ORIGINAL

ILLINOIS POLLUTION CONTROL BOARD
JANUARY 13, 2010

IN THE MATTER OF:	)	
	)	
WATER QUALITY STANDARDS AND	)	
EFFLUENT LIMITATIONS FOR THE	)	R08-9
CHICAGO AREA WATERWAY SYSTEM AND	)	(Rulemaking -
THE LOWER DES PLAINES RIVER:	)	Water)
PROPOSED AMENDMENTS TO 35 Ill.	)	
Adm. Code Parts 301, 302, 303	)	
and 304	)	

REPORT OF PROCEEDINGS at the hearing of the above-entitled cause before Hearing Officer Marie Tipsord, taken before Rebecca A. Graziano, Certified Shorthand Reporter within and for the County of Cook and State of Illinois, at the Thompson Center, Room 9-040, Chicago, Illinois, commencing at the hour of 1:15 p.m. on the 13th day of January, A.D., 2010.

A P P E A R A N C E S

ILLINOIS POLLUTION CONTROL BOARD:

Ms. Marie Tipsord, Hearing Officer
Mr. Anand Rao, Senior Environmental Scientist
Mr. G. Tanner Girard, Acting Chairman
Ms. Carrie Zalewski
Mr. Thomas Johnson
Ms. Andrea Moore
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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY:

Ms. Stefanie Diers
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BY: MR. ALBERT ETTINGER
MS. JESSICA DEXTER

Appeared on behalf of ELPC, Prairie Rivers Network, and Sierra Club.

MS. WILLIAMS: Good afternoon, Dr. Burton. I think we left off at Question 29. On Page 3, Paragraph 1 of your pre-filed testimony, you state, quote, "In 2004, Illinois EPA identified more than 800 causes and sources of impairments. The most common sources of impairment are municipal point source discharges, CSOs, urban runoff/storm sewers, contaminated sediments, channelization, flow regulation, hydro modification, and habitat alteration."

Question A asked, "How did you reach the figure of 800 causes and sources? Aren't there only 65 possible causes and 55 possible sources of impairment?"

DR. BURTON: I was looking at the total number of individual causes and sources of impairment that were listed for the Des Plaines River, so I counted and added together the number of causes and sources of impairment that are listed in the 2004 305-B for each segment in this waterway. Because the upstream --

MR. ETTINGER: I don't want to take over Marie's job, but I can't hear you.

DR. BURTON: Oh, I'm sorry.

MS. TIPSORD: Are you sure?

DR. BURTON: Because the upstream reaches can contribute to downstream water quality, I thought this was one of the appropriate ways to generally assess total impacts within the UIW system.

MS. WILLIAMS: I think we've covered some of these parts in the earlier questions.

MR. ETTINGER: I'm sorry. 800 causes and sources -- a cause and a source are two different things, as they define it in these rules, aren't they?

DR. BURTON: I simply added up all the ones that were listed in the 305-B report for each segment. That's how I got to the 800.

MR. ETTINGER: But a source could be -- have more than one cause, or it could give rise to more than one cause. So for example, a sewage treatment plant that put out ammonia and phosphorus would be contributing towards two causes with one source, right?

DR. BURTON: Right.

MR. ETTINGER: Okay. Now I understand what you meant.

MS. FRANZETTI: And Albert, I'll just say for the record, so it's a little clearer, perhaps, on Exhibit 374, which is just certain excerpted pages, I think this answer was based on even more segments that are included in here.

But he took -- he was adding what's listed in the causes -- there's a column entitled "Causes," and there's a column entitled "Sources," and that's what he was referring to in terms of counting up what's listed under those two columns for every segment that's in the UIW, including the Des Plaines River.

MS. WILLIAMS: And if a particular source was identified in more than one segment -- so an individual plant can be counted more than once the way you've done this?

DR. BURTON: I added for each segment, so yes.

MS. WILLIAMS: Okay. What areas are you referring to specifically? Does this go back to the 18 segments on the Des Plaines River, or does it include the entire Watershed?

DR. BURTON: For this particular tabulation of 800 it was a whole Des Plaines

Watershed. The whole watershed.

MS. WILLIAMS: Did you look at whether the Illinois River Watershed or any other watershed in Illinois have comparable numbers to these if you looked at the watershed as a whole?

DR. BURTON: Well, I think the earlier document we talked about from U.S. EPA 303-D number 375 does that for us and lists the causes of impairment and ranks the Des Plaines as the worst on the list with 18 waters.

MS. WILLIAMS: Well, that's a totally different analysis though, right? That's the number of segments, and we don't even know --

DR. BURTON: Well, it's going to have a direct correlation though, isn't it, the number of segments?

MS. WILLIAMS: It might not. No, it might not.

DR. BURTON: So it might be 500 instead of 800?

MS. WILLIAMS: Because there might be one cause and one --

MS. FRANZETTI: Counsel, can I just object? I think you're arguing with the witness

now. You may do the analysis differently. He's telling you how he did it.

MS. TIPSORD: I'd have to agree. You can ask him questions more about how he did the analysis. You can ask him did he not consider this, but you're making a statement.

MS. WILLIAMS: So you think that because -- what do you base your conclusion on that because -- let me strike that.

Do you know one way or another whether there's another watershed in Illinois that would have a higher number?

DR. BURTON: Of what?

MS. WILLIAMS: Of sources and causes -- potential sources and potential causes of impairment, yes or no?

MS. FRANZETTI: I'm just going to object to the use of the word potential, because I don't think that's what the Agency uses when it lists the causes and sources.

MS. WILLIAMS: Do you know if they're listed as potential causes and potential sources?

DR. BURTON: Do I what?

MS. WILLIAMS: Are they listed as

definitive, or are they listed as potential?

DR. BURTON: I see a column that says "Causes," and one that says "Sources."

MS. WILLIAMS: Did you review the narrative to determine whether they're considered potential causes and potential sources?

DR. BURTON: No. IEPA identified them and I did not.

MS. WILLIAMS: Okay.

MR. ETTINGER: Well, let's look at it this way: Let's look at the lowest segment in the Illinois River, the one down in Pike County. If I used your methodology and added up all the potential sources and potential causes in the entire Illinois Watershed, wouldn't I come up with a much larger number than the number you have for the Lower Des Plaines?

DR. BURTON: Yes, you would.

MR. ETTINGER: Thank you.

MS. WILLIAMS: Moving on, Question 30, "What conclusions about the sediments were reached based on the work you did for Commonwealth Edison in the mid '90s?"

DR. BURTON: Generally, the

conclusions reached about the sediments were the same as the conclusions reached in the EA survey and the study by Maylor (phonetic) et al., 2010, in the USGS 2004 study. The sediments are highly contaminated and likely to have adverse impacts to benthic biota.

MS. WILLIAMS: Question 32 asked, "Have you conducted or participated in any sediment data generation or study not contained in the record involving CAWS, Brandon Pool, or Upper Dresden Island Pool or any of the tributaries?

DR. BURTON: Before I answer, I should note, based on the review of the record, I don't think Illinois EPA introduced any sediment study reports into the record. The sediment data is referenced in the Lower Des UAA reports from sources, such as the Com Ed UIW study, which includes my work, the MWRD sediment sampling work, and that of the U.S. EPA. But none of the data generation or studies were introduced into this record by the Agency.

With that qualification, and excluding the EA sediment report that's attached to my testimony, I did participate in a sediment data

generation for the north branch of the Chicago River for MWRD, and those sediments were found to be highly toxic.

MS. WILLIAMS: Are you on 32?

MS. FRANZETTI: Yes.

MS. WILLIAMS: Okay. Because I was expecting you to tell me that you've identified studies in the -- I was expecting this answer to, kind of, already be covered by your submission here of studies. Is that accurate for some of the studies now in the record that were not before?

MS. FRANZETTI: Are you asking him whether, on the CDs, they include any of the studies he was just referring to, for example, the Com Ed UIW study? Because, Counsel, I'll just point out, just to move it along, CD number one is a one and two volume final report aquatic ecological study of the Upper Illinois Waterway, Commonwealth Edison, 1996, that has at least a summary of the work he's referring to.

That study -- and I actually have a couple of hard copies here if you wish -- is so big that just the summary makes up two volumes. If we can take -- let me just take a moment. This is

the summary of the UIW studies. So it's -- the stuff is so voluminous. It's from the mid '90s. Nobody's got it electronically. So if where we're going is you'd like all of that stuff, I'd have to say that it's going to be really difficult.

MS. WILLIAMS: That's not where we're going.

DR. BURTON: Well --

MS. WILLIAMS: We gave a list of studies -- we were told at the beginning that the list of studies that were given are in response to questions that you were asked. So I just was expecting a simple, kind of, cross reference. In response to this question, I submitted this index which has -- if that's not the case, then that's fine. We can move on.

DR. BURTON: It is the case.

MS. FRANZETTI: He'll point out to you.

DR. BURTON: I was on a different question than you were, and I've listed all the things I just said.

But in addition, I reviewed the national state -- natural history -- the Illinois

State and Natural History Survey studies, the one by the USGS --

MS. TIPSORD: Excuse me, Dr. Burton. For the record, let me try and clear up something, because I am really confused right here. Question number 32, and what you asked him, was had he conducted or participated in any sediment data for other studies that are in the record -- that are not contained in the record.

MS. WILLIAMS: That are not contained in the record. So I assumed that when she said, "Here are things that were addressed," but I guess that could be wrong.

MS. TIPSORD: Okay. I thought he answered that question, and I thought you were looking for an answer to 31, which is what I thought you were now beginning to answer.

MS. FRANZETTI: And that's what I was about to say.

MR. GOODFELLOW: Well, he actually started 31 and then went to 32.

MS. WILLIAMS: I was planning to skip 31. I'm sorry if I confused everyone.

MS. FRANZETTI: Then he did answer 32,

right?

MS. WILLIAMS: Okay.

MS. FRANZETTI: Yeah, you answered 32. Now you're starting to go back to 31, but I think --

DR. BURTON: Those studies have been submitted.

MS. WILLIAMS: Let's go to 33, please. Can you compare the likelihood of impacts from sediment contamination in a small stream compared to a large river?

DR. BURTON: Well, I'm not certain what you're referring to when you talk about the likelihood of impacts from sediment contamination or any reference making them potentially more resilient in small streams.

But assuming you were asking whether the likelihood of adverse impacts from sediment contaminants are greater in a small stream as compared to a large stream, my answer would be that you cannot make such a broad or absolute generalization. It depends on many other factors, such as the available refugium, the degree of bioavailability, flow rates, et cetera.

MS. WILLIAMS: For example, does the

presence of some hot spot areas of contaminated sediment in large rivers automatically mean that fish that have the ability to avoid such areas will experience toxic affects?

MS. FRANZETTI: Counsel, I'm sorry. We lost you.

MS. WILLIAMS: It's not a -- it's a follow-up question.

MS. FRANZETTI: Oh, I'm sorry.

DR. BURTON: Could you repeat that question?

MS. WILLIAMS: Does the presence of some hot spot areas of contaminated sediment in large rivers automatically mean that fish that have the ability to avoid such areas are going to experience toxic affects?

DR. BURTON: No. It's too little information.

MS. WILLIAMS: Okay. How much of the bottom of the large river would need to be contaminated by sediments to prevent the river from being able to attain the Clean Water Act goal?

DR. BURTON: No one knows the answer to that question.

MS. WILLIAMS: About how high would the sediment contaminant concentrations have to be to prevent a large river from attaining the Clean Water Act aquatic life goal?

MS. FRANZETTI: Excuse me just a second.

MS. TIPSORD: Ms. Williams, remember to keep your voice up too.

DR. BURTON: The sediment quality guidelines were developed to help make those decisions. So if they're exceeded, you expect adverse impacts.

MS. WILLIAMS: Okay. Let me ask that question again. The sediment quality guidelines were developed to make the decision about whether the Clean Water Act aquatic life goal can be attained. Is that what you just testified?

MS. FRANZETTI: No, that's not.

DR. BURTON: No, that's not what I said.

MS. WILLIAMS: Okay. Well, the question was: How contaminated do sediments have to be to prevent attainment of the Clean Water Act aquatic life use goal?

MS. FRANZETTI: And that's the question he was answering, Counsel.

MS. WILLIAMS: I'll let you finish.

DR. BURTON: So the sediment quality guidelines, if they're exceeded, you're going to suspect you're going to be adverse effects to your aquatic life.

MS. WILLIAMS: Is adverse effects the same thing as failure to attain the Clean Water Act goal? Would they be equivalent?

DR. BURTON: In my mind it is.

MS. WILLIAMS: I mean, I'm just trying to understand your testimony.

DR. BURTON: I mean, that's the goal of the Clean Water Act is not to have adverse effects.

MS. WILLIAMS: Okay.

DR. BURTON: So I think your whole context of the large river is -- I gather you're meaning there's refugium, there's places they can hide, and what I'd like to -- if we look at this, I would like Dr. Bill Goodfellow to review this study to show the pervasive nature of the contaminated sediments.

MS. FRANZETTI: That was a slam on me. I introduced him has Mr. Bill Goodfellow. He is a doctor.

MR. GOODFELLOW: No, I'm mister. He was right.

MS. FRANZETTI: You are mister. Okay. I'm sorry.

DR. BURTON: He's been faking me out.

MS. TIPSORD: And for the record, you're holding up Exhibit 378?

MR. GOODFELLOW: Yes, and this is the Figure 2 from the EA report.

MS. FRANZETTI: You know, if he comes over here, if you put it up here and stand to the side, then I think all of you, and pretty much you, and maybe even some of you can see it.

MR. GOODFELLOW: What this is is this is the study that we did in concert with Dr. Burton. Trying to mimic many of the sites -- I believe it was 18 of the sites -- were repeated from his study, and we threw in a couple other ones to make sure that we didn't make a patchy graphical interpretation. So we wanted to make sure that if there was a large span of the river that really

wasn't sampled that we were pulling a sample from there.

These samples were pulled from the depositional zone sediments. So they were closer to shore. They weren't in the main channels of the river. Water flow comes from the upper right to the lower left. This is Brandon Lock and Dam area here, and you can see this is metal toxicity.

Of all the metals that we evaluated, they're on, sort of, a clock type thing, just to show graphically the entire data set of all the metals that were evaluated the first time in the 1990 samples from Dr. Burton. Red is where it exceeds the probable effect concentration. And in the original report, they were yellow. When we blew it up, it turned it more of, kind of, a chartreuse. But it still shows, color-wise, the difference.

You can see that we have pockets of red, red, and red down here. And then after I-55, it starts just being a lot more yellow, or in this case the chartreuse. That was for the metals. The chartreuse is where it's at the threshold effect level, which is the lowest concentration -- the highest concentration that wouldn't cause an effect.

This is the PAHs and PCDs --

MS. TIPSORD: Which is Exhibit 377?

MR. GOODFELLOW: Yes, thank you.

MS. FRANZETTI: No, actually I had --

MR. GOODFELLOW: I think it's flip-flopped. I think three had the lower number of exhibits.

