

City of Sandy WSFP Detailed Discharge Alternatives Evaluation

Market Potential for Sandy's Recycled Water



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Key Findings

Sandy is located at the edge of one of Oregon's most important agricultural production centers. That setting seems like a perfect match for Sandy's recycled wastewater. During much of the six-month dry season, growers need water. Ironically, that's not exactly the situation.

Looking ahead to the availability of Class A water to be produced in the future by Sandy's membrane treatment facility, this has the potential to become a valued resource. The highly treated water will meet most federal/state drinking water standards and can be used to irrigate any agricultural crop -- including food crops.

However, a number of other factors limit the potential of using Sandy's future Class A water for agricultural irrigation. Despite the Sandy area's prominence as an agricultural production center, it's less than ideal in many respects for expanding Sandy's successful recycling program.

Key findings of the market analysis:

1. Sandy's current irrigation customer can accept all of the treated Class B water the City can deliver from its existing treatment plant. There's not enough water, now or in the future, to serve more customers from that source. There are no other immediate or near-term prospects (1-4 years) for marketing Sandy's recycled water for agricultural irrigation.



Sandy's current irrigation customer can use all of the City's Class B water for the foreseeable future.

2. Nearly all of the pipeline route options have adequately sized (20+ acres) agricultural land parcels to accept irrigation with recycled water. However, most candidate sites are committed to grazing livestock, raising Christmas trees or growing crops that don't require supplemental irrigation.
3. Nurseries –container nurseries in particular – consume much more water than other agricultural operations and are ideal candidates for recycled water. However, most of the Sandy area's nurseries are located north and west of the target area for Sandy's recycling program.
4. The best opportunities for irrigating with Sandy's recycled water are properties clustered along Kelso Road, just north of the target area. While the Kelso Road area holds the

best opportunities for water recycling, those may not be financially feasible here due to the distance from the transmission pipeline and the high cost of extending service.

5. Three other potential opportunities are worth considering for the long-term:
 - Purchasing a suitable agricultural parcel that could be leased to a commercial partner and operated as a container nursery, giving the City of Sandy greater long-term control over the irrigation program.
 - Partnering with the fruit processor in the Kelso Road area on a joint program to distribute recycled water.
 - Exploring the option of using injection well(s) or infiltration basins to discharge water that replenishes the water table in the Sandy-Boring Groundwater Limited Area.

6. With the national and local growth of organic food producers, it may become necessary to better understand their willingness to accept recycled water. Even though federal/state regulatory agencies now approve Class A water for all crops, it's possible the organizations that bestow "organic" certification may be reluctant to give their approval, and organic growers will predictably also be reluctant.

Sandy Area Climate			
<i>The coolest, rainiest place in the Portland Metro area:</i>			
<ul style="list-style-type: none"> • <i>Great for growing things</i> • <i>Not so great for finding irrigation customers</i> 			
	<u>Sandy</u>	<u>Metro</u>	<u>U.S.</u>
Annual Precipitation (inches)			
Rain	70	43	38
Snow	5	3	28
Rainy Days	175	156	106
• <i>Rainiest place in the Portland Metro area; one of the rainiest in Oregon</i>			
Sunny Days	141	144	205
Temperature			
Avg. July High	78	80	86
Avg. January Low	34	35	21

Overview/Summary

Program Summary

The City of Sandy is working to address pressing problems that confront the City's wastewater infrastructure. Sewage from Sandy's homes and businesses is treated at the City's wastewater treatment plant located on SE Jarl Road. Despite improved operations, the plant has been unable to reliably meet federal/state permit requirements. Sandy is also a growing community – in just 20 years its population has doubled to 11,000 residents and will double again over the

next 20 years. Investments are needed immediately to treat that wastewater and comply with laws designed to protect our streams and rivers.

As it leaves local homes and businesses, Sandy's sewage travels through a network of buried pipelines and pumps (the sewer collection system) to Sandy's wastewater treatment plant. The final use of the water from the treatment plant depends on time of year.

In winter treated water is returned to Tickle Creek (which goes into the Clackamas River). Higher winter flows from rain and snow increase the creek's capability to accept treated wastewater without harming aquatic life.

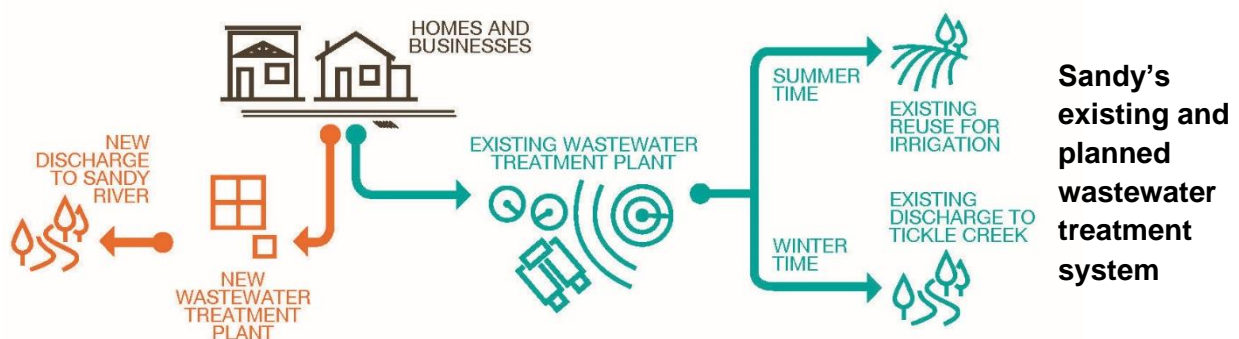
In summer the City produces highly treated "recycled water" that is used to irrigate plants at a nearby nursery. The City is proud to be conserving water resources through this longstanding, successful water recycling program.

The City of Sandy is working closely with the Oregon Department of Environmental Quality (DEQ) to address the community's wastewater challenges. Sandy is committed to keeping customers informed about plans for wastewater improvements, protecting water quality in local streams and rivers – and keeping service affordable.

Sandy is investing in these system-wide improvements:

Sewer system improvements – The City will repair and replace aging sewer pipelines and disconnect storm drains from the sewer. The City is currently identifying locations with the highest I&I (infiltration and inflow) flows where improvements can be made most cost-effectively. These improvements also reduce the volume of water to be treated and discharged from the wastewater plant.

Treatment plant upgrades – Sandy is investing in upgrades to the existing plant to bring it into regulatory compliance and make the most of the community's past investments. However, upgrading the existing plant to meet all of Sandy's long-term needs isn't feasible.



A new path forward – Studies show the best way forward for Sandy is to build a second wastewater treatment plant. The new plant will use state-of-art membrane technology producing high quality water similar to what comes out of the tap. Plans call for the highly treated water from this new satellite facility to be used to meet agricultural irrigation needs, or to be released to the Sandy River.

Building a well-functioning wastewater system that complies with current regulations and is poised for Sandy's future is costly. The City of Sandy recently increased monthly sewer rates for a typical household by 98% to build the financial resources needed to move ahead with timely system improvements.

Detailed Discharge Alternatives Evaluation

The City of Sandy's Wastewater Facilities Plan (WSFP) was adopted by the City Council in October 2019. The WSFP recommended rehabilitation of the sewer collection system, upgrades at the existing wastewater treatment plant, construction of a new Eastside Membrane Bioreactor Satellite Treatment Facility, and a new pump station to move treated effluent to a proposed year-round outfall on the Sandy River.

