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ILLINOIS POLLUTION CONTROL BOARD

MAY 29 2009

May 20, 2009

STATE OF ILLINOIS  
Pollution Control Board

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 )

TRANSCRIPT OF PROCEEDINGS held in  
 the above-entitled cause before Hearing Officer  
 Marie Tipsord, called by the Illinois Pollution  
 Control Board, pursuant to notice, taken before  
 Rebecca Graziano, CSR, within and for the County of  
 Cook and State of Illinois, at the James R. Thompson  
 Center, 100 West Randolph Street, Room 9-040,  
 Chicago, Illinois, on the 20th Day of May, A.D.,  
 2009, commencing at 10:00 a.m.

A P P E A R A N C E S

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ILLINOIS POLLUTION CONTROL BOARD:

Ms. Marie Tipsord, Hearing Officer  
Ms. Alisa Liu, P.E., Environmental Scientist  
Mr. Anand Rao, Senior Environmental Scientist  
Mr. G. Tanner Girard, Acting Chairman  
Ms. Andrea Moore  
Mr. Gary Blankenship  
Dr. Shundar Lin

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY:

Ms. Stefanie Diers  
Ms. Deborah Williams

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BY: MR. ALBERT ETTINGER  
MS. JESSICA DEXTER

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

BARNES AND THORNBURG LLP  
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(312) 357-1313  
BY: MR. FREDRIC ANDES

Appeared on behalf of the Metropolitan Water  
Reclamation District of Greater Chicago,

A P P E A R A N C E S

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THE CHICAGO LEGAL CLINIC  
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BY: MR. KEITH HARLEY

Appeared on behalf of the Southeast  
Environmental Task Force,

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BY: MR. ANDREW ARMSTRONG

FRANZETTI LAW FIRM P.C.  
10 South LaSalle Street  
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(312) 251-5590  
BY: MS. SUSAN FRANZETTI

Appeared on behalf of Midwest Generation,  
L.L.C.

1 MS. TIPSORD: Good morning, everyone.  
2 My name is Marie Tipsord, and I've been appointed by  
3 the Board to serve as hearing officer of this  
4 proceeding entitled Water Quality Standards and  
5 Effluent Limitations to the Chicago Area Waterway  
6 System and Lower Des Plaines River, proposed  
7 amendment 35 IL Admin code 301, 302, 303, and 304.  
8 This is docket number R08-9. And for those of you  
9 who are still keeping count, this is day 28 of our  
10 hearings.

11 With me today to my immediate  
12 right is Board Member Dr. Tanner Girard. Tanner is  
13 a board member who is overseeing this rulemaking,  
14 the presiding board member. To his immediate right  
15 is Dr. Shundar Lin, and to Dr. Lin's right is Andrea  
16 Moore, also a board member. To my left is Board  
17 Member Gary Blankenship. To my immediate left is  
18 Anand Rao, and to his left is Alisa Liu from our  
19 technical unit. Also today Nicole Mayor (phonetic)  
20 is here. Nicole is our extern this summer from Kent  
21 and will be attending the hearing today to see how  
22 we do things in the real world.

23 Today we're going to continue to  
24 hear testimony from members of the public, and we're

1 going to begin with Dr. Kevin J. Boyle, and then go  
2 to Dr. David Thomas, and, time allowing, we'll go to  
3 Gerald Abalin (phonetic). Again, time allowing.

4 The testimony will be marked as an  
5 exhibit and entered as if read. And after marking  
6 the pre-filed testimony as an exhibit, we will  
7 proceed to questions for the testifier, beginning  
8 with IEPA, the Metropolitan Water Reclamation  
9 District of Greater Chicago, and I believe Midwest  
10 Generation has pre-filed questions for these  
11 witnesses today.

12 MS. FRANZETTI: For two of them. Not  
13 for --

14 MS. TIPSORD: Depending upon how that  
15 order works out. And I see that, once again, the  
16 District is probably going to take the lead first,  
17 since they filed the most questions for Dr. Boyle  
18 and Dr. Thomas both, I believe.

19 MR. ANDES: Well, I think as to Dr.  
20 Thomas, it might make sense that Midwest Gen go  
21 first.

22 MS. TIPSORD: Okay. That's fine.  
23 Whatever works out best for all of you. Anyone may  
24 ask a follow-up question, and you need not wait

1 until your turn to ask questions. I do ask that you  
2 raise your hand, wait for me to acknowledge you.  
3 After I have acknowledged you, please state your  
4 name and whom you represent before you begin your  
5 questions. Please speak one at a time. If you're  
6 speaking over each other, the court reporter will  
7 not be able to get your questions on the record.  
8 Please note that any questions asked by a board  
9 member or staff are intended to build a complete  
10 record for the Board's decision, and not express any  
11 preconceived notion or bias.

12 Also, scheduling-wise, for those  
13 of you who were here when I first announced this --  
14 it's not a surprise, but let me say it again --  
15 today the James R. Thompson Center is participating  
16 in a building-wide -- floor-by-floor evacuations in  
17 preparation for building-wide evacuations tomorrow  
18 afternoon. What that means is they will start at  
19 1:00 o'clock testing the system, and every  
20 15 minutes or so will declare certain three floors  
21 to be evacuated, and people are required to go to  
22 the stairs, walk down three flights, and take the  
23 elevators back up to the floor.

24 My understanding is on

1 floor-by-floor, they're not as hard as they are for  
2 building-wide, but they do ask that you participate.  
3 So to avoid that and avoid the noise, what I would  
4 like to do is go for about an hour, hour and a half  
5 this morning probably until somewhere around quarter  
6 to 12:00 or 12:00-ish, and we'll take a ten to  
7 fifteen minute break. If you're really starving,  
8 you can grab a snack. We'll come back in, and then  
9 we'll go until 1:00, 1:15 if we can stand the noise,  
10 and then we'll take an hour break. This floor is  
11 scheduled for 1:45. So if we come back at 2:00 or  
12 2:15, we should miss this floor's evacuation drill  
13 and be able to get back in. Otherwise, you'll have  
14 to walk down three flights, and that will take us an  
15 hour anyway.

16 With that, Dr. Girard?

17 DR. GIRARD: Good morning. On behalf  
18 of the Board, I welcome everyone to hearing day 28  
19 in this rulemaking. Thank you for the exceptional  
20 time and effort everyone as invested in this  
21 activity. We look forward to your testimony and  
22 questions today.

23 MS. TIPSORD: Thank you. And with  
24 that, Mr. Armstrong, did you have an opening

1 statement, or do you want to go directly to the  
2 testimony?

3 MR. ARMSTRONG: Just to the testimony.

4 THE COURT: All right. Then let's  
5 have the witness sworn in, and we'll enter the  
6 testimony.

7 (Witness sworn.)

8 MS. TIPSORD: If there's no objection,  
9 we will mark the pre-filed testimony of Dr. Kevin J.  
10 Boyle as Exhibit 286. That includes all the  
11 attachments. Seeing no objection, it is  
12 Exhibit 286.

13 MR. ARMSTRONG: And one point of  
14 clarification. Dr. Boyle, did you notice any typos  
15 in that testimony upon reviewing it?

16 THE WITNESS: Yes, I did. The  
17 testimony on Page 9, Lines 9 and 10 --

18 MS. TIPSORD: I'm sorry. You're going  
19 to have to speak up, Doctor. We can't hear you up  
20 here.

21 DR. BOYLE: Sorry. I noticed on  
22 Page 9, Lines 9 and 10, I said I used a linear  
23 regression model where some variables are not  
24 statistically significant. In the editing, two



1 sentences got combined together, and what I should  
2 be saying is I used the linear regression where some  
3 the insignificant variables are removed from the  
4 outfit paper that I based my testimony on.

5 MR. ARMSTRONG: And this relates to  
6 pre-filed Question 42 from the Metropolitan Water  
7 Reclamation District.

8 MS. WILLIAMS: Can you repeat what the  
9 sentence is supposed to say?

10 THE WITNESS: Yeah. I used a linear  
11 equation restricted model where some variables that  
12 are not statistically significant are excluded.

13 MR. ARMSTRONG: And I'm sorry, that's  
14 43 of the District's questions.

15 MS. TIPSORD: Thank you. With that,  
16 Mr. Andes?

17 MR. ANDES: Good morning, Dr. Boyle.

18 DR. BOYLE: Good morning.

19 MR. ANDES: Let's start with Question  
20 1, and I'll indicate when I'm skipping over a  
21 question. Sometimes we'll come back, and sometimes  
22 I'll let you know if we're not going to do that.

23 On Page 1, Line 12, you indicate  
24 that the benefits you have calculated represent the

1 amount Cook County households are willing to pay.  
2 How have you determined that Cook County households  
3 are willing to pay \$47 per household to derive  
4 economic benefits you were alluding to?

5 DR. BOYLE: I'd like to thank the  
6 Board for allowing me to testify today.

7 The approach that I used is called  
8 the benefit transfer. It's a procedure that is in  
9 USPEA's guidelines for conducting economic benefit  
10 analyses. The benefit transfer takes the results  
11 from existing studies that have been conducted. I  
12 used a meta analysis procedure to statistically  
13 summarize those results, and so that benefit  
14 transfer approach resulted in an equation where you  
15 can predict a customized value for a new setting.

16 The benefit transfer that I used  
17 was based on studies of stated preferences. There  
18 are 18 study preferences that Dr. Van Houtven at the  
19 Research Triangle Institute in North Carolina had  
20 summarized in his benefit transfer -- excuse me --  
21 in his meta-analysis.

22 And so starting out with those  
23 initial studies, Van Houtven, in his meta-analysis,  
24 provided a statistical study. I used that

1 statistical summary as the benefit transfer to  
2 predict the calibrated estimate for the Chicago Cook  
3 County area of \$47.

4 MR. ANDES: So you haven't actually  
5 asked the people of Cook County how much they're  
6 willing to pay. Am I right?

7 DR. BOYLE: We have not.

8 MR. ANDES: I don't know if you  
9 followed the papers here. Are you aware of  
10 controversy regarding Cook County possibly raising  
11 taxes?

12 DR. BOYLE: I have not followed the  
13 recent papers here in Cook County, but I would not  
14 think that that would influence the results of my  
15 testimony.

16 MR. ANDES: So if the people of Cook  
17 County and the Cook County board are reluctant to  
18 raise taxes at all right now, that wouldn't  
19 influence whether Cook County residents would be  
20 willing to pay another \$50 per household?

21 DR. BOYLE: It's two different  
22 questions. One is increasing taxes, and the other  
23 is the value that Cook County households would place  
24 on good water quality. And the value that I'm

1 reporting is the value that Cook County households  
2 place on improved water quality, not a referendum on  
3 increasing taxes to Cook County residents.

4 MR. ANDES: But if the District were  
5 to have to disinfect, that would directly increase  
6 taxes on Cook County residents. Are you saying they  
7 would be willing to pay another \$50 in taxes?

8 DR. BOYLE: You're mixing two things  
9 here. There's the benefit side of it, and the cost  
10 side of it. So the cost to the disinfection is also  
11 a benefit that the public will receive in terms of  
12 improved water quality. What I'm giving you is the  
13 benefits of improved water quality, not the cost  
14 side of the equation.

15 MR. ANDES: Okay. So you're not  
16 saying that Cook County residents would be willing  
17 to pay another \$50 in taxes for disinfection?

18 DR. BOYLE: I'm saying the value of  
19 the Cook County households, the best estimate we  
20 have is \$47 per household for improved water quality  
21 and cost.

22 MR. ANDES: But you've done it in a  
23 meta-analysis. You haven't actually asked the  
24 people of Cook County?

1 MR. ARMSTRONG: Objection. Asked and  
2 answered.

3 MR. ANDES: Okay. Question 2, in your  
4 answer to the question, "What is the purpose of your  
5 testimony," you first state that the purpose is to  
6 analyze the economic benefits of water quality  
7 improvements associated with the new recreational  
8 use designations proposed for the CAWS, but then go  
9 on to state the conclusion of your analysis, in  
10 terms of costs that Cook County households are  
11 purportedly willing to pay to achieve the water  
12 quality improvements.

13 What are the actual economic  
14 benefits, and who would receive actual tangible  
15 economic benefits from the improvements?

16 DR. BOYLE: Well, first of all, you're  
17 doing the switching between benefits and cost again,  
18 just like you did in the last question. I didn't  
19 phrase it in terms of cost. I phrased it in  
20 willingness to pay for improved water quality.

21 This is the standard economic  
22 definition of the benefit of something that you'd  
23 learn in an Economics 101 class. The willingness to  
24 pay is how much someone will pay for an item that

1 they want to get. It could be a bottle of water  
2 like I have right here today. It could be a public  
3 good, like water quality. So what we're measuring  
4 is willingness to pay for an improvement of water  
5 quality.

6 MR. ANDES: Let's move on to Question  
7 No. 3. You make the statement on Page 1,  
8 "Willingness to pay is based on preferences for  
9 recreational opportunities, concern about health  
10 risks, and a sense of responsibility and stewardship  
11 toward the ecosystem."

12 Tell us how you would determine  
13 these preferences, concerns, and senses in this  
14 situation.

15 DR. BOYLE: We didn't determine those  
16 senses in this situation. What we did is we  
17 estimated willingness to pay. The economic  
18 literature suggests that the -- what you call  
19 referring to the responsible stewardship to the  
20 ecosystem health risk recreation, that's the reason  
21 people will pay for improved water quality.

22 Some people will pay for improved  
23 water quality because they recreate on it and would  
24 like to see it improve. Some people don't recreate,

1 but would in the future if it is approved and would  
2 be willing to pay. Other people -- I estimate  
3 non-use benefits -- don't use the river, but would  
4 still pay something to see that water quality in the  
5 river is improved. And there's a large body of  
6 literature out there that shows that people are  
7 willing to pay for improvements in water quality.

8 Later in my testimony, I site  
9 some, what are called hedonic property values  
10 that --

11 MS. TIPSORD: Speak up a little bit.

12 DR. BOYLE: I will. Hedonic property  
13 values are studies where if you look at how property  
14 values are related to water quality. And what we've  
15 been able to show in those studies is where water  
16 has higher water quality, people pay even more for  
17 those properties. It's an opportunity where they  
18 can actually express that value.

19 MR. ANDES: Those are generally  
20 studies concerning homeowners of property located on  
21 the water body. Am I right?

22 DR. BOYLE: There's studies of  
23 homeowners on the water body, and then there's also  
24 studies that have looked at how that value tapers

1 off as you move farther away from the water body.

2 MR. ANDES: Okay. On the next  
3 question, on Page 3, you describe the two types of  
4 benefits to households' direct use benefits and  
5 indirect intrinsic benefits. Are those benefits  
6 both linked to EPA's estimated reduction in fecal  
7 coliform levels and disinfected discharges?

8 DR. BOYLE: The answer to that is yes,  
9 but I should clarify that we estimate a total value  
10 that includes both use and intrinsic, or what I  
11 refer to as non-use. We don't estimate them  
12 separately, we estimate them together. The reason  
13 that we do that is if you estimate separate use and  
14 then separate intrinsic, there are problems in  
15 economics, as far as how you add them together. So  
16 it's much more direct to estimate them at the same  
17 time.

18 In the meta-analysis, it's a ten  
19 point water quality index. With that index, what we  
20 look at is change in ambient fecal coliform levels  
21 in the CAWS, and that is the trigger that increases  
22 the total values we estimated.

23 MS. WILLIAMS: Can I ask a follow-up?  
24 This question says, "For the benefits linked to



1 IEPA's estimated reduction and fecal coliform  
2 levels, can you explain to us what you believe -- "  
3 and you answered yes. So please explain what you  
4 looked at to determine IEPA's estimated reduction in  
5 fecal coliform levels in your answer.

6 DR. BOYLE: They're based on Mr.  
7 Twait's testimony before this Board of what his  
8 understanding the impact would be, and so he gave  
9 orders of magnitude of what it might be. We have  
10 100 -- or a two order of magnitude difference in the  
11 fecal coliform levels.

12 MS. WILLIAMS: And you're talking  
13 about if the actual discharge from the Metropolitan  
14 Water Reclamation District as opposed to in the  
15 receiving stream?

16 DR. BOYLE: I believe that Mr. Twait  
17 was talking about discharges, and we assumed it  
18 would be the same change in the ambient water  
19 quality of the river.

20 MR. ANDES: What is your basis for  
21 that assumption?

22 DR. BOYLE: What was our basis for  
23 that assumption?

24 MR. ANDES: Right. Have you -- go

1 ahead.

2 DR. BOYLE: In this, I had --  
3 Mr. Armstrong is just pointing out the specific  
4 numbers to us here from Mr. Twait's testimony, where  
5 he said that it could be 5,000 to 400, or as great  
6 as 100,000 to 100 change. In doing this -- I'm an  
7 economist, and I had Christopher Ellis of Industrial  
8 Economics in Cambridge, Massachusetts, who has a  
9 Ph.D. in public health from the Harvard School of  
10 Public Health, and his specialty is water quality,  
11 and he helped me using the water quality index that  
12 was developed by McCullen to calculate this  
13 difference in fecal coliform levels.

14 MR. ANDES: So have you -- either you  
15 or Mr. Ellis, who's not here to ask him these  
16 questions, reviewed any of the other testimony in  
17 this matter concerning -- there's been testimony  
18 concerning the extent to which reductions in the  
19 District's effluent would cause or not cause  
20 reductions in actual ambient water quality levels.  
21 Neither you nor Mr. Ellis has reviewed that  
22 information. Am I right?

23 DR. BOYLE: I have not reviewed that  
24 information, but I understand from discussions with

1 the attorneys that there is some controversy about  
2 that. If there was a specific number that was  
3 agreed on, the advantage using this benefit transfer  
4 approach with the equation is we could calculate out  
5 a new number that would be based on that specific  
6 number that was agreed upon. We used what we could  
7 do for a best estimate with the available  
8 information. But if more information was available,  
9 it doesn't nullify our analysis. We could  
10 recalculate it with a different number if that was  
11 agreed to.

12 MR. ANDES: Well, if -- so if the  
13 reduction in ambient levels is not proportional to  
14 the reduction in effluent discharges, that would  
15 take your numbers down to some extent, right? If  
16 the reduction in ambient levels was less than the  
17 reduction in effluent levels, then your numbers  
18 would go down in terms of dollars?

19 DR. BOYLE: That's possible. I don't  
20 have specific numbers in front of me.

21 MR. ARMSTRONG: Just to --

22 MR. ANDES: Would it go up? I'm  
23 asking a hypothetical. If the effluent levels -- if  
24 the reduction in effluent levels was less than

1 proportional to the reduction in -- if the reduction  
2 in ambient levels was less than proportional to the  
3 reduction in effluent levels, then your numbers  
4 would have to go down. It couldn't go up, right?

5 DR. BOYLE: Well, there's ratios, and  
6 there's physical numbers. So we're just talking  
7 about the ratio, but not the physical numbers. If  
8 the ratio went down, then our number would go down.

9 MR. ANDES: Okay. Thank you.

10 MS. WILLIAMS: I'd like to ask a  
11 follow-up. A similar question but reversed, I  
12 think, a little bit. You relied on effluent data  
13 for the starting point as well, correct? You didn't  
14 use numbers from the receiving stream for the  
15 existing conditions either, did you?

16 DR. BOYLE: We have -- in the  
17 equation, there's the baseline of current conditions  
18 of water quality. That is based on the Metropolitan  
19 Water District's monitoring stations. And so we  
20 have current ambient levels in the CAWS, and then we  
21 -- from Mr. Twait's testimony, we have a calculation  
22 of what the change would be from the current ambient  
23 level.

24 MS. WILLIAMS: Do you know where your

1 current ambient level data was taken?

2 DR. BOYLE: It was taken from --  
3 information from the Metropolitan Water District's  
4 monitoring stations. If you give me a minute, I can  
5 probably find the exact -- so what we used was fecal  
6 coliform data supplied by the EIPA taken at  
7 Metropolitan Water District's sampling stations  
8 downstream from the plants from January of 2004  
9 through May of 2007.

10 The sampling sites were on the  
11 main stem of the Chicago River, and below the  
12 confluence of the Cal Sag Canal, and they were  
13 looking at the spring and summer months when most of  
14 the recreation would occur. The winter months were  
15 excluded.

16 MS. WILLIAMS: Thank you.

17 MR. ARMSTRONG: And the state will  
18 submit the sampling data that Dr. Boyle and  
19 Mr. Louis used in CD form.

20 MS. WILLIAMS: Excuse me? You said  
21 the state will submit it?

22 MR. ARMSTRONG: Yes.

23 MS. WILLIAMS: Can you clarify, for  
24 the record, what you mean when you say the state

1 will submit it?

2 MR. ARMSTRONG: We will submit the  
3 data that Dr. Boyle just referred to --

4 MS. WILLIAMS: You mean the Attorney  
5 General's office will submit the data, right?

6 MR. ARMSTRONG: Yes.

7 MS. WILLIAMS: I just wanted to be  
8 clear in the record that the proponent is not the  
9 one that's --

10 MR. ARMSTRONG: Very good point.

11 MR. ANDES: So Dr. Boyle, are you  
12 aware that there are other sources of bacteria to  
13 the CAWS, including hundreds of combined sewer  
14 overflow points plus other storm water runoff?

15 DR. BOYLE: I'm aware that they're all  
16 contributors to it.

17 MR. ANDES: And is it your  
18 understanding that the disinfection requirements  
19 would not address those sources at all?

20 DR. BOYLE: I understand that, but I  
21 also understand that we're basing our change on the  
22 current ambient level in the river that allows for  
23 those other contributing sources to the current  
24 level. When we look at the change, though, we're

1 not talking about those other sources. We're just  
2 talking about the change in terms of the three  
3 treatment plants.

4 MR. ANDES: So there will be a  
5 reduction in the levels of bacteria discharge by the  
6 treatment plants, but no reduction in the bacteria  
7 discharge by the other sources?

8 DR. BOYLE: Let's clarify that for a  
9 minute. What we're talking about here in the  
10 analysis I did was changes in fecal coliform counts.  
11 We have nine elements that go into this water  
12 quality index, and one of them is fecal coliform.  
13 One is not bacteria, so we're looking at changes in  
14 fecal coliform counts, and what we're looking at is  
15 just changes in releases from treatment plants.  
16 We're not looking at any changes in those other  
17 sources, but those other sources are in the baseline  
18 current ambient water quality.

19 MR. ANDES: But you're assuming that  
20 the baseline amount would be reduced by a percentage  
21 that will yield an economic benefit, and you said  
22 earlier that you were determining that reduction by  
23 looking at Mr. Twait's information about the  
24 reductions in the treatment plant discharges and

1 applying that. That was your -- those were the  
2 numbers you used in determining a percent reduction.  
3 Am I correct?

4 DR. BOYLE: Right. So we're talking  
5 about the treatment. We're not talking about the  
6 other sources in my statements there, correct.

7 MR. ANDES: But were you assuming that  
8 the ambient water quality will improve by a  
9 percentage, roughly equivalent to the numbers in Mr.  
10 Twait's analysis?

11 DR. BOYLE: Yes.

12 MR. ANDES: Even though some of the  
13 sources will not be reduced at all?

14 DR. BOYLE: What we're talking about  
15 is -- we're talking about the share that's coming  
16 from the plants.

17 MR. ANDES: Do you know what that  
18 share is?

19 DR. BOYLE: Fecal coliform?

20 MR. ANDES: Yes.

21 DR. BOYLE: We're talking about a  
22 percentage reduction, and so we're just looking at  
23 that in terms of the reduction in the baseline.  
24 We're not talking about any changes in any of the



1 other sources.

2 MR. ANDES: But you don't have a  
3 number in terms of what percent of the total  
4 loadings of fecal coliform are from the treatment  
5 plants versus CSOs. Am I correct?

6 DR. BOYLE: I do not have that number  
7 in front of me right now.

8 MR. ARMSTRONG: I'd like to ask a  
9 clarifying question. What order of magnitude  
10 reduction did you estimate, based upon disinfection  
11 of effluence in the ambient levels?

12 DR. BOYLE: It was a two order of  
13 magnitude.

14 MS. TIPSORD: I'm sorry. You'll have  
15 to speak up.

16 DR. BOYLE: Two order of magnitude.  
17 Excuse me.

18 MR. ANDES: So you assume 100 times  
19 lower level in the ambient water quality due to  
20 disinfection?

21 DR. BOYLE: That's correct.

22 MR. ANDES: But you don't have any  
23 numbers in terms of -- well, I'm sorry. You  
24 understand, based on what you just said, that there

1 is no reduction at all in the CSO's storm water  
2 sources from this rulemaking?

3 DR. BOYLE: I'm not sure whether I  
4 understand whether they are or not. We're not  
5 taking any account for any of those. What I  
6 understand is we're just looking at the treatment  
7 plants and changes from them, not from any of the  
8 other sources.

