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Rethinking water usage

Bend couple wants their home to run on rainwater and graywater, but getting permits is proving tricky

By Kate Ramsayer / *The Bulletin*

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Tom Elliott and Barbara Scott should get used to hearing, “No.”

The couple, who are designing a sustainable and efficient dream home in northwest Bend, are pushing the envelope of what city planners and regulators are used to approving, said Morgan Brown, a water specialist with Idaho's Whole Water Systems.

They're proposing to collect rainwater for all household uses — including drinking water — and to treat and reuse wastewater. And those kinds of new efforts, especially within city limits, are bound to run into obstacles, Brown warned.

“Normally, within a sewer district, the first 20 answers will be, ‘No,'” he said last week at a meeting in the home of Elliott and Scott.

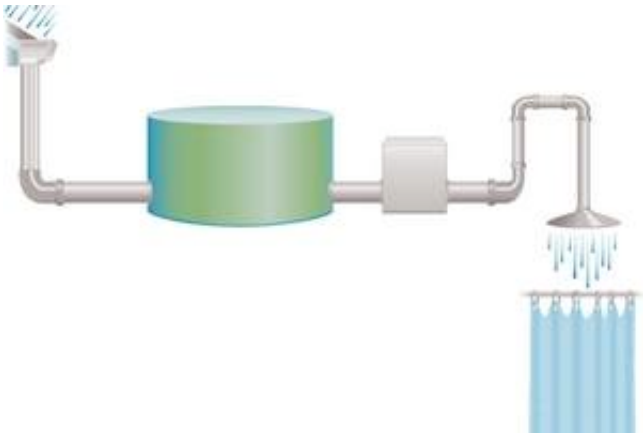
But with three months left until they hope to begin construction, the couple and their design team are brainstorming ways for their house to be as independent as possible from the city of Bend's water and sewer system, in order to meet the requirements of the Living Building Challenge.

“It's a lot of thinking. It's not (just), ‘Hook up to the city and turn the faucet,'” Scott said. “It's really putting us to the test.”

The Living Building Chal-lenge sets strict standards for sustainable houses, including producing all the necessary electricity on-site and only using nontoxic, environmentally friendly building materials.

The water requirements are designed to “really redefine the way we think about water, pushing that notion that water really is a precious resource,” said Eden Brukman, vice president of the International Living Building Institute, based in Seattle.

Rainwater collection and graywater recycling



Rainwater and graywater

To meet program standards, the home can only use collected water from rain and snow.

“The precipitation that falls on the building site is what's available — which in our climate is tight,” said M.L. Vidas, owner of Sustainable Design Services and part of the team working on Elliott's and Scott's house.

So the first thing to do, she said, is ensure all of the plumbing fixtures — showerheads, toilets, the washing machine, dishwasher and more — are as water efficient as possible.

“Everything that uses water, you start to look at,” Vidas said.

Project planners have estimated that roofs on the house could collect between 30,000 and 40,0000 gallons of rainwater a year, said Chris Hart-Henderson, owner of Heart Springs Landscape Design, based on the surface area of the roofs and rainfall in Bend.

They've also calculated that an average household of four will need about 73,000 gallons a year — so efficiencies will be key.

But, she added, “It's so early in the process, we still don't have a solid direction yet. Everything's on the table for discussion.”

Also on the table — what to do with the graywater once it is rinsed down a sink or shower.

The current idea, Vidas said, is to filter it, treat it and reuse it to flush toilets.

Elliott, Scott and their team are looking at different graywater treatment options, including installing a constructed wetland where microbes and plants take up the nutrients, break down organic material and clean up the graywater.

Rainwater collection and graywater recycling

Rainwater collection

1. To collect water for home use, the couple would collect rainwater from the roof.
2. Rainwater would be stored in a large cistern, possibly capable of holding 35,000 gallons.
3. The rainwater would be filtered and treated to meet drinking water standards.
4. Collected water could be used for drinking, sinks, showers and irrigation.

Graywater recycling
5. Graywater from showers and sinks would be collected in a separate graywater tank, equipped with an overflow valve that leads to the sewer.
6. Graywater would be pumped through a lined, constructed wetland, where plants and microbes in a gravel bed would treat the water.
7. While the homeowners hope one day to use treated graywater to irrigate landscaping, currently the only approved use in Oregon is to flush toilets.