Uses for Recycled Water	
<p>Class A Water – Opportunities*</p> <ul style="list-style-type: none"> • Any agricultural or horticultural use • Groundwater recharge • Unrestricted recreation: recreational lakes, water features, fishing ponds • Parks, playgrounds, school yards • Residential and other landscapes • Commercial car washing • Aesthetic fountains • All uses allowed for Class B Water <p>*To be produced by the City of Sandy's proposed new membrane treatment facility to meet all federal/state standards for Class A water; bacteria and turbidity standards must be tested daily.</p>	
<p>Class B Water – Opportunities**</p> <ul style="list-style-type: none"> • Ornamental nursery stock, Christmas trees • Orchards or vineyards • Pasture for animals • Golf courses, cemeteries, highway medians, business/industrial campuses • Restricted recreational impoundments (no swimming) <p>**Produced by Sandy's current treatment plant; bacteria standards must be tested 3 times per week.</p>	

The new satellite treatment facility makes it possible to expand Sandy's longstanding, successful recycling program. The membrane plant will produce Class A water – suitable for any agricultural use and many other purposes.

The initial output is projected to be around .5 mgd (million gallons per day), increasing to .75 mgd over 20 years (see table).

Sandy Satellite Membrane Treatment Facility Projected Flows (mgd)*		
Initial	10 Years	20 Years
0.5	0.6	0.75
*Average dry weather flows (ADWF) mgd = million gallons per day		

To capitalize on this and other opportunities for sustainable solutions to the community's pressing wastewater needs, Sandy is conducting a Detailed Discharge Alternatives Evaluation. The evaluation includes a systematic assessment of the near-term and long-term potential to expand on Sandy's current recycling program.

In addition to completing a marketing assessment for recycled water, the Detailed Discharge Alternatives Evaluation will also cover:

- Diverting flows to existing treatment plants operated by WES (Clackamas County Water Environment Services) or the City of Gresham
- Roslyn Lake alternatives: treatment wetland, cooling effluent, infiltration ponds, evaporation ponds, "leaky" wetlands that allow gradual infiltration
- Sandy River stream survey
- Sandy River seasonal or year-round discharge, and outfall siting

Water Recycling Customer Outreach

Outreach to potential customers for Sandy's recycled water was carefully targeted to include:

1. Sandy's current, longtime irrigation customer – a wholesale nursery
2. Growers who had expressed interest in receiving recycled water from Sandy
3. Potential customers located along the discharge pipeline route options emanating from Sandy's planned membrane treatment facility.

Local agricultural organizations also contributed information for this analysis: OSU Extension, Clackamas Soil and Water Conservation District, and the Clackamas County Water Master.

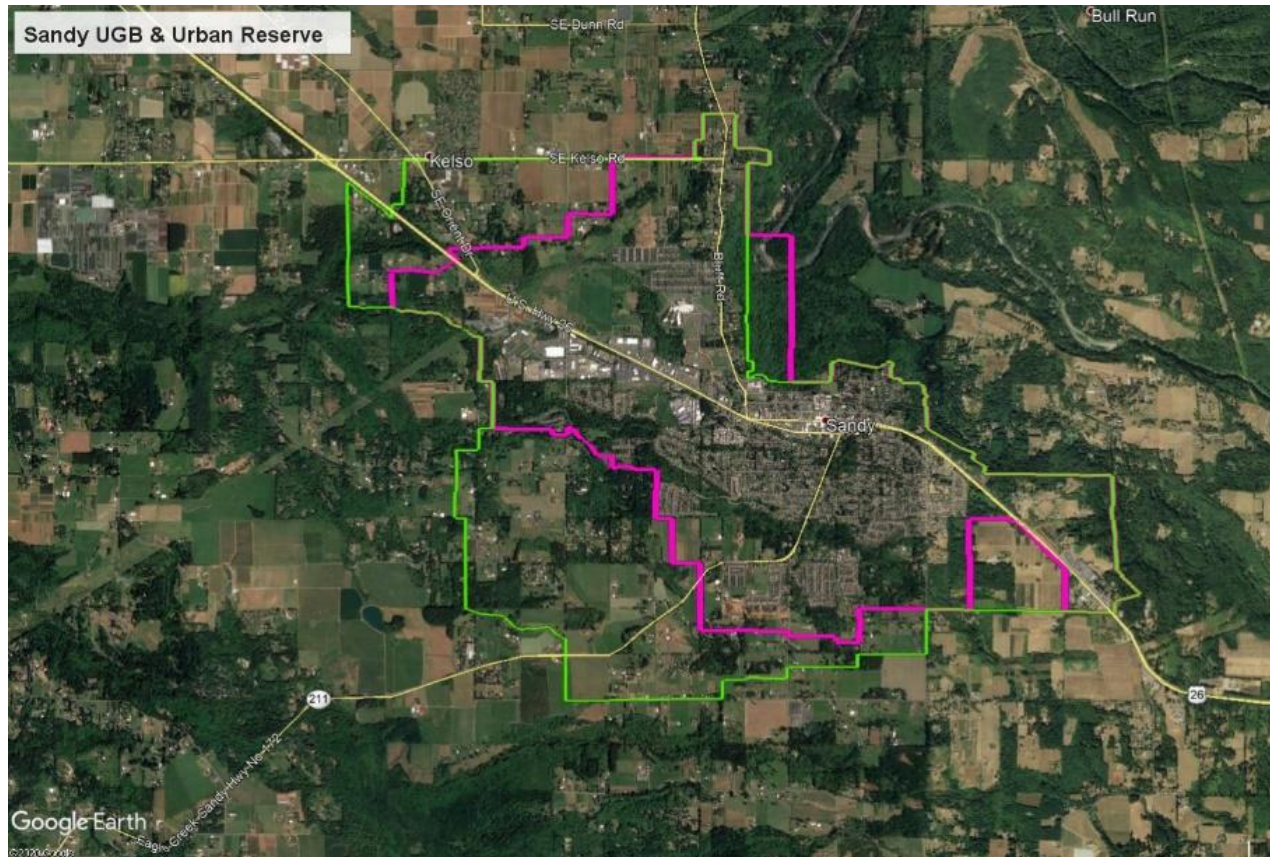
Given the pandemic circumstances in March-April 2020, all contacts with potential irrigation customers were by telephone. A fact sheet was provided to any contacts who requested more information (included in an appendix).

Project Area

The project area was defined as the agricultural area having the greatest potential to receive recycled water for irrigation from Sandy's treated wastewater. As initially envisioned, the search for irrigation customers would concentrate on two general areas:

- The area west of the City in the vicinity of the existing wastewater plant, near the current irrigation customer; and
- The areas north and northeast of Sandy in the direction of possible pipeline routes that would eventually connect the new membrane treatment plant to a proposed discharge point on the Sandy River.

Due to the high cost of piping the water – around \$3.5 million per mile – attention in these areas centered on candidate irrigation sites located within one mile of the pipeline routes (existing pipeline or proposed new pipeline alignments). The target areas were toured and photographed by the consultant team.



Further consideration was given to:

Zoning; with a preference for EFU (Exclusive Farm Use) zoned land and larger parcels (20+ acres); and also outside Sandy’s UGB (Urban Growth Boundary) – the area approved for future urban growth.

Current and historical use: with preference for sites currently (or formerly) in agricultural production, and not forested.

Elevation: farmland elevations in the target area vary widely from around 300 feet to 900 feet. At upper elevations – above 700 feet – sites may experience shorter growing seasons, limiting their potential for irrigation over the full six-month “dry weather” season. The preference is for sites at lower elevations with longer growing seasons.