9 MR. ANDES: You're assuming the  
10 overall ambient water quality is going to decline by  
11 100 times in fecal coliform levels, because Mr.  
12 Twait said that the effluent levels have declined by  
13 100 times, even though there are other sources in  
14 the calculation here that aren't being reduced at  
15 all?

16 MR. ETTINGER: I'd like to object to  
17 some of the statements that Mr. Andes is making,  
18 because I don't think it's been proven that none of  
19 the other things that might be done to control  
20 dissolved oxygen levels or other things to meet  
21 other portions of this proceeding would not also  
22 reduce the amount of fecal loading to the system.  
23 He, of course, is free to pose his question as a  
24 hypothetical, but not to testify as to what, for

1 example, efforts to reduce BOD in the system might  
2 do on fecal.

3 MR. ANDES: That's fine. We'll move  
4 on. Question No. 5 --

5 MS. TIPSORD: For the record,  
6 Mr. Ettinger, did you -- you've got him? Sorry. Go  
7 ahead.

8 MR. ANDES: Question No. 5, "How is  
9 the value of the use and intrinsic benefits related  
10 to your estimate that ten percent of households  
11 actual use the CAWS?"

12 DR. BOYLE: Okay. Let me, kind of, go  
13 back. We estimated total value, not use and  
14 intrinsic separately. So when we estimate the total  
15 value, the equation that we used to do it had one  
16 variable. It was a percent of the people that had  
17 used the waterway for recreation.

18 One of the studies in the  
19 meta-analysis was based on -- it was a Croke study  
20 that was done here in Chicago in the mid-1980s. In  
21 that study, they found that ten percent of the  
22 households that they sampled used the river -- or  
23 excuse me -- used waterways for recreation. We used  
24 that as the assumed level of participation and

1 recreation on the waterway by households in the  
2 Chicago area and Cook County.

3 MR. ANDES: Now, the ten percent isn't  
4 all canoeing and kayaking. Am I right?

5 DR. BOYLE: It's all types of uses, as  
6 I understand it. They don't clearly define what it  
7 is. They have a general term of use, and so I would  
8 assume that it would include all types of uses along  
9 the river.

10 MR. ANDES: On -- and actually, let me  
11 go to the Croke study for a moment, and I'll  
12 introduce the Croke study. The name of the study is  
13 Estimating the Value of Improved Water Quality in an  
14 Urban River System.

15 MS. TIPSORD: We have some more copies  
16 up here if anybody needs them. If there's no  
17 objection, we'll mark Estimating the Value of  
18 Improved Water Quality in an Urban River System from  
19 J. Environmental Systems, Volume 16(1), 1986-87, by  
20 Kevin Croke, Robert Fabian, and Gary Brenniman,  
21 School of Public Health University of Illinois at  
22 Chicago as Exhibit 287. Seeing no objection, it's  
23 Exhibit 287.

24 MR. ANDES: On the -- Dr. Boyle, on

1 the fourth page, under definition of water quality,  
2 I note that in the third paragraph it reads, "To the  
3 extent that Chicago area rivers are used for  
4 recreation, activities are more likely to be focused  
5 on outings, such as picnicking, hiking, and  
6 photography, rather than activities such as boating,  
7 fishing, and swimming."

8 So does -- the ten percent use  
9 includes all of those activities and outings being  
10 more common. Is that right?

11 DR. BOYLE: That -- the ten percent  
12 would be based on all of these activities. I don't  
13 know whether outings are more common. That's  
14 their -- the author's assertion. They don't present  
15 any data in their paper that tells us that that  
16 assertion is, in fact, correct.

17 MR. ANDES: You don't have any reason  
18 to disbelieve the author's assertion though?

19 DR. BOYLE: I don't have any data to  
20 support that either. I have no reason to believe it  
21 or disbelieve it.

22 MR. ANDES: Okay.

23 DR. BOYLE: I think it's clear that  
24 those are the types of activities. It's not clear

1 what share is attributed to each one of those types  
2 of activities.

3 MR. ANDES: Okay. Next question, "Do  
4 the use and/or intrinsic benefits for the public's  
5 willingness to pay for these benefits record actual  
6 or only perceived water quality improvements?"

7 DR. BOYLE: They're based on actual  
8 water quality improvements.

9 MR. ANDES: Well, isn't the issue --  
10 doesn't the issue come down to what the public  
11 perceives is happening as to water quality, rather  
12 than what is actually happening? If something is  
13 happening but they don't perceive it, how does that  
14 affect their willingness to pay?

15 DR. BOYLE: Perceiving it is not a  
16 necessary prerequisite to have people value a change  
17 in water quality. All of the studies that the Van  
18 Houtven meta-analysis is based on are based on what  
19 are called stated preference studies, where you go  
20 out and you do surveys to illicit people's  
21 preferences for improvements in water quality.  
22 Those studies present described changes and  
23 scenarios from what baseline conditions are in water  
24 quality and what the improvement will be, and then

1 people's willingness to pay is based on those  
2 changes.

3 Most of the value is non-use  
4 value. If you look at the Croke -- I'm not sure of  
5 the correct way to pronounce it -- you just put it  
6 in front of me on Page 19, Table 2, you can see that  
7 for the people that had use values, that was 27 or  
8 28 of the respondents. The non-use was 252 to 268  
9 of the respondents. A vast majority are giving  
10 non-use values.

11 So that's based on their  
12 understanding that there is an improvement in the  
13 water quality. Those people that give non-use  
14 values are not going out there and actually seeing  
15 it. And there are changes that can occur in water  
16 quality that you can't necessarily perceive the  
17 change, but if you understand it, you will have a  
18 higher value for the change.

19 There are things that can happen,  
20 for example, like the change in dissolved oxygen.  
21 People can't necessarily see a change in dissolved  
22 oxygen, but they can understand the technical  
23 description of the improvements that would occur in  
24 water with dissolved oxygen changes, and they would

1 have a value for that improvement.

2 MR. ANDES: Well, when we're -- let's  
3 clarify something. When I'm asking about  
4 perceiving, I'm not saying that they can visibly see  
5 a change in the water quality. The question is  
6 isn't the willingness to pay based on their having  
7 an understanding that water quality is improving?

8 DR. BOYLE: Yes. It's based on the  
9 understand that water quality is improving.

10 MR. ANDES: Okay. So in the next  
11 question, "Is your estimate of the public's  
12 willingness to pay in Cook County based on people  
13 believing that reduced fecal coliform in the CAWS  
14 will represent a real improvement in water quality?"

15 DR. BOYLE: It's based on their  
16 understanding that there will be a change in fecal  
17 coliform and that that would improve water quality.

18 MR. ANDES: Okay. So if the actual  
19 improvement of water quality were different in that  
20 perception, would that change people's willingness  
21 to pay?

22 MR. ARMSTRONG: I'm going to object.  
23 That's vague in terms of what perception are you  
24 referring to?



1 DR. BOYLE: I'm sorry. I'm confused,  
2 because you just told me it wasn't perception, it  
3 was the actual, and now you're asking me between  
4 actual and perception.

5 MR. ANDES: We're not using visual  
6 perception. Let's ask about understanding. If  
7 people understand or believe that water quality is  
8 going to improve, but it actually won't. In real  
9 water quality terms, there's no or very little  
10 improvement, but they believe that it will improve,  
11 they believe that it is improving, how does that  
12 affect their willingness to pay?

13 DR. BOYLE: Their willingness to pay  
14 is affected by their understanding of what the  
15 actual change would be. You're talking about  
16 whether there's very little or a small change.  
17 People can still have values for very little or  
18 small changes. You know, we're talking about -- we  
19 did a .7 change in a water quality index. That's  
20 ten points, and so I'd consider that a relatively  
21 small change in water quality. And yes, people can  
22 value small changes in water quality.

23 MR. ANDES: But they won't value them  
24 as much as large changes, correct?

1 DR. BOYLE: That's fair to say, yes.

2 MR. ANDES: And it's all based on  
3 their understanding of the amount of the change?

4 DR. BOYLE: It's based on a correct  
5 description of what the baseline conditions of water  
6 quality are and what the improvement would be.

7 MR. ANDES: So if the -- so if the  
8 question really is what the public believes, what if  
9 the public believed that reducing fecal coliform  
10 levels at these effluents would not significantly  
11 reduce fecal coliform levels in the system, would  
12 that change their willingness to pay?

13 DR. BOYLE: Well, I'm having a little  
14 bit of trouble with this believes in the abstract.  
15 When you do these studies, you present them with  
16 information that, at the time, is the best  
17 information of what the baseline conditions would be  
18 and the change. And, you know, the work that I've  
19 done and other people have done in the literature  
20 shows that if you provide a good description, a  
21 good, sound description, the respondents will  
22 understand it, they'll believe it, and they'll give  
23 you honest responses to it. If, for some reason,  
24 the number that you give them is not a correct one

1 that's different from the perception, then there  
2 would be a problem.

3 MR. ANDES: Dr. Boyle, in this  
4 rulemaking, there is controversy about the extent to  
5 which reductions at these treatment plants will  
6 actually improve water quality in the system. So  
7 if, for example, survey respondents were to be given  
8 a statement based on Dr. Blatchly's testimony, which  
9 I assume you haven't reviewed, which indicated that  
10 there would be very little change in the overall  
11 ambient levels, would it be logical to suppose that  
12 if they believe that they would be less willing to  
13 pay a significant amount or be willing to pay a  
14 smaller amount for that reduction?

15 DR. BOYLE: Well, let's separate it  
16 out into two ways. One is we didn't do a survey  
17 here. We did a meta-analysis where we're  
18 transferring the numbers from 18 other studies to  
19 this one. So we're not comparing it to a survey  
20 that was done of Cook County households and then  
21 say, "Whoops, the information we provided in that  
22 survey is wrong and it should be this." We used the  
23 equation to do the transfer, okay?

24 With that, if the numbers turned

1 out to be different from what the information I had  
2 to base my current analysis on, the advantage of  
3 this benefit transfer with the calibration equation  
4 is that a different value could be calculated.

5 And if you go -- I mean, you're  
6 talking about small. But if I go back to Mr.  
7 Twait's testimony, he said the differences could be  
8 as great as from 100 to 100,000? So, you know,  
9 we -- rather than doing two orders of magnitude, we  
10 could've done three orders of magnitude. We took  
11 the more conservative approach in interpreting that.

12 MR. ANDES: Well, but --

13 DR. BOYLE: Let me finish, please. If  
14 the numbers came out and they were different, this  
15 calibration equation, we could put in the different  
16 number and calculate on a different number. It  
17 doesn't invalidate the basic principles or process  
18 of the analysis. We could adjust for that.

19 MR. ANDES: So it's all dependant,  
20 first, on your assumption that the reductions  
21 identified by Mr. Twait of 100 or more reduction --  
22 100 times or more reduction in effluent levels would  
23 equate to at least that in ambient levels. So if  
24 another assumption were made, based on another

1 testimony in this proceeding -- and there has been  
2 other testimony that disagrees with that -- you  
3 could rerun it and you would get different results?

4 DR. BOYLE: If there was a different  
5 number, we could rerun it, yes.

6 MR. ANDES: Okay. So it's all  
7 dependant. And in that respect, it's dependant on  
8 what you're telling the hypothetical response. The  
9 information you're giving them determines -- or is  
10 at least a significant factor in determining what  
11 their willingness to pay is?

12 DR. BOYLE: Yeah. But we're not doing  
13 a survey. I mean, you're creating a hypothetical  
14 here that's taking what was done out of context,  
15 okay? There were 18 studies of water quality that  
16 have been done around the country that Van Houtven  
17 used in his statistical studies. Those studies  
18 looked at a variety of water quality on the water  
19 quality index that's commonly used by USEPA and  
20 other agencies.

21 From that, you can predict what  
22 the change in water quality would be, and calculate  
23 out what the value that a household would place on  
24 that. So we're not doing a hypothetical survey here

1 or talking about what they do or don't understand.  
2 We start with the assumption that the people in  
3 those 18 studies understand what they're being asked  
4 to value. And collectively using that information,  
5 we can predict a calibrated estimate for what the  
6 value is for the Cook County household. That's  
7 where the \$47 per household came from.

8 MR. ANDES: So your estimate was based  
9 on an overall analysis of 18 studies around the  
10 country, only one of which, the Croke study,  
11 concerned Cook County?

12 DR. BOYLE: Correct.

13 MR. ANDES: Okay. So -- and we have  
14 several questions that deal with this issue. If the  
15 public were -- if the assumption were built into  
16 this hypothetical, that, in fact, there were no  
17 significant risks now to recreators, so therefore,  
18 the disinfection would not make much of a difference  
19 in risk that would change the outcome of this  
20 analysis. Am I right?

21 DR. BOYLE: Risk is not one of the  
22 elements that go into that scale. If you can just  
23 give me a moment here.

24 So this is in response to your

1 Question 27B, later on. But the variables that go  
2 into that water quality index are dissolved oxygen,  
3 PH, biochemical oxygen demand, nitrates, phosphates,  
4 temperature, turbidity, total solids, and then the  
5 fecal coliform. Those are the ones that are going  
6 in. And so risk, as you say, is not a variable  
7 that's going into that water quality index.

8 MR. ANDES: If one were to -- and  
9 again, this is hypothetical. But some of the  
10 methods that are used in looking at use and non-use  
11 benefits include surveys, correct?

12 DR. BOYLE: Yes.

13 MR. ANDES: And if one were to survey  
14 the residents of Cook County, would one think that  
15 the extent of risk to the recreators be relevant in  
16 determining their willingness to pay?

17 DR. BOYLE: Risk is something that can  
18 influence willingness to pay. When economists do  
19 surveys, they are very careful about how they use  
20 risk, and there has to be some real demonstrated  
21 risk before you put it in.

22 What we're doing here is looking  
23 at a total value study so you're surveying  
24 households. Risk doesn't come into play necessarily

1 in the non-use component of it. It could come into  
2 play in the use component of it. But as I  
3 understand it, the use designation of the river  
4 right now is for incidental contact, and so there's  
5 a policy in place to try and reduce the exposure of  
6 risk to anybody using the river.

7 So if you were doing a survey, you  
8 probably would not be talking about risk as if  
9 somebody was going swimming or having substantial  
10 contact or adjusting the water. You'd be telling  
11 the people about the current use designation on the  
12 river.

13 MS. WILLIAMS: Mr. Boyle, I'd like to  
14 ask a follow-up. You had said that risk was not a  
15 component of the water quality index that you relied  
16 on, correct?

17 DR. BOYLE: Yes.

18 MS. WILLIAMS: Is another way of  
19 expressing that to say that your study did not  
20 attempt to quantify the benefit of reduced risk of  
21 illness to recreators in the CAWS? Could that be an  
22 additional benefit that was not within the scope of  
23 your study?

24 DR. BOYLE: I'm not sure. I'd have to



1 go back and look at the studies that were done to  
2 give you a clear and definitive answer to that.

3 But what we're looking -- you  
4 know, risk, to me, as an economist, is you know  
5 what's going to happen to people. And what we're  
6 using for our water quality index is what's  
7 happening to the water. And so we're looking at  
8 physical measures of changes in water quality. If  
9 there was some change in risk associated with the  
10 use designations, some of that probably would be  
11 captured in the number of -- that I reported,  
12 because we're talking about that change of fecal  
13 coliform. If there was something else unrelated to  
14 that, then that would not be done and that would be  
15 an addition.

16 MR. ANDES: Now, Dr. Boyle, if --  
17 again, in a hypothetical survey, focusing on use  
18 benefits, if people believed or understood that  
19 there's not a significant risk to canoe or kayak on  
20 the CAWS, and then one were to ask them, "Would you  
21 be willing to pay for reductions in the fecal  
22 coliform levels," logic would say they probably  
23 wouldn't be willing to pay very much if they don't  
24 believe there's any risk right now. Am I right?

1 DR. BOYLE: No, I don't think you're  
2 right, because you've got to overlay the policy, you  
3 know, the current use designation that's out there  
4 to protect people right now in terms of incidental  
5 contact with the water. And so if there was a  
6 change, that would reduce that so you could have a  
7 more liberal use designation, yes, they would value  
8 it.

9 I would also think that people --  
10 taking risk aside -- would consider that having  
11 fecal coliform in the river is an undesirable  
12 characteristic and would like to see that removed.

13 MR. ANDES: But that's a non-use  
14 benefit, right? That's not a use benefit if we're  
15 telling them it won't change the risk of using the  
16 water body, they might be able to pay something  
17 because they'd feel better if it had less fecal  
18 coliform. But that's a lot different than saying,  
19 "What would you pay to make it safe?"

20 DR. BOYLE: You're misusing the term  
21 use and non-use. Use value is a value that somebody  
22 can use as a whole, and so it's the value that they  
23 would place on a change in the water quality of the  
24 river. People -- you know, research I've done, I've

1 done a lot of work with beautification. People will  
2 pay for improved visible clarity of the water.  
3 There's no risk associated with that change, but if  
4 it improves the desirability of the water, people  
5 will pay for that improvement of water quality. I  
6 would think that the same would hold for removing  
7 fecal coliform from the river.

8 MR. ANDES: What's your evidence for  
9 that?

10 DR. BOYLE: It's my professional  
11 judgment from doing a lot of water quality studies  
12 and doing a lot of evaluation studies. I've been at  
13 this since the early 1980s. I've done studies  
14 around the world. The weight of evidence tells me  
15 that people will pay for changes in water quality,  
16 and you do not have to have just a risk trigger for  
17 people who have a value for improvement in water  
18 quality.

19 MR. ANDES: So you think -- and I'm  
20 talking about now in these economic times -- if you  
21 said to people, "There's no change in risk to  
22 recreators from these measures, but there will be  
23 less fecal coliform in the CAWS, in the Chicago  
24 Sanitary and Ship Canal," that they would agree to

1 pay money for that to happen?

2 MR. ARMSTRONG: I'm going to object.  
3 That's a compound question. In these economic  
4 times, are you concerned about the current economic  
5 position, or are you concerned with the other issue  
6 relating to the connection between fecal coliform  
7 and risk?

8 MR. ANDES: Well, let's ask this  
9 question generally as to people in Cook County. And  
10 if you said to them, "We're going to reduce fecal  
11 coliform levels in the Chicago Sanitary and Ship  
12 Canal. It won't reduce the risk to recreators, the  
13 health risk to recreators, but it'll reduce fecal  
14 coliform levels. It will reduce bacteria levels in  
15 the system," you think that people would be willing  
16 to pay money for that?

17 DR. BOYLE: I do. I have -- I'm  
18 participating in a study for the state of Oklahoma  
19 right now looking in changes in water quality in the  
20 Illinois River water shed in Lake Tenkiller, and  
21 there's no health risk, and people are still willing  
22 to pay for improved water quality.

23 And you did put -- make it a  
24 compound question in these economic times, and that

1 survey was done last fall when we really had the  
2 collapse before things were coming back. And yes,  
3 people were -- in Oklahoma, one of the hardest hit  
4 states, were willing to pay during these economic  
5 times.

6 MR. ANDES: Well, what kind of  
7 improvements in water quality?

8 DR. BOYLE: What types of  
9 improvements? It was mainly beautification that  
10 they were looking at. It was poultry waste in the  
11 water shed. So it wasn't human waste, but it was  
12 mostly from the poultry operations.

13 MR. ANDES: And did that affect the  
14 visual characteristics of the water body's  
15 beautification?

16 DR. BOYLE: In some cases, yes. In  
17 some cases, no.

18 MR. ANDES: Did it affect the uses of  
19 the water body, including the degree to which it can  
20 nourish an aquatic community?

21 DR. BOYLE: Yes.

22 MR. ANDES: Okay. Let's move on. I  
23 believe that the series of questions from eight  
24 through 14, I believe, we've covered. I don't

1 expect to go back from this last line of  
2 questioning.

3 MS. TIPSORD: Excuse me, Mr. Andes.  
4 Mr. Harley has a follow-up.

5 MR. HARLEY: My name is Keith Harley.  
6 I'm an attorney for the Southeast Environmental Task  
7 Force.

8 I want to go back to the point  
9 relating to current economic conditions. Did your  
10 study take into account how the public would  
11 perceive job creation, how the public would value  
12 job creation during these economic times, which  
13 would result from improvements at water reclamation  
14 district plants?

15 MS. TIPSORD: And a point of  
16 clarification, are you talking about the Oklahoma  
17 study?

18 MR. HARLEY: No. I'm talking about  
19 the work that was done in preparation for today's  
20 hearing.

21 MS. TIPSORD: Thank you.

22 DR. BOYLE: We did not consider jobs.  
23 I was not asked to look at jobs. Whether jobs  
24 are -- an increase in jobs is a benefit or not

1 depends on whether an economy is what's called full  
2 employment. So if you're not at full employment and  
3 you're creating jobs that reduce the unemployment  
4 rate, then it is a benefit.

5 So if you do have an increase in  
6 jobs in a down turn in the economy, it would be an  
7 additional economic benefit. But we did not look at  
8 that. We only looked at the change with respect to  
9 water quality.

10 MR. HARLEY: Thank you.

11 MR. ANDES: And you're not aware of  
12 any evidence in the record or anywhere else  
13 indicating that a significant number of additional  
14 jobs would result from acquiring disinfection at  
15 these three plants, are you?

16 DR. BOYLE: I think somewhere in your  
17 questions you actually mentioned additional jobs  
18 that might occur from some of these activities. I  
19 can't put my finger on it, but I think you actually  
20 raised that issue in your questions at one point.

21 MR. ANDES: That would've been in  
22 another context, but we'll move on.

23 Question No. 15, on Page 3, you  
24 claimed the local site-specific information was used

1 in your economic benefits for the CAWS. I guess my  
2 first question is what information -- what local  
3 site-specific information is that?

4 DR. BOYLE: We used the ten percent  
5 recreation from the Croke study that we've already  
6 discussed, we used the average household income for  
7 Cook County, and then we also used the predicted  
8 change in fecal coliform counts.

9 MR. ANDES: So you didn't use any  
10 other information from the Croke study, including  
11 the telephone survey results?

12 DR. BOYLE: We did not use other  
13 results from the Croke study.

14 When you're doing benefit  
15 transferring, there's two types of transfers you can  
16 do. One's called a value transfer, where you take  
17 information from a specific study and transfer it  
18 over. The other is called an equation transfer,  
19 where you can calibrate your estimate and include  
20 things like the percent of recreation income. And  
21 those equation transfers have been shown in the  
22 literature to be much more accurate, and so we used  
23 an equation transfer, rather than just taking the  
24 results from the Croke study.



1 MR. RAO: I have a follow-up question.  
2 This ten percent population used in waterways that  
3 you took from the Croke study, that was from almost  
4 25 years ago, right?

5 DR. BOYLE: Right.

6 MR. RAO: Do you think that may have  
7 changed since then, increased?

8 DR. BOYLE: I do think it's increased.  
9 You know, it's general knowledge that there's been  
10 an increase in a lot of different recreation  
11 activities. The attorneys provided me with a couple  
12 of reports that talked about changes in recreation  
13 activities, that I believe that Mr. Armstrong is  
14 going to submit to you for the record.

15 In addition, you know, at this  
16 point -- yesterday they took me for a boat ride out  
17 along the river and seeing all the new development  
18 and walkways and stuff that weren't there a few  
19 years ago. You have to -- it's pretty easy to see  
20 that recreation activities along the river have  
21 increased and are increasing. We left about noon  
22 time, and when we came back at the end of the day,  
23 there were kids out kayaking on the river and a lot  
24 of people along the banks, families walking. And so

1 I saw substantial recreation that would not have  
2 been there without the improvements along the  
3 riverbank.

4 MR. RAO: How would --

5 MR. ARMSTRONG: And I do have a couple  
6 of exhibits to introduce at this time.

7 MR. RAO: How would a higher  
8 percentage of population using the waterways affect  
9 your results?

10 DR. BOYLE: The equation we used is --  
11 I'll just -- on Page 58 of my testimony -- but if we  
12 used a higher value, that would have increased the  
13 value. So if it was greater than ten percent, we  
14 would've -- we would be reporting a larger number.

15 MR. RAO: Thank you.

16 MR. ANDES: The additional -- the  
17 increase in recreational use is all taking place  
18 without disinfection. Am I right?

19 DR. BOYLE: You know, I don't know the  
20 details, but I understand that the Metropolitan  
21 Water District does disinfect at some plants and not  
22 at some plants.

23 MR. ANDES: The plants on the CAWS --  
24 it's a factual matter that it does not disinfect.

1 So if you're speaking about increased recreational  
2 activity along the CAWS, that would be without  
3 disinfection. I'm sure all the parties here would  
4 stipulate to that.

5 So given that, all of these  
6 increases and recreational activities, am I right,  
7 have taken place without the District disinfecting  
8 the plants on the CAWS?

9 DR. BOYLE: But an improvement in  
10 water quality could increase recreational use, and  
11 even people that are using it right now would be  
12 willing to pay something, I believe, professionally  
13 to see the water quality improved.

