West Virginia Department of Environmental Protection
Water Quality Standards
Public Meeting Minutes
August 22, 2019

I. CALL TO ORDER

Laura Cooper, Assistant Director of the Water Quality Standards Program of the Division of Water and Waste Management opened the second quarterly meeting of 2019 at 2:17 p.m. on August 22, 2019 at the headquarters of the West Virginia Department of Environmental Protection, 601 57th Street Southeast Charleston, West Virginia. The agenda and information to be discussed at this meeting were made available to attendees on DEP's website prior to the meeting.

II. ROLL CALL

DEP personnel in attendance: Laura Cooper, Chris Smith, Kathy Emery, Terry Fletcher and Michael Whitman.

Participants in attendance: Autumn Crowe, WV Rivers Coalition; Ben Faulkner, Civil and Environmental Consultant; Jennie Henthorn, Henthorn Environmental; Katie Musick, Henthorn Environmental; Dustin White, OVEC; Erin Beck, Beckley Register-Herald; Pam Nixon, People Concerned About Chemical Safety; David Yaussy, Spilman Thomas and Battle and James Turley, ICC.

Several participants joined the meeting via Zoom Meeting.

III. MEETING AGENDA

- Schedule of upcoming Water Quality Standards review
- Human Health Criteria Bioaccumulation Factors
- Nutrients and algae update
- Discussion and questions

IV. PRESENTATION AND DISCUSSION

Laura Cooper:

DEP proposed human health criteria last year which were adjusted using the West Virginia fish consumption rate. These revisions were taken out of the rule by Legislature allowing time for submission of human health criteria proposals until October 1st. By April 1, 2020 we will propose Human Health Criteria updates as mandated by West Virginia Legislature.

In May of this year we held a public meeting to discuss how the human health criteria were calculated. By October 1st DEP will receive any submissions for human health criteria. In November we will hold a public meeting to hear presentations of proposals.

In March of 2020, we will hold a public meeting to propose human health criteria revisions. In June we will put out public notice version of the criteria revisions we propose. In July we will hold a public hearing and submit the agency-approved rule for Legislative review. In fall of next year, the rule will be reviewed by the Legislative Rule-Making Review Committee. Legislature will review the proposed rule in the 2021 Legislative session.

Bioaccumulation refers to the uptake and retention of a chemical by an aquatic organism from all surrounding media such as food, water and sediment as opposed to Bioconcentration which refers to the uptake and retention of a chemical by an aquatic organism from water only. Bioaccumulation can be greater than bioconcentration for hydrophobic chemicals stay in the organism longer. Hydrophobic chemicals do not mix well with water like the example of oil and water. These chemicals stay in the tissues of organisms.

EPA's approach to development of Bioaccumulation Factors was to develop a long-term average bioaccumulation potential in aquatic organisms which are commonly consumed in the U.S.. Different methods can be used to derive BAFs.

The first method is the BAF method which uses data derived from field studies. In this method, field-measured BAFs are normalized by adjusting the water-dissolved portions of the chemical and the lipid fraction of fish tissue for each species, as well as the fraction of the total concentration of chemical in water that is freely dissolved. Multiple BAFs are averaged using the geomean of normalized BAFs by species and trophic level. BAFs across the different species are averaged to compute trophic level-based BAFs. BAFs are adjusted by national default values for lipid content, organic carbon content and the Octanol-Water Coefficient. EPA used the 50th percentile for organic carbon content.

The BCF method estimates BAFs from laboratory-measured bioconcentration factors. They do this when no BAFs are available. Similar to BAFs, laboratory-measured BCFs are normalized with the lipid fraction and the fraction of the total concentration of chemical in water that is freely dissolved, then multiplied by the food chain multiplier where applicable. BCFs are averaged using the geomean across species and across trophic levels to compute baseline BAFs. BAFs are adjusted by national default values for lipid content, organic carbon content and the Octanol-Water Coefficient. EPA used the 50th percentile for organic carbon content.

