

1 STATE OF MICHIGAN

2 STATE OFFICE OF ADMINISTRATIVE HEARINGS AND RULES

3 In the matter of: File Nos.: GW1810162 and  
MP 01 2007  
4 The Petitions of the Keweenaw  
Bay Indian Community, Huron Part: 31, Groundwater  
5 Mountain Club, National Discharge  
Wildlife Federation, and 632, Nonferrous  
6 Yellow Dog Watershed Metallic  
Environmental Preserve, Inc., Mineral Mining  
7 on permits issued to Kennecott  
Eagle Minerals Company. Agency: Department of  
8 \_\_\_\_\_/ Environmental  
Quality  
9 Case Type: Water Bureau  
10 and Office of  
11 Geological  
Survey

12 D R A F T T R A N S C R I P T

13 HEARING - VOLUME NO. XXXVI (36)

14 BEFORE RICHARD A. PATTERSON, ADMINISTRATIVE LAW JUDGE

15 Constitution Hall, 525 West Allegan, Lansing, Michigan

16 Monday, June 30, 2008, 8:30 a.m.

17 APPEARANCES:

18  
19 For the Petitioner MR. ERIC J. EGGAN (P32368)  
20 Keweenaw Bay Indian Honigman Miller Schwartz and Cohn LLP  
Community: 222 North Washington Square, Suite 400  
21 Lansing, Michigan 48933-1800  
(517) 377-0726  
22  
23  
24  
25

1 For the Petitioner MR. BRUCE T. WALLACE (P24148)  
Huron Mountain Club: Hooper Hathaway Price Beuche & Wallace  
2 126 S. Main Street  
3 (734) 662-4426

4 For the Petitioners JEFFREY K. HAYNES (P25140)  
Yellow Dog Watershed Beier Howlett, PC  
5 Preserve and National 200 E. Long Lake Road, Ste. 110  
Wildlife Federation: Bloomfield Hills, Michigan 48304  
6 (248) 645-9400  
and  
7 F. MICHELLE HALLEY (P62637)  
National Wildlife Federation  
8 PO Box 914  
Marquette, Michigan 49855  
9 (906) 361-0520

10 For the Respondent ROBERT P. REICHEL (P31878)  
Michigan Department of Assistant Attorney General  
11 Environmental Quality: Environment, Natural Resources and  
Agriculture Division  
12 6th Floor, Williams Building  
525 West Ottawa Street, PO Box 30755  
13 Lansing, Michigan 48909  
(517) 373-7540

14 For the Intervenor RODRICK W. LEWIS (P43968)  
15 Kennecott Eagle JEFFREY W. BRACKEN (P25648)  
Minerals Company: CHRISTOPHER J. PREDKO (P56040)  
16 Warner Norcross & Judd LLP  
2000 Town Center, Suite 2700  
17 Southfield, Michigan 48075  
(248) 784-5000

18  
19  
20 RECORDED BY: Marcy A. Klingshirn, CER 6924  
Certified Electronic Recorder  
21 Network Reporting Corporation  
1-800-632-2720  
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1                   Lansing, Michigan

2                   Monday, June 30, 2008 - 8:33 a.m.

3                   JUDGE PATTERSON: Are we ready?

4                   MR. REICHEL: Yes, your Honor. As you may recall,  
5 the Intervenor had one more witness that we needed to move  
6 out of sequence and they're going to call him this morning.

7                   JUDGE PATTERSON: Right.

8                   MS. HALLEY: Your Honor, before we get started, I  
9 apologize for my unanticipated absence last week, and I need  
10 to square away my exhibit issues from the previous Friday.

11                  JUDGE PATTERSON: No need to apologize. I'm sure  
12 you didn't do it on purpose.

13                  MS. HALLEY: No, I assure I did not.

14                  MR. EGGAN: Some people will do anything to get  
15 out of a hearing.

16                  JUDGE PATTERSON: I should try that.

17                  MS. HALLEY: I'm not that desperate. I could have  
18 chosen something less inconvenient. But during Mr. Maki's  
19 cross-examination, we assigned new numbers to a lot of the  
20 existing exhibits. And I agreed to give those to the court  
21 and to the other counsel in hard copy renumbered with the  
22 new numbers.

23                  JUDGE PATTERSON: Okay.

24                  MS. HALLEY: So I have those here.

25                  JUDGE PATTERSON: Okay. These have already been

1 admitted but just renumbered?

2 MS. HALLEY: Those that were admitted were  
3 renumbered. And we also assigned numbers to those that were  
4 offered but not admitted, and those are labeled as such.

5 JUDGE PATTERSON: Oh, and those would be? Did you  
6 want to offer those now?

7 MS. HALLEY: If you're inclined to make a  
8 different ruling.

9 JUDGE PATTERSON: I thought you said they were --  
10 you mean they were excluded?

11 MS. HALLEY: They are -- we assigned them numbers.

12 JUDGE PATTERSON: I remember now, yeah.

13 MS. HALLEY: But they are labeled as offered but  
14 not admitted.

15 JUDGE PATTERSON: I thought -- I interpreted what  
16 you're saying as "not offered." Now I recall. Okay.

17 MS. HALLEY: Okay. But they're clearly labeled as  
18 not admitted.

19 JUDGE PATTERSON: Okay. Anything else?

20 MR. PREDKO: Are we ready?

21 JUDGE PATTERSON: We're ready if you are.

22 MR. PREDKO: Kennecott calls Dr. William Taylor.

23 REPORTER: Do you solemnly swear or affirm the  
24 testimony you're about to give will be the whole truth?

25 DR. TAYLOR: Yes.

1 WILLIAM W. TAYLOR, PH.D.

2 having been called by the Intervenor and sworn:

3 DIRECT EXAMINATION

4 BY MR. PREDKO:

5 Q Dr. Taylor, could you please state your full name and spell  
6 your last name for the record?

7 A My name is William Waller Taylor, T-a-y-l-o-r.

8 Q And, Dr. Taylor, where are you currently employed?

9 A Michigan State University.

10 Q And what is your position there?

11 A I'm a university distinguished professor in fisheries and  
12 wildlife.

13 Q And what is a distinguished professor as opposed to a  
14 regular professor?

15 A It's the highest title that a university faculty member at  
16 Michigan State can achieve. There's 104 people selected  
17 since 1979 when the title arose. And probably about  
18 two-thirds remain in the workforce, because you get to --  
19 the title stays with you throughout your life.

20 Q Okay. And how do you attain that title?

21 A For excellence in scholarship, in teaching, research and  
22 outreach.

23 Q And is that an appointment?

24 A No. It's gone through administrative governance both on the  
25 faculty as well as the administrative side that have gone

1 through committees and then is made a recommendation to the  
2 provost who makes a recommendation to the board of trustees.

3 Q Dr. Taylor, I'd like to talk a little bit about your  
4 education -- your formal education. You have a bachelor's  
5 degree in biology?

6 A That's correct.

7 Q And where did you receive that degree from?

8 A At a liberal arts school at Oneonta, New York, called  
9 Hartwick College.

10 Q And you also have a master of science degree?

11 A Yes.

12 Q What is that degree in?

13 A That's in biology again, the department of biology, looking  
14 at fisheries and aquatic systems.

15 Q And where did you receive that degree from?

16 A West Virginia University.

17 Q And your Ph.D. you received in 1978. What is that degree  
18 in?

19 A That's in zoology and work -- and concentration on fisheries  
20 and working on rainbow trout and its impact on *Daphnia pulex*  
21 in the high mountain countries of Arizona at Arizona State  
22 University.

23 Q And was that your dissertation, Doctor?

24 A That was my dissertation.

25 Q And I think you just said it. But where was that degree

1 from?

2 A Arizona State University.

3 Q Dr. Taylor, do you have areas that you consider your  
4 specialty?

5 A Yeah. I consider fisheries ecology, population dynamics and  
6 management policy issues related to management as my  
7 expertise areas.

8 Q You said that you are currently a distinguished professor at  
9 Michigan State. I'd like to go through a little bit of your  
10 professional history. Prior to becoming a distinguished  
11 professor, what did you do?

12 A I was -- started at Michigan State University in 1980 as an  
13 assistant professor. And in 1992, then I moved up to -- an  
14 associate professor around '86 and then a full professor in  
15 the early 90's. '92 I became department chair of fisheries  
16 and wildlife. In '99 I became the acting dean of the  
17 college of agriculture and natural resources. And in 2001,  
18 I came back and took over the department chair as of January  
19 of 2002 as -- and most recently in February stepped down  
20 from that position to concentrate on my teaching and  
21 research and outreach.

22 Q And that chair position, what kind of responsibilities do  
23 you have in -- did you have in the chair position?

24 A Hiring faculty, maintaining budgets, helping to guide  
25 curriculum programs and outreach programs, helping to

1 facilitate research funding.

2 Q And the dean role that you were in, is that also in  
3 administrative capacity?

4 A It's -- that was an administrative role in which you look at  
5 the teaching, research and outreach efforts of the college  
6 of agriculture and natural resources.

7 Q And tell us about the kind of courses that you had taught as  
8 a professor at Michigan State.

9 A I've taught fisheries management. I've taught courses on  
10 global issues in fish and wildlife. I've taught courses on  
11 fish and wildlife management for the non-majors. I've  
12 taught a couple of human and natural systems as a one-credit  
13 sort of seminar part which links humans to the environment.

14 Q Is it fair to say that most of your work at Michigan State  
15 has related to the field of fisheries?

16 A Yes. I should say, Chris, that I also taught, before I  
17 became department chair, two graduate courses, one in fish  
18 population dynamics and one in fish communities and aquatic  
19 ecosystems at Michigan State.

20 MR. PREDKO: And just for the record, Dr. Taylor's  
21 CV, which has already been admitted by stipulation is  
22 Kennecott Intervenor Exhibit 373.

23 Q Dr. Taylor, you are an alternate U.S. commissioner for the  
24 Great Lakes Fishery Commission. Can you tell us what is the  
25 Great Lakes Fishery Commission?

1 A This is a binational treaty organization between the U.S.  
2 and Canada that helps to control sea lamprey in the Great  
3 Lakes and provide a forum for sustainable or productive  
4 fisheries -- return of productive fisheries.

5 Q And how did you become an alternate commissioner?

6 A It -- presidential appointment from the U.S. president.

7 Q And you are also a member of Michigan's Aquatic Nuisance  
8 Coordinating Council?

9 A Yes.

10 Q Can you tell us what that is?

11 A Yeah. That's a governor's advisory board that reports to  
12 the Office of the Great Lakes. And it evaluates threats to  
13 Michigan's aquatic ecosystems based on invasive species.

14 Q And how did you get that commission?

15 A It was a Governor Granholm appointment first and before that  
16 Governor Engler.

17 Q You are also currently a member of the Sport Fishing and  
18 Boating Partnership Council. What is that?

19 A That's a federal advisory committee that advises the  
20 Secretary of Interior and the Fish and Wildlife chief --  
21 Fish and Wildlife Service chief of issues related to  
22 recreational fishing and boating opportunities in the U.S.

23 Q And was that an appointment?

24 A That's an appointment by the Secretary of Interior in the  
25 U.S.

1 Q And how long have you been a member?

2 A I've been a member since roughly 1997, '98.

3 Q And do you have a chair position on that committee also?

4 A Yes. I served as chair for eight years.

5 Q You are also a member of the science advisory team for the

6 Great Lake Fishery Trust. Can you tell us what is the Great

7 Lakes Fishery Trust and what do you do for them?

8 A Great Lakes Fishery Trust is a trust organization that came

9 about from the settlement of Ludington pump storage damage

10 on Great Lakes fisheries. And funds were set aside for a

11 number of activities including access points research. And

12 I serve on their science advisory team to help give -- guide

13 the science program along with about 12 other people.

14 Q And from 1995 until the present, you've also been an

15 associate director for the Michigan Sea Grant College

16 Program. What is that program?

17 A That's a program funded by a match of monies between the

18 federal government and state government. The federal money

19 comes from the National Oceanographic and Atmospheric

20 Administration. It's a joint partnership with the

21 University of Michigan as the Sea Grant College Program

22 helps fund research as -- throughout university programs in

23 Michigan and has extension agents in the field that help

24 with coastal community development and fisheries aquatic

25 issues.

1 Q I'd like to talk just a little bit about some of your  
2 publications, Doctor. I do note in going through your CV  
3 that you have well over a hundred publications. I don't  
4 want to talk about all of those. I want to focus in on some  
5 that may be relevant to the work that you've done for this  
6 case. First of all, can you tell us, what percentage of  
7 your publications have to do with Michigan fish?

8 A Probably 90, 95 percent.

9 Q And what bodies of water or types of bodies of water would  
10 those fish be in?

11 A Great Lakes and tributary systems.

12 Q And have you done research and published papers on  
13 salmonids?

14 A Yes.

15 Q And could you give us just some examples of the type of work  
16 you've done with salmonids?

17 A Yes. Worked on brook trout in the Ford River in the Upper  
18 Peninsula of Michigan and have published papers on our  
19 findings of brook trout movements within the Ford River as  
20 related to temperature. I've published papers on pink  
21 salmon and its range extension between -- from Lake Superior  
22 all the way down to Lake Huron and Lake Michigan and some of  
23 the basic ecology of fish that's -- in enhancing and  
24 extension of its range, then declining. I've published  
25 papers on brown trout, rainbow trout competition in the

1 Rifle River system out of Lake Huron. And I've done work on  
2 the charter boat industry and its relationship to salmon  
3 fisheries and its communication network.

4 Q And what about unpublished reports? How many unpublished do  
5 you think that you have?

6 A A lot because of reports for grants that you would get that  
7 you have to do yearly reports on. And the study on the Ford  
8 River was related to the extra low frequency antenna that  
9 the Navy was going to put in the Upper Peninsula. And so  
10 you had quarterly reports. So I have quite a few reports on  
11 that. I've never counted.

12 Q When you say "extra low frequency antenna," what are you  
13 talking about?

14 A This was what called the ELF project. And it was an antenna  
15 system that was going to communicate with submarines at  
16 depth so that, should something have gone bad between the  
17 U.S. and Russia at the time, that the submarine would no  
18 longer have to come to the surface to get communication but  
19 could receive that information via this large network called  
20 the extra low frequent network.

21 Q Have your unpublished reports included reports on salmonids  
22 or brook trout?

23 A Yes.

24 Q Can you give us an example of unpublished reports that you  
25 have done on salmonids or brook trout?

1 A Yeah. It's progress reports for the Sea Grant Program when  
2 I was a Sea Grant investigator, not the associate director  
3 but when I actually received funds funding pink salmon  
4 research. The brook trout studies up in the Ford River to  
5 the contractors would be examples of those.

6 Q And you've received several professional awards, which are  
7 listed within your CV. I just want to ask you about a few  
8 of them. Dr. Taylor, you've received the J.W. Leonard Award  
9 of Excellence for the Michigan Chapter of American Fishery  
10 Society. Can you tell us about that award and why you  
11 received it?

12 A It's the award of excellence given for research and findings  
13 that help our understanding of fisheries and their habitats  
14 that allow for better management. It's provided by the  
15 Michigan Chapter of the American Fishery Society, which are  
16 your professionals in the state of Michigan that recognize  
17 accomplishments that you have made and provide you that  
18 award in recognition of those activities.

19 Q And one of the most recent awards that you received from the  
20 Michigan United Conservation Club?

21 A Yes.

22 Q Fisheries conservationist of the year award in 2008?

23 A That's correct.

24 Q Do you consider yourself a conservationist?

25 A Yes, I do.

1 Q Dr. Taylor, I'd like to talk about the kinds of things that  
2 you've done in preparation for your testimony in this case.  
3 What kinds of research or literature review have you done?  
4 A I've looked through the literature that I could find on  
5 brook trout ecology and coasters, the migratory forms of any  
6 of the salmonids that we look at. I looked at some of the  
7 testimony that has occurred, particularly Dr. Strand's and  
8 Dr. Workman's, also looked at Dr. Ames' --  
9 Q Adams?  
10 A -- Adams -- sorry -- Adams' testimony and then reports that  
11 we could find.  
12 Q And when you're referring to testimony, you're referring to  
13 the transcripts, testimony in this particular case?  
14 A In this -- correct.  
15 Q From both some Petitioners' experts and some Kennecott  
16 experts?  
17 A Correct.  
18 Q Have you had an opportunity to review the 90-day finding for  
19 the coaster brook trout from the Fisheries and Wildlife  
20 Service?  
21 A Yes, I did.  
22 Q And have you had an opportunity to review state agency  
23 comments or submissions on that petition?  
24 A Yes. On May 19th there were two reports that came out, one  
25 from Michigan and one from Minnesota, that I received copies

1 of last week.

2 Q And what agencies in particular were those from?

3 A Michigan Department of Natural Resources and the Minnesota  
4 Department of Natural Resources.

5 Q And specifically what were those agencies commenting on?

6 A They were commenting on the Fish and Wildlife Service 90-day  
7 request for information.

8 Q On the coaster brook trout?

9 A On the coaster brook trout.

10 Q And did you rely on the literature review research that you  
11 did and these agency submissions from Fisheries and Wildlife  
12 Service in reaching your conclusions in this case?

13 A Yes, I did.

14 Q And have you come to a conclusion in this case?

15 A Yes, I have.

16 Q And, Dr. Taylor, you've prepared some demonstrative slides  
17 for us.

18 MR. PREDKO: And if we could go to demonstrative  
19 slide number 25.

20 MR. WALLACE: I'm going to interpose an objection  
21 to the conclusions that I believe Dr. Taylor is going to  
22 reach here. I don't think he's been qualified as an expert  
23 in the disciplines that are relevant to the conclusions he's  
24 reaching. And I would like that objection for the record.  
25 I can voir dire now. I can question him later. But I don't

1 want his opinion to go in unopposed. This is a matter of  
2 genetics, among other things, and they're very specialized  
3 studies of these particular fish. He's conducted none of  
4 the studies. He's not a geneticist. This is what the  
5 determination turns on. And I think he's going to offer  
6 testimony that's irrelevant and in opposition to that.

7 MR. PREDKO: Well, first of all, your Honor, Dr.  
8 Taylor is a rebuttal witness to experts that Petitioners  
9 have put up who are not geneticists. They are ecologists.  
10 And specifically they were not fisheries ecologists. They  
11 were, number one, a biology conservation ecologist and a  
12 stream ecologist. And Dr. Taylor is rebutting testimony  
13 specifically given by those experts again who were not  
14 geneticists. And I believe that, as we go through this,  
15 we'll show that Dr. Taylor is certainly qualified to give  
16 the opinions that he's given in this case and can talk about  
17 the studies that were done on genetics just as the  
18 Petitioners' experts have done.

19 MR. WALLACE: Well, the determination of the  
20 90-day finding depends in significant part on genetic  
21 research. That research was, you know -- underlaid the  
22 testimony that was given in the admission of the  
23 Petitioner's Exhibit 35, which is the 90-day finding. To  
24 the extent this gentleman is here to rebut that or comment  
25 on it, I don't think he's qualified. And I would like that

1 objection for the record.

2 JUDGE PATTERSON: I think his qualifications  
3 establish the expertise. Obviously, Counsel, you can pursue  
4 that on cross-examination as to the weight of it.

5 Q Doctor, can you tell us briefly the conclusion that you've  
6 reached in this case?

7 A Yes. I reached the conclusion that brook trout -- coaster  
8 brook trout, as it is referred to is one that migrate out  
9 into larger waters staying near shore, are not genetically  
10 unique to any other brook trout or distinct population  
11 segment. They are a fish that move into larger waters, more  
12 favorable habitat for food and thermal conditions, which  
13 allow them to get larger, and then will move back. But  
14 you'll see this pattern throughout. And we'll talk about  
15 that, I'm sure, as we go along. So I do see these are the  
16 separate species or subspecies or distinct population  
17 segment based on the literature that I've read and other  
18 reports.

19 Q Dr. Taylor, you've prepared a number of other slides here to  
20 help us guide you through your testimony. And essentially  
21 it's kind of a lesson in the brook trout and then the  
22 coaster brook trout. And this first slide is entitled  
23 "Brook Trout" and has a picture of a fish on it. Could you  
24 give us just some general facts about brook trout?

25 A Yeah. It's a beautiful fish to begin with. It's noted by

1 its -- it's the State fish of Michigan. And it's an  
2 important recreational fishery. At one time, it was also  
3 strong in the commercial fishery in certain areas. It still  
4 is a significant component of the Michigan landscape,  
5 especially northern Michigan and the Upper Peninsula. It is  
6 noted by its white fringing fins, as you can see here in the  
7 picture. That's one of the parts, the adipose fin, which  
8 is --

9 Q Do you have a laser pointer there, Doctor, if you want to --

10 A Right there is the adipose fin. Talking about salmonids --  
11 salmonid formae. There's the white fringing fins. It often  
12 has a red belly especially as it becomes mature in there.  
13 And this vermiculation up here and speckled part makes it  
14 called often a speckled trout. It's very common through  
15 western Minnesota up through the Hudson Bay area over to the  
16 East Coast down along to Georgia on the Appalachian chain  
17 and across through Ohio and Michigan and then up to  
18 Wisconsin, Minnesota, Alberta.

19 Q And what family of fish is the brook trout in?

20 A It's in the Salmonidae family.

21 MR. PREDKO: And the next slide?

22 Q Can you tell us -- there's been some other testimony about  
23 salmonids in general. But I don't think that anybody has  
24 ever defined it. Can you tell us about the Salmonidae  
25 family of fish?

1 A There are a large number of animals and species in the  
2 Salmonid group in North America, northern hemisphere,  
3 roughly about 66 species of fish. The ones that you're most  
4 familiar would be brown trout, brook trout, rainbow trout,  
5 steelhead, coho, pink salmon, lake trout -- would be all in  
6 that group. These are large. They can get to be large.  
7 But -- and they're all predatory fish. They get to be  
8 large. They often have anadromous form, which means they  
9 move; anadromous meaning they move out to the -- the  
10 traditional one is move out to the ocean and then return.  
11 In this case, in the Great Lakes, they move out to the large  
12 lakes and return to streams to spawn.

13 Q You said predatory fish. What does that mean?

14 A They're eating other animals.

15 Q And physical features of the salmonids, do they have any  
16 distinct physical features where you could tell salmonids  
17 from other fish?

18 A Yes. They have that adipose fin that we just -- I pointed  
19 out on that slide before. These are very economically  
20 important, as I mentioned -- very economically important  
21 fish throughout the -- North America.

22 Q Let's go back and specifically focus in on the brook trout.  
23 Let's talk about brook trout habitat. Where do you find  
24 brook trout?

25 A Brook trout you find in a wide variety of environments but

1           needing cool, clear streams, ponds and lakes, so you need  
2           colder water temperatures. You need well oxygenated water.  
3           And they have a -- you'll often find them in the near shore  
4           areas of lakes, and you'll find them in the lake areas where  
5           the temperatures are below 25 degrees Centigrade.

6       Q     And the slide 3 here also lists estuaries. Do you find  
7           brook trout in estuaries?

8       A     In the Great Lakes, we call them bays, so river mouth, down  
9           river mouth and near the shorelines is where you'll find  
10          what are called coasters. In the Atlantic Ocean you will  
11          find them into the estuaries and along the ocean -- near  
12          shore ocean areas, and they're called salters often;  
13          coasters and salters.

14      Q     And generally what habitat characteristics are important for  
15          brook trout?

16      A     Water temperature and dissolved oxygen are critical. You'll  
17          need substrate for spawning, which is coarse gravel, and you  
18          need adequate food supply for each life stage. And the  
19          larger the fish get, the more they like to eat fish, which  
20          make them grow faster.

21      Q     Okay. And we're going to talk about each one of those  
22          separately with the next slide, slide number 4.

23      A     Okay.

24      Q     Doctor, can you tell us about the key water qualify  
25          parameters that are necessary for brook trout as represented

1 on slide 4?

2 A Uh-huh (affirmative). The preferred water temperature is 19  
3 degrees Centigrade. Growth ranges -- fish are going to  
4 actually grow above 5 degrees Centigrade up to about 25, but  
5 the optimal growth is right around 19 degrees Centigrade,  
6 which means that they get the most energy transfer at that  
7 point. The temperature is perfect for them as long as food  
8 is there. The lower and upper critical temperature where no  
9 growth -- in fact, if they extend for periods of time below  
10 5 degrees and above 25 degrees, they will die if they have  
11 to extend long periods of time or periods of time in there.

12 Q Now, what do brook trout do when they're exposed to  
13 temperatures either above or below the optimal temperatures?

14 A They start to look for habitat which are better for them.  
15 They'll start to move. In the Ford River system that we  
16 studied, when temperatures went above 20 degrees, they  
17 started to migrate towards a cold water tributary called Two  
18 Mile Creek.

19 Q The last item that you had mentioned earlier was dissolved  
20 oxygen content. Can you tell us what that is and why it's  
21 important for brook trout?

22 A Dissolved oxygen content -- obviously for living you have  
23 respiration that occurs, and you need oxygen to help with  
24 the metabolism. And in -- if you don't have high oxygen  
25 content for these fish, they will not survive.

1 Q And, in general, these preferred water quality parameters,  
2 where do you find those conditions in the state of Michigan?

3 A There's 5400 miles worth of designated trout streams. And  
4 you'll find these conditions in the 5400 miles of trout  
5 stream -- designated trout stream.

