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Winter 2025
Vol. 47, No. 1

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H2Oregon is
published for the
Oregon Association of Water Utilities by
Mt. Angel Publishing, Inc.
401 Oak St. Silverton, OR 97381
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H2Oregon is the official publication of the Oregon Association of Water Utilities, and is published quarterly for distribution to representatives of rural and municipal suppliers. Issues are mailed free of charge to member and nonmember rural water/wastewater associations. Articles and photos are encouraged with payment in complimentary copies.

Best Practices for Securing Your System

by Jason Coker, Cyber Security Circuit Rider



Securing your water and wastewater systems requires a multifaceted approach that addresses both the vulnerabilities of operational technology (OT) and the evolving nature of cyber threats. Implementing best practices tailored to the unique needs of this industry can greatly reduce the risk of cyber incidents. Here are some key strategies that water utilities can adopt to improve their cybersecurity posture:

Conduct Regular Risk Assessments

The foundation of any effective cybersecurity strategy is understanding where vulnerabilities exist. Regular risk assessments help utilities identify weaknesses in both OT and IT environments. These assessments should evaluate everything from software and hardware vulnerabilities to physical access controls and personnel training. By continuously monitoring potential risks, utilities can take preemptive steps to mitigate them.

Implement Network Segmentation

Network segmentation is a critical defense mechanism that separates operational systems from non-operational or external networks. By isolating OT networks from IT networks and other user-access networks, the chances of a cyberattack spreading from one area to another are significantly reduced. This practice limits the attacker's ability to access critical control systems even if the IT network is compromised.

Adopt Multi-Factor Authentication (MFA)

Using multi-factor authentication (MFA) ensures that remote access to sensitive systems is protected by more than just a password. MFA requires users to verify their identity through multiple factors—such as a password, a mobile device, or biometric data—adding an extra layer of security that helps prevent unauthorized access, especially in remote management systems.

Operator Training and Awareness

Operators are often the first line of defense against cyberattacks, but they can also be the weakest link if they are not adequately trained. Regular cybersecurity training ensures that staff are aware of the latest threats, including phishing and social engineering attacks. Training should cover how to recognize suspicious emails, practice good password hygiene, and follow secure procedures when using remote systems.

Patch Management and Software Updates

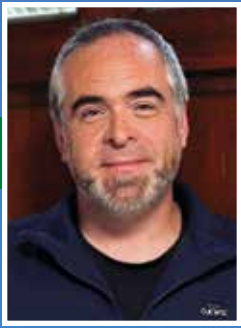
One of the most overlooked aspects of cybersecurity is ensuring that all systems are up-to-date with the latest patches and security updates. Attackers frequently exploit known vulnerabilities in outdated software. A robust patch management process ensures that both OT and IT systems are updated regularly to address these vulnerabilities.

Develop and Implement an Incident Response Plan (IRP)

A well-defined incident response plan (IRP) is essential for mitigating damage when a cyber incident occurs. The IRP should outline clear steps for detecting, containing, and recovering from an attack. It should also define roles and responsibilities within the organization, ensuring that everyone knows how to respond swiftly to minimize disruptions. Regularly testing the IRP through simulations or tabletop exercises helps ensure preparedness for real-world attacks.

By implementing these best practices, systems can create a more secure operational environment that is resilient to cyber threats. The focus should be on prevention, detection, and response, all working together to minimize risks and ensure the continued delivery of safe and reliable services. ♦





Introducing Jason Brooks

by Jason Brooks, Small System Circuit Rider

As Jason stood there with wet feet, dust caked on his face, and the piercing sound of sirens reverberating through his earplugs, he was unaware that this seemingly ordinary situation would ultimately send him down a path to a fulfilling career in water and wastewater.

Jason graduated from Toledo High School in 1996 and returned to his hometown to commence a career in the paper industry in October 2002, driven by the desire to support his wife and son. He dedicated twelve years to operating a paper machine before seizing an opportunity to contribute to the development of a training program. Over the subsequent two years, he honed his skills in dissecting intricate mechanical systems, systematically dividing them into manageable categories, and facilitating meetings that effectively captured operator knowledge for translation into a computer-based asset-driven job training program.

Upon the conclusion of this project, Jason made the decision to continue providing either assistance or education to others. Consequently, he transitioned to the onsite laboratory, where he acquired expertise in industrial wastewater testing, process testing, and chemical handling and mixing. Despite his growing proficiency in these areas, Jason remained dissatisfied with his career path.

In 2021, Jason made a conscious decision to depart from the paper industry and embark on a new career in the water and wastewater sector. Over the ensuing three years, he operated a small single-well water system, supplying drinking water to Eddyville Charter School, where three of his four children were enrolled. Subsequently, he joined the City of Siletz, primarily responsible for operating the water plant, while also providing backup and weekend operations at the wastewater facility. Most recently, Jason secured employment with the City of Toledo, expanding his knowledge in water distribution and collections, then adding fleet maintenance to his knowledge base just before joining OAWU.

Jason has a strong desire for a close relationship with his family. All through his career, he struggled to find time outside of work to enjoy the things he grew up with, like hunting, camping, family trips, and holiday dinners. Camping in particular was so important that he and his wife Betsy included it in their vows when they were married in June of 1999. Jason really hopes that someday his four children and 3 grandchildren see that he chose his career path to participate in what he holds most dear, which is time spent with loved ones experiencing life, and all it has to offer.

Jason is very enthusiastic about seeking out a need and discovering the solution for it. He is grateful that OAWU provides the opportunity to do just that. 💧



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Teaching to a Rapidly Changing Clientele

by Keith Bedell, Wastewater Technician

Recently I was talking with a co-worker about a class he had just taught. He brought up a comment he had received on the course evaluation. The participant thanked the instructors for not bringing politics into the classroom. What a reflection on the times in which we are living when people in a math class feel threatened because of their political affiliations. This conversation caused me to reflect on my own teaching style and the changing times. The demographics of rural Oregon are rapidly changing. We are met with new world views everywhere we go. With these changes, it is necessary for all of us to take steps to greet our new patrons with respect. This is not an article on political correctness, but rather addresses the need for empathy, respect, and inclusion. With the small communities that we work with there are plenty of things to keep the operators busy without having to deal with non-operational problems.

Like it or not, the homogeneity of rural Oregon is changing. Medford and Bend are now sprawling metropolises. Tourism is replacing logging and fishing along the Oregon Coast, and wilderness areas are surrounded by resorts. This diversification is good for the economy but can bring about irritation when dealing with the new attitudes and values of the people we encounter. The makeup of our industry are older men, and this also describes the majority of our clientele. However, more and more often we run into capable women and younger employees that are new to our field. The question we need to ask ourselves is, "how we will meet these changes?" Not that it is really a question because from what I have seen everyone is ready to help someone that needs it.

Empathy and respect are two words that most of us learned as children, but how do we put them into action. Empathy is not just observing that a person has had different experiences than we have, but actually reflecting how such experiences might affect our world views. It is not enough to tell someone, "there, there," or "boy that must be tough." The practice of empathy means we look into ourselves and view how our views might be shaped by being in another's situation. We figuratively put ourselves in their shoes. This practice teaches us how to relate to others and see a little of how they see the world. Respect is a word we have all been drilled in, "Do unto others as you would have others do unto you." Respect is more than being polite, it is acceptance. It is necessary for us not only to say please and thank you, but we must value the opinion of others as valid. We can agree to disagree.

