>> Dr. Chrissy Henderson: Alright, we will go ahead and begin. I would like to welcome you to our Corrosion Webinar Series. I'm Dr. Chrissy Henderson and I will be your host for today. We are part of the Materials and Corrosion Laboratory, which is with the Reclamation Technical Service Center, located in Denver. Four of these Corrosion Webinars are put on annually, in order to share with you special topics in our four main disciplines: cathodic protection, coatings, geosynthetics, and hazardous materials. Today we will be focusing on oil and when it is a hazardous material. Today's Corrosion Webinar will be using Microsoft Teams Live events and is automatically recording the presentation. If you would not like to be part of the live recording, you are free to leave at this time. The recording will be available after this webinar is over, through the webinar link that you received in your email. Or through the invitation that you got. During this presentation, we do encourage you to ask questions as they come up. There's a live Q&A chat feature. So, basically, you would click on the Q&A icon—which looks like a little chat bubble with a question mark inside of it—to access this feature. Grace Weber will be monitoring the questions and at the end, we will have our Q& A session. I would like to go ahead and welcome our presenter for today, Lise Pederson. She is a professional chemical engineer in our Materials and Corrosion Laboratory. She has worked for private industry, designing systems to monitor and remediate contaminated surface and groundwater. She has done river restoration and flood structure design work. Lise provides technical advice and support on chemical contamination and hazardous materials for Reclamation's various projects. With her colleagues, she is working to rebuild the Technical Service Center's hazardous materials response, in support of our construction projects throughout Reclamation. With that, I would like to go ahead and hand this presentation over to Lise Pederson.

>> Lise Pederson: Thank you Chrissy. Good afternoon for those of you who are on Pacific and Mountain Time. And good afternoon to those of you on Central Time. Our first screen up there shows you, uh, future goings-on. Every year we do a Corrosion School We already had ours for FY21. And we will be having another one in FY22. Uh, we've got another webinar like Chrissy was pointing out. And that next one will be on cathodic protection. So, jumping in... There's my contact information up in the upper right-hand corner. And, oil as a waste. So, there's a—we use a lot of oil in various functions at Bureau of Reclamation. So I just wanted to talk about, um, the issues that are involved that I have seen at various Reclamation facilities. And... give you guys some ideas on what you can do with it. Okay, so we've basically—It makes a ton of sense—Bureau of Reclamation is—has two major functions. We generate hydroelectric power. You can break that basically into mechanical and electrical. Both of these use oil. So, let's first go through the mechanical equipment. So, if you look at the pictures, the one in the lower left, there—that's in a turbine pit. So, uh, you got the penstock. And the water will come in. You can't see it but the water is actually coming in here. And these are called wicket gates. And these are servos. They're part of the turbine speed governor and they control how much these gates are open, which controls the speed of the turbine. These, as you can see, there's a drum here. There's hydraulic lines here. This is all hydraulics. All—everything you see in here. And then on the floor above it. This is more of the turbine speed governor. And just about everything in here is all hydraulic oil. And then continuing on, what you've got down here in the lower left, this is in a elevator pit. And you can see this shaft here. The elevator is somewhere