14 MR. ARMSTRONG: And in terms of my  
15 exhibits, I have a May 2000 report from Friends of  
16 the Chicago River entitled Waterways for Our Future  
17 that I'd like to introduce.

18 MR. ANDES: So if recreation  
19 activities have increased, and your testimony is  
20 consistent with other witnesses who have testified  
21 as well to significant increases in recreational  
22 activity without disinfection of the CAWS treatment  
23 plants, do you have any way to separate that out --  
24 those improvements that are happening any way from

1 any improvements that might happen due to  
2 disinfection?

3 DR. BOYLE: I didn't value the  
4 improvements that have happened any way. I valued  
5 the improvements from the current ambient water  
6 quality with these activities going on right now,  
7 and improvement in water quality had changed from  
8 that.

9 You know, I've been through a lot  
10 of these hearings, and this is an old argument,  
11 okay, that recreation is going up. It's great, you  
12 know. Let's not worry about it. It overlooks the  
13 fact that if water quality improves, more people  
14 might use it, and it also overlooks the fact that  
15 people who use it would have greater enjoyment if it  
16 was improved. It overlooks the fact that people who  
17 don't even use it, the non-users, care about water  
18 quality.

19 MR. ANDES: When the Board is trying  
20 to assess the economic reasonableness of this  
21 requirement and considering the 900 -- more than  
22 \$900 million that will be spent by the taxpayers of  
23 Cook County, don't you think it's relevant to  
24 determine to what extent the improvements would

1 happen anyway, to what extent this is really needed  
2 to address real health risks?

3 MR. ARMSTRONG: I'm going to object.  
4 Dr. Boyle's not here to testify on what the Board  
5 should consider. He's here to testify on the  
6 economic transfer analysis that he performed.

7 MR. ANDES: The last statement he made  
8 went well beyond economic transfer equations.

9 MS. TIPSORD: I think he can answer.

10 DR. BOYLE: Can I have him reask the  
11 question? I lost track.

12 MS. TIPSORD: Sure.

13 DR. BOYLE: Do you want to read it  
14 back?

15 (Whereupon, the record was read as  
16 requested.)

17 MR. ARMSTRONG: I would also like to  
18 object on the characterization of the cost of  
19 disinfection.

20 MR. ANDES: Then treat it as a  
21 hypothetical. There's been testimony about it.

22 DR. BOYLE: I'm just going to  
23 backtrack to my testimony before. What we're  
24 valuing is a change in water quality and a change in

1 fecal coliform count that goes into the water  
2 quality index. That water quality index does not  
3 have risk as an element that goes in, and so we're  
4 measuring the willingness to pay for improvement of  
5 water quality for a change in the fecal coliform  
6 index.

7 I guess in terms of your broader  
8 question, both the benefits and cost are relevant.  
9 I mean, that's a basic thing that we teach in  
10 economic classes. So I'd agree that both benefits  
11 and costs should be considered.

12 MR. ANDES: Okay.

13 MS. TIPSORD: And Mr. Andes, before  
14 you go on, two things. Mr. Harley has a follow-up.  
15 Go ahead with that.

16 MR. HARLEY: In terms of the scope --  
17 in terms of the scope of your work, did you consider  
18 the economic value which might be created by onshore  
19 activity, for example, new recreational facilities,  
20 new residential developments?

21 DR. BOYLE: We -- there are two parts  
22 for that. The new residential development, that  
23 part of it, the higher value that would be  
24 associated with water quality should be captured in

1 the number that we have, and we're presenting an  
2 average value for Cook County households. Those  
3 households located right along the CAWS expect to  
4 have higher values than the other ones, and so that  
5 would be captured.

6 In terms of new economic activity,  
7 in terms of businesses located along the river, I'm  
8 assuming, canoe rentals and the like, we did not  
9 look at that type of benefit.

10 MR. HARLEY: Thank you.

11 MS. TIPSORD: The second thing,  
12 Mr. Armstrong had offered as an exhibit the May 20th  
13 Waterways for Our Future, the Friends of the Chicago  
14 River report. If there's no objection, we will mark  
15 that as Exhibit 288. Seeing none, it's Exhibit 288.

16 MR. ARMSTRONG: Also, on the issue of  
17 increased use of the Chicago Area Waterway System, I  
18 have a Comprehensive Annual Financial Report of the  
19 Metropolitan Water Reclamation District of Greater  
20 Chicago for 2007. I'd like to enter that as an  
21 exhibit.

22 MR. ANDES: We might have already.

23 MS. TIPSORD: I was going to say, is  
24 this different than the CD that we have?

1 MR. ANDES: We might have already put  
2 this in.

3 MR. ARMSTRONG: We've got the budget  
4 book in.

5 MR. ANDES: But I don't -- it was  
6 awhile ago.

7 MR. ARMSTRONG: Okay.

8 MS. TIPSORD: Let me double check.

9 MR. ANDES: Okay.

10 MS. TIPSORD: Hang on. I have the  
11 list of exhibits here.

12 MR. ANDES: I thought we put it in.  
13 It may be that these documents were just requested  
14 by the state and we provided them. I'm not sure. I  
15 remember providing them.

16 MS. TIPSORD: You put some of the  
17 budget stuff in.

18 MR. ANDES: Okay.

19 MS. TIPSORD: I do remember.

20 MS. WILLIAMS: It was around 160, 161  
21 that we put those budget books in, I think. So you  
22 might want to try and --

23 MS. TIPSORD: We have the 2007 budget  
24 book in its entirety, the 2008 budget book in its



1 entirety.

2 MR. ARMSTRONG: I think these might  
3 be -- this might be a separate document from the  
4 budget book itself.

5 MS. TIPSORD: Okay. And the 2008  
6 selected pages also. All right. In that case, if  
7 there's no objection, we will mark Comprehensive  
8 Annual Financial Report of the Metropolitan Water  
9 Reclamation District of Greater Chicago for the year  
10 ending December 31st, 2007, as Exhibit 289.

11 MR. ARMSTRONG: I was specifically  
12 referring to material on Pages 16 and 23, but since  
13 we've moved on from that line of questioning...

14 MS. TIPSORD: All right. Seeing no  
15 objection, it's Exhibit 289.

16 MR. ANDES: Question 16, you state on  
17 Page 4 of your testimony that the water quality  
18 improvements will occur if the implementation of  
19 wastewater disinfection at the North Side Stickney  
20 and Calumet wastewater treatment plants. What form  
21 of disinfection technology did you assume would be  
22 employed?

23 DR. BOYLE: We didn't make any  
24 assumption about what technology would be employed.

1 MR. ANDES: Can you account for  
2 introduction of possibly carcinogenic disinfection  
3 byproducts into the CAWS in your analysis?

4 DR. BOYLE: We did not.

5 MR. ANDES: Based on your previous  
6 testimony, is it correct to say that the water  
7 quality improvement in your analysis is solely based  
8 on the implementation of disinfection at those three  
9 plants?

10 DR. BOYLE: It's based on a change in  
11 fecal coliform. If it's brought about by  
12 disinfection, you can back up to it. But it's based  
13 on change in the fecal coliform count.

14 MR. ANDES: Well, it's not based on  
15 any other changes in sources of fecal coliform to  
16 the water body, correct?

17 DR. BOYLE: Correct.

18 MR. ANDES: Only those plants?

19 DR. BOYLE: Yes.

20 MR. ANDES: And you do acknowledge  
21 there are other sources, am I correct, such as CSOs,  
22 storm runoff, feces and birds and other animals, all  
23 which can introduce bacteria and pathogens into the  
24 CAWS?

1 DR. BOYLE: I do understand, from  
2 conversations, that those other ones -- but I'll  
3 reiterate my point before, that we're starting from  
4 an ambient water quality in the CAWS that is the  
5 current water quality that includes all those other  
6 sources.

7 MS. TIPSORD: Your voice is falling,  
8 Doctor.

9 DR. BOYLE: Okay. Sorry.

10 MR. ANDES: But since you've not  
11 quantified those sources relative to the treatment  
12 plants, and those sources will not be reduced, the  
13 actual reduction of pathogen levels is unknown after  
14 disinfection, correct, in terms of ambient levels?  
15 You don't really know that?

16 DR. BOYLE: I wasn't asked to give any  
17 opinion on pathogen levels. I'm an economist, so,  
18 you know, I'm not --

19 MR. ANDES: Let's ask about fecal  
20 coliform levels --

21 MS. TIPSORD: Let him finish, please.

22 MR. ANDES: I'm sorry.

23 DR. BOYLE: I was going to say what we  
24 did is looking at a change in fecal coliform levels.

1 MR. ANDES: So you don't know what the  
2 actual changes in fecal coliform levels in ambient  
3 water quality would be since you haven't considered  
4 these other sources. Am I correct?

5 DR. BOYLE: No, I don't think you're  
6 correct. Those other sources are in the baseline.  
7 What we're looking at is just the predicted change  
8 from the treatment plants, not a change in all of  
9 those other sources.

10 MR. ANDES: But you assumed the  
11 baseline would be reduced by a percentage based on  
12 Mr. Twait's numbers concerning the reduction in the  
13 effluent. If the effluent is, say, half of the  
14 water, then obviously -- and if it were a 50 percent  
15 reduction, obviously the change in ambient would be,  
16 say, 25 percent. Am I right?

17 DR. BOYLE: I think that it's not  
18 quite -- being stated quite correctly, okay? What  
19 you have is you have the ambient level water quality  
20 that has all the different sources contributing to  
21 it. When we're talking about the reduction that  
22 goes on that baseline, it's a reduction based on how  
23 much it's going to be reduced coming out of the  
24 plant, not an overall reduction. So we're not

1 trying to include reductions in those other sources.  
2 We're just -- it's just a prediction of what the  
3 change is going to be coming out of the plants.

4 MR. ANDES: Did you do a mixing  
5 analysis to determine how the reduction in effluent  
6 levels affects the ambient water quality levels?

7 DR. BOYLE: I've already answered  
8 that. We've assumed that there's a direct  
9 proportional change between the two of them. We  
10 haven't done any adjustment between that. If  
11 it's -- you know, that rate of coming out is the  
12 same reduction on the ambient one.

13 MR. ANDES: Thank you. Let's move on  
14 to Question 17. Did your approach consider  
15 degradation of air quality, increased truck traffic,  
16 other adverse impacts that will result from  
17 construction and operation of disinfection  
18 facilities?

19 DR. BOYLE: We didn't, and we weren't  
20 asked to. We were looking at the benefits of it.  
21 That's something that would be done if a cost  
22 analysis was being conducted. But it's not part of  
23 the benefit analysis. There's not a standard  
24 economic approach to doing that in the benefits.

1 MR. ANDES: So you looked at benefits.  
2 You didn't look at the countervailing costs?

3 DR. BOYLE: That's correct.

4 MR. ANDES: In a region such as  
5 metropolitan Chicago, which is already a Clean Air  
6 Act non-attainment zone, does your model take into  
7 account further degradation of air quality and its  
8 impact on property values?

9 DR. BOYLE: We're looking at water  
10 quality, not air quality.

11 MR. ANDES: But if a change in water  
12 quality controls has an impact on air quality -- an  
13 adverse impact on air quality, you're not looking at  
14 that. Am I right?

15 DR. BOYLE: We're looking at the  
16 benefits.

17 MR. ANDES: Let's move on to Question  
18 19. In answering the question, "What is the  
19 approach you filed to compute economic benefits,"  
20 you provided an outline in this section of your  
21 testimony of your methodology. Did you produce a  
22 report that details your work?

23 DR. BOYLE: We we did. It's R2008-009  
24 in the record.

1 MR. ANDES: Is that available in the  
2 record in this case?

3 MR. ARMSTRONG: You're referring to  
4 your pre-filed testimony?

5 DR. BOYLE: My pre-filed testimony,  
6 yes.

7 MR. ANDES: Well --

8 MS. TIPSORD: Would that be Exhibit 2?

9 DR. BOYLE: I don't know the exhibit  
10 number.

11 MR. ANDES: There's a summary of  
12 calculations in Exhibit 2. I'm wondering was there  
13 an actual report done which explained how you --  
14 that's a summary of your calculation. Is there an  
15 actual report that shows your calculations that  
16 shows your work?

17 DR. BOYLE: There's a -- the tables in  
18 the back, but that was -- that summary is what I was  
19 asked to submit, and there was no report behind  
20 that.

21 MR. ANDES: Okay. There's no report  
22 that reflects your calculations?

23 DR. BOYLE: Correct. I just thought  
24 you were asking me about my pre-filed testimony

1 there. We did do the calculations in a spreadsheet,  
2 and we can submit an electric copy of that  
3 spreadsheet to the Board so you can follow through  
4 all the calculations that we did with the water  
5 quality index and the calibration equation.

6 MS. TIPSORD: Thank you.

7 MR. ANDES: Thank you.

8 MR. ARMSTRONG: That would include the  
9 MWRD data that Dr. Boyle previously referred to.

10 MR. ANDES: I'm going to skip over 19  
11 C and D for now. I may come back to those questions  
12 later. But let's move on to 20. On Page 6 of your  
13 testimony, you make the statement that third, the  
14 affected populations are similar. Please explain  
15 how you characterized and compared the affected  
16 populations.

17 DR. BOYLE: Those are the two  
18 variables that I referred to before with the percent  
19 of our recreation users in the average household  
20 income. Income is a standard economic variable that  
21 you would include in this analysis that you'd want  
22 to look at, and then we also know that some of the  
23 people that recreate influence the value that they  
24 place on it. So you want to account for people who



1     recreate.

2                   MR. ANDES: Well, when you're talking  
3     about similar -- you're talking about -- that the  
4     people of Cook County, or similar to the affected  
5     populations in the 18 studies in Van Houtven? Is  
6     that -- is that what you were trying to say?

7                   DR. BOYLE: We're trying to say that  
8     we could calibrate to them through those two  
9     variables. Those are the two standard variables  
10    that are used by economists in this type of  
11    analysis.

12                   MR. ANDES: I'm trying to figure out  
13    how do you know that the affected population here,  
14    whether users or non-users, is similar to the  
15    affected populations in those 18 studies around the  
16    country? That's your statement, the affected  
17    population is similar. I assume that means the  
18    population here is similar to the affected  
19    populations in those 18 studies.

20                   DR. BOYLE: And what we mean is that  
21    through the variation of those 18 studies, we can  
22    predict a value for Cook County households using  
23    those variables to make a similar adjustment.

24                   MR. ANDES: Okay. And I still don't

1 think I have an answer to the question. How -- did  
2 you look at the affected populations -- let's put  
3 aside that you looked at household income. Did you  
4 look at the affected populations in those 18 studies  
5 and compare them to the Cook County affected  
6 population to determine that they are similar  
7 enough -- that they are similar, which is the  
8 statement you made here?

9 DR. BOYLE: What we're trying to do is  
10 do -- when you do a benefit transfer -- I'll go back  
11 to the two types of benefit transfers you have to  
12 do. One is a value transfer, where you take study  
13 from one area and you transfer it to another. In  
14 that one, you've got to match them up line by line  
15 for the different characteristics. When you use an  
16 equation transfer, which is the more accurate  
17 approach, you need variables in there that represent  
18 key characteristics. Income and recreation are the  
19 two here.

20 And when we do that through  
21 prediction, we're able to predict a value for those  
22 ones, and so they're similar to the prediction of  
23 putting in the average household income for Cook  
24 County residents and the percent of recreation.

1 MR. ANDES: So you looked at -- if I'm  
2 correct, you tried to do specific information on  
3 household income and percent users in Cook County,  
4 and determined that, in those respects, the Cook  
5 County population was similar to the population  
6 studied in the other studies?

7 DR. BOYLE: What we're saying is that  
8 you can use the equation to predict a value for  
9 those people that are similar. If you're looking at  
10 whether that type of prediction is valid, one of the  
11 things that Van Houtven did is they took their  
12 meta-analysis that they did, the equation I'm using,  
13 and they tried to predict another study you  
14 mentioned in your questions, Mitchell and Carson,  
15 and they tried to say, "Can we use our equation to  
16 predict what Mitchell Carson found in their study?"  
17 And they be found that they could with this linear  
18 restricted equation. That's the equation that we  
19 used in our analysis.

20 MR. ANDES: Now, did you look at other  
21 factors such as climate in terms of, for example,  
22 warm versus cold, which can affect the extent of  
23 recreational use?

24 DR. BOYLE: We did not bring in

1 climate. Once again, we're doing a total value, not  
2 just recreation one. And these are -- you know,  
3 when Van Houtven did it, they looked at what  
4 variables and the characteristics that matter in  
5 terms of affective people's preferences. And we  
6 used the variables in their equation that they found  
7 to affect whether people would pay more or less for  
8 water quality.

9 MR. ANDES: Wouldn't you think,  
10 though, that people would be willing to pay more if  
11 they're, say, in California on a coast where they  
12 can use their beaches or other recreational  
13 facilities year-round, versus in Chicago where  
14 that's definitely not possible?

15 DR. BOYLE: That's an empirical  
16 question of whether they would or wouldn't. We're  
17 not just doing beach use. We're not getting a value  
18 here for total recreation. We're getting a value  
19 here for change in water quality.

20 And so the appropriate question is  
21 whether people in California would value a change in  
22 water quality the same as people in Chicago would  
23 value a change in water quality. We're not asking a  
24 value for, you know, what's your total value of

1 beach use in California and comparing that to the  
2 total value of water quality here in Chicago.

3           You're making a key economic  
4 mistake here, I think, of talking in terms of total  
5 value and overlooking the concept of marginal value,  
6 and what we're estimating here is marginal value for  
7 change in water quality.

8           MR. ANDES: Wouldn't it -- beyond  
9 income and percent of use, wouldn't it also be  
10 relevant to calibrate for the availability of  
11 competing recreational facilities? Because if you  
12 have a lot of other ways to recreate, including on  
13 the water, one might value less a change in water  
14 quality in one particular water body, whereas if you  
15 only have one water body to recreate at, say, if  
16 you're in a rural area and there's one big lake, one  
17 might value that much more highly? And that  
18 doesn't -- you're not addressing that fact. Am I  
19 right?

20           DR. BOYLE: Well, again, you're trying  
21 to reduce this to just a recreation value study. If  
22 we go way back to the beginning, you know, if we go  
23 back to the, you know, Croke study, when they're  
24 looking at it, they had, you know, 28 recreational

1 users, and 268 that were non-use values. So you're  
2 trying to box it down and talk about just one little  
3 component.

4 Second, what you're referring to  
5 is substitutes in economic terms, and, you know, the  
6 other available waters. Whether it's recreation or  
7 non-use values, substitutes do come into play. But  
8 when we're looking at the 18 studies that were done  
9 in the Van Houtven study, all of them had a variety  
10 of substitutes that came into play. They weren't  
11 doing studies that had no substitutes and were  
12 totally excluding them.

13 MR. ARMSTRONG: I would like to ask a  
14 follow-up question at this point that might cut  
15 through some of this issue of comparing populations.  
16 What is the benefit of using a meta-analysis in  
17 terms of different populations?

18 DR. BOYLE: A meta-analysis is -- the  
19 purpose of it is so that you can predict a  
20 calibrated estimate to the population where you're  
21 doing the study. That's the primary reason why the  
22 equation transfer is more accurate than the value  
23 transfer.

24 MR. ARMSTRONG: And then the

1 meta-analysis controls for differences between  
2 populations?

3 DR. BOYLE: Yes.

4 MR. ANDES: But you didn't control for  
5 the differences I just identified, right? You  
6 didn't control for climate, you didn't control for  
7 availability of other recreational facilities,  
8 correct?

9 DR. BOYLE: Those were not variables  
10 in the Van Houtven study, so they were not available  
11 to us. Controlling for climate is not something  
12 that is commonly done when you're doing these  
13 benefit transfers. You can always find something  
14 that is not controlled if you look far enough.

15 MR. ANDES: But doesn't --

16 DR. BOYLE: Let me finish, please,  
17 okay?

18 MR. ANDES: Sure.

19 DR. BOYLE: Let me go back. We're  
20 using the most accurate procedure to do it. We're  
21 following the standard variables for adjustment that  
22 are found to be significant in these types of  
23 studies, and we're using the equation out of  
24 Van Houtven where they show that they could take

1 this, predict it to another area, and validate it.  
2 And so using the variables that are available to  
3 them in the analysis.

4 If all these ones were widely  
5 significant in the literature, then, you know, it  
6 would be logical to expect that Van Houtven would  
7 have a lot of these variables in it. When you go in  
8 and look at the evaluation literature, you'll find  
9 that income, percent or recreation are two variables  
10 that always come in significant in terms of  
11 explaining differences. You can throw other  
12 variables on the table, but generally they do not  
13 move the values around too much.

14 MR. ARMSTRONG: And now I'd like to  
15 introduce the Van Houtven study at this time as an  
16 exhibit.

17 MS. TIPSORD: I've been handed Valuing  
18 Water Quality Improvements in the United States  
19 Using Meta-analysis: Is the Glass Half Full or Half  
20 Empty for National Policy Analysis, George  
21 Van Houtven, John Powers, and P-a-t-t-a-n-a-y-a-k  
22 are the authors -- I'm looking for a date --  
23 February 20th, 2007. If there's no objection, we  
24 will mark this as Exhibit 290. Seeing none, it's



1 Exhibit 290.

2 MR. ANDES: With all due respect to  
3 Van Houtven and his compatriots, wouldn't it make  
4 sense to you that there would be a difference in  
5 terms of willingness to pay if one can use the  
6 recreational resource and value improvements in  
7 water quality year-round, rather than a few months  
8 out of the year? Wouldn't that make sense?

9 DR. BOYLE: I'm going to go back to  
10 the same point. We did a total value study.  
11 Recreation is a small part of it. We're not doing a  
12 total value of recreation through the whole season.  
13 We're estimating the value for change in water  
14 quality. The marginal value, not the total value of  
15 recreation, and not just recreation. The total  
16 value, which includes use and non-use.

17 MR. ANDES: I'm not sure that answers  
18 my question. It was a yes or no. Don't you think  
19 it's common sense that one would value marginal --  
20 even marginal changes in water quality more if one  
21 were using that resource around the calendar, rather  
22 than a few months out of the year?

23 DR. BOYLE: Okay. I'm going to take  
24 your question as a hypothetical.

1 MR. ANDES: Sure.

2 DR. BOYLE: So if we're doing a  
3 recreation demand study and we're looking at  
4 recreation, it's possible that if you used it  
5 year-round that that recreation value could be  
6 higher.

7 MR. ANDES: Okay.

8 MR. ARMSTRONG: And again, that's only  
9 one part of your analysis use, and you did not  
10 conduct a recreation demand study in this case?

11 DR. BOYLE: No. I was just responding  
12 to his hypothetical.

13 MR. ANDES: And let's also ask another  
14 hypothetical. Wouldn't it make sense if one had two  
15 situations. One, we're talking about improving  
16 water quality on one water body, and there are a  
17 number of other recreational -- water recreation  
18 sources to use, versus another were there's only one  
19 place where you can recreate on the water. It would  
20 make sense that people would be more willing to pay  
21 for the marginal improvement where there's only one  
22 lake, versus where you're improving one water body,  
23 but there are a bunch of others to choose from. Am  
24 I right? Wouldn't that be common sense?

1 DR. BOYLE: I'll be with you in just a  
2 second. So you're creating another hypothetical --

3 MR. ANDES: Yes.

4 DR. BOYLE: -- where you're saying  
5 there's just one water body. So do you want me to  
6 pretend that Lake Michigan doesn't exist and none of  
7 the waters up in Wisconsin exist and none of the  
8 other ones exist?

9 MR. ANDES: No. The CAWS was the  
10 second part of the hypothetical where there are a  
11 variety of recreational sources. I'm saying  
12 wouldn't the willingness to pay be less there than  
13 if you're out in Nebraska somewhere -- and not to  
14 insult Nebraska -- but say that there's one lake  
15 where people can recreate at, one would think their  
16 willingness to pay would be more than on the CAWS  
17 where they can go a lot of other places. Isn't that  
18 right? Wouldn't that be common sense?

19 DR. BOYLE: The marginal access  
20 value -- once again, I'm following his hypothetical,  
21 just making this a recreation study. The marginal  
22 access value of a recreational user day probably  
23 would be higher if there were no substitutes around,  
24 no other waters to choose from. That does not make

1 any statement about the marginal value of water  
2 quality. Marginal value of water quality could  
3 still be substantial even when there are substitutes  
4 around.

5 MS. TIPSORD: Ms. Meyers?

6 MS. MEYERS: Ms. Meyers, Glen  
7 Openlands, for the record. Wouldn't that negate the  
8 value, though, of proximity?

9 DR. BOYLE: Wouldn't what negate the  
10 value of proximity?

11 MS. MEYERS: Wouldn't there still be a  
12 value of a waterway being closest, or at least much  
13 closer, to a resident in order to use, enjoy, to  
14 build next to, wouldn't that, in itself, contribute  
15 to the value? If it's right in your backyard,  
16 compared to some ways away, doesn't that make it  
17 more valuable to that individual?