The Octanol-Water Coefficient method predicts BAFs based on the chemical's Octanol-Water Coefficient (or K_{ow}) with or without adjustment using a food chain multiplier. The K_{ow} is calculated by dividing the amount of chemical in octanol by the amount of chemical in water. If the K_{ow} is high, the chemical is more hydrophobic. If the K_{ow} is low, it is more easily dissolved in water and can be flushed out of the body.

(A slide was shown from EPA's Technical Support document illustrating the decision tree used to determine selection of methods for deriving national BAFs). Using the decision tree, the chemical of concern is identified as nonionic organic, ionic organic or inorganic or organometallic. If the chemical is nonionic organic, hydrophobicity is then defined followed by metabolic properties then method selection. If the chemical is inorganic or organometallic, biomagnification potential is defined followed by method selection. If the chemical is ionic organic, ionization potential is defined. If ionization potential is negligible the nonionic organic method selection process is used. If the ionization potential of the chemical is not negligible, the inorganic and organometallic method selection process is used. Acenaphthene was used as an example to illustrate EPA's method selection process using the decision tree.

(A slide was shown illustrating where to find chemical-specific information on EPA's website regarding derivation of BAFs).

At this time I'd like to introduce Jennie Henthorn from Henthorn Environmental. She has been doing research on EPA's Bioaccumulation Factors on behalf of the West Virginia Manufacturer's Association and she is going to provide us an update on her research.

Jennie Henthorn:

A sensitivity analysis was performed to figure out which factor is driving the equation (in the human health criteria revisions previously proposed by DEP). This analysis was performed in order to determine which criteria changed based on Bioaccumulation Factors.

There were about 161 studies in EPA's database of which 119 were located in this review and 42 were not. Study searches were performed using author name and date but were difficult in some cases due to different study names in EPA's database. In May, I reached out to EPA for assistance in finding the studies that they were not able to find but haven't heard anything back. I also filed a FOIA request but haven't received a response yet.

Of the studies that were located, the vast majority are over 20 years old. Of the 161 studies (used by EPA) only 12 were done since 2002. More than half were done up to 1989.

EPA defines BAFs as the first priority and BSAFs as the second priority however there are no BSAF studies in EPA's database. We found more than 75 studies in just 2 days. Not all of them would qualify for use but most do; probably 8 out of 10. A study summarization is a report; we would need raw data from the researcher to assess.

(A spreadsheet was shown illustrating EPA's study citations and study species for several chemical compounds). It was shown that author references differed in EPA's documentation (multiple authors of study shown versus first author followed by "et al." notation). For several of the chemical compounds shown on this slide, algae was listed as the species used in the studies. Why would algae be considered instead of fish.

(A slide was shown illustrating a list of Bioaccumulation Factors derived from a study conducted by Freitag et al. which was stated to have been used by EPA. Multiple chemicals on the list were highlighted in yellow). The compounds highlighted in yellow are ones that DEP has a standard for, however these chemicals were not incorporated into EPA's database. Some of the highlighted compounds are ones that EPA said they couldn't find BAFs for.

In EPA's recalculated criteria, the majority are calculated from K_{ow} which is EPA's least preferred method. Of 58 Bioaccumulation Factors, 33 were calculated from the K_{ow} method.

EPA's calculations were based on Great Lakes fish; can we recalculate BAFs based on West Virginia fish? I'm struggling with the fact that we can't find all of the studies. I'm struggling with the fact that we found so many new studies so quickly. It took EPA 13 years to add in 12 studies; we can't do hundreds in the amount of time we have. What we've learned is how little we know.

Laura Cooper: Are there any questions about what we've discussed so far?

Erin Beck: From the last slide, is there any indication that we do have this information for West Virginia?

Laura Cooper: She's looking for more recent data that wasn't included.

Jennie Henthorn: It would be nice if we could find out if we have lipid information for fish.