6 Q And how about lakes?

7 A In lakes, I don't have the exact number on that. But you  
8 will get them in the more northern stratified lakes that  
9 have dissolved oxygen going down to the bottom layers and  
10 maintaining colder temperatures.

11 Q One of the other habitat requirements that you mentioned was  
12 reproduction. Can you talk generally about how brook trout  
13 reproduce and why habitat is important?

14 A Yes. When maturity occurs, brook trout will find gravel  
15 areas, cobble, about that size (indicating). And they'll  
16 use -- the female will use fins to make out a redd,  
17 basically clearing it of any silt sedimentation.

18 Q A couple of things, Doctor.

19 A Yes.

20 Q For the record, you said "about that size." And you  
21 gestured with your finger.

22 A Yeah.

23 Q Can you tell us, you know, in terms of a coin size maybe?

24 A Gravel -- yeah, coin size gravel gravel areas.

25 Q Like the size of a penny or --

1 A Yes. A penny would be a good size to look at, too.

2 Q And then you also mentioned females using their tails (sic)

3 to create a redd. What is a redd?

4 A A redd is where they're going to deposit the eggs and this

5 is what -- the term we use in fisheries is a redd, which is

6 the location that the eggs will be deposited in. They'll

7 nestle between the gravel. And the eggs will then be

8 fertilized as they're being laid, and they'll incubate in

9 those -- in that gravel there.

10 Q Now, is temperature important for spawning?

11 A Yes. Temperature is important for spawning. The preferred

12 temperature is about 50 degrees, 49 degrees Fahrenheit, so

13 about 10 degrees of Centigrade. And it occurs easily in the

14 October, November period in Michigan.

15 Q And on the slide here, you also have listed the typical egg

16 production for females. And what is that?

17 A That's the number of eggs that you'd expect out of females

18 in Michigan, 100 to 400. The larger the female fish, the

19 more eggs that can be produced. So these are the typical

20 ones that you get, but you can get larger numbers if they're

21 larger fish.

22 Q Dr. Taylor, can you just take us through the process of the

23 life of the brook trout from egg on through maturity?

24 A Uh-huh (affirmative).

25 Q And can you tell us about that process and, I guess, how

1 long each stage takes and what's going on in each stage?

2 A Sure. Once the eggs are deposited in the redds in October  
3 or November period -- all these are temperature-dependent  
4 processes as is growth, in general, for fish, because they  
5 are cold-blooded vertebrates. The larvae will be in the  
6 redd for -- if it's at 40 degrees, for about 100 days and,  
7 at -- I'm sorry -- 40 degrees Fahrenheit for about 100 days  
8 and, at 50 degrees, they'd be in there for about 50 days.

9 Q And then before you go on, Doctor, we do have a slide with  
10 some fisheries on it that may help us understand what's  
11 going on.

12 MR. PREDKO: If we could go to slide 12, if we  
13 could.

14 A Okay. So the eggs -- there's the egg -- will -- so once  
15 deposited in October, November, they'll be deposited in  
16 those redds, which have oxygen coming over it and colder  
17 temperatures. The colder it is, the longer it's going to  
18 take to mature that egg and larvae. Eventually about 50 to  
19 100 days later you're going to get this, which are called  
20 yolk-sac larvae. It's got the yolk sac right there, which  
21 is the larvae is feeding on to grow. At about 1.5 inches  
22 this fish will have totally absorbed this yolk sac, and  
23 it'll become a juvenile and start free feeding on insects  
24 that are floating in the river nearby. And it'll go to the  
25 juvenile stage where you notice its body is completely

1 enclosed, and it's a free feeding fish. These fish then  
2 will eventually become adults if they survive the mortality  
3 factors.

4 Q And when do brook trout usually reach maturity?

5 A In Michigan, around two to three years.

6 Q And how is maturity defined? How do you know --

7 A This is when they can produce viable eggs and milk the  
8 sperm. You can get some that are later, depending on the  
9 food conditions. And you can get some precocious males  
10 that -- they call them precocious because they mature early  
11 in some of the eastern areas of one year as a male. But  
12 that was out of Quebec area.

13 MR. PREDKO: And if we can go to slide 7.

14 Q One of the -- the third habitat determinant that you talked  
15 about is food source. What do brook trout eat? And you've  
16 prepared this chart here. Can you tell us what this chart  
17 shows?

18 A What we have here is the stage that we just talked about;  
19 larval stage, juvenile stage and adult stage and roughly the  
20 age in Michigan we're looking at of size that would be the  
21 age. So this post-emergent coming out of the redd, they're  
22 now free feeding. That'd be two to three months old here at  
23 the time. They're feeding on the immature stages of aquatic  
24 insects that are in the water, primarily the blackflies and  
25 midge larvae and pupae that are inside the water.

1                   When you go to the juveniles, which is three  
2 months to the time that they become sexually mature, they  
3 now start to take terrestrial more adult insects as well as  
4 what's floating in the water as immature. So you'll have  
5 mayflies, which, of course, is a bigger fly than the  
6 blackflies or the midge larvae. They'll continue to eat  
7 blackflies and midges, but these will be more the adult  
8 forms. And then they'll start to increase their diet of  
9 earthworms that might get washed in from the sediment,  
10 oligochaetes in general, crickets, ants and, of course,  
11 they'll move to -- and they can, into fish. Fish always  
12 grow better on fish. And so they get bigger faster. So  
13 once they get a mouth size and an ability of -- locomotive  
14 ability, they'll start to eat particularly on northern red  
15 belly dace and brook sticklebacks from the areas, but  
16 they'll also eat other species of fish. These are just  
17 examples of fish there.

18                   By the time they're adults, we have the same.  
19 They'll start to get amphipods or scuds, caddisflies in  
20 addition to these -- this is in addition. But you'll notice  
21 here that we've actually had literature reports that they'll  
22 eat terrestrial vertebrates that would come across the  
23 water -- get swimming across the water and get eaten by a  
24 brook trout of a significant size. And those are just two  
25 examples. There's ones; snakes, for instance, that have

1           been found. But again primarily they're going to be on  
2           fish, earthworms and amphipods. But they have found other  
3           vertebrates.

4       Q     Would it be fair to say that the brook trout will eat just  
5           about anything that's available?

6       A     They're a big carnivore.

7                       MR. PREDKO: If we can go to the next side.

8       Q     Dr. Taylor, can you tell us about the growth rate for the  
9           brook trout and whether that varies depending upon  
10          environment?

11      A     Yeah. I put this chart together from Scott & Crossman to  
12          show an example that these fish are very classic in their  
13          life history behavior and are very responsive to  
14          environmental conditions. I've already talked about  
15          temperature being a key ingredient, that they can live  
16          between 5 and 25 degrees without optimal temperatures,  
17          between 10 and 19 but 19 is the optimal, so preferred  
18          temperatures in there. And depending on what food resource  
19          they run into that they feed on helps to determine what  
20          their growth rate. So this slide shows this here. The SL  
21          here, what we have here is age, and we have inches or  
22          millimeters on this and several different locations  
23          throughout North America primarily up in Canada, in this  
24          case, because Scott & Crossman came from a Canadian  
25          reference. But it shows what happens here. We have the

1 Moser River in Nova Scotia. You got sea-run, which would be  
2 their salters or coaster, brook trout versus freshwater,  
3 which is our stream brook trout. And you can see that the  
4 age structure is different. As you go across here, you'll  
5 see different parts. And you'll see different inches.

6 I should mention that the SL talks about length  
7 measurements. We have three different types of length  
8 measurements here. We have standard length, which is a  
9 fisheries term for -- from its mouth to where the tail will  
10 bend. It's a standard length. The fork length is if you  
11 take the tail of a fish and pinch it, take it from its mouth  
12 to where you pinch the tail at the end, that's called fork  
13 length there. And total length, which is right out to the  
14 tail -- end of the tail.

15 Q And what does this chart tell us about growth rates within  
16 different bodies of water?

17 A They vary. And it varies because of environmental  
18 conditions.

19 Q In general, how do brook trout in rivers compare to brook  
20 trout in lakes with respect to growth rate?

21 A Generally brook trout in lakes grow faster than brook trout  
22 in river systems.

23 Q And why is that?

24 A It's generally considered to be a food resource. They have  
25 more access to other fish, smaller fish, so that they can --

1           that is, compared the stream; just a more productive  
2           environment for feeding.

3       Q     And this is back to what you said about fish -- that these  
4           other fish grow faster?

5       A     Yes.

6       Q     The next slide, at the end of the brook trout life cycle,  
7           brook trout mortality, can you tell us about brook trout  
8           mortality?

9       A     Yes. These fish generally, as I mentioned, are -- they  
10          mature at about two to three years of age. But they also  
11          die early. They die very often about three years in  
12          Michigan. They're fish that three to five years is a  
13          long-lived brook trout in a river system particularly. And  
14          so the question has always been -- there's been a lot of  
15          literature in Michigan -- fisheries literature about why do  
16          these fish not survive a long time. Because the older a  
17          fish is, the more it can feed, the bigger the fish can get.

18                 And so people started to do a lot of study on  
19          this. And these are in the reports that you've seen  
20          already, I'm sure, and certainly in the Department of  
21          Natural Resources reports. But you have predation on fish;  
22          what are the things that kill off fish or reduce its  
23          survivability. And certainly there's been people that  
24          believe and have reported in the scientific literature that  
25          predation on fish less than 2 inches by fish-eating birds

1 and mammals like mink, herons and cormorants, fish like  
2 that -- fish-eating birds and mammals that have a  
3 significant impact especially in stream systems where  
4 they're confined have had a significant impact in reducing  
5 the numbers of brook trout in the stream area.

6 Cannibalism -- fish are not really very fussy  
7 about whether they eat their own or whether they eat another  
8 species, and so they often -- cannibalism is often a trait  
9 of all fishes that will feed on any fish that comes by  
10 including their own. And that's been considered to be a  
11 major issue and especially in a stream which has -- or lake  
12 which has not many other choices of food. Predation by  
13 other fish, certainly predators, other fish, especially  
14 smaller -- larger fish will feed on smaller fish. So one of  
15 the survival tactics is to get bigger faster than your  
16 predator so the fish can't eat you, because fish don't take  
17 chunks out of you. They have to eat you whole. So if you  
18 can get bigger than its mouth, it'll immediately be  
19 protected in what they call a predator window.

20 And the last one, of course, especially is angler  
21 harvest, which is what's considered one of the key  
22 characteristics that brook trout were heavily influenced by  
23 angler harvest. And that would hit the larger size fish,  
24 those 6 to 8 inches or larger if they were available to  
25 them.

1 Q What is the general life expectancy of a brook trout?

2 A In Michigan, it's been three to five years. And this is one  
3 that the Department of Natural Resources have tried --  
4 historically tried to increase the longevity by looking at  
5 special regulations to try to increase the size of fish,  
6 because anglers like larger fish. And so one way to get  
7 those larger fish, as I showed in -- earlier in growth is,  
8 the longer a fish lives, the more it's going to grow. And  
9 so this has been typically a three- to five-year-old fish.  
10 And it's been a conundrum of why it's been limited in terms  
11 of its length of life. Lake dwellers, we believe, have less  
12 exploitation by anglers, a better food resource, and so  
13 they've often lived six to seven years as you saw on some of  
14 those slides before.

15 Q Move to the next slide and talk about -- "Brook Trout  
16 Migration" is what the slide says. What do you mean when  
17 you use the term "migration" as it refers to brook trout?

18 A When I talk about migration, I'm looking at a movement  
19 pattern of fish moving from one area to another for some  
20 reason. So the reasons for movement of brook trout from one  
21 area to another area either within the stream or between a  
22 stream and into a lake or into the ocean has always been  
23 related to its movement from a area of less favorability to  
24 more favorability.

25 And the four areas that the people have identified

1 in the research literature is food, that they're going out  
2 to better food resources, that the -- they're coming into an  
3 area for reproduction so that you'll find an area of cold  
4 water streams, for instance, with good gravel for  
5 reproduction. So fish would move in for reproductive  
6 purposes. If habitat conditions become too warm, fish will  
7 move out assuming they're not blocked by some way of moving  
8 out to another area, either another area in the stream so  
9 you have a history of fish moving from tributary streams  
10 down into the main stream of rivers where they're deeper and  
11 more thermally stable during the wintertime and back up to  
12 the cold water streams in the summertimes. And limited  
13 available habitat; the less habitat there is, the less food  
14 there's going to be for fish because each fish has got to  
15 have a certain amount of food so there will be movement. So  
16 you have what we call nomads or nomadic movements or  
17 movements away from areas, that fish are just opportunists.

18 Q Dr. Taylor, which one of these or these factors that you've  
19 talked about would make a brook trout move back and forth  
20 between a river and a lake?

21 A I would say that the food availability is certainly one and  
22 that food availability being better in the lake. But that's  
23 going to come about because of the limited available habitat  
24 within the stream. There's going to be limited food  
25 resources within the stream, and some fish are going to be

1 pushed out or moved out or just move out for reasons. The  
2 other one is the temperature. If the temperature rose too  
3 high, they would move to different areas.

4 Q And generally how about reproduction? Is a stream or a lake  
5 better for reproduction of brook trout?

6 A Generally you think about streams being better because you  
7 have more gravel areas because of the movement of the river  
8 exposing more gravel and having the temperature and oxygen  
9 requirements of a egg and larvae. But near shore you can  
10 also have brook trout spawn in the adfluvial or near shore  
11 zone, because you'll have some areas that have gravel in  
12 that area which has been shown to produce in some areas in  
13 Michigan and in the northern -- and in Lake Superior places  
14 where larvae can survive. But generally you look at streams  
15 as being better for trout populations for reproduction.

16 Q And if we can move to the next slide, this is the slide that  
17 we've looked at before, slide numbness 12, which is entitled  
18 "Brook Trout Life Cycle." We're kind of full circle here.  
19 And this is a summary slide about the concepts that you just  
20 talked about. Can you just take us just briefly through  
21 this slide?

22 A Yes. We've done the egg. We talked about deposition of the  
23 eggs in the redds, the development time, 100 days later --  
24 or 50 to 100 days later depending on temperature, then the  
25 yolk sac, larvae and then to a juvenile stage. These are

1 the fish that will be moved out on their own when they're  
2 free swimming or go with the currents out into another area,  
3 or they could just move downstream and then move back up  
4 like we found in the Ford River. Once they get to be  
5 adults, they'll either -- they'll have two choices. One is  
6 to move out or to stay in lakes or to go in rivers or go  
7 back and forth between them. They can live in both areas in  
8 Michigan.

9 Q And the next slide, you said they live in both areas in  
10 Michigan. Can you tell us generally about the brook trout  
11 distribution within Michigan? Are brook trout common, and  
12 where do we find them?

13 A They are the State fish. They are common in Michigan  
14 through the northern Lower Peninsula and throughout the  
15 Upper Peninsula of Michigan. As I mentioned earlier and  
16 stated on the slide, there's 5400 miles of designated trout  
17 streams that have this temperature regime and support trout.  
18 There's also a number of trout lakes in both areas. I don't  
19 know the exact number.

20 Q And can you tell us about the historic populations in  
21 Michigan?

22 MR. PREDKO: Go the next slide, slide number 14.

23 A The historic population in Michigan where we -- brook trout  
24 were primarily in the Upper Peninsula of Michigan with some  
25 in the northwestern part of the Lower Peninsula of Michigan.

1 Arctic Grayling were in -- Grayling -- Michigan Grayling  
2 were in the other parts of the lower northern peninsula. As  
3 habitat started to change due mostly to agriculture and  
4 forestry practices and urbanization processes in the 1800's,  
5 most of the wild populations of Grayling started to decline  
6 and brook trout started to decline because of increased  
7 sediment load in the stream. And so we went through a  
8 period where they really became -- the Arctic Grayling  
9 became extinct in Michigan. And the brook trout continued  
10 to expand its range in different areas primarily through  
11 stocking areas. And we started to have rehabilitation  
12 pieces of that. But land use patterns changed which  
13 impacted streams which impacted the brook trout populations  
14 significantly during the 1800's. Restoration efforts  
15 started around the 1870's, 1880's, primarily using what the  
16 fishery managers knew in the day, which were stocking  
17 practices of trying to replenish populations that had been  
18 diminished by environmental degradation by land use  
19 practices.

20 Q And you've been talking about some of the things that we  
21 have in the next slide with the population decline in the  
22 mid to late 1800's of the brook trout. You talked about  
23 habitat destruction. Can you tell us the kind of things  
24 that destroyed the habitat?

25 A Uh-huh (affirmative). These are primarily land use changes

1 of forestry practices that -- and agriculture practices that  
2 allowed for a lot of sediment to be washed off the lands and  
3 into the -- into the streams that would bury the gravel  
4 areas so they no longer have the well oxygenated gravel  
5 areas there. You'd also take away the riparian zone from  
6 the streams, because we didn't have a lot of rules and  
7 regulations that were thinking about fish protection at that  
8 time. They were thinking about agricultural crops and  
9 forestry-related wood products. And therefore when you take  
10 the vegetation and the riparian zone, you no longer have a  
11 sediment buffer, nor do you have a cooling of the  
12 temperature of the water, because you now have sunlight  
13 penetration directly into the stream and heating of this.  
14 So the streams would warm up. They would sediment, so you  
15 would lose the gravel areas needed for the reproduction side  
16 of the brook trout. And then in addition, you had a lot of  
17 dams that were being put in for power generation of some  
18 form whether they were gristmills or areas that were  
19 actually blocking any movement from a brook trout both  
20 within a river system as well as between a river system and  
21 a lake if that's what they did. But they started to block  
22 out areas.

23 Q You talked about the restocking of brook trout. Has that  
24 restocking of brook trout in the late 1800's been successful  
25 in restoring the population?

1 A Very successful.

2 Q And how would you characterize the brook trout population in  
3 Michigan today?

4 A Common.

5 Q Would you say that the population is flourishing?

6 A Yes. I would say in most areas it's doing well. There's  
7 some areas that -- you know, that they're still working on  
8 management practices and they still stock brook trout trying  
9 to rehabilitate. But for the most part, I think our rules  
10 and regulations have gotten to be much better.

11 Q There has been a lot of talk in this case about the coaster  
12 brook trout. And this slide that you prepared is labeled,  
13 "Adfluvial 'Coaster' Brook Trout." Can you tell us what  
14 those terms mean? What does "adfluvial" mean? And you I'd  
15 of described it before, but tell us what "coaster" means.

16 A Yeah. What "adfluvial" means is they moved from a river to  
17 a lake. You have river-to-lake movements. And the coasters  
18 are an example of that, where they live along the  
19 coastlines, move out of a river system, migrating along the  
20 shoreline of a lake or an ocean, and that's why they're  
21 called coasters.

22 Q And what is a coaster brook trout?

23 A To me it's a brook trout that has a migration -- a movement  
24 pattern into a lake that gets larger than a stream  
25 resident -- a stream dwelling brook trout.

1 Q And on this slide you have the term "life history variant."  
2 What is that, and how does that differ from a separate  
3 species?

4 A As we talked about, brook trout are very susceptible to  
5 environmental conditions, whether it's the food resources  
6 and the temperature. And so you can get morphologically  
7 different looking, in terms of sizes, of fish based on what  
8 environment they're living in. So this would be a life  
9 history variant in that they moved out into a lake. They've  
10 encountered a larger food source. Preferred temperatures  
11 were better and got larger compared to if I was looking in  
12 the stream where they -- the stream was -- is the only life  
13 that they've ever seen would be smaller.

14 Q Are there any real differences ecologically or physically  
15 between a coaster brook trout and a stream-dwelling brook  
16 trout?

17 A None that were reported.

18 Q What kinds of things are similar between the two?

19 A They have -- reproduction is similar. Temperature  
20 preferendums are similar. The physiology of the fish are  
21 similar. The water -- I mentioned, I think, the water  
22 quality is similar in needs, and the optimal growth  
23 temperatures are similar. The food habits are similar in  
24 terms of the general types of food.

25 Q And on the next slide, slide 17, where can we find adfluvial

1 coaster brook trout?

2 A The -- I made a list of ones that I have been able to  
3 decipher from the literature, and you can see that Isle  
4 Royale has some adfluvial brook trout. The Salmon Trout  
5 River in Michigan has populations that have larger brook  
6 trout coming into them; tributaries in the Pictured Rocks  
7 area. Lake Nipigon and the Nipigon River both have larger  
8 brook trout forms that are present. The Assinica and  
9 Temiscamie Lakes in Quebec have those. Michigan Department  
10 of Natural Resources has stocked in fish from these  
11 larger-size brook trout. And the Gratiot, Little Carp,  
12 Anna, Hurricane, Mosquito Rivers and the Sevenmile Creek,  
13 which are tributaries to Lake Superior, Wisconsin DNR has  
14 stocked in these larger brook trout progeny into Whittlesey  
15 Creek. And the Michigan DNR has stocked into Grand Portage,  
16 Minnesota. Plus on their report in the response to the ESA  
17 petition, they list other areas in Northern Ontario and in  
18 Minnesota that these fish have been noted in as well.

19 Q And for those, just the first three locations that are  
20 listed on the list on slide 17, Doctor, can you tell us  
21 about the movement or migration habits generally of these  
22 brook trout?

23 A Yeah. Some of these fish at Isle Royale tend not to have  
24 the river systems that they can go in and spawn in, and they  
25 spawn along the near shore areas. The Salmon Trout, they

1           come into the -- they do spawn in a lower river system --  
2           the Salmon Trout, before they come to a waterfall area. And  
3           in the Pictured Rocks they go into the tributaries. There's  
4           probably some spawning in the near shore areas and other  
5           areas of Lake Superior. It's been speculated but not  
6           proven, because there has not been a lot of research done in  
7           that area.

8           Q     The next slide. Dr. Taylor, there has been discussion in  
9           this case about what we've admitted into evidence as  
10          Petitioner's 632, Exhibit 35, which is the Fish and Wildlife  
11          Service 90-day finding. Are you familiar with this  
12          document?

13          A     I am.

14          Q     And can you tell us generally what it means when there is a  
15          90-day finding from the Fish and Wildlife Service?

16          A     What it means is that they need to collect more information  
17          to determine accurately the status of the petitioners of the  
18          status of -- status and trends of the brook trout. That  
19          does not mean that these fish are threatened or endangered  
20          but that they need additional information from public  
21          comment and reviews by scientific literature.

22          Q     And what is the current status of this coaster brook trout  
23          petition? What are they doing now?

24          A     They are right now gathering information from the public and  
25          by the state agencies and by research communities to

1 determine whether there is a discrete population segment.

2 Q And what kind of information has Fisheries and Wildlife  
3 Service asked for and been provided by agencies and others?

4 A These are what the more -- whether these are unique. Are  
5 they different -- whether they're different than brook  
6 trout; essentially information.

7 Q The next slide. The petition for listing suggests that  
8 coasters are reproductively isolated and should be  
9 considered a distinct population segment. First of all,  
10 before I ask you whether you agree with that, can you tell  
11 us generally, what is meant by "distinct population  
12 segment"?

13 A To me a distinct population segment is a component of a  
14 species which are reproductively isolated and only spawn  
15 with each other that have certain physiological and  
16 morphological characteristics that make them unique.

17 Q Now, do you agree with the statement that coasters are  
18 reproductively isolated and should be considered a distinct  
19 population segment?

20 A No, I don't.

21 Q And why not? And you prepared some slides that made your  
22 points here, beginning with slide 20.

23 A Right. These are from the literature and that -- first off,  
24 that the adfluvial brook trout are large morphological  
25 variants of stream dwellers, and there were no physiological

1 differences that we saw at all on -- in the literature on  
2 these. We do not believe -- we do know that this behavior  
3 of movement is not unique just to brook trout. You'll see  
4 them throughout all salmonids; that you have movements of  
5 fish from one habitat type to another habitat. And it's not  
6 unique to any one genetic strain. It happens throughout.  
7 Coasters is in -- specifically in the Salmon Trout River are  
8 not unique to the Salmon Trout River, as I mentioned. I  
9 listed other areas that coaster brook trout, the larger  
10 variants, have been noted, and reports by the Minnesota DNR  
11 and the Michigan DNR list other areas in addition that I  
12 didn't find.

13 Q And when you used the term in the first bullet point  
14 "morphological variant," do you just mean that they are  
15 larger?

16 A They're larger.

17 Q And how do you explain coasters getting larger than  
18 stream-dwelling brook trout?

19 A Better food resources and more consistent thermal  
20 temperatures that are preferred.

21 MR. PREDKO: And then the next slide, please?

22 Q And the last reason that you've listed that the brook trout  
23 are not a distinct population segment?

24 A Yeah. This -- in the Minnesota Department of Natural  
25 Resources and Michigan Department of Natural Resources

1 reports plus my own -- other articles that I reviewed stated  
2 specifically that they were not a genetically unique group.  
3 We do see interbreeding between resident stream brook trout  
4 and coasters. This has been shown out on the East Coast as  
5 well and in the Quebec systems where you'll have coasters  
6 come in and spawn with resident trout.

7 Q Now, Doctor, before we get into what the specific research  
8 studies have shown about coasters, can you tell us about  
9 your experience throughout your educational and professional  
10 career in dealing with the types of research studies that  
11 you've reviewed here, specifically genetic types of studies?