18 DR. BOYLE: The closer it is to you,  
19 all other things considered, the more valuable it  
20 would be.

21 MS. MEYER: Okay.

22 MR. ANDES: So then people who live a  
23 block from the lake, that might be more valuable to  
24 them than people -- if they lived four blocks away

1 from the CAWS, but a block away from the lake, do  
2 you think that makes much of a difference in terms  
3 of their assessment of the recreational values?

4 DR. BOYLE: I'm not sure that question  
5 is clear. Could you rephrase it for me, please?

6 MR. ANDES: If you looked at the  
7 differential values for various people around the  
8 Cook County area in terms of whether they're closer  
9 to Lake Michigan, the CAWS, the Des Plaines River,  
10 the Fox River, other sources or other areas where  
11 they can recreate.

12 DR. BOYLE: I think that was a  
13 statement, not a question.

14 MR. ANDES: Have you looked at the  
15 differential values for those people who are located  
16 in the Cook County area with regard to how close  
17 they are to various water bodies?

18 DR. BOYLE: We have not.

19 MR. ANDES: Okay.

20 MS. TIPSORD: Mr. Harley, you have a  
21 follow-up?

22 MR. HARLEY: Conversely, how does your  
23 assessment take into account people who do not live  
24 in Cook County, but would be attracted to use the

1 CAWS if the CAWS was disinfected?

2 DR. BOYLE: They are not accounted  
3 for, but they would have a value for improving water  
4 quality --

5 MR. HARLEY: I'm sorry?

6 DR. BOYLE: I said they're not  
7 accounted for, but they would have a value for  
8 improving water quality in the CAWS, but they're not  
9 in the benefit estimate that I report.

10 MR. HARLEY: Thank you.

11 MS. WILLIAMS: Is the same true for  
12 tourists to Cook County?

13 DR. BOYLE: The same is true for  
14 tourists to Cook County.

15 MS. TIPSORD: Mr. Harley?

16 MR. HARLEY: Just a clarifying  
17 follow-up, does your assessment take into account  
18 the value of increased tourism to use the CAWS that  
19 might occur as a result of disinfection?

20 DR. BOYLE: No. We're just looking at  
21 the value to Cook County households. We're not  
22 looking at the value of two people who might travel  
23 here to enjoy it, and we're not looking at any  
24 enhanced economic activity that they may contribute

1 to Cook County.

2 MR. ARMSTRONG: Also, to allude back  
3 to a question that Illinois EPA had earlier asked  
4 about medical -- possible medical benefits of  
5 disinfection, does your study attempt to quantify,  
6 in any way, benefits from reduction of illnesses  
7 associated with disinfection of the CAWS?

8 DR. BOYLE: No. We're just looking at  
9 changes in fecal coliform count. We're not looking  
10 at any illnesses that may be prevented by change in  
11 water quality.

12 MR. ANDES: Okay. Let's go to the Van  
13 Houtven report, and I want to read to you some  
14 statements out of the summary and conclusions and  
15 get your thoughts. And this starts on Page 224  
16 toward the bottom of the page, where the authors  
17 state, "The results of our review and analysis of  
18 water quality valuation estimates have mixed  
19 implications for national policy analysis using  
20 benefit transfer. Although the existing empirical  
21 literature in this area is extensive, only a small  
22 subset of these values could be meaningfully  
23 combined through meta-analysis. One major reason  
24 for this limitation is that water quality is defined

1 and characterized in a variety of ways across  
2 studies.

3 "Thus, on the one hand,  
4 meta-regression results provide a reasonable basis  
5 for predicting how average WTP, willingness to pay,  
6 varies for broad changes in water quality, and can  
7 be used as a benefit transfer function.

8 "On the other hand, some of the  
9 main limitations of these models as benefit transfer  
10 tools for national policy analysis are a consequence  
11 of the variation in WTP that is not -- bold not --  
12 explained by the meta-regressions.

13 "For example, our results provide  
14 very limited evidence about how WTP is related to  
15 the spatial characteristics of water quality  
16 changes. The meta-regression does not measure how  
17 WTP varies with respect to the proportion or amount  
18 of waters that are improved or the distance of the  
19 water quality changes from populations. This lack  
20 of specificity imposes limitations on the precision  
21 of policy-relevant benefit transfers, since policies  
22 almost always impact water bodies in spatially  
23 nonuniform ways.

24 "Consequently, despite the large



1 and diverse body of existing studies, there is a  
2 continued need to water quality valuation research  
3 that can be used to address the requirements of  
4 national and region-scale benefit assessments."

5                   You don't disagree with any of  
6 that, do you?

7                   DR. BOYLE: That's standard language  
8 that most economists put in conclusions, because  
9 you're tempering the results of your analysis.

10                   MR. ANDES: You have similar  
11 extensive -- that's -- these are summaries of their  
12 analysis. This is not boilerplate. Are you --  
13 you're not saying this is boilerplate that every  
14 economist uses, right?

15                   DR. BOYLE: Of some type. There's  
16 always some tempering language that you put in about  
17 the general reliability of your results.

18                   MR. ANDES: Do you have any reason not  
19 to believe that their specific statements about the  
20 18 studies they reviewed are -- do you have any  
21 reason to disbelieve their conclusions?

22                   DR. BOYLE: Well, some of it's  
23 described in the studies, and some of it is  
24 suggestion for future research. It's not all

1 conclusions. But, you know, they did do some  
2 spatial testing. They had variables for estuaries,  
3 whether it was local fresh water, whether it was in  
4 the Midwest, whether it was in the south, and none  
5 of those variables were significant of changing the  
6 values as you moved around different parts of the  
7 country. So they did do some testing on the spatial  
8 distribution of the values.

9 MR. ANDES: But they characterize it  
10 as very limited evidence, correct?

11 DR. BOYLE: They -- I don't know  
12 whether I would call that very limited evidence.

13 MR. ANDES: So you disagree with their  
14 conclusion when they say all results provide very  
15 limited evidence?

16 DR. BOYLE: I think when they're  
17 saying very limited evidence, they're saying that  
18 they did not find that there was statistical  
19 variation with those spatial geographic features  
20 that they included in their model.

21 MR. ANDES: In fact, they didn't say,  
22 "We find that to be a significant variable." They  
23 indicate that had this lack of specificity of those  
24 variables imposes limitations on precision. If they

1 were insignificant variables, why would those be  
2 limitations.

3 DR. BOYLE: Because that affects how  
4 you would use them in terms of calibration. Let me  
5 just go back to the -- where you started. Let's  
6 see. That was Page 224, correct?

7 MR. ANDES: Right.

8 DR. BOYLE: And so, I mean, when you  
9 did this, you're reading down through two  
10 paragraphs. Whenever you write something, you know,  
11 usually a paragraph is a complete thought, and so  
12 you're merging them together.

13 MR. ANDES: I wasn't trying to merge  
14 them. I was just reading them.

15 DR. BOYLE: And so the first one --  
16 let me just read the first paragraph back. "The  
17 results of our review and analysis of water quality  
18 evaluation estimates have mixed implications for  
19 national policy analysis using benefit transfer.  
20 Although the existing empirical literature in this  
21 area is extensive, only a small subset of these  
22 values could be meaningfully combined through  
23 meta-analysis. One major reason for this limitation  
24 is water quality is defined and characterized in a

1 variety of ways across studies."

2           And so what they're saying there  
3 is they're talking about when they went and looked  
4 at the studies on emperical literature. They have  
5 18 that they used here. They're saying that there  
6 are other studies that had been done, but they were  
7 not minimal to being -- to using the ten point water  
8 quality index, or for some other reason that they  
9 couldn't be included. Perhaps they were in  
10 recreation demand, and they just looked at access to  
11 waters, and they didn't look at changes in water  
12 quality. So they're talking about the broad studies  
13 that are out there and what they could -- were able  
14 to use in their analysis. So that's the first  
15 paragraph.

16           The second paragraph, "Thus, on  
17 the one hand, our meta-regression results provide a  
18 reasonable basis for predicting how average willing  
19 to pay varies broad changes in water quality." And  
20 note, they're saying it provides a reasonable basis.  
21 It can be used as the benefit transfer function, and  
22 they're saying that can be used as an benefit  
23 transfer function.

24           "On the other hand, some of the

1 main limitations of these models as benefit transfer  
2 tools for national policy analysis are a consequence  
3 of the variation of the willingness to pay that is  
4 not explained by the meta -- regressions. For  
5 example, our results provide very limited evidence  
6 about how willingness to pay is related to spatial  
7 characteristics of water quality changes."

8 I interpret that statement to say  
9 that they did not find anything significantly  
10 different between the areas that they were able to  
11 control for in their equation, but they're allowing,  
12 perhaps, there could have been that they weren't  
13 able to identify.

14 MR. ANDES: Dr. Boyle, let me ask  
15 you --

16 DR. BOYLE: Can I finish my answer.

17 MR. ANDES: Finish. Sure.

18 DR. BOYLE: And it says that  
19 meta-aggression does not measure willingness to pay  
20 with respect to the portion of the amount of waters  
21 that are approved or the distance to water quality  
22 changes from the population. This lack of  
23 specificity proposes limitations.

24 But in all of the studies, they

1 had people that were located a variety of distances  
2 away from the water bodies, and we're looking at  
3 different mixes. So I just don't see how that  
4 statement follows from the analysis that they've  
5 done.

6 MR. ANDES: So you'd disagree with  
7 their conclusion?

8 DR. BOYLE: I'm agreeing with some and  
9 disagreeing with others.

10 MR. ANDES: Okay. And they  
11 specifically said their regression did not measure  
12 how willingness to pay varies with proportion amount  
13 of waters improved or distance, so therefore they  
14 really couldn't make any conclusions about that. It  
15 sounds like you're making a conclusion saying you  
16 disagree with their interpretation of their own  
17 meta-analysis.

18 DR. BOYLE: I'm saying that there  
19 could be -- I'm not disagreeing that they didn't  
20 have a variable. There was not a variable in their  
21 equation. But there are a number of different  
22 interpretations that could be placed on that.

23 MR. ANDES: They said this lack of  
24 specificity and imposed limitations on precision.

1 You're saying that they shouldn't have concluded  
2 that, they should have concluded it wasn't a  
3 significant variable?

4 DR. BOYLE: Can you read that back to  
5 me, please?

6 (Whereupon, the record was read as  
7 requested.)

8 MR. ANDES: They're saying their  
9 results have a very limited evidence on spatial  
10 characteristics. Their regression didn't measure how  
11 one varies with respect to those factors, and that  
12 that lack of specificity imposed a limitation on  
13 precision of their transfer calculations. You're  
14 saying they shouldn't have concluded that, they  
15 should have concluded that spatial characteristics  
16 weren't a significant variable?

17 DR. BOYLE: That's the result of their  
18 analysis. You know --

19 MR. ANDES: That's not what they said.

20 DR. BOYLE: What?

21 MR. ANDES: I'm sorry. That's not  
22 what they said.

23 DR. BOYLE: I know. But if you look  
24 at their empirical results, if you go back to the

1 table on Page 219, Table 5, they did have variables  
2 that they included in that they were not able to --  
3 they were not statistically significant.

4 So there were things that they  
5 tested in their analysis, and I'm saying that this  
6 conclusion could be -- have been stated much more  
7 clearly and specifically to the empirical results of  
8 their analysis.

9 MR. ANDES: And which --

10 DR. BOYLE: Can I finish?

11 MR. ARMSTRONG: Can you please not cut  
12 my witness off?

13 MR. ANDES: Sorry. I thought you were  
14 done.

15 DR. BOYLE: When we did the  
16 uncertainty analysis, we used these equations that  
17 had these insignificant variables in them to see how  
18 turning them on a local water change in the Midwest  
19 would affect the benefit of that estimate. So we  
20 did take those into account in the uncertainty  
21 analysis to look at what the bounds might be.

22 MR. ANDES: You're saying the factor  
23 of being in the Midwest reflects spatial  
24 characteristics or distance of water quality changes



1 from the population?

2 DR. BOYLE: Well, there's some spatial  
3 characteristics. Distance from the population is a  
4 different variable. So there are variables in the  
5 equation that were insignificant that they could've  
6 made one speculation about. They -- you can always  
7 say that there are variables outside of your  
8 equation that might have an effect. We don't know  
9 what that effect would be if we included them.

10 MR. ANDES: They said specifically  
11 there were two things they did not measure in their  
12 regression. The proportion or amount of waters that  
13 are improved, and the distance of the water quality  
14 changes from populations did not measure. They said  
15 that these -- the regression did not measure how WTP  
16 varies with respect to those. Are you saying  
17 they're wrong, they did measure those?

18 DR. BOYLE: No. I'm saying those were  
19 the parts that were left out. What the effect of  
20 those would be is unknown.

21 MR. ANDES: Okay. So you're not  
22 saying that they looked at them and they were  
23 insignificant. You're agreeing with them, they did  
24 not look at those, and then they go on to say the

1 failure to look at those variables imposes  
2 limitation on the precision of their calculations.

3 DR. BOYLE: And I'm saying that they  
4 may have overstepped their bounds with that, because  
5 it's relevant to say that those should be  
6 investigated in future analysis to see whether they  
7 were -- would have an effect. It is not appropriate  
8 to jump to the conclusion that they would have  
9 affected the estimates.

10 I guess there's two other points  
11 here. One is that we're doing a total value study.  
12 We're not doing just a recreation demand study. And  
13 so if you're doing a recreation demand study, you  
14 know, how close you are to water affects the value  
15 that you have.

16 If you look at the studies that  
17 they did, used in their analysis -- I'm just trying  
18 to find it here -- they had studies that -- in there  
19 that have a mixture of these conditions that would  
20 be similar to the Chicago situation. For example,  
21 on Page 212, Table 2, is where they list all of the  
22 studies. Number five is the Gramlich study. And,  
23 you know, they had different scenarios in there.  
24 One was looking at improving water quality in the

1 Charles River in Boston, and then they also did a  
2 nationwide value.

3 But their value, looking at water  
4 quality in the Charles River, is very similar to  
5 looking at water quality in the CAWS. Austin has  
6 Austin Harbor right by other -- you know, another  
7 major water quality, just like Lake Michigan.

8 So I think, you know, trying to  
9 draw the inference that, you know, this is -- it's  
10 irrelevant because they didn't look at it, the  
11 studies that they have that are the basis -- the  
12 reason that a metal analysis is so good for this is  
13 it allows for the averaging and the inclusion of  
14 information from a variety of studies, rather than  
15 just one study that would be the extreme that you  
16 have of just having one lake, no substitutes along  
17 ways away, and another one having many and they're  
18 all close together.

19 MR. ANDES: Well, let's -- I have a  
20 question about that, and we'll go back to my initial  
21 question. First, as to the Gramlich study, which  
22 was one of the studies here, as I understand that,  
23 that looked at improving to a level clean enough for  
24 swimming. Am I right?

1 DR. BOYLE: And wildlife.

2 MR. ANDES: Right. Okay. That's  
3 different than improving to a level for canoeing and  
4 kayaking.

5 DR. BOYLE: But what Van Houtven was  
6 able to do with his colleagues is map that into the  
7 water quality index. The ten point water quality  
8 index is an index that has been around since the  
9 1970s. It's been developed by McCullen. I think  
10 Mr. Armstrong has that study to introduce into  
11 evidence.

12 But that is related to what USEPA  
13 has done for years using boatable, fishable, and  
14 swimable. So there are ways to map that back into  
15 that index. And so they were able to take the study  
16 with those changes and put them in the ten point  
17 index of water quality that's being used.

18 MR. ARMSTRONG: And I do have the  
19 McCullen study to introduce at this time as an  
20 exhibit.

21 MS. TIPSORD: I've been handed Water  
22 Quality Index Application in the Kansas River Basin  
23 from February, 1974, USEPA and Kansas City,  
24 Missouri. If there's no objection, we will mark

1 this as Exhibit 291. Seeing none, it's Exhibit 291.

2 And Mr. Andes, would it interrupt  
3 your flow too much if we took a couple minutes now?

4 MR. ANDES: I'm fine.

5 MS. TIPSORD: All right. If that's  
6 okay, we'll take a ten-minute break and come back.  
7 Grab a snack, and we'll go until at least 1:00  
8 o'clock before we break for lunch.

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

12 MS. TIPSORD: Mr. Andes?

13 MR. ANDES: Thank you. We may come  
14 back to the Van Houtven report for some other  
15 questions later, but let's move on.

16 MR. ARMSTRONG: I do have some  
17 follow-up questions on the Van Houtven study if  
18 you're going to be moving on right now.

19 MR. ANDES: Sure.

20 MR. ARMSTRONG: Thank you. In the  
21 context of the quoted language that we were just  
22 discussing, that was a call for additional research.  
23 Was that done?

24 DR. BOYLE: That is my interpretation

1 of it. At a previous section, there was  
2 implications for a benefit transfer, but this was  
3 conclusions and recommendations. It's typical in  
4 the studies of recommendations you make for  
5 research.

6 MR. ARMSTRONG: Are you aware of any  
7 additional research that has been conducted along  
8 the lines that we have discussed?

9 DR. BOYLE: Not to my knowledge at  
10 this point in time.

11 MR. ARMSTRONG: And the analysis  
12 methodology described in the Van Houtven study, is  
13 that accepted within your field?

14 DR. BOYLE: A benefit transfer is an  
15 accepted approach to estimated values, as is  
16 contingent evaluation, which was the study framework  
17 that was used for the underlying values, those 18  
18 studies. Those approaches are outlined in EPA's  
19 guidelines form conducting economic analysis. It  
20 provides the road map for how you do a benefit  
21 transfer, which we follow. It's also been admitted  
22 as evidence in court decisions.

23 MR. ARMSTRONG: Was the Van Houtven  
24 article specifically relied upon by any bodies

1 conducting benefit transfers that you're aware of?

2 DR. BOYLE: I believe there are some  
3 that have been done by USEPA where they have used  
4 the results of the Van Houtven study, but I don't  
5 have reports with me here today.

6 MR. ARMSTRONG: Thank you.

7 MS. TIPSORD: Mr. Andes?

8 MS. WILLIAMS: Are we going to still  
9 be on this study, Mr. Andes? Because I have a  
10 couple follow-ups on this article as well.

11 MR. ANDES: Sure.

12 MS. WILLIAMS: But if we're --

13 MS. TIPSORD: No, he was going to move  
14 on, so go ahead.

15 MS. WILLIAMS: Okay. I would just  
16 like -- I mean, I think, Dr. Boyle, I'm willing to  
17 accept, at face value, your testimony that this  
18 methodology is widely used and accepted, but I think  
19 it's something we may be a little bit unfamiliar  
20 with here, so I think some of the basic terms and  
21 concepts in this article could use a little bit  
22 further explanation.

23 And I believe on Page 214 of this  
24 article, Exhibit 290, there's a discussion of the

1 terms water quality index and water quality ladder.

2 Are you --

3 DR. BOYLE: Are you on Van Houtven?

4 MS. WILLIAMS: I hope so. Yes. It's  
5 214, Section 4.1, the water quality commodity. And  
6 I just wondered if you could help us a little bit to  
7 understand this terminology of water quality index  
8 and water quality ladder.

9 DR. BOYLE: And where exactly on the  
10 page are you so I can --

11 MS. WILLIAMS: The second paragraph.

12 DR. BOYLE: Okay. I'm just reading  
13 the paragraph --

14 MS. WILLIAMS: That's fine.

15 DR. BOYLE: -- and then I'll respond.

16 The term water quality ladder was  
17 terminology used by USEPA. It started in the early  
18 1980s, and it was moving water quality up  
19 thresholds. It was when they were doing their  
20 initial economic evaluations for the Clean Water  
21 Act, and so it was increasing it to boatable, to  
22 fishable, to swimable, to drinkable. And so that  
23 was, kind of, where the terminology ladder came  
24 from, because you're, kind of, going up rungs or



1 thresholds on water quality.

2           The index has all those physical  
3 measures of water quality that I mentioned before  
4 that go in to develop that ten point index. Those  
5 points, those thresholds of the water quality  
6 ladder, were mapped over to specific levels on the  
7 water quality index so that the two of them related  
8 to each other. But the ladder was the thresholds  
9 that USEPA was trying to meet with improvements of  
10 water quality as part of the Clean Water Act.

11           MS. WILLIAMS: So you articulated four  
12 rungs, I guess, of the ladder, boatable, fishable,  
13 swimable, and you added --

14           DR. BOYLE: Boatable and drinkable. I  
15 believe that my recollection is correct.

16           MS. WILLIAMS: So when you say  
17 fishable, do you understand what that rung of the  
18 ladder is intended to respond to?

19           DR. BOYLE: I don't have that  
20 information right here in front of me today to  
21 answer that question. I don't know whether it means  
22 free of fish consumption advisories or not. I would  
23 have to go back and check that. I don't have that  
24 right here today with me.

1 MS. WILLIAMS: Do you know if any of  
2 those rungs correspond to aquatic life uses?

3 DR. BOYLE: In the -- it was late  
4 1990s, early 2000s -- my dates are foggy in my mind,  
5 but I think it was late 1990s -- the EPA changed the  
6 ladder to include healthy aquatic ecosystems or  
7 aquatic life uses, and so that ladder, from what was  
8 referred to in here from the early studies, has been  
9 changed by USEPA, and so they have a different  
10 ladder of thresholds that they're using today.

11 MS. WILLIAMS: Can you also turn  
12 briefly to the Table 1 on Page 210 of this article?

13 DR. BOYLE: I'm there.

14 MS. WILLIAMS: I guess just generally,  
15 do you have an understanding of what the table is  
16 trying to explain for the reader?

17 DR. BOYLE: This is this table that we  
18 referred to, Table 1, Summary Statistics for U.S.  
19 Water Quality Evaluation Studies, is reviews of all  
20 the studies that Van Houtven and his colleagues were  
21 able to identify.

22 So whenever you do a  
23 meta-analysis, you go out near -- you try to  
24 identify all the studies that are in the literature.

1 So this is one that's -- the studies that they were  
2 able to identify, and that's the set that they  
3 started working from, down to the 18 that they  
4 actually used in their analysis, and so there's  
5 descriptions of these articles.

6 The first one here is -- whether  
7 it was published in a peer review journal, whether  
8 it was a Ph.D. or masters thesis, or some other  
9 thing, like a government report, year of  
10 publication, major characteristics of the studies  
11 are summarized here.

12 MS. WILLIAMS: And so some of the  
13 studies summarized here were not relied on?

14 DR. BOYLE: That is correct. The  
15 reason that they were not relied on is some of the  
16 studies, they were not able to map them into the  
17 water quality index. When economists go out and do  
18 these studies, they aren't necessarily always  
19 thinking that they're all going to go in and be able  
20 to merge together at the end. And so the way some  
21 of them were designed would not make them  
22 commensurate to be able to put them all together in  
23 a meta-analysis.

24 When you do a meta-analysis, you

1 want to have studies that essentially evaluation  
2 common items. You want it to apples and apples, not  
3 apples and oranges. So there's always some  
4 synthesizing and removing that you go down to get  
5 your useable set.

6 MS. WILLIAMS: The last item on that  
7 table is titled what are -- well, I assume WQ means  
8 water quality -- descriptor/indicator used?

9 DR. BOYLE: Yes.

10 MS. WILLIAMS: And then it lists five  
11 topics?

12 DR. BOYLE: Yes.

13 MS. WILLIAMS: And then provides  
14 information on number and percent. And could you  
15 just explain a little bit for us what -- how to read  
16 this table and what it means?

17 DR. BOYLE: This last one, the water  
18 quality descriptor, this would be a summary of how  
19 water quality was described to people in the  
20 original study. The first one would be -- is  
21 recreation, boatable, fishable, swimable. My  
22 interpretation of that is that they were using the  
23 old EPA ladder of going through thresholds.

24 The next one, rating, good --

1 poor, fair, good and excellent was a qualitative  
2 rating of water quality. Pollutant concentration  
3 would've been specific pollutants and the  
4 concentrations. Secchi depth are measurements of  
5 the amount of clarity in the water, and then fish  
6 consumption and advisory would be whether there was  
7 a fish consumption advisory and perhaps the type of  
8 fish consumption advisory. And the fish consumption  
9 advisories that are being done are perhaps on one  
10 meal a month, or women of childbearing age should  
11 not eat the fish. So it would be some type of fish  
12 consumption advisory with that.

13 MS. TIPSORD: Your voice is falling  
14 off again.

15 MS. WILLIAMS: So, for example,  
16 taking --

17 DR. BOYLE: Okay. I'm getting dry.  
18 Let me have a drink of water.

19 MS. WILLIAMS: So, for example, taking  
20 this last item, fish consumption advisory, the table  
21 then says publications, the number, so that means  
22 there were nine?

