Meeting 3.10 Summary
October 20, 2022, 5:30 PM

Advisory Group Welcome, Introductions, Agenda Review
The meeting started at 5:30 p.m., conducted virtually and facilitated by Joanne Lind, LOTT's Public Communications Manager.

Update on Community Forum and Study Activities
Wendy Steffensen, LOTT Environmental Project Manager and Lisa Dennis-Perez, LOTT's Environmental Planning & Communications Director gave an update on outcomes from the Community Forum, online open house, and feedback survey. They also provided highlights of recent presentations to the public and industry groups, as well as other study activities.

Presentation: Master Planning Update & Community Presentation Preview
Lisa Dennis-Perez gave a preview of the draft presentation prepared for partner jurisdictions and public outreach. The presentation explained the master planning process and options being considered to meet future wastewater capacity needs. Results of the Reclaimed Water Infiltration Study are being incorporated into review of future options. The Community Advisory Group was asked to provide feedback on this draft presentation.

Questions and Feedback on Master Planning
Joanne Lind facilitated discussion on the draft master planning presentation.

Tina Peterson: Regarding the proposal for a new, major airport in the county in 2050, have you been looking at that in terms of the increased need for wastewater treatment?
That has not been part of our population or wastewater use projections. LOTT looks to Thurston Regional Planning Council for that data, and we do not believe the airport proposal has been considered in their current population numbers. We'll definitely need to pay attention to that.

Audience member: You're very concerned about nutrients, as you should be. But, do you test the effluent after it's gone through your treatment processes? Do you test what's in Budd Inlet for other contaminants, and any of the animals that might be there? Are you testing beyond the nutrients and testing the animals?
LOTT has a lot of requirements for testing the treated water that goes into Budd Inlet. The daily tests focus on pH, nutrients, and things of that nature. On a less frequent basis, we are required to look at specific chemical compounds and other parameters in addition to nutrients, and to perform bioassays to look at how the water affects animal life. That's all part of the permit process and thousands of monitoring points that need to be met on an annual basis.

Karen Janowitz: As far as feedback on the presentation, take a look at the graph showing how further treatment yields capacity. I'm generally good with graphs and this was hard to understand. For starters, write out TIN. What does the curved line show?
This curved line shows how capacity changes based on changing the concentration of total Inorganic nitrogen (TIN). If the effluent concentration of TIN is 3 mg/L, you hit the curve close to 12 mgd capacity. If we can perform better, and can achieve 2 mg/L, then the curve shows that capacity increases to 17 mgd.

Karen Janowitz: I think it would help to put words, in lay terms, near the curved line to say, "lower nutrient levels would allow for more discharge" or words to that effect. Also, mention or have a slide to say that we are regularly testing for water quality parameters. Safety is what people are going to be concerned about.

Dick Wallace: I thought it was really well put together. Having been in the business, I am probably overly sensitive, but when you talk about things like strict permit limits, speak about the studies that have shown that Budd Inlet is particularly sensitive to nutrient loading. In addition to saying "strict permit limits" tie that to the water quality sensitivity and benefits, in the same voice.

Holly Gadbaw: I have a few questions for clarification: how much water is LOTT permitted to discharge?
LOTT is permitted to discharge flow as long as we do not exceed our limit in terms of the total load (in pounds) and the concentrations of total inorganic nitrogen and other parameters. So, it is not necessarily a flow quantity limit, but we have to meet limits in terms of different parameters, including nitrogen and biochemical oxygen demand.

Holly Gadbaw: So what is the daily average now?
About 13 million gallons per day. This graph shows we are performing better than our permit would require. Our concentration of total inorganic nitrogen (TIN) is below 3 mg/L to allow discharge of more than that 11.5 mgd.

Holly Gadbaw: When we developed the original plan, the reason we went with satellite plants was because we were told by Department of Ecology that we couldn't discharge any more effluent than what we were doing. So, are you consulting with Ecology regarding whether increasing more effluent, as long as within nutrient limits, will be okay?
Yes, we are talking to Ecology about options and where we think we're headed. The difference may be that in the late 1990s, when the original plan was put together, it was not conceived that wastewater treatment could achieve nutrient levels as low as technologies now allow. At the time, Ecology's position was that it was not technologically possible for LOTT to treat to a level where it would be okay to put additional flow into Budd Inlet. That has changed quite a bit.

Holly Gadbaw: With regard to sea level rise, is LOTT confident that the Budd Inlet Treatment Plant will remain operational through 2050?