The word inclusion is one you hear often in the teaching community. It means that all opinions are valued and that each individual has a part in instruction and the world. It means we not only don't preach our world views but listen to the views of others and include them in the class community. Values and opinions of others can be incorporated into our instruction so that every voice can be heard. It is not easy to learn in an environment where you not only don't feel valued, but you might be put down or even attacked for your views. Teaching is a skill that most of us have not had any formal training in, regardless of this we must strive to do our best and allow our students to do their best.

The rapid growth of Oregon and the changing patrons in our classrooms and even the towns we consult with is a reality here to stay. It is important that we meet these changes with flexibility and dignity. Change is almost always hard, but it is often good. The future of cooperation with the cities we serve depends on our ability to accept these changes and incorporate them into our way of life. The comment my co-worker received on the evaluation gives me hope for our future. I am honored to work with people who are able to put aside differences and work together for the good of our state. 💧

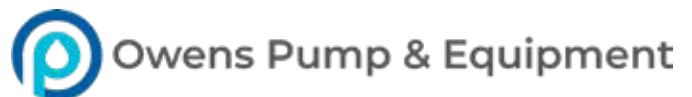


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Troubleshoot First

by Heath Cokeley, Programs Manager/Circuit Rider

The way I have always viewed mechanical things is from the moment they are made they are doing their best to destroy themselves. No, I'm not saying they actually have a mind of their own and are looking for ways to break, but if it has moving parts or electrical parts it will need to be worked on at some point. An interesting thing I have noticed and mentioned in other articles, is how often maintenance needs are not thought of during design of the system. While that is not the main point of this article it is worth a quick side bar to say, go over the engineers' plans during design very carefully, to make sure there is enough room around that pump or control valve to get in and work on it when it needs maintenance.

The main purpose of this article is about what to do when things break. It is interesting to me, as I see today far more operators just picking up the phone when something breaks rather than trying to figure out what broke and why. Yes, I fully understand there are things we can't work on without additional licenses and certifications, but to me, there is great value in at least some level of troubleshooting. It's almost comical to me looking back on my early days in the water industry, as I never really thought about picking up the phone to get a contractor in to fix something. That was always a last resort as it was going to cost the system a lot more money, which we didn't necessarily have.

I guess what I am saying is, when the opportunity presents itself, troubleshoot first. If you have a leak, before you shut the water off, listen to it with whatever leak detection equipment you have. Not necessarily to pinpoint it, as you may know exactly where it is, but more to learn to use the equipment better. When something breaks in a treatment plant, pull out the O and M manuals and see if you can figure it out, even if you will still need someone to come out and fix it. If you do need to have a contractor, come fix something, don't be afraid to look over their shoulder so you can gain a better understanding of the infrastructure you are running. Don't be afraid to use the internet and especially YouTube to help you fix things, it is now just one more tool in our toolboxes. Troubleshooting is just the opportunity to understand that aspect of the system better, while it may be time consuming today, what you learn will likely help you 10-fold in the future. Hopefully you are already taking the opportunity to troubleshoot, and this is just a reminder, but if not, I hope you think about it the next time something breaks, and with that I'll see you down the road. 💧



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What is Your Attitude Towards Continuing Education?

by Heather Davis, Apprenticeship Coordinator

It may sound like a weird question, but I believe it is a question that we do need to ask ourselves in this industry. To be completely honest, I think the question is for every part of our lives, but we won't get into that here.

Water and wastewater treatment, laboratory, and procedures are always changing. There is always something new to learn or a new updated way of doing something. So, what is your attitude towards continuing education? Are you the person that gets upset every time you have to take a class? Are you the kind of person that is always excited to learn more and will take as many new classes as you can, or are you the kind of person that is right in the middle, where you would like to learn something new, but only if it will help you do your job better?

Each person has a different attitude when it comes to their job. There are some people who are perfectly fine doing the exact same thing every day for the rest of their lives. What comes to mind is someone working on an assembly line in a factory putting the same pieces together day in and day out for their entire career. That sounds so boring to me. Don't get me wrong, sometimes steadiness can be very nice in life and help you feel safe and secure.

Then there are some people who look and see if there are new and improved ways of doing something at their job. People like that end up having a lot of different skills that come in very handy with projects and help them think more outside the box.

Everyone has the ability to learn new skills at any point in their life. The catch is, they have to be willing to learn. If we don't want to learn something new, then we won't. It comes down to our attitude and willingness to do it. I will admit that it can depend on the teaching the topic and how we are feeling that day.

Even the OAWU staff have to take continuing education classes for our jobs. Some of the training we have to do is very informative, and I have learned a lot from those classes. Sadly, some of the training is not always useful and is more of a sales pitch than an actual training class. I have two choices when it comes to training, I can try and learn no matter what or not pay attention and do something else.

It is our own personal choice whether we learn or not. Don't stop trying to learn new things. There is always room for improvement in our way of doing things. Go into each training session with the mind set of, "I'm going to learn something today." You may be amazed to find out what you are capable of. 💧

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Data Management II

by *Tim Tice, Projects Manager*

Managerial data and operational data must coexist to better the effectiveness of the overall health of any utility. The two data sets are obtained in the same manner, yet the information derived gives two timelines.

Operational data gathered is information supporting real time processes. In the last article, we mentioned reviewing kilo-watt hours on motors in comparison to how much was pumped. If the amount of liquids moved during the timeline is relatively the same, yet more kilo-watt hours are consumed, the efficiency of the components (motor and pump) is diminishing. If the power consumption begins to spike, there could be evidence of eventual, sooner than later, failure (from a heavy load or worn impellers).

Managerial data provides similar information, but the information should be used to assist in the health of the utility for the future. The information allows decision makers to strategically prepare for better informed decisions. By knowing the total power consumption, or change in it, data can be tracked to optimize said operations. This data can also be used to support asset management programs.

Today, more than ever, utilities are looking at future projects and costs associated with said projects to sustain operations. How does a utility measure sustained operations? By knowing the specifics in its operations, which is the reason for better management tools. Fiscal impact from capital improvement planning is a worrisome task due to the increased costs and how to pay for upgrades. Combine the dollar side with prioritizing projects, and the decision becomes convoluted.

To prioritize a capital improvement list, one should look at the low hanging fruit, those smaller projects that can be accomplished either in-house or those that are less expensive. A method to start the process can begin with past system performance. If a particular component needs routine attention, it may require either rebuilding or replacing. All too often we hear there are no longer replacement parts, which simplifies the decision, replacement is the answer.

The amount of data required for operations is growing and understanding the idea of how to monitor the information and use it is another question that needs answering. One single goal in data management would be to develop reports that deliver insights towards higher efficiencies. Two aspects in looking at better efficiencies are a) attempt to keep expenses down, b) provide data on future ranking of system processes and how to best apply dollars to meet the goal.

Tracking data is a continual process, and if data is not routinely reviewed, all too often it becomes obsolete. Implementation at the onset may seem daunting, but what information derived from the beginning will prove worthwhile for the

future. To start, most utilities already have a good amount of data, i.e. pumping totals, chemical usage, meters for power consumption, mileage on vehicles, etc. Organizing said data becomes a challenge and when it is organized, look to co-workers to discuss the goals from information. One would be surprised by the interpretation from multiple individuals. From a staff perspective, the team should get a consensus to be on the same page.