MS. TIPSORD: Yeah, Exhibit 3 is 377 -- Figure 3 is 377, Figure 2 is 378.

MR. GOODFELLOW: Because the difference between the 1990 and 2008 was that we've now analyzed PCBs differently. We did it as total PCBs, just to give us -- handle them as likes instead of confusing the issue.

But you can see the same orientation. PAHs are the top half of the circle, the bottom half of the circle is PCBs, and you can again see that we have heavy contamination above the probable effect level, all the way down until a little past the I-55, and they actually just exceeded for PAHs below I-55 until you get much lower.

MS. FRANZETTI: Thank you.

MS. WILLIAMS: Unfortunately, I think

because of this answer we probably need to delve in, for the Board, on what these terms mean.

MS. FRANZETTI: PEC and TEC?

MS. WILLIAMS: PEC and TEC, yes. So is Dr. Burton or Mr. Goodfellow the proper witness to explain this terminology?

MS. FRANZETTI: I think actually they both can. If you just help us, Ms. Williams, if you want to jump to another part of your questions, they can -- give us where you're going. Or if all you want is for them to give you what does --

MS. WILLIAMS: Yeah, I'd like to start there.

MS. FRANZETTI: You just want to know what PEC is and TEC is?

MS. WILLIAMS: For now, yeah.

MS. FRANZETTI: Oh, okay. That's fine.

DR. BURTON: These are consensus-based guidelines that were developed that looked at about 8,000 data points across the nation, and looked at the distribution of the benthic data that was there versus the chemical concentrations that were there where the benthos was living.

So these were field samples collected primarily. They was some lab tox testing, but most of the database is from field sample that's equating a benthic response with a chemical concentration in the sediment.

And with that distribution, they found that if it was 80 percent or higher of the distribution, you had probable adverse effects to the benthic community. And I forget the cutoff, but somewhere down in the 30 or 40 percent range of that distribution, you had threshold effect concentrations, meaning between the TEL and the PEL you might have adverse effects.

So a large data set came up with that. Now, this data set has been used a lot throughout the country and Canada and Europe, and found to be accurate, if you just use a number and go to a field and see does that number really equate to an impacted benthic community about 75 percent of the time.

MS. WILLIAMS: So they're found to be accurate about 75 percent of the time. Is that across all chemicals, or are some chemicals found to be more accurate than others?

DR. BURTON: I think they do -- yes, you're right. Some are not as good. I believe mercury is one they do not predict well.

MR. GOODFELLOW: Lead is another. Some of the metals that are most affected by other water chemistry, they aren't as readily biologically available or most impacted. But where -- they start falling in and being very predictive when there are multiple contaminants that exceed thresholds or the probable cause and effect levels.

Then it all comes down to, as Dr. Burton talked about, the weight of evidence. If there's -- when it's one compound, the changes of it are probably, you know, not being as predictive or higher than if there's three or four, then they're much more predictive to the point where when there's a lot of compounds then they're very predictable.

MS. FRANZETTI: Can you keep going in terms of now bringing it to here? What's the case here for the 2008 sediment sampling data?

MR. GOODFELLOW: Well, that's an excellent question. That's part of the reason we wanted to show all the metals in one graphic interpretation, to give that -- you can see that

many of these circles here are almost completely filled in with red, and if they're not completely filled in with red they're between red and yellow, which is now chartreuse. Same as for the organics --

MS. FRANZETTI: Okay. Wait a second. What's the significance of the fact that most of the metal circles are almost all red?

MS. WILLIAMS: Are we looking at 378? When you mean most, you mean more than half?

DR. BURTON: It looks that way.

MS. TIPSORD: Actually, no. That's 377.

MR. GOODFELLOW: 377.

MS. TIPSORD: Figure 3 is 377, Figure 2 is 378.

MS. WILLIAMS: Metals is 378, right?

MS. TIPSORD: No. 377 you have right there is metals.

MS. WILLIAMS: Right, but Figure 2 is the one that says, "Concentration of Metals Use."

MS. FRANZETTI: Right, and that's 378. I did them backwards. I did Figure 3 first and Figure 2 --

MS. WILLIAMS: Well, which one is he holding up?

MR. GOODFELLOW: Figure 2.

MS. FRANZETTI: Figure 2 is the metals.

MS. TIPSORD: Okay. Sorry.

MR. GOODFELLOW: From my perspective, virtually all the sampling points have either yellow or red in them.

MS. WILLIAMS: Most of them don't have red -- is what I was hearing -- you don't mean to say most of them have red?

MR. GOODFELLOW: Most of them have either red or yellow, but you can see that a large portion of them have many -- are filled in almost completely with red.

MS. WILLIAMS: And when it's filled in completely with red, that means --

MR. GOODFELLOW: It exceeded the probable effect concentration for more than one metal, in fact, the eight metals.

MS. WILLIAMS: For as many as you have?

MR. GOODFELLOW: Right.

MS. FRANZETTI: So then the circle is divided like a pie?

MR. GOODFELLOW: It is, yes.

MS. FRANZETTI: And so each slice of the pie --

MR. GOODFELLOW: Is one metal.

MS. FRANZETTI: So when you've got about six of the slices of the pie red, that means six metals were above --

MR. GOODFELLOW: It's heavily contaminated with metals in those samples.

MS. WILLIAMS: Can we tell from this chart whether those metal samples are ones that are reliable or ones that are found to be unreliable, the PECs for those metals? You have just testified that some of the PECs from metals --

MR. GOODFELLOW: Are more reliable.

MS. WILLIAMS: -- are found to be -- okay. Less reliable. Do we know by looking at this whether any of those pie pieces represent the less reliable PEC exceedances?

MR. GOODFELLOW: Well, primarily -- well, lead -- if you look at it as a clock, lead is at 7:00 o'clock, and 9:00 o'clock is mercury. Those

have been the compounds that are most problematic with sediment quality guidelines. Compounds like zinc, nickel, cadmium, copper, chromium, are very good indicators for that.

So at the most, you're only talking two of the eight compounds. So you can see that many of these compounds -- or many of the sampling spots are completely covered with either yellow or red. So I would argue that these are heavily contaminated for metals, as related to the sediment quality guidelines.

MS. FRANZETTI: Bill, I think it may be pretty obvious, but can you just -- for purposes of the Upper Dresden Pool, can you just note what you're talking about? The sediment samples that go -- I-55 crosses the Des Plaines right here. So just for the Board's benefit, the sediment samples that were within what's been called the UDIP in the proposed rules is all the sediment samples from I-55 bridge --

MR. GOODFELLOW: And I-55 is right there. So it's right this way. Actually, for the metals, virtually everything that has red in it is in that area.

MS. WILLIAMS: And some of the -- at the top where we see a lot of red, are those --

MS. FRANZETTI: Still on the metals?

MS. WILLIAMS: Yeah. Those are within -- some of those are within the Brandon Pool, correct?

MR. GOODFELLOW: Yes, the top four are. These are -- Brandon reaches right there.

MS. TIPSORD: For the record, could you tell us what -- give us the numbers on the four you're talking about?

MR. GOODFELLOW: It's BR 0801, 02, 03, and 04.

MS. TIPSORD: Thank you.

MS. FRANZETTI: We used BR to signify it was in the Brandon Pool.

Actually, while they're -- I have one follow-up question. Can either Dr. Burton or you, Mr. Goodfellow, explain why were there a few samples included for the Brandon Pool? Why is that relevant?

DR. BURTON: Well, because we had sampled there before because it's immediately upstream of the lock and dam, so the sediments there

are most likely to be the sediments that travel downstream.

MS. FRANZETTI: Into the Upper Dresden Island Pool?

DR. BURTON: Right, and the MWRD has a lot of sampling sites in that area too.

MS. WILLIAMS: So let's talk about the yellow dots though. The yellow pie pieces are samples where there was a violation of one of the TECs, correct?

DR. BURTON: Right.

MR. GOODFELLOW: Correct.

MS. WILLIAMS: Now, that -- but there was a violation of a TEC, but not so high as to reach the PEC, correct?

DR. BURTON: Right.

MS. WILLIAMS: Okay.

MS. FRANZETTI: And we might want to say exceedance instead of violation.

MS. WILLIAMS: Okay. That's fine.

MS. FRANZETTI: I think that's clearer assurance of what we're talking about.

MS. WILLIAMS: Sure. Would you agree that within the yellow, it's unknown what effect the

sediments are going to have on aquatic life?

DR. BURTON: No. That would be below the TEC.

MR. GOODFELLOW: It would be white.

DR. BURTON: In the area between the TEC and the PEC, its adverse effects have been noted, but you've got more in certainty around it.

MS. WILLIAMS: So there's no area that's unknown, because below the TEC we're saying there's no effect, right?

DR. BURTON: There's no data to show any effects at those concentrations.

MS. WILLIAMS: But you wouldn't agree that between the TEC and the PEC it's unknown if there's an adverse effect?

DR. BURTON: There's a greater uncertainly, I guess would be the best way to answer that.

MR. ETTINGER: Can I just clarify a few things? Probable means more likely than not in effect?

DR. BURTON: Right.

MR. ETTINGER: And what kind of effects?

DR. BURTON: Oh, adverse effects with the benthic communities for these data sets were comprised of lots of different endpoints. The ones that were laboratory would be mortality, the ones that were in the field could be increased dominance of tolerate species, depressed diversity, richness. So something to show that it's a depressed response.

MR. ETTINGER: Okay. But we don't know what -- reproduction rate might be lower, or what kind of effects --

DR. BURTON: These aren't chronic effects. The benthic indices that were used are pretty much the standard aquatic biologists use, like richness and abundance.

MR. ETTINGER: So it had a lower IBI score?

DR. BURTON: Right, a lower IBI, exactly.

MS. WILLIAMS: Wait, did you say -- I thought you said you used benthic -- IBI is fish index, right?

DR. BURTON: That can be used for benthic.

MR. ETTINGER: IBI is invertebrates.

MS. WILLIAMS: Right, invertebrates versus macro invertebrate.

DR. BURTON: There's lots of versions of IBIs.

MS. WILLIAMS: Okay. I'm sorry if I missed part of your questioning from Albert, so maybe I'm misunderstanding, but are you saying they did use IBIs to judge the toxic effects in developing these guidelines?

DR. BURTON: There's over 8,000 data points. There were all kinds of typical adverse benthic responses that went into that database.

MS. WILLIAMS: And if any of those responses were found -- did it only take one response to trigger a finding of a toxic effect?

DR. BURTON: I don't know, but it's 8,000 data points looking at the distribution of the data. So you're not going to have, like, one response, one data point dictating the adverse effect. It's going to be lots of data points that dictate that concentration is the probable effect or the threshold effect level.

MR. GOODFELLOW: But they were all ecological evaluation endpoints that were used in

combination with the sediment samples, regardless of the varying degrees of metrics that tend to be on a regional basis.

MS. WILLIAMS: Can you explain that a little more for us?

MR. GOODFELLOW: Well, ecological endpoints would be endpoints that are dealing with population, species richness, dominant species. Different river systems geographically have different ecological endpoints that are more beneficial within those regions, so that -- to use these all inclusive guidelines they, you know, are forced to make some compromises.

The other thing, the 80 percent and the 40 percentiles, when it was 80 percent or greater, the developers of the sediment quality guidelines believed that they were very certain to call it probable effect concentration, that there was a high degree of likelihood that every one of them that was part of the sediment quality guidelines initiation group would say, "Yes, we all believe that that's the number." And, you know, that's -- there's going to absolutely be an effect there.

The 40 percentile, or at least the concentration for the threshold one, there was evidence that there was ecological harm, but it was not as strong of a signal compared to the 80 percent. So it's almost like a two-tier criteria of saying, "We feel absolutely comfortable that the probable effect concentration is going to be an absolute effect."

And when it was -- when you've exceeded the threshold effect concentration, that's when they said, "We believe that there's going to be some harm, but we're not 100 percent certain," and that's where the weight of evidence comes in.

So if you have three or four compounds that exceed the threshold or higher, then there's a much stronger likelihood that there would be harm.

MS. WILLIAMS: I think you've answered part of 35 about how the sites -- what sites were sampled in the Dresden Island Pool. How was it determined that these sites adequately represented the sediment concentrations encountered by aquatic life?

DR. BURTON: Well, the initial survey

that I did in the mid '90s was basically trying to sample all the areas we could over the 55-mile stretch, and we quickly learned that if you drop a Ponar into the middle of the Chicago Ship Canal, you're often going to hit bedrock. So you obviously can't sample the sediments there.

So the sampling, by necessity, to collect a sample had to move to the depositional areas, which are outside of the main channel. So we tried to get all the habitats, as you can see from this map, pretty equally spaced all the way downstream, and we focused a few more samples where there was more concern about habitats, such as the tail waters.

MS. WILLIAMS: Can you explain why we find bedrock at the bottom of the Sanitary and Ship Canal in the main channel?

DR. BURTON: High flow. It was dredged out to bedrock. I mean, when it was constructed it went down to bedrock.

MS. FRANZETTI: Counsel, do you mean why we don't find as much sediment --

MS. WILLIAMS: Right.

MS. FRANZETTI: -- and we find

bedrock?

DR. BURTON: It's the flow and the barge traffic, of course, that keeps a lot of that sediment resuspended.

MS. WILLIAMS: And where is it going?

DR. BURTON: Downstream to the nearest depositional zone.

MS. WILLIAMS: Does it stay in the nearest depositional zone do you think?

DR. BURTON: Sometimes, sometimes not. If it gets resuspended it will go further downstream.

MS. WILLIAMS: Question 36, you've answered part of this. The last piece, "Do you know of rivers with elevated levels of sediment contamination that maintain good aquatic assemblages?" That's the very last part of 36.

DR. BURTON: I know of no streams where good benthic communities exist in contaminated sediments. If fish are present, then the data seems to indicate a higher correlation with exceedances of fish tissue advisories.

MS. WILLIAMS: And by fish tissue advisories, we mean it's not safe for the humans to

eat the fish, right? Not necessarily that the fish themselves --

DR. BURTON: Well, that's --

MS. WILLIAMS: I mean, that's the purpose of this, right?

DR. BURTON: That's the purpose, but it's not safe for any anything, whether it be wildlife or humans.

MS. WILLIAMS: Question 37 asks, "Are you suggesting that the fine sediment areas where contamination is high below the Brandon Lock and Dam are the same areas where fish would be spawning?"

DR. BURTON: Yes.

MS. WILLIAMS: Were the sediment samples from the Brandon Lock and Dam taken from the riffle/flowing areas or in the depositional areas next to the bank?

DR. BURTON: Well, if you look at one of the satellite photographs of this -- and it's not very visible from this -- it's easy to see that the waters in the tail waters are all flowing. There's no real area where the waters are quiescent there.

