Great Salt Lake & Water Reuse

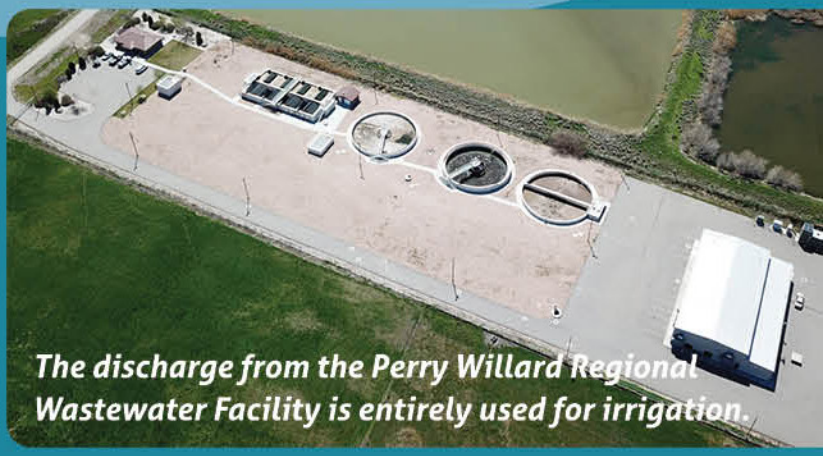
Determining the Future of Great Salt Lake

Introduction

Water reuse is the practice of treating sewage effluent to an acceptable level, based on type of reuse, and then distributing it to end users rather than discharging it to a waterway or a water body. EPA stated in its National Water Reuse Action Plan "Water reuse (also commonly known as water recycling or water reclamation) represents a major opportunity to assure the quality of and supplement existing water supplies from sources such as industrial process water, agricultural return flows, municipal wastewater, oil and gas produced water, and stormwater." In this report we use reuse to mean the recycling of water from industrial, commercial, and residential sources that are discharged to a municipal water reclamation facility (WRF).

Along the Wasatch front, reuse can provide a benefit by providing water for water security but may also be a significant negative by reducing flows to Great Salt Lake (GSL).

Average annual flows to GSL are about 2.9-million acre-feet. Wastewater discharges in the GSL Basin are about 280-thousand acre-feet or 9.7% of the average flow. Wastewater flows are a greater percent of the total flow on dry years.



The discharge from the Perry Willard Regional Wastewater Facility is entirely used for irrigation.

Regulations Governing Water Reuse

Utah Code Title 73-3C "Wastewater Reuse Act" addresses permissible water reuse based on water rights. This section of the Code allows for reuse "consistent ... with the underlying water right." It also assigns a priority consistent with the underlying water right. The Code also defines an application and approval process and finally it stipulates that reuse water "meet standards and requirements for water quality set by the Water Quality Board in accordance with Title 19, Chapter 5, Water Quality Act."

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PROTECTING WASATCH FRONT WATERS THROUGH COLLABORATIVE, APPLIED RESEARCH

Utah Administrative Code R317-3 sets forth the different types of reuses depending on where human exposure is likely (Type I) such as irrigation of landscape at individual houses or on golf courses, or where human contact is unlikely (Type II) such as irrigation on agricultural crops excluding where direct contact occurs with the editable parts of foods or for pasture for milking animals. This section also identifies the treatment level and limits required based on type of reuse and requires that reuse water have a chlorine residual. Finally, section R317-13 defines the approvals and permits required of a reuse project for a publicly owned WRF.

Types of Reuses

The following are types of reuses that may occur:

- Direct Potable Reuse
- Secondary Water Reuse
- Agricultural Reuse
- Cooling Water Reuse
- Aquafer Storage and Recharge.

In addition to the defined forms of reuse, it is also viable to consider ecosystem protection and recharge as a beneficial reuse.

Potential for Reuse in the GSL Basin

There are eleven major and several minor WRF's along the Wasatch Front. As stated, they discharge a combined current flow of 280 thousand acre-feet per year into the Utah Lake-Great Salt Lake complex. Of this amount, about 45 thousand acre-feet discharge into Utah Lake with the remaining going directly or indirectly to GSL.

