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Oregon Goals to Reduce It's Carbon Footprint of Water

Indoor Water Conservation

Through our analysis of the Environmental Protection Agency (EPA) research and the River Network's report "The Carbon Footprint of Water", we find that the U.S. water-related energy use is at least 521 million MWh a year—equivalent to 13% of the nation's electricity consumption. While this appears to be a conservative estimate of water-related energy use, our findings suggest that the carbon footprint currently associated with moving, treating and heating water in the U.S. is at least 290 million metric tons a year. The CO2 embedded in the nation's water represents 5% of all U.S. carbon emissions and is equivalent to the emissions of over 62 coal fired power plants.

Conservation, efficiency, reuse, and low impact development could reduce municipal water use on a per-capita basis by 40%, an equivalent of 200 MWh annually and is achievable by 2030.

Simply retrofitting water using fixtures and appliances will reduce hot water use by approximately 20%. If every household in the United States installed efficient fixtures and appliances, residential hot water use could be reduced by approximately 4.4 billion gallons per year. Resultant direct energy savings are estimated to be 41 million MWh electricity and 240 billion cubic feet of natural gas, with associated CO2 reductions of about 38.3 million metric tons. Based on national averages, indirect energy savings from reduced water supply and treatment energy needs would be about 9.1 million MWh per year, with carbon emissions reductions of 5.6 million metric tons.

Based on national averages, the EPA estimates that if just 1% of American homes replaced their older, inefficient toilets with WaterSense™ labeled models, the country would save more than 38 million kWh of electricity, which is enough to supply more than 43,000 households electricity for one month. Furthermore, if every household in the U.S. replaced their major water using fixtures and appliances, the indirect energy savings due to water efficiency would amount to about 9.1 million MWh per year, with carbon emissions reductions of 5.6 million metric tons.

All new construction should be required to use fixtures that meet or exceed the "Water Sense™ Label" as outlined by the Environmental Protection Agency (EPA) (link).

Outdoor Urban Water Conservation

Outdoor water use often drives peak water demands and requires the utilization of marginal water sources with greater energy intensities. Reducing outdoor irrigation,

especially during summer months, can result in substantial "upstream" energy savings by reducing water consumption from the most energy-intensive supplies and by avoiding the need to develop additional supplies.

Residential outdoor water use in the United States accounts for more than 9 billion gallons of water each day, mainly for landscape irrigation. Experts estimate that as much as 50 percent of this water is wasted due to overwatering caused by inefficiencies in irrigation methods and systems. Irrigation control technologies can significantly reduce overwatering by applying water only when plants need it. Certified WaterSense™ irrigation controllers (link) can conserve 20% from conventional controllers simply due to technical advantages in adjusting to local weather conditions.

Irrigation systems must utilize a weather based system and meet the "Water Sense Label" as outlined by the Environmental Protection (EPA) department.

In addition, compost amended soils with mycorrhizae (i.e. beneficial mushroom roots) and xeriscaping with native plants can significantly reduce and even eliminate long-term irrigation. Compost amended soils are a proven approach to reducing runoff, reducing weed establishment, and reducing the application of excess nutrients, herbicides and pesticides.

All new development shall limit turf lawns to no more than 50% of the maximum open space of the development. All new development must amend final lawn and landscape areas with compost as outlined in the Oregon DEQ "Restoring Soil Health in Urbanized Lands" 2001 report.

In the U.S., the average person uses about 40 gallons of water per day to bathe, wash dishes and clean clothes, which equals about 35% of our indoor water use. Unfortunately, this water almost always goes straight down the drain. But this "graywater" could be put to good use to irrigate fruit trees and other plants. A simple laundry to landscape graywater system is relatively inexpensive and is approved by Oregon DEQ.

To insure system identification and protection of public health, Oregon water purveyors shall provide an annual rebate (currently at $40) for the annual permit reporting for the property owner of a tier 1 & 2 graywater systems as required by the DEQ.