These site characteristics are illustrated in the accompanying maps.

The type of crop grown is not necessarily a limiting factor, since Class A water is approved for any agricultural or horticultural use. While the type of crop isn’t a limiting factor for recycled water, different crops consume much different amounts of water. The most irrigation-intensive operations are container nurseries (such as Sandy’s current irrigation customer) that have a long (200-day) growing season and consume more than twice as much water per acre as pasture/grassland or traditional crops. The accompanying table compares water consumption for various categories of crops.

Crop	Irrigation Requirements*		
	Water Use (Annual)	Gallons Per Acre (Annual)	Daily Water Use 20-Acre Site (Gal)
Pasture/Grassland	2.0 to 2.5 acre feet	.65 to .81 million	72,000 to 91,000
Traditional Crops	2.0 to 2.5 acre feet	.65 to .81 million	72,000 to 91,000
Field Nursery	1.0 to 3.5 acre feet	.33 to 1.14 million	36,000 to 127,000
Container Nursery	5.0 acre feet	1.6 million	163,000

*Assumes 200-day irrigation season for container nursery; 180-day irrigation season for other crops

Conversion table:
 1 US liquid gallon = 0.133681 cubic feet
 1 acre foot = 43,559.9 cubic feet
 Gallons per acre foot = 325,849.6
Note: irrigation requirements vary due to soil type, weather, irrigation method and other factors

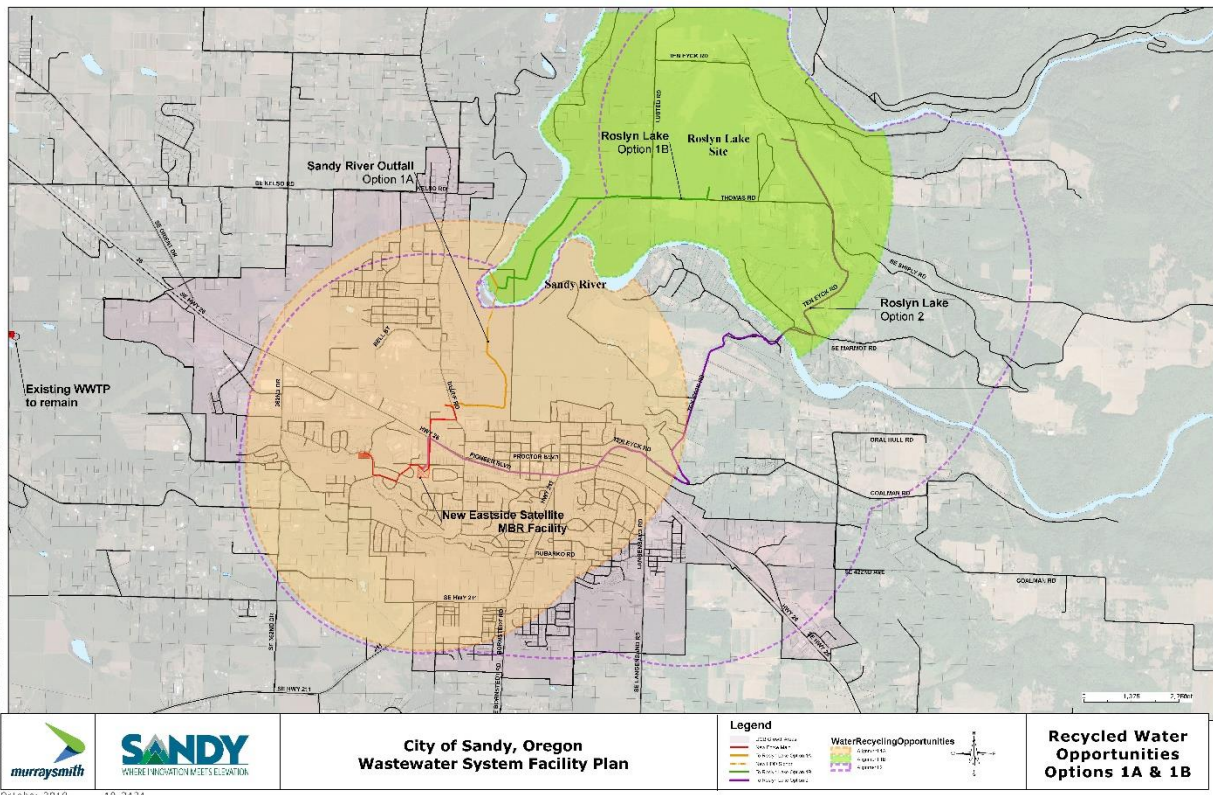
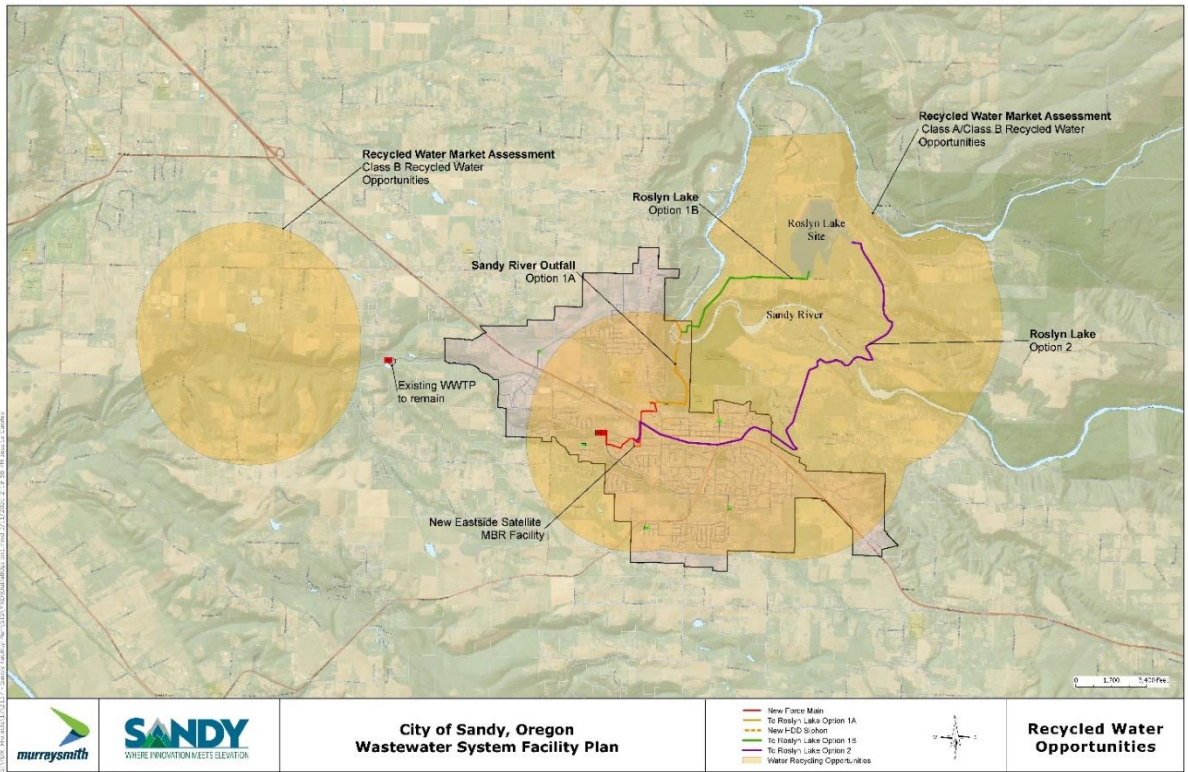


Container nurseries use twice as much water as standard crops.