23 DR. BOYLE: There were nine studies.

24 MS. WILLIAMS: And percent of the

1 total would be ten?

2 DR. BOYLE: Ten, yes.

3 MS. WILLIAMS: What did the next two  
4 items mean?

5 DR. BOYLE: That means the next item  
6 is there were 31 estimates. That means that the  
7 nine studies presented 31 value estimates, or, you  
8 know, an average of three and a half value estimates  
9 per study. When you do these studies, you look at  
10 different scenarios, and you present values for them  
11 so that they don't just present one single value.

12 And then the last number was three  
13 percent. So these fish consumptions were ten  
14 percent of the studies, but only three percent of  
15 the value estimates reported. So these studies tend  
16 to report fewer value estimates than the other  
17 studies -- than other studies did, other types of  
18 studies.

19 MS. WILLIAMS: And so in looking at  
20 the pollutant concentration line, 51 percent of the  
21 value estimates were based on pollutant  
22 concentration?

23 DR. BOYLE: Fifty-one percent of the  
24 estimates were based on pollution concentrations,

1 yes.

2 MS. WILLIAMS: Okay. I think that  
3 helps me understand. That's all I have on the  
4 study.

5 MS. TIPSORD: Mr. Andes?

6 MR. ANDES: I'm going to skip a few  
7 questions I may come back to, but I think we've  
8 probably covered this --

9 DR. BOYLE: Can you just remind me  
10 where you are on the list?

11 MR. ANDES: I shall. We're on  
12 Question 24. Are you familiar with all of the  
13 studies surveyed by Van Houtven?

14 DR. BOYLE: I've read 15 of the  
15 studies before I did this benefit transfer, and then  
16 was able to subsequently review the other studies.

17 MR. ANDES: Okay. And your assessment  
18 of the quality of those various studies?

19 DR. BOYLE: They're all high-quality  
20 studies. They're done by well respected economists.  
21 They're published in peer review journals. Peer  
22 review is the highest scientific standard for grant  
23 proposals or scientific research, and they are  
24 dissertations, and dissertations receive substantial

1 scrutiny from the graduate committee. So these  
2 studies are meeting the highest quality standards.

3 MR. ANDES: Okay. I believe we've  
4 already answered 27. As to 28, I believe you talked  
5 about what reclamation district data were used in  
6 your confrontation, but let's go back to that. I  
7 want to be clear on which data were used.

8 DR. BOYLE: So we used data that we  
9 got from the Illinois EPA from the Metropolitan  
10 Water District sampling stations, and the data were  
11 from January 2004 through May 2007. They were  
12 sampling sites along the main stem of the Chicago  
13 River and below the confluence of the Cal Sag Canal.  
14 And the months of the year --

15 MR. ANDES: I'm sorry. Let me go back  
16 to that for a minute. From the main stem of the  
17 Chicago River, and from the ship canal below the  
18 confluence of the Cal Sag?

19 DR. BOYLE: Well, the confluence  
20 confluence of the Cal Sag. When we provide --

21 MR. ANDES: I just want to provide --

22 DR. BOYLE: Below the confluence and  
23 the Cal Sag the ship canal were excluded. I'm  
24 sorry. I misspoke.



1 MR. ANDES: Oh, oh, okay. So let's go  
2 back to -- what was in included?

3 DR. BOYLE: I can provide the -- when  
4 you get the spreadsheet, it has all the ones that  
5 we're doing. But they were mainly in the main stem  
6 of the Chicago River.

7 MR. ANDES: Okay. So they were mainly  
8 in the main stem of the Chicago River. You said the  
9 ship canal below the Cal Sag was --

10 DR. BOYLE: I can give you examples.  
11 The North Shore Channel at Touhy Avenue, the North  
12 Branch of the Chicago River at Wilson Avenue, the  
13 South Branch of the Chicago River at Madison Street.  
14 And so this, you know, goes down, and when you get  
15 that spreadsheet it will go through each sampling  
16 station where the data was taken from.

17 MS. WILLIAMS: Dr. Boyle, can you  
18 clarify to us how you're using the term main stem of  
19 the Chicago River? I think you may be using that  
20 terminology differently than we are in this  
21 proceeding.

22 DR. BOYLE: Yeah. I guess, perhaps, I  
23 misspoke, saying that the main stem -- it was, you  
24 know, the geographic sections of where it is here.

1 Those location descriptions are the ones that were  
2 in the data where they -- you know, it was provided  
3 for us. So it's, you know, the North Branch of the  
4 Chicago River or the South Branch of the Chicago  
5 River. I probably shouldn't have used the term main  
6 stem.

7 MS. WILLIAMS: Thank you.

8 MR. ANDES: So I heard the North Shore  
9 Channel at Touhy, the north branch of the river at  
10 Wilson, and the south branch --

11 DR. BOYLE: I can't go through all of  
12 these right now and give them to you, because  
13 they're color-coded in the spreadsheet, and this is  
14 black and white, and I can't -- without having that  
15 in front of me, I can't identify all of them from  
16 the different colors. But all of that information  
17 is in the electronic spreadsheet that we will  
18 provide to you and the Board.

19 MR. ANDES: And were you saying that  
20 there were -- is it your understanding that you  
21 covered all of the main segments of the CAWS, other  
22 than the ship canal below the Cal Sag Channel? Is  
23 that what you're saying?

24 DR. BOYLE: Not the Cal Sag Channel.

1 MR. ANDES: Not the Cal Sag Channel?

2 DR. BOYLE: Right.

3 MR. ANDES: Okay. How about the ship  
4 canal?

5 DR. BOYLE: The Cal Sag Ship Canal,  
6 that little section there? It would be easier if we  
7 have a map, per se, to see --

8 MR. ANDES: I didn't bring that.

9 DR. BOYLE: -- which section you're --

10 MS. WILLIAMS: You mean after last  
11 time you didn't bring your maps?

12 MR. ANDES: I thought you would bring  
13 yours.

14 MS. WILLIAMS: I'm not really sure if  
15 this map will help you, because it doesn't have all  
16 the --

17 DR. BOYLE: It looks like the same one  
18 here. Yeah, it's not the one that I saw that has  
19 all the sections marked on it.

20 MR. ANDES: We can determine it once  
21 we get the spreadsheet. I was just trying to  
22 understand what process was gone through to  
23 determine which data from which segments was  
24 considered.

1 DR. BOYLE: The segments that were  
2 considered were done in consultation with the  
3 information we got from Illinois EPA, and they were  
4 the monitoring stations that would be -- that would  
5 mesh the ambient flow below the treatment plants,  
6 and I -- you know, I -- when I go through here, I  
7 don't have all these different segments, you know,  
8 with the name changes. It's not memorized right now  
9 in my head. But you will be able to map each of  
10 those out when you get that information.

11 MR. ANDES: Okay. Okay. I was trying  
12 to understand why the Cal Sag would've been excluded  
13 since there's a treatment plant on that channel.  
14 But perhaps we'll have greater clarity when we see  
15 the spreadsheet. So that -- that may be a question  
16 we'll have more follow-up on after we've seen that.

17 Let me move on to Question 29.  
18 We've covered some of this, and I'll summarize the  
19 initial statement. We've talked about your use of  
20 numbers from Mr. Twait's testimony about reductions  
21 in fecal coliform levels in the treated discharge,  
22 and you've testified -- correct me if I'm wrong --  
23 that you used those values in your analysis?

24 DR. BOYLE: Yes.

1 MR. ANDES: Okay. And we've talked  
2 about how you translated that into improvements in  
3 water quality in the ambient waters. I'm not going  
4 to ask that question again.

5 Question C, did you consider the  
6 volume of the discharges from the plants compared to  
7 the total flow in the system?

8 DR. BOYLE: And what do you mean by  
9 volume? Are you talking about water volume or fecal  
10 coliform?

11 MR. ANDES: Water volume.

12 DR. BOYLE: What we looked at was the  
13 current fecal coliform. That's what goes into the  
14 current water quality index and the predicted  
15 change. Volume of water does not go into that water  
16 quality index.

17 MR. ANDES: Okay. We talked about the  
18 fact -- we've talked about our sources of the fecal  
19 coliform loadings, so I'll skip over Question D and  
20 E. I think we've asked and answered that one  
21 before.

22 On F, did you consider whether  
23 disinfection would result in decreased levels of  
24 total pathogens in the CAWS, rather than only fecal

1 coliform?

2 DR. BOYLE: I think I've already  
3 answered that, that pathogens were not one of the  
4 variables in the water quality index.

5 MR. ANDES: And correct me if I'm  
6 wrong, you did not assess whether disinfection would  
7 result in a decrease in risk or decrease in  
8 pathogenic illnesses?

9 DR. BOYLE: We did not look at risk or  
10 pathogenic illnesses.

11 MR. ANDES: On -- and we'll go to  
12 Question 30. On Page 8 of your testimony, you  
13 indicated that IEPA's estimated reduction in fecal  
14 coliform density at the treatment plant would result  
15 in a 0.7 improvement in the index value from 6.1 to  
16 6.8 out of ten. Is that correct?

17 DR. BOYLE: That's correct.

18 MR. ANDES: Okay. Is it your  
19 conclusion that a .7 increase in one of the nine  
20 measures of water quality is worth over a billion  
21 dollars?

22 DR. BOYLE: Yes, it is. And so that  
23 estimate is \$37 per household. You get to that  
24 billion dollars through aggregating across

1 households in time.

2 MR. ANDES: Now, let me ask a question  
3 on that, and we can go back to the Croke study.  
4 the -- let's see. I had that right in front of me a  
5 minute ago. Here it is. Here it is.

6 In the Croke study, which is the  
7 only one of the 18 in Van Houtven that concerned  
8 Cook County, and if we go to table two, which I  
9 believe is on Page 19, it looks as if willingness to  
10 pay from -- and we're looking at users for a  
11 moment -- the willingness to pay for being able to  
12 do outings was \$43. Outings and boating was another  
13 \$.67 cents. Outings, boating, and fishing was  
14 another about \$6.

15 Now, the -- if I'm right, the  
16 change in index from boating to boating and fishing  
17 is 2.6 points, from 2.5 to 5.1. So to a 2.6  
18 increase in the Croke study, people are willing to  
19 pay an extra \$6. So 2.6 points, \$6 they were  
20 willing to pay. You've got .6 points, and people  
21 willing to pay \$47. Can you explain the difference  
22 there?

23 DR. BOYLE: Well, there are several  
24 things. One, you have to consider is this was done

1 in the 1980s, so that that number needs to be  
2 brought up to current dollars, and so that would  
3 increase once you had adjusted for inflation.

4 But the other thing is that when  
5 you do a meta-analysis, you're bringing in the  
6 information from all of the studies. That's the  
7 reason that a meta-analysis is accurate. Some of  
8 them are going to have lower numbers, and some are  
9 going to have higher numbers, and the meta-analysis  
10 uses all that information to get the best estimate  
11 available.

12 MR. ANDES: But this is the one study  
13 that was done in Cook County with actual survey  
14 respondents. Wouldn't that make sense to you to be  
15 the most relevant?

16 DR. BOYLE: No. It is a relevant  
17 study, but it's not necessarily the most relevant.  
18 If I came in here and I just used the Croke study,  
19 you would've gone to the literature and found the  
20 literature that -- saying that doing a value  
21 transfer -- just taking one one study to another  
22 study is less reliable. You'd be asking me why I  
23 just used the Croke study.

24 MR. ANDES: Let's not speculate about



1 what I'd be asking. The question is for you.

2 DR. BOYLE: Okay. But what you want  
3 to do is you want that information that encompasses  
4 the information from all of the studies. And so  
5 you've got -- when you have variation of water  
6 quality across all of them, you get more information  
7 across the index, better gradation on the index, and  
8 you get a better estimate overall of what the change  
9 would be.

10 Any study that you have has error.  
11 It could be above or it could be below. And the  
12 meta-analysis smooths that error out to give you  
13 your average prediction, which has been shown to be  
14 the best type of benefit transfer.

15 MR. ANDES: But this study, the Croke  
16 study, which you acknowledge is of high quality,  
17 peer reviewed, high quality, just like the other  
18 studies, shows a radically different picture of  
19 asking Cook County residents what they would pay. A  
20 radically different picture than the picture you're  
21 painting through your meta-analysis.

22 So my question is: How do you  
23 explain that difference when this is asking the  
24 right population in questions about the value of

1 these various recreational activities, and their  
2 answer is radically different than yours?

3 DR. BOYLE: There can --

4 MR. ANDES: There's a much lower  
5 willingness to pay than you're concluding. I'm  
6 trying to understand the difference.

7 DR. BOYLE: And what I'm telling you  
8 is that each study has information to contribute.  
9 Each study has error associated with it. The Croke  
10 gives you one number. It isn't necessarily our best  
11 number. It is one number to you consider valid in  
12 your data. The process of doing it is to put  
13 together the information of all the studies with all  
14 the information that they have, and look at what  
15 that collective information provides is the best  
16 estimate.

17 MR. ANDES: And so you didn't weigh  
18 the one study as to this locality anymore than any  
19 other?

20 DR. BOYLE: No. There's no -- there  
21 hasn't been any practice of weighting a study like  
22 like that, more or less. There'd be no rule in  
23 terms of that weighting, other than some ad hoc rule  
24 of thumb. There's weighting that goes on in terms

1 of how many observations a study presents. You  
2 know, I guess there was a question earlier about how  
3 many value estimates were presented. You don't want  
4 one study to provide 100 value estimates and have  
5 another study provide two or three and have more  
6 weight than the analysis.

7 So Van Houtven looked at weighting  
8 in terms of number of observations. But there's no  
9 precedent for weighting individual studies more than  
10 another one, other than on the basis of observations  
11 that you can actually observe.

12 MR. ANDES: So you don't think this  
13 study is particularly relevant in engaging the  
14 willingness to pay of people in this area?

15 DR. BOYLE: I think it's relevant  
16 information, but I don't think it's the only piece  
17 of information.

18 MR. ANDES: And you're saying it's no  
19 more relevant than a study in Colorado, Iowa or  
20 Florida?

21 DR. BOYLE: Because there are  
22 different things that are done in different studies  
23 that help you understand the full range of how  
24 people value water quality. And, you know, the key

1 thing is mapping it back into that water quality  
2 index, and other studies are providing other  
3 information.

4 You know, if we talk about error,  
5 when you're talking about, you know, 300  
6 observations, that's not a lot of observations for a  
7 study like this. You know, some of the other  
8 studies have more observations, so there would be  
9 more accuracy in their estimate.

10 MR. ANDES: Oh, accuracy in looking at  
11 that population, not necessarily as relevant as this  
12 one, correct?

13 MR. ARMSTRONG: Objection. You've  
14 already asked him about the relevancy of this study  
15 relative to other studies. Asked and answered.

16 MS. TIPSORD: I would agree.

17 MR. ANDES: Okay. Let's move on to  
18 Question 31. On Page 8, in your testimony you state  
19 you used the value reflecting average household  
20 income for Cook County of \$62,488. Are you aware  
21 that in the Van Houtven paper it was stated that  
22 most studies report average or median annual income?

23 DR. BOYLE: I am. But the reason we  
24 use average income is if you go to Page 217 of the

1 Van Houtven article, Table 3, they define what they  
2 use for income in their equation. They have  
3 income -- it's average household income. And so we  
4 had to use the variable in the same metric as they  
5 use in the equation.

6 MR. ANDES: So just to clarify, so  
7 did -- if studies reported -- I'm trying to  
8 understand. If studies report a median household  
9 income, did Van Houtven not use the studies?

10 DR. BOYLE: I believe Van Houtven used  
11 an average for those areas. I don't have it right  
12 here in front of me. I think somewhere in the  
13 article, he does say that they used census data to  
14 apply the average if it was not available in the  
15 study.

16 MR. ANDES: Okay. So if a study -- so  
17 if a study reported a median, he went outside the  
18 study and used the averages instead?

19 DR. BOYLE: I believe that's correct.  
20 I don't have that right here in front of me, but I  
21 believe that's correct. You need to measure all the  
22 variables in the same units. You could not have a  
23 variable where some observations are medians and  
24 some are averages. There's no precedent in the

1 literature for using medians or means. You could  
2 use the average, mean, or you could use the median,  
3 as long as you used one consistently.

4 Usually the median is smaller than  
5 the mean, and what happens is if you use the median,  
6 the coefficient estimate that you'd get would be  
7 larger because of the reduction from the average to  
8 the mean. You'd both get, essentially, the same  
9 result whichever way you go. So there's no  
10 precedent that says you should use one or the other  
11 in an economic analysis.

12 MR. ANDES: Okay. Let's move on to  
13 Question 32. I believe we've answered parts A and  
14 B. What categories of use were defined in the Croke  
15 study in which use was predominant?

16 DR. BOYLE: I think we've already been  
17 there on this one, and I agreed with you that there  
18 was outings, boating, and fishing cited in the  
19 study, but they didn't present any data that --  
20 other than their own assertion about what those were  
21 for the activities, the predominant one.

22 MR. ANDES: Okay. But what they said  
23 was that outings were predominant, correct?

24 DR. BOYLE: I think so. Can you show

1 me the exact quote that you're referring to?

2 MR. ANDES: I'm looking for that now.

3 I don't have a page number. The fourth page under  
4 definition of water quality, the third paragraph. I  
5 think we have touched on this issue before, so I  
6 don't think we have to go back in terms of your  
7 statement on that.

8 Is it your understanding from  
9 reading the report that their focus, in terms of  
10 outings, was mainly on removing odors and debris?

11 DR. BOYLE: I'm sorry. I was looking  
12 at the wrong sheet there. I'm trying to find the  
13 specific words, but I believe that it was how  
14 changes and odors and debris would affect outings,  
15 outings and boating, and outings, boating, and  
16 fishing.

17 MR. ANDES: Okay. And you don't have  
18 any basis for believing disinfection if the three  
19 treatment plants would change odors or debris?

20 DR. BOYLE: I was not asked to make  
21 any evaluation on that. I was asked to look at  
22 changes of fecal coliform.

23 MR. ANDES: Okay. I'm going to skip a  
24 couple of questions I don't think we'll be coming

1 back to, and we'll go to 35. On Page 9, you  
2 indicate that you assigned this variable, and this  
3 was the year in which the study was published in  
4 1973. "I assigned this variable a value of 27,  
5 which reflects the date of the most recent study  
6 from 2000 from the 18 studies used in the  
7 meta-analysis."

8 Is it correct that the date of the  
9 most recent study in the Van Houtven paper was 2003,  
10 not 2000?

11 DR. BOYLE: It's correct that the most  
12 recent study was published in 2003. But if you look  
13 at the definition of a variable, Page 217, Table 3,  
14 second to the last line, the study here in '73, it  
15 says year SP survey was fielded, minus 1973. And so  
16 that's not when the study was published, that was  
17 when the data collection was actually conducted. It  
18 takes a couple of years to collect your data,  
19 analyze it, write it up, and get it published. So  
20 there's a delay between when data is collected and  
21 the study is fielded.

22 If you go down to Table 4 at the  
23 bottom of the page, second line on the bottom,  
24 you'll see that the maximum value over on the



1 right-hand-side is 27. So if you take the 73 and  
2 you add 27 to it, 2000 is the year that the most  
3 recent study was fielded. So they use the year the  
4 study was fielded, not the publication date.

5 MR. ANDES: Okay. Because your  
6 testimony on Page 9 says the variable reflects the  
7 year in which the study that produced the economic  
8 benefit was published.

9 DR. BOYLE: If I did, that's a mistake  
10 on my part. That's a mistake on my part. It's the  
11 year the study was fielded, and that's what we used  
12 in our analysis.

13 DR. BOYLE: So you used that  
14 consistently?

15 DR. BOYLE: We did.

16 MR. ANDES: So for each study, you  
17 went back and checked -- I assume the publication  
18 takes a while with all of these studies?

19 DR. BOYLE: We didn't go back and look  
20 at all studies. We used the year of the most recent  
21 study in the prediction. We didn't predict a value  
22 for each study. We used an overall prediction. The  
23 methods have been improving over time, and so we  
24 took the most recent study because it would have the

1 most up to date methods involved in it. So that's  
2 another quality indicator. So we were looking at  
3 what year the most recent study had been conducted.  
4 So that would've been 2000.

5 MR. ANDES: Okay. Moving on to the  
6 next question, isn't a result of the Van Houtven  
7 meta-analysis that a one unit increase in water  
8 quality had an average benefit of \$14?

9 DR. BOYLE: No. This is where you're  
10 looking at -- you're trying to treat this as a total  
11 evaluation equation versus a marginal. What this is  
12 is an equation that predicts the marginal. You're  
13 just looking at the contribution of that that has  
14 the change in water quality, but all those other  
15 variables in the equation affect what that margin or  
16 value is, and you have to turn on all of those  
17 variables to get it, and you're just focusing on the  
18 water quality one.

19 MR. ANDES: Well, on Page 221 of the  
20 Van Houtven paper, it says the results of the linear  
21 specifications -- this is in the last full  
22 paragraph. The results of the linear specification  
23 suggests that each unit increase on the WQI ten  
24 scale that includes a recreational use description

1 increases willingness to pay by an average of \$14.

2 DR. BOYLE: That's correct. They are  
3 just talking about the derivative -- taking the  
4 mathematical derivative of one variable in the  
5 equation and what that contributes. So if I looked  
6 at it, that's one part of it. But you have to look  
7 at the affects of all variables in the equation.

8 So they're just talking about the  
9 interpretation of the coefficient on that, not what  
10 the effect would be on your left-hand-side or your  
11 dependant variable, but all of those variables are  
12 explaining. This is something that we -- you know,  
13 we go over in a basic economics class all the time,  
14 marginal versus total. This is a marginal value  
15 equation. You have that marginal value equation.  
16 This is the contribution in terms of just the water  
17 quality variable, but those other things affect what  
18 the value is, and you need to have assigned values  
19 to all of them.

20 MR. ANDES: But the main change we're  
21 talking about here is in water quality.

22 DR. BOYLE: But you have to do the  
23 math correctly. You have to use the equation  
24 correctly.

1 MR. ANDES: Right. And no reason to  
2 think they didn't use the equation correctly, right?

3 DR. BOYLE: But you're taking their  
4 statement out of context. They're taking that  
5 coefficient and giving the reader an understanding  
6 for what that one coefficient in the understanding  
7 means in terms of dollars. You need to have  
8 assigned variables to all the variables in their  
9 equation.

10 If you go back there to page,  
11 let's say, 219, where they report all of their  
12 equations, you can't just pull out one variable from  
13 one of those equations and say this is the total  
14 answer. Each of those variables -- when you  
15 estimate an equation, you have a dependant variable,  
16 which you're trying to explain, and then you have  
17 independent variables that explain the variation.  
18 Our dependant variable is the value that the public  
19 place on the marginal change of water quality.

20 When you do that, you're going to  
21 use all the variables that you have on the  
22 right-hand-side. You're picking on this because it  
23 happens to be a linear specification, and you can  
24 separate them out and look at the effects one at a

1 time, but that doesn't mean you ignore those other  
2 variables.

3 MR. ANDES: But one would expect this  
4 would be the most important variable is change in  
5 water quality, whereas they show a one unit  
6 increase, increase in willingness to pay about \$14,  
7 you have a .6 increase, increasing willingness to  
8 pay by \$47.

9 DR. BOYLE: That's because the \$47  
10 accounts for all of the other variables in their  
11 equation. If you go to, let's say, where they --  
12 Section 8, where they're looking at the implications  
13 for a benefit transfer, and you go to the end of it  
14 where they're doing their validity assessment, they  
15 say our parsimonious -- this is Page 224, the top of  
16 the page. It's an incomplete paragraph, about  
17 halfway down. The line on the left starts out "To  
18 fishable increment."

19 It says, " our parsimonious linear  
20 meta-regression equation predicts average  
21 willingness to pay of \$111 and \$113." And so  
22 they're using their whole equation when they do it  
23 to predict out those numbers. That's that validity  
24 that they do to compare to the Carson and Mitchell

1 study.

2 So whenever you're writing an  
3 article, you go through and you do something to  
4 explain the affect of individual variables, but then  
5 you need to use the whole equation in what you're  
6 doing. So the \$14 that they're talking about is  
7 with respect to the individual variable, but when  
8 they came back and they want to look at that  
9 marginal value for change, they use all the  
10 variables in the equation, and you can see that they  
11 came up with something that's quite a bit different.

12 MR. ARMSTRONG: Could you please  
13 explain what a marginal change means?

14 DR. BOYLE: A marginal change means  
15 how much people would pay for a change in water  
16 quality going from, you know, 6.1 on the scale to  
17 6.8, versus the value if you just have it -- of how  
18 much would the water quality of 6.58 be. That's,  
19 kind of, a total value for that. The marginal is  
20 just the change, and then there are other factors  
21 that affect this equation.