Yes, we have been working with City of Olympia and Port of Olympia to develop the Sea Level Rise Response Plan; we've taken a look at the plant and its elevations and what we would need to do to protect it. The conclusion was that it looks reasonable and manageable to protect the plant through 2100.

Holly Gadbaw: I think that is something that people in the community will be worried about.

Maureen Canny: With regard to drought and climate change, is there concern that if we continue to discharge into Budd Inlet and not recharge our groundwater, we are going to run low on groundwater because of the growing population drawing groundwater? If we don't restore the groundwater through golf courses and infiltration ponds, will our groundwater dry up because it is all going into Budd Inlet? Is it in balance – is it raining enough to restore groundwater without infiltrating it?
That is a great question, and I don't have the answer. LOTT has not looked that broadly since we are focused on the wastewater piece of things. The master plan and the direction we're heading is still very flexible. So, if at some point our community says they have a different need, we'll be able to pivot and we have options to meet those needs. It might be groundwater replenishment, it might be treating water to higher quality. In some areas, like in Lacey, with growing demand for potable water supply coming from groundwater, mitigation is already part of the plan with groundwater recharge with reclaimed water. In that area, recharge is going to continue and there are plans to expand that to address issues related to growing pressures on the water supply in the Lacey area.

Maureen Canny: Would recharge need to be expanded, not just because you want to get rid of the water and not dump it into Budd Inlet, but to reuse that water beyond what Lacey is currently doing?
It is on the City of Tumwater's radar as well and they've been actively looking for locations where they might be able to recharge to replenish groundwater.

Dick Wallace: That is why, on the water quantity side, there is a permit for the city to withdraw water. Ecology said there is no more available; it is totally capped, which is why they started to look at options like mitigation through reclaimed water. That's recognition that we are reaching a point where no more net withdrawal of groundwater can happen.

Bill Liechty: As a lot of you know, each water utility - Lacey, Tumwater, and Olympia - is doing long range water resource planning, and I've got to think that they've thought well down the road about where they're going to secure their water. Are they all on board with the decision to increase discharge to Budd Inlet, and maybe slow down on the recharge?
We have been talking to the partners throughout this process. That included asking them to try to estimate and project their future demand for reclaimed water, in terms of reuse, irrigation, and recharge. How much reclaimed water do they think they would want and need, and roughly on what timeline? Then, we completed an inventory of their projected needs for the future. This strategy to expand the Martin Way Plant and the Budd Inlet Reclaimed Water Plant, once those projected demands become reality, is still expected to meet the partners' needs as projected at this point in time. Of course, things could change in the future and that's why we want to make sure we have options.

Audience member: I am speaking from the perspective of the value of aquifers and the difficulty / near impossibility of remediating in the future. Let me acknowledge that this is a regional leading piece of work and very important to those of us in other parts of Puget Sound. I'm in Kitsap County and the county is looking at the issue of what level of treatment is appropriate for what size of receptor. Do you get a lot of dilution by putting it into Puget Sound? What are the impacts when you switch up the treatments to a degree and put it into a relatively tiny body of inaccessible groundwater? Here are my comments:

1. Early in your summary you note that some chemicals found in reclaimed water are found in other areas (where there is no infiltration). The implication is that those continued insults to the groundwater are acceptable. I don't find that to be a logical or scientifically valid position.
2. The analysis is a single chemical analysis; it doesn't look at combinatorial, synergistic, and antagonistic effects of different compounds that get into the water. In California, they have used various types of bulk analyses, amphibian and fish models, in vivo testing, and more modern chemical methods. That point came up to me looking at pharmaceuticals; I provided a reference to Wendy a couple of years ago regarding some studies showing that if you take very low concentrations of pharmaceuticals and put them together, they do have adverse impacts. I think that is something that we are going to have to look at in the future.
3. How does the system catch the next nasty contaminant? We don't know what it will be and whether it will be single or multiple. How will we catch that in time, if you're rapidly infiltrating to an aquifer? *Thank you for sharing those points. We do plan to keep an eye on new research around these issues to keep tabs on changing conditions and new chemicals identified that may be of concern. That could entail additional monitoring and updating the study over time.*

Audience member: My main point here is to clarify what's not said in conclusions, specifying some of the limitations of the study.
We tried to be clear that the study has limitations and that we couldn't do it all with this study, especially answering questions about synergistic effects.

Audience member: Study results relate to ongoing discussions of whether secondary treatment is suitable for effluent disposed to Puget Sound, and the viability of aquifers some generations into the future. It's a tough problem. Water quantity is easy; water quality is hard.