A few years ago, a utility was looking at adding more storage to the system and estimate how to cover the cost of an additional reservoir. This stems from the system being at maximum production, and challenges maintaining available stored water. An idea was shared to look at and determine significant leaks. The discovered information was a water loss above thirty percent and with repairs of

a couple of larger leaks, the system was able to postpone the project of building a new reservoir. This example is a short-term solution but proved the process in establishing or assisting the management of the financial side of the utility.

Both managerial and operational data can assist with overall system improvement. The challenge with data is a) collection of, and who will coordinate, b) understanding the data, c) changes in data and d) what to do with the data. To simply gather data to improve efficiency can be the primary goal, but as operators see the findings, changes towards the betterment of the utility can be evident. The best of everything in life! 💧

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Wastewater Testing... at Another Level

by Monty Norris, Wastewater Technician

What can we learn from what we flush besides how to treat, disinfect, and create an effluent better than the river that receives it. As we all know covid detection in our wastewater became detectable and used as another resource for monitoring this epidemic we all will not forget.

What else can we detect? The possibilities are endless, as technology is always improving. At a glance is pfas, opioids such as fentanyl, xylazine (“tranq”) meth, cocaine and naloxone, along with viruses. What it can do is provide us with a snapshot of what is occurring in our area whether it be viruses or drug use, which will allow us to be more proactive with outreach efforts and health care if we can see a surge or indicator beforehand.

How do we detect them? By isolating the wastewater sample for specific chemicals, we want to test for them. Using liquid chromatography-mass spectrometry, it is separated by its molecular signature which determines the drug itself (flushed), or the metabolites which are the end product that people excrete after consumption of the drug.

Who is doing the tracking? There are several agencies doing this, public and private. OSU has done this with facilities and offered samplers for participants in return for sampling of city wastewater. Biobot Analytics is another, which is where some results have come from with Scientific American as the author. Covidpoops19 website will show statistics of where there has been covid sampling and whether it is still ongoing or not, as well as who is sampling that facility.

Typically, we only sample for permit required testing parameters, but it may become an evolving test that could include sampling for additional information related to our health care. I chose this topic to also bring to light the opportunity that has been available the last three years to small, rural, tribal, and territorial communities through U.S. CDC funds WEF is offering free autosamplers and flow meters to those that apply and meet the criteria in an attempt to broaden the opportunity for wastewater sampling in rural populations but not required. By the time this comes out, if they renew the opportunity, it should be available to those that meet the criteria to apply. Please, if you meet the requirements look into this opportunity. 💧

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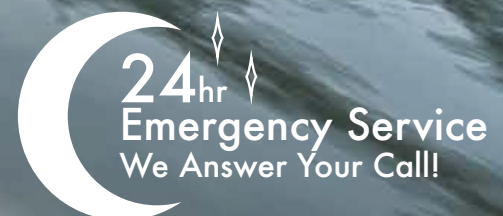
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Step...Down...Across...

by Bill Palmaymesa, Small System Trainer

She's not as popular as her big sister to the West, he thought to himself as he looked down at the dark water below. *But maybe that's a good thing...* His thought trailed off as he surveyed the river and geology downstream. The flat-topped basalt monolith that blocked her East-West flow, forcing her Northward home to the Big River, loomed against the Mid-November steel grey sky in the distance. Looking Eastward upstream towards the Highlands, he could see, if only in his memories, the river's flow draining the Strawberry's, Blues, and Elkhorns. *It's snowing up there*, he thought to himself before stepping off the edge of the overlook onto the remnants of an overgrown game trail.

His new old-man knees reminded him of his age as he side-stepped his way down through the dried-out rabbit brush and bunch grass, finally reaching the cut bank on the river's edge. He turned and gazed up the steep slope to where his truck was parked. *It is gonna be tough climbing out of here.* The upstream USGS monitoring station showed a stream flow of 243 cfs. Recent rains had created a small amount of turbidity, but it also reminded the fish that it was time to move. Bracing himself against a large boulder, he gently eased himself into the current and cold water, careful not to make a splash.

He was in water just above his waist, with a slight current pushing against him, and unable to see his toes, a wading sin that he'd often preached against to his now adult son. *But hey, do as I say, not as I do.* Besides, He knew this run and this river bottom. After only a few steps the water shallowed and he was on the opposite bank, river right. He stepped out of the water onto the cobbled shore and walked the 150 yards upstream to the top of the run, trying to hug the willow line and not spook any holding fish. He was throwing a fast action 9 foot, 6 weight graphite rod, strung with an intermediate sink tip line. He reached the top of the run and stripped line off his reel. He made a few roll casts until he was comfortable with his line control distance. He began his internal cadence...

Step. He was already in place for his first cast *Down* stream river left towards the cliff and cut bank he had just come down. *Across.* He allowed the current to swing his fly (with a mend or two) across the run to finish directly below him. Taking a *Step* downstream he once again cast his fly *Down* stream towards the cliff and cut bank, letting the current carry it *Across*, returning it directly below him. *Step...Down...Across.* Repeat.

His mind began to enter the random stream of consciousness that can occur when swinging a fly for steelhead. *Great, now I'm hungry. Are cubits and cubics the same thing? What's for dinner? Will she make dinner or is she*



mad that I'm fishing and not cleaning the garage? We need to have a garage sale. I wonder if I could put a sail on my pontoon boat.

Step...Down... Across. That OAWU conference at Spirit Mountain Casino was pretty good. Didn't see the supersmart big guy in suspenders and gold rimmed glasses though, maybe he retired. Man, I want to retire. Retire, who's going to run my water system? An apprentice? I need an apprentice. OAWU has an apprenticeship program now. I should give them a call...

Step... Down... Across. Keep a tight line. Throw a mend in that line belly... BAM! The hit from the fish snapped him to his senses. He wanted to react instinctively and set the hook towards the main current, but experience had taught him otherwise. Knowing the fish was taking his fly back to its original holding spot in the run, he set towards the bank. He landed her quickly, a bright hen sporting her adipose fin. She was wild and she had a job to do upstream. He released her gently without removing her from the water. He looked heavenward, said a brief "thank-you" and began his mantra again.

Step... Down... Across. I've never caught a hatchery fish on this river, why does ODFW allow bait and treble hooks? ODFW? Is a wolf watching me? I could outrun a wolf in waders. Ha! Especially if he's the one wearing the waders! He looked downstream during his swing and realized he still had about 120 yards left to cover in this run. The temperature was starting to drop. I'll fish until my rod guides start to freeze up, he thought to himself as he began another swing. Or until I freeze up.

Step...Down...Across. It's pretty cool that OAWU is building a training facility with a wet lab. Wet lab, I miss my dog. If someone could come up with a perfume that smells like Wet Lab and diesel fuel...Good to hear that this training facility will not impact the conferences. I like the OAWU conferences, especially Hood River...

Step... Down... Across. He didn't have the opportunity to mend before his line and fly unnaturally headed

back to its original landing position. He set and immediately the fish raced past him upstream to the deep hole above the run. Reeling like a mad man, he couldn't get his line back on the reel fast enough. All that slack and the fish was gone. It was worth the rush. As he looked heavenward for his brief prayer of thanks, his face was met with the fresh sting of graupel falling from the sky. He looked east upstream towards the Highlands. Sure enough, the snow that he had seen to the East was here and he was cold. He knew he'd work up a sweat climbing back to his truck but that would be short lived. The graupel was falling harder now, soon to become sleet and then, snow. Hooking his fly into the hook holder on his rod, he pulled the hood of his wading jacket over his head and began the cardio work-out back to reality. ♦



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Importance of Exercising Water Valves

by Sam Waller, Circuit Rider

Water valves are essential components in water distribution systems, serving as control points for directing and regulating the flow of water in pipes. Their significance spans across municipal water supply systems, irrigation systems, and industrial applications. However, despite their critical role, water valves are often placed into service to operate under the assumption that they will function seamlessly when called upon. This assumption can lead to severe consequences if valves are not exercised regularly. Exercising water valves is a crucial maintenance activity that ensures reliability, enhances performance, prolongs the lifespan of the valves, and ultimately protects water resources.