12 A These are pieces of information that we used in my study in  
13 terms of population dynamics to determine whether the growth  
14 parameters are -- in terms of length and weight, age  
15 distributions are different. I am not a geneticist, and so  
16 we've relied on others to provide that information to us.  
17 The -- we do use the information for how to -- better  
18 management. If you have a selection for certain types of  
19 animals, can you actually continue to move for increased  
20 growth rates? For instance, there was a Donaldson Trout  
21 years ago that people thought were a faster-growing rainbow  
22 trout, and it turned out that, once you put them into other  
23 places, they weren't that fast growing, so they were a  
24 rainbow trout.

25 Q Are genetic studies that studies you and others who are fish

1 ecologists typically rely on during the course of your own  
2 studies?

3 A We certainly look at that information to determine whether  
4 or not we think that there is a reproductively isolated and  
5 separate stock so that we know, when we come with management  
6 plans, that -- whether we have different growth potentials  
7 and survival rates.

8 Q Let's talk about the research findings with respect to the  
9 genetics of the coaster brook trout, and that's slide 22?

10 A Uh-huh (affirmative).

11 MR. WALLACE: Your Honor, I guess I'll just  
12 restate my objection and add to it that Dr. Taylor has  
13 acknowledged that he is not a geneticist, and we're now  
14 being asked to hear testimony about the reports of other  
15 geneticists that are not in the record that are -- the  
16 authors aren't here present at the time and in an area which  
17 he does not have expertise. So this is hearsay and outside  
18 the scope of this gentleman's specific expertise.

19 MR. PREDKO: Well, Dr. Taylor's testified, your  
20 Honor, that these types of genetic reports are the types of  
21 reports that he and other fish ecologists typically rely on.  
22 I do believe they're' admissible in this proceeding under  
23 APA 75.

24 JUDGE PATTERSON: I agree. I'll overrule the  
25 objection.

1 Q Can you tell us, Doctor, just generally what these research  
2 studies have shown with respect to genetics of the coaster  
3 brook trout?

4 A In the studies that are in the reports that I have reviewed,  
5 there has been no separate adfluvial or coaster genomes that  
6 have been present.

7 Q What does that mean in --

8 A It means there's -- that brook trout are brook trout. It  
9 doesn't mean that there's a separate genome for a coaster  
10 brook trout as opposed to a stream-resident brook trout.  
11 The -- they also -- another study is genetically much more  
12 similar to sympatric resident brook trout than either form  
13 is to brook trout from other drainages. So if you look  
14 within a drainage, they're more similar within that drainage  
15 than they are between drainages. But brook trout have a  
16 very high commonness of genetic loci together.

17 Q And when you talk about drainages, you're talking about  
18 river bodies or streams?

19 A Yes.

20 MR. PREDKO: The next slide.

21 A The other thing we see is that, when you do have movement  
22 between these fish that move into the lakes, the fidelity of  
23 the systems are not known how well do they return to any one  
24 stream. They do -- we do know from other salmonids as well  
25 as brook trout that they will go into other streams, and

1 that would be a vector for mixing the genomes from one  
2 stream to another stream. And that's probably one of the  
3 reasons why the high similarity, in addition to all the  
4 stocking that was done of brook trout. We saw with pink  
5 salmon -- well, this is brook trout, but pink salmon  
6 obviously move from one stream in Lake Superior throughout  
7 the upper Great Lakes area without any other stockings.

8 Q And the next bullet point on this slide talks about  
9 interbreeding?

10 A We do know that there is interbreeding between the adfluvial  
11 brook trout and the resident brook trout, those that come to  
12 the stream. There will be resident brook trout that do  
13 spawn successfully with the larger coaster or larger  
14 adfluvial species so -- sorry -- the larger adfluvial brook  
15 trout so that you will actually get intermixing of the  
16 resident Salmon Trout and the ones that had moved out to  
17 large water.

18 Q And why is that important in determining whether the coaster  
19 is a distinct population segment?

20 A Because to me, if -- you have to have reproductive isolation  
21 where -- that you would not have a mixing of resident  
22 trout -- the trout that don't move with trout that do move.

23 Q From your own research with respect to what genetic studies  
24 have shown, what do you glean from the research?

25 A I glean that these brook trout -- that coaster brook trout

1 are no more than a brook trout that happens to move into  
2 larger water and feed have better thermal temperatures, get  
3 bigger and are not a unique subspecies or a unique, distinct  
4 population segment.

5 Q And that's, again, where you've stated -- and that is your  
6 conclusion here in this case, Doctor?

7 A Uh-huh; yes, it is.

8 Q Do you believe that coaster brook trout are unique or rare?

9 A No, I do not.

10 Q Are coaster brook trout replaceable?

11 A Yes, I believe they are replaceable. They have certainly  
12 been stocked in the brook trout populations that have  
13 diminished greatly in the 1800's in Michigan, had been  
14 heavily stocked by state agencies and had brought back the  
15 brook trout to be very common in Michigan in the areas  
16 including ones that are migratory.

17 Q Doctor, you had mentioned in your testimony reports that  
18 were done in response to the 90-day petition by state  
19 agencies, and you mentioned Minnesota and Michigan. When  
20 were those reports available?

21 A They were dated May 19th. I got them last week.

22 Q So May 19th of --

23 A Of 2008; sorry.

24 Q And so those reports did not become available until this  
25 trial had already been ongoing?

1 A That's correct.

2 Q And do these reports further support your conclusions about  
3 whether the coaster is a distinct population segment?

4 A Both reports say they are not.

5 Q And did you rely on both of those reports as future support  
6 for your conclusions?

7 A I did.

8 Q And now what is an organization called Trout Unlimited?

9 A It's a nongovernment organization formed on the banks of the  
10 AuSable River in 1959 that was there to protect cold water  
11 fishing and fish and their habitats.

12 Q And so this is an organization that is interested in trout  
13 conservation?

14 A Trout conservation and cold water stewardship.

15 Q We're going to put up on the screen here what is marked as  
16 Intervenor 377, and it is a Trout Unlimited publication  
17 that's called "The Coaster Challenge."

18 A Uh-huh (affirmative).

19 Q Are you familiar with that document, Dr. Taylor?

20 A I am.

21 Q And what does this independent group, Trout Unlimited,  
22 conclude about whether the coaster brook trout is  
23 genetically unique?

24 A They do not --

25 MR. WALLACE: Excuse me just a minute, Doctor.

1 THE WITNESS: Sorry.

2 MR. WALLACE: Again, your Honor, this is  
3 completely hearsay. The authors aren't here. Introducing  
4 the content of this document with none of its authors  
5 present to be cross-examined is -- should be inadmissible.  
6 There's no indication this gentleman had anything to do with  
7 preparing this publication.

8 MR. PREDKO: No. But again, this is another  
9 report that talks about the coasters that Dr. Taylor has  
10 relied on to form his opinions.

11 MR. WALLACE: Well, not even that foundation was  
12 laid, but I think we're getting very far afield by marching  
13 in a bunch of documents and the content of documents that  
14 are hearsay and whose authors aren't present and can't be  
15 cross-examined in contravention of, you know, a number of  
16 prior rulings.

17 MR. PREDKO: Well, it's not in contravention of a  
18 number of prior rulings. It's actually in line without  
19 APA75, which is -- allows such documents to be put in. And  
20 I can form the foundation --

21 JUDGE PATTERSON: Yeah. I don't think at this  
22 point there is a proper foundation, If you can pursue  
23 that --

24 MR. PREDKO: Sure.

25 Q First of all, in general, what is this publication?

1 A This is a publication which talks about how to restore brook  
2 trout into Lake Superior basins and to evaluate coasters as  
3 a -- as one segment -- large brook trout as one segment of  
4 the fishing population.

5 Q Now, are you familiar with conservation plans for fish like  
6 this one?

7 A Yes.

8 Q What kind of experience do you have with those?

9 A They're -- we review these plans at the National Fish  
10 Habitat Action Board meeting that I'm on as well -- that's  
11 another board at the federal level that we look at to look  
12 at how to improve fishing and fish compilations in the U.S.  
13 and its sport fishing board and partnership counsel, and I  
14 review proposals.

15 Q And is this a type of report that you typically rely on as a  
16 fish ecologist?

17 A Uh-huh (affirmative). I look at these as what is the best  
18 science and the public understanding, as well as the  
19 scientific understanding of the current status of fish and  
20 basins.

21 MR. PREDKO: And with that, your Honor, before we  
22 talk anymore about content, I would move admission of  
23 Intervenor 377.

24 MR. WALLACE: Just, if I may, state -- preserve  
25 the objection I've made.

1 JUDGE PATTERSON: You may. And I'll overrule it  
2 and admit it.

3 (Intervenor's Exhibit 377 received)

4 Q Now, Doctor, what does Trout Unlimited include about the  
5 coaster and whether the coaster is genetically unique?

6 A They do not believe it's a genetically unique segment of  
7 brook trout; that it's brook trout that has gotten into  
8 favorable environmental conditions and is a morphological  
9 variant.

10 Q And so they support the same conclusion that you came to?

11 A They do. And some of the reasons for the increase in size  
12 when it -- and reduction in take in Lake Superior was to  
13 create more large-size brook trout by the Department of  
14 Natural Resources.

15 Q Now, Dr. Taylor, we've talked about your conclusions about  
16 the coaster. Before I turn you over to opposing counsel for  
17 questioning, I do want to just touch on a couple of other  
18 fish that have been mentioned by some of Petitioner's  
19 experts.

20 MR. PREDKO: And if we could, bring up  
21 Petitioner's 632, Exhibit 11, page 26?

22 Q Doctor, you've become familiar through reviewing testimony  
23 in this case with a fish called the cisco and the Rush Lake  
24 trout?

25 A Uh-huh (affirmative).

1                   JUDGE PATTERSON: You have to say "yes" or "no,"  
2                   Doctor.

3           Q       Is that a "yes"?

4           A       Yes. I'm sorry; yes.

5           Q       Dr. Taylor, using this map that we have up here, which,  
6                   again, is Petitioner's 632, Exhibit 11, page 26, which shows  
7                   the Salmon Trout River Watershed, can you show us where the  
8                   cisco and the Rush Lake trout that has been talked about  
9                   Petitioners -- where those fish reside?

10          A       Rush Lake is up in this (indicating) area here just off the  
11                   map coming up, and that's part of it here. And that's where  
12                   there is consideration of a cisco in here that's endemic to  
13                   this area, although there's other people that believe it  
14                   isn't. And Ives Lake here has a cisco, and there -- like  
15                   you will see, this is -- the yellow boundaries in which --  
16                   in -- shaded in yellow is the Salmon Trout Watershed, so  
17                   they're in different watersheds than the Salmon Trout.

18          Q       So both of those fish are completely outside the Salmon  
19                   Trout Watershed?

20          A       They are.

21                   MR. PREDKO: Thank you, Doctor. your Honor, I do  
22                   have several exhibits that I would like to offer for  
23                   admission.

24                   JUDGE PATTERSON: Okay.

25                   MR. PREDKO: Would it be an appropriate time to

1 take a break, and we can do that when we come back?

2 JUDGE PATTERSON: I think so.

3 (Off the record)

4 JUDGE PATTERSON: Okay.

5 MR. PREDKO: Yes, your Honor, I've sorted through  
6 what has already been admitted and what I have yet to offer,  
7 and I just have a few. The first one is the Michigan  
8 Department of Natural Resources Fisheries Division, official  
9 agency statement on the listing of the coaster brook trout.  
10 This is Proposed Exhibit -- Kennecott Exhibit 653.

11 MR. WALLACE: And just to restate our objections,  
12 the author is not here. It's a hearsay document. It can't  
13 be cross-examined. I'm not sure when it was listed but, if  
14 it was listed, it was pretty late in the game. And we  
15 haven't had a chance to prepare for it nor cross-examine  
16 this gentleman about it, and he's not the author.

17 MR. PREDKO: Well, the same response that I had  
18 last time, your Honor. And I would just add that this  
19 document, as Dr. Taylor testified, did not become publicly  
20 available until just a week ago. It's dated May 19th, 2008,  
21 and so it was actually published submitted to the Federal  
22 Fisheries and Wildlife Service on or after May 19th, 2008.  
23 It is the MDNR's official statement on whether the coaster  
24 should be listed. It's a publicly available document, and  
25 it is part of the federal record of which I believe a couple

1 of the Petitioners here are actually the Petitioners that  
2 filed that 90-day -- the coaster listing petition.

3 JUDGE PATTERSON: And I believe Dr. Taylor also  
4 testified that he reviewed it and relied on it, from the way  
5 he was --

6 MR. PREDKO: He did, your Honor.

7 MR. REICHEL: We have no objection.

8 JUDGE PATTERSON: All right. I'll admit it over  
9 objection.

10 (Intervenor's Exhibit 653 received)

11 MR. PREDKO: And, your Honor, along similar lines,  
12 the Minnesota Department of Natural Resources official  
13 statement response to the proposed coaster petition is  
14 Kennecott Exhibit 654.

15 MR. REICHEL: No objection, your Honor.

16 MR. WALLACE: And the same objection. I just want  
17 to be clear here, you know. These are not listed exhibits.  
18 I mean, they have an explanation why they didn't list them,  
19 but, I mean, there is a procedure, and it simply hasn't been  
20 followed here, and there was no way that we could prepare in  
21 this trial for exhibits that are being created and published  
22 within the past few days so -- along with the fact that we  
23 can't cross-examine the authors because they're not here,  
24 although they're presumably, at least with respect to the  
25 Michigan DNR, absolutely available to the Respondent for

1 presentation and for cross-examination. It's a late  
2 exhibit, and it's hearsay, and this gentleman can't  
3 authenticate it or speak to its contents.

4 MS. HALLEY: Your Honor, might I add that, while  
5 the 90-day finding is relevant to these proceedings, because  
6 this court should know that a potentially listed species is  
7 in the affected area, we're getting pretty far afield. And  
8 if the Intervenors are going to start bringing in what are  
9 essentially public comments to that process, then perhaps we  
10 want to start bringing in other public comments. And I  
11 don't think that necessarily the public comments are  
12 relevant to this proceeding. This court is not determining  
13 whether or not the coaster is eligible for listing or not,  
14 so I don't think these documents are even relevant to what's  
15 going on here.

16 MR. PREDKO: Well, as far as relevancy, your  
17 Honor, had Petitioners not put on any evidence at all as to  
18 the genetic uniqueness of the coaster through their own  
19 witnesses who were not geneticists, we would not have to  
20 have put on Dr. Taylor's rebuttal testimony. This is purely  
21 rebuttal testimony. And Dr. Taylor said that he did rely on  
22 these reports. These are official state agency reports.  
23 They're part of the public record of the Fisheries and  
24 Wildlife petition. They're publicly available and, you  
25 know, have not been publicly available until at least May

1 19th, 2008, which was well after this trial had commenced.

2 JUDGE PATTERSON: All right. Again for the same  
3 reasons, I will admit it over objection.

4 (Intervenor's Exhibit 654 received)

5 MR. PREDKO: And the last exhibit, your Honor, for  
6 purely demonstrative purposes are Dr. Taylor's PowerPoint  
7 slides, which are identified as Kennecott Exhibit 655.

8 MR. REICHEL: No objection, your Honor.

9 MR. WALLACE: And as previously stated, we do  
10 object to the contents and particularly the conclusions that  
11 weren't supported by this gentleman's disciplines or  
12 expertise but, as demonstrative, we don't have an objection.

13 JUDGE PATTERSON: Mr. Egan, do you have the  
14 usual --

15 MR. EGGAN: I do not, your Honor. I take no  
16 position on it.

17 JUDGE PATTERSON: Okay. Thank you. And  
18 Intervenor 655 will be admitted.

19 (Intervenor's Exhibit 655 received)

20 MR. REICHEL: Your Honor, I have no questions of  
21 Dr. Taylor at this time, but I reserve the right to examine  
22 him based upon cross-examination.

23 MR. WALLACE: Dr. Taylor, my name is Bruce  
24 Wallace. I represent the Huron Mountain Club.

25

CROSS-EXAMINATION

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BY MR. WALLACE:

Q I'd like to discuss the coasters and some related issues from a little different angle with you. We looked a few minutes ago at an exhibit that showed the watershed area of the Salmon Trout River; correct?

A Yes.

Q Are you familiar with the area that's at issue in this lawsuit?

A I'm familiar with the Salmon Trout River.

Q You are?

A Yes.

Q Have you fished it?

A I have not fished it. I was there in the early 80's.

Q Are you familiar with the Yellow Dog Plains?

A I am not.

Q Let me just tell you the Yellow Dog Plains -- part of the Yellow Dog Plains are depicted in the map, which I think is Exhibit 32 that's on the easel in front of us. And I'm going to stand up for a minute. It includes the basin of the Salmon Trout River, which ultimately discharges into Lake Superior here and encompasses this area (indicating).

A Okay.

Q The proposed mine area is shown on this map right here. Okay? The Huron Mountain Club encompasses the lakes,

1 including Rush Lake and Ives Lake and about 15 miles of Lake  
2 Superior shoreline, about 30 square miles altogether,  
3 including portions of the Huron Mountains. The McCormick  
4 Tract is south of the mine site. And the headwaters of the  
5 Salmon Trout River begin in the proposed mining area about  
6 here and cross -- I'm not seeing exactly where the crossing  
7 is -- cross the Triple A Road and a culvert near the mine  
8 site just to orient you.

9 A Okay.

10 Q What is landscape ecology?

11 A Landscape ecology is looking at the scales of ecological  
12 processes from local to watershed to global scales.

13 Q Okay. And this is an area of interest and expertise on your  
14 part, is it not, sir?

15 A Yes, it is.

16 Q When you say "scales," what does that mean?

17 A It means the geographic regions, so from a very small area  
18 to a very large area where processes or vectors of change  
19 can occur.

20 Q Is it part of the discipline of landscape ecology to look at  
21 areas of human disturbance and relate them to the landscape  
22 in which they're located?

23 A People can do that.

24 Q And what is a landscape?

25 A A landscape is a geographic unit of varying sizes in which

1 ecological processes occur.

2 Q Would a landscape include some of the features that I just  
3 pointed out on this map: Lake Superior, the Salmon Trout  
4 River, the McCormick Tract, the rivers and the lakes  
5 encompassed within it?

6 A You could have it there, depending on your question that you  
7 would be asking ecologically to solve.

8 Q I think I read in a text that you were involved in that a  
9 landscape may be a few meters, --

10 A Uh-huh (affirmative).

11 Q -- if it's looked at from the -- through the eyes of an  
12 insect?

13 A Right.

14 Q But it may be dozens or hundreds of square miles if looked  
15 at from the perspective of humans; right?

16 A Correct, but more accurately, if the ecological processes  
17 extend across those miles so that you have not just a human  
18 looking at it but whether what occurs at one level affects  
19 the other levels.

20 Q I should have pointed out as well that the Yellow Dog River  
21 flows south of the Yellow Dog Plains and winds its way then  
22 north to Lake Superior? Are you familiar with the Yellow  
23 Dog River?

24 A I am not.

25 Q Okay. And there's a river to the west referred to as a

1           creed, Cedar Creek, which flows from the area of the Yellow  
2           Dog Plains north and into the lake system of the Huron  
3           Mountain Club. Are you familiar with the Cedar Creek?

4           A     I am not.

5           Q     Do you recognize the Yellow Dog River as a famous trout  
6           stream by name?

7           A     No.

8           Q     Would you expect that ecologically there's an  
9           interrelationship among the features that I just pointed out  
10          and that we're discussing?

11          A     That's a very broad question. There will be  
12          interrelationships between those that are related to each  
13          other and which they have connections of processes of  
14          movements of nutrients or animals or predators through it,  
15          and there will be in the same watershed or if it's beyond  
16          what -- there could be no connection between some of those.

17          Q     What, for example, would be the connections between the  
18          headwaters of the Salmon Trout River and the land  
19          immediately surrounding it, the uplands immediately  
20          surrounding it? What are examples?

21          A     The connection would be the quality of the water that comes  
22          from the land and to the water, so how much sedimentation  
23          would be there; whether was a riparian zone for the  
24          temperature.

25          Q     How about among the animal life and having the uplands and

1 the river? Would you expect interrelationships between  
2 them?

3 A You would have some bird communities that would be related  
4 to the fish communities that were there if they were  
5 fish-eating birds or -- and you'll have mammals that will be  
6 using water resources as a place for drinking.

7 Q Did you edit a book on the subject of landscape ecology  
8 fairly recently?

9 A Yes, I did. It was some years ago. It was --

10 MR. PREDKO: What I'd like to do is hand out to  
11 everybody a portion of sections of this book -- because I  
12 assume it's been some time since you've read your own  
13 book --

14 A That's true.

15 MR. PREDKO: -- to the court and to counsel and  
16 just discuss a few of the principles stated in that book,  
17 your Honor.

18 Q At least from the cover page, do you recognize the title  
19 "Integrating Landscape Ecology Into Natural Resource  
20 Management"?

21 A I do.

22 Q And if there's a way of saying it succinctly, what was the  
23 overall purpose of this text?

24 A For having ecologists -- landscape ecologists, particularly  
25 those that look at different scales and how processes move

1 from one level to another to interact with natural resource  
2 managers that often look at only animal populations or only  
3 one component of a system.

4 Q And you authored substantial portions of this back as well  
5 as editing the entire text; is that right, sir?

6 A I wrote one of the chapters in there -- a couple of the  
7 chapters in there, and I edited the text with Dr. Liu.

8 Q Did you also author some introductory sections along the  
9 way?

10 A Yes.

11 Q Let's look at the forward for just a moment. And I'm  
12 looking down to the fourth paragraph where it states,  
13 "Landscape ecology is a rapidly growing interdisciplinary  
14 field." Does that remain true, sir?

15 A Yes, it is.

16 Q "Its concepts, theories and methods are uniquely relevant in  
17 addressing large-scale issues in natural resource  
18 management; for example, biodiversity, conservation and  
19 land-use planning." And does that remain a true statement?

20 A Yes, it is.

21 Q I'm moving now to the preface a couple pages in. And I'm  
22 going to read you another portion here and ask you if you  
23 agree with it and some questions about it:

24 "Traditionally, natural resources have often been  
25 managed using information collected in some scales,

1           resulting in variable and limited success. To improve  
2           these results, many scientists and natural resource  
3           managers have recognized the need to adopt a  
4           large-scale approach to natural resource management  
5           using the concepts, principles and methods of landscape  
6           ecology."

7           And does that remain true and something that you believe in,  
8           sir?

9           A     Yes.

10          Q     What are patches as that term is used in landscape geology  
11          or ecology?

12          A     Patches are localized areas of interactions and which are  
13          then connected to other patches.

14          Q     Okay. At this mine site there have been two areas defined  
15          in the mining application, one a 92-acre area of land where  
16          the improvements and the main mining activity will go on on  
17          the surface, and buildings will be built and the wastewater  
18          treatment plant and so forth. Would an area like that be  
19          called a patch in the definition of landscape development?

20          A     No, not generally considered a patch, because you're looking  
21          at a -- you would be looking at what are the ecological  
22          similarities of movements of nutrients and energy through  
23          the system and how it's related to other patches beyond.

24          Q     And it's not a patch because it's --

25          A     Because it was --

1 Q -- dominated by human disturbance?

2 A No. I mean, you can have forested patches, which could be a  
3 plantation, which would be dominated by human or  
4 agricultural lands or urban areas, but it depends on how  
5 you're defining the area. So I mean, it's a very broad  
6 statement. But patches, we're looking for the ecological  
7 movements or movements of energy and nutrients and  
8 production from one area to another.

9 Q Okay. There's a somewhat larger area that's been defined  
10 encompassing 1360 acres?

11 A Uh-huh (affirmative).

12 Q And I believe it is depicted by the red line that I pointed  
13 to as the mining area.

14 A Okay.

15 Q And it includes a portion of the headwaters of the Salmon  
16 Trout River, and it has been studied in connection with the  
17 mining application. Does it -- would an area like that fit  
18 the definition of a patch?

19 A You could have multiple patches in there, depending on what  
20 systems were in there.

21 Q It includes some standing timber, some cleared areas, some  
22 wetlands and so forth?

23 A Uh-huh (affirmative).

24 Q Are those patches within it?

25 A So those would be more characterized as patches as you moved

1           into those.

2           Q     Towards the end of the first paragraph of the preface it  
3           says, "As is often the case between academic and nonacademic  
4           worlds, landscape ecologists and natural resource managers  
5           historically have not communicated well." Is that something  
6           that you have personally observed and studied?

7           A     Yes, I have, and tried to make better.

8           Q     And tried to make better?

9           A     Yeah.

10          Q     And I think you conclude here that managers -- natural  
11          resources managers, quote, "often do not know how to apply  
12          landscape ecology to managing natural resources." That's a  
13          problem that is true; is that not correct, sir?

14          A     It was a problem when we tried to get this -- when we were  
15          working on this book, and I think it's improved greatly.

16          Q     In a situation like we're dealing with in this case where  
17          we're looking at a river system that contains coaster brook  
18          trout and other brook trout, two other river systems,  
19          mountains, lakes and so forth, what attention to the  
20          principles of landscape ecology would you want natural  
21          resource managers to pay in studying the possible effects of  
22          a mining operation?

23          A     I'd like to make sure that the integrity to the system is  
24          intact and that you would have a flow of production.

25          Q     That you would have?

1 A Have a flow of production through the system that's on --  
2 was not significantly deteriorated.

3 Q And when you say -- I'm just paraphrasing --

4 A Uh-huh (affirmative).

5 Q -- because I didn't write down your exact words --  
6 "preserving the integrity," you're talking about protecting  
7 the existing natural features of the environment, among  
8 other things?