Reuse could occur twelve months of the year, but most likely, except for aquafer storage and recharge, will only occur during the growing season or for about eight months annually. In addition, it would be difficult to reuse all flows during these eight months. It is estimated that during the reuse period about 75% of the discharge water could be channeled to reuse. Given these factors, total reuse is projected to be about 50% of total reclaimed water.

Of the eleven major WRF's along the Wasatch Front, eight have considered or are planning some form of reuse project, using some of their discharge water in the proposed project.

Costs for Reuse

Almost all the WRF can either now meet or will in the next few years be able to meet all of the numeric discharge standards for reuse with the exception of the requirement found in R317-3requiring an approved filtration process for Type I reuse. In addition some facilities may need to add chlorination equipment , too. The costs for filtration are dependent on the size of facility and the type of filters used. Filters could be cloth media filters, or they could be membranes. The range of costs for filtration could be as little as $250,000 per million gallon a day (MGD) treatment capacity up to $1,400,000 per MGD. While this is costly, it is much less than the cost of developing new water sources. In addition to the cost of filtration, there is also the cost associated with the delivery of water to the end users. The transportation of water to the end user could be as simple as tying into a nearby secondary water system or it could involve transport over a significant distance. As such, the cost increase for transport is highly variable.

New or rebuilt WRF such as this one in Salem, Utah requires only the installation of filters to comply with Reuse Standards.

A shrinking Great Salt Lake will reach a historic low water elevation in 2021.

Impact of Reuse on GSL

Water reuse impacts on GSL is dependent upon why reuse occurs. If reuse happens after conservation, and the reuse replaces depletion of natural stream flows and these natural flows remain in streams and go to the Lake, that could be good. In addition, water reuse could aid in water security and drought proofing. If, however, water reuse is used to augment existing water resources and is consumed by excessive water use or by population growth, then the water reuse will deplete the current GSL water supplies.

The quantity of potential depletion to the Lake is estimated at about 120 thousand acre-ft. This is based on (1) Utah County WRF flows are assumed to add little currently to GSL; (2) the remaining WRF flows are consumed in reuse at a rate of about 50% of total flows; and (3) there will be very little return flows from the reuse water.

According to 2019 Utah Division of Water Resources, "Executive Summary Bear River Development Report" the net depletion of water from GSL for this Bear River project is 85,600 acre-ft. The report further states that the effect on the level of the Lake is a reduction in Lake level from 8.5 inches to 14 inches depending on Lake level. Scaling from the Bear River report, the effect of reuse could reduce the Lake level from 12 inches to 20 inches. This drop is a significant impact to the Lake.

Impact on Wetlands

Several wetlands, particularly in Farmington Bay are fed with water from WRF's. These wetlands support millions of birds and other aquatic life that will be affected if the water is diverted to reuse and the wetlands dry up. 80% of all Utah wetlands are around the Lake. Other wetlands may remain, but the loss of any wetland area creates a loss of habitat in the ecosystem.

Central Davis Sewer District provides water for a significant wetland area in GSL.

Black-necked Stilt feeding in the wetland of Great Salt Lake.

Drying Great Salt Lake.

SUMMARY

More than 10 million migratory birds depend on GSL for habitat and food as part of the Western Hemispheric Flyway. The Lake has a direct and indirect annual benefit to Utah's economy of over $1.3 billion. If the Lake continues to drop the cost over 20 years could be more than $32 billion. As the second driest state in the United States, Utah's citizens use more water than most other states and this diversion has caused an estimated 11 feet drop in lake elevation. Years of drought and projected population growth will cause the Lake to drop further unless we take corrective action.

Water reuse can be either a further depletion of water to GSL or it can be source of secure water to the ecosystem. To prevent more water being diverted from Great Salt Lake significant conservation is needed. Water suppliers will make the decisions for reuse based on the collective actions of end water users. If conservation is enough, reuse will, by default, not deplete water from the ecosystem. If there is not sufficient conservation, reuse will become another piece of the puzzle further damaging Great Salt Lake.