Exercising water valves involves opening and closing them to their full operational positions, ensuring that they move freely without obstructions or excessive wear. During this mundane task, several things can be learned. In my opinion, the most important part of valve exercising is learning your system. Knowing where valves are before a water line breaks at 2 am in the snow can be invaluable knowledge. Another advantage is just to ensure valves aren't paved over or covered in gravel.

Valves are not cheap, so why not help expand the useful lifespan of them. Exercising valves helps prevent rust and corrosion build up that can cause premature failure. During valve exercising, simple observations can save time and money. For example, if a valve can is full of gravel, it can be cleaned out so the valve can be used in an emergency. Also, during the operation the valve should turn uniformly, if this is not the case it should be noted for replacement or at least looked at in the future.

The practice of exercising water valves is not merely an optional maintenance activity, but a vital aspect of ensuring the reliability and performance of water distribution systems. The prevention of mechanical failure, maintenance of system integrity, extension of equipment lifespan, preparedness for emergencies, and enhanced operator training are all critical components supporting this practice. As water infrastructure continues to age and face increasing demands, proactive maintenance strategies, including the regular exercising of valves, will be critical to delivering safe, reliable water service to communities. By prioritizing valve exercising, systems can safeguard their water resources, reduce long-term costs, and ensure uninterrupted service delivery to as many customers as possible. 💧

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Road Trip *written by Erin Collier, 13*

Mike Collier, Deputy Director/Source Water Specialist

It was a cold fall morning in Albany, Oregon. Karmen looked out of her foggy window and sighed. The worst part of going to her cousin's house for Thanksgiving was the drive. With her brothers in the back, and a 15-hour drive ahead, Karmen did not know how she would survive. She plugged her headphones into her phone just to hear the heartbreaking digital voice say, "out of battery." Karmen let out another long sigh. Why had she forgotten to charge her phone last night? She could tell this would be a long day.

Out of Karmen's window was a field of red, yellow, orange, and brown. It was beautiful, and Karmen wanted to treasure it while it lasted. Soon, all she would be able to see would be a vast field of rock, with the occasional tree or waterfall. Eventually, she would see a few fields with cows, or a family of deer. That is how she would know she reached Montana. She couldn't wait, she hadn't seen her relatives since last Christmas. She always had the best time with her cousins. Although she played Roblox with some of them almost every day, it just wasn't the same. Also, her oldest cousin had just moved away to college, which was crazy, and she couldn't wait to ask him all about it.

Karmen's younger brother, Jamal, tugged her dark red hair, dragging Karmen out of her thoughts. "Are you even listening? I asked if you wanted to play Go Fish with us!" Jamal exclaimed. Karmen had nothing better to do, so she accepted the offer. It would be a good game to play to pass the time. Her youngest brother, David, delt first. He won in only three rounds. Somehow, David always got lucky with these games. Karmen saw Jamal's eyes fuming behind his bleach blond bangs. Jamal never liked to lose, especially to his siblings. "Maybe we should do something else," Karmen said.

Karmen felt her stomach grumble and suggested they stop for breakfast. They had rushed out of the house at 4 am, and did not have time to eat. "Honey, there's no need to stop, remember we have yummy oatmeal bars in the back!" Mary, her mom exclaimed. Mary always insisted they eat healthily and was not a huge fan of fast food. "Okay, thanks mom." Karmen said. Karmen was so hungry that even an oatmeal bar sounded delicious right then. She reached the back and patted her hand around the luggage until she found the bag with the oatmeal bars. She pulled one out and examined it carefully. It was lumpy and bumpy with clumps of who knows what, and it smelt strongly of cinnamon and spice. Karmen forced it down, at least it satisfied her hunger.

"Daaaddyyyyyy, I need to go to the bathroom." David whined in his high-pitched voice. David had the smallest bladder ever and went to the bathroom about once every hour. Scott, her dad, hated to stop. He claimed it was just a waste of time and would cause them to get there late. Scott eventually gave in, after many long minutes of David whining. He was the biggest whiner ever, but it worked, and he almost always got what he wanted. Scott stopped on the side of the road, and David got out and pulled down his pants. Karmen looked away; David was not very good at modesty.

"Toby Mac!" Mary shouted, once they were back on the road. Karmen and her mom always played this game where they would try to guess the artist of



the Christmas song playing on the radio before the other person. Most of the time, her mom won. Scott hated this game, because he strongly believed that Christmas music should not be played until after Thanksgiving, or better yet, the week of Christmas. He would much rather listen to some staticky AM sports podcast, or some old guys ranting about politics.

Karmen was bored out of her mind. She absolutely hated car rides, especially when she didn't have her phone, her main source of entertainment. She did bring a book, but right now all she wanted to do was listen to music to block out the sound of her brothers fighting in the back. They always fought about the stupidest things, and right now they were fighting about who was better at soccer, a sport neither of them played. Her brother was on his phone, as he always was, on a stupid football app that he always told them about. He seemed to win all of his games, and it did not help his ego. Karmen thought about asking him if she could listen to music on his phone for a bit, but she knew what the answer would be, no.

"I'm hungryyyyyy!" David whines. "Hi hungry, I'm dad," Scott jokes. "Hahaha. But seriously, can we stop for lunch?" David asks, "Pleaseeeee!" David knows there is plenty of food in the back, but he also knows that if he whines, he will eventually get his way. Scott gives in again, and searches for directions to the nearest Subway, David's favorite fast food place. David would always get the same thing, cheese, bacon and extra olives toasted on Italian herb and cheese bread. He was a very picky eater.

When they are almost at the fast-food place, Scott tells everybody to put their shoes on. David and Karmen already have theirs on, but Jamal is shoe-less. He looks around the car for his pink Crocs but can't find them anywhere. He tries to walk into subway bare foot but gets caught by a frustrated Scott. "Did you forget your shoes, Jamal?" Scott asks, an angry expression on his face. Jamal slowly nods his head, afraid of what Scott might do next.

Scott laughs and reaches into the car. He grabs Mary's sandals and tells Jamal to put them on because they are the shoes closest to his size. At first, Jamal hesitates, but then he reluctantly puts them on.

They all order and sit down in the booth by the drive through line. Whenever they eat out, they like to see how many people they can get to look at them through their car windows. It was a little challenging to see who could get the most waves. Once, they even got to play a short game of rock paper scissors! When their food comes, David goes to the soda fountain. He fills his cup with every drink they offer. The soda turns a dark poop brown color. Although Karmen thinks it looks very unappetizing, David insists it is delicious.

When they get back into the car, Karmen realizes how tired she is. She woke up so early in the morning, barely had any time to sleep. She wiggles around and tries to get comfortable, but it is nearly impossible in this cramped car. She doesn't understand how it takes less than a minute for some people to fall asleep. She closes her eyes and sits there for what she thinks is about thirty minutes, but then she gives up. It is useless, and her brother's loud arguing in the back doesn't help.