Urban Water Re-use

In dense, urban centers the use of on-site alternate water sources is a key strategy for expanding potable water savings. Decentralized or district scale systems have been proven to be a market rate, viable approach to water and energy savings. Various pilot projects have proven that these urban approaches can achieve 65% and greater savings from their conventional counterparts. By capturing and reusing rain, soapy (gray), nuisance (groundwater), and black waters, these compact systems are highly efficient and resilient. Developments utilizing these systems also have the added benefit and opportunity to provide a more equitable community and neighborhood due to the

inherent desire for mixed-use and collaborative functions. In many cases throughout the West Coast, the return on investment period is less than 8 years. In Seattle, water re-use developments are cost-effective at 100-unit buildings and above. In San Francisco, these projects pencil at 250,000 square-foot commercial buildings.

> **New development projects with at least 250,000 square feet of gross floor or that have a floor area ration (F.A.R.) of 2.5 or greater are required to treat and reuse available graywater, rainwater, and foundation drainage for toilet and urinal flushing and irrigation.** Capacity Rebates and Excess Use Charges will apply (see below).
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> **New development projects of 40,000 square feet or more of gross floor area are required to prepare water budget calculations assessing the amount of available rainwater, graywater, and foundation drainage, and the demands for toilet and urinal flushing and irrigation[2].** Capacity Rebates and Excess Use Charges will apply (see below).
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> [2]San Francisco Public Utility Non-potable Water Program (link)

Utility customers with onsite non-potable water systems should receive an adjustment on their water and wastewater capacity charge because their systems have reduced the demand for water delivery and/or sanitary sewer capacity. This is called a Capacity Rebate and Excess Use Charge. This adjustment will accurately assess capacity charges for buildings with onsite non-potable water systems by charging new users only for the demand placed on local water and wastewater utility. Additionally, the utility would create a "Water Use Allocation Program" to manage the rebate and excess use charges for new development projects. Projects will be assigned monthly water use allocations based on the project's approved Water Budget, and any amount of potable water used in excess of the monthly allocation is subject to excess use charges and will be billed at a rate equal to 300% (3x) the applicable water and wastewater rates. Fees collected for excess use would support water costs for 'frontline' populations and voluntary water re-use programs.

Outdoor Rural Water Conservation

The water flowing in streams and percolating in the ground is directly connected to what comes out of your tap. We depend on clean water to support healthy communities, a vibrant economy, and habitat for native fish and wildlife. Water is the fundamental building block that defines our way of life in the Northwest. The Trump administration recently started the process to repeal the Clean Water Rule (link), a landmark set of guidelines that strengthened protections for important waterways. Without it, fewer streams, wetlands, and other waters would be protected by the Clean Water Act's requirement to clean up polluted waters, its pollution control standards for industrial dischargers, its protections against burying streams and wetlands, and numerous other safeguards. In 2014, the Oregon Environmental Council researched and drafted recommendation for the state to adopt.

The DEQ shall include specific load allocations for agriculture, forestry and urban stormwater runoff TMDLs. The DEQ shall require that Designated Management Agencies develop a stormwater management program to meet TMDLs.

To control dirty water run-off from farming practices, the Oregon department of agriculture (ODA) needs a strong agriculture water quality program. The program needs to monitor water quality standards, including dissolved total maximum daily loads TMDLs. The program should include a plan to evaluate every watershed in the state to assess and ensure landowner compliance with rules by 2030. To do this effectively will require additional funding which should be embedded in the state budget. ODA Agricultural Water Quality Program should include these specific changes:

Clarify that "The ODA has authority to require landowners to actively restore site potential riparian vegetation".

The coastal zone act reauthorization amendments (CZARA) litigation jeopardizes one of the only funding sources Oregon has for water quality pollution projects-federal 319 grants. It appears that the DEQ's current approach to forestry, urban development and septic tanks is not adequate for a coastal nonpoint source program to receive federal approval, and the DEQ seems unwilling to propose significant improvements.

The governor must resolve and redirect the DEQ to make changes to programs impacted by CZARA, such that they are eligible for federal grants

The State of Oregon has a unique approach to water quality regulation that is not widely supported by the EPA: the DEQ, ODA, and ODF each have water quality jurisdiction over different land parcels based on their land use or ownership. Goals may be inconsistently implemented across a single watershed with no single agency having jurisdictional authority over the water quality of Oregon's watersheds in a holistic way.

DEQ, ODA, and ODF will work cooperatively to transfer jurisdictional water quality authority for all of Oregon shall be transferred to the Department of Environmental Quality by 2028.