So we've got the inputs coming over the lock and dam, and then we've got Hickory

Creek feeding in right to the top of the tail waters. So within the cobble and gravel that exists throughout that area, you have little pockets of depositional sediment that are filling in the cracks and crevices. So it's always flowing, and the depositional sediment is, kind of, mixed in there.

MS. FRANZETTI: Counsel, if I may, just so we go right to the source, Mr. Vondruska, would you mind adding to that? You were out in the field, weren't you, and responsible, in part, as one of the people who collected these samples, am I right?

MR. VONDRUSKA: Yes.

MS. FRANZETTI: All right.

MS. TIPSORD: And may I remind you you were previously sworn in, so you're still under oath.

MS. FRANZETTI: You're still under oath.

MR. VONDRUSKA: Joe Vondruska with EA engineering.

MS. FRANZETTI: Would you describe these as riffle, or flowing areas, or depositional areas? And if you would like -- would you like the

aerial?

MS. WILLIAMS: What are these items?

MS. FRANZETTI: The sample locations. I'm trying to make it real clear what the nature of the sampling locations were for purposes of the question. And let's just have one of of the people who is out there doing it weigh in.

MR. VONDRUSKA: Okay. We sampled four locations in the Brandon tail water. The two upper ones, which were right off the Brandon Road -- I believe it's 30 -- and 31 one was in the mouth of Sugar Run, which is a flowing tributary on the elevation of the tail water sample depositional area there, and then we sampled, I believe it was --

MS. FRANZETTI: You can use your version of the map.

MR. VONDRUSKA: DR 0830, which is near the mouth of Sugar Run, which is just adjacent to the fast water in the cobblely areas of the Brandon Road tail waters.

MS. WILLIAMS: I think we're getting confused. Is Sugar Run a creek or is it within the Brandon Tail Waters? What is Sugar Run?

MR. VONDRUSKA: Sugar Run essentially

is a tributary to the Brandon tail water just downstream of Hickory Creek.

MS. WILLIAMS: Okay. I think we're trying to understand -- is this sampling point within the Des Plaines River or is it within Sugar Creek?

MR. VONDRUSKA: That's what I'm explaining.

MS. WILLIAMS: Oh, okay. Go ahead and finish then.

MR. VONDRUSKA: I was talking of our four locations we sampled in the Brandon Road tail water. One was in Sugar Run, which is a tributary that comes in right upstream of Brandon Road downstream of the dam. We sampled one just outside of that mouth, which was kind of the only depositional area within the stretch from Brandon Road upstream to Brandon Road Lock and Dam.

MS. FRANZETTI: And that number is what sampling location number on the map?

MR. VONDRUSKA: DR 0831 was in Sugar Run. DR 08-30 was just outside of the mouth.

MS. FRANZETTI: Outside of the mouth of Sugar Run?

MR. VONDRUSKA: Yes.

MS. FRANZETTI: In the Brandon tail water?

MR. VONDRUSKA: In the Brandon tail water. We sampled two other areas within the Brandon Road tail water and both of these locations downstream of Brandon Road. DR 0829 is a small, triangular shaped, kind of, back water area, which again, it's just off from the flowing water. And then basically at the bottom of the tail water, right before it empties out into the main channel, which is DR 0828, was another depositional area, kind of, outside from the flowing area of the tail water. So those were the four locations we sampled there.

MS. FRANZETTI: And before you move on, Mr. Vondruska, was it correct that one of the reasons that EA and Dr. Burton, as they worked together to select the sampling locations, why you had several in the Brandon tail water was because you were trying to see whether or not there were not just siltation, but also contaminated sediments in areas of the Brandon tail water that, in this proceeding, have -- some have suggested might

otherwise provide good habitat?

MR. VONDRUSKA: Yes.

MS. FRANZETTI: Thank you.

MR. VONDRUSKA: Can I elaborate just a little bit?

MS. FRANZETTI: Absolutely.

MR. VONDRUSKA: So these depositional areas we sampled are areas where we noted contamination, but are areas where the larval fish, when they're spawning in the tail waters, they're going to fall out in the drift in these areas and be exposed to those. So that's why it, kind of, was important to sample them, because it is a habitat where those young larval fish are going to fall out and try to develop.

MS. WILLIAMS: Okay. I'm going to ask this -- it's going to sound very unscientific, I know. But from listening to the testimony of Mr. Seegert, I was under the impression that the riffle areas are good habitat for many types of fish -- not all of them, but many -- and that would not be precisely the same areas as the depositional areas where you would find the contaminated sediment, would it? I know they're all within the

same Brandon tail waters, but it seems like I'm --

MS. FRANZETTI: Are you done with your question? What gets tough is you keep talking and it's really hard to tell what the question is. Let me -- can I -- maybe I can help. Are you asking whether none of these sampling locations were in what Mr. Seegert was referring to as riffle areas? Is that what you want to know?

MS. WILLIAMS: That would help. Let's ask that. I'm not sure that will cover it, but we can ask that.

MS. FRANZETTI: Okay. Well, Mr. Vondruska, do you need Mr. Seegert to tell you what he was referring to as riffle areas in his testimony, or can you answer this question?

MR. VONDRUSKA: No, I can -- sorry, we were having a conversation. Can you repeat the question?

MS. WILLIAMS: It was Susan's question.

MR. VONDRUSKA: I'm sorry.

MS. FRANZETTI: And I'm going to change it slightly to hopefully make it even clearer.

Were any of these sediment sampling locations, riffle areas as described by Mr. Seegert in his testimony, as areas that fish prefer to live in?

MR. VONDRUSKA: Well, no. They were -- deposition doesn't occur on riffles, so no.

MS. TIPSORD: Could we --

MR. VONDRUSKA: We could not sample --

MS. TIPSORD: I'm sorry. Go ahead.

MR. VONDRUSKA: We cannot sample riffle areas because they are just rocks. There's no sediment deposition.

MS. TIPSORD: That may be part of the confusion, because the original question was were any of those four sampling points -- were any of the four sampling points you were just talking about, the Brandon tail waters, were any of those taken in riffle flowing areas or were they all in depositional areas?

MR. VONDRUSKA: All in depositional areas.

MS. TIPSORD: Thank you.

MS. WILLIAMS: Thank you.

MS. TIPSORD: I was with you on this

one, Deb. I was lost.

MS. WILLIAMS: Well, I didn't know. I wasn't with myself. I appreciate that.

MS. FRANZETTI: Hang on just a second, Ms. Williams.

DR. BURTON: Well, I guess I feel like I need to add a little bit here.

MS. TIPSORD: Go ahead, Dr. Burton.

MS. WILLIAMS: I'm fine. Go ahead.

DR. BURTON: As I said, the deposition sediments fall in the riffled area, and they get between all the cracks, where your eggs and larvae and benthic invertebrates are. He can't sample there because he's using a ponar dredge, and there's too much gravel and cobble mixed in with that.

So we do have contaminated -- we have to have contaminated sediments because the nearest place he can sample downstream is contaminated. So within the riffle area, I would argue there is contaminated sediments between the larger particles. And the larvae, once they are hatched, they can't stay there. They drift downstream, as Joe noted, to the areas where he sampled. They can't avoid this exposure.

MS. FRANZETTI: I'm sorry. Mr. Seegert would also like to supplement, instead of having to pass notes to other people.

MS. TIPSORD: And I remind you, Mr. Seegert, you are still under oath.

MR. SEEGERT: Does that last forever, by the way?

MS. TIPSORD: At least for the length of this proceeding, which could be forever.

MR. SEEGERT: I'm sorry. Dr. Burton just explained that couldn't physically take the samples within the riffle. But nonetheless, even larvae then might have been -- the point I was making during my testimony was the area within the gravelly cobblely areas tend to be the best areas for spawning.

But once the larvae have hatched, they react almost like particles. I mean, you're talking about a thing that might be five to ten millimeters long. It doesn't have much swimming ability, so it acts almost like a particle. And so it ends up getting swirled around, and they settle out, in the same way inert particles would, in the depositional areas.

So even though they might have been spawned in an area that have less sediment, they end up getting into areas where they encounter, because that's where the larvae settle out. And they're going to spend the early part of their life stage in that area where they don't have to fight the current. As they get larger, then they'll move back into the riffles as sub-adults and adults.

MS. FRANZETTI: Thank you, Mr. Seegert.

MS. WILLIAMS: And were the PEC levels developed with probable effects of fish and fish spawning?

DR. BURTON: No. They were developed for benthic invertebrates, which the fish eat.

MS. WILLIAMS: Question B, "Your report on the sediment study suggests there's a great spacial heterogony and results between samples. How certain can you be about trends or lack of them between the two time periods of the results?"

DR. BURTON: You cannot be sure about trends, but there's a preponderance of data showing excessive contamination in most sediments throughout

the Upper Dresden Island Pool, Lower Brandon Pool, and the Ship Canal from all the data collected in the past two years. I do not know of a more extensively sediment contaminated area, with the exception of three superfund sites, the Hudson River, Fox River, and Cordelane River (phonetic).

As noted above, the USGS study also found UIW to be one of the most contaminated areas in the nation, as did the USEPA national sediment inventory.

MS. WILLIAMS: So let me make sure I heard that. You said there's only three superfund cites that you think have more sediment contamination?

DR. BURTON: Extensively spatial --

MS. WILLIAMS: Spatially? Do you think this should be a superfund site?

DR. BURTON: I'm not going to go there. I'm sorry. That's -- the designation for superfund site revolves -- it's very complicated.

MS. WILLIAMS: Question 38, what studies are you referring to on Page 9 that showed that, quote, "Turbidity is a major stressor in both the Chicago Sanitary and Ship Canal and the Upper

Dresden Island Pool?"

DR. BURTON: I'm referring to the literature review that I submitted, and also a wealth of literature that's provided in my other submissions, such as Wood and Armitage number 46, '97, which is an extensive lit review.

MS. FRANZETTI: He is referring to Exhibit 371, the index to CD number two.

DR. BURTON: And the USEPA's draft criteria for extended embedded sediments, number 42, which has an extensive review within it by Barry (phonetic) et al., the adverse effects.

MS. WILLIAMS: Okay. So those are not -- those are not site-specific, correct? So you're using those studies to analyze the system?

DR. BURTON: They were not collected in this system, but they drew relationships between the levels of total suspended solids and adverse biological effects.

In addition, I've done a number of studies for the city of Dayton on the Great Miami Watershed that also found suspended solids were the primary stressor in issuing nutrients during storm water.

MS. WILLIAMS: Did you look at any data on turbidity in this system?

DR. BURTON: Yes, I did.

MS. WILLIAMS: Where did that data come from?

DR. BURTON: MWRD.

MS. WILLIAMS: And what did you find?

DR. BURTON: The MWRD data from 2005 and 2008 for the Dresden Pool showed TSS levels that range from below three to 69, and below ten to 94, which those levels can cause adverse effects in some aquatic life.

And in addition, it should be noted that the MWRD data does not sample the plumes of the barges that are going up the river. I think about 12,000 per year go up the river, and we have one photograph that shows the plume of turbidity that's amid every time one of these barges goes through.

MS. WILLIAMS: Explain why --

MS. FRANZETTI: Counsel, since he referenced it, can I --

MS. WILLIAMS: Don't we have lots of pictures of barges in the record?

MS. FRANZETTI: I apologize, but I'll enter as the next Exhibit. I'll just use one photograph of an example of barges and turbidity --

MS. TIPSORD: I've been handed a barge picture.

MS. FRANZETTI: -- so people know what he's referring to.

MS. TIPSORD: That's all I can describe it as, is a barge, which we will mark as Exhibit 379, coming up on a bend with tanks, which we will mark as Exhibit 379, if there's no objection. Seeing none, it's Exhibit 379.

MS. FRANZETTI: Marie, we can further verify this, but we dropped off the description. I believe this is in the Cal Sag area. I'll try and get more specific information and supply that to the record.

MS. TIPSORD: You're just trying to make me crazy, right?

MS. FRANZETTI: I know. Sorry.

MS. WILLIAMS: Can you explain, Dr. Burton, why you stated that MWRD's sampling data does not sample the plumes from the barges? What about their sampling methodology does not capture

that?

DR. BURTON: Well, I guess that was a little naive on my part. I would not expect them to go out behind the barges and sample. I imagine they have fixed stations on the bank. They sample -- I'm not sure how often they sample. I was just assuming that.

MS. WILLIAMS: Okay. Did you make any analysis when you looked at turbidity -- I mean, I guess in this question I've provided a quote where you say turbidity is a major stressor. Are we talking both about resuspension of sediment from barges and other -- what are the other sources of turbidity that you include within that definition? Are we talking just about wet weather events, or would it be turbidity during dry weather and wet weather both?

DR. BURTON: Both.

MS. WILLIAMS: So what are the sources of turbidity other than dry weather, that you know of?

DR. BURTON: Turbidity is -- well, total suspended solids are coming out of wastewater treatment plants coming from conditional bank

erosion. So anywhere there's flow over clay, silty sediments, you may get resuspension.

MS. WILLIAMS: Do you think you're going to have levels of turbidity greater than ten coming out of the treatment plant?

DR. BURTON: I have no idea. I just know that's a source that's been identified by Mr. Lanyon, L-a-n-y-o-n.

MS. WILLIAMS: Question D asked, "Do turbidity and solids exist in streams achieving clean Water Act goals, and what level of turbidity needs to be present for Clean Water Act aquatic life use goals to be unattainable?"

DR. BURTON: So you're asking if turbidity and suspended solids exist in streams that are achieving goals? They exist in all streams.

MS. WILLIAMS: Okay.

DR. BURTON: Of course all streams have turbidity. EPA is, as I submitted here, trying to establish criteria for suspended sediments and bedded sediments unrelated to chemical contamination -- just the physical presence of the sediments -- to determine when this causes a beneficial use impairment in the absence of chemical

contamination.

MS. WILLIAMS: And they don't have a final guideline on what that is yet, do they?

DR. BURTON: They present all kinds of different ways for states to determine that. It's going to vary with the region of the country and the watershed.

MS. WILLIAMS: Do you know if --

MS. FRANZETTI: Counsel, just to clarify, can you please, Dr. Burton, explain what you were referring to by the USEPA guidelines on this topic?

DR. BURTON: I was referring to Attachment 42. It's the draft document that USEPA has produced.

MS. WILLIAMS: But is it a draft?

DR. BURTON: Yes.

MS. WILLIAMS: Okay. What was what I was trying to get at --

MS. FRANZETTI: That's what I wanted to make clear in the record, too, Counsel. We're not trying to contend that it's final criteria.

MS. WILLIAMS: I'm going to move on to Question 39. On Page 4 of your pre-filed testimony,

you state that, quote, "Despite reductions of untreated discharges of sewage from the Metropolitan Water Reclamation District of Greater Chicago's tunnel and reservoir plant, significant loading of raw sewage with associated solids, nutrients, and chemical contaminants will continue into the foreseeable future."

Will you quantify significant loadings and explain what levels constitute significance?