22 MR. ANDES: Okay. And is that -- let  
23 me ask you, in looking at those numbers, quoting on  
24 224, are those with respect to people's willingness

1 to pay -- is that based on Carson and Mitchell in  
2 terms of willingness to pay for improvement of water  
3 quality across the U.S.?

4 DR. BOYLE: Those are predictions  
5 for -- to compare to Mitchell and Carson across the  
6 U.S.

7 MR. ANDES: So asking someone what  
8 would you pay for improved water quality, generally,  
9 not as to what you would pay for improvement of  
10 water quality on a particular water body, correct?

11 DR. BOYLE: That is for all surface  
12 water bodies in the U.S. prediction.

13 MR. ANDES: Okay. So it's not -- it's  
14 not an estimate of if we took this particular water  
15 body and improved water quality, what would you be  
16 willing to pay for that. That's not what we're  
17 getting at in these numbers.

18 DR. BOYLE: No, because they're trying  
19 to compare to Carson and Mitchell.

20 MR. ANDES: Which is a national --  
21 what would people be willing to pay for better water  
22 quality across the country?

23 DR. BOYLE: Yes.

24 MR. ANDES: Okay.

1 MR. ARMSTRONG: In the context of this  
2 article, why were they trying to compare the results  
3 to the Carson Mitchell transfer function?

4 DR. BOYLE: Because the Carson and  
5 Mitchell study is the study that's used most often  
6 by EPA. And whenever you do something and you want  
7 to do a validity analysis -- this is called  
8 convergent validity -- and if you can get two  
9 studies to predict out similar values, then you  
10 would assume that it's valid. So they picked what  
11 has been commonly used in policy to see how their  
12 meta-analysis did, and they found out it worked  
13 well.

14 When they talked about issues or  
15 implications for benefit transfer policy and  
16 analysis, they said a key issue is always whether  
17 the estimate equations can provide a reliable  
18 benefit transfer functions for predicting  
19 willingness to pay for specified water quality  
20 changes, and then over here they find that the  
21 linear meta-regression equation there estimates  
22 similar to Carson and Mitchell.

23 And I think back to what we talked  
24 about, those paragraphs you had before, that led to



1 their conclusion, that our meta-analysis results  
2 provide a reasonable basis of predicting how average  
3 water quality varies.

4 MS. TIPSORD: Let's go ahead and  
5 continue.

6 MR. ANDES: So the \$111 dollars, for  
7 example, is if you ask someone if you want to  
8 improve water quality across the U.S. from fishable  
9 all the way to swimable, what would you pay, and  
10 they would say \$111. Is that a good way to  
11 summarize it?

12 DR. BOYLE: That's what they're trying  
13 to predict, yes.

14 MR. ANDES: So the amount someone  
15 might be willing to pay to make an incremental  
16 change in fecal coliform for a particular water  
17 body, not all the way to swimable, might be -- would  
18 probably be somewhat less than that?

19 DR. BOYLE: Yeah. We came up with a  
20 number of 47, so it's less than that number.

21 MR. ANDES: Okay.

22 MS. TIPSORD: I think it's going to  
23 get -- start getting very difficult to hear. Let's  
24 take a lunch break and come back about five after

1 2:00. This all should be over by then.

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

5 MS. TIPSORD: Mr. Armstrong has handed  
6 me a couple more exhibits. Do you want to explain  
7 what these are?

8 MR. ARMSTRONG: Sure. These are in  
9 response to the Illinois EPA's pre-filed question  
10 No. 13 asking for some guidance documents that were  
11 listed in Dr. Boyle's pre-filed testimony, and those  
12 two documents are the O and B 2003 guidance on  
13 development of regulatory analysis, and USEPA's 2000  
14 guidelines for preparing an economic analyses.

15 MS. TIPSORD: And circular A4, is that  
16 the O and B document you referred to?

17 MR. ARMSTRONG: Yes.

18 MS. TIPSORD: I have circular A4,  
19 September 17th, 2003, to the heads of executive  
20 agencies and establishments. If there's no  
21 objection, I'm going to mark that as Exhibit 293.  
22 Seeing none, it's 293.

23 And the document, which I have,  
24 Chapter 1 Introduction Background to the Guidelines

1 for Performing Economic Analyses, I will mark that  
2 as Exhibit Number 292 if there's no objection.  
3 Seeing none, it's Exhibit 292.

4 MR. ARMSTRONG: I believe the 2000  
5 guidelines includes all chapters of the guidelines.

6 MS. TIPSORD: Okay.

7 MR. ARMSTRONG: There's multiple  
8 chapters in there.

9 MS. TIPSORD: Okay. The cover page,  
10 then, is the Chapter 1?

11 MR. ARMSTRONG: Yes.

12 MS. TIPSORD: Okay. Great. And then  
13 also while we're waiting for -- we can do this off  
14 the record.

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

17 MS. TIPSORD: Mr. Andes, if you would  
18 like to continue.

19 MR. ANDES: Sure. Let's go to  
20 Question No. 39. Can you explain if we go to  
21 Page 58 of your testimony, the first line of the  
22 table, what that variable is about?

23 DR. BOYLE: So on Page 58 is a table,  
24 and what this table represents is the variables --

1 coefficients on the variables from the Van Houtven  
2 meta-analysis that you used in the benefit transfer,  
3 the value that we assigned to each of those  
4 variables to use that equation to compute the  
5 effect, and then the product of those two variables  
6 is the third column, and the sum of those is the  
7 number that's in the bottom of the right-hand  
8 column.

9                   The first row is the change in the  
10 water quality index. The coefficient on that is  
11 4.44. The assigned value for the change of fecal  
12 coliform that we talked about of the index is .7,  
13 and the product of those two is 3.11.

14                   MR. ANDES: So that line represents  
15 the benefit of a .7 unit increase in the water  
16 quality index?

17                   DR. BOYLE: No. That's just from that  
18 variable. The benefit is \$57 at the bottom. This  
19 is a linear equation of the marginal value. Each  
20 one of those variables enters separately, and you  
21 have to take the effect of all of them to get the  
22 full margin of value.

23                   MR. ANDES: And what does that  
24 specific function represent?

1 DR. BOYLE: That is the Van Houtven  
2 meta-analysis that they used to analyze the  
3 differences in the 18 studies that they based their  
4 study on.

5 MR. ANDES: Now, the first variable  
6 represents change in the water quality index,  
7 correct?

8 DR. BOYLE: Yes.

9 MR. ANDES: A .7 change in the water  
10 quality index?

11 DR. BOYLE: Yes.

12 MR. ANDES: So that aspect of your  
13 calculation, the marginal change in the water  
14 quality index for the water body results in a number  
15 of 3.11?

16 DR. BOYLE: Correct.

17 MR. ANDES: Or \$3.11, right?

18 DR. BOYLE: Correct.

19 MR. ANDES: Okay. Now, the second  
20 line of the table, am I correct that shows the  
21 increase -- that shows the value based on the change  
22 in water quality index, assuming there's also a  
23 recreational benefit?

24 DR. BOYLE: Assuming that -- what this

1 is is studies that told respondents about recreation  
2 uses of the water, and 47.6 percent and 48 percent  
3 of those studies told respondents about the  
4 recreation use of the water. And so we use that  
5 value in the meta-analysis. That's conservative.  
6 If I was going to do an original study of the CAWS,  
7 I would have told people about the recreational  
8 uses, and that would've resulted in a higher value.  
9 But what we did is since we haven't done a study  
10 there, we took the average of the studies that  
11 composed the meta-analysis.

12 MR. ANDES: So that's based on whether  
13 you would tell the people that there was a  
14 recreational benefit?

15 DR. BOYLE: Not whether you tell them  
16 it's a recreational benefit, whether you told them  
17 about recreational use of the water.

18 MR. ANDES: So in 47.6 percent of the  
19 studies, people were told about recreational uses of  
20 the waters?

21 DR. BOYLE: Correct.

22 MR. ANDES: Okay. And then you add --  
23 if you added together that dollar amount and the  
24 dollar amount for the change in water quality index,

1 you get a total of \$8.06?

2 DR. BOYLE: For those two variables,  
3 yes.

4 MR. ANDES: And can you explain the  
5 third variable to me?

6 DR. BOYLE: The third variable is the  
7 affect of the current ambient water quality  
8 coefficient estimated there by Van Houtven as 1.93.  
9 The assigned value that was computed for the index  
10 is 6.1 -- and we discussed that this morning -- and  
11 the product of those two is 11.77.

12 MR. ANDES: So that's based on what  
13 people are willing to pay to retain the current  
14 water quality status?

15 DR. BOYLE: No. What that says is  
16 this -- remember, this is a margin. You're trying  
17 to switch it back to a total value. This is  
18 marginal, and it says that the marginal value  
19 depends on what the base is that you're starting.  
20 You've got to remember, this equation, the value  
21 that you're predicting, is the marginal value, and  
22 all of these variables are variables that affect  
23 that margin of value. And so what it's saying is  
24 that if the basis is 6.1, it's adding \$11.77 to the

1 value of the marginal change.

2 MR. ANDES: So if the -- if the base  
3 water quality status is higher, this number will go  
4 up?

5 DR. BOYLE: That's what they found.

6 MR. ARMSTRONG: Dr. Boyle, does that  
7 mean that as water quality increases people would  
8 then apparently be more willing to pay for increases  
9 in water quality?

10 Let me rephrase that. If you have  
11 a very low quality stream or waterway, a specific  
12 increase in water quality would be valued less there  
13 than in a water body that was of a higher base  
14 quality?

15 DR. BOYLE: A marginal change would be  
16 valued higher. That's what their results said, yes.

17 MR. ANDES: Doesn't -- isn't that  
18 exactly the opposite of what Croke said as to Cook  
19 County, where they said that people were more  
20 willing to pay for -- to get water quality to a  
21 basic level but less willing to pay after that?

22 DR. BOYLE: Well, Croke had different  
23 marginal values. Croke did not have a baseline  
24 variable that they had. So you can't make a direct



1 one to one comparison there. They don't have a  
2 variable that -- you know, they give you the values  
3 that they estimated. They don't have an equation  
4 that tells you how those values might change if the  
5 baseline as different.

6 MR. ANDES: Well, but in Table 1 and  
7 Table 2 of the Croke study, they seem to indicate  
8 that people are willing to pay \$33 to improve water  
9 quality for outings, but then to move it to the next  
10 step with boating, another \$4 dollars, boating and  
11 fishing another \$8, and I believe there's a  
12 conclusion at the end, indicating that, in fact,  
13 people are more willing -- and this really goes  
14 toward the last paragraph, I believe -- they talk  
15 about getting out of water quality, and that  
16 accounts for two-thirds of the total benefits. So  
17 people are willing to pay for the initial  
18 improvements to get it up to a minimum level, but  
19 after that less willing to pay?

20 DR. BOYLE: Can you just tell me where  
21 you're reading? You mentioned the tables, but I  
22 don't know where you are in the text.

23 MR. ANDES: I'm sorry. The tables are  
24 Table 1 and Table 2. Those are Pages 18 and 19.

1 Let's talk about those numbers. It says in the  
2 first paragraph on 18, the mean household value for  
3 a river system with outing quality water is \$33, but  
4 \$4 dollars for yearend recreational value is added  
5 by raising water quality to support boating.

6 The next increment in value  
7 achieved by permitting the rivers to support fishing  
8 is about \$8. That would seem to say that the  
9 greater willingness to pay is when you're trying to  
10 get the water body up to levels that allow some  
11 minimal level of activity, and it's smaller, less  
12 willingness to pay after that, for the margins.

13 DR. BOYLE: Well, there's two things.  
14 One is we're talking about the baseline, and the  
15 baseline is not defined here. They are finding a  
16 value that the margin of value goes down as you go  
17 up. But you've got to take in the whole effect  
18 here, and you got to take in the first variable that  
19 we talked about, the water quality change, change of  
20 recreational use, and base.

21 What the Croke study is reporting  
22 here is a nonlinear function where it is declining.  
23 The Van Houtven equation is a linear equation, and  
24 when they did their validity analysis, they found

1 that they had a higher validity of using the linear  
2 equation to predict out changes than they do the  
3 nonlinear one. And so values just increase linearly  
4 in the Van Houtven equation that we used, and that's  
5 one of the reasons that you use a benefit transfer  
6 function when you do it like a meta-analysis,  
7 because it's different results from different  
8 studies, and you use that information collectively  
9 to find out what the best prediction is.

10 MR. ANDES: Have you assessed or are  
11 you aware of Van Houtven assessing why the results  
12 of the Croke study seem opposed to the results of  
13 other studies? Apparently if they are all put  
14 together by Van Houtven and other studies said  
15 something different, do we have any understanding of  
16 why, in Cook County, this was the way things came  
17 out in the survey, but other water bodies gave a  
18 different result?

19 DR. BOYLE: I do not know of any  
20 analysis that anyone has done to compare why the  
21 Croke study is different in terms of that  
22 relationship when you look at the results overall.

23 MR. ANDES: Okay. I believe that  
24 Question 43 is modified somewhat by the couple of

1 lines that were inadvertently deleted. Can we go  
2 back to that for a minute so we can understand what  
3 was deleted on Page 9? Because our questions  
4 related to that -- making sense of that statement.

5 DR. BOYLE: I can't explain exactly  
6 how this -- how this came about, but the statement  
7 did read, "I used a linear equation model where all  
8 variables are statistically significant to compute  
9 the household economic benefit." And there were --  
10 originally there were, when we were putting  
11 together, there were several sentences there in the  
12 editing that's what ended up.

13 But what I was referring to is in  
14 the Van Houtven paper, they estimated -- this is  
15 Table 5, Page 219. They estimated six equations.  
16 They estimated a linear equation, a semilog  
17 equation, and a log linear equation. And for each  
18 of those three equations, they estimated what they  
19 call a full and a restricted, and the restricted  
20 excluded a set of variables that were insignificant.

21 And what I was trying to say is  
22 that I had excluded those variables that were  
23 insignificant in using the linear restriction. The  
24 reason I chose that equation is that was the

1 equation that Van Houtven and his colleagues showed  
2 was valid in their comparison with the Mitchell and  
3 Carson study results that we talked about this  
4 morning.

5 MS. TIPSORD: Excuse me. Dr. Lin, you  
6 have a follow-up.

7 DR. LIN: I have follow-up on  
8 Questions 59 and 41. Would variable coefficient --

9 DR. BOYLE: I can't hear.

10 DR. LIN: The variable coefficient on  
11 Page 58, are those values subjected by you, or did  
12 you look in other studies?

13 DR. BOYLE: The available coefficients  
14 were estimated by Van Houtven based on the 18 other  
15 studies.

16 DR. LIN: Oh, I see.

17 DR. BOYLE: Those are the ones that  
18 were taken from this table in Van Houtven I was just  
19 talking about, and I was explaining why we chose  
20 that equation that the coefficients are repeated  
21 here.

22 MR. LIN: Okay. On Page 57, Column 2,  
23 on Page 58, Column 3, are almost exactly the same  
24 except the second variable. One is .68 and one

1 is .76.

2 DR. BOYLE: Okay. The second  
3 variable, if we --

4 MR. ANDES: Well, in 58, isn't that  
5 just the product of the two factors? I believe 58  
6 is --

7 DR. BOYLE: I'm just double checking  
8 before I answer. But yes, four, six, and seven  
9 should be --

10 MR. ANDES: .7 times .68 would be .76,  
11 I think.

12 DR. BOYLE: Yes, that's correct.

13 MR. ANDES: I think on Page 58 that  
14 second value is the product of the first two factors  
15 on Page 7 of 57. I think that's why they differ.

16 DR. LIN: On Page 57 it's .68. On  
17 Page 58 it's .76.

18 DR. BOYLE: Yeah. They are the  
19 product, because it's -- as you see on Page 58, in  
20 the left-hand column, you got WQI ten change, the  
21 first variable, times WQ recreation of use, and then  
22 that's multiplied. So you got .7 times .68 to give  
23 you the .76 and I should correct my testimony,  
24 because I said .67 was a percentage that mentioned

1 -- it's actually .68, and .476 is the product of it.  
2 So thank you for catching me on that.

3 MR. ANDES: So let's go back for a  
4 moment to -- now that we have a sense of those  
5 numbers, let's go back to Page 58 for a second and  
6 Question 42. If you were to use this equation  
7 benefit when there's no water quality improvement --  
8 let's assume for a moment there's no water quality  
9 improvement. So the value in Column 2 for the first  
10 variable would be zero. The value for the second  
11 variable in Column 2 would be zero, so then the  
12 products in Column 3 would be zero. So you take  
13 away \$8.06, you still have \$48.94 left of a benefit,  
14 even though there's no change in water quality.

15 DR. BOYLE: That's math that you can  
16 do. But again, you're using the equation wrong.  
17 The equation was not estimated for any situation  
18 where there was no change in water quality, and that  
19 would not make sense. Somebody's not going to give  
20 you a margin of value if there's no change in water  
21 quality.

22 So you take out -- you take a  
23 value of zero that's outside the data for which the  
24 equation was an estimate, and it just doesn't apply.

1 This is only used for data where there is a change  
2 in water quality.

3 MR. ANDES: It can only be used in  
4 that situation?

5 DR. BOYLE: That's what the data was.  
6 It was not used with any data or if there was no  
7 change in water quality.

8 MR. ANDES: But I'm saying what if you  
9 did?

10 DR. BOYLE: It would be an  
11 inappropriate use of the equation. Whenever you do  
12 an analysis like this, you have to consider the data  
13 with which the equation is estimated. You can  
14 always do mathematical manipulations beyond it, but  
15 this equation was estimated just when there were  
16 changes in water quality in the value.

17 MR. ANDES: But that --

18 DR. BOYLE: To go to zero would be  
19 going outside in that range, and it is not a correct  
20 use of the equation.

21 MR. ANDES: Can you find where in Van  
22 Houtven it indicates that you cannot apply this to a  
23 situation where there's no water quality improvement?

24 DR. BOYLE: I can, but it's so common



1 understanding to myself and my peers, I don't think  
2 any of us would ever bother putting in that little  
3 tidbit. You know, you're writing for your peers.  
4 They understand what you've used.

5 MR. ANDES: Well, but the question is,  
6 say -- okay. Let's say there's a really, really  
7 small increase in water quality -- a timing increase  
8 in water quality. And yet, under this system,  
9 you're going to add \$48 onto whatever increase in  
10 water quality there is. It can be, you know, an  
11 infinite decimal, .0001 and .0001, which would even  
12 be multiplied out, and then you have little values  
13 in the first two variables, and \$48 to the rest of  
14 them.

15 So you're pretty much guaranteed  
16 that the benefits always going to be at least \$48.  
17 How does that not -- let's say there's a very slight  
18 increment in water quality, it's still going to have  
19 a \$48 benefit.

20 DR. BOYLE: But once again, you're  
21 confusing a total and a marginal, okay? And when  
22 you have a total value equation, what the total  
23 value would be, you would want -- you would take a  
24 derivative of that, the first derivative, to find

1 out what the effect would be. You'd get the --  
2 you'd have to have water quality in there so that  
3 that comes out, but there can also be a constant  
4 with other variables, and the total value equation  
5 would be multiplied by water quality, the derivative  
6 of a single variable with the exponent or anything  
7 would be one, and you have a constant that falls out  
8 of there.

9                   And that's what happens in this  
10 marginal value equation, is there's a constant for  
11 these other factors that affect water quality, and  
12 they are -- you're right. There is a specific  
13 amount that you add in, but it's because you've got  
14 a marginal value where you've taken a derivative of  
15 your total value function. And so you can play  
16 these little games with the equation, but it's an  
17 incorrect use of it.

18                   MR. ANDES: Where -- so it's incorrect  
19 to add these up based on a smaller increment of  
20 water quality?

21                   DR. BOYLE: No. That's what I'm  
22 saying. Adding them up is the correct thing to do.  
23 The incorrect thing to do is ignore the other  
24 relevant variables that are in the equation.

1 MR. ANDES: We're not asking you to.

2 DR. BOYLE: Sure you are. You're  
3 asking me to make them zero.

4 MR. ANDES: How do the other variables  
5 change if the water quality impact is lower?

6 DR. BOYLE: In the marginal equation,  
7 they stay the same. They don't change with it. In  
8 the total value equation, they would be multiplied  
9 times water quality, and so that interaction would  
10 cause it to go up and down. But the marginal one,  
11 there is this fixed amount, the constant in the  
12 derivative, that affects what the value is that  
13 people place on it.

14 MR. ANDES: So I'm asking about the  
15 marginal. In 57, if we're talking about willingness  
16 to pay \$57 for disinfection for the marginal  
17 increase in water quality due to disinfection --

18 DR. BOYLE: Fifty-seven is the  
19 marginal value.

20 MR. ANDES: Right. And if the  
21 increment in water quality is lower, it sounds like  
22 that makes a small change in that \$57. So even if  
23 you have a tiny change in water quality, you're  
24 still going to have, like, a \$50 willingness to pay?

1 DR. BOYLE: Right, because changes in  
2 water quality are very important to people.

3 MR. ANDES: Even if they're tiny,  
4 tiny, tiny changes?

5 DR. BOYLE: Yes.

6 MR. ANDES: And it's pretty much the  
7 same willingness to pay, about \$50, as a more  
8 significant increase in water quality that you  
9 assume from disinfection. It's, sort of, between  
10 about \$50 and \$57, and it really -- people are just  
11 as willing to pay for a tiny, tiny change in the  
12 water quality as they are in what they might view as  
13 a significant change in water quality?

14 DR. BOYLE: You're loading the  
15 question with lots of words here.

16 MR. ANDES: I'm a lawyer.

17 DR. BOYLE: If you go back to Van  
18 Houtven, and you look at their data -- I'm talking  
19 about Table 4 on Page 217 -- the second row is the  
20 water quality index change. The minimum value of  
21 that is one, and the maximum value of that is 8.9.  
22 And so, you know, those are the ranges that they  
23 looked at when they were doing it.

24 You know, if you -- if you tried

1 to take that value, you know, down to zero, keep  
2 letting it get lower and lower and lower, but not  
3 making it be zero, you're doing the same thing as  
4 making it zero, and that's not occurring to use of  
5 the equation.

6 MR. ANDES: So if we're making it  
7 really small, that's the same as zero?

8 DR. BOYLE: That's what I'm hearing  
9 you say. You keep saying very, very small. And so  
10 to me, in a mathematical sense, that's when you  
11 have -- when something is coming down -- you know,  
12 if this is zero and you keep bringing it down, this  
13 is the change, and you keep bringing it down closer  
14 and closer and closer, but it doesn't quite get to  
15 the table, you're making it pretty close. So you're  
16 just rephrasing it another way.

17 MR. ANDES: Well, let's talk in terms  
18 of half of the improvement in water quality that  
19 would be brought about allegedly by disinfection.  
20 It sounds like the value is still going to come out  
21 in the mid 50s, okay? You'll change it, maybe, \$3  
22 or so. So you're at about \$54. So you're saying  
23 it's \$54 to get half the benefit of disinfection,  
24 it's \$57 to get all the benefit of disinfection?

1 DR. BOYLE: Because you have to  
2 control for all those other factors. If I went  
3 out -- we've got to control for the factors across  
4 the study, the differences in the population, the  
5 local things that you made me talk about earlier.  
6 You have to control for all of them.

7 And so when you control for all of  
8 them across studies, that's showing where -- those  
9 are explaining why values differ from study to  
10 study. If I went out and did an original study --  
11 and let's say that that \$57 is today's dollars,  
12 okay -- my best guess is that people are going to  
13 give me a value of \$57, not the \$3 dollars or the  
14 estimates on the individual equation coefficients.

15 MR. ANDES: But my question was then  
16 if you said -- all right. If you asked them a  
17 different question, which is, assuming for a moment,  
18 you said, "We're going to make the District  
19 disinfect its treatment plants, and the levels of  
20 fecal coliform are going to go way down," you're  
21 saying they would say, "Yeah, that's worth \$57 to  
22 me," and then you came to them and said, "All right.  
23 I'm going to make them reduce it, but only half as  
24 much or one tenth as much. So there's still going

1 to be 75, 90 percent of that fecal coliform going  
2 out." They'd say, "Okay. That's worth \$54 dollars  
3 to me."

4 Do you really think that's the way  
5 people would value the commodity, the improvement in  
6 water quality?

7 DR. BOYLE: I'm thinking that this is  
8 the best evidence we have in front of us. It's been  
9 shown to work. It's established procedure, and  
10 that's our best estimate, and I don't think that the  
11 values are going to change that much for -- you  
12 know, even if we take it in half, you know .7 is not  
13 a big change. So we're talking about a relatively  
14 small change to begin with, and take that in half.  
15 I don't think it's going to change that much.

16 You know, as we talked about this  
17 morning, I've done a lot of work valuing water  
18 quality. You know, my first work was done in  
19 Wisconsin and Illinois with issues like this. You  
20 know, people value environmental quality, and they  
21 have a strong basic value for it to wanting to see  
22 water cleaned up.