Wasted Food

In the most recent 2016 report on wasted food by the National Research and Defense Council, its states; "America does not eat 40 percent of its food. If the United States went grocery shopping, we would leave the store with five bags and drop two in the parking lot. And leave them there. All told, America throws out more than 1,250 calories per day per person, or more than 400 pounds of food per person annually. That's a loss of up to $218 billion each year, costing a household of four an average of $1,800 annually. At the same time, 42 million Americans face food insecurity—and less than one-third of the food we throw out would be enough to feed this population completely. To place this in a global context, the average American consumer wastes 10 times as much as his or her counterpart in Southeast Asia or sub-Saharan Africa. We leave entire fields unharvested, reject produce solely for cosmetic reasons, throw out anything past or even close to its "sell by" date, inundate restaurant patrons with

massive portions, and let absurd amounts of food rot in the back of our fridges. In our diverse nation of 322 million people, wasting food emerges as an embarrassing unifier. No matter our age, gender, economic status, or education level, we all waste food". Wasted food is more than just food, when we waste it, the impact is [1]:

- $218,000,000,000 (or 1.3% of the U.S. gross domestic product (GDP)) and cost a family of 4 and average of $1800 annually.
- 2.6% of all U.S. greenhouse gas emissions annually, equaling 37 million passenger vehicles.
- 21% of the U.S. agriculture water usage (which is more water used than Texas, California and Ohio combined.)
- 19% of all croplands which is more land than in New Mexico
- 21% of U.S. landfill content, which is the #1 content (by weight)
- 18% of all farming fertilizer, which contains 3.9 billion pounds of nutrients, causing water quality impacts such the algae blooms that numerous waterways in Oregon experience.

[1] National Resource Defense Fund 2014 data research

Food Loss and Waste Reduction Goal of 50% by 2030 (EPA) will achieve 10% reduction in methane gas from US landfills, and more than $100B annual savings (Defined by the Global Food Loss Index EPA; Food Loss Program).

Diversity Equity and Inclusion

Oregon's government must recognize that water is a basic human right and no one regardless of their race, gender, ethnicity, housing status, where they choose to live, or any other status should impact their access to water. Model code language, from California, can be viewed here. This will likely require state-level modification of rate calculations for water utilities.

Water purveyors in Oregon shall develop a business plan by 2028 to supply Oregonians with a subsistence level of water of 21 gallons per day per person for free. Water purveyors shall fully implement this program by 2038, prioritizing the provision of free water to frontline communities first.

How These Policies Support Oregon's Statewide Planning Goals
Oregon's Statewide Planning Goals were designed to protect the economic and environmental health of our communities. Numerous academic and governmental papers have stated that we are now in an era of climate change impacts when water availability cannot be predicted based on past hydrologic patterns.

Our policy recommendations help ensure that Oregon will be economically and environmentally healthy with resilience droughts, floods, and all the conditions between. The following are some specific ways they support several Oregon's Statewide Planning Goals.

Goal 2

Land Use Planning. "To establish a land use planning process and policy framework as a basis for all decision and actions related to use of land and to assure an adequate factual base for such decisions and actions."
The policies proposed here support better decisions during the comprehensive/land use planning process, which requires jurisdictions to consider "social, economic, energy and environmental needs".

Goal 3

Agricultural Lands. "To preserve and maintain agricultural lands."
A guideline in this goal is "land conservation and development actions provided for by such plans should not exceed the carrying capacity of such resources." Water availability is already a limiting factor in achieving this goal in Umatilla County and other places throughout Oregon.

Water conservation and water reuse both potentially contribute to the continued use of these lands for agricultural purposes.

Goal 4

Forest Lands. "To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with sound management of soil, air, water, and fish and wildlife resources and to provide for recreational opportunities and agriculture."

Numerous drinking water purveyors rely on surface water. From the Integrated Water Resource Strategy published by the Oregon Water Resources Department, "Oregon's forests are a source of high quality drinking water and directly support public drinking water systems and ecosystem health." In studies by the US Forest Service, water flowing from forested land is less expensive to treat to EPA drinking water standards than when that water flows from other land uses. Said another way, for municipalities drawing a portion of their surface water flowing from deforested land, treating water can be much more expensive and more energy intensive. Water conservation could potentially

open up more forests for harvesting without increasing overall drinking water costs because as treatment costs go up, conservation can reduce the treatment needs.