9 A Protecting the processes of the energy that we talk about  
10 moving from one system -- down in the system so that you  
11 have viable populations and that you would be able to  
12 maintain productive resources there so --

13 Q And what do you mean by "energy" or "flow of energy"?

14 A That you would have conditions -- if you're talking about  
15 the river system, you have good, clean, clear water that has  
16 a temperature preferendum and sediment loads that are  
17 conducive to having brook trout.

18 Q And so does landscape ecology look at the upper reaches or a  
19 river as being relevant to the conditions of the lower  
20 reaches of a river, for example?

21 A Uh-huh; yes, it would.

22 Q And the maintenance of water levels at the headwaters of the  
23 river being relevant to the integrity of the fish population  
24 at the lower reaches of the river?

25 A It could. It depends on the domination of the stream by

1 groundwater versus surface water, and you'd work with  
2 geohydrologists to work with those.

3 Q Do you know where the coaster brook trout spawn in the  
4 Salmon Trout River?

5 A I don't know the exact location, but I know they have to be  
6 below the waterfall that I saw many years ago up there.

7 Q Were you on the Huron Mountain Club property when you --

8 A I was.

9 Q Were you there at the invitation of the Huron Mountain Club?

10 A I was.

11 Q You're familiar with the Huron Mountain Club as a location  
12 of various biological studies over the years?

13 A Yes, I am.

14 Q And were you conducting such a study when you --

15 A I was with Dr. Ray White, and we were up sampling trout  
16 populations in the Salmon Trout and looking at the use of  
17 hinge cutting of tag alders to increase flow of stream water  
18 to reduce the sediment to make more spawning habitat. That  
19 would have been in the early 80's.

20 Q In any event, I gathered that, if you're studying a river  
21 system like the Salmon Trout, you studied the headwaters,  
22 the waterfalls, the spawning areas and relate them to each  
23 other?

24 A Right, and the watersheds -- the whole watershed.

25 Q The whole watershed?

1 A You'd look at what's going on in the watershed and would  
2 determine what would -- change that would affect. In our  
3 case the issue on fish is what would affect fish production.

4 Q You know, one of the concerns in this case is the orebody  
5 that's being mined happens to be directly beneath the  
6 headwaters of the Salmon Trout River. Are -- did you know  
7 that?

8 A I'm familiar with that.

9 Q And one of the concerns is that, because there have been  
10 other mines in the area that have collapsed, that this  
11 mining operation might collapse right beneath the headwaters  
12 and affect the flow of the river. Is -- do you know about  
13 that?

14 A That's not my expertise area.

15 Q Okay. Assuming that that is a concern, is the concern about  
16 the headwaters and the loss of water into a mining cavity  
17 under the principles of landscape ecology related somehow to  
18 the spawning population of the coaster brook trout or  
19 downstream or potentially?

20 A It would -- you would have to ask a geomorphologist about  
21 the aquifers and what's coming forward in that area. But  
22 it's very possible that it'd be a very localized event, or  
23 it could be a very big event. I'm not the person that you  
24 would ask.

25 Q Would a landscape ecologist, to understand the potential

1 effects of a mining catastrophe like that, study the  
2 potential effects on the whole area that we're talking  
3 about?

4 A Uh-huh (affirmative). They would.

5 Q I'm getting a little bit away from fish for a minute.

6 A That's correct. No. That's all right.

7 Q But we can come back to fish. There was testimony last week  
8 that there's a -- there was testimony on two subjects. One  
9 is that wolves move across the Yellow Dog Plains in the area  
10 of this proposed mine and that one of the packs is resident  
11 in the Ives Lake area in the Huron Mountain Club. In order  
12 to study -- to understand potential effects on wolf  
13 populations, would landscape ecologists look at the entire  
14 area we're discussing, including where the pack is resident  
15 and where it forages or otherwise passes through?

16 A You would have to talk to a wolf expert exactly what wolf  
17 need for their livelihood, but they would look at anything  
18 that the wolf would need to sustain itself.

19 Q In any event, is it one of the goals of landscape ecology to  
20 make sure that natural resource managers don't just look at  
21 the wolves as they might be affected in one location without  
22 looking at where they also live in other locations?

23 MR. PREDKO: Objection; asked and answered. He  
24 already testified he's not a wolf expert. And we are  
25 getting far afield, especially far afield about from what

1 Dr. Taylor testified on direct. I mean, this has nothing  
2 absolutely to do with fish and especially the coaster brook  
3 trout.

4 MR. WALLACE: Well, I think it's very much within  
5 his area of expertise. And I can't say that it was asked  
6 and answered. I could barely formulate the question, so I  
7 couldn't have asked it twice.

8 MR. PREDKO: Well, he did say he's not a wolf  
9 expert and you have to go ask that question to a wolf  
10 expert.

11 MR. WALLACE: I'll withdraw it to simplify things  
12 and see if I can find language that's on point here.

13 JUDGE PATTERSON: All right.

14 Q Let's move, if we could, sir, to page 4 of the text, and I'm  
15 looking at the first full paragraph that begins, "Although"  
16 where it says, "Although landscape ecology provides a  
17 spatial systems perspective and has great relevance to  
18 natural resource management, the application of landscape  
19 ecology and natural resource management has been lagging."  
20 And was that true as of the time this book was written?

21 A Yes, it was.

22 Q And I think you've indicated you believe there's been  
23 improvement in that area?

24 A We hope so. That's what we've been trying to teach people.

25 Q Okay. The statute that governs the proposed mining

1 operation here and the regulations requires studying the  
2 potentially affected area for flora and fauna and requires  
3 studying cumulative impacts -- not just the impact of, you  
4 know, one aspect of mining or another aspect of mining but  
5 the cumulative impacts on the entire area. Do those sound  
6 like concepts that are adopting principles of landscape  
7 ecology?

8 A Yes. We'd look at changes between different areas due to  
9 any sort of disturbance.

10 Q So you'd look foremost beyond the area of the disturbance  
11 itself to the other area potentially affected?

12 A If they were affected.

13 Q And midway through that same paragraph it indicates, "Given  
14 these needs and potential benefits, the main goal of this  
15 book is to identify links and ways of bridging the gaps  
16 between landscape ecology and natural resource management."  
17 Do you have any knowledge yourself of the application of  
18 principles of landscape ecology by the Michigan Department  
19 of Natural Resources or the Michigan Department of  
20 Environmental Quality?

21 A I think their strategic plans that they came up with on  
22 river basin plans are just along that line that they've done  
23 since this time.

24 Q And you've been working with them on that, have you?

25 A I have read them reports, and I have reviewed some. I think

1           their eco region team is another one that I know of, but I  
2           have not worked with those teams, which were bringing the  
3           different divisions that were an attempt to try to link all  
4           the different aspects of land management organization  
5           together.

6           Q     And you called it an eco region?

7           A     They called it eco region team. They have it inside the  
8           Michigan Depart of Natural Resources.

9           Q     Is there a technical definition for eco region? Is that --

10          A     It's -- it was --

11          Q     What does it mean?

12          A     The river basins are a clearer way you would talk about the  
13          entire river system that go -- all the processes on the land  
14          and water that go into making fish production in the case.  
15          In the eco regions they were talking about, the hardwood  
16          forest, for instance, versus a cold water trout stream would  
17          be closer to what they do. But they're really trying to  
18          bring -- the land management divisions and the DNR could be  
19          better to help you or, when you have them up here, to talk  
20          about their teams. But it was trying to bring them together  
21          in a holistic viewpoint so that one action by a forest  
22          management minerals and fire management team did not go on  
23          without seeing what happened to wildlife or fisheries. But  
24          that's what they do inside their own organization.

25          Q     Let's look at the bottom of page 5 just to continue with the

1 definitions for a minute. It says, "Patches of landscapes  
2 are not isolated enemies but embedded in local, regional and  
3 global contexts." How would that principle or statement  
4 relate to looking at an area that includes mountains,  
5 forests, three different river systems, 10,000 acres of old  
6 growth forest to the north and then the equivalent  
7 wilderness to the south? How would we apply that notion  
8 that these are not isolated enemies in landscape ecology?

9 A Well, Counselor, I think we talked about this; that the  
10 river is directly affected by the landscape, by the land and  
11 what happens on the land in terms of determining with  
12 sediment load or the temperature of the stream. So you  
13 can't -- you have to connect these together, and that's what  
14 we're looking at there.

15 Q And we could show the river basin of the Salmon Trout.

16 A Uh-huh (affirmative).

17 Q But what we looked at a few minutes ago, if you were  
18 studying the Salmon Trout, you would study the entire Salmon  
19 Trout and its watershed?

20 A I would look at the entire -- what impact we have on the  
21 entire Salmon Trout River.

22 Q You noted that Rush Lake, which is the home of the Rush Lake  
23 trout, is outside the Salmon Trout River basin; correct?

24 A I did.

25 Q Were you aware that it is within the Cedar Creek Basin and

1 that Cedar Creek has its origins in the Yellow Dog Plains?

2 A I was.

3 Q Under principles of landscape ecology, would you study the  
4 relationship of one watershed to contiguous watersheds?

5 A If they were somehow connected by some flow of some process  
6 that would impact either watershed.

7 Q Now, looking at the bottom of page 5 and reading on to page  
8 6, it says:

9 "A landscape is an open system which flows across  
10 landscape boundaries and interactions with other  
11 landscapes. For instance, nutrients and pollutants may  
12 follow hydrologic flows from uplands to aquatic  
13 systems. Landscape functions or processes include  
14 matter flows, energy flows and organism flows such as  
15 migration and dispersal among patches. Through these  
16 various flows, patches and landscapes connect within  
17 influence of each other."

18 Is that description applicable to the movement of coaster  
19 brook trouts from the Salmon Trout River into Lake Superior  
20 and back?

21 A And their other systems would tell you that you need to look  
22 at what's happening in Lake Superior, other river systems  
23 that they might migrate into, what happens in --

24 Q You have to look at all of their habitat and potential  
25 habitat?

1 A Right; correct.

2 Q And that would be true with respect to all animal life that  
3 moves around?

4 A If you have a flow of energy or the animals moving through  
5 and being impacted by any process, that's what you'd look  
6 at.

7 Q On page 7 -- and again, this is the -- page 7 of the  
8 chapter -- initial chapter that you authored; correct?

9 A Uh-huh (affirmative).

10 JUDGE PATTERSON: "Yes"?

11 A Yes; sorry.

12 JUDGE PATTERSON: That's all right.

13 Q Under "Methods" you indicate:

14 "Research methods in landscape ecology have  
15 progressed markedly fast -- remarkably fast over the  
16 past two decades. These methods include approaches and  
17 tools for collection analysis and integration of both  
18 spatial and nonspatial data."

19 What are some of these approaches and tools?

20 A Satellite imagery, being able to have a large computer  
21 system to look at large data sets at fine scales and be able  
22 to come up with patterns.

23 Q If you're trying to study the cumulative impacts of let's  
24 say a mining operation on the area depicted in this map, the  
25 old growth forest, the mountains, the three river systems,

1 the McCormick tract and so forth, what sort of disciplines  
2 are brought to bear to study cumulative impacts?

3 A Depends on what sort of disturbance is being -- occurred.  
4 Certainly you would have individuals that would be looking  
5 at spatial analysis, so geographers. You'd have ones that  
6 if there was humans involved, you'd have sociologists or  
7 political scientists. You would have foresters, you'd have  
8 land managers in a broad sense. So you would have  
9 foresters, you could have interpreters, you could have  
10 biologists, communications people. It depends on what your  
11 impact is. It's very broad.

12 Q One of the concerns about a mining operation like this is  
13 that it's a sulfide mining operation. You're aware of that?

14 A I am aware that it's a sulfide mining operation.

15 Q And you're aware that sulfide mines have a history of  
16 leaching sulfuric acid and heavy metals into the  
17 environment?

18 A I read the testimony that was claiming that.

19 Q Okay. Have you read books or articles or academic works on  
20 that subject?

21 A I have seen that, but it's not my expertise.

22 Q Okay. And you know I would suppose or could imagine that a  
23 mining operation like this involves ore trucks and fuel  
24 trucks and light and noise and wastewater treatment plants,  
25 a cement plant and so forth? Would landscape ecologists try

1 to look at the cumulative impact of all those factors, or  
2 who would do that?

3 A A landscape ecologist would do that, each of the individual  
4 disciplines would do that on their own right in terms of --  
5 and then what the extent and magnitude of those impacts and  
6 what the overall reduction or enhancement would be and  
7 whether the mitigation procedures are appropriate for  
8 minimizing what they see as impacts.

9 Q And the goal or at least a goal of a landscape ecologist  
10 looking at all of those potential and actual consequences of  
11 a mining operation would look at the potential for the  
12 entire area -- correct? -- the mountains, the headwaters,  
13 the downstream areas and so forth?

14 A The connected areas that would connect if there was flows.

15 Q On page eight you say,

16 "While traditional natural resource management has  
17 met numerous societal needs, it has also caused a host  
18 of problems such as conflicts between management for  
19 short-term and long-term benefits between management at  
20 small scales and large scales and between management of  
21 different natural resources"; correct?

22 A Yes, it says that.

23 Q Would you consider a mining operation of seven or eight  
24 years' duration in the middle of the Yellow Dog Plains an  
25 example of what we're talking about here, the potential

1 conflict between short- and long-term benefits?

2 A I don't understand your question.

3 MR. PREDKO: I'd object. It's vague.

4 Q Well, do you see that allowing a mine operation involving  
5 some of the phenomenon I just listed, ore trucks, fuel  
6 trucks, potential for leaching, sulfuric acid, potential for  
7 mine collapse and so forth, as raising the conflict between  
8 management for short-term and long-term benefits?

9 A It could raise a conflict between different people. I would  
10 assume that the appropriate disciplines have been involved  
11 to make sure that any mitigation that was needed has been  
12 taken care of and safeguards that keep maintaining  
13 ecological processes have been there in place for any mining  
14 to exist.

15 Q At the top of page ten you state,

16 "Conventional management was often conducted  
17 within the boundary of land ownership but within the  
18 same patch of landscape without taking account of the  
19 interactions between focal patch/landscape and other  
20 patches/landscapes."

21 Ownership boundaries don't represent a very good way  
22 scientifically to study an area from a landscaping ecology  
23 standpoint, do they?

24 A Or from an ecology point of view.

25 Q Excuse me?

1 A Or from an ecological point of view.

2 Q You need to look at what's actually going on terrestrially  
3 and aquatically?

4 A Where those processes link together. They don't go with  
5 ownership. They go with where the habitats are available,  
6 where the animal migration patterns are available.

7 Q So stopping at the boundary lines in studying the potential  
8 effect of human disturbance is an inadequate approach from a  
9 landscape ecology standpoint?

10 A We would look at what the impact are on the whole region  
11 area.

12 Q I'm going to kind of fast forward here. I'm going to page  
13 14, the end of your summary where you say,  
14 "The specific rules of thumb" in quotes, "and  
15 general guidelines proposed in this book are valuable  
16 to help insure the sustainability of natural resources  
17 around the world."  
18 I take it you consider sustainability of natural resources  
19 around the world a valuable goal?

20 A I do.

21 Q Can you give us an idea of what some of the specific rules  
22 of thumb are that emerge in this text?

23 A The ones we just talked about about looking at regions that  
24 are associated with each other that have flows of energy and  
25 nutrients and animals and plants that go across; that any

1 boundary, any barrier to their viability and sustainability  
2 need to be evaluated and mitigated if there's any changes  
3 that go on.

4 Q On a regional basis?

5 A Yes.

6 Q I'm moving ahead to page 241, which is the beginning of  
7 chapter nine.

8 A Okay.

9 Q And this indicates in the very beginning,

10 "Historically ponds and lakes were viewed as  
11 isolated systems separate from their surrounding  
12 landscapes, although a stream was recognized as a  
13 network interweaving the countryside its border with  
14 the surrounding land was often overlooked." And now  
15 jumping ahead a couple sentences, "Several decades  
16 later the relationship between aquatic and terrestrial  
17 landscape elements is viewed quite differently. The  
18 terrestrial habitat is integrally connected to lotic  
19 and lentic systems and provides resources that are  
20 essential to their health."

21 What does that mean about the terrestrial habitat?

22 A Things we talked about earlier, Counselor, which was the  
23 what you do on the land effects the water quality, which  
24 then effects the fish.

25 Q In the case of brook trout, it appeared that much of the

1 diet of the brook trout or some of the diet of the brook  
2 trout is terrestrial; correct?

3 A Uh-huh (affirmative). As they get to be juveniles.

4 Q Okay.

5 A But in relationship to the brook trout, it's the same reason  
6 for the demise of the brook trout; that we didn't see the  
7 connections or didn't value the connections as a society  
8 between the land and the water and the fish. So that when  
9 the agricultural processes and practices came forward  
10 without further knowledge of what the impact was going to be  
11 on the fish, you'd have sedimentation, warming of the  
12 streams and an impact on in removing and severely reducing  
13 if not extirpating brook trout populations throughout a lot  
14 of Michigan and certainly the Michigan Grayling went  
15 extinct.

16 Q Did you see in the 90-day finding that a particular concern  
17 about the Coaster population in the Salmon Trout River was  
18 siltation?

19 A I did.

20 Q Okay. And what are some of the causes of siltation?

21 A Improper forestry practices and agricultural uses and no  
22 riparian zone along the side that allows for sediment to  
23 flow. Certainly it talked about roadways, sand roads that  
24 blow out, improper culverts, needs for engineering pieces.

25 Q If you were studying the possible effect of a mining

1 operation that includes ore trucks, fuel trucks, heavy  
2 transportation vehicles moving on a daily basis and the  
3 possible impact on the Salmon Trout River or the Yellow Dog  
4 River, would you look at how that vehicular travel could  
5 cause increased siltation at the crossings into those  
6 rivers?

7 A I think a landscape ecologist and management person would  
8 look at what the potential impact of that movement and how  
9 to mitigate to make sure that we did not have increase in  
10 sediment load into the Salmon Trout.

11 Q Increased siltation is simply bad for brook trout?

12 A It covers up the redds that we talked about, it covers up  
13 the redd area so you don't have good oxygenated cold water  
14 coming through because there's no gravel where the eggs have  
15 to nestle in between. It also reduces the food resources by  
16 having a lot of sand in the habitat. So sediment is bad.

17 Q So this is why the female makes a point of in essence  
18 creating a redd by sweeping her tail back and forth to get  
19 rid of silt; right?

20 A Correct.

21 Q Looking at page 242, sir, second sentence of Section 9.2.1  
22 states,

23 "Biologists quickly realize that wildlife species  
24 rarely rely on just one habitat or ecosystem type.  
25 Instead different species incorporate a complex

1 selection of habitats in their life histories and move  
2 amongst these in response to different factors."

3 Have you found that to be true?

4 A Yes.

5 Q And is it true of a broad range of terrestrial animals, for  
6 example?

7 A I can only talk to you about aquatic animals. That's my  
8 expertise.

9 Q Do you consider amphibians among the things you study?

10 A No.

11 Q Do larval stages of amphibians provide food source to brook  
12 trout?

13 A They could if they get into the water near a brook trout, as  
14 you know from the Adirondack state you know that that's --

15 Q Brook trout will eat -- okay. You may know -- you may not  
16 know whether this is true, but let me just ask you. On page  
17 243 it indicates, fourth line,

18 "Amphibians such as adult salamanders and frogs  
19 are a major contributor to biomass of northeast forests  
20 and to both biomass and species diversity in ponds in  
21 the southeastern United States."

22 I'm interested in the northeastern forest. Do you believe  
23 that to be true?

24 A I don't know. I do not know the answer to that.

25 Q You don't know? Okay. And this might be more relevant to

1 your interest in fish. It indicates, again, with reference  
2 to amphibians, "They consume incredible quantities of  
3 zooplankton and their eggs and young are in turn key food  
4 items for birds, fish, and other predators"?

5 A That's on fish, yes. That's true. Yeah. It was one of the  
6 mortality figures we put in the -- one of the slides that I  
7 put up there on the mortality on brook trout.

8 Q Well, let me ask you this: Of the 5400 miles of brook trout  
9 stream habitat in Michigan --

10 A Designated trout streams.

11 Q Designated trout streams. How many of those miles are  
12 habitat to Coasters?

13 A I don't know the answer to that.

14 Q Do you know it to be --

15 A I would say that if you have brook trout you have migration  
16 of brook trout in all those streams of some form like we did  
17 in the Ford River. We had movement. They didn't go out to  
18 Lake Michigan that we know of, because we were up at Felch  
19 and Ralph area. But they did go miles up to the Two Mile  
20 Creek every year when they got above 20 degrees centigrade,  
21 and then they come back down into the Ford main stream  
22 sometime during the late fall to spawn. So you have  
23 movement both within the stream system to different habitat  
24 types as well as into a lake if it's nearby.

25 Q I know you don't accept the genetic distinction of Coaster

1           brook trout. Do you accept that there are -- that Coaster  
2           brook trouts are larger than other brook trout?

3        A     I accept that there are fish that move into lakes that get  
4           larger and we call them Coasters.

5        Q     Okay. Is that something different from what my question  
6           was?

7        A     Yes. I don't believe there's a genetic basis of the Coater  
8           brook trout. I believe that the brook trout are highly  
9           variable in terms of their movement patterns and they'll  
10          move out of different areas and some will get into lake  
11          systems.

12       Q     Is some populations are distinctly physically larger than  
13          others, would we say they're morphologically distinct?

14       A     Yeah, they're morphologically distinct.

15       Q     Okay. And Coaster brook trout, I know you don't like the  
16          term Coaster brook trout, but it's out there.

17       A     We use it. We use Salters and Coasters.

18       Q     Coaster brook trout are morphologically distinct; correct?

19       A     Yes.

20       Q     Have you ever studied a trout stream or brook trout habitat  
21          under which a hard rock mining operation was being  
22          conducted?

23       A     No.

24       Q     Are you familiar with any anyplace in the world?

25       A     I'm familiar with some in the sense that I know they exist.

1           And but I've not studied them at all. In West Virginia, of  
2           course, there was a lot of coal mining.

3           Q     You know that there are brook trout streams under which hard  
4           rock mining's been conducted?

5           A     I don't.

6           Q     Do you know of any brook trout habitats under which in  
7           particular sulfide mining is being conducted --

8           A     I don't.

9           Q     -- or has ever been conducted?

10          A     I don't.

11          Q     I'm looking at page 436, and this is Monica Turner's section  
12          under "Fish Habitat." Do you see that?

13          A     Okay. Yeah. I'm here. I'm with you.

14          Q     Would you agree that, although fish clearly respond to local  
15          conditions, habitat quality is influenced by activities and  
16          conditions that may occur far from the stream?

17          A     We've said that, yeah.

18          Q     Okay. That's a truism; correct?

19          A     That's landscape -- land use patterns.

20                         JUDGE PATTERSON: I'm sorry, Mr. Wallace. Where  
21                         is that?

22                         THE WITNESS: It's right here under "Fish  
23                         Habitat."

24                         JUDGE PATTERSON: Okay.

25                         MR. WALLACE: Page 436.

1 JUDGE PATTERSON: Okay. Got it.

2 THE WITNESS: And it's the second sentence under  
3 that there. It says, "Although."

4 JUDGE PATTERSON: Okay. Thank you.

5 Q And then about six lines further down it says, "Thus, fish  
6 populations and communities must be viewed in the context of  
7 the entire watershed." And you would agree with that as  
8 well?

9 A I agree, yeah.

10 Q Do you agree that there is a morphologically distinct  
11 population of Coasters that spawns in the Salmon Trout  
12 River?

13 A Yes. I believe there's a morphological large brook trout  
14 that come in the Salmon Trout River that do spawn. Whether  
15 they're genetically unique is the question we're --

16 Q That's the question that you --

17 A That's the question.

18 Q -- contest? Do you agree that that morphologically distinct  
19 population is endangered?

20 A No.

21 Q Do you agree that it's small?

22 A No. I don't believe that the Coasters -- I think the  
23 Coasters are more widely distributed than we originally  
24 knew. That's those reports -- based on the reports. And  
25 I'd say there was -- my last review there was 248 adult

1 Coasters, in your terms, coming into the Salmon Trout, which  
2 has been an increasing number of Coasters which means things  
3 are going well for the Coasters.

4 Q And you know that -- you know about the measures that are  
5 being taken and have been taken for some period of time to  
6 protect them?

7 A I do.

8 Q And that includes catch and release fishing; correct?

9 A Uh-huh; yeah. A change in -- a change in size limit and bag  
10 limit in Lake Superior.

11 Q And prohibition against fishing during the spawning period?

12 A Right; yeah. Better understanding of what I would consider  
13 landscape ecology where we have less siltation going in  
14 streams, better production of brook trout streams, better  
15 hatchery survival and naturalization back up brook trout.  
16 So I think there's a lot of success stories.

17 Q So, I mean, there's no question that one of the keys to the  
18 flourishing of that population of Coasters in the Salmon  
19 Trout River is water quality; correct?

20 A Water quality, temperature, stocking -- previous stocking  
21 activities which allowed for the brook trout to continue,  
22 better regulations by the management agency, both in Lake  
23 Michigan and nearby streams. I put all those --

24 Q Are you suggesting that the Salmon Trout's been stocked?

25 A I'm suggesting that many of these locations that would

1 impact the Salmon Trout have been stocked historically from  
2 the 1879 forward.