Holly Gadbaw: For background, in the late 90s when the plan was put together, we made some projections about how much flow there would be in the future. Are we ahead or behind what we thought we would have?
I would have to look at those numbers, but my sense is we have not grown as quickly as we assumed. And, we had our flow reduction successes and found that the total flow in the system is currently not as high as what was anticipated.

Holly Gadbaw: I think it's good to emphasize the flow reduction successes and things that people can do to continue to help with flow reduction and source reduction. Is there a plan for ongoing monitoring of chemicals of concern?
That plan for additional monitoring has not been put together yet. That's going to take some time and we want to reengage our science task force and come up with a monitoring plan. We will probably start working on that the beginning of next year.

Lisa asked the group for feedback on the presentation. Was it too long? Too detailed? Confusing?
Audience member: I thought it was fine, in terms of length and detail.
Holly Gadbaw: I thought it was good. Right on, very informative.
Karen Janowitz: I thought it was great. There are a few places where you need to use simpler terms, but I thought it was right on.
Maureen Canny: I did, too. It was a good summary. Thank you for all of your work.
Tina Peterson: I thought it was great, too, especially if you can fix the one graph.
Ed Steinweg: I thought it was great, also. I would add a point to the graph that shows where we are right now.

Review of Draft Study Video
Joanne Lind showed a preview of the draft Reclaimed Water Infiltration Study video and facilitated a discussion with CAG members to get their feedback.

Holly Gadbaw: I was amazed that after ten years, you could boil it down to that 10-minute video that really told the story.

Maureen Canny: I really liked it. Thank you. I want a copy so I can show my kids.
After the video is finalized, a link to the final version will be provided to the Community Advisory Group and others who are interested.

Karen Janowitz: Scott and Holly, you were great! My only comment is A, B, C had dot, dot, dot, instead of the letters. My logical brain thinks it should be A, B, C. Otherwise, I thought it was great.

Celebrate Completion of the Study
LOTT project team members expressed their appreciation and gratitude to the Community Advisory Group members for their ten years of participation in the study and the invaluable contribution they made. Committee members expressed their appreciation for the thorough and well run process.

- Karen Janowitz: Has it really been ten years?!
    - Yes, the selection process *began in late 2012, ten years ago. It is amazing that you stuck with us, giving your time. Your feedback has been invaluable to help us figure out how to communicate this complex information in a way that people can understand, and keeping us on task to make sure we were addressing the tough questions. We really appreciate it so much. A huge thanks to you all – your role in this has been very important.*

Maureen Canny: I want to thank you for your patience with my many questions. You all have been so present, professional, efficient, and good-hearted. So, thank you very much.

Dick Wallace: I really appreciate the diversity of the advisory group, because we approached the study from a lot of different perspectives, which was helpful. And, I'll echo the comment on professionalism; the process has been educational and enjoyable, and I appreciate everyone's participation. Thanks!

Tina Peterson: I learned so much about sewage and reclaimed water – I had no idea before. Thank you so much for informing us. I'm hopeful that the community will be very appreciative of the hard work.

Bill Liechty: I think LOTT should be very proud of the study results produced. I'm grateful that you listened to us. As someone who has been in the regulatory world for many years, it is gratifying to see long range planning in practice. Seeing a utility learn from earlier plans and be able to adapt to the current conditions – that's how it is supposed to work.

Ed Steinweg: I really appreciate a process well done. This whole time has been enjoyable, interacting with the other members of the advisory group, and learning so much. Overall, very well done. Thank you!

Public Comment
Joanne Lind, opened the meeting to public comment.

Audience member: I've been really impressed looking at it from afar and I hope it leads to more investigations. The water quality issue is a huge issue. Department of Ecology is still signing off on secondary treatment for everything going into the sound. I hope to see the day when tertiary treatment or better becomes the standard for discharges going into the Sound, and a parallel improvement with infiltration.

Audience member: I live in Portland now, and they put all of their effluent in the Columbia River and they don't test for anything. I want to say how pleased I am that LOTT has done this study. I have been following the email updates and what you have done here is amazing! I hope you're teaching other cities a lot about what can be done to expand your treatment capacity while also making sure management practices are safe. I'm glad you're going to continue to look at trace chemicals. I want to compliment you on all the work you've done. I'm impressed and thankful for the work you've done.

Wrap-up/Adjourn
The meeting was adjourned at 7:30 p.m.