DR. BURTON: In the testimony offered by MWRD's witness, Richard Lanyon, he noted that between 2002 and 2006 the District was averaging 43 days a year of CSO discharges. These events resulted in thousands of gallons of discharge into the effluent dominated system.

Given that even non-CSO urban waterways frequently have degraded life, these additional inputs certainly are significant from an ecosystem quality perspective. And as I noted earlier, the downstream section of our study area will not be affected by TARP.

MR. ETTINGER: Wait a minute --

MS. WILLIAMS: When did you note that

earlier?

DR. BURTON: It will not be captured by TARP.

MS. WILLIAMS: I'm sorry. Could you repeat that?

DR. BURTON: It will not be captured by TARP. The runoff in the lower end of this system is outside of TARP.

MS. WILLIAMS: Okay. I think the simplest way I can think of to address the rest of these points here is -- are you assuming that the current situation, as you just testified to from Mr. Lanyon's testimony, will continue into the foreseeable future? When you look into the foreseeable future in this quote, you're talking about as it is today? You're talking about the level of overflows we're receiving today?

DR. BURTON: Yes.

MS. FRANZETTI: And just for the record, I wanted to point out that Dr. Burton included a PowerPoint map of TARP as reference number 33 on CD number two that's been submitted into evidence. That's the basis on which he is referring to the area that TARP captures.

MS. WILLIAMS: So you're not assuming that TARP won't reduce the loadings, are you? I mean, you're assuming it will, but that it's too far in the future to take it into account. Does that accurately summarize what you're trying to say?

DR. BURTON: Not exactly. It will reduce the loading certainly, and I believe I heard from Mr. Lanyon, 2024 is when it will be completed.

What I'm saying is in addition to that, because of all of the impervious area that exist outside of TARP -- and that's where the greatest urbanization is occurring -- we're going to continue to have urban runoff issues, even after 2024.

MS. WILLIAMS: Give me a second to see if we've already addressed 40. I know we've talked a lot about this.

DR. BURTON: I should also note that Mr. Dennison's testimony for the MWRD said that TARP is not going to eliminate all the CSO discharge. It's not going to eliminate 100 percent of the gravity CSOs, and it's not going to eliminate the CSOs from the pump stations.

MS. WILLIAMS: Do you know how many

overflows Mr. Dennison said that would be?

DR. BURTON: No, I don't.

MS. FRANZETTI: I don't think he did give a number actually looking at the -- I've got the transcript. I think he just said a huge volume.

MS. WILLIAMS: I just wondered if he did.

MS. FRANZETTI: Well, I didn't think it was a test of --

MS. WILLIAMS: I don't think that we need to ask anything else in 40. Let me see about 41. I think we've already talked about 41 A. 41 B, let me read the quote and then I'll go on to 41 B.

You state on Page 5 of your pre-filed testimony that, quote, "The sheer magnitude of urbanization and agriculture in the UIW and lack of affected non-point source controls mean that non-point source related degradation would be the dominant source of impairment for the foreseeable future."

Does the predominance of combined sewers versus separate sewers in this area impact your conclusion?

DR. BURTON: Yes and no, because they

are going to continue to be a factor for the foreseeable future. And even after 2024, according to Mr. Dennison, they will be a factor after that.

MS. WILLIAMS: C is definitely covered. I guess what I was trying to ask in this question is: Did you look at the differences between urban runoff in areas that have combined sewers versus areas that have separate sewers at all, or did you just, sort of, take urbanization impacts as being urbanization impacts generally?

DR. BURTON: Well, as I mentioned earlier, the literature shows that even urban systems that don't have CSOs have degraded aquatic life commonly. And in this system we've got both scenarios going on.

So no, I didn't attempt to separate them. Once you get above ten percent impervious area, you start to see aquatic life degradations. I believe this area ranges from 25 to 40 percent impervious area.

MS. WILLIAMS: Do you know if those studies looked at whether there was a difference between impervious areas with separated sewers or impervious areas with combined sewers?

DR. BURTON: They included both.

MS. WILLIAMS: They didn't try to compare and contrast?

DR. BURTON: Some did, but I'm talking about the 100 studies I submitted.

MS. WILLIAMS: Question D, on Page 9 of your testimony, you call suspended solids and turbidity, quote, "This dominant stressor of the UIW aggravated by barge and navigation traffic."

Is this the same stressor you are referring to above as, quote, "NPS related degradation?" If so, please explain. If not, which is more dominant in your opinion?

DR. BURTON: Well, suspended solids and turbidity both are part of a non-point source degradation. The debris and materials that are carried into the waterway in non-point source runoff contribute to the degradation.

There's been a number of studies that have shown this. TSS has strongly correlated with contaminant concentrations in human dominated systems. High TSS lows and rivers contribute to water quality impairment, habitat loss, excessive turbidity, resulting in impairments of

recreational --

MS TIPSORD: I'm sorry, Dr. Burton. We have a train going by and I lost you.

DR. BURTON: High TSS lows in rivers contribute to water quality impairments, habitat loss, excessive turbidity relating to impairments to recreational fish and wildlife, water supply designated uses, the results suggesting that controlling TSS specific lane uses may result in reducing other particle bound constituents. Navigation impacts from fresh water fish assemblages, the ecological relevance of swimming performance, have also been noted.

Specifically, turbidity is comprised of more than total suspended solids. It can be algae, plankton, it can be organic matter, it can even be human substances, natural coloration. But typically, TSS is a more specific stressor than turbidity. Sometimes I use them interchangeably.

MS. WILLIAMS: Subpart E, later on Page 9 of your testimony you also state that, quote, "When nitrogen is elevated, another stressor of particular concern is ammonia, which can be particularly toxic to certain aquatic species," end

quote.

Studies have found ammonia to be a primary sediment stressor in the UIW and Brandon Pool area. What studies have found ammonia to be a primary sediment stressor in this area?

DR. BURTON: The commonwealth study I conducted in the mid '90s, the studies by Rick Sparks of the Illinois Natural History Survey, the USGS, and MWRD studies have all shown high levels of ammonia in some parts of this system, either in the overlying water, or associated with the bulk sediments, particularly in the area from Dresden Lock and Dam upstream.

It ranks high. The ammonia is high in sediments in the depositional sites, and likely is a benthic stressor. And as I mentioned before, the USGS found ammonia to be at some of the highest levels of any water shed in the U.S. This is on top of the proposed draft USEPA ammonia criteria being lower.

MS. WILLIAMS: So are you saying USGS found the water column ammonia to be among the highest?

DR. BURTON: Yes, but that was -- I

believe their sampling was further upstream.

MR. ETTINGER: It's complying -- is it your understanding that this water is now complying with the current Illinois ammonia standard?

DR. BURTON: That's my understanding.

MR. ETTINGER: But it's still higher than almost every other water in the United States, according to USGS?

DR. BURTON: The upstream river -- the area where the USGS sampled upstream, that's what they found.

MR. ETTINGER: And where exactly did they sample?

DR. BURTON: I don't know exactly where it was. I just remember it was upstream a little bit. Their study actually encompassed the whole Illinois water system.

MR. ETTINGER: And this is in the water column?

DR. BURTON: Yes, this is water. But we've got very high levels in the sediment, and we don't have standards for that.

MR. ETTINGER: Right. And the proposed USEPA ammonia criteria is for water column?

DR. BURTON: Yes.

MR. ETTINGER: And it's specifically designed to protect muscles. Is that correct?

DR. BURTON: Yes. It's a two-faced approach, with and without muscles.

MR. ETTINGER: Right. But if it's an area without muscles, you have essentially the same standard as you have now. Is that correct?

MS. FRANZETTI: Emphasis on essentially, right, Albert?

MR. ETTINGER: Well, I'll ask the question, rather than try and -- what's your understanding if it's an area that they call muscles not present -- and that's not too well spelled out in the draft, but assuming we've got an area where muscles are not present, does the new proposed criteria vary from the existing criteria, and if so, how?

MR. GOODFELLOW: I'd like to answer that, because I was one of the independent peer reviewers prior to the EPA submitting it as a draft criteria.

MR. ETTINGER: Wonderful. I might want to hire you.

MS. FRANZETTI: Nope, he's mine.

MR. GOODFELLOW: The acute provision of the -- without muscles is slightly lower, because there's no species -- or actually more included in the criteria. On a chronic basis, it's a little less stringent for chronic. And then with muscles, it's considerably lower for both, acute and chronic.

MR. ETTINGER: Okay. Do you know whether the Lower Des Plaines that we're talking about here is an area in which we would consider muscles present?

DR. BURTON: I believe Rick Sparks suggested that when he did his studies, and unfortunately the EPA criteria doesn't tell the states how to determine that. Should they be here or should they not be here is a big question that's going to be difficult.

MR. ETTINGER: Just as a biologist --

MS. FRANZETTI: Well, that's what I was actually going to switch over to, but I don't know I'm catching Mr. Seegert off guard.

MR. SEEGERT: Well, I would expect there should be some muscles present. Because of all of the other stressors that we've talked about

and the habitat limitations, I wouldn't expect there to be a diverse population. I guess that also, kind of, just as a scientist, I would wonder about if you have one species of highly tolerant muscle, does that count? I don't know, but there should be some muscles present in a water body of this size and given its overall habitat.

MR. ETTINGER: To our knowledge, are there muscles present?

MR. SEEGERT: Joe, have we encountered -- I think -- I should say I don't know.

MS. FRANZETTI: I don't know.

MR. SEEGERT: I haven't investigated that.

MR. VONDRUSKA: I'm not aware of any.

DR. BURTON: There's a lot of zebra muscles there.

MR. VONDRUSKA: Corbicula.

DR. BURTON: You know, if you go back to the 1800s, there were muscles in most of the streams east of the Mississippi. So again, how do you define --

MS. FRANZETTI: Muscles present.

DR. BURTON: Right.

MR. ETTINGER: That will be fun for the next proceeding.

MS. FRANZETTI: I was going to say, Albert, can we not go into that here? We have enough issues here.

MR. ETTINGER: Well, never mind. We'll see where we go.

MS. WILLIAMS: I think you've mentioned a couple of times the Illinois Natural History Survey studies by Mr. Sparks or Dr. Sparks. Was that on your index provided in 371, Exhibit 371, do you know?

DR. BURTON: Those are -- they're not. They are actually cited in the paper I submitted, number 27, who looked closely. They were doing a TIE on all the sediments of this river, and they specifically cited the works of Rick Sparks and some previous work by the Duluth USEPA lab.

MS. WILLIAMS: For the record, can you explain what TIE stands for?

DR. BURTON: Well, I mentioned that earlier. It's the toxicity identification evaluation approach that USEPA came up with to separate out which chemicals are causing the most

toxicity.

MS. WILLIAMS: Finishing up with ammonia, in question E, it asks, "How does this stressor -- " and by "this" I'm assuming that we mean --

MS. FRANZETTI: I'm sorry, Counsel. We lost you. Give us the question reference again.

MS. WILLIAMS: It says this stressor, and we've been talking about ammonia as a primary sediment stressor. So how does ammonia as a primary sediment stressor rank in dominance compared to non-point source related degradation and turbidity, subpart E?

DR. BURTON: What number are you on?

MS. WILLIAMS: I'm sorry. 41, subpart E.

DR. BURTON: Well, I thought I already answered that.

MS. WILLIAMS: We asked about what studies and then you went into the studies. I know you did that, but I don't know if you answered the relative dominance of this stressor compared to the other stressors. I did not hear an answer to that.

DR. BURTON: Well --

MS. WILLIAMS: Is ammonia worse than turbidity?

DR. BURTON: I guess I need to reemphasize something, because it keeps coming up as we talk about each stressor. The organisms are seeing all of these stressors. Cumulative stress is the issue here.

And so to separate out one is okay, but in reality they're seeing everything. So one might not be acutely lethal to them, but if there are several other stressors it could be because it's pushing them over the edge.

So I would rank -- if I had to give a one to ten ranking of stressors, I would put ammonia in the top ten. I would -- the habitat issues I talked about earlier, the flow issues, the contaminated sediments, probably are greater issues in the system, the high nutrients. Even though we're not violating water criteria, we have loaded up the sediments and that's changing the ecosystem.

MR. ETTINGER: Are you done with ammonia?

MS. WILLIAMS: I am done with 41.

MR. ETTINGER: Okay. I'm not quite

sure I understand the chemistry or whatever it is of this dependant clause at the beginning of the beginning quoting sentence here. It says, "When nitrogen is elevated, another stressor of particular concern is ammonia." What do you mean by that?

DR. BURTON: Well, it's a night vision cycle. If you've got high nitrates around, you're going to probably end up having high ammonia concentrations.

MR. ETTINGER: Let's say I'm discharging nitrate, rather than ammonia, or there's nitrate in the system. Are there circumstances in which the nitrate will go to ammonia in this system?

DR. BURTON: Yes, it can go to ammonia.

MR. ETTINGER: When would that happen?

DR. BURTON: If you have the right conditions, the nitrifying bacteria that are there and the denitrifying bacteria. So it just has to be the right conditions. And most of that activity in this system is probably happening in surficial sediments. That's why we're seeing higher concentration notice the poor water. We have higher concentrations of ammonia in the sediments.

MR. ETTINGER: That's what I'm trying to understand as a matter of chemistry. And you don't have to get too precise, but let's imagine we have a sewage treatment plant, which is denitrifying, so it's putting out nitrate, rather than ammonia. The nitrate goes into the water. Are there conditions in the sediment that nitrate then will be turned into ammonia?

MR. GOODFELLOW: I can answer that I think.

MR. ETTINGER: Please do.

MR. GOODFELLOW: Nitrates are very water soluble. So the chances of them getting into the sediment are -- I mean, there will be -- some amounts will get into the sediment, but not a large concentration of it. In comparison of 100 percent nitrate, you'll have a very small percentage that will actually go into the sediment, because it wants to say dissolved in the water column.

Probably a larger source of nitrogenous material would be just degradation of organic material, leaves, any other vegetative material. They're also going to be pumping a lot of ammonia out of the sediment into the water column.

So additional to any discharge from a point source, that's a large portion of ammonia in a natural system that's coming from -- in an aquatic system is coming from that route also.

MR. ETTINGER: The route being just --

MR. GOODFELLOW: Natural degradation of vegetative material -- of protein, proteinaceous material.

MS. WILLIAMS: I think -- let's do Question 79. Would that throw you off too much to jump ahead? Because I think Albert was trying to answer the rest of the ammonia questions, and that might help.

MS. TIPSORD: Can we skip the ones in between?

MS. WILLIAMS: I reserve the right to go back.

MR. ETTINGER: Can I just follow up with one thing? Are you aware of studies of nitrate toxicity?

DR. BURTON: To aquatic life?

MR. ETTINGER: To aquatic life.

DR. BURTON: No. Usually the stressor comes in from changing the ecosystem up. You get

nitrification occurring. Did you say nitrate or nitrite?

MR. ETTINGER: Nitrate.

DR. BURTON: Nitrate, no. But you can obviously cause degradation to the ecosystem by producing more algae.