Other factors to be considered include soil type, irrigation system, precipitation, and the availability of water for dry-weather irrigation. *Soils* in the target area vary. To accept seasonal irrigation, soils need to be well-drained but various soil types are suitable. *Annual precipitation* (rain and snowfall) in the target area ranges up to 74 inches – 85% above the Portland metro area average. Along with moderate temperatures, this is an important reason for the cluster of successful horticulture operations in the Sandy area, but also suppresses the demand for irrigation from other sources. Additionally, groundwater wells are productive in this area, generally at depths of 250 to 1,560 feet. However, the aquifer to the west and north of Sandy is reportedly showing signs of drawdown especially during the dry summer months with periods of heavy pumping.

For the target area west of Sandy, it was determined the City’s current customer can consume all of the irrigation water produced by the existing treatment plant for the foreseeable future. Also, the existing agreement for use and delivery of reclaimed water allows the customer to

“transfer deliveries of reclaimed water to other parties” – potentially locking up any future surplus that could exist. As a result, the search for new customers in that area was suspended.



Potential Water Users

Crops/Irrigation Potential in Project Area

Agricultural Water Use from the Existing Sandy Treatment Plant

The General Manager of Sandy's current nursery customer indicates they irrigate with all of the Class B water available in July and August, and generally also use all of the water available in June and September. He indicates they are highly satisfied with the current arrangement with the City of Sandy for irrigation.

The nursery manager believes there is no reason to supply water from the existing plant to any other agricultural user since their nursery can accept/use any more water that may become available. He also believes other prospective nearby water users grow food crops that reportedly cannot use Class B recycled water.

Agricultural Water Use from the Proposed New Membrane Treatment Plant

Analysis of crops and the potential for irrigation was conducted through a multi-step process. This began with a visual inspection of farming activity by driving routes that closely follow the discharge pipeline route options. This provided a good initial view of the type of farming currently in place and identified the main farm operations using irrigation. The tour also revealed the existing infrastructure that might be useful for supplemental application of recycled water.

The next step used the criteria described previously to identify farm properties, namely, focusing on sites in EFU zones and over 20 acres. Exclusive Farm Use (EFU) zones are important because these lands are designated for long-term protection from development and have characteristics best suited for producing high value crops that require larger quantities of applied water (e.g., nurseries and vegetable crops). Parcels larger than 20 acres are important because they have the needed size to economically incorporate additional water supply in their farm operations. During this investigation we also were able to see the type of farm infrastructure in place. Farms lacking basic improvements in land, equipment or buildings were also taken into account.

Clackamas County GIS parcel data that identifies tax parcels, map locations, and acreages was cross-referenced to Google maps and the Oregon Water Resources Department (OWRD) databases of irrigation wells and surface water diversions. This information was also cross-matched with OWRD map data on water rights for irrigation wells. The search for water diversion from surface water sources identified no irrigation diversions directly from the Sandy River or its tributaries in the target area that could be supplemented or replaced with recycled water.

This analysis identified a set of farm land clusters near each pipeline route option that might offer expanded irrigation using recycled water.

Many factors influence the view of agricultural property owners as to the desirability of considering new or expanded irrigation. While conducting the analysis, these factors were identified:

Ownership: Many Sandy area farms, especially those involving high-value crops, are operating under lease arrangements. In such situations, agreements for supplemental

Discharge Route Option 1A

Within the target area for Route Option 1A there are no farm properties in the target area, much of which lies within the existing Sandy city limits. However, if a transmission line could be extended north to Kelso Road, a cluster of farm properties there could possibly be served. The Kelso Road opportunity is discussed later in this report.

Discharge Route Option 1B

Farm Land Cluster 1

Extending the discharge pipeline to Roslyn Lake by crossing the Sandy River would allow service to farm properties in that area. Over 200 total acres of EFU land referred to as Cluster 1 are in an area west of Roslyn Lake. After excluding residential lots, steep slopes not suited for farming, and tree-covered sites also unsuited for farming, about 100 to 130 acres of land hold potential for recycled water; 60 to 70 of these acres are already irrigated. Most of this ground appears to be in annual crop cultivation, likely high value specialty crops requiring 2 to 2.5 acre feet of water per acre. The crop(s) could not be verified. Additional land is in pasture. This low intensity use suggests the ground may not be a strong candidate for additional recycled water.

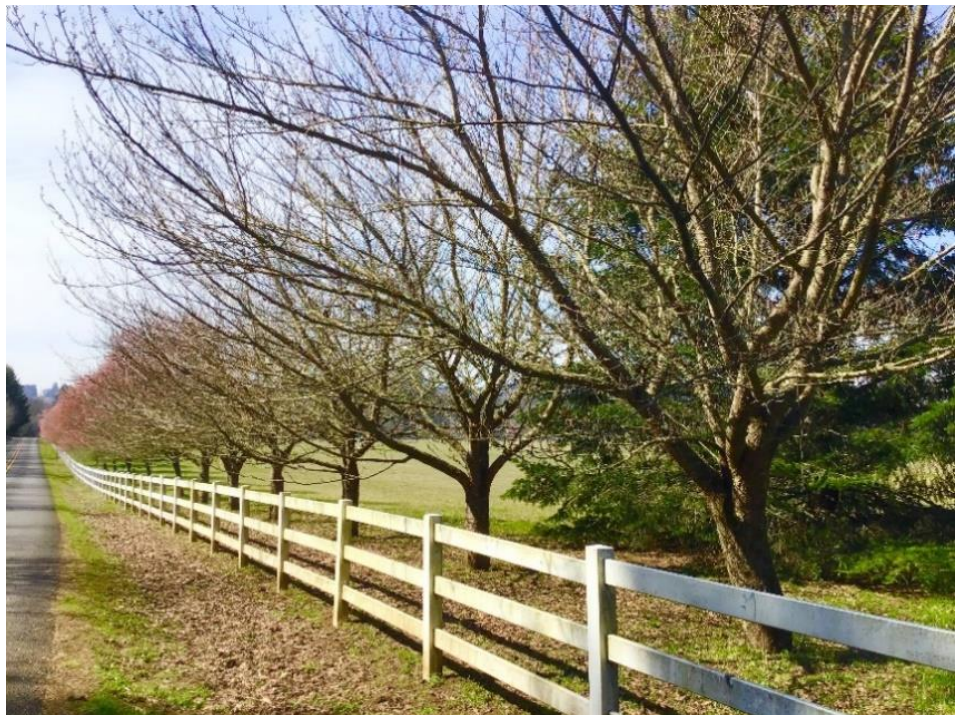
One property owner has an irrigation well on-site for applying water to portions of two parcels. The water right allows for irrigation of 2.5 acre feet per year during the irrigation season – enough water for most crops. No surface water rights for irrigation by any property owners were identified in this cluster.

One potential concern for additional water application here:

these properties are

situated at the base of a steep slope dropping about 100 feet in a short distance going west and south from Lusted Road. The farmed soils may already receive significant added surface and/or subsurface water by hydraulic connectivity down from higher elevations.

The farmed soils in this cluster are principally Bull Run silt loam with 3 to 8 percent slopes. These are generally deep and well drained soils but can be prone to erosion on sloped fields.



Pasture at Ten Eyck Road and Lusted Road near Cluster 1

This farm cluster in the Sandy River Valley is among the lowest elevation ground in the target area, at 500 to 540 feet. Microclimate factors such as wind, spring and fall temperatures, and winter snow cover are not known but could significantly impact farming in this area. The south-southwest exposure allows for added solar radiation that is beneficial in comparison to other sites.