up here on the top. And this shaft here is actually coated with a thin, um, coating of oil. So part of this—I mean this whole thing is hydraulic—So this—if you could see back through the back of this wall here, this is the hydraulic oil tank. And back in here, this actually has an inline filter system. And we'll go into the importance of inline filter systems. Another oppor—or another option—or another way that hydraulic oil is used is in a crane hoist. So this is... the... The hoist mechanism itself and you'll have wire rope on that. And from that—below, you'll have a hook for being able to lift whatever you need to lift with the crane. Now this is the—where all the hydraulic oil—it sits in that. That's just a giant bin and it has lots of oil in it. Now in hydraulic systems you run into two basic systems. What I would call a closed and open. And the two systems that I've shown you today, right here, they're both open systems. So what "open" means is that you can take—you can easily get access to them. The downside of this is—these are the systems that tend to be the most contaminated. Another—woops, going too fast. Another way that we use hydraulic oil is in gate actuators. Like right here, this whole thing—well, below it—is a tank that holds hydraulic oil. This is another—it's a closed system. In this particular case, this oil hadn't been changed out in years. It came out pretty contaminated. This is a hydraulic press. This is a closed system. The only time we usually end up having to... Uh, deal with the oil on this one is if a hydraulic oil line breaks. And that actually did happen, and that was a big mess. So, then, on the electrical equipment—These are, um... Generator step-up transformers. So, these sit on the back of the power plant. So, you've got—you know, we had a picture of the turbine pit. That would be—if you had to go look at it—that'd be down here. Somewhere down below grade. This is at the surface. And then here's—you can see two, maybe a third, generator step up transformer. And you can actually see the oil that's kind of leaked out. And you can see another drum right here. And if you can read the really tiny print, it says "used oil." These—another thing that's—That uses oil, in a sealed capacity, is these items up here. These are called bushings. And here's a close up of another one, right here on the lower left. And you can see a sight glass. I've got a white arrow pointing to it. That's how you can tell that these are oil filled. 'Cause if you could actually go up and see it, you'll see like a—you'll see a line. Um, but if you look and see the sight glass, you'll know that these are also oil filled. Another is breakers. So, these tanks right here. These are all oil. It's—everything, this is all filled with oil. This is an electrical box, so obviously no oil into that. Just to give you an idea of just how much oil is in—and the quantity of oil in these tends to run to thousands of gallons. You're talking about a lot of—a large quantity of oil. Here, you're probably talking a couple hundred. But when you start adding it up, it ends up being a large quantity of oil. So BOR, in our facilities, we still use quite a lot of oil. So... What do we do when we decide we want to dispose of our oil? Basically there's three categories. EPA's got what's called a—the Used Oil Specifications. And I've listed the information up there for if you were—can't sleep one night and you really need something to put you to sleep. Go read that table. It will totally work. But what it does is, it breaks down what your oil needs to be tested for and how—what it needs to be—if you want to be able to recycle it. Or, in the second category, if it's going to be a hazardous waste. quite a bit. And we'll get into why that is. The other thing you need to know is, even if—you know, it may pass—your oil may pass for the hazardous waste on the federal criteria. You still need to know what your state regulations are. Because it may pass for federal, but it may not pass for the state. So, it's important to know what you've got. Um... excuse me. Okay, so here's