David needs to pee again, but Scott doesn't let him. Scott says that they are almost there, and he doesn't want to stop anymore. Karmen gasps. Are they almost there? She can't believe it. She feels like just a second ago, there were still five hours left. Maybe she did fall asleep! The next ten minutes go by very slow, and the anticipation in the car goes crazy. None of them can wait to see their family. As the car creeps along the path, they glimpse their cousin's house in the distance. Their family is standing outside, waiting for them on the front steps. Karmen is so excited to see her family, but she can't stop thinking about how much she will dread the drive back. 💧

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Changing Organizational Structure to Obtain Municipal Use

by Laura A. Schroeder and Max Jones

Introduction

Many members of the Oregon Association of Water Utilities (“OAWU”) provide water delivery under water rights limited to group domestic use. Unlike the limited group domestic type of use, the municipal type of use includes a wide range of “types” of uses and therefore provides more flexibility than group domestic. This article discusses why a water management organization (“WMO”) might consider changing its organizational structure to make an application for municipal use.

Group Domestic Water Use

The distribution of water under a group domestic type of use is common among small WMOs in Oregon. “Group domestic” is the use of water for “domestic water purposes” by more than one residence or dwelling unit.¹ Domestic water purposes are limited to the use of water for human consumption, household purposes, and domestic animal consumption that is ancillary to residential use of the property, or related accessory uses.² A WMO holding water rights limited to group domestic use cannot distribute water for purposes such as irrigation or commercial use. Thus, water used for irrigating yards, gardens, and common space; commercial use for hotels, stores or other small businesses; are all prohibited.³ However, a WMO holding group domestic water rights may consider organizational restructuring to be eligible for an Oregon Water Resources Department (“OWRD”) transfer from “group domestic” to the more flexible “municipal” type of use.

Municipal Water Use

A “municipal” type of use as defined by OWRD provides for the delivery and use of water usual and ordinary to municipal water systems.⁴ Examples of “usual and ordinary” water uses of municipal systems includes water use for human consumption, irrigation of lawns and gardens, commercial water use, industrial water use, fire protection, irrigation and other water uses in park and recreation facilities, and street washing.⁵

Types of WMOs Eligible for Municipal Type of Use

Not all WMOs may apply for water rights associated with the “municipal” type of water use. The WMO must be considered a municipality, which includes a broad variety of entities in Oregon. Stating the obvious, a “municipal

corporation” is one that avails itself to the public, such as “any county, city, towns or district”.⁶ A common municipality form is a “district” and there are many forms of districts that qualify for “municipal” type of water use. For example, there are domestic water supply districts, people’s utility districts, water control districts and many others.⁷

The various entities that qualify for “municipal” type use require adherence to specific formation criteria. It behooves a WMO to determine which municipal entity best meets their demands prior to restructuring.

Type of Use Change

Once a WMO has re-formed as a qualified municipal organization under Oregon law, the WMO may file an application with OWRD to transfer the use in its water right certificates from group domestic to municipal. Only after a transfer is approved by OWRD may the WMO utilize its water rate and duty for the additional types of use allowed by the municipal type of use. Remembering, however, that though the type of use is changed by the approved transfer, the amount of water, i.e. the rate and duty, will not change.

Conclusion

Use of water rights limited to group domestic use are common amongst small WMOs in Oregon. However, the permitted type of water use with these rights is limited in scope. A WMO should consider restructuring to a municipal entity to be eligible for a municipal type of water use. After forming the new municipal qualified organization, the WMO may file a transfer with OWRD to change its right to municipal use. At Schroeder Law Offices, P.C., we can assist in WMO restructuring and with any OWRD transfer.

About the Authors

Schroeder Law Offices, P.C., was founded by Laura A. Schroeder and represents water-rights clients in six western states and consults internationally. Max Jones is an Associate Attorney and practices in Oregon. You can read more about other water right issues at Schroeder Law Offices’ Water Law Blog, <http://water-law.com/home/blog>. 💧



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IoT and Hub-Spoke Networks: How They Connect

by Jonathan Frank, ACS



In the modern world, the Internet of Things (IoT) has become indispensable for homes, industries, and critical infrastructure like water and wastewater treatment, connecting billions of devices globally. But have you ever wondered what makes IoT so efficient at handling this massive connectivity? The answer lies in the hub and spoke network model, a critical design that underpins successful IoT deployments.

Understanding Hub and Spoke in IoT: At its simplest, the hub and spoke model resembles the structure of a wagon wheel. The wheel's center has a hub in the middle and spokes extending out towards the rim. However, the rim is irrelevant in this model; it is just the endpoints where the spokes connect to the rim. Devices at the endpoints interact with a centralized system (hub) to share information and instructions. This model is incredibly effective at scaling and managing large networks of devices, simplifying everything from data processing to device control.

For example, in smart home systems, devices like thermostats, lights, and cameras communicate with a central hub that processes data and allows remote access. The same principle applies to water treatment and water resource recovery (WRRF) systems, where radar-level sensors send water-level data to a central programmable logic controller (PLC), ensuring prompt maintenance and improving operations. As the hub gathers data, endpoint devices communicating through spokes can function autonomously or coordinated, ensuring no single device is overloaded with complex tasks.

Without this model, managing the enormous data flow and device actions would be chaotic and inefficient.

The beauty of this approach is how it balances the load between the hub and the spokes. The hub takes on data processing and decision-making, while the individual devices (endpoints of spokes) focus on gathering data and executing commands. This model's efficiency can be seen in industrial systems, known as Industrial IoT (IIoT), where machines and sensors relay operational data back to a central system. The central hub analyzes this data to refine workflows, predict failures, or schedule

maintenance, ensuring that each device on a “spoke” works at its full potential.

In a water resource recovery facility (WRRF), returning to the example, various sensors check everything from temperature to equipment performance. Each sensor is a spoke in the system, feeding data to a central hub overseeing facility operations. Acting as the hub, this central system can then analyze the data and send instructions back to the sensors, ensuring the best performance and alerting human operators when issues arise. This hub and spoke architecture prevents bottlenecks by distributing workloads efficiently and provides a reliable system where the failure of a single spoke doesn't collapse the entire operation.

IoT's Evolution Through Hub-Spoke Networks: My journey with IoT goes back to 2007, when I first came across the term at a convention in Anaheim, CA. The concept fascinated me, and I later worked on RFID tracking systems for the Department of Defense, unknowingly contributing to what we now call IIoT. I didn't yet refer to it as IoT back then, but the principles were the same. IoT has evolved far beyond those early days, with AIIoT (Artificial Intelligence of Things) now layering advanced intelligence on these interconnected devices. AIIoT systems can predict and adapt autonomously, refining industrial processes and consumer-facing technologies like smart homes.

As IoT continues to grow, the hub and spoke model stays fundamental. One key benefit of this structure is that it minimizes latency, critical in industries where real-time data is essential. For example, in intelligent water systems, variable frequency drives (VFDs) and sensors must respond instantly to water pressure and other changes. A delay of even a few seconds could cause damage to pump motors. In the broader water distribution system, the central hub processes vast amounts of data from various sensors and inputs such as VFDs (endpoints of spokes). This system can adjust pressure zones appropriately, ensuring seamless operations.

Hub-Spoke vs. Mesh Networks architecture in IoT: While the hub and spoke model is effective, it is not the only architecture used in IoT. In some applications, a mesh network may be more suitable.