Three property owners have crop land in this cluster. The preliminary estimate is crop irrigation here uses 145 to 180 acre feet of water annually (a mid-point estimate is 65 acres at 2.5 acre feet per acre on average). If the non-irrigated land is also placed under irrigation, this could double the water usage to an additional 145 to 180 acre feet annually.

Discussion with the farmer in this area revealed they use biodynamic growing methods including organic certification on all of their tilled fields. They say recycled water is not suitable for their methods and they are not interested in the City's treated water.

The Roslyn Lake area, located in this vicinity, wasn't itself considered for agricultural irrigation because it isn't being farmed and isn't zoned for agricultural use.



Irrigable field on Lusted Road in Cluster 1

Discharge Route Option 2

Farm Land Cluster 2

The land closest to the City of Sandy on Option 2 is divided to the west and east by Ten Eyck Road in the Sandy River Valley. All of these farm properties are south of the Sandy River.

A total of over 270 acres is zoned EFU, but many parcels are rural residential properties smaller than 20 acres, especially along Ten Eyck Road. Seven separate parcels equal or exceed 20 acres. Of these larger parcels, three properties have pasture or forage for livestock for a combined total of about 120 acres.

The largest of the farm sites is in two tax parcels along Fish Hatchery Road to the west of Ten Eyck Road. The total acreage of these parcels is just over 100 acres. The owner/operator of these properties is raising cattle with non-irrigated pasture and hay fields. No irrigation wells are on-site. The owner reports that some years ago his father talked to a nursery about raising ornamental trees or plants, but the idea was set aside because the ground



Large, unirrigated field in Cluster 2

is too wet from subsurface water and there was no interest in gravelling the land for a container nursery. The owner sees no reason or need to consider supplemental irrigation.

One other property owner with a larger parcel is west of Ten Eyck Road. This owner has 39 total acres and is establishing a food crop agricultural production. They have a new irrigation well, commercial size greenhouse and are working to improve the soil for irrigated crop production. They have established market channels via Portland area farmers markets and a Community Supported Agriculture (CSA) program for direct sales to consumers. As an organic producer, they indicate a reluctance to consider recycled water for their food crop business. This property features 15 to 18 acres on a lower terrace that is devoted to cattle pasture and hay production. This portion of the farm is at the same elevation as the two properties to the west that have drainage problems and likely has the same conditions which make it unsuited for converting to higher value crop production with supplemental irrigation.

The soils on the three properties that are managed for current agricultural production are Bull Run silt loams on terraces with slopes up to 5 percent. These are average in crop yield capability but may need tile drainage in order to produce high value vegetable or nursery crops.

Digital imagery for other properties east of Ten Eyck Road show either idle land or very low-level agriculture management. There is no evidence of irrigation on these properties. The fields, barns, corrals and other features indicate former livestock operations with little or no ongoing agricultural activity.

The elevation ranges from about 550 to 620 feet for most of the valley agricultural properties. The upper elevations to the south drain to add subsurface water on the lower elevation land, making farming and supplemental irrigation less attractive.

To summarize, in this cluster there is only one farm with improvements for intensive farming. That operation is an organic farm, potentially leaving little opportunity for supplemental irrigation with recycled water. Given the intentions of current property owners and the land conditions that do not favor demand for any supplemental irrigation, this cluster has little potential to use Sandy's recycled water.



One of the livestock producers with unirrigated pasture in the Sandy River Valley

Farm/Retreat Center Land Cluster 3

A group of properties along Coalman Road and Oral Hull Road in the Sandy River valley at the eastern edge of the target area were reviewed. There are three properties with 20+ acres in the EFU zone; two have cattle pastures and one is a retreat center. The cattle operations have a total of about 55 acres in pasture and hay. They are not using wells to irrigate their fields. One of the two property owners reports they have two springs which provide sufficient water for subirrigation (also referred to as seepage irrigation, where water is delivered to the plant root zone without the need for applied surface water). This is a natural occurrence near springs where the water table is high.

The retreat center has lawn and landscaped plants but is using little applied water from their well. Otherwise there is no irrigation on their property.

None of these three properties are considered reasonable for supplemental irrigation potential given their current status.

Farm Land Cluster 4

Five properties along Marmot Road are 20+ acres and zoned EFU. These are north of the Sandy River and follow a ridge. Elevation rises going east from 580 feet to about 900 feet. The properties slope to the south. The open farmland is mainly devoted to pasture for livestock grazing or grass for hay production. Most of the properties have a portion of the land in native tree cover. The largest parcel is 61 acres with about 20 acres in ornamental planting, probably



Cluster 4: Unirrigated hayfield on Marmot Road

Christmas trees (note that Christmas trees can be cultivated without irrigation). Much of the remainder of this property is in tree cover. It is also the eastern-most property and much of it extends outside the target area.

The remaining properties also do not have evidence of irrigation. The open ground of each is in pasture or hay, with the exception of one property that has less than 10 acres in Christmas trees. None of these properties have an agricultural base that would support supplemental irrigation, so they are not considered potential candidates for recycled water.

Farm Land Cluster 5

This cluster of properties is north of the Sandy River and along the ridge to the south of Phelps Road. The fields of these properties have southern exposure and are principally in grass production. Portions of these properties are cleared of native trees and probably started as livestock operations to pasture cattle and provide winter hay.

Three property owners have 20+ acres each and a fourth has nearly 20 acres. However, these four properties total only about 50 acres of open ground for agriculture. The non-agriculture portions of the properties are in trees, homes, roads and outbuildings. No irrigation wells are associated with these properties. A limited supply of irrigation water is indicated on two properties from Bowman Creek access. This provides a water source for higher value crops. One property also has its own irrigation well with about 4 acres of organic vegetable crop production. These crops are grown in a greenhouse and in fields, which also include plastic row covers.

Given the very small amount of irrigation activity, and the distance required to serve this area, it is not feasible to access with Sandy's recycled water.

Livestock producers predominate in Cluster 5



Farm Land Cluster 6

This cluster of farm properties is located to the southeast of Sandy and south of Highway 26. There are five parcels of 20+ acres in the EFU zone and within the target area. Four of these sites are

under one ownership. Only two of the properties have over 20 acres of agricultural activity and both are in Christmas tree production. These properties are dryland operations and not intensively managed. There is no potential for adding a significant amount of supplemental water for agricultural activity in this cluster of properties.

Farm Land Cluster 7

Properties in this cluster of EFU zoned land are south of Sandy. There are three properties of 20 or more acres that are close to the outer boundary of the target area. All three are within the Urban Reserve area for Sandy and close to the current city limit of Sandy. The largest parcel is about 43 acres and fronts on Highway 211. It has minor acreage in horse pasture and a barn but is mainly left in open, and nearly unmanaged condition. No irrigation is apparent.

The other two 20+ acre sites are not completely in agricultural production, and their use is forage or pasture grazing. Irrigation is not evident. These properties do not have significant potential for recycled water use.

Irrigation Potential by Farm Land Cluster

Farm Land Cluster	Discharge Pipe Route	Potential for Applying Recycled Water
1	Option 1B	Potential exists but subsurface drainage and water flows are questionable. Main property owner may not want recycled water due to organic standards. Maximum potential is 180 acre feet on multiple properties.
2	Option 2	No significant potential due to lack of water application by farmers
3	Option 2	No significant potential due to lack of water application by farmers
4	Option 2	No significant potential due to lack of water application by farmers
5	Option 2	No significant potential due to lack of water application by farmers
6	NA	No significant potential due to lack of water application by farmers
7	NA	No significant potential due to lack of water application by farmers

Note: There are no agricultural properties within the target area for Option 1A. Later in this report the potential to extend a pipeline to serve Kelso Road farm properties is reviewed.