the table that is from that 40 CFR Part 279. These are your—the Used Oil Specifications. So what—when you've got a bunch of oil and you need to dispose of it... Particularly, I'd say, if it's mechanical. Because the electrical gets tested about every month, like the oils that are being used in transformers. I believe by IEEE standards that they are required to be tested every month or so. Because you need to be able to run those transformers and that oil needs to be within some very strict standards. So, typically transformer oil is already tested. So it will typically—it will typically pass these standards. So what you're going to do is have your oil tested. Like I said the the high—the... typically the... mechanical oil. So, the first one, the first set is just metals. There's three or four metals: arsenic, cadmium, lead, and chromium. And there's the standards. So if your oil is—comes up as less than all of these—so it's got to be less than five parts per million. Less than... two. Less than ten. And less than 100. Now what I've seen, as I put down here, is most hydraulic systems—if they've got an open system and they're not filtering—will typically fail from metals. But what I have seen is, if it's filtered by an inline system where they've got—you've just got a cartridge and the oil just goes right through it and gets filtered out—Those are typically fine. The other thing that I've seen is, when the oil is removed and run through a manual filter—like the paper filters—and then it's pressed through. And then it's put back into the system—those typically are—also do pass because you've taken—you know, you've taken the time to filter your oil out or filter all the contaminants out. And uh, you know. It just—it makes it better for the equipment. And, uh, makes trying to dispose of your oil later a lot easier. So, the next one on our list is flashpoint. I've given the definition here. It's the minimum temperature where a liquid gives off a vapor, sufficient that it can—it can ignite. So, instead of just trying to give you a definition, I thought examples would be far more easily—easy to understand. So, when you go to fill up your vehicle with gas and it's a warm day, everything smells like gasoline. Gasoline is a great example of a liquid with a low flashpoint. That's why you're smelling all that gas. And that's why there's all those signs that say don't smoke around the gas pump. Don't smoke around anything that's—anything around the gas pump, your gas tank... Why they say to also ground things, 'cause you don't want it to spark. And then for high flashpoint... So, your motor oil that you put in your engine or like this 80W90—that's, you know—some lube oils... those have very high flashpoints. And you can see from the temperature. So, look at—let's look at gasoline. It's got a low flashpoint: minus 40 degrees Fahrenheit. Minus 40 degrees Celsius. And now we look at the oils and what do we have? I mean, it's... We're in the 400-degree range. And keep in mind—what, water boils at about... mmmm.... 205 to 210, depending on what altitude you're at. So yeah, this is—it's going to take quite a bit for an oil to actually give off any type of, um... vapors at all. That's why if you get oil on your hands, it doesn't really smell, but your hands are greasy. Okay. So, halogens. So, if you remember your high school chemistry class, the halogens were the line—the vertical line of chemicals on the right side of the periodic table. So, if anybody goes to quiz night, you can remember this and answer the question correctly. So, where do we run into it? So, we run into it typically in the machine shops when you have degreasers and things—and different items like that. So... And you might have some of this stuff in your garage, 'cause honestly, the chlorinated degreasers work way better than the non-chlorinated. The chlorin—the dechlorinator—er, the non-chlorinated ones, they work okay. But if I have to do work on my truck, I usually use—and I need to do a degreaser—I typically will use a chlorinated 'cause it does a much better job. But this is where

you're going to see that—the degreasers coming in. And the reason this is important is—I think what's happened in the past is that these chemicals were mixed. And that's why we've ended up having some of the—some of the oil in these systems get contaminated. So, unless you go and thoroughly clean out your whole hydraulic system, a lot of this stuff will just end up staying in there because what ends up happening is they just start—you start throwing in new oil, which is fine. But what you haven't done is gotten rid of all the contaminants that are still sitting in the system. it's less than 1,000 ppm, then you're good to go. And that's why I did this as like a green, yellow, and red. I'm sorry, skip that, that's the next slide. I'm—it's 1,000 / 4,000. And the 1,000 to 4,000 is kind of a maybe. This, to me—it goes to economics honestly. If you're within that range, you are—unless you can prove otherwise—it's going to be hazardous waste. It may be helpful to try to do that and run more tests. And I'll go through what those tests are later. But it honestly depends on how much you have. If you only have a little bit, it's probably not going to be worthwhile. And—trying to, trying to do this. But if you've got thousands of gallons, yeah, it may be worthwhile trying to do that. Again, it really depends on what your situation is to know which way to go. And if you're greater than 4,000 parts per million, you're done. It's a hazardous waste. And that's on the—again—that's on the federal range. But—uh, like I put it in yellow—I don't know that I've ever seen any oil yet that was over 1,000. It's all tended to be less than 1,000. 'Cause like I said, the hydraulic oil tends to fail on metals and PCBs. But I haven't seen—I've seen it outside of BOR, but I haven't seen it here. So, that's not an area, I don't know, that I'd get too concerned about. Okay, so now PCBs. This is a constant issue for Bureau of Reclamation facilities. You know, PCBs were banned back in 1979. And most of our facilities predate this by a whole bunch. The other issue that we run into is that—a lot—since our equipment is so old, a lot of times we were using PCBs. And then we drained all that oil out of there and disposed of it. But what we—what wasn't planned on is for the PCBs—The PCBs actually leach into the metal and then when you add oil back in that doesn't have PCBs, the PCBs leach back out and contaminate the oil. So you think you've gotten rid of it. You test your oil. Boom, you're done. You know you've—boom, you've got PCBs in your oil. Like, where did it come from? No, it's not the fault of the "PCB fairy." There is no PCB fairy. There is no tooth fairy. And I'm sorry, I made somebody sad by telling you there's no PCB fairy or that there's no tooth fairy. But this is an issue. So what I've seen happen is that, you know, you'll change out your oil annually—recycle it—and what ends up happening is the PCB levels do start to drop. But that's what's going on, is the PCBs are just leaching out of the uh, the body of the—of whatever used container. Usually this has to do with the electric. So it's like a transformer or a breaker. Something large like that where you actually do change out your oil. Okay, so by federal regulations, if the oil comes out to be greater than or equal to 50 parts per million, it's regulated. It's a PCB-containing oil. And you—it's required that it goes to an EPA-approved incinerator. To a—an approved PCB incinerator, I should have added in there—for it to be incinerated there. And because more strict, but they can't make it less. And the—and what I've seen so far is... We're typically less than 50. So we're usually in the range of the less than two—which, like I said—I've point—made this like a green, yellow, red. Like a stop light, here. Just because it makes—I think it makes it easier to understand. So the red—we're done. I mean, you're going to be sending that to a PCB—like I said—a PCB incinerator. The other thing you can do, though, is—a lot of people think that you

