Day Two: September 12, 1996

Session Five: Questions and Answers

After each session, there was an opportunity for questions and answers and group discussions pertaining to the speakers' presentations.

Q (John Connolly, HydroQual, Inc.): Amy, in your work with BSAFs, are you assuming that if you cut the sediment concentration in half, the fish concentration will drop by a factor of 2? How do you know that is true?

Amy Pelka, U.S. EPA Region 5:

It probably is not true. It depends on where the site is. The BSAFs are not linear at one site that has 20,000 parts per million PCBs. Here, as the concentration increases, it does not go up with the BSAFs. Similarly, as the concentration decreases, it does not go down by half. Looking at this further, we decided that it is very important to consider when and where you are taking your sediment sample. This sample represents what you think presently and in the future or what you are trying to create theoretically. I am not sure whether we can do that, because we do not always have the data. We are seeing that there is some kind of curve where the concentration tops out and the BSAF is not going to increase or decrease. The way to deal with this issue presently is by deciding whether the samples represent what we think are steady-state levels. Sometimes we have looked at caged fish data from upstream to see if that represents what the bioaccumulation might look like at these low levels versus the high levels. You do not want to do BASFs on a hotspot, for example. You would want to look at something lower.

Q (John Connolly): My big concern is that it is not a conservative assumption. For example, suppose there are sources you do not know about, as in Puget Sound. We have contaminated fish, and we say we are going to go in and remove sediment and expect contaminant levels in the fish to decrease. But what we do not realize is that some residual sources are contributing to the problem. We remove sediment and it does not get better, because we did not address those sources. If we are talking about particular issues that may have significant economic costs (for example, dredging that costs $50 million or $100 million), is it worth spending $500,000 or $1 million to find out that cutting the sediment concentration is going to be protective of the ecosystem and human health, before you make the decision based on the sort of routine procedure that has been outlined?

Amy Pelka:

I agree that you should be clear about where your sources are before you go about trying to attack a problem and setting cleanup goals. And you are right that it is not a conservative assumption. I do not know if it was clear, but for Saginaw there were very low levels of PCBs on the surface. I showed you only normalized numbers, but, on average, the Saginaw levels are only 2 parts per million. The fish are a lot more contaminated there than they were in Manistique, which was much more contaminated. The curve for this example actually flattens down at the bottom as well as at the top. I am trying to show that, if you get a lot of contamination, it does not mean there will be more bioaccumulation at the bottom. It never really goes away. You need to see where you are and look at the system to decide what you are going to do. Sometimes that is a question of whether just modeling should be done. There are a lot of Superfund sites in Region 5 where this is a problem, and you may not have the option of modeling to come up with an answer due to the high cost. It may not reduce enough of the uncertainty. So you could spend nothing, if you consider me free, or you could spend $12 million like they did to model Green Bay. In some cases that make sense and, in other cases, it does not. It really depends on the circumstances.

Q (John Connolly): I think you do have to approach it on a case-by-case basis. I have one last question. You mentioned offhandedly that mass removal was a good thing. I am not sure why that is true.

Amy Pelka:

I wanted to make it clear that risk assessment is one way to look at whether or not a site has bioaccumulation at levels of concern, but it is not the only way to assess

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whether or not you have a problem. In some cases, you will not see the differences in a risk assessment. For example, with Saginaw, the levels are not going to decrease in the surface concentrations in sediment and the levels in fish populations probably will not decrease significantly either. From a risk assessment perspective, this is because the uncertainty is too large when estimating the different ingestion rates associated with risk assessments. Therefore, it is appropriate to look at mass as well. Maybe it is appropriate for EPA or a state agency to remove PCBs because they do not want loadings to the Great Lakes. I do not want people to think risk assessment is the only approach, because sometimes mass can be a reasonable approach.

Q (John Connolly): For your case in Saginaw, consider an example where you may have 2 parts per million on the surface and 100 parts per million at depth. If you go in and dredge, you may end up with a residual concentration of 5 parts per million. In this example, you may have made the problem worse.