MR. ETTINGER: Okay. But the nitrate itself, to your knowledge, is not a problem of toxicity in the system, although it might be facilitating an algal bloom or something which would be a stressor?

DR. BURTON: Right, exactly. There were some questions in that line, which I don't know if we've skipped or not.

MR. ETTINGER: Okay.

MS. WILLIAMS: Now you're really getting me confused.

MR. ETTINGER: I'm sorry. I'll be quiet for a while. I just, sort of, woke up a little bit this afternoon.

MS. TIPSORD: Albert, no more coffee for you at lunch.

MS. FRANZETTI: Ms. Williams, you're going to Question 79?

MS. WILLIAMS: Yes, in an attempt to finish out the ammonia questions, but there are other nutrient questions and I won't say I haven't got to those.

You state on Page 14 of attachment one that, quote, "It is not until the Low Dresden Pool that levels drop significantly for nitrogen, ammonia, phosphorus, and fecal coliforms," end quote. Where precisely do these levels drop, and what levels do they drop to?

DR. BURTON: The MWRD reports are showing a substantial drop that occurs right at Dresden Lock and Dam. The summary observations from water quality for 2007 and 2008 by MWRD, the Lockport station was always more degraded for total ammonia, total nitrogen, and total phosphorus in regards to the other stations, but the Brandon Road Pool stations and Dresden Island Pool stations were similar to Lockport, and the proceeding downstream stations were considerably lower in regards to these parameters.

It should be noted that the Brandon Road Pool and the Dresden Island pools were roughly a PH unit lower, versus the lower downstream

stations which had a higher PH, which would make the unionized ammonia concentrations lower.

With regards to nutrients, the Lockport Pool, Brandon Road Pool, and Dresden Island Pool are carrying the highest nutrient loads.

MR. ETTINGER: I'm not sure whether I heard you right or whether you misspoke. The higher the PH, the higher the amount of unionized ammonia?

DR. BURTON: Yes.

MR. ETTINGER: I think that's what you meant to say. I'm not sure that's what you said.

DR. BURTON: Yes, that's what I meant to say. So you have the upstream having the lower PH, so downstream the ammonia is going to be more of a concern because it has a higher PH.

MS. FRANZETTI: Can you just give an example of what figure you're looking at here?

DR. BURTON: A lot of this is coming from example 5 and 6 from the 2008 report, 09-46.

MS. FRANZETTI: Issued by the metropolitan Water Reclamation District of Greater Chicago. I think it may already be an exhibit or it was referenced, but we did not include it on the CDs. It's available on their website.

MS. WILLIAMS: Okay. Let's try -- hopefully these will go quickly, because I think I've gotten into some of them already. I think they're just, sort of, yes or no.

Question A, "Do you have evidence that the upper Dresden Island Pool is not in compliance with the general use water standard for ammonia?"

DR. BURTON: It's not exceeding the current ammonia standards. But as I noted, in the future, it may. Those draft criteria are adopted from USEPA.

MS. WILLIAMS: Is it your testimony that Illinois's ammonia water quality standard does not protect Clean Water Act goal aquatic life uses?

MS. TIPSORD: That's B?

DR. BURTON: No.

MS. WILLIAMS: C, I'm sorry. And what is the evidence that ammonia is present in toxic amounts to support ammonia as a stressor to aquatic life in the Brandon Pool and the upper Dresden Island?

DR. BURTON: Well, the previous studies I cited and the studies I conducted on the

Brandon Road Lock and Dam were the sediments from there that showed in the TIE I did there shows ammonia as a toxicant.

MS. WILLIAMS: And by that, do you mean ammonia in the sediment or in the water column?

DR. BURTON: In the sediment.

MS. WILLIAMS: This is moving on to 80, and then we'll jump back. You answered the first part of 80 A, and the second part of 80 A asked, "What is the relationship between ammonia in the sediment in the water column?" I think maybe -- do we think Mr. Goodfellow already answered that? Do you want to add anything to that?

DR. BURTON: Well, obviously a lot of the ammonia, if it's a gradient distribution, if you have a high concentration of something like ammonia that's water soluble in the sediment, it's going to migrate out of the sediment to the overlying water.

So the concern are really the organisms that live at that interface of sediment and water having toxicity there. Certainly, as soon as that ammonia gets into the overlying water, it's diluted out, and it's not going to be a problem for the organisms in the water column.

MS. FRANZETTI: I'm sorry, Counsel. Just for the record, you also have used the phrase "poor water." Is that the water you were just referring to that is in contact with the sediment?

DR. BURTON: Right. The poor water is the water between the sediment particles, so that would go all the way up to the sediment water interface.

MS. WILLIAMS: The last piece of that asks, "Has ammonia been detected in both sediment tests?"

DR. BURTON: Yes. The study I did showed TIE, bulk sediments, and the poor water that comes from those sediments.

MS. WILLIAMS: And was there a particular methodology used in your TIE tests? That's part of B that you haven't answered yet.

DR. BURTON: Yeah. That was explained in my reports that were submitted. The TIE followed a modified draft USEPA protocol for poor water TIEs. That would be number six of the exhibits that I submitted.

MS. FRANZETTI: Reference number six on Exhibit 371.

DR. BURTON: The other part of that TIE test, which is relevant here, it showed a PH used to be a principal toxicant. We separate -- basically, in those exposures you separate out the different kinds of chemicals and then expose the organisms to the poor water again. And when we remove the PAHs, the survival greatly increased in the poor water, suggesting the PHs are the source of toxicity. Those are the same results that Maylor just published this month.

MS. WILLIAMS: And these were done in '95, correct?

DR. BURTON: Yes. His were done last year.

MS. WILLIAMS: And where were the samples subject to TIE testing collected?

DR. BURTON: Mine were collected from the Brandon Road Lock and Dam area.

MS. WILLIAMS: How were they selected? How were the sample locations selected?

DR. BURTON: I wanted a depositional sediment, and something that was close to the Joliet station where we were doing most of our work.

MS. WILLIAMS: The last piece of

that --

MS. FRANZETTI: Counsel, can I just, for a moment, to put it in context, his work? Was your work included ultimately in the proceeding that's been referred to in this rulemaking as AS 96-10, the Board proceeding? The work that you did in the mid '90s, '95, '96, that was for Com Ed. Com Ed relied on that work in the AS 96-10 adjusted standard proceeding, correct?

DR. BURTON: Yes. I have not heard that number before, but yes.

MS. FRANZETTI: I'm sorry. And that was part of the reason why you were staying close to the Joliet station --

DR. BURTON: Right.

MS. FRANZETTI: -- for your sampling locations because it was related to seeking an adjusted standard for the Joliet station, correct?

DR. BURTON: Correct.

MS. WILLIAMS: Were you upstream or downstream of the Brandon Road Dam?

DR. BURTON: Upstream.

MS. WILLIAMS: The last piece asked, "Were the sample locations intended to be

representative or more conservative worse case scenario samples?"

DR. BURTON: Worst case, because I was trying to look also at temperature effects.

MS. WILLIAMS: Okay.

MR. ETTINGER: I don't promise to leave nitrogen alone in the future, but just as to ammonia, what are the critters that we believe are being affected by any ammonia in the sediment?

DR. BURTON: Obviously there is a wide range of responses from organisms. We have a lot of pollution tolerant organisms in this system that don't really care whether ammonia is around or not. But the desirable species, like hilolazteca (phonetic), which is, again, a USEPA indicator species that's supposed to be relatively sensitive and protective of other species, seize toxicity in the presence of the ammonia concentrations we were talking about.

And, as you know, cold water fish are much more sensitive to ammonia than warm water fish, and then you have a whole range of responses there.

MR. ETTINGER: Now, as I recall -- and

I haven't looked at the ammonia criteria in general for a whole -- the most sensitive critters were salmonids?

DR. BURTON: Yes.

MR. ETTINGER: And that was what was driving the standard outside of Illinois in many places. But in Illinois, we throw out the salmonid data because we don't have salmonids?

DR. BURTON: Right.

MR. ETTINGER: So what are the next most sensitive critters that might be affected there?

MS. FRANZETTI: By ammonia?

MR. ETTINGER: By ammonias. This is all about ammonia.

DR. BURTON: Well, it would be muscles for sure.

MR. ETTINGER: Well, muscles, as you know, were not taken into account in this standard either. So other than muscles -- muscles and salmon are out of here -- are not in this criteria. What then would be the critter that might be in this?

DR. BURTON: What would be nice is to have, as I was mentioning to Bill, a species

sensitivity distribution. Those data are out there. I don't know what the answer is. I'm guessing what I've just mentioned, the anthropoids, is down near the more sensitive area. But I really haven't looked at the data that make up those criteria.

MR. GOODFELLOW: Formally, the old one was a darter. It was one of the species. I cannot remember the invertebrate. There was an invertebrate -- I think it was a snail. I'm not 100 percent sure on that one. But there were -- only one species changed, and the newer data made the numbers go -- that's why they go down slightly in the absence of salmonids for the newer criteria.

MR. ETTINGER: Okay. So just to be clear then, I guess -- leaving aside -- well, there's a number of concepts here, but what we're saying here is that because the ammonia is there, we're possibly not seeing some benthic critters that would obviously be there. We're seeing more ammonia-tolerant benthic critters?

DR. BURTON: Correct. But again, I want to point out that we don't have to be killing something from ammonia for it to be a worry. It's

an additional stressor in the midst of a lot of other stressors.

So I hesitate to say, "Well we're not above this level, so it's not a problem." If it's an early life stage of an organism and it's inducing stress --

MR. ETTINGER: So the fact that the ammonia levels are higher than natural conditions, shall we say, would be an additional -- would be a stressor, and might make the critter more susceptible to problems from other stressors than it would be otherwise?

DR. BURTON: Correct.

MR. ETTINGER: Thank you.

MS. TIPSORD: Let's take a ten-minute break.

(Whereupon, a break was taken, after which the following proceedings were had.)

MS. WILLIAMS: I'm going to start on Question 43. I think only Subpart D do I want to ask at this point. I'll start with the introduction.

At the top of Page 5 of your

testimony, you state, quote, "As I have studied and documented in prior studies, as well as documented elsewhere, urban and agricultural storm waters are often acutely toxic to fish and other aquatic species."

So Question D says, "Does this statement mean that aquatic life are routinely killed off in water bodies of urban and agriculture storm water?" Is what what you mean by acutely toxic?

DR. BURTON: You meant 43?

MS. FRANZETTI: We had trouble with D and B.

MS. WILLIAMS: 43-D, as in debit.

DR. BURTON: I'm not saying that species are killed off, but rather that the system is not hospitable to higher quality organisms, because you've already downgraded the neighborhood, so to speak. Therefore, if they were there, they had moved out. Because of the conditions they can't move in to that area.

MS. WILLIAMS: Question 45 -- I'm going to skip 44 and move on to 45.

On Page 5, Paragraph 2 of your

testimony, you state, quote, "Depositional sediment in the UIW, including those in the Upper Dresden Pool, are severely contaminated." And subpart C asks, "How do you classify sediments as severely contaminated?"

DR. BURTON: That was based on the previous discussion we had with using the probable effect and guidelines.

MS. WILLIAMS: So the exceedance of the PEC would be the same as the definition of severe in this case?

DR. BURTON: That's what I'm using as a commonly recognized indicator of quality, yes.

MS. WILLIAMS: Do toxic sediments have to be available to aquatic life before one can classify the sediments as severely contaminated? This is D.

DR. BURTON: Well, that's what the guidelines are doing. They're based on biological effects. That's means they have to be bioavailable to have an effect. So toxicity was determined by -- this was mentioned by some of these laboratory mortality-based bio-essays. Some were field-based benthic indices.

Studies were conducted throughout the nation by many academic and government institutions, and actually there are a number of different SQGs we haven't even talked about today, but they all are similar in some regard. They're doing pretty much the same thing.

The empirical guidelines that EA used were based on the relationship between benthic indices and concentrations. I think we've already discussed most of that. There's some other chemical tool -- other tools available to look at bioavailability, such as acid sulfides, and simultaneously extracted metals, organic carbon, the PH of water. All of those things have some effect of controlling bioavailability.

Severely contaminated sediments that are high in chemical concentration that is exceeding the guidelines have potential under-ecological conditions to cause adverse effects to organisms by a variety of mechanisms.

MS. WILLIAMS: I'm going to ask E. I was trying to decide to ask E. I'm not sure it's clear, so I may have to flush it out with some follow-up.

Have you demonstrated that sediment in the Lower Des Plaines River is severely contaminated and that toxic in these sediments are available to and accumulated in aquatic life?

DR. BURTON: Clearly and unequivocally, by multiple investigations, as I've cited previously. In the case of the sediments contaminated by petroleum and combustion products, advanced chemical analyses really don't need to be done to ascertain whether they're grossly contaminated or toxic.

A real simple visual and smell test will do that for you. So to demonstrate this, we went out in late December and collected from six of the sites that we've collected from before, and two of these were from the Brandon tail water area.

These sediments smell of petroleum. They release oily sheens into the overlying water, and due to the very small size the particle size, they're unsuitable for habitat for any desirable species. We could get some worms to live in there, but little else would.

So Joe is going to open these up briefly for anyone that would like --

MS. FRANZETTI: I don't even know if we're going to -- unless you want, we are not going to open all of them up, but --

MS. TIPSORD: I would certainly prefer the ones that you're going to enter as exhibits do not get opened.

MS. FRANZETTI: Well, you need to tell me whether you want these introduced as exhibits or not. We don't want to burden you. There has been a lot of testimony about these sediments.

MR. RAO: Our fridge is full.

MS. FRANZETTI: Right. And so we don't really need to, but we just thought that the Board members might like to actually see, when they talk about the contaminated sediments out there, see and actually smell what they're talking about.

DR. BURTON: So my point --

MS. FRANZETTI: I always think a picture is worth 1,000 words. This is a little bit better than a picture.

DR. BURTON: And my point to the Board is I've been doing this since the late 1980s, and really for most sites that are like this, I don't need to do a bunch of toxicity tests and spend a lot

of money. I can just look at the sediment.

MS. WILLIAMS: Can I smell?

MS. FRANZETTI: You can take a bottle. Here you go. Just for you.

MS. TIPSORD: Ladies and gentlemen, we're still on the record, so let's make clear that we have some -- these sediment jars are being shown to people. If there's no objection -- I am not going to enter these into the record unless someone really feels strongly that we should. Seeing no objection, we won't enter them into the record. We will -- I will try to describe what I'm looking at. This is from the Dresden Reach 09-18. Is that correct?

MR. VONDRUSKA: 09 for the year, and 18 refers to the same location that we sampled in 2008.

MS. TIPSORD: And this is murky, to say the least. Oh, yeah, it smells like gasoline. I'm not tasting it.

MS. WILLIAMS: Wait, mine doesn't smell like gasoline.

MS. TIPSORD: Oh, mine does.

MS. WILLIAMS: I want to smell yours.

MS. TIPSORD: Mine definitely smells like gasoline.