have to send it straight to the incinerator, but you don't necessarily have to. You can get ahold of a facility called a TSDF—a treatment, storage, and disposal facility—and send it to them. And then later. So it's like having an outstation, where you can just send it down the road. And this will be much closer, much easier than having to send a very small load to the incinerator, which is going to be really expensive. The thing you need to do is—you have to be able to—you need to be able to track the paperwork. And we're not going to go into that. If you have more questions on manifesting, tracking, all that—Let me know. Because that is something that does need to be followed up on. And I've included, in case you need the information—there's the—EPA's, uh, listing... for places where you can send your... TSDFs. And also the incinerators. And there's actually quite a long list. So, this would be if you've got that "over 50." It's worth taking a look at the list. 'Cause like I said, you don't have to send it to—I think there's an incinerator in Utah... Texas... I can't remember the other one. But there's not many. But if you get on the list, you can send it to these guys. And they're usually not that far away. Versus trying to ship it way across states. Okay, so now we get into the yellow level. It's the 2 to 49. And this is probably the most common. 'Cause you'll see a lot on the—you'll see a lot of transformers and breakers that are marked with "PCB free." That's not necessarily—That is true. But what they are—what it, what it means is that it's less than 50. It doesn't mean that it's, um... above 2. So you need to know what those levels are. Just because it says "PCB free"—not going to get—that's not going to get you a ticket out of here. The thing you can't—so if it's a transformer, you're likely already having testing done. So you can get that paperwork and take a look at it. I don't know that I've ever seen one where they didn't do it. So you likely will have that already. If it's mechanical, now you likely have not had any of that testing done. In fact, I found hydraulic oil for an elevator that had PCBs up in like 5 or 6 parts per million. And we're still not quite sure how that happened. But again, it makes it into that range where it's not—you can't recycle it as a used oil. What you have to do is send it to, um... You send it for energy recovering, like I noted, just burning as a fuel. But the big point is you don't have to send it to that PCB incinerator. Which makes it much, much less expensive to dispose of. And then I've got, down below on the bottom, it says "make sure you understand your state regulations." 'Cause this is where the gotcha gets into place. Your state may regulate—in their own state—that this range here is now a hazardous waste in that state. So you still—this is like I said, if you run into this range, go check your state regulations to find out. 'Cause you don't want to end up with a gotcha on that one. And I think, to mind... two that I can think of—that I know of—is California and Washington. There may be others, but those are the two that I can think of off the top my head... Yeah, so we talked about this, um... earlier in the talk. That your oil, your nice clean oil, it can continue to be contaminated. And there isn't—I have found no cleaning method for it. So it's—you're just going to have to continue to let it leach out. And it does help over time. Especially if you're just—every so often you have to change out the oil in the transformers and the breakers. And if you're doing hydraulic equipment, see if you can get into that sump. If you are going to be trying to clean your oil out, what happens is all that sludge and goo at the bottom of the—of the sump—you need to get into there and get all that junk out. That's the stuff that will keep sitting around and contaminating your oil. So, it's the gift that keeps on giving, but it's a gift nobody wants. Okay, so I said we'd go through the testing on it. These are the test methods for the different tests that we need to run. So, when you