Amy Pelka:

The goal of the removal project is to remove the surface material. But there are cases where dredging probably will increase the surface concentrations, and how do we mitigate that? The problem with Saginaw was that it had 22 miles of contamination at 2 parts per million. There would not be enough money to pay EPA Region 5 to bring it down to 0.5 parts per million. That was the point. I agree with you. We worry about that a lot. Sometimes with the dredging, what you actually think you are going to get as a result will often be higher than what you started with. A big issue is whether that is good.

Robert Paulson, Wisconsin Department of Natural Resources:

It can also certainly affect transport into the future with whatever residual you leave behind, if the residual is at a level that will work itself up into the system a little bit more. You can reduce significantly the transport into the future by dealing with just mass. This is just one variable.

John Connolly:

I agree, but I think that is really on a case-by-case basis. If your contaminants are high 2 feet down, they may really be locked away forever. But you have to evaluate that on a site-by-site basis.

Q (Robert Paulson): Are they really all locked away forever? This is the point we are questioning.

Amy Pelka:

There is another set of modeling you can do. With the risk assessment, you can try to determine whether or not certain storm events are going to reveal that and what the bioaccumulation will be after that. So, you can torture yourself with that consideration, too, if you want to.

Q (Ed Pfau, Ohio EPA): My question is directed to Laura Weiss. You had mentioned that, as part of your uncertainty analysis, you had gone back and revisited the numbers using uncertainty analysis with the stochastic model. You alluded to the fact that it was surprising that your point values came out at about the 80th percentile from the final stochastic analysis. What particular inputs in the equation in the algorithm did you use distributions for, and were the distributions from the same original database that the point values were derived from?

Laura Weiss, Washington Department of Ecology:

We distributed as many input parameters as we could that were appropriate to be distributed. Some parameters were fairly simple and obvious like body weight and exposure duration. We also distributed fish consumption rate, fish lipid, and BSAFs. We kept risk level constant and evaluated one of the more controversial factors, the cancer potency factors (CPFs). A consultant was hired to evaluate CPFs. This is something EPA has been grappling with over time as Monte Carlo analysis has become more popular. The results of this analysis showed that there was too much uncertainty and none of the approaches that were evaluated were really defensible. So, ultimately the toxicity factor was held constant as well.

Q (Ed Pfau): Was the database for the point values basically the same from which the distributions were drawn?

Laura Weiss:

Yes, it basically was. We relied on local data as much as possible, especially for parameters like fish consumption rate.

Q (Ed Pfau): You talked about using various methodologies to determine an effective concentration both in fish tissue and for sediments. You also talked about the surface area weighted average and use of geometric means. Is it appropriate at some point in the future, if the stochastic approach becomes more viable, that use of the distribution with its appropriate shape of distribution would be a reasonable substitute for either one of those methods of trying to average out concentrations in fish tissue or in sediment concentrations?

Laura Weiss:

On a site-specific basis, it is a potential option we might want to look at. There might be a place for it in the Tier 2 analysis. However, I think it affects the other programs in our agency as far as how they deal with Monte Carlo analysis, particularly how the results are analyzed and whether the input parameters are appropriate. We will need to develop guidance for its use.

Amy Pelka:

You want to make sure the set of data that you have is representative of what you want to look at, which may be the sediment concentration at the surface. If you have varying spacial intensities where there are several samples around the rot spots, your distribution still is not representative of the true distribution, even if you have run a Monte Carlo analysis. It all depends on how the distribution was done. A distribution, or Monte Carlo analysis, is not inherently evil. It just depends on how it is used. It can be useful.

Q (Ed Pfau): So the surface area weighting is to remove the bias in sampling, and that would not be something that would be addressed in a Monte Carlo distribution? Is that correct?

Amy Pelka:

I am not sure that just because you have a surface area weighting means that you cannot use a Monte Carlo distribution. I do not think Monte Carlo takes away that bias in sampling. If it shows you the mean and if you are still using a distribution that is based on a small subset of the data, you are still going to have the same problem.