The Dots for Process Efficiency

A mesh network distributes tasks across devices, allowing them to communicate directly with one another rather than through a central hub. This reduces the dependency on a single point of failure, making it ideal for decentralized applications. However, mesh networks can struggle with managing large-scale data and require more complex algorithms to support efficiency. The hub and spoke model remains the top choice for industries looking for reliability and simplicity.

The hub and spoke model can adapt across different communication mediums like Ethernet, fiber optics, radio, cellular, and satellite, providing versatility depending on distance, bandwidth, and real-time processing needs. Cellular networks (4G/5G) can provide the backbone for IoT systems or remote monitoring applications. The hub (data center or control server) communicates with devices (endpoints of spokes) through cellular networks. Each technology has strengths and limitations that must be considered when implementing the IoT system.

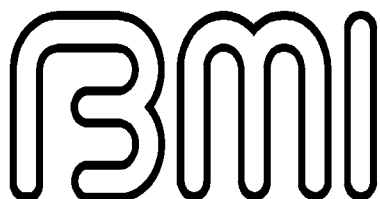
The hub and spoke model has proven indispensable in our work with water treatment and wastewater treatment plant (WWTP) automation and control systems. Whether managing water treatment plants or industrial factories, the ability to centralize data processing while distributing tasks to various devices

ensures efficiency and reliability. Yet, as IoT continues to evolve, integrating Artificial Intelligence (AI) and machine learning (ML) with IoT networks (AIoT) takes this model to the next level. By allowing hubs to process and learn from data, AIoT systems can predict issues before they arise, making industries more resilient and efficient.

What's Next for Hub-Spoke in IoT? As IoT adoption grows, the hub and spoke model will remain the backbone of connected systems, from homes to entire cities. However, challenges like data privacy, security, and bandwidth limitations must be continually expanded and supported. This model offers a clear path to scale, but integrating AI and blockchain technologies may be necessary for future advancements in secure, real-time decision-making.

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Is Winter Over Yet?

by Hans Schroeder, Circuit Rider

Hopefully spring is right around the corner. Winter has drawn on long enough. The shop is organized, equipment has been serviced, and outside projects are ready to start when the weather decides to comply.

As we prepare for our spring projects, be it equipment operation, mowing, excavations, street sweeping, plant upgrades, or distribution line/meter installs.

We need to make sure safety for employees and the public are a priority. To do this, here are a few things we should remember to do:

- Make sure all your certificates are up to date: i.e. confined space, flagger, CPR and First Aid.
- That all PPE is still in great shape, if not make sure it is replaced or re-certified. Remember keeping you visible and ready not only protects you but makes the public more aware of where you are working.
- Schedule out the weekly or monthly safety meetings depending on what your city requires or what kind of projects are going on.
- Are your first aid kits updated and in all your vehicles and buildings. It is always a good idea to update those supplies that may be past their expiration date.
- Along that line, have all your fire extinguishers been serviced and are ready to go?

I hope this helps you get to thinking of some extra things we all need to take care of before our busy season starts!

Happy Spring! ♦

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Date	Class Title	Location	CEU Information	ESAC#, Fee/Free
February 4-5	Water Treatment, Water Distribution Certification Review	Independence	1.4 Water/0.5 Wastewater/Onsite	5815 Fee
February 6	Water T/D Level 3,4 & Filtration Endorsement	Independence	0.6 Water	5816 Fee
March 3-7	47th Annual Management & Technical Conference	Sunriver	3.0 Water/Wastewater	TBA Fee
March 18-19	Wastewater Treatment/Collections Certification Review	Keizer	1.4 Wastewater/0.5 Water	6043 Fee
April 8-9	Water Treatment, Water Distribution Certification Review	Keizer	1.4 Water/0.5 Wastewater/Onsite	5815 Fee
May 13	Math for Operators	Redmond	0.4 Water/Wastewater	6104 Fee
May 13	Pumps & Pumping	Redmond	0.3 Water/Wastewater/Onsite	6216 Fee
May 14	Trident Users Group	Molalla	0.7 Water	6314 FREE
June 10	Math for Operators	John Day	0.4 Water/Wastewater	6104 Fee
June 10	Pumps and Pumping	John Day	0.3 Water/Wastewater/Onsite	6216 Fee
July 22-23	Water Treatment, Water Distribution Certification Review	Redmond	1.4 Water/0.5 Wastewater/Onsite	5815 Fee
August 5-6	Wastewater Treatment/Collections Certification Review	Salem	1.4 Wastewater/0.5 Water	6043 Fee
August 18-21	31st Annual Summer Classic Conference	Seaside	2.3 Water/Wastewater	TBA Fee
October 6-9	Fall Operator's Conference	Canyonville	2.0 Water/Wastewater	TBA Fee
October 14-15	Water Treatment, Water Distribution Certification Review	Keizer	1.4 Water/0.5 Wastewater/Onsite	5815 Fee
October 16	Water T/D Level 3,4 & Filtration Endorsement	Keizer	0.6 Water	5816 Fee
October 21-22	Wastewater Treatment/Collections Certification Review	Redmond	1.4 Wastewater/0.5 Water	6043 Fee
November 11-13	Spirit Mountain Casino Operator's Conference	Grand Ronde	2.0 Water/Wastewater	TBA Fee
December 8-11	Annual End of Year Operator's Conference	Hood River	2.3 Water/Wastewater	TBA Fee

Levels 1–4 Water Operator Exams

Trained and certified operators are necessary to ensure that the systems are managed in a manner that fully protects public health and the environment. The OARs for certification stipulate that the qualifying experience for applicants for certification as a water treatment plant operator must attain at least half the required operating experience at a public water purification plant that uses complex filtration technology and is not more than one classification lower than the level of certification they are seeking. In other words, if you have only worked for a Class 2 treatment plant, we allow you to apply for a Level 3 certification but not a Level 4 certification. If you move on to a Class 3 plant, then you must have ½ the qualifying experience (at the Level 3 plant) before allowing to apply for a Level 4 certification. Reciprocity from state to state ensures that the operator have the operating experience for which they are certified.

For additional information, please visit <http://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/OperatorCertification/Levels1-4/Pages/exams.aspx>

Drinking Water Data Online <https://yourwater.oregon.gov>

Drinking Water Services <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/Pages/index.aspx>

Training class dates, class topic and/or locations may be subject to change as needed.