Editors note: Tom Elliott and Barbara Scott invited The Bulletin to follow their building project — to build the greenest home possible — from start to finish to share their goals, decisions, costs, concerns, problems and achievements, and to be an open book on what it takes to build such a home. The Bulletin will follow the couple's project through periodic stories. This installment examines the challenges facing the home's water and waste- water plans.

“We want to go with a constructed wetland if we can get the city to approve it,” Elliott said. “It's just a natural system, it's how all water essentially on the Earth is treated.”

Getting OKs

While Oregon has approved rainwater harvest and graywater use for toilet flushing in recent years, the processes are new within the city of Bend, Vidas said.

“We're going to need to demonstrate how it works, and that it's safe,” she said.

Tom Hickmann, Bend's city engineer, said the city is fine with Elliott's and Scott's plan to minimize the amount of water they will pull from the city.

But that doesn't mean that they can completely cut themselves off, he said — the city still needs to provide water for fire protection. And if too many people stop using city water, it could cause financial problems.

“If people don't pay into the system, all of a sudden the costs of the system get spread out over fewer and fewer people, and nobody can afford it,” he said.

And if the couple wants to reuse graywater to flush toilets, they'll have to follow the plumbing codes for doing that and ensure that none of it contaminates the city's potable water supply, he said.

Not yet approved

But beyond collecting rainwater and using graywater to flush toilets, many of the things Elliott and Scott would like to do are not yet approved.

“The code and a desire to be off-grid don't always meet eye to eye,” Hart-Henderson said.

For example, the couple would like to use graywater for irrigating plants and trees in their yard.

The Legislature approved using graywater for irrigation in June 2009, but the regulations on it are not yet in place, and won't be until late 2011, said Ron Doughten, biosolids and water reuse program coordinator with the Department of Environmental Quality.

For now, if a household wants to use graywater for irrigation, it would have to go through the expensive permitting process used to approve wastewater treatment facilities.

“It's not practical on the scale of a single-family residence,” Doughten said.

And if they could, the Bend couple would like to treat the blackwater from toilets on-site as well.

One idea could be to build in a septic tank, where the solids settle out and liquids are pumped through a 600-square-foot wetland. After treatment, the water could be used for irrigation.

“Unfortunately, right now, that water has to go in the sewer,” Elliott said.

State law requires residences within 300 feet of a sewer system to connect to it, and Hickmann said the city would not allow a septic system on the property. The groundwater in the area flows in such a way that any contamination from a septic system on the site could potentially contaminate the city's drinking water wells, he said.

“We certainly don't want that situation,” Hickmann said.

So, with the start date for construction approaching, Elliott and Scott are considering building several layers of plumbing systems into their home.

“They want to proceed to get the house built, and we can see that the rainwater harvest and the graywater and the on-site waste treatment, all of those may take a lot longer because of having to explain as we go along,” Vidas said. “So we've separated it.”

The first step, Vidas said, is simply to design and build the house with water and sewer hookups.

But the designs will include plumbing systems so that if Elliott and Scott get the OK from the city for specific rainwater collection systems or graywater systems to flush toilets, they can turn a valve and start up those systems.

And they'll build the house so that as more options are available — like irrigating with the graywater — they can take advantage of them.

“Our intention is to build the system we want to have, but instead of irrigating with the water, we'll send it down the sewer until more rational policies” are in place, Elliott said.

The Living Building Challenge also encourages homeowners to advocate for changes in regulations — something that Elliott and Scott can do if they can't meet some of the requirements.

“It's kind of spurring that conversation between regulatory officials and different municipalities,” said Brukman of the International Living Building Institute, “to start thinking differently about our rules and regulations and water use.”

For now, those involved with the project will continue to design the home with water collection, conservation and reuse elements, keeping the regulations in mind and advocating for change, Vidas said.

“The project should be able to meet the needs of Tom and Barbara, and meet the needs of Living Building Challenge, and comply with our codes,” Vidas said. “It should work. But I don't know how we'll get there.”

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