MS. WILLIAMS: See, yours smells worse than mine. Smell mine.

MS. FRANZETTI: Does anyone else want want to actually come up and look at these or smell them?

MR. ETTINGER: 09-18?

MS. FRANZETTI: Yes.

MS. TIPSORD: 09-22 is actually clearer and does not have the same strong scent.

MR. VONDRUSKA: What's really interesting to note is the sample from DR-22, which you notice doesn't have as a distinct odor as some of these others, actually had the highest concentrations of total PHs.

MS. FRANZETTI: We're not introducing them.

MS. TIPSORD: Off the record for just a second.

(Whereupon, a discussion was had off the record.)

MS. TIPSORD: Dr. Burton, did you have anything further to add to that?

DR. BURTON: No, ma'am.

MS. FRANZETTI: Hand sanitizer?

MS TIPSORD: Well, maybe just to be on the safe side.

Ms. Williams, I think we're ready for your next question.

MS. WILLIAMS: Okay. Number 46 -- are you ready, Dr. Burton?

DR. BURTON: Yes.

MS. WILLIAMS: Paragraph 2 on Page 5 of your testimony, you mention transport mechanisms and processes, such as resuspension, convection, bioturbation, and diffusion. And all of these processes exist on the Lower Des Planes today, correct?

DR. BURTON: Yes.

MS. WILLIAMS: Do these processes exist in most waterways?

DR. BURTON: Yes, they do.

MS. WILLIAMS: What impact does resuspension have on sediment or water quality toxicity?

DR. BURTON: Well, like a lot of things in this field, it depends on many factors,

biological, chemical, and physical, the magnitude and frequency and duration of when those resuspension events happen.

So there's really no simple answer. It also depends on if the organisms living in that system are pollution tolerant and can stand that resuspension or turbidity.

MS. WILLIAMS: What data demonstrates that resuspension is resulting in deleterious effects on aquatic life in the Upper Dresden Island Pool, and what data demonstrates these effects are significant enough to prevent the Upper Dresden Island Pool from attaining the Clean Water Act aquatic life goals?

DR. BURTON: Well, as I discussed previously, I did some suspended solid studies that showed some effects on daphnia. I don't think the phenomenon really needs to be documented in every waterway to prove this phenomenon exists.

Because of all the publications that I've already discussed and submitted, we know that resuspension occurs a lot in this system. And so if we have high TSS, then we're going to have potential stress to the organisms that live there.

Otherwise, USEPA wouldn't be developing suspended sediment criteria.

MS. WILLIAMS: Would you agree that if we knew precisely what all these impacts are in aquatic life that we'd have final criteria that the states could use?

DR. BURTON: Are you talking about the suspended solids criteria? There's already a lot of criteria.

MS. WILLIAMS: When referring to the criteria, you said that's why USEPA is working on developing criteria for -- maybe you should finish.

DR. BURTON: As I mentioned, they are trying to make it flexible, because right now the states use a wide range of criteria to determine standards.

MS. WILLIAMS: For suspended solids or for everything?

DR. BURTON: I'm talking about suspended solids.

MS. WILLIAMS: Question D asks, "What effect does advection have on sediment or water quality toxicity? And maybe you should first explain what advection is.

DR. BURTON: That would be the movement of groundwater up through sediments, the movement of water through sediments, which then can go out into the overlying waters. And it's a common phenomena in waters and streams and rivers. So it's a very site-specific process.

If you've got sediment contamination and if you've got advection in those sediments it's going to move the contaminants out of the sediment into the water where more organisms can see it.

MS. WILLIAMS: You have to have ground water come in for that to occur?

DR. BURTON: It can be ground water. It can be water from just upstream that's going through the sediments. So most streams are recharged from the bank, and that's where you tend to get this advection coming into the stream.

MS. WILLIAMS: Do you have data that demonstrates advection as resulting in deleterious effects on aquatic life in the Upper Dresden Island Pool that prevent attainment of the Clean Water Act aquatic life uses?

DR. BURTON: No, I do not, but it's a

common process, so I don't know why it wouldn't exist there.

MS. WILLIAMS: What effect does bioturbation have on sediment or water quality toxicity? And again, maybe you should explain bioturbation.

DR. BURTON: That's any resuspension of the sediment. That's the turbation due to biota. So although it could be fish, like carp, it's usually referred to the benthic invertebrates and the worms that are moving through the sediments. They're resuspending some of those sediments, they're causing chemicals in the sediment to go into the overlying water.

So again, it's a very site-specific phenomenon. It tends to be greater in areas and sediments that have a lot of organic matter, like a lot of these depositional settings.

MS. WILLIAMS: What data demonstrates that bioturbation is resulting in deleterious effects on aquatic life in the Upper Dresden Island Pool that is significant enough to prevent attainment of Clean Water Act aquatic life goal uses?

DR. BURTON: Well, as in my previous answer, there's no specific data. It happens in all aquatic systems, and one would expect it's happening in this one, and would be contributing to moving contaminants out of sediments.

MS. WILLIAMS: Explain what diffusion is and what effect does diffusion have on toxicity.

DR. BURTON: As the previous two questions, this is a very common process that occurs in all waterways. When you have a higher concentration in sediment than you have in the overlying water, the chemicals are going to slowly diffuse to the area of lower concentration.

So it's more common in lake systems as being important. In the river systems, usually advection and bioturbation would be more important than diffusion.

MS. WILLIAMS: Question 47, you mention on Page 5 Paragraph 2 of your pre-filed testimony the contaminant sediment concentrations can steadily increase in depositional sediments.

Question A, "Are sediment contaminant concentrations actually increasing in this system, and what evidence do you base your

answer on?"

DR. BURTON: Well, they appear to be very similar, despite the suggestive reductions that are occurring in overlying water in the statements that were made in the UAA Chapter 3. That's based on the reports we've submitted here of my studies and EA studies, USGS, Maylor et al., and the MWRD studies.

Metals detected in the EA study were higher or within a factor of two or less, indicating that overall the sediment quality has essentially stayed the same, or even has degraded in some areas. That's table eight of the EA report. Sediment samples in --

MS. FRANZETTI: That's table 11.

DR. BURTON: Excuse me, table 11 of the 2008 EA report.

Sediment samples in most river systems have a very high degree of spacial heterogeneity, which makes it hard to make determinations of improvements or trends over time.

MS. WILLIAMS: So do you agree or disagree that the levels of contaminated sediments in this system will decrease over time, and why or

why not? This is C.

DR. BURTON: No, because they do not appear to have. The loadings of contaminants are going to continue to be high with or without TARP. And it's a depositional system, much of it. So there's no evidence to me that sediment contamination will go down in the foreseeable future.

When I look at Figure 3.6 and 3.7 and Figure 3.8 that the UAA report Chapter 3 had that was citing that sediments were becoming cleaner because of MWRD's data on metals, from 1991 forward to 2000, there is absolutely no trend whatsoever. So I don't really know how they establish that.

Zinc concentrations went down in the late '80s. But at the same time, most zinc measurements were faulty during that period of time because of contamination from the overlying -- the hoods they were using to digest sediments.

So there's no evidence from any of this wealth of data that shows declines are occurring.

MS. WILLIAMS: Question D asks, "Is it your testimony that natural attenuation processes

will not occur at this site?"

DR. BURTON: Well, given the fact that the contaminant levels in the sediments and the more recent data are not significantly different, this is an indication that natural attenuation alone, even assuming that that was occurring, is not going to be adequate to break down or move the contaminants out of the system.

MS. WILLIAMS: What was the highest -- farthest upstream that sampling was done over the period of time that you looked at? How far upstream did you go?

DR. BURTON: Are you referring to my mid '90s studies? Those went, as I mentioned, all the way up into South Branch turning basin here in downtown.

MS. WILLIAMS: And then the more recent data was collected --

DR. BURTON: Up to Brandon Road Lock and Dam.

MS. FRANZETTI: Again, just so it's clear, that is the data collected by EA, not MWRD, that Dr. Burton is referring to.

MS. WILLIAMS: What I'd like to

know -- and it's very basic and probably not too scientific -- did you look at any data that would help you to have an opinion on whether or not legacy sediments may actually be moving out of, say, the South Branch of the Chicago River and the Sanitary and Ship Canal and finding their way into the Dresden Island Pool?

DR. BURTON: So when you say legacy, you're talking, what, deeper sediments?

MS. WILLIAMS: Older.

DR. BURTON: Older sediments. I collected two cores from that upper end, and the findings were, kind of, unequivocal. One had lower in the higher sediments and one didn't.

Really in a system like this -- in a system like this, core data is relatively worthless, because the sediments are so -- can be so dynamic. So, for example, you'll never see dating of sediments done in rivers. You can do that in lakes.

MS. WILLIAMS: Because of the process of storms and other flow?

DR. BURTON: Too much mixing and the advection stuff I was talking about. All that is

going on. So you're best off, I think, just looking at surficial sediments over time, because that's what you really care about. That's where the benthic invertebrates are, not the deeper sediments. So our surficial sediments here are still highly contaminated.

MS. WILLIAMS: But there's no way of knowing if the upper sediments in the Dresden Island Pool were possibly originally deposited in the Sanitary and Ship Canal and then flushed downstream at this point? There's no timing -- no way to tell that?

DR. BURTON: There's no tracer studies. Since we know sediments move -- and I think that was the premise of another earlier IEPA testimony, that they're going to flush out in time and be better. But in reality, that's happening, but they're still contaminated. So that must mean they're becoming contaminated from ongoing sources.

Because we've got such a high impervious area, we're going to keep getting PHs, washing off of every street, every parking, lot into every storm drain, and that's going to continue to be an issue.

MR. ETTINGER: Let me just ask something in general. These metals obviously don't break down. Do some of the compounds -- the ammonia, as it's stirred up, doesn't some of that cease to be ammonia and go to nitrate or other chemicals?

DR. BURTON: Right, ammonia is extremely labile. So it's not persistent. Metals do not degrade?

MR. ETTINGER: Exactly.

DR. BURTON: The PAHs, it depends. PCBs, as you know, not very well.

MR. ETTINGER: Okay. But the PAHs, is there a half life on them, so to speak?

DR. BURTON: They vary too much. And we have small ones that break down quickly and volatilize, and then we have big ones that don't and they hang around. Like creosote, you know, is made up of a lot of PAHs. You know, that stuff hangs around a long time.

MR. ETTINGER: So if you quit adding anything through the system, you'd except -- if you put a cap on a bottle and added nothing else to the system expect to shake it a little bit every once in

awhile, you'd expect in time the ammonia to go away relatively quickly, the PAHs would vary, PCBs will be there a long time, and, of course, the metals will be there forever because they're not going anywhere. Is that right?

DR. BURTON: That's right, and we'd want to move the river away from Chicago.

MR. ETTINGER: There's been suggestions of that.

DR. BURTON: Well, this is a case where the PAHs -- we're not going to find PAHs in agricultural runoff. So if we can divert more ag runoff into the system, the sediments would probably clean up a little bit faster.

MR. ETTINGER: Then we'd have different problems.

MS. WILLIAMS: I'm going to move on to question 50. In footnote one of your testimony, you state that SQGs are commonly accepted benchmarks and have been widely used in the U.S. for many years to establish cleanup levels for federal and state remediation activities and to determine which sediments are toxic and represent a threat to aquatic life.

Why is it called a sediment quality guideline, and what do you mean by a commonly accepted benchmark?

DR. BURTON: There's a lot of history behind why it's called a guideline. It took about five years of arguing with the U.S. Corps of Engineers and USEPA. The USEPA wanted to call them criteria, and the U.S. Corps of Engineers won at the end of the day. That's why it's called a guideline.

It's obviously a non-enforceable number, but they have been used, as I mentioned, to -- particularly for superfund and hazardous waste cleanups as a cleanup goal. And, of course, the most common one is for PCBs, because most of our cleanups are being spurned by PCBs.

And so a lot of these cleanups will say let's get the sediments down to five parts per million PCBs or ten or one, depending on what was negotiated in the record of decision.

MS. WILLIAMS: How would an SQG be used to determine if sediments represent a threat to aquatic biota, and would no -- and I'm going to change to exceedance -- of an SQG mean that no impairment to aquatic life would be expected?

DR. BURTON: Well, I think we explained how the SQG would be used if sediments are toxic. If they're exceeded, particularly the PEC, we assume they're toxic. Based upon all of the rationalities I gave before, if it's exceeded, it's likely a threat. It is just one line of evidence.

So if one wanted to be certain -- let's say we have a lead problem and the SQGs aren't particularly good with lead. Then we would want to do more biological testing and look at the benthic community that lives there or do toxicity testing.

MS. WILLIAMS: Would bulk sediment chemistry benchmark SQGs be used in establishing clean up levels? This is D.

DR. BURTON: Yeah, that's what I just mentioned in the previous two answers ago. They're used for a lot of cleanup sites.

MS. WILLIAMS: Question F, "Are these SQGs based on effects to humans from drinking water or fish consumption, impacts to fish, or impacts to macro invertebrates?"

DR. BURTON: The SQGs we've been talking about are only for benthic invertebrates.

MS. WILLIAMS: Does the presence of sediments that exceed SQGs mean that fish will not be able to reproduce within the habitat?

DR. BURTON: Perhaps, but it's certainly a site-specific issue. Because if the benthic invertebrates are contaminated with PAHs and metals and PCBs and the fish are eating them, that's their food source, then one might expect they're going to have difficulty reproducing.

Again, we have to come back to the issue that it depends on the pollution tolerance of the fish. Some fish can handle a lot of PCBs, like carp.

MS. WILLIAMS: Question I, "If you believe that the violations of SQGs listed in your testimony would make Clean Water Act aquatic life goal uses unattainable, what aquatic life use would be attainable?"

DR. BURTON: I'm sorry?

MS. FRANZETTI: Can you repeat the question?

MS. WILLIAMS: It's question I. Do you want me to read it again?

MS. FRANZETTI: Would you mind?

MS. WILLIAMS: "If you believe exceedances of SQGs listed in your testimony would make Clean Water Act aquatic life use goals unattainable -- which I think you have already suggested, correct?

DR. BURTON: Mm-hmm.

MS. WILLIAMS: What aquatic life use would be attainable under these conditions?

DR. BURTON: I didn't look at that.

MR. ETTINGER: Maybe we ought to ask what do you mean by attaining the Clean Water Act aquatic life goal?

DR. BURTON: Well, we talked about this this morning.

MS. FRANZETTI: I actually thought -- go ahead. You can repeat it. It's not that big of a deal. I think he did describe it this morning.

DR. BURTON: I'm looking at any impairment to aquatic life. It's got to be affecting the goals of the Clean Water Act, doesn't it?

MR. ETTINGER: Well, let's say hypothetically there was a chemical in the water that knocked out one critter, but everything else

was just happy there. Would you say that the water was meeting Clean Water Act aquatic life goals or not?

DR. BURTON: Well, no. But that's not a situation that I have ever heard of happening.