3 Q Who is Dr. Edward Baker?

4 A He is a Michigan Department of Natural Resources fisheries  
5 biologist up at Marquette.

6 Q Okay. Have you read any studies by him about Coaster brook  
7 trout?

8 A Uh-huh (affirmative).

9 Q "Yes"?

10 A Yes. Sorry.

11 Q Okay. And what studies have you read by Dr. Baker?

12 A The review of the report that you have there will have some  
13 of his materials in there. And it'll be the review of  
14 Huckins and Scribner and others that he works with.

15 Q Do you know what conclusions Dr. Baker has reached regarding  
16 Coasters?

17 A That they're a life history variant.

18 Q How about Kim Scribner? Who is he?

19 A He's a geneticist -- genetics faculty member on the faculty  
20 in fish and wildlife at Michigan State University.

21 Q Okay. So you work with him at the same institution?

22 A Yes, I do.

23 Q And he's a geneticist; is that right?

24 A That's correct.

25 Q Is he a specialist in fish genetics?

1 A He's a specialist in wildlife and fish genetics, yes.

2 Q And has he studied the Coaster brook trout from a genetics  
3 standpoint?

4 A Yes; yes. He studied and had a paper out there in press or  
5 in review of final report, and then I think it's now in  
6 press, which he believes that there is some deviants in  
7 Coaster brook trout, alleales compared to non-Coaster.

8 Q Okay. And alleale, that's spelled a-l-l-e-a-l-e?

9 A Correct.

10 Q And what is an alleale?

11 A It's a part of a genome, a neutral genome, part of the  
12 genetic code in which they look for -- evolutionary  
13 ecologists look for changes in speciation and uniqueness.

14 Q Okay. And Dr. Scribner's study of is it two particular  
15 alleales relating to brook trout that he studied, if you  
16 know?

17 A I know at least that it was at least one. There may have  
18 been two. There's a lot of studies.

19 Q And his conclusion from studying one or more alleales is  
20 that there is the genetic distinction between Coasters and  
21 other brook trout; correct?

22 A He said there was a divergence between those, and it was  
23 countered by many other geneticists in the areas in the  
24 report that you'll read here that Mary Burnham-Curtis showed  
25 that there was 75 percent similarity between all brook trout

1 in the area, meaning there had not been a lot of deviance.  
2 And that's what I base my opinion on. As you know, I said  
3 you have to bring geneticists in to fight out the genetics  
4 area. But based on the literature out there, the  
5 overwhelming support of the genetics community is that these  
6 fish are not divergent from brook trout. And I do know they  
7 spawn with each other, the resident and the brook trout, so  
8 they're not isolated by themselves.

9 Q And you don't know that firsthand? You've just read that in  
10 other people's studies?

11 A I read that. I read it.

12 Q Have you ever spoken to Dr. Scribner about his conclusion  
13 that as a geneticist that differs from your view?

14 A I have not.

15 Q Is he a friend or --

16 A He's a colleague.

17 Q Did you find fault with the genetics of his study, Dr.  
18 Scribner's study, that found they were distinct?

19 A I thought it was a very small sample size, difficult to  
20 ascertain with the number of fish that he was able to see.  
21 And, therefore, the weight of evidence were with a larger  
22 samples of Mary Burnham-Curtis and others around the basin.

23 Q Do you think that the brook trout -- I'll call them Coaster  
24 brook trout.

25 A Fine, as long as we're both understanding how we're using

1           it.

2           Q     The brook trout that spawn in the Salmon Trout River, the  
3           Coaster brook trout, deserve less protection because in your  
4           view they're genetically similar to other brook trout or the  
5           same?

6           A     I think they deserve the same protection that you have on  
7           brook trout in general.

8           Q     And you wouldn't -- if you were sustained in your belief  
9           that they are not genetically distinct, you wouldn't  
10          recommend any measures that put that population more at  
11          risk, would you?

12          A     I wouldn't recommend any measures that put the brook trout  
13          at risk.

14          Q     So I'm just wondering if in your mind there's a practical  
15          importance to your disagreement with Dr. Scribner about the  
16          genetics in terms of the future of the management of these  
17          Coasters.

18          A     I don't know if we have a disagreement on the future of the  
19          management of the Coasters. He and I have never talked  
20          about it, and he didn't write about the management of the  
21          Coaster. He wrote about that there was divergence in the  
22          alleles that he looked at, a couple of the alleles on the  
23          nine fish that he had that were different from the resident  
24          stream fish.

25          Q     Other than the sampling size, if the alleles are different,

1 does that mean it's a different species?

2 A No, because this is a highly variable species, and a lot of  
3 plasticity both in their genome -- but as Mary  
4 Burnham-Curtis said, 75 percent of the alleales are similar  
5 throughout the entire range of brook trout in the Great  
6 Lakes -- in the Lake Superior basin, which is a large  
7 percentage of similarities.

8 Q Among Dr. Scribner's findings was that the genetic integrity  
9 of the Salmon Trout River Coasters has not been compromised  
10 by interbreeding with hatchery brook trout? Do you disagree  
11 with that?

12 A I have no evidence to disagree or agree.

13 Q Do you know how he came to that conclusion?

14 A Just on the genetic alleales that he was looking at on the  
15 nine fish, didn't see any of the other --

16 Q And he also found that the Coasters in the Salmon Trout  
17 River are reproductively isolated?

18 A That's what he said.

19 Q Okay. Do you have any evidence to the contrary?

20 A Not in the Salmon Trout River.

21 Q You're not an expert in the Endangered Species Act?

22 A I am not.

23 Q I'll just represent to you that among the factors that are  
24 looked at by the Fish and Wildlife Service include the  
25 separation of the population from other populations.

1 A Uh-huh (affirmative).

2 Q You don't disagree that the Coaster brook trout in the  
3 Salmon Trout River are separated from the populations in the  
4 Nipigon River, do you?

5 A I don't.

6 Q And they are separated geographically by a vast distance; is  
7 that correct?

8 A That's correct.

9 Q They're also separated by an international boundary;  
10 correct?

11 A That's correct. But we just got rid of international  
12 boundaries and property lines -- what? -- a little bit ago.

13 Q In any event, the Nipigon River is --

14 A Right. No. I understand. They're far apart and there's  
15 been no evidence that trout move that large distances.

16 Q The Coaster brook trout in the Salmon Trout River are also  
17 physically separated from those that spawn around Isle  
18 Royale; correct?

19 A Yes.

20 Q Okay. That's over a hundred miles distance, and there's a  
21 land mass, Keweenaw Peninsula, in between; correct?

22 A Uh-huh (affirmative). And there's been no evidence of  
23 intermixing between those.

24 Q Do you have any idea how many creeks and rivers flow into  
25 Lake Superior, --

1 A No.

2 Q -- not this specific -- I'm not quite through.

3 A Okay. But I don't have any idea how many lakes and streams  
4 go --

5 Q Where I'm getting to is, aren't there a lot of rivers and  
6 creeks flowing into Lake Superior that contain brook trout  
7 populations but not Coaster brook trout populations?

8 A I think the Minnesota report will tell you that there's been  
9 a lot more identified than what we currently knew on the  
10 original.

11 Q How about on the southern coast of Michigan?

12 A I'm not sure we've looked well enough to go there, but we  
13 know there's a lot of migration of brook trout in all those  
14 streams, but not necessarily out to the lake.

15 Q But I guess what I'm asking is, can you identify --

16 A Other than Pictured Rocks and Salmon Trout --

17 Q Right.

18 A -- in the Michigan boundaries?

19 Q Right.

20 A Not that I remember at this moment.

21 Q And what do you think is special about the Salmon Trout that  
22 makes it the habitat of Coasters when all these other rivers  
23 and creeks are not Coaster habitat?

24 A I don't know.

25 MR. WALLACE: Judge, could I have a little break

1 and kind of wrap things together?

2 JUDGE PATTERSON: Sure.

3 MR. WALLACE: Thank you.

4 (Off the record)

5 MR. WALLACE: I just have a few more questions.

6 Q Sir, what just in general were the Trout Unlimited  
7 restoration plans for the Coaster brook trout in that study?

8 A Reduction of sediment was a primary one, maintenance of cold  
9 temperatures by having a riparian zone.

10 Q By?

11 A A riparian zones, having maintaining and having enforced  
12 riparian zone.

13 Q And what sort of riparian zones?

14 A The riparian zones along the stream corridor looking at  
15 hundred foot zones I believe was the -- I'd have to go back  
16 and look at the exact number, but they wanted all streams  
17 protected with the riparian zones, maintaining.

18 Q And a riparian zone is an area of no human activity; is  
19 that --

20 A It's an area of maintaining protection along the stream side  
21 in which there is not reduction in the vegetation.

22 Q Okay. Is there -- I know we've talked about some 200 -- and  
23 I think you mentioned the figure 248 Coasters counted --

24 A In the Salmon Trout.

25 Q -- in the Salmon Trout at a given point in time. Is there a

1 population number that you consider safe for a  
2 morphologically distinct population like that?

3 A You're acting as if morphologically distinct is genetically  
4 distinct. And if it's morphologically distinct without a  
5 genetic background, then there is no number 'cause it would  
6 move. Because if it's genetically distinct, then you would  
7 have to have somewhere between around 30 to 50 I believe is  
8 the genetic answer to that, but you would have to ask a  
9 geneticist for sure.

10 Q Okay. I guess what I'm asking is, I mean, you think it's a  
11 good idea, don't you, to maintain the Salmon Trout River as  
12 a catch and release area for these Coaster brook trout, or  
13 do you?

14 A I think that's a decision that's not in my purview. And I  
15 haven't studied whether catch and release would be what  
16 would be good for the Salmon Trout River.

17 Q Well, is it good for the Coaster brook trout in the Salmon  
18 Trout River to maintain their numbers, or doesn't it make  
19 any difference from your standpoint?

20 A If you want larger fish, larger size fish, catch and release  
21 is always a good way to go.

22 Q Okay. Let me ask you this question: To you is it a matter  
23 of scientific or environmental indifference whether the  
24 Coaster brook trout in the Salmon Trout River exist at all  
25 or disappeared tomorrow and were replaced by smaller stream

1 living brook trout?

2 A I think that you're going to have movement of brook trout  
3 into the lakes by brook trout because of their variability  
4 and their plasticity of their life histories we talked  
5 about. And that it is not a genetic trait just of the  
6 Salmon Trout River or anyplace else.

7 Q I'm really asking a different question.

8 A Okay.

9 Q Is there any importance whatsoever to these Coaster brook  
10 trout in the Salmon Trout River from your perspective, or  
11 might they just as well be little brook trout, the kind that  
12 are found in 5400 miles of rivers in Michigan?

13 A That's a personal value system. I can't answer it from an  
14 ecological one. From a personal side, I like to see large  
15 trout. So I would like to keep anything that would maintain  
16 large trout would be good for me. But from an ecological  
17 perspective, whether there's more small trout versus fewer  
18 large trout, I can't answer that question.

19 Q And are you familiar with any figures as to the size of the  
20 population of Coaster brook trout at Isle Royale?

21 A I'm not.

22 Q Okay. I mean, between hundreds and thousands, you don't  
23 know where on the scale?

24 A I don't. I just know that they're identified as having  
25 viable populations of Coasters that have been identified

1           routinely there.

2       Q     And how about Pictured Rocks?

3       A     Same thing.

4       Q     Any idea of the numbers?

5       A     No.  Again, the research that I was quoting that had the  
6           actual numbers on it was the Salmon Trout that had the video  
7           monitor and studies being done.

8       Q     You can't say whether it would be better to get that  
9           population up to 500 or 1,000?

10      A     I can't.

11      Q     Okay.  And by the same token, would it be worse  
12           environmentally if that population dropped to 50 or ten in  
13           the Salmon Trout River?

14      A     I can't say what would happen to the Salmon Trout River if  
15           it dropped there, because there were very few back in  
16           1980's, I believe, when you looked at the Diana study that  
17           was commissioned, very few large, large trout and very few  
18           trout.  So certainly from the trout point of view and  
19           somebody that likes trout like we do, we like to see more  
20           trout and we like to see bigger trout.  So from a social  
21           point of view, I think larger trout would be good.  I've  
22           always supported the Michigan DNR's move to increase the  
23           size perspective of brook trout by reducing the harvest out  
24           in the waters and reducing exploitation.  But I can't tell  
25           you whether it has an ecological parameter.  I don't think

1           anybody's studied. They were all the Coaster and the  
2           ecological system.

3       Q     How much bigger are these Coaster brook trout than normal  
4           brook trout?

5       A     Normal stream brook trout, as we both know, is between --  
6           our own fishing stuff is between six and eight inches. If  
7           you get a ten inch one, you -- that there you usually start  
8           thinking about the Coasters people start talking 12 to 15.  
9           I think the biggest one in the Salmon Trout that I remember  
10          seeing in I think was Huckins' report was around 18.

11       Q     Okay. When you put that slide up that had the various ways,  
12          the lengths, I thought it was going to be fisherman's  
13          length.

14       A     Yeah. Well, you and I both know that changes with who's  
15          with us.

16       Q     If you weren't fishing the Salmon Trout River, if you were  
17          on the AuSable or the Pier Marquette or whatever, and you  
18          caught an 18 inch brook trout --

19       A     That would be a huge brook trout.

20       Q     Okay. This would be a day you would remember forever;  
21          correct?

22       A     It'd be a trophy; absolutely. That's a really --

23       Q     Because these Coaster brook trout are that much larger  
24          than --

25       A     Yeah.

1 Q -- normal brook trout?

2 A Yeah.

3 Q And just to be clear, in preparing for this testimony, you  
4 haven't done any independent research; correct?

5 A No, not -- I haven't done independent research, never on a  
6 Coaster brook trout. But on brook trout I've done  
7 independent research on it in the Ford River where I saw  
8 them move during the summer temperatures. And so I've done  
9 a brook trout research previously, but never on Coasters and  
10 never in this area.

11 Q Okay.

12 A So my literature -- my reviews would be the literature from  
13 this.

14 Q Okay. What you did to prepare to testify here and render  
15 the opinions you've rendered is to read testimony and  
16 reports?

17 A I read scientific literature and read the testimony and my  
18 own experience with the movements of brook trout in the  
19 streams that I've studied.

20 Q And you've told us everything that you've read --  
21 correct? -- pertinent to the Coasters?

22 A I read a lot of the stuff on the West Coast -- East Coast --  
23 sorry -- the East Coast areas. I had a former colleague  
24 that worked in Quebec on the Metimac River system, which  
25 looked a lot at Salt Coasters and movements in and out and

1 fidelity. Bob Naiman was a colleague of mine at Arizona  
2 State, and that's one of the citations that are in those  
3 reports as well as Lynn Montgomery. So I've kind of kept up  
4 with salmon life history.

5 Q And how did you get involved in this case?

6 A How did I get involved? I got asked to be involved to give  
7 my -- what I believed whether brook trout and Coasters were  
8 uniquely different or the same.

9 Q Did you suggest when you were asked that it would be better  
10 to ask a geneticist?

11 A No, I did not. But 'cause I look at somebody asking me for  
12 my expertise based on what I know. And I told them what I  
13 did know and what I didn't know. And that's what I'm here  
14 for.

15 Q Would you acknowledge that in a scientific question that  
16 turns on genetics that a geneticist would be in a better  
17 position to render an ultimate opinion than you might be?

18 A No. I would say that that would be one additional piece of  
19 information that I think as an ecologist that you talk about  
20 life history strategies, you look at physiology, behavioral  
21 differences, or from morphology differences, spawning  
22 differences, all the different life histories that we talked  
23 about and we went through in the book, where do they live,  
24 do they live in different places, do they eat different  
25 things. Those are all pieces that reflect genetic

1 background as well as environment, so I think they go  
2 together. I think you need a team of people. That's what  
3 we were talking about in landscape ecology to come together.  
4 I'm just one part of that team.

5 Q Are you familiar with any of the professional geneticists  
6 who argue with Dr. scribner about the discreet distinct  
7 genetic nature of the Coasters?

8 A I am familiar with some of them. I know some of them  
9 personally, but I have not talked to them about this case.

10 Q When you were hired to undertake this task, sir, were you  
11 interested in doing anything more than reading the  
12 literature, other people's writings?

13 A I was interested in brook trout and maintaining -- making  
14 sure that we have brook trout that are healthy and --

15 Q I'm sorry. That wasn't the purport of my question. When  
16 you were hired, did you want to do anything more than read  
17 other people's work on the subject to prepare for your  
18 testimony?

19 A No.

20 MR. WALLACE: All right. I have nothing further  
21 at this time. Thank you.

22 THE WITNESS: Yeah. Thank you.

23 MS. HALLEY: I have just a few questions. I'm  
24 Michelle Halley representing the National Wildlife  
25 Federation and the Yellow Dog Watershed Preserve.

CROSS-EXAMINATION

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BY MS. HALLEY:

Q Have you ever studied the impacts of mining on fisheries?

A I have not.

Q Were you involved in writing the EIA for this application?

A I was not.

Q Have you read the EIA?

A Yes, I have.

Q The whole thing?

A I read EIA, yes, and responded to a public comment.

Q Excuse me?

A I read the EIA, and I read the materials, but I restricted it primarily to the areas that I'm an expert in.

Q Okay. Now, did you see any discussion of the effects of blasting underneath the river on fish in the EIA?

A I saw it was made a comment that there was worried about blasting and its effects.

Q My question is, was it included any -- was any analysis of blasting included in the EIA regarding its impacts on fish?

A Not that I remember.

Q How about seismic activity due to mining?

A No, not that I remember.

Q Now, I think you said in your direct testimony, and I think Mr. Wallace revisited this idea that an impact somewhere in the watershed should be looked at for the whole length of

1 the watershed; right? Right?

2 A Yes.

3 Q Okay. Well, just for the record, you just need -- you can't  
4 just nod.

5 A Yes. I'm sorry. I'm sorry.

6 Q She has to hear it. Okay. So would that include something  
7 like blasting underneath the river?

8 A It depends on what the impacts of blasting are. That's  
9 not --

10 Q But we need to know what they are -- right? -- in order to  
11 make that decision?

12 A You should know what occurs when blasting occurs if it  
13 effects the fish population.

14 Q And how about if there is an introduction of acid mine  
15 drainage someplace in the watershed? The impact of that  
16 should be studied along the whole river?

17 A Yes. You would have a whole team of people that would look  
18 at different components of how this mine's activities may  
19 effect the aquatic ecosystems and the fish, which is what I  
20 was looking at.

21 Q I see. And how about air deposition of metals? Should that  
22 be looked at in the whole area that the deposition would  
23 occur?

24 A In a landscape ecology you would look at air deposition,  
25 land impacts onto the water systems and into the fish.

1 Q And how about -- oh, I'm sorry.

2 A And into the fish.

3 Q And into the fish? Okay. And let me just ask you a couple  
4 questions about that. If the fish -- I mean, you had a  
5 chart up of what fish eat, including things like earthworms  
6 and even terrestrial beings like mice. If they're eating  
7 food that has increases in metals or toxins of some sort,  
8 fish, do they bioaccumulate those types of toxins in their  
9 tissues?

10 A You have experts that have talked to you about ecotoxicology  
11 which are much better than I would be. But you had  
12 differing opinions on which metals and which contaminants  
13 would bioaccumulate. But some bioaccumulate and some don't.

14 Q Okay.

15 A And so you had testimony by people that are experienced in  
16 that area, and I'm not.

17 Q Right. I'm not asking you specifically about any particular  
18 metal. But generally fish bioaccumulate?

19 A You could have bioaccumulation of certain metal speciation.

20 Q All right. Now, changes in temperature to the water, is  
21 that something that should be looked at for the length of  
22 the watershed?

23 A Yes.

24 Q And how about changes in water chemistry?

25 A Yes. We talked about water chemistry in terms of

1 contaminants, in terms of pH. You've talked about  
2 temperature. I mean, we -- through this whole last part  
3 those were the key peak things we were talking about and  
4 water quality parameters.

5 Q How about selenium? Changes in selenium levels important to  
6 look at?

7 A I don't know. I can't answer that question. I don't know.

8 Q Chlorine?

9 A I think -- I would think chlorine would be one that you  
10 would need to monitor. But again, you have to get an  
11 aquatic chemist to do that.

12 Q Sulfides?

13 A Sulfides would go into pH levels, and you'd have to be  
14 measuring pH.

15 Q At one point I think actually at a couple of points you  
16 talked about the economic importance of salmonids.

17 A Uh-huh (affirmative).

18 Q Could you tell us a little bit more about that?

19 A Okay. Brook trout are very important to the state economy  
20 in terms of recreational fishing. And historically were  
21 always important as a recreational and a commercial fish at  
22 one time. But most recently and since the 60's and probably  
23 before as a recreational fish.

24 Q Are there studies talking about the importance of fish,  
25 particularly salmonids, in the economy of Michigan?

1 A Yes; yeah.

2 Q Pardon?

3 A Yes, there is.

4 Q Have you read any of those?

5 A Yes, I have.

6 Q What do they generally say?

7 A It depends on -- well, that they're extremely important to  
8 the economy. It's important to the livelihood and to in  
9 essence of being in the state. That's why it's the state  
10 fish. It's in some of the listings of making a state -- the  
11 state fish, the brook trout. It also talks about the  
12 economic valuation of the salmonid fisheries in the Great  
13 Lakes depending on which one and what date you're looking  
14 at. But it's going to be up to -- brook trout internally I  
15 can't give you those figures. But \$4 billion for the Great  
16 Lakes fishery, which brook trout is one piece but not the  
17 major piece. Obviously it's the salmon.

18 Q And you would say that the economic importance of the brook  
19 trout is prominent in the Upper Peninsula?

20 A And in the northern Lower Peninsula.

21 Q Okay. A lot of people travel to the northern Lower and the  
22 U.P. just to fish for brook trout; right?

23 A Yeah, and other places.

24 Q Did you see any assessment of the economic value of brook  
25 trout or, as we're calling them here, Coaster brook trout in

1 the EIA when you read that?

2 A I don't remember seeing that.

3 Q How would you characterize the quality of the Salmon Trout  
4 fishery right now?

5 A I don't know about the fishery. The Salmon Trout having the  
6 numbers of fish moving up in terms of fish populations, it  
7 looks like it's getting better and better and healthier.  
8 And so the numbers of fish are moving up, and the biomass is  
9 up considerably since the 1980's based on the reports that I  
10 saw in terms of how many --

11 Q And you read Dr. Workman's testimony?

12 A I did.

13 Q And I think he characterized it as very good or --

14 A Yeah; excellent.

15 Q -- excellent. I think you -- I think you had different  
16 sites, as I remember. And most of them fell in excellent.  
17 I think there was one that was very good but was almost  
18 excellent based on his studies.

19 Q So based on that, something's going right in the river right  
20 now; right?

21 A Yes.

22 Q Okay. So we wouldn't want to see a degradation of the water  
23 quality which might reverse whatever's happening right now  
24 that's improving the fishery and the quality of the river;  
25 right?

1 A I agree. I don't think anybody's looking for a degradation  
2 of the water quality. No ecologist would.

3 Q And we wouldn't want to change the temperature, or at least  
4 we wouldn't want to make it any warmer; --

5 A No.

6 Q -- right?

7 A Correct.

8 Q Okay. Are you familiar with the July 2007 report that was  
9 funded by the U.S. EPA and the Michigan Department of  
10 Environmental Quality called the Salmon Trout River  
11 Watershed Management Plan?

12 A I am not.

13 Q You're not?

14 A Unh-unh (negative). I am not.

15 Q Okay. Are you aware that in July -- I'm sorry -- April of  
16 2005 91 tons of sediment were dumped, ran off into the  
17 Salmon Trout River from a road crossing that Kennecott had  
18 re-engineered and rebuilt at the Triple A crossing of the  
19 Salmon Trout River?

20 A I had heard that.

21 Q Do you believe that 91 tons of sediment dumped into the  
22 river at one time is enough to impact the quality of the  
23 river?

24 A Yes, I do. At certain areas I believe it would be certainly  
25 in the near areas it would be it depends on how much -- how

1 fast it would move downstream that there would be an impact.

2 Q What would the impacts be from a 91 ton event?

3 MR. PREDKO: Excuse me. I just want to place an  
4 objection. I don't believe that there's been any testimony  
5 at all in the record as to 91 tons of sediment being run off  
6 into the river by Kennecott. It's not in this record.

7 MS. HALLEY: Well, he just agreed that that's an  
8 accurate statement.

9 A I agree that sediment would -- sediment had come in from the  
10 road crossing and that that would have an impact. Sediment  
11 coming into a stream would have an impact.

12 Q So I'm wondering what in your opinion would the impact of a  
13 very large amount in the neighborhood of 91 tons of sediment  
14 being put into the stream, what are some of the likely  
15 impacts of that?

16 A In the near area you'll have to get -- for 91 tons, you'll  
17 have to get somebody that knows the water flow, water  
18 dynamics to tell you how it would move through the system  
19 and how fast it would move and what the grain sizes were.  
20 But you certainly would have an impact in the local area of  
21 fish having gills abraded and you'll have a reduction in  
22 numbers of redds if they were available up there, if gravel  
23 was available. If they weren't there, you wouldn't have any  
24 effect on reproduction. So it depends on where the go out  
25 was and what the habitat was trout was next to it.