For more information on any class by OAWU, contact 503-837-1212 / office@oawu.net or visit

www.oawu.net

Read past H2Oregon issues and learn about
upcoming events at

www.oawu.net

QUIZ CORNER

1. A pump is pumping 2.5 gallons per minute. How many gallons will be pumped in a week?
A. 25,200 gallons C. 32,300 gallons
B. 28,800 gallons D. 35,600 gallons
2. How many pounds does 5.5 cubic feet of water weigh?
A. 218 pounds C. 317 pounds
B. 268 pounds D. 343 pounds
3. Based upon AWWA recommendations, how often should a Basic Water Audit be completed?
A. Every 3 years.
B. Annually, coinciding with annual reporting.
C. On a bi-annual quarterly basis as required by the Water Management Conservation Plan.
D. Immediately after the repair of a water main break.
4. Based upon AWWA recommendations, when should a Comprehensive Water Audit be completed?
A. Every 3 years.
B. When a Basic Water Audit shows a substantial change (greater than 2%).
C. When a Basic Water Audit shows a substantial change (greater than 10%).
D. Both A and B
5. Water bears can survive in environments of extreme pressure. Fill in the blank and complete the sentence with the best choice:
Water bears can survive in an environment that has six times the amount of pressure than?
A. a vacuum devoid of oxygen
B. there is at the top of Mt. Everest
C. a point ten miles under the Earth's crust
D. the deepest ocean trench on Earth
6. Most lawbreakers shun publicity, but not Billy The Kid. He was feted in newsprint and famed in the oral tradition of the West. He was reputed to have killed 21 men, but he met his match at the end of a six-gun. Who killed Billy The Kid?
A. Edward Reilley Forman C. Pat Garrett
B. Kris Kristofferson D. Lash La Rue
7. What is the distance from earth to the sun?
A. 25 million miles C. 87 million miles
B. 93 million miles D. 1.3 light years
8. What U.S. state is home to Acadia National Park?
A. Missouri C. Maine
B. West Virginia D. Kentucky
9. What is the definition of amperage:
A. The amount of flow of electricity
B. The amount of work done
C. Electrical "pressure"
D. Column of water
10. Which is more efficient, single phase or three phase power supply?
A. Single phase
B. Three phase.

ANSWERS: 1-A, 2-D, 3-B, 4-D, 5-D, 6-C, 7-B, 8-C, 9-A, 10-B



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Member Name: _____

Mailing Address: _____

City/State: _____

County: _____ ZIP: _____

Email: _____

Phone: _____

Contact Person: _____

Number of Hook-ups: _____

Were you referred? By whom _____

Type of System:

Water Wastewater Both

Membership Category Membership Dues

- Regular Member \$ _____
See schedule below
- Associate Member \$600.00
- Individual Member \$100.00

Regular Member Dues Schedule

1 to 100	\$75 + 48 cents per connection
101 to 500	\$85 + 48 cents per connection
501 to 1,000	\$90 + 48 cents per connection
1,000 and up	\$100 + 48 cents per connection
Maximum dues is	\$1,400.00

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Membership Types

Regular Member

A Regular Member shall be any water or wastewater utility, public or private, engaged in the production, distribution or reclamation of water. A Regular Member shall have one vote. Annual Dues: See Regular Member Dues Schedule

Associate Member

An Associate Member shall be any organization, individual or corporation, supplying services or equipment to water and wastewater utilities. An Associate Member shall have one vote. Annual Dues \$600.00 per year

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An Individual Member shall be an individual involved in the water/wastewater industry or a user of such utilities. The membership is informational in nature and shall be non-voting. Annual Dues \$100.00 per year

Benefits of Membership

- On-site technical assistance
- Various free training programs
- Discounts on training courses
- Discounts on Annual Conference registration
- Access to on-site training program
- Subscription to quarterly H2Oregon magazine
- Direct mailings about upcoming training courses in your area
- Summaries of legislative issues
- Legislative representation at state and federal level
- Associate Member Services and Products Guide
- Access to technical assistance library
- Access to technical and testing equipment for loan
- Voting rights in Association affairs
- Positive contacts with other organizations
- Camaraderie with water and wastewater professionals
- Operator Of Record services
- Job referrals, announcements and searches
- Well testing, plan review, rate studies, WMCP plans
- System performance evaluation and options
- Additional programs and services
- Disaster response assistance and planning



MB25



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62nd Court Mutual Water Company
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 Adams, City of
 Adrian, City of
 Agate Water System
 Albany, City of
 Albany Rifle & Pistol Club
 Alfalfa Water LLC
 Alpine Crest Improvement Dist.
 Amity, City of
 Ananda Center at Laurelwood, Inc.
 Arch Cape Water & Sanitary District
 Arlington, City of
 Arrowhead Mobile Home Park
 Aspen Lakes Utility Company, L.L.C.
 Astoria, City of
 Athena, City of
 Aumsville, City of
 Aurora, City of
 Avion Water Company
 Baker City, City of
 Bandon Dunes Resort
 Bandon, City of
 Banks, City of
 Barlow Water Improvement District
 Barlow, City of
 Bay City, City of
 Bay Hills Water Association
 Bayou Water Improvement District
 Beaver Water District
 Beaverton, City of
 Bend, City of
 Benton County Service District
 Bents Court Water Co.
 Berndt Creek Water Corp.
 Beverly Beach Water District
 Biggs Service District
 Black Butte Ranch
 Black Mountain Water District
 Blue River Water District
 Blue Spruce Estates
 Bly Water & Sanitary Dist.
 Boardman, City of
 Bonanza, Town of
 Boring Water District #24
 Brandy Bar Landing, Inc.
 Breitenbush Hot Springs
 Bridge Water District
 Brightwood Water Works
 Brooks Community Service District
 Brownsville, City of
 Buell-Red Prairie Water District
 Bunns Village Properties, LLC
 Burlington Water District
 Burns, City of
 Burnside Water Association
 Butte Falls, Town of
 Camp Baker BSA
 Camp Rilea
 Canby, City of
 Canby Utility
 Cannon Beach, City of
 Cannon View Park, Inc.
 Canyon City, Town of
 Canyonville, City of
 Carlton, City of
 Cascade Locks, City of

Cave Junction, City of
 Cedarhurst Improvement Club, Inc.
 Central Coast Clean Water Company
 Century Meadows Sanitary System, Inc
 Century Meadows Water System, Inc.
 Charles Tracts Water Company
 Chart Water Supply, Inc.
 Chehalem Mt. Sun Ridge Association
 Chenoweth Water PUD
 Chiloquin, City of
 CHR Dist. Improvement Co.
 Christmas Valley Domestic Water
 Cimmarron City Water Co., Inc.
 Circle C Improvement Dist.
 Clackamas River Water
 Clarks Branch Water Association
 Clatskanie, City of
 Clayton Creek Water Association
 Clean Water Services
 Cline Falls MHP
 Cloverdale Sanitary District
 Cloverdale Water District
 Coburg, City of
 Collins Products LLC
 Colorado Lake Co-Op
 Colton Water District
 Columbia City, City of
 Columbia Hills Homeowners Association
 Columbia River PUD
 Condon, City of
 Coquille, City of
 Corbett Water District
 Cornelius, City of
 Corvallis Waldorf School
 Cottage Grove, City of
 Country Club Water District
 Country View Mobile Estates
 Covanta Marion, Inc.
 Cove Orchard Water Association
 Cove, City of
 Crater Lake National Park
 Crescent Sanitary District
 Crescent Water Supply & Improvement District
 Creswell, City of
 Crooked River Ranch Water Co-Op
 Crystal Springs Water District
 Culver, City of
 Dallas, City of
 Dayton, City of
 Dayville, City of
 Deer Creek Estates Water Association
 Delphian School
 Depoe Bay, City of
 Deschutes Valley Water District
 Detroit, City of
 Dexter Oaks Mobile Home Park
 Dexter Sanitary District
 Diamond Peaks at Leisure Woods I&II
 Dietz Airpark Water System
 Donald, City of
 Drain, City of
 Drifter's MHP
 Dry Creek Airpark HOA, Inc.
 Dufur, City of
 Dundee, City of
 DWF Round Lake Utilities