MR. ETTINGER: Well, I'm trying to get a gauge, you know. What is your view of how many species would have to be affected, or when do we fall short of the goal?

MS. FRANZETTI: I'm just going to say, for the record, I think that's a regulatory answer if you satisfy one or more of the UAA factors. I mean, is that what you're getting at?

MS. WILLIAMS: No.

MR. ETTINGER: No, I'm not. And I agree with you, it's a regulatory factor. It's just we're using this term in the testimony now, so we need to understand, you know, how good do I have to be before you say I've met the goal? Do I have to have 100 percent of the species that we would want there to meet the goal, 95 percent of the species? What, in general, do we mean by meeting the goal?

MS. FRANZETTI: Well, I'm just going to state on the record that I don't think you can

answer that question without reference to the six UAA factors because of the presumption under the Clean Water Act that a water body can attain the goal, unless you show that one or more of the six factors apply. So I just wanted to state that from a legal perspective.

MS. WILLIAMS: But I think he's already testified that any adverse effect on aquatic life means you haven't met the Clean Water Act goal, correct?

MS. FRANZETTI: No.

MS. WILLIAMS: That's what I thought he testified to.

MS. FRANZETTI: Is that what you testified to?

MS. WILLIAMS: Do you want to correct that at this point?

DR. BURTON: I think that's being a little extreme, because you're thinking of the Clean Water Act goals in a regulatory sense and I'm not. I'm thinking at it purely from an ecological impact, and I'm not drawing bright lines on what's acceptable and what else not. I'm talking about an impacted community in an impacted watershed that's

impacted by multiple stressors and which of those stressors are probably dominating.

Now, if we were in Ohio, Ohio has biological criteria, and I think it would actually be easier to answer your question, because you can tie it into the IBI. If you're at a certain level, you're good. If you're at another level, you're just fair.

And it's that percentage of the community response I think you're looking for. But in this system, I can't say. I mean, the EPA's water quality criteria are based on the assumption that they're predicting 95 percent of the populations that are out there. That means five percent are the species. Five percent are expendable. I don't know where the ecology is in that. I don't think there is any.

But, you know, just that one method of evaluating Clean Water Act attainment, water quality criteria, is allowing five percent of the species to be lost. So I really can't answer your question, I think, the way you would like me to, because I'm just looking at a relationship between exposure to stressors and responses.

MS. FRANZETTI: And in fairness to Dr. Burton, he was asked here by Midwest Gen to review the UAA factors, except for the last one, the widespread economic impact. But the first five -- he was asked to review the first five and apply them to the information, the data that you've seen and heard him present today and in his written testimony, and form an opinion as to whether one or more of the UAA factors were satisfied here with respect to the South Branch of the Chicago River, Ship Canal, Brandon Pool, Upper Dresden Island Pool.

So that's why I'm making the point in terms of what we asked him to do and what opinions we asked him to form were focused on the UAA factors.

MR. ETTINGER: Well, I don't want to belabor it anymore. All I want to know is if we use a term that we understand, if people think they understand the way we're using the term now, I guess we've got an answer, and it's in the transcript or it isn't. Thank you.

MS. WILLIAMS: Do you know, Dr. Burton, if you find that a PEC has been exceeded, would a wait of evidence approach require

further information to conclude with reliability that an adverse effect has actually occurred? This is a follow-up, if you're looking for the pre-filed question.

MS. FRANZETTI: It's not a pre-filed question.

DR. BURTON: I think I stated earlier that it's one line of evidence, and a weight of evidence study means you have more than one line of evidence.

So my sediment chemistry would be one. My sediment quality guidelines would be another. It's linked to a biological effect, so that's good. But benthic data from the site would be even better.

MS. WILLIAMS: Okay. Question 51, on Page 86, Attachment 1, you state that, quote, "SQGs have been used in superfund RCRA, and state investigations for many years, and are frequently used to establish cleanup levels for remediation activities," and you site Tiwinny (phonetic), et al.

And the question asks, "Doesn't that document state that SQGs are intended for screening purposes and should not be used to set

site-specific cleanup standards or remediation goals?"

DR. BURTON: Yes, it does. That conference workshop was convened because of that controversial point, that people were putting too much weight of their decision on just the SQGs.

And so the Chapter 5 that I helped write in that book said you should use weight of evidence. It was recognized that SQGs would be small -- would be fine alone at small sites, not big sites. You have to look at other forms of data.

But the stark reality is, as I mentioned, they're used commonly for cleanup goals. So, I mean, we thought that book was great, but it's not getting really adhered to by the project managers of these hazardous waste sites.

MS. WILLIAMS: 52, on Page 7 of attachment one you state, with regard to sediment sampling, quote, "All have shown typical high degrees of rivering spacial heterogeneity, i.e., natural variations across the river and longitudinally. This high degree of spatial heterogeneity makes determinations of improvements through time extremely difficult, end quote."

A, are the variations and sediment samples in the CAWS and Lower Des typical or high?

DR. BURTON: I've seen more and less.

MS. WILLIAMS: Do you agree that there is not enough data to determine whether sediment levels are decreasing over time?

DR. BURTON: Well, as I said earlier, I think there's more data on this system than most any I've seen. But there's still enough noise in it that you can't say a lot, except that it's not significantly different.

It's going to be difficult to see an improvement without multiple years of sampling at all of these sites. The closest thing you've got is the MWRD data, and it's really not showing an improvement.

MS. WILLIAMS: Okay. Question E -- I'm going to move on. I think you've answered C and D.

MS. FRANZETTI: If you can give us just a moment. I'm sorry, Counsel. You can proceed.

MS. WILLIAMS: Skipping on to Question E, which is referencing the bottom of Page 9 of

Attachment 1, asks how do you conclude from these studies that, quote, "It is likely that depositional sediments are not being cleaned out, tabbed, or significantly degraded?"

DR. BURTON: I state this because the contaminant levels are roughly similar to what they were 15 years ago.

I should also note -- have added that another scenario that may be occurring in the waterways is contaminated sediments are being flushed out, and the areas are then being recontaminated from continuing or new sources of discharges into the system.

MS. WILLIAMS: Question F asks, "Isn't it true that most samples were lower in 2008 than in 1994 through 1995?"

DR. BURTON: No, most of them were not in the EA study.

MS. WILLIAMS: G, you state at the top of Page 10 of Attachment 1 that, quote, "For the detected metals, the sediment quality has remained the same or degraded in several areas," end quote.

Did more samples degrade or improve, and how do you define "remain the same" in

this context?

DR. BURTON: It's shown as Table 11 of the EA 2008 report and summarized at Page 12 for the detected metals. The majority of detected concentrations are either higher or within a factor of two or less, indicating that overall sediment quality has essentially remained the same or has degraded in several areas.

Also, as stated on Page 12 of the report, when environmental samples are compared using the weight of evidence approach, a factor of two is generally a rule of thumb that is used to determine if sample concentrations are similar when doing a comparison. For sediment samples with mental concentrations that exceeded the TEC or PEC concentrations in 2008 are often less than a factor of two compared to the '94 or '95.

So for these reasons, I do not agree that it would be more accurate to say sediment quality has improved or stayed the same.

MS. WILLIAMS: When you talk about using factor two -- a factor of two, can you explain that again a little better or a little more fully?

MS. FRANZETTI: Well, do you want to

or, do you want Mr. Goodfellow?

DR. BURTON: I would ask Bill.

MS. FRANZETTI: That's really the EA part in the sediment report.

MR. GOODFELLOW: Because samples are not homogeneous -- it's not a solution -- it's difficult to drop a ponar sample in exactly the same spot, and there's actually almost no expectation that it will be exactly the same. Because it's a mixture, there's a chance you're going to get a couple particles that have a little higher concentration or even a lower concentration of contaminant in that same equal volume of sediment that a ponar is pulling up. A ponar is a little mini steam shovel that drops into the sediment and pulls a bite out of the sediment and brings it up.

So a factor of two or less is a general rule of thumb that says if you're within a factor of two, then essentially those samples are the same. And, in fact, if the concentrate is higher, you could argue that it could be a little higher because it's also within a factor of two of what it was the first time.

At the same time, over the 13-year

period, analytical detection limits, analytical precision for making sure we're not making false, you know, type one errors, saying something is concentration and it's different slightly, have improved because our analytical protection limits are much better over that 13-year period.

So that, on top of it, makes it another reason why the factor of two of comparing samples is a general rule of thumb that is used within the analytical and toxilogical community.

MS. WILLIAMS: Let me see if I understand what's going on in this Table 11. If it's white -- if the box is white, you're saying that the sample went down, decreased?

MR. GOODFELLOW: Correct.

MS. WILLIAMS: And if the box is yellow --

MR. GOODFELLOW: Can I add to that? If the box is white, it means the sample is in -- the 2008 sample was lower and it was lower than -- it was lower than -- how do I say it -- lower than a factor of two.

MS. WILLIAMS: So those are the white?

MR. GOODFELLOW: Those are the white.

MS. WILLIAMS: There was at least a factor of two lower. If it's yellow or orange -- I'm not sure how it came out to everyone -- those are the samples that you're saying stayed the same because they're within a factor of two?

MR. GOODFELLOW: Factor of two, correct.

MS. WILLIAMS: If a box is green, you're saying the sample increased, correct?

MS. FRANZETTI: No, that it's higher.

MR. GOODFELLOW: That it's higher. It's a higher concentration than it was in the 1990 study.

MS. WILLIAMS: Is it higher by a factor or two, or just higher?

MR. GOODFELLOW: It's just higher. All I was comparing -- the whole purpose of this study was to evaluate the statement that the samples are getting better.

MS. WILLIAMS: I understand. But what I'm --

MS. FRANZETTI: Sediments, I think you mean, not samples are getting better.

MR. GOODFELLOW: Yeah, the sediment sample concentrations are becoming less concentrated -- less contaminated.

MS. WILLIAMS: But what I want to get at, Mr. Goodfellow, is I think your analysis is very biased. Because if your sample was less than a factor of two lower, you didn't consider it getting better. But if it was higher, even by a teeny tiny amount, you're identifying it as being higher.

Wouldn't you say that a lot of these greens should actually be yellow in order to make an unbiased presentation to say that they're staying the same?

MS. FRANZETTI: That wasn't the purpose --

MR. GOODFELLOW: Yeah, agreed. That wasn't the purpose of the study. Your assessment is moot, because we were -- whether it's beige or green, if it was colored that meant it was virtually the same or worse.

MS. WILLIAMS: Okay.

MR. GOODFELLOW: So it really doesn't matter. I was just -- all I was trying to say is these samples -- I wasn't even making a statement

that it was worse saying these samples in that 13-year period have not improved.

MS. WILLIAMS: Okay. Well, I don't think that's how this visual presentation --

MR. GOODFELLOW: It's how it was stated in the narrative. It stated that in the narrative.

MS. WILLIAMS: So the question in number -- well, that's fine. I understand. I just want to make sure it was clear to the Board that you're interpreting both colors in the same way, and it just means it hasn't improved, correct?

MR. GOODFELLOW: Correct.

MS. WILLIAMS: That's fine.

MR. GOODFELLOW: A colored box meant that samples indicated that there was -- minimally, there was no improvement to it could have been slightly worse, and a white box meant it was better. And from the -- in the chart, it's primarily colored with very little white.

MS. WILLIAMS: But your table does not mean where it's green you've concluded the sediments got worse?

MR. GOODFELLOW: I wasn't making a

statement that green was worse, other than refuting the statement that it was improving.

MS. WILLIAMS: Question H asks -- Question H of 52, "Do sediment levels need to improve in the Brandon Pool for the CAWS and Brandon Pool aquatic life use B designations to be attainable?"

DR. BURTON: I'm not sure I understand the meaning of the proposed aquatic life use B designation sufficiently to be able to form an opinion in response to this question. I would need a clear explanation of just what the proposed designation means, in terms of what the waterway's aquatic life support level is supposed to be.

However, if the proposed aquatic life B designation is intended to reflect the existing aquatic life community that is present in the Brandon Pool, then I would conclude the sediment levels do not need to improve to support the existing community.

MS. WILLIAMS: Question 53, you state on Page 7 of your testimony and Page 8 of Attachment 1 that, quote, "There are no known plans to remove contaminated sediments in the UDP area."

The question asks, "What do you consider the Upper Dresden Pool area " -- I hope we've already addressed that -- but it asks, "Are you aware of any plans to cap contaminated sediments in the Chicago Sanitary and Ship Canal or the South Fork of the South Branch of the Chicago River?"

MS. FRANZETTI: And I think you should clarify a bit. Do you mean plans just has anyone talked about it, or do you mean plans that are going to be implemented?

MS. WILLIAMS: If he's heard of either.

MS. FRANZETTI: Okay.

DR. BURTON: I'm aware of the testimony of Ms. Wasik (phonetic) for MWRD seeing some plans on the books to sediment cap parts of the CAWS. Engineers have determined it's not possible in the Bubbly Creek area, besides the mouth. The District is involved in some wetland projects off the Ship Canal with some capping. The CAWS itself is a similar project that would impact flood control function, so caps are not really feasible there.

I'm also aware of Dr. Melching's (phonetic) testimony in the proceedings that the

CAWS areas, which includes the Ship Canal and South Fork, capping would create problems in the system -- other problems.

MS. WILLIAMS: So do any of the testimony that you reviewed, if it was implemented, would it change any of your conclusions if any of those plans were implemented or ideas were implemented?

MS. FRANZETTI: Well, just objection in the sense of he's pointed out that several of those plans have been found to be essentially not feasible.

MS. WILLIAMS: Some of them. Not all of them, though, right?

MS. FRANZETTI: Not all of them, but I just want to clarify that his answer already said it's not going to happen, so it's not going to effect his opinion.

MS. WILLIAMS: If it did happen, would it change your opinion?

DR. BURTON: So as to whether plans would change any of the conclusions, we've already -- reversibility of impacts to aquatic life from contaminated sediments in the CAWS or Lower Des

Plaines, it would depend on a number of things, such as how extensive the capping was going to be, would it be sufficient to make a significant improvement on the degree that sediments are a stressor, and how well the plans, once they're implemented, are -- how well those caps are actually stopping that exposure to the contaminants, which is a tricky issue.

Because of the extensive sediment contamination that we've talked about, the cost of a capping system is very high, and I doubt there are any so-called plans that would likely change my opinion for capping because of these issues.

Capping technology in a system like this would be very difficult. And as the previous experts noted, it would actually change the hydraulics. You can't just fill the system up with sediment, because the hydraulics will wash it out. So it would be very difficult to get caps in there that can actually stay in place.

MS. WILLIAMS: I'm going to skip 54. On Page 7, you state, "Further, the fact that the 2008 sediment survey reveals highly contaminated sediments similar to what I observed in the mid '90s strongly suggest that depositional sediments remain

significantly degraded and are not being reduced, contrary to Illinois EPA's assumption that the sediment quality in the Chicago Sanitary and Ship Canal and Dresden Island Pool are improving."