1 Q Okay. Now, we've talked a lot about Coasters, but you  
2 understand that there are brook trout in the stream inside  
3 the red square there, inside the proposed mining area?  
4 A Above the waterfall.  
5 Q Pardon me?  
6 A Above the waterfall.  
7 Q Right.  
8 A You're talking above the waterfall.  
9 Q There are resident brook trout --  
10 A Right.  
11 Q -- in that area?  
12 A Correct.  
13 Q And up into what we've been calling the headwaters area  
14 right above the orebody; right?  
15 A Yes.  
16 Q And sort of the list of things that we talked about before,  
17 changes in water temperature, changes in the levels in the  
18 stream, air deposition of metals, all of those things have  
19 the potential to impact that fishery; right?  
20 A Correct.  
21 Q Now, I'm curious. Maybe we can talk for a minute not about  
22 fish, but about birds but in the context of landscape  
23 ecology. And I'm wondering how does landscape ecology take  
24 into account bird activity and bird movement? Birds are  
25 very mobile, far more mobile than most other species. So

1 I'm just kind of curious about how landscape ecology takes  
2 that movement into account.

3 A With the caveat that I'm not a bird ecologist, --

4 Q I understand.

5 Q -- you should get a bird person to talk. But they would be  
6 looking at whether birds, what patches birds need for  
7 roosting and for nesting and for food and for water and look  
8 at where those habitats are available and then where the  
9 migration -- the ability of the bird to move, whether it's  
10 all encompassing and whether those habitats are near each  
11 other, close enough that they can survive and prosper.

12 Q And would that sort of analysis look at the impact of roads  
13 to all of the things you just talked about in --

14 A They'd look at anything that would break up habitat or  
15 fragment habitat to the point where the animal couldn't get  
16 across.

17 Q Okay. So new roads; right?

18 A You look at everything that would change any habitat, look  
19 and see if it changed it where it had an impact on the  
20 animal population that you were interested in the community.

21 Q So just out of curiosity, would that include new roads?

22 MR. PREDKO: Your Honor, I just want to place an  
23 objection. We're way far afield of Dr. Taylor's expertise.  
24 And secondly, we're getting into things that are not even  
25 part of this permit. This is again an area of new roads

1           that are not included within this permit. There are no new  
2           roads in this permit.

3                       MS. HALLEY: Your Honor, he is an expert in  
4           landscape ecology. In fact, he helped write the book on the  
5           topic. I'll withdraw the question about the new roads.  
6           That's fine.

7                       JUDGE PATTERSON: Okay.

8           A     You look at any --

9           Q     Okay. How about increased traffic -- oh, I'm sorry.

10          A     You would look at any impact area.

11          Q     Okay. How about things like increased traffic on existing  
12          roadways? Would that be something to consider?

13          A     I think you would consider any change in activity and how it  
14          impacts the animals and the plants in the area.

15          Q     Right. My question specifically, though, is related to  
16          increased traffic on existing roadways. Would that be  
17          something to consider?

18          A     In what sense? Into the trout population or to --

19          Q     No. In relation to bird population, bird habitat, bird use  
20          of the area.

21          A     You would really have to get an avian ecologist here,  
22          because I imagine it would depend on where the bird --  
23          whether the bird is flying at what height, whether it  
24          needs -- what that road would do to its migration.

25          Q     But it would be something worth considering; correct?

1 A Sure. I think you'd bring all the disciplines in. I think  
2 that's what the idea is to make sure that you have the  
3 expertise you need to make those decisions.

4 Q And likewise, clearing along roadways would be an important  
5 thing to consider; right?

6 A Yes.

7 Q And likewise, increases in noise in the vicinity of bird  
8 habitat?

9 A Again, you're talking birds. You need to get a different  
10 expert on it. But I would say any impact -- any new change  
11 in behavior or a change in habitat fragmentation would need  
12 to be looked at and what the response would be to the  
13 communities that you're looking at, whether it's birds,  
14 fish, whatever.

15 Q So from a landscape ecology perspective, things like noise,  
16 lighting, increases in human activity, increases in traffic,  
17 all those would be considered in the analysis; right?

18 A Looked at, yeah. You bring different disciplines together.

19 Q Okay.

20 MS. HALLEY: Can I just confer with my co-counsel  
21 just for a minute?

22 JUDGE PATTERSON: Sure.

23 (Counsel confer)

24 Q Now, you I believe testified that you did not participate in  
25 the development of the EIA for this project; right?

1 A That's correct.

2 Q But you read it?

3 A I did.

4 Q Could you enumerate for us if you believe the EIA as it is  
5 reflects the principles of landscape ecology? Could you  
6 tell us how you believe it does?

7 A It was looking at the example of the Coaster as a distinct  
8 population segment or a unique species that would be just  
9 different than the resident brook trout. And I'm speaking  
10 from my area of expertise.

11 MR. PREDKO: And just for the record, I think  
12 there's some misunderstanding as to the terms EIA,  
13 environmental impact assessment, that was submitted along  
14 with this project. And ESA, the Endangered Species Act,  
15 petition.

16 THE WITNESS: I read the ESA.

17 MR. PREDKO: Correct.

18 Q Oh, you have not --

19 A I'm sorry.

20 Q -- read the environmental impact assessment --

21 A No.

22 Q -- that was submitted with this application?

23 A No.

24 MR. WALLACE: That makes a difference.

25 MS. HALLEY: That makes a big difference. Thank

1           you.

2           Q     So you haven't read it and you weren't involved in writing  
3           the environmental impact assessment?

4           A     I was not.

5           Q     And you haven't even read it?

6           A     No.

7           Q     Okay. Before you testified in this case, did you think it  
8           might have been important to read what the company felt the  
9           environmental impacts would be?

10          A     The question that I was asked was about the Coaster brook  
11          trout, were they a unique species.

12          Q     That's the only thing you're testifying about?

13          A     That's what I'm testifying about.

14          Q     Is that the only thing you're testifying about?

15          A     It is.

16                         MS. HALLEY: No further questions. Thank you.

17                         MR. PREDKO: Your Honor, I do want to move along  
18                         so that we can get Dr. Taylor out of here. Can we go a  
19                         couple minutes past noon here?

20                         JUDGE PATTERSON: That's fine with me.

21                                 REDIRECT EXAMINATION

22          BY MR. PREDKO:

23          Q     Dr. Taylor, I do have a few follow-up questions. You were  
24          asked questions about how you would recommend evaluating  
25          cumulative impacts on a project such as this, and you said

1           that you would get the individual disciplines involved.

2       A     That's correct.

3       Q     And one of the disciplines you mentioned was hydrologists.

4           What other disciplines would you get involved to do a

5           cumulative impact assessment?

6       A     Well, I would look at -- certainly from the trout point of

7           view I would look at people related to the water quality and

8           chemistry, the temperature, so an ecotoxicologist, aquatic

9           chemist. I would look at people that understood sediments

10          and I would look at people that -- so the water temperature,

11          the sediments, the aquatic chemistry and the toxicology ends

12          for sure.

13       Q     And as far as effects on terrestrial animals, I know you're

14          not an expert in those areas, what kinds of experts would

15          you get involved to look at those?

16       A     I'd certainly bring in the engineers on the roadways that

17          were talked about on sediment control, certainly bring in

18          people about vegetation.

19       Q     Wildlife biology?

20       A     Wildlife biologist, ecologist. I'd bring in --

21       Q     Wetlands experts?

22       A     -- wetland experts, the airborne experts so you can look at

23          the pathways of any sort of impacts, hydrologists. I think

24          we already said that earlier. But I'd bring along any

25          expertise that we needed to answer the questions that you've

1           been asking and specifically to their disciplines.

2       Q     And you talked about the what's been called the Scribner  
3           report on the Coaster brook trout.  And you said that you  
4           had a concern about the sample size of nine fish.

5       A     Uh-huh (affirmative).

6       Q     Why do you have a concern about that?

7       A     Nine is a very low number statistically of a fish that's  
8           highly variable, that as a genome that's highly variable  
9           such as brook trout.  And so the question gets to be is how  
10          representative it is of the total population.  It may be  
11          representative, it may not be.  But nine is a very small  
12          number when you've got a highly variable genome like the  
13          brook trout.

14      Q     And do you know who sponsored that Scribner report?

15      A     The Huron Mountain Research Foundation, the Michigan  
16          Department of Natural Resources and I believe some Michigan  
17          State University.

18      Q     And other than this Scribner report with the nine fish  
19          sample size sponsored in part by the Huron Mountain Research  
20          Foundation, is there any other report or study that you're  
21          aware of that shows or gives any indication at all that  
22          there is a genetic difference between Coasters and common  
23          brook trout?

24      A     No.

25      Q     One last question, Dr. Taylor.  You testified earlier that

1           you believe that brook trout and Coasters were replaceable.  
2           If this population of Coasters in the Salmon Trout  
3           disappeared, do you believe that they could be restocked?

4       A     I do.  And they are being done so by -- in Minnesota and  
5           Wisconsin and Michigan has done.

6                       MR. PREDKO:  Thank you, Dr. Taylor.

7                       MR. REICHEL:  Dr. Taylor, my name is Bob Reichel.  
8           I represent the Department of Environmental Quality.  I just  
9           want to follow-up briefly on a line of questioning that Mr.  
10          Wallace proceeded with you.

11                                       CROSS-EXAMINATION

12       BY MR. REICHEL:

13       Q     As you know he asked you a great many questions about  
14           landscape ecology.  And at one point I believe he asked you  
15           about whether you believed it would be important to look at  
16           impacts in connected areas or words to that effect.  My  
17           notes are not clear.  But I think at or around the same time  
18           he listed a variety of areas, and I think at one point he  
19           said mountains -- I'm not sure what else.  I guess I'd like  
20           to step back from this.  Have you as a party that worked on  
21           this project been asked to -- or have you undertaken an  
22           analysis of what areas are or not ecologically connected to  
23           the site of the proposed mine?

24       A     I haven't.  I have looked at the groundwater -- in terms of  
25           the Salmon Trout, I looked at the connections between the

1 trout populations and the lake.

2 Q Right. I guess more specifically have you undertaken any  
3 evaluation about any areas other than the Salmon Trout  
4 waters?

5 A Oh, yes, in terms of reading other papers. I misunderstood  
6 what you said. Yes, I've read quite a few other papers.

7 Q Right.

8 A Okay.

9 Q But in terms of, again, have you been asked to or did you  
10 undertake an analysis of whether or not the Cedar Creek  
11 watershed, for example, is or is not going to be impacted by  
12 the proposed mine?

13 A Yes. I looked at whether the Cedar Creek was looked at. I  
14 didn't look at whether the mine would impact it. I looked  
15 at whether it would have an impact on the Salmon Trout  
16 River.

17 Q And what did you conclude in that regard?

18 A There would be no impact.

19 Q No impact?

20 MR. REICHEL: Nothing further. Thank you, sir.

21 MR. WALLACE: I guess I'm not sure I understood  
22 the answer to the last question.

23 RECROSS-EXAMINATION

24 BY MR. WALLACE:

25 Q You looked at Cedar Creek and the Salmon Trout?

1 A I looked at where the watershed's boundaries were.

2 Q And you're testifying that the Salmon Trout doesn't have an  
3 impact on the Cedar Creek watershed?

4 A I'm saying that there were no -- inside the Salmon Trout  
5 River there were no impacts that I could see that would  
6 effect a Coaster brook trout.

7 Q Impacts from what?

8 A From the -- from looking at how does -- will cold water  
9 occur. I could not comment specifically on water chemistry  
10 or toxicology. It's not my area. So I could see nothing  
11 that would effect a Coaster brook trout based upon the upper  
12 portions of the Salmon Trout basin.

13 Q I'm still not getting it. Are you saying, because you're  
14 not a toxicologist and because you're not a hydrologist and  
15 because you're not a geochemist, you were not able to study  
16 and determine impacts of the mining operation on the  
17 watershed? Is that what you're saying?

18 A Up in that area. Yes, I am. Up in that area.

19 Q Okay. You're not saying you studied all that and --

20 A No.

21 Q -- have an opinion there's no impact?

22 A That's correct; that's correct.

23 MR. WALLACE: Thank you.

24 MR. REICHEL: I have nothing further.

25 MS. HALLEY: Nothing further.

1 MR. PREDKO: Nothing, Your Honor.

2 JUDGE PATTERSON: Thank you. Break for lunch.

3 (Off the record)

4 JUDGE PATTERSON: Back to you?

5 MR. REICHEL: Yes, your Honor. But Mr. Predko has  
6 advised me that before we begin with our witness, he wanted  
7 to raise a procedural issue from last week.

8 JUDGE PATTERSON: Oh, okay.

9 MR. PREDKO: Your Honor, I raised the procedural  
10 issue on Friday about rebuttal witnesses.

11 JUDGE PATTERSON: Right.

12 MR. PREDKO: And we do anticipate that Petitioners  
13 will want to call rebuttal witnesses. We submitted a bench  
14 memorandum on Friday to the court and to opposing counsel on  
15 the appropriateness of --

16 JUDGE PATTERSON: I did read that.

17 MR. PREDKO: -- rebuttal testimony. While we  
18 don't think it appropriate, if the court deems it  
19 appropriate, we do believe that under Michigan law it should  
20 be restricted to real rebuttal rather than repetition of the  
21 case in chief. And what we're asking for today is a  
22 deadline certain prior to our break whereby Petitioners will  
23 tell us who they plan to call, the subject matter on which  
24 they propose to testify, and a general order. And that's  
25 for a couple of reasons. It's for planning purposes so that

1 we can prepare to have the right attorneys here, opposing  
2 experts here if necessary, to listen to those rebuttal  
3 witnesses, and also to allow us to have discussions either  
4 in chambers or on the record about the appropriateness of  
5 certain testimony should we have objections. And we can do  
6 that prior to our week-and-a-half break so that no effort or  
7 resources are expended unnecessarily on preparing for  
8 rebuttal that just should not happen.

9 MR. HAYNES: Your Honor, with regard to rebuttal,  
10 I think since you've already scheduled rebuttal witnesses;  
11 that takes care of the principal issue, which is whether or  
12 not Petitioners have the right to rebuttal; we think we do.  
13 We think it's appropriate in this case because Respondents  
14 and Intervenor put on some fairly extensive proofs that need  
15 to be -- that call for rebuttal. We think we have the right  
16 to it, and I don't think there's any question we get it in  
17 this case, and we ought to have it in this case because of  
18 the technical nature of the proceedings.

19 As to the order of witnesses, we're working on  
20 that now. We've been discussing it obviously among  
21 ourselves to determine the order of our rebuttal witnesses.  
22 We may have that order ready tomorrow; we may not. But what  
23 we -- I think what we can represent is that we will give  
24 that order to the Respondent and to the Intervenor no later  
25 than the first part of next week, because we're -- we

1 haven't finalized our discussions on the order of witnesses  
2 yet. That should give them plenty of time to prepare. But  
3 I don't think that we're ready -- from what I can tell, it  
4 appears that we're going to finish up with the State's case  
5 tomorrow, and I don't think we'll be ready by the close of  
6 business tomorrow to furnish that list, although certainly  
7 we have no objection to providing the Intervenor and the  
8 Respondent with the subject matter of the rebuttal testimony  
9 consistent with their disclosures that they gave us for  
10 their witnesses, and we think that will certainly be  
11 sufficient for their purposes. And if we give it to them  
12 the first part of next week, that should give them  
13 sufficient time to prepare. They'll have a week to discuss  
14 that list and call their folks and get their attorneys  
15 ready.

16           And last part: As to the question that this ought  
17 to be real rebuttal, I'm not quite sure what counsel means  
18 by that. But if he means that rebuttal will be points  
19 addressed to the Respondent's case and the Intervenor's  
20 case, we agree; that's what we think the purpose of rebuttal  
21 is. We don't intend to put on our case in chief again.  
22 There's no need for that. We weren't contemplating doing  
23 that anyway. So to that extent, I guess I agree with  
24 counsel that our rebuttal will be focused, but will be -- it  
25 will not rehash our entire case. I don't think you would

1 stand for it anyway if we started to do that, so we don't  
2 intend to.

3 MR. EGGAN: I would only add that I think that we  
4 are in general agreement on almost all of the issues with  
5 the company on this -- in this matter and with DEQ. We want  
6 to cooperate. And we don't want rebuttal to be one moment  
7 longer than it needs to be, so we're going to focus our  
8 rebuttal on issues that are appropriate for rebuttal. In  
9 terms of the timing of when we can give them the guidance,  
10 part of the problem is we have lawyers from out of state and  
11 clients who are spread throughout the state, and there needs  
12 to be communication with people on those issues.

13 MR. PREDKO: Your Honor, real rebuttal is as how  
14 we defined it under Michigan law in our memo.

15 JUDGE PATTERSON: Right.

16 MR. PREDKO: And it's not only not to bolster the  
17 case in chief; it's also not to bring things that you could  
18 have brought in the case and chief but decided not to. It  
19 is to only address new issues that were brought up either by  
20 Intervenor or Respondents. And we believe that it's  
21 important to get that list sooner rather than later so that  
22 we can actually discuss that and have that argument rather  
23 than go the week and a half and then have the argument while  
24 Petitioners have their witnesses lined up and ready to  
25 testify and all the work has gone into it, people have

1           expended resources on both sides, because we won't know  
2           who's in and who's out; we'll have to prepare for everybody.  
3           We think that it's reasonable that they give us that list  
4           prior to our break and then we have a discussion about who's  
5           in and who's out or what's in and what's out prior to the  
6           break so everyone knows where we're going when we get back  
7           from break.

8                         In our case I imagine that rebuttal is going to be  
9           aimed substantively at what was testified about by  
10          Kennecott's witnesses as opposed to DEQ's witnesses, or at  
11          least the major thrust of it. And so Kennecott's witnesses  
12          have been done testifying now for over a week. And so this  
13          is the -- you know, and sort of surprise or they wouldn't  
14          know who was going to testify. They should have this all  
15          ready given that they didn't know when the DEQ's case was  
16          going to finish, and they could have been putting on  
17          rebuttal witnesses this week had the DEQ wrapped up his case  
18          earlier. But the point is, your Honor, we believe it's  
19          important to have that list of witnesses and to have that  
20          discussion whether it be in chambers or on the record about  
21          what's in and what's out prior to our week-and-a-half break.

22                         MR. HAYNES: Your Honor, in brief response, I  
23          understand counsel's desire to limit our rebuttal case.  
24          That's a natural desire on his part. However, if by his  
25          suggestion that we have a meeting, say, tomorrow to discuss

1           who our rebuttal witnesses are going to be, I get the sense  
2           that counsel is trying to tell us who we can bring in as a  
3           rebuttal witnesses. And it strikes me that if counsel is  
4           concerned about the issues that our rebuttal witnesses will  
5           be testifying about, that's a matter that's going to have to  
6           come up when they start testifying. And I don't think  
7           counsel can limit us on who we bring in as a rebuttal  
8           witness to their case. If the witnesses testify about some  
9           matter that counsel believes is just restating our case in  
10          chief, then he can bring it up when the question is asked.  
11          But I don't think that can be done beforehand.

12                    JUDGE PATTERSON: That was going to be one of my  
13                    comments. We're sort of dealing in a vacuum at this point,  
14                    because we don't know exactly what's going to happen. First  
15                    of all, I'm not going to preclude rebuttal. But I would  
16                    encourage you to -- and I think you're telling me you're  
17                    willing to limit it as much as you possibly can.  
18                    I think if you can get them a list of witnesses and  
19                    substance -- I think you said no later than the first of  
20                    next week. Is that --

21                    MR. HAYNES: That's what we plan to do, your  
22                    Honor.

23                    JUDGE PATTERSON: We do have a holiday coming up,  
24                    which we need to accommodate in some respects. If you can  
25                    do it sooner, I would encourage you to do that, but no later

1 than a week from today. Would that work?

2 MR. HAYNES: I think that will work, your Honor.

3 JUDGE PATTERSON: All right. Anything else?

4 MR. PREDKO: No, your Honor.

5 MR. HAYNES: No, your Honor. Thank you.

6 JUDGE PATTERSON: All right. And if we need to,  
7 we can take some time when we come back on Monday to -- if  
8 you need me to get involved in it in any way. We can do it  
9 then.

10 Mr. Reichel?

11 MR. REICHEL: Yes. Respondent calls Eric  
12 Chatterson.

13 REPORTER: Do you solemnly swear or affirm the  
14 testimony you're about to give will be the whole truth?

15 MR. CHATTERSON: Yes.

16 ERIC CHATTERSON

17 having been called by the Respondent and sworn:

18 DIRECT EXAMINATION

19 BY MR. REICHEL:

20 Q Mr. Chatterson, could you please first state your full name  
21 and spell your last name for the record?

22 A Eric Allen Chatterson. Chatterson is spelled  
23 C-h-a-t-t-e-r-s-o-n.

24 Q Mr. Chatterson, you work for the Department of Environmental  
25 Quality Water Bureau; is that correct?

1 A Yes.

2 Q And you're by training a geologist and hydrogeologist; is  
3 that correct?

4 A Yes.

5 Q And were you one of the staff who participated in the review  
6 of the groundwater discharge permit application that's at  
7 issue in this case?

8 A Yes.

9 Q Before we get into the details of that, sir, I'd like to ask  
10 you first to briefly review your educational background.

11 A I have a bachelor's of science degree in geology from Grand  
12 Valley State University, and I also have a master's of  
13 science degree in geology from Southern Illinois University  
14 at Carbondale.

15 MR. REICHEL: I would note for the record that Mr.  
16 Chatterson's resume, which is marked Respondent's Exhibit  
17 Number 4, is already in the record pursuant to stipulation.

18 Q Mr. Chatterson, in pursuing your academic work, were there  
19 any particular areas of specialization that you pursued?

20 A Primarily groundwater modeling and hydrogeologic  
21 characterization.

22 Q And when you pursued your master's degree, was there a  
23 particular subject or focus for your research or your thesis  
24 project?

25 A Yes. My thesis involved doing a three-dimensional

1 groundwater flow model at a working mine -- underground mine  
2 in Illinois focusing on the impacts of acid mine drainage,  
3 essentially a geochemical -- groundwater flow model focusing  
4 on geochemical aspects of acid mine drainage.

5 Q From an operating mine; is that correct?

6 A Yes.

7 Q After you obtained your bachelor's and master's degree, how  
8 were you first professionally employed in the field of  
9 geology or hydrogeology?

10 A I was hired by a company called at the time Roy F. Weston,  
11 Incorporated. And they're an environmental consulting  
12 company that does various environmental consulting work  
13 around the Midwest, initially was hired by the Vernon Hills  
14 office, which was the Midwest headquarters for that company.

15 Q And is that located in the Chicago area, sir?

16 A Yes. It's Vernon Hills. It's kind of north Chicago. It's  
17 kind of considered Chicago, but it's a suburb, too.

18 Q In any event, when you went to work for Roy F. Weston, could  
19 you briefly describe the kinds of activities that you worked  
20 on and the types of client for whom you did that work?

21 A The majority of my work was probably 50 percent groundwater  
22 modeling-type work. I worked for a lot of private clients,  
23 large corporations, generally dealing with large-scale  
24 problems, Super Fund sites. I also worked for USEPA  
25 under -- as a subcontractor under -- what Weston had was

1 called at the time a rack contract where they essentially  
2 subcontract their work out. And I worked for EPA doing  
3 hydrogeology and some groundwater modeling to evaluate Super  
4 Fund sites, pump and treat systems and the effectiveness of  
5 pump and treat systems on Super Funds site -- mostly Super  
6 Fund sites.

7 Q And if I understand you correctly, during this initial time  
8 period in question, your work was roughly evenly divided  
9 between private clients and contractual work for EPA?

10 A Yeah. I would say it comes pretty close to 50/50 over my  
11 time I spend there.

12 Q And again you've mentioned Super Fund sites. I take it  
13 these projects where you were involved in attempting to  
14 determine hydrogeologic conditions; is that correct?

15 A Yes. It was generally tracking contaminants. It would be  
16 either assessing the hydrogeology and quite often -- on many  
17 of the sites, it would lead to a groundwater flow model  
18 either to design a pump and treat system, designing treated  
19 water infiltration basins, maybe -- some of the sites were  
20 already up and operating, but they had a problem. They  
21 weren't getting capture. And I would evaluate those and do  
22 a groundwater flow model to try and determine what was  
23 wrong, what the cause of the problem was and come up with a  
24 corrective action.

25 Q Now, you've indicated that a substantial portion of your

1 work in that capacity involved groundwater modeling. Was it  
2 limited to just modeling, or did you deal with other  
3 hydrogeologic issues or investigations?

4 A No. It was sort of the full range of hydrogeologic  
5 characterization. Modeling was -- when you get a larger  
6 scale site, a lot of times modeling is one of the many tools  
7 that is used, but it's just one component of the overall  
8 characterization. But it involved pump tests, slug tests,  
9 drilling, the typical hydrogeologic characterization.

10 Q And as a regular part of that work, were you called upon  
11 either to oversee such investigations or to review the  
12 results of those kinds of investigations?

13 A Yes. Quite often I would either be overseeing the work or  
14 reviewing it or -- yes.

15 Q Moving forward in time, your resume indicates that you  
16 worked for Roy F. Weston between 1997 and 2000. How did  
17 your employment change at all in about 2000?