23 And then, you know, it moves  
24 around. But there's nothing, I think, that you need

1 to -- this is a really important point. There's  
2 nothing that says that the -- you know, if the  
3 doubling of water quality, that the value has to  
4 double. There's nothing in economic theory or the  
5 math or anything that says that. That's based on  
6 peoples preferences. And the preferences that I've  
7 seen is a strong preference for improved water  
8 quality, and that strong preference comes through.  
9 And then as we move through, oftentimes the change  
10 in value is less than proportionate to the physical  
11 change in water quality that we're seeing.

12 MR. ANDES: So what you're saying  
13 is -- correct me if I'm wrong -- that it doesn't  
14 make much difference how much improvement of water  
15 quality they're being told is going to happen. If  
16 you say there's going to be an improvement of water  
17 quality, pretty much they're willing to pay between  
18 \$50 and \$57?

19 DR. BOYLE: I haven't said that. I  
20 said that it -- that it's not going to be  
21 necessarily large, but, you know, it depends on  
22 what -- the changes that you're talking about, and,  
23 you know how big that change is.

24 MR. ANDES: But it sounds like you



1 just said it doesn't depend very much on how big the  
2 change is, because those factors account for, at  
3 most, \$8 out of the \$57. \$49 are pretty much no  
4 matter what the water quality improvement is,  
5 they're going to be willing to pay \$57.

6 DR. BOYLE: Well, the base matters  
7 too. So it's the base and the one that mattered.  
8 So if you look at all of them collectively, you  
9 know, this \$3, \$5 and about \$12, I'm not buying into  
10 it's necessarily between \$50 and \$57. I'm saying it  
11 does not have to be proportionate, but I'm saying it  
12 doesn't have to necessarily fall between that \$50  
13 and \$57 range.

14 MR. ANDES: But the base doesn't  
15 change in any scenario. That's the base number. So  
16 whatever --

17 DR. BOYLE: Well, the base could  
18 change, depending on the application. You were  
19 saying -- you were giving me a hypothetical of some  
20 study, and I was responding to the hypothetical.

21 MR. ANDES: Well, but the first two  
22 variables regard the change you're going to be  
23 making in water quality. The third one is here's  
24 the base we're starting from. The base we're

1 starting from is the same in any of these  
2 hypotheticals I'm giving you. That doesn't change.

3 DR. BOYLE: You didn't tell me that  
4 before.

5 MR. ANDES: Okay. Well, I'm --

6 DR. BOYLE: You've been talking about  
7 those three variables, so I was still --

8 MR. ANDES: Let's talk about the first  
9 one.

10 DR. BOYLE: -- incorrectly assuming  
11 that we're still talking about all three variables.

12 MR. ANDES: We were speaking about the  
13 first two. Excuse me a moment.

14 Okay. Let me follow up on that  
15 question for a moment. We were talking about the  
16 possibility of a zero value or a negative value.  
17 The Carson and Mitchell study -- and I don't know if  
18 you've introduced that. If not, I can do that.

19 MR. ARMSTRONG: No, we haven't  
20 introduced it yet.

21 MR. ANDES: And this report title is  
22 The Value of Clean Water: The Public's Willingness  
23 to Pay for Boatable, Fishable and Swimable Quality  
24 Water.

1 MS. TIPSORD: Did you say boatable?

2 MR. ANDES: Boatable.

3 MS. TIPSORD: If there's no objection,  
4 we will mark the aforementioned article from the  
5 Water Resources Research, Volume 29, July 1993, as  
6 Exhibit Number 294. Seeing no objection, it's  
7 Exhibit 294.

8 MS. WILLIAMS: Wait a minute. I'm not  
9 objecting. I might be off. The last -- so  
10 Chapter 1 Background --

11 MS. TIPSORD: Is 292.

12 MS. WILLIAMS: Okay.

13 MS. TIPSORD: Circular A4 is 293.

14 MS. WILLIAMS: Thanks. Sorry. Thank  
15 you.

16 MS. TIPSORD: Soon we'll be at 300 and  
17 it just won't matter anymore. Go ahead, Fred.

18 MR. ANDES: On Page 2447 of the Carson  
19 and Mitchell study, on the first column, the last  
20 paragraph, states, "When asked to value the boatable  
21 minimum level, they were asked how much they would  
22 be willing to pay, quote, to keep the nation's fresh  
23 water bodies from going below the boatable, minimum  
24 level where they are now," unquote.

1                   Isn't that an attempt to assess  
2 the possibility of degradation of water quality  
3 below the current levels?

4                   DR. BOYLE: It is.

5                   MR. ANDES: Okay. So doesn't that  
6 indicate that the concept of looking at a negative  
7 change in water quality is possible in this  
8 approach?

9                   DR. BOYLE: No. When I looked at the  
10 Van Houtven study initially to decide whether it was  
11 appropriate or not, the first thing I saw, which  
12 you're probably looking at, is Table 2, Page 212,  
13 that Carson and Mitchell had avoiding a reduction.  
14 Next one, the Croke study had an improvement, and so  
15 I was concerned about how they handled reductions  
16 and improvements, and so I called Van Houtven to ask  
17 him what he did with that in his analysis, because  
18 it wasn't reported here in his paper.

19                   What they did is they tried an  
20 approach where they treated the reductions as an  
21 increase, and so it set the baseline at the new  
22 lower quality, and looked at that as an improvement,  
23 and statistically tested whether that had an affect  
24 on the results, and it didn't. So the equation that

1 Van Houtven reports here is where all of the changes  
2 in water quality are for improvements.

3 MR. ANDES: If it didn't make a  
4 difference -- it didn't make a difference if you  
5 included that particular scenario?

6 DR. BOYLE: It didn't make it a  
7 difference when he did that coding of the data.

8 MR. ANDES: So therefore --

9 DR. BOYLE: It doesn't make it  
10 appropriate to make it negative, because all of the  
11 numbers were estimated as positive changes.

12 MR. ANDES: Well, once you turn them  
13 around. But the underlying information used by  
14 Carson and Mitchell was useful. In the possibility  
15 of that scenario, which I might have rephrased, it  
16 was still a scenario under the current levels. You  
17 still used it, right? Or you just redefined what  
18 the current level was?

19 DR. BOYLE: He looked -- he created --  
20 he coded the new level as the baseline, and looked  
21 and did it as a change and tested whether that  
22 significantly affected the results and did not find  
23 that there was an effect. So he could've had an  
24 equation that was plus or minus from zero, but the

1 equation he reports here is for only positive  
2 changes in water quality.

3 MR. ANDES: To make it more  
4 comparable. But he could've done plus or minus?

5 DR. BOYLE: It's possible he could've  
6 done that, yes.

7 MR. ANDES: Okay. On the next  
8 question, in producing your estimate, you assume  
9 that 100 percent of the hypothetical Cook County  
10 residents would be surveyed in person?

11 DR. BOYLE: I did not assume that  
12 100 percent would be interviewed in person. I  
13 assumed that an in-person interview would be used to  
14 conduct the data collection. There's no blue ribbon  
15 panel that came after the Exxon Valdez oil spill  
16 about how these studies should be conducted, and  
17 that panel that had two Nobel laureates in economics  
18 and probably the most well-known survey researcher  
19 recommended personal interviews. Mr. Armstrong has  
20 that to introduce in evidence, and it's a federal  
21 registered publication.

22 And so what we did is we assumed  
23 that personal interviews were conducted of a sample,  
24 not that personal interviews were conducted with

1 every single person. If you go back to the Van  
2 Houtven definition of variables, Page 217, Table 3,  
3 in-person equals one if the study was administered  
4 in person. So that doesn't mean 100 percent of the  
5 population was sampled. That just means an  
6 in-person interview was used to collect the data  
7 from a sample of people.

8 MR. ANDES: I don't see the word  
9 sample of people. I guess my reading would be that  
10 means that you actually interviewed everyone in  
11 person. Where do you see the representative sample  
12 of people interviewed part?

13 DR. BOYLE: They don't say it there.  
14 But, you know, if I go back to these studies, we can  
15 find that they are all samples. I don't know any  
16 person with any common sense that would do an  
17 in-person interview of every single person. It's  
18 too expensive, and, you know, the survey research  
19 literature suggests that all you need is a sample to  
20 get a representative estimate.

21 We have -- hang on just a second.  
22 NOAH has standards and guidelines for statistical  
23 surveys that will -- Mr. Armstrong will give the  
24 panel. But nowhere once in there do they recommend

1 that you go out and you conduct a survey with every  
2 single person. The standard practice that is used  
3 is you take a representative sample.

4 And then the question is: How do  
5 you implement that survey? Do you use in-person, do  
6 you use telephone, do you use mail survey, do you  
7 use what are called internet surveys? And the  
8 belief is for a survey like this, you get the  
9 highest quality with an in-person survey so that  
10 they can explain what's being valued as a customized  
11 script that each of the interviewers follow, and  
12 that's why the panel recommended in-person surveys.

13 MS. TIPSORD: Okay. Before we go any  
14 farther, the NOAH panel is the National Oceanic and  
15 Atmospheric Administration. Is that correct?

16 DR. BOYLE: Yes. Sorry about that.

17 MS. TIPSORD: That's all right. And I  
18 have before me Proposed Rules to the Department of  
19 Commerce, National Oceanic and Atmospheric  
20 Administration, 15 CFR, Chapter IF, Natural Resource  
21 Damage Assessment Under the Oil Pollution Act of  
22 1990, Friday, January 15th, 1993. If there's no  
23 objection -- this is a Westlaw copy -- I'll mark  
24 this as exhibit 295. Seeing none, it's exhibit 295.



1                   Then I've also been handed Office  
2 of Management and Budget Standards and Guidelines  
3 for Statistical Surveys, September 2006. If there's  
4 no objection, we'll mark this as exhibit 296.  
5 Seeing none, it's exhibit 296.

6                   DR. BOYLE: Could I finish my answer?  
7 I stopped so she could jump in.

8                   MR. ANDES: Sure.

9                   DR. BOYLE: Another variable in this  
10 table is the response rate. It's right above in  
11 person. If you note, if you're doing a sample and  
12 you had surveyed every single person in the  
13 population, your response rate would be 100 percent  
14 to all studies. And if you look down below at  
15 Table 4, the response rate goes from a minimum of  
16 14 percent up to a maximum of 87 percent. So it's  
17 clear that these studies have not surveyed every  
18 single person in the population that were of  
19 interest to them.

20                   MR. ANDES: And what are -- you're  
21 just assuming that a representative sample would be  
22 interviewed in person?                   --

23                   DR. BOYLE: We are assuming that a  
24 representative -- that a representative sample could

1 be drawn of Cook County households, and the survey  
2 would be done with in-person interviews.

3 MR. ANDES: Now, in the Van Houtven  
4 paper, the notes on Page 222 that the effect of  
5 in-person on willingness to pay is found to be  
6 positive in all cases, which is consistent with the  
7 hypothesis that in-person interviews encourage  
8 yea-saying by residents.

9 DR. BOYLE: That's their opinion, and  
10 I do not agree with it. There's limited evidence  
11 that they encourage yea-saying. As a matter of  
12 fact, yea-saying is technically defined as something  
13 that's different from in-person interviewing. The  
14 issue of yea-saying occurs whether you do in-person,  
15 telephone, mail, an internet survey, and that is --  
16 yea-saying is where somebody is unresponsive to the  
17 stimulus that you provided. It's not something  
18 that's unique to in-person surveys.

19 I think the more appropriate  
20 interpretation of that, and the reason the NOAH  
21 panel recommended in-person, is that if people have  
22 a lot of uncertainty about what it is they're being  
23 asked to value, you would expect to have more  
24 values. If you can put graphics in front of them,

1 have somebody explain it so that they have a better  
2 idea of what it is, they have -- there's more  
3 confidence in the value, and your value would  
4 probably go up, and I think that's the reason that  
5 the NOAH panel recommended it.

6 But this is -- you know, in here,  
7 this is speculation by Van Houtven and colleagues  
8 that's not supported by the literature generally.

9 MR. ANDES: Well, they state as a fact  
10 that the effect of in-person on WTP is found to be  
11 positive in all cases. Do you disagree with them on  
12 that?

13 DR. BOYLE: I agree that the values go  
14 up. I'm not agreeing with the reason that -- for  
15 why they're saying that. I don't agree with the  
16 interpretation of yea-saying. I'm one of the people  
17 that's done the most research on yea-saying in the  
18 literature, and never once has yea-saying been  
19 linked to personal interviews in the effect of the  
20 interviews on the outcome.

21 MR. ANDES: So you think Van Houtven's  
22 wrong?

23 DR. BOYLE: Van Houtven isn't doing a  
24 test of yea-saying. A test of yea-saying in a

1 specific study is where the stimulus has varied and  
2 it didn't change. What Van Houtven is looking at is  
3 differences across studies, and finding those that  
4 did do personal interviews had higher value  
5 estimates.

6 MR. ANDES: In all cases. In all  
7 cases. And then you said that is consistent with  
8 the hypothesis, which he doesn't discredit here,  
9 that in-person interviews encourage yea-saying by  
10 respondents. I would read that as he says that it  
11 makes sense by intent to confirm that hypothesis.

12 DR. BOYLE: I don't --

13 MR. ANDES: You're saying you don't  
14 believe that hypothesis?

15 DR. BOYLE: It's not consistent with  
16 literature.

17 MR. ANDES: Now, is it consistent with  
18 the information in Van Houtven's report?

19 DR. BOYLE: It's not consistent with  
20 the information in Van Houtven's report. Yea-saying  
21 is when you're testing whether an individual in an  
22 experiment, one subject is unresponsive to the  
23 different changes that you're giving to him. What  
24 Van Houtven is looking at is does the change -- do

1 you get a different value with different methods.  
2 He's finding that you do get a different value with  
3 different implementation methods. That is not a  
4 test, even in a macro or global sense, of whether  
5 there would be a change for individual subjects when  
6 you did it.

7 MR. ANDES: Well, maybe we're looking  
8 at it from a laymen's standpoint. I read this as  
9 having someone in front of you asking if you if  
10 you're willing to pay for water quality makes you  
11 more likely to say, "Yes, I am," as opposed to if  
12 it's over the phone or on paper. Does that make  
13 sense to you?

14 DR. BOYLE: It is, but the reason -- I  
15 think the appropriate reason for it is not  
16 yea-saying. The appropriate reason is that in a  
17 personal interview, you can give people more  
18 information than you can in the other survey modes.  
19 You can control how you're giving that person  
20 information, you probe whether they have problems,  
21 and the interviewer has scripts that are designated  
22 that they can respond to them, and they respond to  
23 them, and the evidence is they get higher values.  
24 It's not because of yea-saying. It's because you've

1 done a better job of describing the change in water  
2 quality versus -- you know, suppose somebody is  
3 calling you up on the phone and you're doing a  
4 telephone interview, right? And, you know, what's  
5 going on in the background? You don't know. You've  
6 got to listen to what they're saying over the phone.  
7 You don't have any visual cues to look at, or what  
8 have you. It's a lot harder. There's much less  
9 information you can provide there.

10 So people have less certainty  
11 about what it is they're being asked to value. The  
12 personal interview approach is the best approach.  
13 That's why the NOAH panel, the leading survey  
14 researchers in the country, recommend that that be  
15 done.

16 MR. ANDES: But let me ask you: If  
17 they're recommending it be done because it gives  
18 more accurate answers, here what we're saying is  
19 it's not always -- it's not that it goes up  
20 sometimes and down sometimes, it's all cases. It  
21 increases the willingness to pay. So somehow -- are  
22 you saying that whenever people are educated by the  
23 issues, they'll always be more willing to pay for  
24 water quality? Why wouldn't it be simply more

1 accurate, not always in one direction, unless  
2 there's some kind of behavioral impact of having  
3 someone in front of you and being embarrassed to say  
4 you're not willing to pay for water quality?

5 DR. BOYLE: What did you eat for  
6 breakfast this morning?

7 MR. ANDES: I don't remember.

8 DR. BOYLE: You don't remember?

9 MR. ANDES: I'm not testifying,  
10 though.

11 DR. BOYLE: I'll do a hypothetical.  
12 Let's assume that you had -- you eat cereal for  
13 breakfast, and you go to the grocery store, and you  
14 go to the cereal aisle, and all the boxes are brown  
15 boxes. How much would you pay for a box of cereal?  
16 Probably not too much, right?

17 MR. ANDES: Right. If I'm hungry --  
18 if I'm hungry, I'm going to pay for a box of cereal.

19 MR. ARMSTRONG: Well -- I'm sorry.  
20 Continue on with your example.

21 DR. BOYLE: The example is that when  
22 you go, you can see the box, you can see whether  
23 it's Cheerios or Raisin Bran, you know whether it's  
24 a small box or a large box. You have more

1 information. So if you go and there's very, very  
2 little information, you're not going to pay much for  
3 that box of cereal. But if you know more and you  
4 can formulate when you're going to get, then you  
5 will pay a higher value.

6 MR. ANDES: So you'll pay more if they  
7 make water quality seem more attractive to you?

8 DR. BOYLE: Not if they see --

9 MR. ANDES: I thought we were asking  
10 neutral questions here about --

11 DR. BOYLE: Not if they make it seem  
12 more attractive if it's a descriptive explanation so  
13 you can understand what is going on and what is the  
14 change in water quality. They're always neutral.  
15 You're not trying to guide it. You're putting the  
16 information out there so people can reveal their  
17 preferences, and you want to put the best  
18 description possible, and personal interviews allows  
19 you to do that.

20 Any CV study right now, pretty  
21 much, that is going in terms of litigation has to be  
22 the highest quality. It's either using personal  
23 interviews, or if they use one of the other  
24 approaches, they use some way to check it against



1 personal interviews to know if their results are  
2 valid.

3 MR. ANDES: Okay. So you don't think  
4 that -- despite what Van Houtven says about  
5 effective in-person on willingness to pay is  
6 positive in all cases, he believes that that  
7 confirms -- that that encourages increase and  
8 willingness to pay, you don't think that should be  
9 adjusted for at all or considered in looking at the  
10 impact, which that particular factor has a value of  
11 \$46 in your calculation, correct?

12 MR. ARMSTRONG: I'm going to object.  
13 Dr. Boyle has explained where he got the variable  
14 from. He's explained the reasoning for it. We're  
15 running short on time here. I'm not really sure  
16 what you're trying to illicit here.

17 MS. TIPSORD: I have to agree. I'm  
18 confused. I think we're covering the same ground  
19 again.

20 MS. MOORE: Over and over.

21 MS. TIPSORD: So maybe if you would  
22 rephrase it a little bit. I mean, he's already told  
23 you he doesn't agree with Van Houtven's premise or  
24 the premise as you've stated it, and he's explained

1 where the variable came from. So if you want to try  
2 rephrasing it, but I have to agree. I think we're  
3 covering the same ground.

4 MR. ANDES: Okay. So you believe,  
5 then, it's appropriate to ascribe a \$46 dollar value  
6 to that particular variable?

7 DR. BOYLE: I believe it is  
8 appropriate that if a high quality study was done of  
9 Cook County residents, that it would be done in  
10 person, what the meta-analysis equation says is that  
11 studies would add \$46 to our estimate.

12 MR. ANDES: Let's go to the next  
13 question. In putting together your estimates on  
14 Page 58, you assumed that the -- the value used  
15 indicates a study of willingness to pay by Cook  
16 County residents that have published in a peer  
17 review journal?

18 DR. BOYLE: I do, and I've already  
19 explained that peer reviewed is the highest sub type  
20 of scientific evidence, and so we assume that it's  
21 peer review.

22 MR. ANDES: And that has a value of  
23 \$58?

24 DR. BOYLE: Yes.

1 MR. ANDES: So if we go to Van Houtven  
2 on Page 216, he indicates that the -- this is in  
3 4.4 -- indicates the publication selection process  
4 may result in estimation bias, if, for example,  
5 reviewers and editors were inclined to accept higher  
6 value estimates, or if analysts are less likely to  
7 submit lower estimates. Do you disagree with that?

8 DR. BOYLE: I disagree 100 percent  
9 with that. I've served as an editor of journals in  
10 our field, including the top journal. Never once  
11 did I make a publication decision on how big the  
12 value estimates were. Never once did I even think  
13 to look and say whether they're big or little.  
14 You're looking at the methods that they used and  
15 whether the methods are appropriate for what they're  
16 doing. Never once did I get a letter from peer  
17 reviewers saying, "You shouldn't accept this. The  
18 value is too high," or, "You shouldn't accept it  
19 because it's low."

20 I've published over 80 journal  
21 articles. Never once have I had a review come back  
22 saying that you're questioning it based on the  
23 magnitude of the estimates. Reviews are based on  
24 the theoretical basis and empirical basis, how well

1 the study was done, not whether the study was good  
2 or bad.

3                   You know, in the Van Houtven  
4 study, the meta-analysis, the procedures of Van  
5 Houtven are great. They're the basic, accepted  
6 procedures for doing a meta-analysis.  
7 Unfortunately, he has a lot of idle speculation, and  
8 this is another example. But I couldn't disagree  
9 with this more.

10                   MR. ANDES: So you would also disagree  
11 with his statement on 222, if published, it is  
12 interpreted as a filter that favors larger,  
13 significantly significant values, and his results  
14 suggests presence of publication bias?

15                   DR. BOYLE: I would agree. I knew you  
16 were going there, so I answered that in my previous  
17 answer.

18                   MR. ANDES: Okay. And this is pretty  
19 substantial. The value for this \$58 is actually  
20 more than the net number of \$57 that you calculated  
21 at the end, correct?

22                   DR. BOYLE: Right, because there are  
23 things that bring it down.

24                   MR. ANDES: So if the result was not

1 peer review, that would get a value of zero? Say if  
2 there was a study that was not a peer reviewed,  
3 would that get a value of zero here?

4 DR. BOYLE: That variable would be  
5 coded as zero. The value wouldn't be zero.

6 MR. ANDES: So if you had everything  
7 else here but you didn't have peer review, the  
8 result would be a willingness to pay of zero?

9 DR. BOYLE: If you left those other  
10 ones at that, but I wouldn't know how to use studies  
11 that were not peer reviewed as the basis for what I  
12 would make for a projection. But yes, you can do  
13 that, but it would not have been a good decision.

14 MR. ARMSTRONG: And why would you want  
15 to use peer-reviewed studies?

16 DR. BOYLE: Because it's the highest  
17 scientific standard for research. It's been  
18 reviewed independently by your peers in terms of the  
19 quality of the research.

20 MS. TIPSORD: Dr. Boyle, I know it's  
21 been a long day, but your voice is beginning to fade  
22 out again.

23 DR. BOYLE: Okay. I appreciate it  
24 when you let me know, and I'm sorry about that.

1 MS. TIPSORD: Okay. Just so you know,  
2 you're not the first, and you probably won't be the  
3 last.

4 MR. ANDES: I'm going to move on to  
5 Question 46, and this has several sub questions.  
6 Using the transfer function you draw from Van  
7 Houtven and your assigned variables for everything  
8 except magnitude and water quality change, I'd like  
9 to ask first what you calculate to be the annual  
10 household economic benefit if the water quality  
11 index for CAWS water quality were to be improved by  
12 1.4 points, rather than 0.7 points on the ten point  
13 scale.

14 DR. BOYLE: And you all those answers  
15 for me on Question 47 in the table that was in the  
16 pre-filed questions. So your response -- I'm  
17 assuming you did the math, right -- is \$65.50.

18 MR. ANDES: Okay. So we'll have an  
19 exhibit, and the exhibit is the table that is on  
20 Page 9 of our questions titled Estimated Benefit,  
21 Various Changes in CAWS Water Quality in Dollars Per  
22 Household Per Year.

23 MS. TIPSORD: If there's no objection,  
24 we will mark this as Exhibit 297. Seeing none, it's

1 Exhibit 297. It's also in the pre-filed questions  
2 under Question No. 47.

3 MR. ANDES: Let's focus on the first  
4 few lines. And I think you're assuming our math is  
5 right, and we hope it is. Under your scenario, the  
6 .7 increase in the water quality index, the value is  
7 \$57.50. Double the improvement of water quality  
8 will go up \$8, small positive improvement .0007  
9 would go down \$8. And you don't have any reason to  
10 doubt those numbers, correct?

11 DR. BOYLE: I don't.

12 MR. ANDES: Okay. So am I correct --  
13 and if we are trotting old ground, tell me -- that  
14 this is a product of review that any improvement in  
15 water quality is perceived as having, I guess, in  
16 this scenario, the significant value of \$49, only a  
17 little bit less than a significant increase in water  
18 quality?

19 DR. BOYLE: I think we're treading the  
20 same ground again, and I've stated that there's  
21 nothing in theory or appearance that says the change  
22 in value has to be proportionate to the change in  
23 water quality, the physical change. And so, you  
24 know, this is the same stuff we're going over again.