Erin Beck: Does DEP have information for lipid fraction in fish?

Laura Cooper: We need to check into that.

Rob Reash: The issue of antiquity of the studies is disturbing. Is there any standard methodology for determining BCFs and BAFs?

Laura Cooper: Each researcher comes up with specific was of making that determination. I don't know that there is a standard method for determining these.

Jennie Henthorn: There is a vast difference in the way the studies were done. It's very different among studies.

Rob Reash: Calculation of BCF and BAF is highly dependent on dose that was given to the animals in the study. You would have to look at the study to see how it was applied.

Commenter: Is anyone from EPA asked to attend these meetings?

Laura Cooper: Denise Hakawski from EPA is attending today by Zoom Meeting and frequently participates.

David Yaussy: Can we ask Denise if she can provide these studies (studies listed in EPA's database that Ms. Henthorn was unable to locate) for us?

Denise Hakawski: Early in the summer I was looking for the studies and I will be sending a letter to the Office of Water to see what the best way is to do that.

Autumn Crowe: Jennie you said you have some ideas what to do with the data; can you expand on that?

Jennie Henthorn: Compare the numbers we have from BAF studies to see how they compare to EPA's. We want to see which ones have numbers that are far apart.

Pam Nixon: How many were you going to look at?

Jennie Henthorn: We wanted to look at all of them but can't tell if we'll be able to.

David Yaussy: We can maybe come up with a process DEP can use.

Laura Cooper: If there are no further questions I will turn it over to Chris Smith who is going to give us an algae update.

Chris Smith:

We haven't done one of these for a while, so I am going to let you know what we have been doing for the last few years.

So why do we monitor algae growth?
The reason that the algae blooms we are looking are a concern is that if they are severe enough they can interfere with the Water Contact Recreation designated use of the stream. Algae blooms are specifically defined in section 3.2g of the Water Quality Standards rule as a condition not allowable in state waters. Generally, the type of algae

that produces impairment is filamentous green algae however we have seen impairment by blue-green algae at least a couple of times.

(A slide was shown showing pictures of filamentous algae from a previous year at the Greenbrier River). This is what filamentous green algae looks like. The strands can grow several feet long; even longer that what you see here. It's easy to see how this could cause problems with recreational uses of water like fishing, swimming, wading and boating.

So how do we determine if algae is causing a recreational use impairment? DEP has a document entitled "Guidelines for Listing" that details our methodology which is based on a study conducted by Responsive Management in 2012. In this study, participants were shown pictures of different amounts of algae coverage to determine how much would prevent them from participating in recreational activities. From this study, DEP determined impairment exists at 40% or greater coverage at one 1 meter wide transect across the river or 20-40% coverage at 3 transects equal distance apart. So, if the river is 200 feet wide, we would take a measurement 200 feet downstream of the site and 200 feet upstream of the site.

These are the conditions that promote algae blooms. Low flow; higher flows tend to scour algae off, warm water temperature, low turbidity allows better sunlight penetration into the water and nutrients. Studies conducted by DEP indicate that phosphorus is the limiting factor for algae growth. As a rule of thumb, hardness levels below 150 mg/l and alkalinity levels above 35 mg/l seem to be the most favorable.

We have seen algae blooms on the Greenbrier, Tygart, Buckhannon, Elk, Bluestone, Cacapon and South Branch Potomac Rivers. DEP monitors the first 5 of these and we contract the Interstate Commission on the Potomac River Basin to monitor the last 2.