18 A I had transferred from the Vernon Hills office to the Okemos  
19 office of Roy F. Weston. Once I came here, the company  
20 was -- sort through a buyout ownership change was changed  
21 to -- the name was changed to Weston Solutions,  
22 Incorporated, but it was essentially the same company, most  
23 of it same management. Upon coming to Michigan, I then  
24 picked up a certain amount of MDEQ work also as a  
25 subcontractor. So I -- to characterize my work in Michigan,

1           it was probably a third of my work was private client, maybe  
2           a third was USEPA as a subcontractor, and another third of  
3           my work was as a MDEQ subcontractor.

4       Q     Let's that each step. With respect to private clients and  
5           once you located to Michigan, how would the work you were  
6           doing -- you started doing then for private clients compared  
7           to the types of work that you were doing when you were in  
8           the Illinois area? Similar? Different?

9       A     It was a -- like I say, it was a little less, because it was  
10          different projects. But there were still some large-scale  
11          projects where -- at the time I was in Chicago, I was  
12          essentially their chief modeler for the Midwest district.  
13          And when I came to Okemos, I still kind of had that capacity  
14          even though I was in the office. So certain groundwater  
15          flow models or hydrogeologic reports or whatnot would be  
16          shipped over to Vernon Hills to Okemos, and I would work on  
17          them here.

18       Q     And what about -- you talked about working under a  
19          subcontract to USEPA.

20       A     Yes.

21       Q     Again when you relocated to Michigan, were you doing similar  
22          or different kinds of work for EPA?

23       A     Similar, because I kept the same sites. I mean, my office  
24          was different, but I still was working on the same sites.

25       Q     Okay. So you were just carrying forward previous

1 assignments?

2 A Yes; yes.

3 Q Okay. Fair enough. Now, you also mentioned that, when you  
4 located to the Okemos area, you started undertaking some  
5 projects under contract to the MDEQ. Could you briefly  
6 describe the kinds of projects that you're talking about?

7 A There's a variety -- a lot of my time was focused on a  
8 certain project up in the Cadillac area where there was a TC  
9 plume had escaped a purge and treat system. And it was a  
10 large-scale project. It took up a lot of time, a lot of, I  
11 guess, issues involved with that. It's also something that,  
12 I think, was -- spent some time in court. I mean, the  
13 project, you know, was, I guess, in and out of the courts.  
14 And we spent a lot of time talking to their technical  
15 people, a lot of effort trying to resolve the issues of why  
16 the plume got away, whose plume it was. There was multiple  
17 plumes in the area. That was my primary job, which probably  
18 took up 50 percent of my DEQ work. But there was also  
19 various other projects around Michigan, generally  
20 groundwater contamination, contaminant transport, typically  
21 had a component of groundwater modeling in a lot of them.

22 Q Okay. And again, similar to your other work that had  
23 involved a combination of both modeling and either  
24 collection or analysis of other hydrogeologic data?

25 A Yes. It was -- you know, it was anything from going out to

1 installing wells and logging the cores to taking groundwater  
2 samples to doing hydraulic testing on the aquifer and coming  
3 back in the office and compiling the data into a report and  
4 maybe using that data as a foundation for a model or other  
5 analytical methods to be used on the data.

6 Q And your resume indicates that you've worked for the MDEQ  
7 directly since 2003. When you first started with the MDEQ,  
8 what branch or part of the DEQ were you assigned to and what  
9 were your responsibilities?

10 A At the time I started, it was water division, and I think it  
11 was groundwater permits and technical support unit -- was  
12 the actual unit. And I think it was the groundwater  
13 section. It was only briefly. Because shortly thereafter  
14 there was a reorganization to Water Bureau, permit  
15 section, groundwater permits unit is where I currently work.

16 Q And leaving the issue of precise administrative title, in  
17 substance, once you came to the DEQ, if I understand you  
18 correctly, you were involved in providing technical  
19 hydrogeologic support to DEQ with respect to groundwater  
20 permitting issues?

21 A Yes. I was basically dealing solely with hydrogeology --  
22 hydrogeologic characterization and various aspects of the  
23 permitting of groundwater discharges.

24 Q Okay. And in the course of that work, again has this  
25 involved the hydrogeologic -- evaluation of hydrogeologic

1 data?

2 A Yes.

3 Q Has it involved to any extent either reviewing or evaluating  
4 hydrogeologic models?

5 A Yes.

6 Q And have your responsibilities -- have you continued in  
7 essentially that same kind of role since 2002?

8 A Yes.

9 Q Okay. I'd like to turn now to your involvement in the  
10 project that brings us all here today, that is the proposed  
11 Kennecott Eagle Mine. Mr. Chatterson, going back to late  
12 2004, early 2005, if you recall, sir, were you contacted by  
13 other department staff about -- provided information about  
14 some preliminary hydrogeologic work that Kennecott's  
15 consultants were doing?

16 A Yes. I believe initially my first, I guess, involvement in  
17 the project is I was given a report -- I'm not sure how it  
18 got its way to me -- from the U.P. district. Kristen  
19 Mariuzza sent down a report and requested -- I didn't really  
20 talk to her, but I got an e-mail asking to look it over.  
21 They were going to have a meeting. There was -- I was told  
22 there was potentially going to be a groundwater discharge  
23 and to look over this report she gave me and let her know  
24 what I think, what comments I have on it.

25 Q And as you received that initial document, were you clear on

1           whether or not you were being asked to look at this part of  
2           an element of a groundwater permit application?

3       A     No.  I was told there may be a groundwater discharge permit  
4           coming along, but I was just told this was some preliminary  
5           work they had done and what do you think basically.  I  
6           didn't have a lot of details.  All I had was the e-mail is,  
7           "Look it over.  Tell us what you think."

8       Q     And did you provide a response to Ms. Mariuzza?

9       A     Yes, I did.

10      Q     And in the course of that response, did you identify some  
11           concerns about at least some aspects of this preliminary  
12           document you were asked to look at?

13      A     Yes.  I noted that, when I looked over the document, that  
14           there had been a certain amount of geologic work done out  
15           there and some advancement of soil borings.  And that's  
16           pretty much all I had to go on.  And the first thing I'd  
17           look at is the geology and the boring logs.  And I noted  
18           that the boring logs were significantly inadequate for what  
19           would be required of a groundwater discharge permit.

20      Q     In what respect, sir?

21      A     They were just really poor quality.  They didn't -- they  
22           were sort of non-descriptive.  A lot of the information that  
23           should be included was missing.  You know, one of the boring  
24           logs, I think, when it intercepted bedrock, it just said,  
25           "Bedrock" one word without saying what that bedrock was,

1           which is completely unacceptable for what would be required  
2           in a groundwater discharge permit.  And since I believed  
3           this was -- you know, eventually could be a groundwater  
4           discharge permit, I had concerns that, if that type of work  
5           or if that truly represented, you know, what was available,  
6           that, you know, since it was unacceptable, the boring would  
7           have to be redone if that log -- or that hole was going to  
8           be utilized.

9           Q     Okay.  After you expressed those concerns to Ms. Mariuzza,  
10           did you subsequently have any further communications either  
11           with her or representatives -- excuse me -- consultants from  
12           Kennecott who were involved in the preparation of the  
13           document you commented on?

14           A     Yes.  Ms. Mariuzza informed me that, if the document was --  
15           the boring logs contained were not -- I guess, that there  
16           were other boring logs out there and this document --  
17           because it wasn't a hydrogeologic study report.  It just  
18           contained hydrogeologic data -- that it was apparently --  
19           had another purpose and they hadn't put the refined or the,  
20           I guess, better quality boring logs in there and also that  
21           they had taken and retained core samples for those borings.

22                     MR. EGGAN:  Your Honor, I'm going to object to  
23           what Ms. Mariuzza may have told him.  That would be hearsay.

24                     MR. REICHEL:  Well, I'm simply asking what other  
25           information he gleaned on the subject.  Let me just step

1 back.

2 Q In addition to discussing with Ms. Mariuzza -- let me back  
3 up for a minute. If you recall, Mr. Chatterson, do you  
4 recall either by the name of the company or by individual  
5 who was involved in putting together the preliminary  
6 hydrogeologic information that you were commenting on?

7 A I believe it was North Jackson Company and Dan Wiitala, if  
8 that's --

9 Q Wiitala (pronouncing).

10 A Wiitala (pronouncing). I'm sorry.

11 Q Okay. Let me ask you this. After you expressed these  
12 concerns to Ms. Mariuzza, did you subsequently have any  
13 communication with Mr. Wiitala?

14 A Yes, I did. My initial contact with him, I expressed my  
15 concerns. Because in -- as I had expressed earlier, my  
16 concern was, if the core -- typically the core is not kept  
17 in these borings. The borings advance. The geologist logs  
18 it. It's thrown away. My concern was, you know, you can't  
19 redo it from memory. You either did it right the first time  
20 or, you know, you didn't do it. And he informed me that  
21 they did have the cores, that they had been logged  
22 following -- closer to following ASTM standards.

23 MR. EGGAN: Your Honor, again this is -- now we're  
24 hearing what Mr. Wiitala ostensibly told him. And at it's  
25 hearsay.

1                   MR. REICHEL: Well, your Honor, I think it's  
2 certainly pertinent to establish the nature -- or describe  
3 the circumstances under which Mr. Chatterson was first  
4 involved. I believe, although I don't have the transcript  
5 in front of me, Mr. Wiitala did have some testimony on this  
6 subject. In any event -- and he was available for  
7 cross-examination.

8       Q     Mr. Chatterson, let me ask you this. Based upon your  
9            communications with Mr. Wiitala about this, was there any  
10           discussion of -- or did you develop any further  
11           understanding of what -- of how the North Jackson Company  
12           and Mr. Wiitala was either conducting or planning to conduct  
13           additional investigations at the site?

14       A     Yes.

15       Q     What methods?

16       A     Yes. I had made it clear what was required, what was  
17            expected as far as to produce a boring log of adequate  
18            quality, I guess, what is as a department we expected. He  
19            understood that. He expressed to me in the future that they  
20            would follow ASTM standards and that the first boring logs  
21            that I seen were not a representative of what I'd be sent in  
22            the future.

23                   MR. EGGAN: Again, your Honor, I'm going to move  
24            to strike this. What is attempting to be done here is to  
25            get into hearsay, that which is not permitted.

1                   MR. REICHEL: Your Honor, I'm simply -- I'm not  
2 necessarily offering this for the truth of the matter  
3 asserted but to give the witness -- to establish a  
4 foundation for the witness to answer my next question, which  
5 is -- so I --

6                   JUDGE PATTERSON: All right. I'll overrule the  
7 objection.

8                   MR. REICHEL: Okay. Thank you.

9           Q       Bottom line, Mr. Chatterson, based upon this further  
10 communication with Mr. Wiitala at North Jackson, ultimately  
11 were the concerns that you expressed in your initial  
12 comments on this preliminary document, were they or were  
13 they not resolved to your satisfaction?

14           A       Yes, they were.

15           Q       Going forward in time in 2005, if you recall, sir, were you  
16 involved in any other preliminary meetings or discussions  
17 between representatives of Kennecott or its consultants and  
18 DEQ staff who might be involved in a possible groundwater  
19 permit application?

20           A       Yes. There was numerous meetings.

21           Q       Back up for a moment, sir, you've testified you've worked  
22 for several years in matters relating to groundwater  
23 discharge permit applications; correct?

24           A       Correct.

25           Q       In your experience and leaving aside this particular case,

1 is it common or uncommon for there to be discussions between  
2 department staff and permit applicants prior to actual  
3 submission of a permit application?

4 A It's quite common. We actually recommend it. Quite often  
5 we recommend it.

6 Q And why would you do that, sir? Why do you do that?

7 A Generally it's called a pre-application meeting. And that  
8 way the applicant knows what's expected -- we can sit down  
9 and meet, explain to the applicant what's expected of them,  
10 and they can asks questions of us and it just opens  
11 communication. So that way, when a document is submitted,  
12 it doesn't go -- I assume so it doesn't go through too many  
13 iterations back and forth that everybody understands what's  
14 required to meet the rules. And a lot of times there's a  
15 question as to just what exactly are the rules.

16 Q And speaking of rules, let me just establish something on  
17 that regard. Based upon your work with the DEQ and  
18 particularly since 2003 in connection with groundwater  
19 permitting issues, do you -- are you familiar with the Part  
20 22 Rules promulgated by the DEQ related to groundwater  
21 discharges?

22 A Yes.

23 Q And, in particular, are you familiar with those rules that  
24 deal with hydrogeologic characterization and other data  
25 requirements as they relate to groundwater permit

1 applications?

2 A Yes, I am.

3 Q So these pre-application discussions that you indicated or  
4 communications you indicated you participated in, would it  
5 be fair to say that the purpose of that was simply to  
6 respond to questions that the applicant may have about what  
7 the rules would or wouldn't require? Was that an issue?

8 A Yes, that was certainly a part of the discussions.

9 Q Moving forward in time to early 2006 but before the  
10 groundwater permit application that brings us here today was  
11 actually -- formally submitted to the DEQ, do you recall  
12 whether or not you participated again with other DEQ staff  
13 in a meeting with representatives of Kennecott and its  
14 consultants to talk about then anticipated groundwater  
15 permit application?

16 A In?

17 Q I'm sorry. In February of 2006.

18 A Yes. There was many meetings but, yes.

19 Q Let me ask you this. Do you recall a meeting relatively  
20 shortly before the -- let me back up. It's established on  
21 the record that the permit application in this case for the  
22 groundwater discharge permit was submitted to the DEQ on or  
23 about February 22nd, 2006. Given that assumption, do you  
24 recall whether or not you participated in a meeting with  
25 Kennecott representatives in the month of February '06 but

1 before that application was actually received?

2 A Yes. I believe there was a February 8th meeting, if I  
3 remember correctly, but right before the application was  
4 submitted.

5 Q And do you recall any of the issues that were -- do you have  
6 any recollection of the issues that were discussed at that  
7 meeting?

8 A I believe that was the meeting when -- there had been a lot  
9 of talk, I think, of groundwater standards and limits. And  
10 I believe that was the meeting where Kennecott had expressed  
11 to us that they were willing to meet all the limits -- or  
12 all of the limits that they had previously suggested their  
13 treatment system could do, which would mean that they would  
14 meet all groundwater and surface water -- essentially all  
15 groundwater and surface water permit limits.

16 MR. EGGAN: Your Honor, I had an objection to a  
17 prior witness testifying about those particular comments  
18 ostensibly made by Kennecott at that meeting. And I  
19 maintain my objection that those are hearsay.

20 MR. REICHEL: I'm sorry. Are you sustaining or  
21 ruling the objection?

22 JUDGE PATTERSON: Oh, I thought he just  
23 reaffirming a previous --

24 MR. EGGAN: Yeah. I'm sorry. I really was. And  
25 it was overruled before.

1 MR. REICHEL: Just a continuing. Okay. Thank  
2 you. Sorry.

3 Q In any event, sir, during the course of this meeting, did he  
4 indicate the information provided by Kennecott about what  
5 they expected to be quality of the effluent proposed to be  
6 discharged to the groundwater, how, if at all, did that  
7 affect your thinking about the scope of the characterization  
8 or modeling effort that might be offered in support of the  
9 permit application?

10 A It changed it somewhat significantly. They had expressed  
11 their willingness that they would be meeting the  
12 groundwater -- or surface water standards for the most  
13 restrictive surface water body. And what that means is that  
14 their limits would be lower for the eastern tributaries of  
15 the Salmon Trout than they would for either the main branch  
16 of the Salmon Trout or the Yellow Dog River. Also the fact  
17 that they were meeting all groundwater standards also was  
18 relevant, because the way we would view the hydrogeo study  
19 is we would want to know where all the groundwater has gone.  
20 But there wouldn't be such an absolute need to make sure  
21 that beyond any doubt at all that no groundwater would make  
22 its way to the Salmon Trout or to the Yellow Dog.  
23 Essentially they were protecting for the most restrictive  
24 surface water body. So the -- it just changed the level of  
25 certainty required in the model to the point where we were

1 pretty much concerned just with the mounding calculation  
2 there and were comfortable, I think, with -- you know, we  
3 could be comfortable as long as the rest of the  
4 hydrogeologic data would show with a high degree of  
5 scientific certainty that you would have flow to the  
6 northeast, which is what was expected.

7 Q Okay. Let's back up a bit. And maybe I haven't asked the  
8 questions in logical order. But up to the time of this  
9 February -- early February '06 meeting, you -- had you  
10 already seen some other preliminary information from  
11 Kennecott that related to anticipated groundwater flow  
12 direction from what was understood to be a potential  
13 groundwater discharge site, the so-called TWIS?

14 A Yes; yes. I had seen a decent amount of data at that  
15 point.

16 Q Okay. And based upon that data that you would read to that  
17 point, what, if any, conclusion did you reach about the  
18 expected direction of groundwater that -- if it were to be  
19 discharged in the TWIS area, what was your understanding  
20 based upon then available data as to what direction that  
21 would go in?

22 A Well, the data we had had so far, it was clear that  
23 groundwater was flowing to the northeast currently from that  
24 area. The question would it continue to flow to the  
25 northeast after the TWIS or the groundwater discharge was up

1 and working, all the data indicated that it was still going  
2 to the northeast. But I guess the level of concern for the  
3 potential for going to the Yellow Dog or the Salmon Trout  
4 was minimized by the fact that they were treating to a  
5 standard which was much below -- I guess the most  
6 restrictive surface water body, which was the eastern  
7 tributaries of the Salmon Trout River.

8 Q When you say "the most restrictive," are you talking -- what  
9 are you talking about? Does this have some -- what  
10 characteristics or assumption were you making about the  
11 amount of flow, if any, if -- how that would compare if, as  
12 predicted, the groundwater flowed to the northeast towards  
13 the tributaries of the east branch of the Salmon Trout as to  
14 other possible flow scenarios?

15 A Well, the eastern tributaries to the Salmon Trout,  
16 essentially the groundwater seeps out. And that's the start  
17 of the stream. For the groundwater -- for the surface water  
18 requirements, you're allowed to calculate in the mixing of  
19 the surface water body. If the discharge had went to the  
20 Salmon Trout or the Yellow Dog, you'd take the discharging  
21 water and calculate the mixing with the river. And  
22 typically you would get an elevated level. Your allowed  
23 discharge limit would go up. However in the case of the  
24 eastern tributaries, there is no, I guess, base flow. It  
25 basically is the beginning -- the seep is the beginning of

1 the stream. So essentially there would be no allowance for  
2 mixing, which makes the number -- you know, usually you have  
3 your lowest number. It usually goes up. In that case, the  
4 number would not go up. So that was the most restricted  
5 number is that discharge -- produced the most restrictive  
6 number for surface water standards.

7 Q And again given that understanding at this pre-application  
8 meeting from February '06 as to the degree of treatment of  
9 the quality of the effluent, again I think you touched on  
10 this before, but I'd just like to be clear. Did that have  
11 any effect on the level of further characterization or  
12 modeling that you believed would or would not be necessarily  
13 with respect to the proposed discharge?

14 A It would be -- it was, I think, at that meeting or shortly  
15 after internally where it was discussed that the level of  
16 modeling required would focus mainly on the mound and not  
17 to, I guess what you would consider, characterizing  
18 everything -- every source and sink in the system to this  
19 extremely high level of confidence to essentially almost an  
20 absolute certainty. It was determined that, given the  
21 standards that they had expressed that they were willing to  
22 meet and the fact that the groundwater was discharging at  
23 the most restrictive surface water body, that we would focus  
24 the modeling work on just the mound that was being created  
25 to make sure that the mound wasn't injurious, which would be

1 outcropping on the surface or something of that nature and  
2 that that would be the extent of the modeling work that  
3 would be required of Kennecott.

4 Q Let me back up and ask you to explain a little more about  
5 this mounding phenomenon. Again based upon your  
6 understanding of the Part 22 Rules, are there provisions in  
7 those rules that are addressed to this issue of the effect  
8 of mounding or its possible effect on the surface of the  
9 surrounding area?

10 A Yes. You're not allowed to have water ponding or running  
11 off of the site or basically outcropping on the surface. It  
12 would be a violation of the permit or the rules.

13 Q And is that the reason why an analysis of mounding or  
14 groundwater mounding at a groundwater discharge site is  
15 typically required?

16 A Yes.

17 Q Mr. Chatterson, again the permit application was submitted  
18 to the department in February 22nd of 2006. Were you asked  
19 to or was it part of your duty to review portions of that  
20 application?

21 A Yes, it was.

22 Q And there's already testimony in the record that the  
23 application supporting documents were quite extensive. I  
24 note for the record that they have been identified as  
25 Respondent's proposed Exhibits 141 through 158. Now, let me

1 ask you, sir. Would it be fair to say that you focused your  
2 review on those aspects of the application that dealt with  
3 hydrogeologic conditions and the hydrogeologic impact or  
4 potential impact of proposed discharge?

5 A Yes.

6 Q And do you recall whether or not one of the things that you  
7 would have looked at was Appendix B, a hydrogeologic report?

8 A Yes.

9 Q Do you recall whether or not you would have looking at  
10 Appendix C, which had to do with water level records?

11 A Yes.

12 Q And why would you have looked at that or what is this water  
13 well records requirement about?

14 A The water well records -- typically we look at water well  
15 records that are within a half a mile of the proposed  
16 discharge. There aren't any in this situation. But I think  
17 it's always good to look at water well records. Usually the  
18 drilling logs aren't very -- aren't really useful, because  
19 they're not done by a professional. But you can still  
20 ascertain a certain amount of information from them and  
21 still get an understanding as to where the nearest water  
22 wells are that are being used. So I looked at it. I can't  
23 say it was real critical in the determination. But it  
24 would be something I would evaluate.

25 Q Okay. Do you recall whether or not you would have looked at

1 Appendix D, which had to do with background groundwater  
2 calculations?

3 A Yes, I would have looked at that.

4 Q Do you recall whether or not you would have looked at  
5 Appendix E-2, which had to do with analytical model  
6 calculations for treated water infiltration system?

7 A Yes, I would have looked at that.

8 Q Do you recall whether you would have looked at Appendix E-3,  
9 which had to do with groundwater flow model of the treated  
10 water infiltration system?

11 A Yes, I would have looked at that.

12 Q And do you recall whether or not you would have looked at  
13 Appendix M, which had to do with an advection dispersion  
14 model?

15 A Yes, I would have looked at that also.

16 Q Based upon your initial review, did you identify any areas  
17 where you believe that additional information needed to be  
18 provided by the permit applicant?

19 A Yes. I believe I have four comments originally when the  
20 hydrogeo study came in.

21 Q And do you recall whether or not you shared the substance of  
22 your comments or concerns with other DEQ staff, specifically  
23 Jeanette Bailey?

24 A Yes. I would have passed those on to her. And I believe  
25 they would be sent back to Kennecott in a letter outlining

1 the concerns myself and other staff had had on the initial  
2 review of the permit application.

3 MR. REICHEL: Could you please bring up  
4 Respondent's Exhibit 159? I would note for the record, I  
5 believe this is already in evidence. It's a letter dated  
6 March 22nd, 2006, addressed to Jonathan Cherry from the DEQ.

7 Q Do you recognize this document, sir?

8 A Yes, I do.

9 MR. REICHEL: Can you scroll down to Section C,  
10 which I believe appears on the next page. Okay.

11 Q Under the heading "Hydrogeologic study," there are a series  
12 of numbered paragraphs. Do you see that?

13 A Yes.

14 Q Do you recall whether or not -- you've seen this document  
15 before. Do you recall whether or not this section of the  
16 document; that is, Section C; involved comments that you had  
17 provided based upon your initial review of the groundwater  
18 discharge permit application?

19 A Yes. I believe all of the C comments were my comments  
20 involved in the hydrogeologic study report.

21 Q I'm not going to ask you to read the entire thing. But  
22 under C-1 -- and this talks about additional  
23 characterization of groundwater flow direction; do you see  
24 that?

25 A Yes.

1 Q You indicated you believe it was needed. Could you --  
2 without necessarily reading it, could you summarize the  
3 nature of your comment or concern here?

4 A I was concerned that the data currently provided, although  
5 it currently indicated that groundwater flow was pretty  
6 definitively to the northeast, my concern was that, once the  
7 TWIS was in place and discharging, that I wanted to be  
8 absolutely certain that if -- we didn't anticipate it, but  
9 if it did happen that a certain component of water was  
10 flowing either west or south, that we would have the geology  
11 characterized enough so that we would detect it.

12 Q Okay. And was the substance of this comment addressed at  
13 all on any subsequent response from Kennecott or its  
14 consultant?

15 A Yes. Their consultant laid out their -- basically their  
16 position and identified different wells and tried to  
17 further, I guess -- I guess, illuminate the characterization  
18 by pointing out different wells and stuff, which did clear  
19 up some ambiguity in the original report. That was -- and  
20 partially it addressed the comment. But we also felt that,  
21 even with that, it would be beneficial to add an additional  
22 well to the west and to the south. But instead of having  
23 them address it, we decided we would just put that a permit  
24 requirement and get the well that way -- or get the wells  
25 installed that way.

1 Q And moving ahead in time, are you familiar with the  
2 requirements of the groundwater discharge permit that was  
3 ultimately issued in this case?

4 A Yes.

5 Q And do you have any knowledge of conditions of the mining  
6 permit that was issued at the same time at least as they  
7 relate to groundwater modeling?