Q (Malcolm Watts, Zeneca, Inc.): I am pleased that one person, Mr. Paulson, did at least mention cost in passing, and I am very upset that the cost issues have largely been ignored. I am part of the handful of people here from the regulated community, and we see these models being generated with inordinate costs possibly associated with the results. This is very disturbing. The methodology of the models seems to be quite good, except when conservative factors are introduced which build upon one another to give inordinately cautious results. In particular, with those sites that I have been involved with, I have found the science base is not worth anything. The data that Ms. Pelka referred to as being very difficult to find and evaluate, I believe, is characteristic of the basis on which the decisions are made. This produces results which cause high costs. I propose to you to use the models and the data you have, and see what the results are. If they are easy to work with, like no action or modest action, then that is fine. If, on the other hand, the costs are very high, you should reverse tracks. You should find the most sensitive parameters, look at the data for those parameters, and focus the research on that. The scientific community is not doing bad work. It is just that they are not being funded to do it correctly, so scientists often make do with what they have, not with what they should have.

Victor McFarland, U.S. ACE, Waterways Experiment Station:

I would like to mention a word about terminology. When we first started talking about the relationship between neutral chemicals and their concentration in sediments and in organisms based on organic carbon and lipid normalization, we called that a preference factor. Later, the preference factor was changed to an accumulation factor, which was essentially the same thing. Then it became a biota-sediment accumulation factor, and we were still talking about the same thing, although the term got stretched to include a disequilibrium situation for fish instead of applying it to just invertebrates and such. Now we are talking about a BSAF for metals, and I am unable to figure out how things are going to be done or what the rationale is.

Laura Weiss:

I assume you are addressing me regarding the slide that alluded to BSAFs from metals. That was probably an oversight in terms of the terminology. The report focused on the bioaccumulation of certain metals, such as methylmercury and tributyltin. These chemicals are of concern from a human health perspective as they are known to bioaccumulate in aquatic biota. The definition of BSAF includes TOC and lipid normalization, and clearly that is not appropriate for metals. Therefore, that was an error on my part since the term BSAF is not strictly applicable to metals.

Q (Victor McFarland): Is it too late to change it and call it something else like a biota/sediment metals factor?

Laura Weiss:

I am interested in some terminology for that. Like I mentioned, it seems that our biggest challenge is quantifying the factor so a sediment level can be determined to protect human health.

Q (Philip Cook, U.S. EPA, Office of Research and Development): Amy, I am concerned about one part of your presentation, which dealt with the comparison of predictions from the site-specific BSAFs to predictions from BAFs. You described the BAFs as being consistent with the Great Lakes Water Quality Initiative methodology. However, if I followed your equations correctly, my impression was that you were applying those BAFs to predicted concentrations in the water and that resulted from an assumption that there was an equilibrium between the sediments and the water. How did you calculate the water concentration so that you could apply the BAFs?

Amy Pelka:

I did not do those calculations. For Buffalo and Saginaw, I think we had water column concentrations that came from the ARCS program. The water column concentrations were measured.

Q (Philip Cook): Were those water concentrations based on freely dissolved chemicals?

Amy Pelka:

Both. When it was available, we looked at freely dissolved and total.

Q (Philip Cook): How did you calculate freely dissolved?

Amy Pelka:

I am not sure of that. I think that would have been operationally defined, where freely dissolved was what passed through a filter.

Q (Philip Cook): The point I would make, in conclusion, is that the BAFs that you used are based on freely dissolved chemicals. You have to be very concerned about what model you use to predict that exposure concentration. In this case, fluctuations in concentrations over time have to be considered, and, if there is a disequilibrium between the sediments and the water column, that would factor into the analysis. So, I have some concern that the high values you predicted for some of the fish may have resulted from improper use of BAFs.

Amy Pelka:

I would have to go back and look more carefully at those specific calculations. I want to make sure I understand your point. Your point is that the BAFs are based on the dissolved portions, and we should be consistent in terms of the water measurements that are used.

Philip Cook:

Yes.

Amy Pelka:

I believe that was taken into account, but those calculations were done a while ago. You are right, though. It is important to be consistent.

Laura Weiss:

I would like to address Mr. Watts. I believe you made a comment about cost, and I would like to reiterate that, in Puget Sound, cost does play a role in our decision-making process. In addition, before we can adopt criteria, we have to go through a cost-benefit analysis as required by our legislature. Cost is something we cannot ignore.

Amy Pelka:

Cost is also considered in the Superfund remedial process. The costs and implications for different cleanup goals and remediations are an important part of the negotiation discussions. They are, by no means, forgotten in any sense of the word.

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