Additional Irrigation Opportunities

Growers Who Contacted Sandy

Two Sandy area growers had formerly expressed interest in the City of Sandy's recycled water (some months ago). When contacted by the consultant team, they were no longer interested or did not respond.

Potential for Irrigating Airports

Two airports with grass runways are identified as potential sites for applying recycled water.

Sandy River Airport is privately operated with about 10 acres of grass. It is located between Clusters 2 and 3, which are not feasible for agricultural irrigation. The 10 acres with irrigation at 2.5 acre feet per acre would require 8.15 million gallons annually (or around 45,000 gallons per day during the growing season) – a volume that probably does not justify the cost to construct a supply line to that isolated location.

McKinnon Airpark appears to have little or no current use as an airport. According to a pilot website, <https://backcountrypilot.org/forum/mckinnon-airpark-sandy-or-og29-11076> for over five years this site has not been maintained for airplane access. The airpark was apparently operated by a former property owner. The current property owner has an herb farm and processing business. The farm is located west of Lusted Road in Cluster 1. Including the

open grass field around what may be a former runway, there are about 22 acres that could be irrigated. The field appears to be mowed and perhaps harvested for hay. No irrigation system can be detected. The property owner owns farmland in Cluster 1 growing herbs with biodynamic methods, and has expressed strong reservations about applying recycled water. Unless the property owner's plans change, moving toward more intensive management of this site, it would be expensive and unnecessary to install an irrigation system.

Conclusion: the identified airports are not viable options for irrigating with Sandy's recycled water.

Opportunities Along Kelso Road

The greatest concentration of intensive agriculture closest to any of the pipeline route options is along Kelso Road, going west from Bluff Road to Orient Road. However, all of the candidate sites along Kelso Road are outside the target area that extends one mile from the closest pipeline route option. The five sites range from about 1.0 to 2.3 miles from the proposed pipeline. Under another future scenario, if Sandy's existing treatment plant eventually has a discharge pipeline to Roslyn Lake or to the Sandy River, that would likely be better aligned to serve irrigation opportunities in the Kelso Road area.

This evaluation reviews the candidate sites along Kelso Road in order from closest to most distant from proposed pipeline routing. The analysis focuses on properties that have short- and long-term potential for recycled water use by nurseries. Most nurseries – especially container nurseries – use significantly more water per acre than other agricultural users.

Another factor is the surplus food processing water from the major fruit processor on the Kelso Road. This surplus wastewater from its processing facility is applied to irrigate company-owned fields and other nearby leased fields. However, DEQ reportedly wants this practice to end in the future. At this time the food processor indicates a reluctance to consider alternatives to their current practices, but this may change in the next few years.



89-acre irrigated nursery on Kelso Road

Property A: the first property for consideration to use recycled water, is an operating nursery currently for sale. It totals 88.8 acres with approximately 62 acres in irrigable nursery production. The table below estimates the potential total recycled water use.

Four additional properties near Kelso Road are also prospects for Sandy recycled water:

- *Property B* is a 39-acre parcel located south of Kelso Road, within Sandy's UGB. The property is in very low management and is suited for a container nursery. No irrigation well water is currently available.
- *Property C* is a 43.2-acre parcel leased by a commercial nursery and managed for in-ground tree production. It has a groundwater well but could be improved with supplemental irrigation. About 41.5 acres is irrigable. This property is in the Sandy Urban Reserve.
- *Property D* is in two parcels that together total 76.4 acres with about 68 acres irrigable. The land is leased by the same nursery that leases Property C and is also in ornamental tree production. This property is also served by a well.
- *Property E* is a 25-acre container nursery located near Kelso Road and Orient Road. It has about 20 acres in container production at full capacity. This property has two wells, but the owner would consider adding City recycled water to enhance their irrigation requirements.

An accompanying table estimates the recycled water use potential for each of these four properties.

Demand for Water

The cluster of farm land along Kelso Road offers the greatest potential for reuse of Sandy's recycled water for irrigation of agricultural land. Potential demand estimates are shown below. These are preliminary estimates to aid in determining next steps for the recycled water planning.

This preliminary analysis includes a review of data and information collected from soils maps, Oregon Water Resources Department water rights and well log data, Google maps review of land use, Clackamas County Assessor's data, City of Sandy incorporated and UGB boundaries, and discussions with land owners and agencies that manage water rights, soil and water conservation and Oregon State University Extension staff. No in-depth, on-site review of properties was conducted – although there have been some introductory discussions with property owners and producers.

The table below shows the irrigation demand for Property A, the site closest to the Option 1A pipeline route. Three scenarios are shown for configuring nursery plant production. (This is relevant since the nursery is currently for sale and will be under new management in the future.) The resulting demand for recycled water varies widely depending how the nursery is operated, and the analysis confirms that configuring the nursery as a container operation would maximize recycled water use.

Estimated Recycled Water Potential – Property A

Scenario	Irrigable Acreage	Seasonal Water Application (acre feet per acre)	Annual Water Use (acre feet)	% Supplemented by Recycled Water	Assumed Recycled Water Use (million gallons)
100% of acres in container nursery	62.0	5.0	310	50%	50.5
70 % in container; 30% in field nursery	62.0	4.6	282.1	45%	41.3
50% in container; 50% in field nursery	62.0	4.3	263.5	40%	34.3

Notes: Irrigable acreage excludes buildings, storage, parking, roads, and ponds. Some 14 irrigable acres of this property are south of Kelso Road, inside the Sandy UGB.

Traveling west from Property A four additional properties hold potential for nursery water application. Potential demand for recycled water at these four sites is shown in the table below.

Estimated Recycled Water Potential – Properties B, C, D & E

Property	Irrigable Acreage	Seasonal Water Application (acre feet per acre)	Annual Water Use (acre feet)	% Supplemented by Recycled Water	Assumed Recycled Water Use (million gallons)
Property B	33.0	5.0	165.0	100%	53.8
Property C*	41.5	0.8	33.2	40%	4.3
Property D*	68.0	0.8	54.4	40%	7.1
Property E	20.0	5.0	100.0	50%	16.3

**Note:* Projections for irrigating Properties B and C reflect the current crop (ornamental trees) and high efficiency irrigation system.

Property B has the greatest potential water use since it is assumed to be operated as a container nursery. However, it is not in extensive agricultural use at the present and is located within the Sandy UGB and could be converted to urban development.

Properties C & D are currently producing ornamental trees and have been leased and operated by the current commercial nursery for many years. This nursery uses a high-efficiency watering system that

reduces the amount of water required. They also have irrigation wells so the City's recycled water would primarily be supplemental for the summer months.

Property E, the furthest from the proposed pipeline, was recently purchased by the current nursery owner and is being redeveloped as a container nursery. While there are two irrigation wells on-site, the nursery could productively use more water for summer season supplementation.

Irrigation water demand is highest for nurseries, although the precise type of nursery production and the irrigation method dictate per acre water demand. Sandy is near some large nurseries, but the target areas for the planned alternative discharge pipeline routes do not encompass any large nurseries. The closest major agricultural water users are found along the Kelso Road corridor – just north of the target area.

The optimum conditions at Kelso Road indicate up to 132 million gallons of recycled water could be diverted annually to agricultural use, if all five properties operated at their greatest demand for recycled water. It also requires a pipeline extension of up to 2.3 miles from the main discharge pipe of Option 1A.