Goal 5

Natural Resources, Scenic & Historic Areas, and Open Spaces. "To protect natural resources and conserve scenic and historic areas and open spaces."
This goal emphasizes the importance of protecting riparian corridors, groundwater, wetlands, wildlife habitat, state scenic waterways, and natural areas, as well as other not-directly-related-to-water resources.

Implementation guidance states, "The efficient consumption of energy should be considered when utilizing natural resources" and "stream flow and water levels should be protected and managed at a level adequate for fish, wildlife, pollution abatement, recreation, aesthetics and agriculture". According to the Oregon Water Resources Department findings, Marion, Polk, Yamhill, Washington, and Clackamas counties, where some of the fastest growth is occurring, have groundwater restricted areas because of pollution. If water must be imported to these areas, energy use to transport water will increase.

Our proposed policies directly or indirectly protect these natural resources while providing needed water for quickly developing communities.

Goal 6

Air, Water and Land Resources Quality. "To maintain and improve the quality of the air, water and land resources of the state."
This goal is primarily concerned with preventing pollutants from entering the environment (i.e. "source control"). One guideline is, "Plans should designate alternative areas suitable for use in controlling pollution including but not limited to waste water treatment plants, solid waste disposal sites and sludge disposal sites."

Decentralized water reuse systems can control pollution to the same high standards as the centralized systems above with the added benefit of improving water resources due to minimizing our draws on the system or decreasing runoff through rainwater harvesting systems. Uncontrolled runoff flows from urbanized areas, even during relatively small storms, scour streambanks and contribute sediment and any other pollutants that sediment may be laden with such as the commonly-found phosphorus and arsenic.

Low impact development practices are especially cost-effective for restoring watershed function by reducing runoff. Limiting lawn areas and compost amending soils are ways to more closely mimic some of the ecological benefits of a forest while allowing for other land uses.

Goal 7

Areas Subject to Natural Hazards. "To protect people and property from natural hazards."
Natural hazards in this goal are identified as "floods (coastal and riverine), landslides, earthquakes and related hazards, tsunamis, coastal erosion, and wildfires."

In a study published by EPA, FEMA, and NOAA, modeling showed that infiltrating the very small frequency storm using low impact development techniques on new development and redevelopment projects shrunk the extent of floodwaters in all 20 watersheds studied nationally. Water harvesting and reuse projects often incorporate water storage. Implemented on a watershed scale, a few hundred storage opportunities could easily add up to the average small pond or reservoir in Oregon (almost 9 million gallons), providing significant storage for floods. Smart devices installed on each tank could monitor weather and ensure that storage tanks are empty before a flood.

Minimizing irrigation in landslide-prone areas is beneficial. In 2008, two homes in SW Portland were destroyed and three others were heavily damaged when a broken irrigation line caused a landslide that sent houses sliding down with it. On steep slopes, eliminating irrigation and the need for these sources of water altogether is an important hazard mitigation practice.

Our policies have the effect of integrating decentralized water and nutrients sources into centralized systems improving resiliency for communities in the face of climate change, which will exacerbate most of the hazards listed above.

Goal 8

Recreational Needs. "To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens."

While most of this goal guidance is dedicated to planning facilities themselves, this goal does include, "Planning and provision for recreation facilities and opportunities should give priority to areas, facilities and uses that", among other things, "minimize environmental deterioration".

Boating, swimming, and fishing are recreational needs supported by our policies, since conservation and storage alike can be used to protect water levels and stream flows.

Goal 9

Economic Development. To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.

This goal is supportive of public-private partnerships and recommends that areas designated to increase economic growth consider, among other things, "materials and energy availability and cost; labor market factors; educational and technical training programs".

Oregon is already experiencing water shortages. the ASCE's March 2017 publication *The Economic Benefits of Investing in Water Infrastructure* highlights the potential impact that a lack of water could have on the US Gross Domestic Product (GDP) and the benefits of investing in that infrastructure: "The aggregate economic activity supported by water investments exceeds the GDP of twenty-six states." Also,

"employment opportunities in water infrastructure sectors are stable, well-paying positions providing average wages above the national average."

