

# Reclaimed Water Infiltration Study

## Task 1: Water Quality Characterization



### Study Framework

The key question that the overall study is intended to answer is:

*What are the risks from infiltrating reclaimed water into groundwater because of chemicals that may remain in the water from products people use every day, and what can be done to reduce those risks?*

**The overall study has four main tasks designed to answer specific questions.**

#### Task 1: Water Quality Characterization

*What is the current quality of our local waters: groundwater, surface water, drinking water, wastewater, and reclaimed water?*

#### Task 2: Treatment Effectiveness Evaluation

*What happens to reclaimed water that is infiltrated to groundwater: where does it travel and how quickly, and how does the quality of the water change over time?*

#### Task 3: Risk Assessment

*What are the relative risks of replenishing groundwater with reclaimed water?*

#### Task 4: Cost/Benefit Analysis

*What are the costs and benefits of various approaches for treating and using reclaimed water?*

### Overview of Task 1

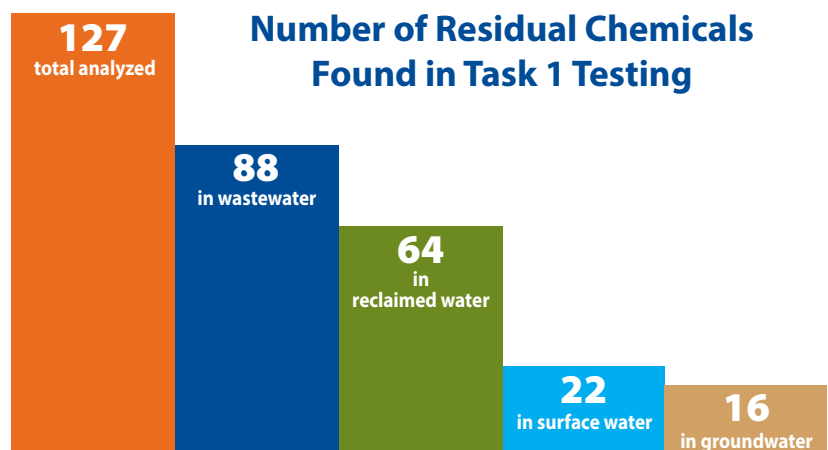
The first task of the Reclaimed Water Infiltration Study was Water Quality Characterization. This fact sheet provides highlights of this task. For more details about Task 1 and the overall study, visit [www.lottcleanwater.org](http://www.lottcleanwater.org).

Task 1 of the study focused on two main questions:

- Are residual chemicals from household and personal care products found in our local groundwater, surface water, wastewater, and reclaimed water?
- How effective are LOTT's treatment processes at removing residual chemicals from wastewater?

### Key Findings

- Residual chemicals were found at very low levels (parts per billion and parts per trillion) in all types of water tested.
- LOTT's treatment processes were found to be effective at removing many residual chemicals in wastewater and reclaimed water, but some chemicals remain after treatment.
- Residual chemicals were found in our environment – in areas where reclaimed water is infiltrated to replenish groundwater – and in areas where it is not.
- Findings are consistent with similar studies conducted in other places in the country and the world.



## Testing for Residual Chemicals

Groundwater, surface water, wastewater, and reclaimed water were tested for 127 residual chemicals. These chemicals come from household and personal care products people use every day, such as medicines, soaps, insect repellents, cleaning products, and some foods. These chemicals are not regulated in water, and wastewater treatment processes are not designed specifically to remove them. LOTT also tested for nutrients, bacteria, metals, and other chemicals that are regulated.

Sampling was done for four types of water:

1. **Untreated wastewater** at LOTT's Budd Inlet Treatment Plant and Martin Way Reclaimed Water Plant
2. **Reclaimed water** at the Budd Inlet Reclaimed Water Plant and Martin Way Reclaimed Water Plant
3. **Surface water** from the Deschutes River, Woodland Creek, and some smaller streams
4. **Groundwater** from municipal and private wells

Surface water and groundwater were sampled in two study areas: Hawks Prairie and Tumwater. The two study areas are similar, with mostly residential development – some served by the sewer system and some by onsite septic systems. The main difference between the two study areas is that reclaimed water is infiltrated into the ground to replenish groundwater in the Hawks Prairie study area, but not in the Tumwater study area.