Apart from Kelso Road, none of the farm land clusters within the target area can contribute any significant agricultural water usage for Sandy's new membrane plant.



Irrigated crop (young ornamental trees) along Kelso Road

Current/Future Water Sources

The main water source for major irrigators in the study area is groundwater. This water is supplied by irrigation wells permitted by the Oregon Water Resources Department (OWRD). Databases and maps from OWRD for these wells were used as a key screen to locate farms with potential need for supplemental recycled water. The number of these wells is quite limited in the study area and only one new irrigation well was reported in the last 20 years. The Clackamas County Water Master reports that groundwater rights for a well can be issued in this area, but the well must not be hydraulically linked to a surface water source. According to the Water Master, applications for irrigation well permits near Sandy have been rare in recent years.

No surface water rights on the Sandy River were found in the target area for irrigation. Minimum flows to protect fish is a paramount concern for the Sandy River, and it would be difficult for a new applicant to receive a water right to withdraw water from the river or its tributaries.

Some small scale farms in the area have springs and subsurface irrigation opportunities, but these are limited to the Sandy River Valley. Subsurface flows and resulting high water tables limit interest in Sandy's recycled water in the valley area.

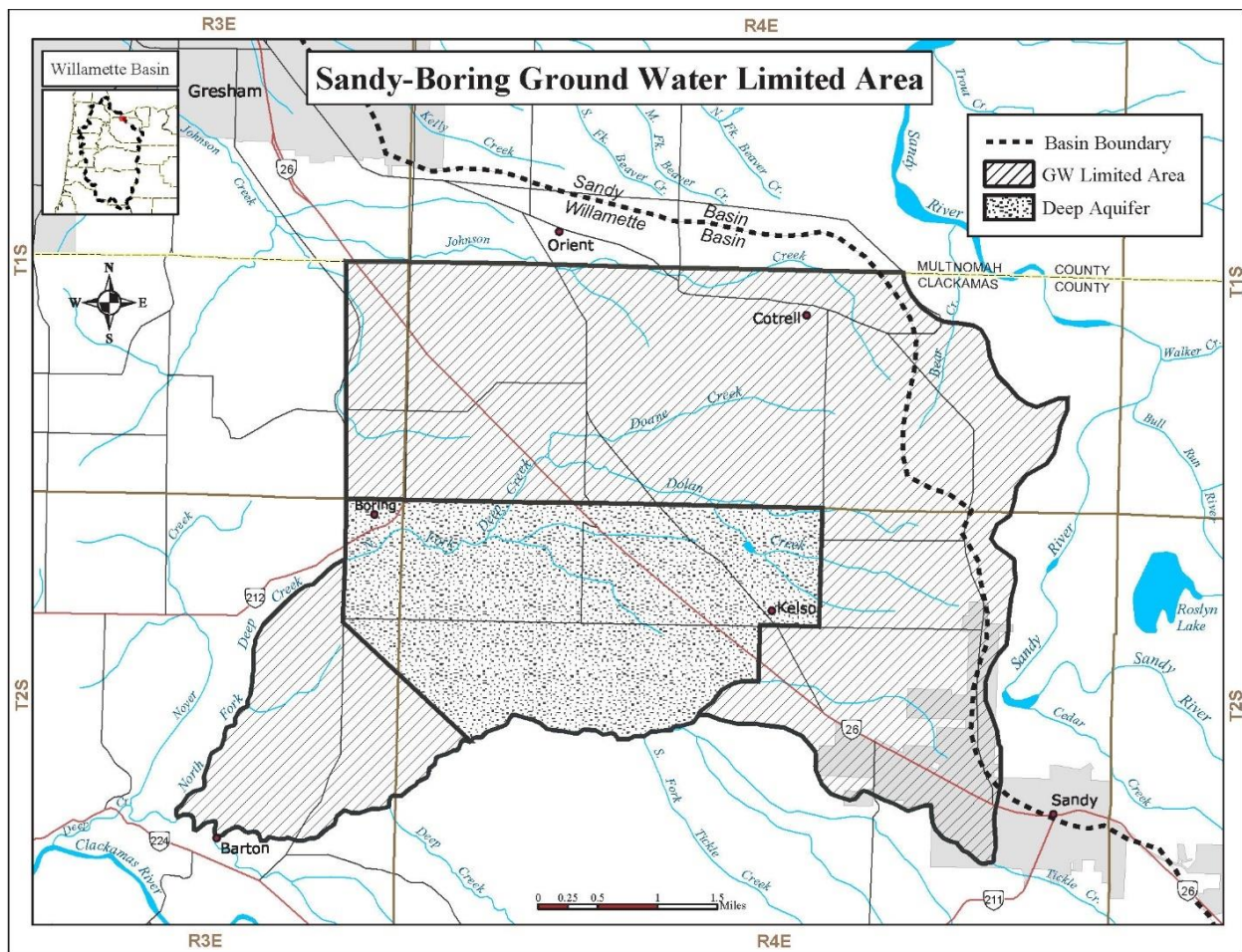
Contacts with Agricultural Community

Highlights

Agricultural producers in the target area fall into four general categories: livestock producers, food and specialty crop growers, Christmas tree growers and nursery operators. The livestock producers, food crop growers and Christmas tree growers are mainly located in the Sandy River Valley and also in the upper elevations north of the Sandy River. A small number of Christmas tree growers and livestock producers are also situated to the south and southeast of Sandy. These agricultural producers are widely dispersed, or are on small-to-medium size properties with little/no need for irrigation. Consequently, these operations are not viable options for applying large volumes of recycled water to their agricultural land.

The most promising area for application of the City's Class A recycled water to be produced in the future by the membrane treatment facility is found along Kelso Road. There are several nurseries in the area and most are large water users. This area is also in the Sandy-Boring Ground Water Limited Area (SBGWLA). (See map.) New irrigation wells are prohibited in this area. Some nurseries report that they need to supplement the well water they apply in the summer irrigation season. Some irrigators here report that water levels drop in their wells in the hottest weeks of summer when maximum groundwater pumping occurs. Elsewhere this report details the opportunities to apply Sandy recycled water on nursery land.

It may be possible to supply recycled water to additional land that is under contract to the area's fruit processor. This could occur once the processor has a satisfactory way to dispose of their own wastewater. This could allow agricultural land that had been receiving the processor's wastewater to accept Sandy recycled water.



Market Potential for Sandy's Recycled Water

Immediate/Near-Term Prospects

There are no immediate (one-year) or near-term (two- to four-year) prospects to increase agricultural use of Sandy's "recycled water".

The current irrigation customer uses all of the Class B water that Sandy's existing treatment plant can produce.

The new satellite membrane treatment facility is still five to seven years in the future.

Longer-Term Potential

Due to the time required to complete design of Sandy's new membrane treatment facility and bring it on-line, the timeframe is five to seven years (or longer). In this time frame any agricultural irrigation opportunities identified here can be implemented.

Nurseries on Kelso Road offer potential for use of recycled water. *Property A* – the closest of all candidate sites is a commercial nursery that is for sale. The pipeline would need to go one-quarter mile west from the intersection of Bluff Road and Kelso Road to reach the property (about 1.0 miles from the nearest location to the Option 1A route). The current nursery could expand water use significantly if it was converted completely to a container nursery from a mixed production of some container plants and in-ground field production.