1 MR. ANDES: Okay. Let me move on to  
2 Question 50. You believe -- why do you -- first, if  
3 you believe that the benefit you calculate for the  
4 water quality improvement of .7 points would ensue  
5 from improving water quality on the CAWS only?

6 DR. BOYLE: That is my assumption.

7 MR. ANDES: Now, wouldn't it be true  
8 that the Chicago area residents would focus some of  
9 their willingness to pay for water quality  
10 improvements on water bodies other than the CAWS?

11 MR. ARMSTRONG: I'm going to object to  
12 that. We covered that this morning.

13 MS. TIPSORD: Forgive me. I don't  
14 quite remember.

15 MR. ANDES: I don't think so.

16 MS. TIPSORD: I think we talked about  
17 what impact there would be, but I don't think this  
18 specific question. So please answer it.

19 DR. BOYLE: Can I just have the court  
20 reporter read the question back?

21 (Whereupon, the record was read as  
22 requested.)

23 DR. BOYLE: So the water quality, if  
24 we did an original study, the values that they would



1 be giving would be based on the change of water  
2 quality and the waters that they were asked to value  
3 if they were asked to value the CAWS. I don't think  
4 there's any reason to think that they would include  
5 values for other waters.

6 MR. ANDES: Well, so if we had two  
7 different surveys scenarios, and one of them was how  
8 much would you pay to improve water quality in the  
9 CAWS, and the other one was how much would you  
10 improve to pay water quality in the CAWS, Lake  
11 Michigan, the Des Plaines River, and the Fox, do you  
12 think they'd give the same answer to both questions?

13 DR. BOYLE: No. They'd give different  
14 answers to both questions.

15 MR. ANDES: And how is that reflected  
16 in your estimates?

17 DR. BOYLE: I only report an estimate  
18 for the CAWS. I don't report an estimate for Lake  
19 Michigan and other waters.

20 MR. ANDES: But if the -- my initial  
21 question was don't they -- wouldn't they focus some  
22 of their willingness to pay improvements of other  
23 water bodies?

24 DR. BOYLE: And what question would

1 they be answering when you're asking them that?

2 MR. ANDES: Are you willing to pay to  
3 improve water quality?

4 DR. BOYLE: Well, you wouldn't ask a  
5 question that that's vague. You would ask a  
6 question that's more specific that would tell them  
7 what water bodies you're valuing, and what the  
8 baseline water quality is and what the change in the  
9 water quality is in those water bodies.

10 MS. TIPSORD: So -- if I may, so what  
11 you're saying is that if you did the survey you  
12 would ask about the CAWS and study the CAWS, and  
13 that's what you've done here is look at the CAWS?

14 DR. BOYLE: Yes.

15 MS. TIPSORD: But if you were to do  
16 one for Lake Michigan, you wouldn't necessarily ask  
17 about all the water bodies, you would then ask about  
18 Lake Michigan?

19 DR. BOYLE: Yes.

20 MS. TIPSORD: And not count for CAWS  
21 in the Lake Michigan?

22 DR. BOYLE: Right. You'd have the  
23 baseline for Lake Michigan, and the change that you  
24 are talking about with Lake Michigan that you'd be

1 trying to value.

2 MR. ANDES: In looking at their  
3 overall willingness to pay for improved water  
4 quality, I assume that most of that you would think  
5 would focus on water bodies that are most amendable  
6 to supporting recreational use, meaning those water  
7 bodies that are already attractive to recreation and  
8 other attributes, such as accessibility, proximity,  
9 ancillary facilities, such as beaches and boat  
10 ramps, and lack of competing commercial boat  
11 traffic. Would that be correct?

12 DR. BOYLE: I think I've already  
13 testified that most of the value is non-use value,  
14 and I would think that it would not necessarily  
15 depend on the recreation component of it. They'd be  
16 valuing for an improvement in water quality, and the  
17 recreation part of it would be for the people who  
18 recreate. And those who recreate, they may be more  
19 willing to pay for an improvement in the one with  
20 the lower water quality.

21 You know, for example, when I went  
22 for a ride on the CAWS yesterday, and people were  
23 talking about -- they were saying one of the nice  
24 things about the CAWS is on a windy day you can come

1 in there for a motor boat and a kayaker and it's not  
2 as great on the lake, you can come into the CAWS to  
3 give themselves more opportunities. They may be  
4 willing to pay for the water quality in the poor  
5 water quality one to increase their opportunities.  
6 But that's speculation. We haven't done that study.  
7 We don't know, but that's what my economic intuition  
8 would tell me.

9 MR. ANDES: Let's move to the next  
10 question.

11 MS. TIPSORD: Let's go ahead and take  
12 a ten minute break before you move to the next  
13 question.

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

17 MS. TIPSORD: Mr. Andes, if you would  
18 like to go ahead?

19 MR. ANDES: Excuse me just a moment.  
20 We've reviewed the remainder of  
21 our questions, and we believe that they have all  
22 been asked and answered.

23 MS. MOORE: Oh, my gosh. It's a  
24 miracle.

1 MR. ANDES: You're welcome. So we're  
2 done.

3 MS. TIPSORD: Thank you very much,  
4 Mr. Andes.

5 MR. ANDES: You're welcome.

6 MS. TIPSORD: Ms. Williams, I  
7 understand you have a few questions? Oh, okay.  
8 Mr. Harley would like to follow up.

9 MR. HARLEY: Keith Harley, Southeast  
10 Environmental Task Force. Mr. Andes' questions  
11 dealt with the benefits side of the equation. I  
12 wanted to deal with the cost side of the equation  
13 for a moment. In coming up with the estimates of  
14 the cost that you would bear, the cost of  
15 disinfection, did you assume that Cook County  
16 residents would bear the entire cost of  
17 disinfection?

18 DR. BOYLE: We did not make any  
19 assumption about who would bear the cost. We made  
20 the assumption that Cook County residents would be  
21 direct beneficiaries of the improvement, but we  
22 didn't make any assumption about who would bear the  
23 cost.

24 MR. HARLEY: If the costs were borne

1 not solely by the Water Reclamation District but by  
2 state or federal sources of funds, would that, in  
3 any way, change the way that the benefits would be  
4 viewed by Cook County residents?

5 DR. BOYLE: I don't think so. I mean,  
6 the benefits are based on the change in water  
7 quality, not how the costs, per se, are distributed.  
8 So, you know, this is the value they place on that  
9 approval. You know, on our side -- on the  
10 benefit side, what's missing is the people who live  
11 outside of Cook County in nearby communities who  
12 might value improvement not counted, or we've talked  
13 about tourists coming to Chicago that might have  
14 their visit enhanced by improved water quality.  
15 Those ones are not being counted so.

16 So if you're looking outside of  
17 the area, we're missing people that would -- from  
18 outside Cook County that would benefit from it that,  
19 from a policy perspective, might justify the cost  
20 being applied over a broader population. I don't  
21 think that changes our benefit estimate.

22 MR. HARLEY: Thank you.

23 MS. TIPSORD: Ms. Williams?

24 MS. WILLIAMS: Dr. Boyle, I think I'm

1 going to start with my final pre-filed question to  
2 clear up some of the housekeeping matters. Question  
3 14 refers to the obligation that state law places on  
4 the Board if it was to rely on your findings in its  
5 final rule, it needs to provide any publications  
6 relied on or any underlying data that the public  
7 requests such.

8 So can you tell us if there's any  
9 other reports or data you relied on that need to be  
10 entered into the record today?

11 DR. BOYLE: Can I just go -- I got to  
12 take a minute and go through the reports that I have  
13 here.

14 MS. WILLIAMS: No, no, take your time.

15 DR. BOYLE: There is a dissertation by  
16 Edith Brashares that looked at the affect of fecal  
17 coliform on property values in Michigan, 1985, that  
18 I referenced in my report that has not been entered  
19 in to my knowledge. There's also a general oral by  
20 Legit and Boxtoll where they looked at the effect of  
21 fecal coliform of property values in the chess peak  
22 bay that I referenced in my report that has not been  
23 entered. I know that Mr. Armstrong has all these.  
24 And then there's also a study by Champ and Bishop

1 that we did an adjustment of the prediction for an  
2 overestimation bias that we based it on, and that  
3 has not been entered. I believe everything else has  
4 been entered.

5 MR. ARMSTRONG: And I do have those.

6 DR. BOYLE: Have these all been  
7 entered here?

8 MR. ARMSTRONG: Yes.

9 DR. BOYLE: So the ones you have on  
10 Question 13 have already been answered?

11 MS. WILLIAMS: Right. And I think you  
12 referenced all of the articles in Question 12, the  
13 only one that hasn't been answered yet about --

14 DR. BOYLE: Yes. And then it's also  
15 the electronic copy of the spreadsheet that we  
16 promised that we would send.

17 MS. TIPSORD: Okay. Estimates of the  
18 In-stream Value of Lake Water Quality in Southeast  
19 Michigan by Edith Brashares -- it's  
20 B-r-a-s-h-a-r-e-s -- from 1985 will be marked as  
21 Exhibit 298 if there's no objection. Seeing none,  
22 it's Exhibit 298.

23 Donation Payment Mechanisms and  
24 Contingent Evaluation and Empirical Study of



1 Hypothetical Bias by Patricia A. Champ, C-h-a-m-p,  
2 and Richard C. Bishop, and this is from  
3 Environmental and Resource Economics, 2001, will be  
4 marked as Exhibit 299 if there's no objection.  
5 Seeing none, it's Exhibit 299.

6 And is there a drum role, please?  
7 Evidence of the Affects of Water Quality on  
8 Residential Land Prices, Christopher G. Legit and  
9 Nancy E. Boxtoll, from the Journal of Environmental  
10 Economics and management, I believe this is a 1999  
11 document, July 27th, will be marked as Exhibit 300,  
12 if there's no objection. Seeing none, it is  
13 Exhibit 300.

14 MR. ANDES: Have we set a record?

15 MS. TIPSORD: We're getting really  
16 close, if we haven't already passed it. It was  
17 actually published -- Exhibit 300 was published in  
18 2000. Go ahead, Ms. Williams.

19 MS. WILLIAMS: I'm going to skip back  
20 to my Question 1. I think you touched a little bit  
21 on this already, but I'd like to ask it anyway. Has  
22 your approach for calculating economic benefits been  
23 used in other states to set water quality standards?  
24 If so, which states and what action did these states

1 take?

2 DR. BOYLE: Well, just like in this  
3 case, the economics have been used, but they haven't  
4 been the only piece of information. So I had -- in  
5 terms of the state of Maine, I've used hedonic  
6 models, and I've estimated water clarity for  
7 beautification for legislative rulemaking, and that  
8 resulted in the funding of the Lakes Protection  
9 Program in the state, which had been cut on a  
10 previous budget cut. So it was one piece of  
11 information that was used there.

12 In the state of New Jersey, right  
13 now we are doing original studies for the state of  
14 New Jersey on the value of groundwater quality to  
15 look at policies related to cleaning up contaminated  
16 water in New Jersey.

17 Another one that I'm involved  
18 in -- and this one is a court case in Oklahoma  
19 relating to contamination of the Illinois River and  
20 the Lake Tenkiller, where the state is taking action  
21 to stop the contamination of those bodies, and there  
22 was an original evaluation study that was done  
23 there, and a benefit transfer.

24 Those are three that I've been

1 involved in. I know other economists have been  
2 involved in other ones in other states, but I don't  
3 have those right at the -- you know, to give you  
4 specifics of those ones.

5 MS. WILLIAMS: Was the benefit  
6 transfer used in all three, or just the last one?

7 DR. BOYLE: The benefit transfer was  
8 used in Maine in that we extrapolated to other lakes  
9 from where the study was conducted, and it's also  
10 been used in the state of Maine in the lake program  
11 to decide which lakes are going to get priority for  
12 protection estimates. And so we've done benefit  
13 transfers to other lakes. Oklahoma had a benefit  
14 transfer. The work that we're doing in New Jersey  
15 is an original evaluation study.

16 MS. WILLIAMS: And in Maine and  
17 Oklahoma, did you also rely on a water quality  
18 index?

19 DR. BOYLE: I did not rely on a water  
20 quality index in those ones. In Maine, it was  
21 beautification, and the primary water quality  
22 indicator that the state uses is Secchi depth  
23 measures of clarity to have a state volunteer water  
24 quality monitoring program, and that's the key

1 policy variable, and so we use clarity measures.

2 In Oklahoma, we had specific  
3 information about water quality in that case, and so  
4 we were using that specific information there, and  
5 so we didn't use the index in that one.

6 MS. WILLIAMS: Can you explain what  
7 you mean by specific information?

8 MS. MOORE: I'm sorry. I couldn't  
9 hear.

10 MS. TIPSORD: We couldn't hear you.

11 MS. WILLIAMS: What does he mean by  
12 specific information on water quality?

13 DR. BOYLE: We have -- that is a large  
14 project where there are a number of physical and  
15 biological studies going on that are providing a  
16 massive amount of data about what water quality was  
17 like and was not like in the river, was like and was  
18 not like in the lake, water clarity are some of the  
19 measures, dissolved oxygen. And so we had specific  
20 information that we were using, and we did not use  
21 the water quality index.

22 The water quality index is a  
23 common usage, and I used it here for Van Houtven,  
24 but it's not used in all applications.

1 MS. WILLIAMS: You looked at a  
2 baseline of water quality and compared it to  
3 improvements that were to be expected, correct?

4 DR. BOYLE: Yes.

5 MS. WILLIAMS: Can you explain at all  
6 why you -- for a regulatory proceeding like this  
7 one, I think it would have seemed logical to me to  
8 look at the baseline regulatory standard and the  
9 improved standard. Can you explain why that wasn't  
10 the way you looked at it? Do you understand what  
11 I'm asking?

12 DR. BOYLE: Yeah. Well, the  
13 standard -- I don't have the specific wording  
14 here -- doesn't specifically map into the water  
15 quality index. It's not an element that goes in  
16 there, so you're looking at the variable that's  
17 changing as a sequence of the policy. And so --

18 MS. WILLIAMS: Right. And that's why  
19 I'm saying in this case, isn't what's changing as a  
20 result of the policy change, it's the current  
21 standard to the new standard.

22 DR. BOYLE: It is. And in any type of  
23 application, you've got the old standard and the new  
24 standard. But what you always are measuring is the

1 change in service that's going to come about from  
2 the standard. What we were lead to understand is  
3 the current service is a current level of fecal  
4 coliform and the change in service for a reduction.  
5 So in any one that you're not putting in what the  
6 specific policy is, but you're putting in what the  
7 changes and services are, and the change in service  
8 here is the change in fecal coliform to affect water  
9 quality. So that's what you'd be putting in this  
10 any economic value study, even if you were doing an  
11 original study.

12 MS. WILLIAMS: So can you explain what  
13 change of service -- how you're using that term?

14 DR. BOYLE: Here, the service I'm  
15 referring to is the change of fecal coliform, which  
16 would change water quality. It's the service you're  
17 providing to the public is improved water quality  
18 through the change in fecal coliform, and we were  
19 lead to understand that the changes in use  
20 designation are being brought about by changes in  
21 fecal coliform.

22 MS. TIPSORD: We're getting a lot more  
23 trains coming by, so both of you need to speak up a  
24 little bit more.

1 DR. BOYLE: Okay. Thank you.

2 MR. ARMSTRONG: Dr. Boyle, would it be  
3 accurate to say the policy says your analyzing would  
4 be the disinfection of effluent from the MWRDGC's  
5 treatment plants?

6 DR. BOYLE: We value a change in  
7 effluent. We didn't -- it doesn't necessarily have  
8 to be disinfection. Whatever policy was implemented  
9 to bring about that change.

10 MR. ARMSTRONG: Okay.

11 MS. WILLIAMS: Does your report  
12 address any environmental benefits of this  
13 rulemaking from improved aquatic life uses? This is  
14 Question 2.

15 DR. BOYLE: We don't measure specific  
16 values for improved aquatic life issues. We  
17 estimate a total value. You would expect that one  
18 of the reasons primarily on the non-use value would  
19 be that the improved aquatic life uses might be one  
20 of the reasons that people would give a non-use  
21 value.

22 MR. ANDES: Excuse me. Let me follow  
23 up. You're not making any connection with  
24 disinfection and improving the aquatic life uses,

1 are you?

2 DR. BOYLE: No.

3 MR. ANDES: Okay.

4 MS. WILLIAMS: Well, I want to  
5 understand how what you just said is reflected --  
6 well, let me strike that. Let me rephrase it.

7 I believe you mentioned earlier in  
8 your testimony that dissolved oxygen improvements  
9 can be appreciated in value. Is that something you  
10 did in this analysis?

11 DR. BOYLE: We only looked at changes  
12 in fecal coliform. We did not look at any changes  
13 in dissolved oxygen.

14 MS. WILLIAMS: Why not?

15 DR. BOYLE: Because we were not  
16 provided with any information that DO was going to  
17 change. We were not provided with any information  
18 that dissolved oxygen levels were going to change.  
19 We were only provided with information about fecal  
20 coliform.

21 MR. ARMSTRONG: And Dr. Boyle, that  
22 was with respect to -- disinfection would not change  
23 dissolved oxygen? Or you just didn't look at  
24 dissolved oxygen at all. Is that correct?



1 DR. BOYLE: We were not asked to, no.

2 MS. DEXTER: Did you look at

3 temperature impact at all?

4 DR. BOYLE: They're all in that index,

5 and those did not change. It was only fecal

6 coliform that changed.

7 MS. DEXTER: Thanks.

8 DR. BOYLE: If -- you know, the same

9 with fecal coliform is different. If there are

10 changes in dissolved oxygen, that equation can be

11 used to recalculate a new number.

12 MS. WILLIAMS: Okay. And I guess I'm

13 trying to understand why it wasn't in this case.

14 Let's -- so for example -- and this is the last

15 area, I think, that I wanted to get at from my

16 pre-filed questions is part of question six, and to

17 get exactly how the water quality index was

18 calculated, what inputs were included. I believe

19 you testified your colleague did that part of the

20 work. Is that correct?

21 DR. BOYLE: Yes, he did.

22 MS. WILLIAMS: And is that information

23 included in the table that you're providing?

24 DR. BOYLE: The spreadsheet. You can

1 go through and see every calculation that was made  
2 in those spreadsheets to get the 6.1 and 6.8.

3 MS. WILLIAMS: Are you able to explain  
4 for us where the 6.1 comes from?

5 DR. BOYLE: The 6.1 comes from taking  
6 the current value of those nine variables that go in  
7 that I listed off this morning, and put their levels  
8 into the equation. That equation has coefficients,  
9 just like the benefit transfer equation does, and it  
10 prints out an index, and that's where the 6.1 comes  
11 from. So it's the current data from the water  
12 quality --

13 MS. TIPSORD: I'm sorry, Dr. Boyle.  
14 We got a train going by.

15 DR. BOYLE: I stumbled too. I said  
16 the 6.1 is taken -- the current data from the MWRD  
17 water monitoring stations and plugging them into  
18 that equation, and that index value is 6.1.

19 MS. WILLIAMS: And do you understand,  
20 for example, for temperature what value is  
21 represented in that 6.1? I mean, is each parameter  
22 a one? I guess that's what I'm asking.

23 DR. BOYLE: No.

24 MS. WILLIAMS: So if fecal was

1 perfect -- it doesn't work that way?

2 DR. BOYLE: No. It's not just you add  
3 them up. They have to have a conversion index.  
4 This water quality index application to the Kansas  
5 River Basin by McCullen, it was an U.S.  
6 Environmental Protection Agency report. It was the,  
7 kind of, initial one that started all of this. You  
8 know, so this gives you the basis, and where the  
9 coefficients come from, and then all we did is apply  
10 those coefficients to the local data.

11 MS. WILLIAMS: So can you explain to  
12 us what the coefficient is that relates to fecal  
13 coliform so that we can go back?

14 DR. BOYLE: This will also be in the  
15 spreadsheets when you get it, but the weight for  
16 fecal coliform is .16.

17 MS. WILLIAMS: And what about for  
18 dissolved oxygen and temperature?

19 DR. BOYLE: Dissolved oxygen is .17,  
20 and temperature is .10.

21 MS. WILLIAMS: Did you say .10?

22 DR. BOYLE: Yes. And what -- all  
23 these weights are normalized so that they sum to  
24 one.

1 MS. WILLIAMS: Are you able to tell us  
2 what the maximum possible change in water quality  
3 index could be for fecal coliform parameter? So  
4 when you're -- you've told us that there's a .7  
5 improvement going from 6.1 to 6.8, but you have only  
6 looked at one parameter in that index, correct?

7 DR. BOYLE: Yes.

8 MS. WILLIAMS: So what is the  
9 minimum -- I would, kind of, like to understand the  
10 range that that parameter could have on the index.

11 DR. BOYLE: Across all of them?

12 MS. WILLIAMS: Just for fecal  
13 coliform. If you were -- if the improvement that we  
14 were measuring was off the chart for fecal coliform,  
15 what would be the maximum improvement in the water  
16 quality index you would see? Is .7 as much  
17 improvement as you can get, or is there a way to get  
18 to .8 or .9?

19 DR. BOYLE: .7 is associated with a two  
20 orders of magnitude change. If -- you know, looking  
21 at Mr. Twait's testimony, he said it's possible that  
22 there could be a three orders of magnitude change.

23 If it was three orders of magnitude, it would be  
24 greater than .7. But we'd have to go through and

1 work that out. I can't give you the number right  
2 now.

3 So if it's greater -- you know, if  
4 it's greater than two orders of magnitude, it would  
5 be greater than .7. If it's less than two orders of  
6 magnitude, it would be less than .7.

7 MS. WILLIAMS: I don't think I have  
8 any further questions. I mean, I think it would've  
9 been helpful a little bit to understand -- for us to  
10 understand for dissolved oxygen and temperature a  
11 little better what goes into this index if we wanted  
12 to make use of it for those improvements, but I'm  
13 not sure that without your colleague you can get  
14 into that in anymore detail today. So I think  
15 that's all I have.

16 MS. TIPSORD: Any other questions for  
17 Dr. Boyle?

18 DR. GIRARD: Dr. Boyle, I have a  
19 question. So essentially what you have here is a  
20 predicted model. You've predicted that residents of  
21 Cook County who are serviced by the District would  
22 be -- would see the economic benefit as \$47 per  
23 household per year if the fecal coliform level is  
24 reduced in the waterway. Is that correct?

1 DR. BOYLE: Yes.

2 DR. GIRARD: And now in terms of, you  
3 know, either this study or some of the other studies  
4 that have been done in the past, has -- have there  
5 been any studies where they've looked at whether or  
6 not the predicted value, you know, would be set up  
7 as a hypothesis after the improvements are put into  
8 a system to see whether or not the model actually  
9 was good at predicting the economic benefits that  
10 people would feel were accrued?

11 DR. BOYLE: There have been studies  
12 that have been done like that. Well, let me just  
13 say there are a couple different types of studies  
14 that have been done. One is to have a predicted  
15 model, but then have an original one that you do at  
16 a site and ask how well it does predict. That  
17 research is what leads to the conclusion that an  
18 equation transfer like this is more accurate than  
19 just a single -- taking a single value from a study  
20 and transferring it.

21 In terms of looking at the primary  
22 evaluation studies, there have been ones that have  
23 been done to look at the validity of those. For  
24 example, in terms of referendums and how people vote

1 and whether it will be the same after the change is  
2 realized, and it's found that the prediction is very  
3 good there.

4 And then in terms of the Van  
5 Houtven study, they did do a prediction like that  
6 compared into the Mitchell and Carson to see how  
7 well they can predict, and found that the results  
8 were quite similar. I do not know of any specific  
9 ones where they've done a prediction and let a  
10 change happen, and then go in and do another one.  
11 But they have done ones where they did an original  
12 study of what the value was for and the prediction,  
13 and found that they could be quite accurate.

14 DR. GIRARD: Thank you.

15 MS. TIPSORD: Anything further? Dr.  
16 Boyle, thank you very much for your time. We  
17 appreciate your testimony today. Have a safe flight  
18 back.

19 DR. BOYLE: Thank you.

20 MS. TIPSORD: It is a quarter after  
21 4:00, and I don't think we would be very productive  
22 to start with another witness today. We discussed  
23 off the record some additional hearing dates. So  
24 with that, we are adjourned today. Thank you all

- 1 very much.
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REBECCA A. GRAZIANO, being first  
duly sworn on oath says that she is a court reporter  
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so taken as aforesaid and contains all the  
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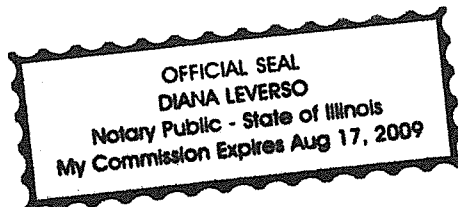
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before me this 29<sup>th</sup> day  
of May, A.D., 2009.

*Diana Leverso*  
Notary Public



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