Let's take a look at the Greenbrier River. In 2008 DEP completed a report entitled *Assessment of Filamentous Algae on the Greenbrier River and Other West Virginia Streams.* In this report, it was concluded that dissolved phosphorus discharged from sewage treatment facilities along the Greenbrier River is able to combine with nitrates in the river from a variety of sources and cause objectionable algae blooms. In 2010, DEP completed a subsequent report entitled *Nutrient Levels and Filamentous Algae Growth In the Greenbrier River*, This report summarized an intensive water quality sampling effort on the Greenbrier River and concluded that algae growth on the Greenbrier was limited by phosphorus and that controlling phosphorus was the most effective way to reduce the algae growth. Also, in 2010, Sections of the Greenbrier River were listed on the 303(d) list of impaired waters due to algal blooms. In 2013 the *Greenbrier River Restoration Plan* was implemented to work on resolving the impairment issue. This plan called for upgrades to 3 wastewater treatment plants to reduce phosphorus in their effluent. The 3 wastewater treatment plants were Alderson, Ronceverte, and White Sulfur Springs. In 2019 all of the upgrades performed by the wastewater treatment plants were fully online.

(A picture of the Ronceverte ribbon cutting ceremony on September 7th 2018 was shown).

I visited the Ronceverte Wastewater treatment plant yesterday to see how their phosphorus removal process works. Mr. John Humphries is the plant manager there.

(Photos of the plant control room were shown). This is where all of the processes that take place in the plant are controlled.

(Photos of the Vertical Loop Reactors and Clarifiers were shown). The picture on the left is a 3-bay vertical loop reactor. This is where biological treatment happens. Mr. Humphries said that the phosphorus level that enters into bay 1 in the influent is around 7 mg/l and by time the water leaves the third bay that the phosphorus level is down to about 1 mg/l. Before the upgrades to the plant, phosphorus could be up to 3 mg/l at this step so there's been a significant reduction here. After the water leaves the third bay it goes into these clarifiers where sludge settles out and a polymer that bonds to the phosphorus is added.

(Photos of the tertiary filters and digesters were shown). The phosphorus with the polymer bonded to it is filtered out by these tertiary filters on the left. The phosphorus that is collected in these filters is transferred to this digester where water is decanted off and sent back through the treatment plant and the sludge containing the phosphorus is cleaned out and sent to a landfill.

J.B. Turley: What is their flow?

Chris Smith: Usually 2 million gallons per day. Right now, Mr. Humphries said it's a little under 1 million gallons per day.

(A graph of the monthly average phosphorus levels reported on Ronceverte's DMR over the past 5 years was shown). You can see the downward trend in phosphorus levels in their effluent, so we can see that the upgrades are doing what they were designed to do.

(A graph of the monthly average phosphorus levels reported on Alderson's DMR over the past 5 years was shown). Here is the average monthly total phosphorus reported on Alderson's Discharge Monitoring Report over the past 5 years. Overall, we are seeing a downward trend in phosphorus here too. I contacted the WWTP about the 4.6 mg/l in March to verify that it was not a transcription error on their end, but this is what the lab reported to them so I'm not sure if this is a true result or a lab error however it is important to note that they actually only run their tertiary phosphorus treatment from May through October; so only during the season that we would normally see algae blooms. At any rate, we are still seeing lower phosphorus concentrations even at times of the year when the facility is not using their tertiary treatment.

(A graph of the monthly average phosphorus levels reported on Alderson's DMR over the past 5 years was shown). And we are seeing the same trend with data from White Sulfur Springs. So there has been a decrease in phosphorus in the effluents of these plants since the upgrades have been completed and are now fully online.

Ben Faulkner: How much was spent on these upgrades?

Chris Smith: I don't know.

Ben Faulkner: It was a lot though right? In the millions?

Chris Smith: Yes.

Ben Faulkner: Why was phosphorus focused on instead of nitrogen?

Chris Smith: Phosphorus was determined to be the limiting factor.

(Maps showing DEP sampling and observation sites on the Greenbrier River were shown). As part of the Greenbrier Restoration plan, we perform water sampling and algae observation at various sites on the Greenbrier River from Talcott on the lower end to Marlinton on the upper end. These are our sampling and monitoring sites. In addition to these sampling points, DEP does longitudinal surveys by boat to determine the extent of impairment when algae blooms occur. James Summers does those surveys. So, let's take a look at what we have seen at these sites over the last few years.