What statistical -- this is not a pre-filed question it's just follow up from -- I think you've answered parts of the pre-filed question already. What statistical quantitative analysis was performed to reach this in-conclusion, or was there any statistical quantitative analysis performed?

DR. BURTON: There's really no statistics that could be used in this data. You don't have a measure of variance at every site. There's just too much variability. The data are not distributed homogeneously, so that's why we're using crude things like a factor of two. If we could do statistics that were meaningful, we would do them.

MS. WILLIAMS: Question D asks -- I'm not sure if you've answered all of this -- "Did you collect sediment samples in the sanitary and Ship Canal?" I believe the answer is yes, correct?

DR. BURTON: I did. The EA study did not.

MS. WILLIAMS: Did you conduct an analysis that compared current and historic sediment conditions in the Sanitary Ship Canal? So that part is no?

DR. BURTON: No.

MS. WILLIAMS: Okay. You state on Page 8, Paragraph 1, that, quote, "Based on my experience, most depositional sediments that are acutely toxic are located in areas as suitable as fish habitat."

Which areas of sampling sites do you refer to in this quote?

DR. BURTON: Of the EA 2003 habitat evaluation of Dresden Pool, it was found sedimentation was moderate to severe in about 70 percent of the areas where the QHEI scores from calculated. Their 2008 study found a similar percentage of locations were moderately to severely impacted by sedimentation.

So sedimentation appears to have gotten worse over the last five to ten years in some areas, such as the DuPage Delta. In my '95 study, it was found that toxicity varied among the pools and habitat types in the river. Differences were

correlated with sedimentation patterns, so we got a lot more toxicity associated with the clay type sediments or depositional sediments. They tended to be at the tributary mouth in the back water areas the protected areas of the main channel, bordered habitat, especially the Lockport and Brandon Pools.

Some of the highest levels of toxicity were found in Brandon Road Lock and Dam in the tail waters, which we've already talked about. The contaminated sediment depositional area provided one of the primary sources of potential habitat for the fish community. As such, fish are likely to be exposed to whatever contamination exists in these areas.

In contrast, sediments collected from the main channel habitat or the power plant intakes and discharges generally have very little sediment toxicity, and these areas are not a good aquatic habitat.

MR. ETTINGER: Can I ask one question? You mentioned the DuPage Delta. Is it relevant?

DR. BURTON: I mentioned it because it's part of this system.

MR. ETTINGER: It's not actually

within the segment that we're looking at.

DR. BURTON: I understand, but the fish don't know that, and they swim up and down past I-55.

MR. ETTINGER: Thank you.

MS. WILLIAMS: I'd like to ask Question D of 56. "Are you familiar with the data collected by EA that found larval fish to be present within and below this riffle area?" And by "this riffle area," it's referring back to the previous question, the Brandon tail waters, I believe.

DR. BURTON: I've not studied the EA data regarding larval fish. It's my general understanding that just because larval fish are found, it doesn't mean that the subject area doesn't have a sediment contamination problem. If you remember the testimony earlier by Mr. Seegert, they float down stream and tend to stop in the depositional areas.

MS. WILLIAMS: I think we've answered 57. I'm going to move on to 58. Please provide the documentation you are referring to on Page 6 of your pre-filed testimony with respect to strong correlations between fish tissue, consumption

advisories, and sediment contamination.

DR. BURTON: This, again, kind of like urban runoff impacts, is one of those widely accepted relationships that exist. 41 of the 42 areas of concern in the great lakes are because of fish advisories, and they're directly related to the contaminated sediments that exist there.

The USEPA's National Sediment Inventory and other EPA guidance documents also note the contaminated sediments are likely contributing to not only fish tissue advisories, but DELTs, high levels of fish deformities, erosions, lesions, and tumors.

MS. WILLIAMS: Question 59 asks you to explain photo-induced toxicity and whether you measured photo-induced toxicity in either the upper Dresden Island or Brandon pools.

DR. BURTON: When ultraviolet light, which is in natural sunlight, strikes some of the larger PAHs, such as fluoranthene, anthracene phenanthrene, very, very common PAHs, that have passed through the membranes of organisms.

So these things are lipophilic. They pass through the outer membrane of the

organism, and then when sunlight hits that, they form an oxygen radical, which is very, very destructive cellular tissue.

So if I have a sediment sample with PAHs in it, and I have fathead minnows swimming around in a beaker, if I'm standing in here there will be no problem, unless there's incredibly high levels of PAHs. But if I was to walk outside, and I wasn't in Chicago, when the sun was shining, within seconds that fish would die and sink to the bottom because this phenomenon occurs so quickly.

So it just takes a short exposure to sunlight if they've been exposed to PHs. And we've shown this phenomena and multiple people have shown this phenomena to the part per trillion levels of PAHs, which means virtually every urban waterway will have PAH toxicity if sunlight is hitting organisms when they've been exposed to PAHs.

MS. WILLIAMS: Did you say whether you've measured photo-induced toxicity, or you're saying it would incur everywhere?

DR. BURTON: Well, we demonstrated in my report that I submitted as occurring in the system.

MR. ETTINGER: I'm sorry. You testified specifically with regard to fathead minnows?

DR. BURTON: Yes. It occurs with multiple species, though.

MR. ETTINGER: Fathead minnows are relatively insensitive. You can pretty much hit them with a sledgehammer, can't you?

DR. BURTON: Well I'm talking larval fathead minnows, and that's part per trillion levels

MR. ETTINGER: Okay. So would this be true with every species?

DR. BURTON: Most species I've seen tested it's been true of. It's all the way to lumbriculus worms, which can be quite happy in these sediment samples we brought.

MR. ETTINGER: Okay. So there's no limitation on the species that you would be expected be affected by this phenomenon?

DR. BURTON: I don't think so.

MR. ETTINGER: And that wouldn't differentiate between carp and rainbow trout?

DR. BURTON: I think it would probably only be an issue at the larval stage with species

like that.

MR. ETTINGER: Thank you.

DR. BURTON: Which might not be a bad thing.

MR. ETTINGER: Well, it depends on how you feel about carp and rainbow trout.

MS. WILLIAMS: Roy is saying I should ask you, don't most larvae just die anyway in general in nature?

DR. BURTON: Well, I don't think I need to refer to Mr. Seegert. We don't want to add more stressors, do we? They're already dying anyway.

MS. WILLIAMS: Is the water column capable of attenuating photo-induced toxicity?

DR. BURTON: Certainly. And the good thing about our system here is that it can be turbid at times. And if there's turbidity, this phenomenon does not exist. You have to have clear water.

MS. WILLIAMS: So we're not too worried about that?

DR. BURTON: Well, I think the IEPA is saying that turbidity and TSS is not a problem in this system. So I think you would have to worry.

MS. WILLIAMS: Where did we say that?

MR. ETTINGER: The fact that they say something doesn't make it true.

DR. BURTON: No, I think we all know that there's clear water in this system at times. And particularly when we get off the main channel where there's less barge traffic, you can get clear water. The Brandon tail waters is a perfect example because it's so shallow.

MS. WILLIAMS: I'm not sure if we answered question 60, I guess. I think you were talking about lab studies. Have any in situ toxicity studies been conducted to assess photo-induced toxicity and whether it's actually occurring in the Lower Des Plaines River?

DR. BURTON: I must admit right now I'm forgetting whether I did some of these studies in situ or in the lab. We did these studies, but they may have been done in the lab with samples from the system. The study by Maylor et al., 2010, showed PAHs with a dominant stressor. So it raises the concern for this phenomenon.

MS. WILLIAMS: I think 63 was the question I was looking for earlier, so let me make

sure that I've already asked it. I wish I would have asked it this way. There's a few new things in here.

Question B, "Were sediment samples taken from the same locations in all years?" I'm not sure if Mr. Goodfellow already answered that or not.

MS. FRANZETTI: In all years -- a little clarity here. As between the 1994/95 survey and the 2008 EA?

MS. WILLIAMS: Yes.

MS. FRANZETTI: Okay. And so you're asking were all the same locations sampled in both surveys?

MR. GOODFELLOW: No, but there was -- 18 of the samples were duplicate from stations, and that's what is in Table 11.

MS. WILLIAMS: The duplicates only are in Table 11?

MR. GOODFELLOW: Yeah. It was only when the same samples were evaluated in 94/95 and the 2008 sampling period.

MS. TIPSORD: Excuse me. Is that because the prior study was Dr. Burton's, which went

all the way to the South Branch, and EA only went to the Brandon Pool -- Brandon Road?

DR. BURTON: Right.

MS. FRANZETTI: I mean, I will add it was -- in part influenced by two things really. It was -- we felt the MWRD's data was pretty well covering north of Brandon Road Lock and Dam area. And so to conserve our resources but get more sampling locations in Dresden Pool area, we focused more on that in the 2008 sediment survey work that was done, where there was not -- really, since 94/95 there wasn't that much, other than the USEPA data.

MS. WILLIAMS: Question D, I'd like to ask from that one. Does a chemical decline or increase correlate to a decline or increase in the bioavailability of that chemical?

DR. BURTON: Not necessarily.

MS. WILLIAMS: Question F asks about other factors that effect the bioavailability of metals. And you may have discussed this already, but if you want to answer it --

DR. BURTON: Yeah, I think we did. As acid volatile sulfides, organic carbon, iron and manganese, oxides. All of those things are

important, but those are mainly important for metals. The only one that is important for organics would be organic carbon.

MS. WILLIAMS: And did you evaluate acid volatile sulfides?

DR. BURTON: No, we did not, because the 94/95 study was really done before AVS was an accepted approach, and we wanted to compare back to that.

MS. WILLIAMS: Question 64, you state on Pages 12 to 13 of appendix C that, quote, "Based on the results in Table 11, it is our opinion that the differences are not improvements of the sediment quality, but rather improvements in detection limits."

I think this was mentioned earlier, but I'm not sure you answered. How many samples fall into this category, and for which parameter does the change in methodology impact the results?

DR. BURTON: Since that was done by the EA report, I'll let Mr. Goodfellow answer that.

MS. WILLIAMS: Okay.

MR. GOODFELLOW: For most of the PAHs,

the samples fall into this category. If you look at the report from 1994 to '95 results for PAHs, for most of them the reported values are less than a value that is stated in the thousands of milligrams per kilogram.

If you look at the 2008 results, the same parameters were detected in thousands of milligrams, although below the higher 1994 and 1995 detection limits, and also were detected in hundreds of milligrams per kilogram. So in affect, we could see lower concentrations in the 2008 period.

MS. FRANZETTI: Bill, you might just give an example of that using Table 11.

MR. GOODFELLOW: For example, for --

MS. FRANZETTI: Give the sample location number.

MR. GOODFELLOW: Sure. For acenaphthylene, for example, in the 1994 and 1995 sample in Brandon Lock and Dam, 08-03, the detection limit was 45,000 milligrams per kilogram. In the new round, it was 1,500 in the 2008.

So that's -- and those compounds are, you know, not that much different, you know, for all the samples. I just pulled the one that was

the last one on the chart.

MS. FRANZETTI: And so that means that in the 94/95 sampling, all they could say was the level at which -- can you say it?

DR. BURTON: Acenaphthylene.

MR. GOODFELLOW: Acenaphthylene.

MS. FRANZETTI: Thank you. The level of it couldn't be detected above 45,000 milligrams per liter? It might have been there --

MR. GOODFELLOW: It definitely doesn't say that -- it could easily, in 94/95, been 1,500.

MS. FRANZETTI: Right.

MR. GOODFELLOW: But all we could say is it was less than 45,000.

MS. FRANZETTI: And in 2008 you could pinpoint it --

MR. GOODFELLOW: Correct.

MS. FRANZETTI: -- at 1,500 or above?

MR. GOODFELLOW: Correct.

MR. ETTINGER: Have you tried to look at any of the data from site to site here and figure out what might have happened at these particular sites?

MR. GOODFELLOW: That's really why we

put it on a graphical basis on the aerials. Because of the complexity of sediments moving a little bit here and there down streams and such, we just wanted to see the overall concentrations and how they -- you know, the degree of contamination.

So what you see when we looked at the exhibits -- and I cannot remember the exhibit numbers --

MS. FRANZETTI: 377 and 378.

MR. GOODFELLOW: Right, which are the blowups of that, is that there's -- when there is contamination, it's clustered for when they are the red or they exceed the probable effect concentrations, and also that largely they, at least, were above the threshold concentration -- effect concentration levels for most of the samples, for metals as well as PAHs and PCBs.

MR. ETTINGER: But for some of these sites, I mean, just looking at -- eyeballing it, DR 8-30 and DR 8-05 seem like they've improved a lot, and there's some other sites that look -- well, DR 8-20, eyeballing it, it seems like it got a lot crummier. And do we have any idea why that is?

MR. GOODFELLOW: The hypothesis that we were using was whether there was a change. We weren't really trying to do a forensic identification line, or at least I didn't. We would have had to collect a lot more samples and a lot more data for other compounds.

DR. BURTON: I think that's a key statement. If we, in 94/95, at each site had collected maybe at least five sediments from a small area so that we knew what the spatial variation was at that site, then in 2008 we had done the very same thing, we might be able to statistically say something about the difference. But right now, we don't know the variance around every graph sample.

MR. ETTINGER: But really it would be best to, sort of, interpret this chart as a whole --

DR. BURTON: Exactly. It's the only way you can.

MR. ETTINGER: -- and not make conclusions about particular sites.

DR. BURTON: Because maybe at Brandon Road Lock and Dam you'll get a variance of ten fold at the same area. We don't know that, so we really have to look at the big picture.

MR. GOODFELLOW: And that largely was the reason I went with the color interpretation, to just give that immediate visual of the entire data set, rather than just focusing on one station versus another station.

MS. FRANZETTI: And once again, the purpose was to rebut the statement that was made earlier in this proceeding by the Agency, that it believed the contamination in the sediments was improving because there have been greater controls, I believe was the cited reason on point source discharges, and we doubted that that was the case with regard to sediments.

So we went out here and did some more sediment sampling in Upper Dresden Island Pool to see whether or not it did generally support that statement. And as they've said, they don't believe it does, that they're about the same as they used to be 15 years ago.

MR. ETTINGER: In the system as a whole?

MS. FRANZETTI: In the system as a whole.

MS. TIPSORD: This is probably a good

time to call it a day. It's about ten minutes to 5:00, and I think we're all growing weary. So let's break up. We'll see you all at 9:00 o'clock tomorrow morning.

STATE OF ILLINOIS)
) SS
COUNTY OF COOK)

REBECCA A. GRAZIANO, being first duly sworn on oath, says that she is a court reporter doing business in the City of Chicago, that she reported in shorthand the proceedings given at the taking of said hearing, and that the foregoing is a true and correct transcript of her shorthand notes so taken as aforesaid, and contains all the proceedings given at said hearing.

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SUBSCRIBED AND SWORN TO
before me this 21st day
of January, A.D., 2010.

Kimberly A Meeks
Notary Public