*Budd Inlet Treatment Plant*



*Martin Way Reclaimed Water Plant*

## Residual Chemicals in Wastewater and Reclaimed Water

At LOTT's Budd Inlet Treatment Plant, wastewater is treated to advanced secondary standards before it is discharged to Budd Inlet. At the Budd Inlet and Martin Way Reclaimed Water Plants, water is treated to even higher Class A Reclaimed Water standards. Reclaimed water can be used for almost all purposes except drinking. It is used locally for groundwater replenishment, irrigation, industrial processes, decorative water features, and toilet flushing.

Residual chemicals decrease in number and concentration as water advances through the treatment process from untreated wastewater, to advanced secondary water, to Class A Reclaimed Water. The number of different residual chemicals found in untreated wastewater was 87 and the number in reclaimed water was 63.

LOTT's treatment processes were highly effective at removing some common chemicals such as acetaminophen, ibuprofen, caffeine, and triclosan (antibacterial agent added to soaps) to levels too low to be detected in reclaimed water. Only 19 residual chemicals were consistently found in all untreated wastewater samples and only 14 residual chemicals were found in every reclaimed water sample. For the 14 chemicals consistently found in reclaimed water, some were removed by 85% or more through LOTT's treatment process, but others showed little to no removal.

## Residual Chemicals in the Environment

In the two study areas, a total of 22 different residual chemicals were found in surface water and 16 were found in groundwater, at levels in the parts per billion to parts per trillion range. These chemicals were found both in areas where infiltration of reclaimed water is occurring, and where it is not. The residual chemicals detected most frequently were of four types. The first three listed – artificial sweeteners, flame retardants, and antiseizure medications – were also found consistently in reclaimed water, but the last type, pesticides, was not.

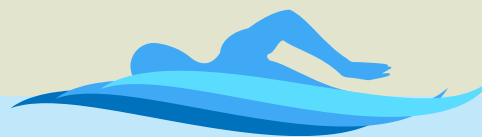
### 1. **Artificial sweeteners** (sucralose and acesulfame-K):

These were the residual chemicals found most frequently and at the highest concentrations. These chemicals are designed not to break down or be absorbed in the human body, so they also resist breaking down in the environment and in wastewater treatment processes.

### 2. **Flame retardants** (including TCPP and TCEP):

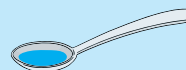
These chemicals are added to many manufactured materials, including plastics and fabrics. Particles from furniture, building materials, and other products can be inhaled and excreted, or washed off fabric in the laundry, and end up in the wastewater system.

## How small is a part per billion (PPB) or a part per trillion (PPT)?



**In one Olympic-size swimming pool  
(660,000 gallons)**

**1 PPB = 1/2 teaspoon**



**1 PPT = 1/2 drop**



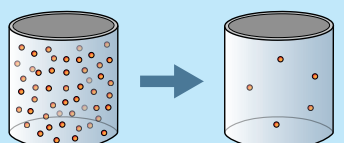
### 3. **Antiseizure medications** (such as carbamazepine):

In other studies, this type of pharmaceutical is often found to resist breaking down in wastewater treatment processes.

### 4. **Pesticides** (including the herbicide cyanazine and the mosquito repellent DEET): There are many pathways by which pesticides enter the environment, including stormwater runoff and wastewater.

## LOTT Treatment Process Removal Efficiencies

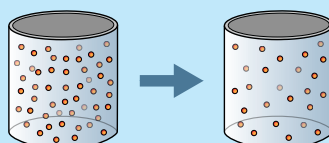
### Good Removal Over 85%



**Before Treatment**      **After Treatment**

- Acesulfame-K – sweetener
- Atenolol – beta blocker
- Cotinine – nicotine degradate
- Metformin – antidiabetic

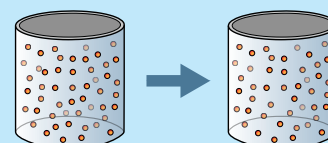
### Moderate Removal 85-33%



**Before Treatment**      **After Treatment**

- Carbamazepine – antiseizure
- Fluoxetine – antidepressant
- Iohexol – x-ray contrast
- Lopressor – beta blocker
- Primidone – anticonvulsant
- Sucralose – sweetener
- TCPP – flame retardant

### Poor to No Removal Under 33%



**Before Treatment**      **After Treatment**

- 1,4- Dioxane – solvent
- Iopromide – x-ray contrast
- TCEP – flame retardant

## Summary

Findings from Task 1, Water Quality Characterization, show that residual chemicals are present in local wastewater, reclaimed water, surface water, and groundwater, usually at very low levels. They are found in our environment in areas where reclaimed water is used for infiltration and in areas where it is not, indicating there are multiple sources of these chemicals. Water Quality Characterization is just the first step in the overall reclaimed water infiltration study.