Before we go any further though it is important to mention that last year was a bad year for sampling and observations due to excessive precipitation and high flows
Last year we were only able to complete 1 and a half rounds of sampling and 2 observations. We did observe some algae growth last yet, but frequent precipitation events caused scouring of algae, so we don't know what the extent of growth would have been without high flows. As far as this year goes, we are just getting into prime algae growth season and we will be doing more observations and sampling over the next couple of months so the information we have for this year is still limited. So, for these reasons, it's still too early to fully assess the impacts that the WWTP upgrades will make on algae growth.

(A table was shown illustrating peak algae coverages observed by DEP at the Greenbrier River observation sites over the past 5 years). Keeping the data limitation for the last 2 years in mind, here's a summary of the peak algae coverages we have seen over the past 5 years at our observation sites. The highlighted values show the times that we have observed algae at impairment levels.

I thought it would be helpful to show you some pictures taken at our observation sites for comparison over the last few years. *(Several site pictures were shown illustrating peak algae coverages observed over the past 5 years).* At our Coffman Hill observation site, we saw impairment in 2014 and 2015 by blue-green algae instead of filamentous green algae. We typically don't see this much blue-green algae at a site. It's not uncommon to see trace amounts but it's pretty unusual to see enough to cause impairment.

As we move forward with the Greenbrier River we will continue to monitor algae growth, continue sampling and monitoring data from the wastewater treatment plants. Of

course, the goal is to remove the Greenbrier from the 303(d) list but we need 3 consecutive years without impairment to be able to do that.

Here's a brief update about the Tygart Valley River. Like the Greenbrier, it is also listed on 303(d) list for algae impairment. So far this year one round of sampling has been performed but we haven't received results from the lab yet. We have seen impairment in the Elkins area; I don't know the coverage amount. James Summers is taking care of this one and he prepared this slide and the next few. We don't have an official restoration plan for the Tygart like we do for the Greenbrier, but we are working toward that. On July 12th of this year, DEP met with Elkins wastewater treatment plant and Dr. Lance Lin from WVU about potentially working with them on an experimental phosphorus removal procedure he has been developing.

The Buckhannon River is not currently listed as impaired on 303(d) list. Like the Tygart, one round of samples has been collected this year with 2 more rounds to be completed So far algae has not been observed at impairment level since 2015.

A new wastewater treatment plant was put online in 2013 on the South Branch of the Potomac River. It replaced 3 existing plants; 2 from chicken processing operations and the Moorefield plant. Since the new plant went online, algae growth at impairment level has not been observed. If the we don't see any more impairment moving forward, we may be able to remove the South Branch from the 303(d) list as soon as next year.

The Elk River is not listed on 303(d) list. We only observed impairment in 2015 but not since then. We are continuing to monitor and sample though.

We were informed about an algae bloom occurring in the Bluestone State Park area in July. *(Pictures were shown of the boat launch Riverside camping areas*). So, this is an area that we will need to continue to monitor as well.

And that's all I have. Any questions about anything?

Pam Nixon: Where is the phosphorus coming from?

Chris Smit: The wastewater treatment plants.

Pam Nixon: Has phosphorus been a problem for drinking water intakes on the Greenbrier River?

Laura Cooper: Our focus is the recreational use, the DHHR handles drinking water limits.

J.B. Turley: Has EPA been looking at nutrient limits for tributaries of the Gulf of Mexico as a result of algae blooms they have been seeing?

Chris Smith: I don't know. Denise are you still online?

Denise Hakawski: I don't know but I can pass that question on.

Laura Cooper: Are there any other questions? Thanks everyone for attending. Our next public meeting will be held in November.

Commenter: Will you share the submittals you receive by October 1st prior to the November meeting?

Laura Cooper: Yes, we will share.

V. ADJOURNMENT

All items from the meeting agenda being completed and discussions concluded, the meeting was adjourned at 3:50 p.m.