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 East Yamhill Rural Water Company
 Eastmont Water Company
 Eastshore Water Improvement District
 Echo, City of
 Elgin, City of
 Elkton, City of
 Emerald Meadows HOA
 Emerald Valley Wastewater Co.
 Enterprise, City of
 Estacada, City of
 Estacada Mobile Village, Inc.
 Eugene Mobile Village
 Fairview Water District
 Fairview, City of
 Falcon Cove Beach Water District
 Falcon Heights Water & Sewer District
 Fall Creek Water District
 Falls City, City of
 Fern Ridge School Dist. 28J-10
 Fern Valley Estates Improvement Dist
 Fernridge Mobile Estates
 Fir Grove HOA
 Fir View Water Company
 Fishhawk Lake Recreation Club, Inc.
 Florence, City of
 Forest Park Mobile Village
 Fossil, City of
 Garden Valley Water Association
 Garibaldi, City of
 Gaston, City of
 Gates, City of
 Gearhart, City of
 Georgia Pacific-Wauna
 Gervais, City of
 Gilchrist Water Co., LLC
 Gladstone, City of
 Glendale, City of
 Gleneden Sanitary District
 Glenmorrie Co-op Association
 Glide Water Association
 Goble Water Association
 Gold Beach, City of
 Gold Hill, City of
 Government Camp Water Company
 Grand Prairie Water Supply Company
 Grand Ronde Community Water Association
 Grand Ronde Sanitary District
 Grants Pass, City of
 Grass Valley, City of
 Green Area Water & Sanitary Authority
 Green Oaks Park
 Haines, City of
 Halfway, City of
 Hall's Trailer Court
 Halsey, City of
 Harbor Water PUD
 Harrisburg, City of
 Hebo Joint Water & Sanitary Authority
 Heceta Water PUD
 Helix, City of
 Heppner, City of
 Hermiston, City of
 Hidden Valley Improvement District
 High Lostine Owners Association
 Highland Subdivision Water District

Hiland Water Corporation
 Hillsboro, City of
 Hines, City of
 Hood River, City of
 Hopewell Water Co.
 Hubbard, City of
 Hunnell Hills Community Water System
 Huntington, City of
 Ice Fountain Water District
 Idanha, City of
 Idleway Improvement District, Inc.
 Imbler, City of
 Independence, City of
 Indian Meadow Water Company
 Inn at Otter Crest
 Interlachen Water PUD
 Ione, City of
 Irrigon, City of
 Island City, City of
 Jackson County Parks
 Jacksonville, City of
 Jasper Knolls Water District
 Jewell School District
 John Day Water District
 John Day, City of
 Johnson Creek Water Services Company
 Joseph, City of
 Junction City, City of
 Keizer, City of
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 Kelly's Brighton Marina, LLC
 Kelso Water Association
 Keno Water Company, Inc.
 K-GB-LB Water District
 Kilchis Water District
 Kingswood Heights Water Association
 Klamath Falls, City of
 Klippel Water System
 Knappa Water Association
 Knoll Terrace Park
 L.A. Water Cooperative
 La Pine, City of
 Labish Village Water Commission
 Lady Creek Water System
 Lafayette, City of
 Laidlaw Water District
 Lake Creek Lodge
 Lake Grove Water District
 Lake of the Woods Resort, LLC.
 Lake Oswego, City of
 Lakeside Water District
 Lakeside, City of
 Lakeview, Town of
 Lakewood Homeowner's, Inc.
 Lamb Weston
 Lamontai Improvement District
 Lamplighter Water Association
 Lane County Parks
 Langlois Water District
 Laurelwood Water User's Co-op
 Lawrence Subdivision Water Assn., Inc
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 Lebanon, City of
 Lexington, Town of
 Lincoln City, City of
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 London Water Co-op



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 Lostine, City of
 Lowell, City of
 Luckiamute Domestic Water Co-op
 Lusted Water District
 Lyons-Mehama Water District
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 Madrone Hill Mobile Home Park
 Madsen Springs Water Assn.
 Malin, City of
 Manzanita, City of
 Mapleton Water District
 Maupin, City of
 McKay Acres Improvement District
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 Myrtle Point, City of
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 Neskowin Regional Water District
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 Newport, City of
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 North Hill Water Corporation
 North Powder, City of
 Northwest Newberg Water Association
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 Oakland, City of
 Oakridge, City of
 Oakwood Water Systems, Inc.
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 Ochoco West Water & Sanitary Authority
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 Oregon Shores II
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 Oregon Water Utilities-Mtn. Lakes
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 Otter Rock Water District
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 Perrydale Domestic Water Association
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 Pioneer Village Water Company, Inc.
 Polehn Heights Water Association
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 Prineville, City of
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 Rainier, City of
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 Redmond, City of
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 Reedsport, City of
 Reehers Homestead, Inc.
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 Richland, City of
 Rickreall Community Water Association
 Riddle, City of
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 River Point Farms, LLC
 Riverbend-Riverbank Water District
 Rivergrove Water District
 Riverside Water District
 Roats Water System, Inc.
 Rock Creek Water District
 Rockaway Beach, City of
 Rockwood Water PUD
 Rocky Pointe Marina
 Rogue Community College
 Rogue Lea Estates MHP LLC
 Rogue River, City of
 Rogue River - Siskiyou National Forest
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 South Hills Water System, Inc.
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Advanced Control Systems	Consolidated Supply Co.	Hose Solutions	Oregon Public Utility Commission	Special Districts Assn of Oregon
Aegion-Insituform Technologies, LLC	CORE & MAIN	Hurley Engineering Company	Orenco Systems	The Automation Group
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American Flow Control	DN Tanks	Inland Environmental Recourses	Perma-Patch, LLC	Treatment Equipment Company
American Leak Detection	Drinking Water Providers Partnership	Instrument Technology Corporation	Pittsburg Tank & Tower Co.	Tripac
Anderson Perry & Associates	Duke's Root Control	Kasco Marine	Prestige Worldwide Technologies, LLC	Umpqua Research Co.
Aqualitec Corp.	Edge Analytical Laboratories	Kennedy/M&H Valve	PumpTech Inc	Underground Tech.
Backflow Management, Inc. (BMI)	EJ	Kleen Tides, LLC	Puttman Infrastructure, Inc.	US SAWS
Bainbridge Associates, Inc	Energy Trust of Oregon	Lakeside Industries/EZ Street	RDO Equipment	USABluebook
Baker Silo, LLC.	Enviro-Clean Equipment, Inc.	League of Oregon Cities	Reiner Pump	USP Technologies
Bancorp Insurance	Ferguson Enterprises	Legacy Power Systems	RJM Company	Waterlab Corp
Baseform	FloHawks	Lesman Instrument Company	Romac Industries, Inc.	Western Systems
Bingham & Taylor	Frank J. Martin Company	Master Meter, Inc.	Romtec Utilities, Inc.	Western Water Works Supply, Co.
Biolynceus, LLC	Frontier Precision, Inc.	Metolius Engineering LLC	Schneider Water Services	Whitney Equipment Company, Inc
Business Oregon Development Dept.	Furrow Pump, Inc.	Metron Farrier	Schroeder Law Offices, PC	Wm H. Reilly & Co.
Cascade Columbia Distribution Co.	G.T. Gordon & Associates, Inc.	Morrison-Maierle	Seattle Pump & Equipment Co.	Xylem, Flygt Products
Cascade Waterworks	General Pacific, Inc.	Mueller Company	Sensus USA	Zenner USA
CIMCO-GC Systems, Inc.	Goble Sampson Associates	Neptune Technology Group		
CIMCO Sales and Marketing	Granich Engineered Products	Northstar Chemical Inc.		
		Numberg Scientific		

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