When Oregon commits to this infrastructure investment, it will reap the economic benefits. Our proposed policies would inherently grow green water-related jobs over time, incrementally improving environmental and social resilience.

Goal 10

Housing. "To provide for the housing needs of citizens of the state."
This statewide policy directs cities to include affordable housing in their comprehensive plans. Our policy recommendations may indirectly support this effort, since decentralized water reuse systems reduce the amount of flow in sewer systems and to municipal wastewater treatment plans, which means bigger pipes and plants are not needed to support population growth. This is a cost savings to cities that could be freed up for other needs as identified by local governments, including housing.

In addition, decentralized systems are cost-effective at high densities, as mentioned, and are a good fit for urban growth boundary planning approaches.

Goal 11

Public Facilities and Services. "To plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development."
This Goal suggests, "Local Governments shall not allow the establishment or extension of sewer systems outside urban growth boundaries or unincorporated community boundaries or allow extensions of sewer lines from within urban growth boundaries or unincorporated community boundaries to serve land outside those boundaries, except where the new or extended system is the only practicable alternative to mitigate a public health hazard and will not adversely affect farm or forest land." Rural areas are already using decentralized systems such as septic tanks and fields; however, these are well documented sources of pollution that affect surface waters and drinking wells.

Small-scale sewage treatment technologies such as bioreactors can treat wastewater to very high levels and produce energy and nutrients for gardens and farms and give rural residents greater independence from sewer extensions.

In addition, implementation guidance includes, "The level of key facilities that can be provided should be considered as a principal factor in planning for various densities and types of urban and rural land uses." In urban areas, the level of key facilities is sometimes limited by the capacity of a jurisdiction to deliver water and sewer services. For instance, the East Portland Action Plan has identified access to water as one of their key needs for future development. Instead of expanding an existing centralized reservoir *and* building a new one to accommodate other growth, policies suggested here give those jurisdictions more flexibility to increase density in "water-limited" neighborhoods.

Goal 12

Transportation. "To provide and encourage a safe, convenient and economic transportation system."

This goal recognizes that the transportation system can have negative environmental impacts and requires the transportation plan to "minimize adverse social, economic and environmental impacts and costs" and as a planning guideline not to exceed the carrying capacity of water resources.

In urban areas, runoff from impervious roadways could be harvested, stored, and delivered to the public for non-potable uses.

Low impact development (LID) and conservation can help ensure adequate flows are available for river transportation during the summer months. Oregon Department of Transportation is saving millions of gallons of water by eliminating irrigation at the Wallowa Lake interchange on I-84 in La Grande. In addition to water and money savings, air quality (which affects water quality) and our carbon footprint will be improved from reduced mowing. Our policy suggestions related to landscapes, especially reducing lawn by 50% from new development could deliver similar community benefits.

Goal 13

Energy Conservation. "To conserve energy."

Conserving water has been identified as one of the most cost-effective and efficient ways to conserve energy. From the Center for Sustainable Infrastructure's publication *A Northwest Vision for 2040 Water Infrastructure,* "When California mandated a 25% cut in water consumption during the historic drought of 2015-6, analysts were shocked to discover the electricity saved by meeting the water conservation targets. It equaled the combined impact of all the energy efficiency programs offered by the state's major electric utilities combined – at about one-quarter the cost."

Typically, energy is needed to create and deliver potable water to flush a toilet where urine and organic matter are mixed together, and their respective values as individual resources are diminished. Waterless toilets and urine diverters instead reduce pollutant export and generate an important nutrient resource with little to no added energy. Harvesting the nutrients from these technologies reduces the energy consumed to treat what would have been a polluting mix of otherwise vital resources at a wastewater treatment plan.

From a heat island perspective, impervious areas and buildings are major masses that store heat then radiate it when the day is supposed to cool off, increasing energy demand for cooling. Tree planting, which is a low impact development technique that our policy recommendations include, is one of the most cost-effective ways to reduce this energy consumption and comes with many, many other environmental and social benefits related to water, mental health, crime, resilience, and improved property values.

Our policy suggestions reduce energy consumption through a diverse set of conservation tactics for buildings.