## What's Next?

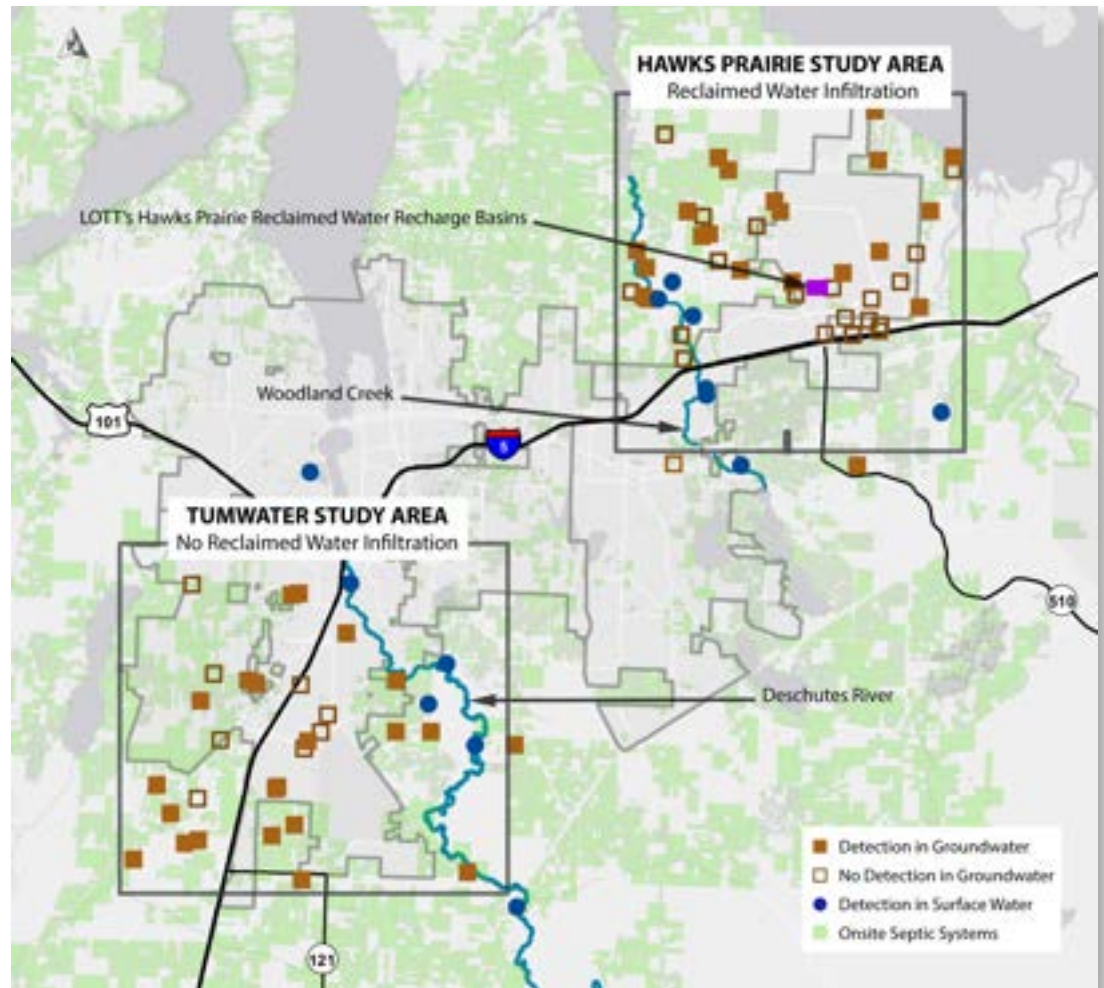
**Task 2** of the study includes a tracer test and water sampling to “follow” the reclaimed water as it infiltrates into the ground to determine where it flows, how quickly, and if residual chemicals decrease over time.

**Task 3** will build on the results of Tasks 1 and 2 to consider if there are any risks to human health or the environment from using reclaimed water to replenish groundwater.

**Task 4** will examine how risks might be addressed, including the costs and benefits of various options for treating and using reclaimed water.

The study is anticipated to be completed in 2020. Community conversations about study results will help inform decisions about future reclaimed water treatment and use.

## Test Locations and Residual Chemical Detections



## Get Involved!

- Learn more or sign up to receive email updates about the study:  
[www.lottcleanwater.org](http://www.lottcleanwater.org)
- Share questions or comments by email:  
[reclaimedwaterstudy@lottcleanwater.org](mailto:reclaimedwaterstudy@lottcleanwater.org)
- Give us a call:  
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