The Kelso Road area offers the best opportunities for Sandy's recycled water

Property B identified above is also close to the Kelso Road/Bluff Road intersection and about 1.1 miles from the Option 1A pipeline. This property is not currently in nursery production and has no irrigation well on-site but could be converted to a container nursery using the City's recycled water. A potential limitation, however this property is located in the Sandy UGB and may be slated for residential development in the future. If the property owners have development plans, then conversion to a container nursery is much less likely.

Properties C and D are in nursery production and the operators are open to discussing supplemental summer season irrigation water. There are two less desirable conditions for these properties: the pipeline would need to extend about 1.8 miles from the Option 1A pipeline. This nursery uses drip irrigation and applies much lower quantities of water than sprinkler irrigation.

The last nursery is *Property E*, near Orient Road. To reach this property the pipeline would need to extend about 2.3 miles from the Option 1A pipeline. The advantage of accessing this property would be its high water demand since the nursery that newly acquired it is planning to redevelop the site for a container nursery in the near future.

A final prospect in the Kelso Road area is the fruit processor that has removed all the berry crops on acreage they own and lease. To access these fields the pipeline would need to extend about 1.6 miles from the Option 1A route. If the owner of the processing plant were to continue

to lease property that they own or lease, this would add about 90 acres of potential new land for applying recycled water.

Yet another long-term possibility is to explore the feasibility for the City to acquire land and install an injection well or infiltration basins to supply recycled water that replenishes the depleted aquifer in the Ground Water Limited Area. This option would require determination that Class A water can be discharged to the aquifer, with study by hydrogeologists to investigate the feasibility. OWRD hydrogeologists would also review this alternative and the DEQ would be involved with permitting. The benefits could include improving water availability for all water users in the area, reducing the amount of recycled water going to the Sandy River, and reducing the total investment needed to extend the pipeline to more distant agricultural users.

Appendix

Sandy Looks to Grow its Agricultural Irrigation Program

March 2020

Sandy is a Leader in Water Reuse

For over 25 years, the City of Sandy has been on the leading edge of sustainable water reuse. Every year in the dry months (May through October), all of Sandy's treated wastewater is used for agricultural irrigation. 100% of the water is reused!

The Future – More Highly Treated Water

Over the past decade, Sandy has emerged as one of Oregon's fastest growing cities. To meet the needs of a growing community and protect the environment, Sandy plans to build a new state-of-the-art reclamation facility that will produce even higher quality treated water. When operating, the new plant can initially produce up to 1.2 million gallons per day of high quality water. This water will be clean enough to meet most federal and state safe drinking water standards, and may be used to irrigate crops and for a wider range of beneficial purposes.

Now, Sandy is looking ahead to find more customers who are interested in getting some of that highly treated water for agricultural irrigation, industrial processes, or other approved uses. Contacts are underway with potential customers to gauge their interest.

Learn More

If you are interested in using Sandy's recycled water or to find out more go to (<https://www.ci.sandy.or.us/wastewater-system-improvements>) or email utilities@ci.sandy.or.us.



Uses for Recycled Water

Class A Water – Opportunities*

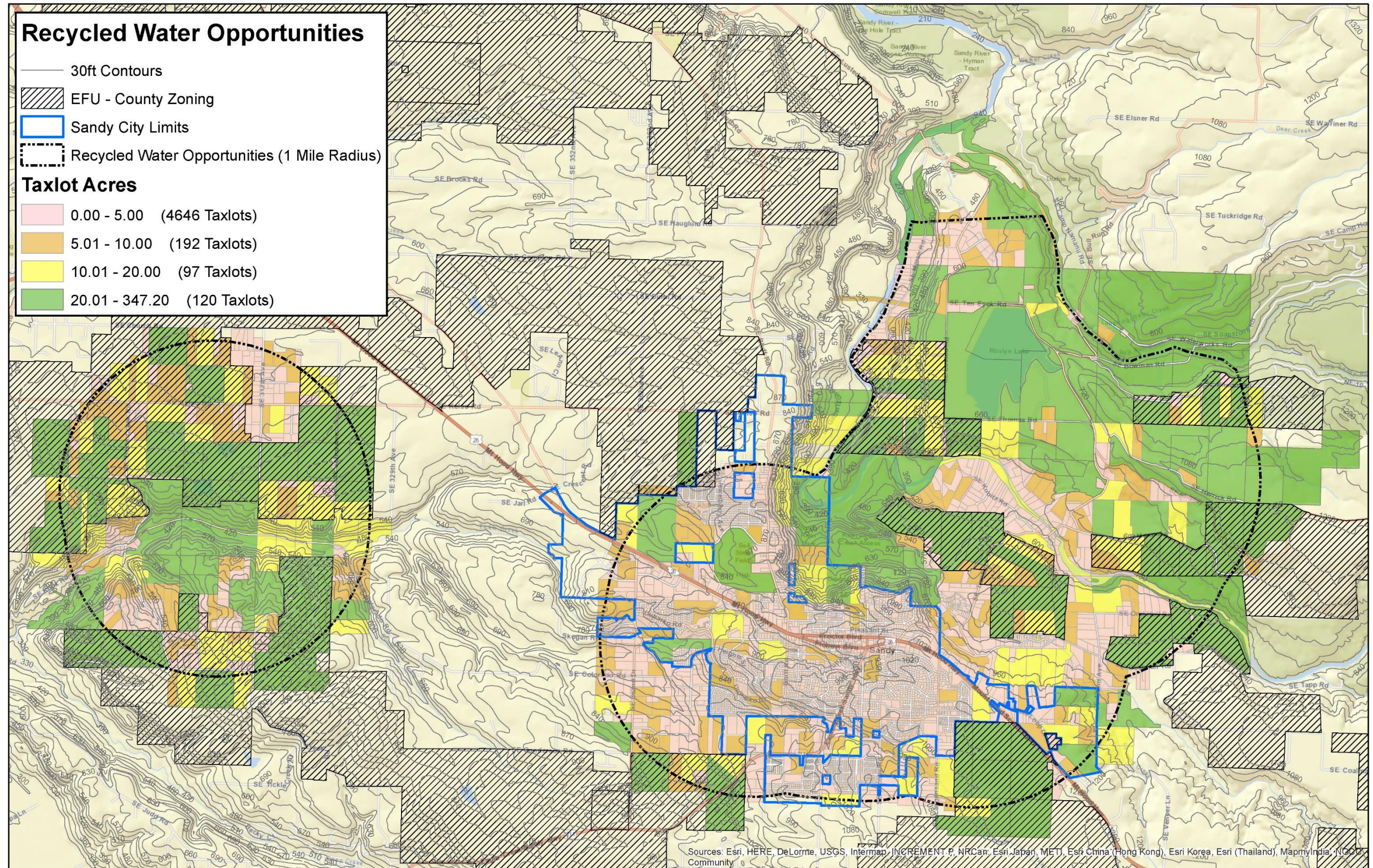
- Any agricultural or horticultural use
- Groundwater recharge
- Unrestricted recreation: recreational lakes, water features, fishing ponds
- Parks, playgrounds, school yards
- Residential and other landscapes
- Commercial car washing
- Aesthetic fountains
- All uses allowed for Class B Water

*To be produced by the City of Sandy's new membrane treatment facility to meet all federal/state standards for Class A water; bacteria and turbidity standards must be tested daily.

Class B Water – Opportunities**

- Ornamental nursery stock, Christmas trees
 - Orchards or vineyards
 - Pasture for animals
 - Golf courses, cemeteries, highway medians, business/industrial campuses
 - Restricted recreational impoundments (no swimming)
- **Produced by Sandy's current treatment plant; bacteria standards must be tested 3 times per week.

Appendix





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