get, for example, the metals test—metals—the Method 6010. You can just tell 'em, hey, I just want these four metals. There's a whole raft of metals, but you don't need to pay for those. You just tell 'em you want arsenic, cadmium, chromium, and lead. And there's a—in every state, there are labs that can do these—this testing. They may have to send it out to another lab. Like, PCBs is not as common. And the equipment is more expensive. But usually the lab will handle that for you. So you just give a—give a call to your local lab and see what they can do. A lot of state environmental agencies will also have a listing of labs that work with the state or that are approved. And that's one stop shopping, that's easy to do. Some other, um... The sources is—ask the Google. There's a whole lot of labs, again, that will advertise on there. And so you can just get on and ask the Google for some other options—other laboratories that you need to do your test—that you might want to talk to. And they've got things where—easily set up these days—to be able to get your samples in. They'll often give you the sample containers, the coolers, they'll have a chain of custody form. They'll walk you through how to do everything. It's really pretty easy now. Okay, so. Let's go through some best management practices. Just get rid of your old oil. It's... Don't leave it around. And if you can, filter it. Because you're going to be able to—you will likely be able to recycle the oil. Now, notice that—note that filtering does not work on PCBs. PCBs are a chemical. They're not a particle. So, filtering is not going to do anything for PCBs. But it will get out—likely get out—like your metals and things like that. Um, segregate and mark your oil containers which—which don't meet—your used oil. And this is—um, the reason you wanna do this is so that people know which container to put the—their—the oil in, and which container to put the haz waste in. The other thing is—so this is just for storage only. Don't... This cannot be used for shipping. So, I've added some notes in there. The reason why you want to—because if you contaminate your used oil, now you've got a whole bunch more hazardous waste. The other thing you want to do is—it doesn't have to be fancy. You can go just use duct tape. So I went on and asked the Google for a picture of duct tape. And then just wrote on—I mean, this is really all you need to do. Is write on there, okay, this one is for hazardous waste. We started accumulating on this date and this is what it has in it. So, I run the hazmat room for our labs. And if—especially in the haz wa—haz waste, I'll just keep putting tape on here—I mean, as I get more stuff in there—And just list out what's in it. And... And it's—just makes it super easy. And like I said, you know... Little, fun statistic about duct tape is it's 60 yards long, which makes it one of the cheapest labels out there. So, now going—so, whatever... If you want to go fancy... You can, then, just get "used oil"—And sometimes these colors are helpful. So you slap a—you put a "used oil" container—the big thing is, put stickers on, like, three sides of the drum. So in case that drum gets turned around, no matter which side, you can always see where it's marked. So I'll typically use a "used oil." Then I'll have a "hazardous waste" one. And again—the accumulation date, contents. And then I'll usually have—if I have a lot, I'll just put some tape down. Like right down here, below, and just start listing things out. This I put up here because this is actually a hazardous waste shipping label. This would go—if you were shipping the drums of, or containers, of whatever you've got—this would actually go on top of this one. 'Cause this is a DOT-approved. This is just for storage. And these both are required. The "used oil" and the "hazardous waste." They're also just a really good idea. Okay, so, here's our summary... Okay, so if your used oil meets these criteria, then it's a used—it's a used oil. You get to pass go, you get to collect $200...

Now, if you—if your PCBs—now, if you're still here, you're less than all these criteria for the metals, the flashpoint, and the halogens... But, you're between the 2 and 49, you may be able to ship it out and get it disposed of. But, again, you want to go check your state regulations. But it doesn't have to go to the PCB incinerator, which is great. 'Cause those are expensive. And then if you're over 50, yeah, you're done. It's going to go to a PCB, um... it's a PCB-containing fluid. You're gonna be sending it to the incinerator. And now, this is, again, this is federal standards if you exceed any of these. Oh and the other thing is—you can't just keep testing your oil until it passes. That is not allowed. And even if it's just 1 over. So, if it's 6 parts per million arsenic, you're done. If it's 3 parts per million cadmium, you're done. And it only has to be one of these and it's auto—it's automatically classified as a hazardous waste. Oh and If you took multiple samples, no, you can't average the numbers either. And that is everything that I have. There's my email address. And here's the contacts and names of everyone in the 8540 group. You will likely see them sometime giving a presentation... on one of our coatings and corrosion topics. Now, I'll turn it back over to Grace and Chrissy.

>> Dr. Henderson: Thank you very much, Lise. We're gonna go ahead now and open this Teams Live Event up for questions. So, please feel free to go ahead and use the chat box to ask any questions that you may have and we will address as many of them as we can. Just to go ahead and address some of your questions that were asked earlier—We will be providing presentation slides. It takes a little bit of time 'cause we have to make them 508 compliant and all that kind of thing—all that. But they do go up on our training website. And they will be available there. Also, if you want to use the link to get back into this webinar, the recording is... going to be available. So you will be able to do that. You can see, or re-listen, to a section if you needed to do that. And also, one of you asked how to get on the mailing list for any of our webinars. Please feel free to go ahead and email me at "chenderson@usbr.gov" and I will put you on our distribution list, if you are not already on it. And it does look like we received a comment from Mike Lawson. He was saying that you can always consult with your area office or regional office hazmat coordinator for any advice and assistance. So, there is that option as well. And so far, we're not receiving much in the way of questions. So, please feel free—I'll leave it open for a little bit longer to go ahead and ask some questions. Maybe I'll go ahead and ask, Lise, why don't you give a case study or something that you encountered out in the field... that would be a good lessons learned type of a thing.

>> Lise Pederson: Thanks, Chrissy. I do have one. And that's—I alluded to it a little bit ago when we were talking about... hydraulic oil. And... what was discovered was that, when we took—that samples had originally been taken from the top of the oil container. But when you went and—down into the sump and drained oil off at the sump and analyzed that, the oil ended up being contaminated with PCBs. And in that particular—in this particular case—it was—it failed on the state and federal criteria. The lessons learned is in where to take that oil sample. So I Try to encourage, as much as possible, to find the lowest point. And something that I've done is I—to be able to do that—like when I showed the picture of the crane—to be able to get down to the bottom—what I've done is, I took a horse syringe and flexible tubing. And then put a—a large... nut

on the end, so that it would weight down the end of the tubing. Lowered the end of the tubing into the oil well. And then just used the horse syringe—'cause they're huge. I mean, they're several—they're several cubic centimeters. And—to pull up my sample. And the point of having the weight on the end is, it gets down to the very bottom, where all he heavy materials and all the goo sits. And how you know that is, when you start pulling it up, instead of pulling up this nice, light yellow colored fluid, it starts turning brown. And if you've really got bad stuff, it turns just pure black. And... That's, to me, how I know when I've got gold in there. Because now I was able to get to the bottom. so I've just had to come up with some creative ways of being able to get soil—er, being able to get oil samples. Because not all—they don't always have a port... or access to be able to get to those. And sometimes they're—they haven't been opened in years and it's about impossible. So, there's just a creative way of being able to get a sample.

>> Dr. Chrissy Henderson: Alright, well, thank you for that case study. So far, we're not receiving any questions. So, I think we might go ahead and close up. I, um... If you do have any questions for Lise, you can email her. And... she would be happy to answer any questions that you have. And, yeah. So, anyways, thank you for joining us today. And we will keep you updated through the distribution list of any of our future webinars, as they come up. We have two more left this year. And... You will receive information about them on the distribution list. Alright, thank you very much.