8 A Yes. There was discussions between myself and OGS as to  
9 these two wells. And we weren't going to ask for the same  
10 well to be installed next to each other if it was going to  
11 be installed for the mining permit -- or if they wanted it  
12 for the mining permit and it was also the same area or the  
13 same well for the same -- essentially the same location as I  
14 wanted for the groundwater discharge permit, we would just  
15 let either one or the other take care of it as long as we  
16 knew it was being installed.

17 Q And to your knowledge, were your suggestion that there be  
18 additional monitoring points to the west and the south -- is  
19 that correct? --

20 A Yes.

21 Q -- were those, in fact, addressed in the permits as issued?

22 A Yes.

23 Q Do you happen to recall the designation of those wells or --

24 A Boy, I'm stretching my memory, but I think one is going to  
25 end up being QAL70 and the other, I believe, is a QAL26,

1 lower portions.

2 Q That's fine.

3 A It may be 29. I don't --

4 Q That's fine. This is not a memory quiz. But the substance  
5 of my question is this. Are you confident that, between the  
6 groundwater discharge permit and the mining permit that, in  
7 fact, additional wells to the west and south that addressed  
8 the substance of your concern here are, in fact, required?

9 A Yes.

10 Q Okay. If we go down to paragraph 2 -- C-2 in this document,  
11 could you briefly summarize the nature of the concern that  
12 you had identified here?

13 A This was -- I was -- I think there's -- this comment kind of  
14 went away, because there was a little confusion as to what  
15 was background baseline and what -- who was referring -- a  
16 little bit of a terminology misunderstanding. They  
17 responded kind of clarifying which was which, and that  
18 essentially resolved the comment.

19 Q Okay. And we'll get to the response shortly. But as of  
20 today, do you have any continuing concern on this point?

21 A No.

22 Q Can we go to item number 3? This talks about compliance  
23 monitoring wells. Could you summarize the nature of your  
24 initial comment on this subject?

25 A Just the wells proposed, I didn't -- I just didn't feel

1           there were enough. I wanted some nested -- I believe there  
2           were some nested wells. And I just simply wanted more wells  
3           for compliance points than what they had proposed.

4       Q     And these would be -- when you talk about compliance wells,  
5           would these be wells -- well water wells that were intended  
6           to observe what the actual impact of the discharge would be  
7           on groundwater in the vicinity?

8       A     I believe some of them were compliance to monitor the  
9           discharge or downgradient. There was also a couple of side  
10          gradient and I believe I believe an upgradient also or some  
11          mix of the two. They had proposed a certain number. And I  
12          added to that number. I can't remember exactly whether it  
13          was -- how many were down and how many were side gradient.  
14          I just wanted additional wells.

15      Q     Okay. But is it your testimony, sir, that ultimately the  
16          company in its response agreed to install -- or it is, in  
17          fact, required to install some additional monitoring wells  
18          to address this concern?

19      A     Yes. They agreed to install the additional wells.

20      Q     So as you sit here today, has this issue been resolved to  
21          your satisfaction?

22      A     Yes, it has.

23      Q     Let's turn now to comment 4 which refers to the MODFLOW  
24          model presented in the supplemental hydrogeologic study for  
25          the groundwater discharge needs additional documentation.

1           Could you briefly describe or explain the substance of this  
2           comment?

3       A     Well, with most groundwater models, you end up getting a  
4           output file that shows something.  But in order to be sure  
5           that what you're getting in output was actually created with  
6           good data, you need to have it well documented.  You need to  
7           say what you put out for input parameters, how many --  
8           there's quite a bit of information you need to be able to  
9           verify that the output is, in fact -- accurately reflects  
10          site conditions and that the model is ran correctly.  And  
11          the documentation was just very skimpy.  So I wanted more  
12          information.  But instead of going point by point of  
13          everything I wanted, I referred them to the MDEQ guidance --  
14          or model documentation report guidelines.  And that kind of  
15          spells out as far as how to document a model and input  
16          parameters.  And I figured that would be a little quicker.  
17          If they referenced, it would --

18       Q     Okay.  And I think you've already touched on this.  But to  
19           your knowledge, did Kennecott or its consultants respond to  
20           this March 22nd letter that is the issues we've just talked  
21           about in Section C, 1 through 4?

22       A     Yes.

23                       MR. REICHEL:  Could we go to Respondent's Exhibit  
24           160, please?  Again, I believe this is already in evidence.  
25           It's dated April 7, 2007, addressed to Jeanette Bailey from

1 Kennecott Eagle Minerals.

2 Q Mr. Chatterson, do you recall receiving either this or some  
3 attachments to this document?

4 A Yes, I do.

5 Q Do you see on this page, sir, there's a restatement of your  
6 comment C-1 and then there's a response to C-1? Do you see  
7 that?

8 A Yes.

9 Q And it continues on to the next page. Now, you've already  
10 talked about this. And if I understand your prior  
11 testimony, you indicated that the company provided some  
12 additional explanation of the existing characterization but  
13 that ultimately this issue was resolved from your standpoint  
14 by a requirement that additional wells be installed; is that  
15 correct?

16 A Yes. They provided some, I guess, helpful discussion on  
17 detailing -- further detailing the hydrogeology. But beyond  
18 that, I felt it was necessary to go a little further and  
19 have a well installed in each of those areas just to add  
20 additional data.

21 Q Okay. And again you talked about this. I believe you  
22 indicated earlier that there may have been some  
23 miscommunication with respect to the terms "baseline" versus  
24 "background"? Is that --

25 A Yeah. And I wasn't really sure what -- there was a little

1 bit of confusion there. But it was cleared up.

2 Q Okay. Moving on to C-3, do you see the response to that?

3 A Yes.

4 Q And what did that indicate in terms of what Kennecott  
5 proposed to do to address the concerns -- or the comments  
6 that you had provided?

7 A That addressed my comment. And I believe I may have even  
8 been in communication with Kennecott, and that was my  
9 requested wells.

10 Q Okay. Again this refers to three additional compliance  
11 monitoring wells to the north and south side of the  
12 infiltration system as requested. Does it also say, "KEMC  
13 will also add two additional wells downgradient of the  
14 infiltration system"? Is that correct?

15 A Yes. And like I say, I think it says "requested" because I  
16 in between spoke with them and actually told them what I  
17 wanted.

18 Q And they agreed to do so?

19 A Yes.

20 Q Comment C-4 indicates, does it not, that a further response  
21 will be provided separately by April 27, 2006? Do you see  
22 that?

23 A Yes.

24 Q And, in fact, did the company provide a further response?

25 A Yes, they did.

1                   MR. REICHEL: Can we please go to Exhibit 164?

2     Q     And again have you seen this document and the attachments to  
3           it? Do you see that?

4     A     Yes.

5     Q     There's a reference to C-4.

6                   MR. EGGAN: Do you have a date on that document?

7                   MR. REICHEL: I'm sorry. Just one moment. I  
8           believe that is dated April 27th, 2006.

9                   MR. EGGAN: So it doesn't appear that the letter  
10          itself is actually -- there's no date on the letter.

11                  MR. REICHEL: I'm just going by the date stamp,  
12          Counsel.

13                  MR. EGGAN: Whenever he received -- okay.

14                  MR. REICHEL: Yeah.

15                  MR. EGGAN: All right. We can agree that there's  
16          apparently no date on this letter?

17                  MR. REICHEL: Not that I can see, Counsel.

18                  MR. EGGAN: Okay. All right. Thanks.

19                  MR. REICHEL: Other than the date received.

20                  MR. EGGAN: Yeah.

21     Q     In any event, Mr. Chatterson, did you -- were you a CC on  
22          this?

23     A     Yes, I was.

24     Q     And did you receive this document and the attachments to it?  
25          Is that correct?

1 A Yes, I did.

2 Q And did one of the attachments address -- did it discuss the  
3 comments you had made with respect to the, I guess, item  
4 C-4, the MODFLOW model?

5 A Yes.

6 Q And from your standpoint, did that initial response from the  
7 company resolve the questions that you had raised to your  
8 satisfaction?

9 A No, they did not.

10 Q Did you subsequently have further communications with  
11 Kennecott or its consultants on the subject of the issue of  
12 -- strike that. Did you prepare a document that addressed  
13 your review of the information provided in this document as  
14 it related to the MODFLOW model?

15 A Yes. I wrote a memo to Ms. Jeanette Bailey, I believe, on  
16 May 10th.

17 MR. REICHEL: Okay. Can we please go to  
18 Respondent's Exhibit 166?

19 Q For the record, this is a memo from you to Jeanette Bailey  
20 dated May 10th, 2006. Do you see that?

21 A Yes.

22 Q And is this your response to Kennecott's response to your  
23 initial comments? Is that a fair statement?

24 A Yes. It's my response to their response.

25 Q Okay. Without going through this line by line, I think you

1 touched on this earlier. After you received the information  
2 from Kennecott in late April, did you still have some  
3 unresolved concerns about the information that Kennecott's  
4 consultants had provided?

5 A Yes. And this memo outlines those concerns.

6 Q And again this relates -- just to put this in context, we're  
7 talking here about -- let me get this straight. We're  
8 talking about a model that was prepared, I believe, for  
9 Kennecott by Golder Associates; correct?

10 A Yes.

11 Q And it had to do with mounding that may be caused -- or  
12 would be expected to result from the proposed groundwater  
13 discharge?

14 A Yes. They were essentially doing mounding calculations or a  
15 mounding study, and they were using numeric modeling to do  
16 it.

17 Q Okay. And again as of May 10, you still had unresolved  
18 concerns about some aspects of what the company had said; is  
19 that correct? Or what Golder had said?

20 A Yes.

21 Q Did you after that point have further communications with  
22 Kennecott or its consultants on the subject of this issue of  
23 the modeling effort for the predicting mounding at the site?

24 A No, I don't believe I did. I think between this -- when  
25 this letter was sent and when the next response from them

1           came back, I do not believe I spoke with them.

2           Q     Okay. Did you have a series of communications on this  
3           subject, though; correct? Were there a series of written  
4           documents -- for example, did Kennecott respond to this in  
5           writing, if you recall?

6           A     Yes. I'm sorry. I may have misunderstood you earlier.  
7           That hey responded in writing, but I didn't have any verbal  
8           communication or anything with them other than the response  
9           that came back in writing.

10          Q     Okay. Without going through each stage in the back and  
11          forth that may have occurred here, as of July -- on or about  
12          July 11th of 2006, did you receive a further communication  
13          from Kennecott addressing the issue or issues of the  
14          modeling that was being done here in connection with the  
15          proposed discharge?

16          A     Yes. I believe that was their final submittal which  
17          addressed the remainder of my concerns or was the memo that  
18          finally addressed all of the issues I had brought up in this  
19          memo.

20                   MR. REICHEL: Okay. Could we please go to Exhibit  
21          178? I would note for the record this is a letter from  
22          Kennecott Eagle Minerals Company dated July -- with a typed  
23          date of July 11th, 2006, statement received date July 13th,  
24          2006, addressed to Jeannette Bailey.

25          Q     Do you recognize this document, sir?

1 A Yes, I do.

2 Q Does this appear to be a technical memorandum from Golder  
3 Associates with a date of July 7th, 2006, to Mr. Cherry at  
4 Kennecott?

5 A Yes.

6 Q And what does this -- what was the point or subject of this  
7 technical memorandum as you -- well, first of all, did you  
8 review this document?

9 A Yes. I believe this is the document that contains the -- I  
10 guess, the data that eventually fulfilled my initial  
11 request. It should -- I think -- yeah. It should contain  
12 all of the modeling, the input parameters and whatnot for  
13 the MODFLOW model.

14 Q Okay. So this --

15 A And additional documentation that I had requested.

16 Q And this goes back to the initial comments previously where  
17 you had requested some additional documentation; is that  
18 correct?

19 A Yes. This was the final iteration that I accepted and  
20 approved.

21 Q Okay. And based upon your review of this document, did  
22 you -- did that -- did that or did that not address the  
23 concern that you had originally expressed about the modeling  
24 and the supporting documentation for -- again this relates  
25 to the modeling predicting groundwater mounding?

1 A Yes; yes.

2 Q And did you convey that conclusion to Ms. Bailey?

3 A Yes, I did.

4 Q And do you know what action she took as a result of that or  
5 the department undertook?

6 A At that point, the application was considered  
7 administratively complete.

8 MR. REICHEL: Could we go please to DEQ 179? And  
9 I believe this is already in evidence, but I would note for  
10 the record this is an August 8, 2006, letter from DEQ to Mr.  
11 Cherry noting documents received from Kennecott through July  
12 11th, 2006.

13 Q Is this the document that you referred to a moment ago?

14 A Yes.

15 Q Okay. At this point, did you believe that you had  
16 sufficient information to complete your technical review of  
17 the hydrogeologic aspects of the proposed groundwater  
18 discharge permit application?

19 A Yes.

20 Q And did you then proceed with that or continue with that  
21 review?

22 A Yes.

23 Q And in doing this review, to what extent, if any, were you  
24 taking into consideration the information provided by the  
25 applicant in relation to what you understood to be the

1 requirements of the Part 22 Rules? Is that something you  
2 were looking at? Let me restate the question.

3 A Yeah.

4 Q In proceeding with your review of the information provided,  
5 did you look at it and compare it -- look at it in light of  
6 what you understood to be the requirements of the Part 22  
7 Rules?

8 A Yes.

9 Q And did you -- is there a -- as it standard practice in the  
10 permit section, if you know, is there a kind of document or  
11 form that you or other staff involved in the project  
12 typically put together as a part of your review?

13 A Yes. There's a hydrogeologic sort of summary type form  
14 that's kind of a standard fill-out that the geologist would  
15 then submit to the permit writer, who would then use that  
16 form to, I guess, move forward with processing a permit.

17 Q And do you recall whether or not you put together such a  
18 summary document on this type of form in connection with  
19 this permit?

20 A Yes, I did.

21 Q Can we please have Respondent's Exhibit 198? Now, could you  
22 identify what this is, sir?

23 A That is my hydrogeologic summary report for new permits.

24 Q Again is this essentially a template where you're asked to  
25 fill in certain boxes and supply some information?

1 A Yeah. It's sort of a -- yeah. It's sort of a canned form  
2 or a template that you just kind of -- yeah, fill in the  
3 boxes and it kind of walks you through it, so to speak.

4 Q Okay. And so under the heading -- there's geologist. Are  
5 those your initials above your typed name, there?

6 A That's actually my signature.

7 Q Signature. I'm sorry. And then underneath the geologist,  
8 there's a heading "soil scientist," Bob Deatruck?

9 A Yes.

10 Q What is that part of the form about, and who is Mr.  
11 Deatruck, if you know?

12 A Mr. Deatruck is a soil scientist, and he reviewed the  
13 discharge management plan.

14 Q And I believe Mr. Janiczek has already testified about that.  
15 But could you briefly describe what the discharge management  
16 plan has to do with and how it is distinct from your review?

17 A Well, I'm not a soil scientist, so I don't know how well I  
18 can characterize what Bob does. But I guess to generalize I  
19 would say that he basically looks at -- typically a soil  
20 scientist looks at nutrient uptake of crops, different  
21 periods for maybe spray irrigation if it's spray irrigation  
22 or if you're dosing beds, you know, underground ribs,  
23 whether you do one every four hours or two of them every  
24 twelve hours, things of that nature.

25 Q As opposed to the basic hydrogeological review?

1 A Right. I deal with the water more once it's kind of in the  
2 ground and flowing, you know, the mounding and where it goes  
3 from there. So in this situation, since it's rapid  
4 infiltration basins and there's no, I guess -- they're not  
5 allowing for any treatment within the soil, Bob's job was  
6 somewhat minimized by the design of the system, so to speak.

7 Q Okay. And there's a summary date. Do you see that?  
8 January 19th, 2007?

9 A Yes.

10 Q Does that indicate that this document was put together at or  
11 around that time?

12 A Yes.

13 Q And over on the right there is another signature. Do you  
14 recognize that?

15 A Yes.

16 Q And whose is that?

17 A That's Jim Janiczek's, the unit chief's.

18 Q Okay. And again -- if you know, as a part of the usual  
19 review process in the permit section, is this sort of  
20 approach standard; that is, completion of the form and then  
21 review and approval?

22 A Yes. Jim -- or Mr. Janiczek gives final review on all  
23 hydrogeos. So he would have looked it over on a rough draft  
24 of mine, potentially back comments or maybe commented on  
25 something or other, and I would have addressed that,

1 submitted it. And when he felt was approvable or the way he  
2 wanted, he would have signed off on it.

3 Q Again I'm not going to -- let's just scroll down here.  
4 There are references to various rules. And you were --  
5 first of all, were you primarily responsible for completing  
6 this form?

7 A What's that?

8 Q Were you primarily responsible for completing this form?

9 A Yes.

10 Q Okay. And so when boxes are checked "yes" or "no," that  
11 reflects your review or summary of your review; is that  
12 correct?

13 A Yes.

14 Q In this section under "site investigation," is this intended  
15 to be a detailed description of the subsurface condition or  
16 something else?

17 A No. This form is usually -- quite often when we have -- I  
18 think a smaller discharger like a food processor or  
19 something where there's very minimal geologic data, this  
20 form typically summarizes that sort of scant data and does  
21 sort of coherent fashion for the permit writer. In this  
22 case, a lot of sort of the canned questions it was asking  
23 were, you know, somewhat difficult to put in just because of  
24 the complexity of the site. For example, there's questions  
25 of how many aquifers are present at the site. Well,

1 typically that's one or sometimes you may get two at the  
2 food processor site. However in this case, you would have  
3 to really know where on site you're referring to, because  
4 some places on site there's one, other places there's two,  
5 other places there's many more. So the sort of  
6 fill-in-the-blanks type form doesn't work real well with  
7 this site, but I did the best I could.

8 Q Okay. And again this Section 3, aquifer information, you  
9 say a number of aquifers affected by discharge 2-plus.  
10 Could you elaborate on that or what are you trying to  
11 capture here?

12 A Well, you know, by definition an aquifer is, you know, I  
13 guess, an area where you would have -- you know,  
14 economically usable quantity of water. And in certain  
15 areas, for example, to the -- I guess just in the area of  
16 the TWIS or northeast of the TWIS, it's pretty continuous  
17 from top to bottom. And you could characterize it as maybe  
18 as few as one aquifer. Other areas of the site there's  
19 clearly two aquifers. And in even other areas of the site  
20 we have a sandy -- what they call a B zone or a C --  
21 different zones where you could probably identify as many as  
22 three or four or more aquifers. So --

23 Q So in other words, it may vary across the site?

24 A Yeah. I put 2-plus here because it's probably only two.  
25 Where the TWIS is there's -- just in that immediate area,

1           there's two aquifers just adjacent to it. The areas that  
2           have maybe three or four that you might consider more would  
3           be kind of to the southwest. And we're not anticipating  
4           that they're going to be impacted by the TWIS. The TWIS is  
5           pretty much going to the northeast primarily impacting one  
6           aquifer. But, you know, there will be a certain amount of  
7           mounding. And there is some, you know, thin deposits there.  
8           So I kind of put two-plus for lack of -- you know, it's kind  
9           of difficult to --

10        Q     Go ahead.

11        A     It's kind of difficult to fill out a form like this that  
12           wants -- with a site as complex as this, it really wants  
13           kind of a one-word answer and a brief description. So I  
14           kind of did a lot of approximation stuff like that in this.

15        Q     All right. Just to get a sense of the other types of things  
16           that you were asked to provide, again are these -- strike  
17           that. Let's keep going, please. Under "groundwater flow  
18           direction," what's the indication there?

19        A     Primarily northeast.

20        Q     Okay. And you've talked about that before; is that correct?

21        A     Yes. Once again once they discharge, you'll have a certain  
22           amount of radial flow. So you'll have slight deviations  
23           from that, but primarily northeast.

24        Q     Okay. There's a section under "mounding."

25        A     Yes.

1 Q Again you completed this part of the form?

2 A Yes.

3 Q Okay. And talk a little bit for Judge Patterson again about  
4 how, as part of your review of the permit application, you  
5 went about this issue of the mounding analysis and the issue  
6 whether or not the discharge as proposed would adversely  
7 affect the surface.

8 A Yes. Immediately below the TWIS there's approximately 100  
9 feet of unsaturated thickness. Now, there's various methods  
10 used to calculate the mound. One was analytical. Then  
11 there's the numerical model that they used.

12 Q "They" being Kennecott?

13 A Kennecott. I'm sorry. And they range everything -- I think  
14 one estimate on the analytical maybe was as high as 33 feet.  
15 And I think it was roughly 28 or so with the numerical  
16 model. So -- and there's different runs, too, with  
17 different sensitivity analysis. So there's a wide range of  
18 values. But I would say it seemed like sort of on the high  
19 end 30 feet was looking to get -- and I put down an  
20 approximation, because there's many different methods to  
21 calculate, and it all came up with different numbers. So --  
22 but we know it's going to be in that ballpark.

23 Q And again in doing your evaluation, you were -- you  
24 testified you were provided some modeling information  
25 submitted by Kennecott's consultants; correct?

1 A Yes.

2 Q And were you also -- I think you touched on this. Were you  
3 also -- did you request and receive some of the model code  
4 itself? Is that --

5 A Yes. They actually submitted -- I requested the digital  
6 model code, and they sent it in to me, so I had that.

7 Q And what, if anything, did you do with that?

8 A I actually -- I went through the code, verified that the  
9 input parameters, made sure it was constructed adequately.  
10 And I also -- one of my concerns I had initially was that  
11 they didn't calculate infiltration from recharge with their  
12 initial mounding estimates. And I added things like  
13 recharge. And I ran the model myself to see what that would  
14 do and what numbers I got when I ran the model.

15 Q Explain what you mean by "infiltration from recharge." What  
16 are you talking about?

17 A Recharge from precipitation. I'm sorry. They had ran the  
18 model with infiltration from the TWIS but not from rain or  
19 snow, which I felt was a necessary component, because it  
20 rains and snows up there.

21 Q So to summarize, then, it would be fair to say you looked at  
22 the information they provided including model runs submitted  
23 by the permit applicant; is that correct?

24 A Yes.

25 Q And you also looked at the model code and verified some

1 input parameters that they --

2 MR. EGGAN: Your Honor, this is -- this is  
3 leading.

4 MR. REICHEL: I'm sorry. Okay.

5 A Yes.

6 Q Let me -- could you summarize then what you did with the  
7 model?

8 A Yes. I got the model. I looked at the code. I basically  
9 looked at how the model was built. I ran the model as it  
10 was. I slightly altered the model for some -- typically I  
11 was throwing in some sort of worst case scenario type  
12 parameters, added the infiltration and just to kind of see  
13 what a worst case scenario would be.

14 Q And having done all that, what conclusion did you reach, if  
15 any, about whether or not the discharge as proposed would  
16 comply with the requirements of the Part 22 Rules as they  
17 relate to this issue of mounding?

18 A I concluded that, even under the worst-case scenario, the  
19 water was still a considerable distance away from the  
20 surface and that there would be no violation of the rules  
21 from this discharge.

22 Q Okay. The next section there's background groundwater  
23 quality. Let's stop here. It says, "Has the applicant  
24 established background groundwater quality in compliance  
25 with Rule 2221(4)(d)?" And you have checked "yes."

1 A Yes.

2 Q Was that and is that today your opinion, sir; that is, that  
3 the applicant established the background groundwater quality  
4 in compliance with the rule?

5 A Yes, and they are -- they do have wells that they will  
6 continue to take that data, so that's -- there is a process  
7 there where they're continuing to take data.

8 Q And then under "Domestic Water Supply," number of  
9 downgradient water supply wells within," and there is  
10 specified distances. Do you see that?

11 A Yes.

12 Q 500 feet, 1,000 and 2,000 feet?

13 A Yes.

14 Q Again, is this a standard sort of checklist that you follow?

15 A Yeah, it's kind of a checklist. And there are no wells  
16 there, but the aquifer -- and I took a broad sort of  
17 interpretation here, is the alluvial glacial aquifer in that  
18 area and put "yes," that it -- because there are wells in  
19 that area. Now, whether or not they would be directly  
20 impacted by the TWIS, that's one of those areas where I  
21 guess it's kind of a qualified "yes," because, you know, it  
22 may not be, but that sort of aquifer is a whole aquifer.  
23 There are wells that -- at some distance away that are using  
24 it.

25 Q And in doing your review of this, did you consider the issue

1 of whether or not the discharge as proposed would present a  
2 risk of unacceptable exposure to potential users of the  
3 aquifer?

4 A Yeah. It -- my determination is it would not for two  
5 reasons. One, it meets groundwater quality standards, so  
6 the water is essentially drinkable. And number two, there's  
7 no receptors anywhere between the TWIS and the discharge to  
8 the surface water. So not only aren't there any receptors,  
9 but it would meet groundwater standards if there were so,  
10 therefore, it would meet the rule.

11 Q Turning to the next section, "Surface Water Venting," could  
12 you describe -- well, you've touched on this subject  
13 already. I mean, could you summarize your understanding  
14 from a hydrogeologic perspective as to whether or not  
15 surface water venting would be expected to occur and where  
16 it would be expected to occur? I'm not necessarily asking  
17 you to --

18 A Could you rephrase that?

19 Q I'm sorry. I'm not necessarily asking you to limit to this  
20 forum, sir, I mean, just on this issue of surface water  
21 venting.

22 A Okay.

23 Q Having participated in the review of this permit  
24 application, looked at the data, what conclusion, if any,  
25 did you reach with regard to whether groundwater -- excuse

1 me -- whether water discharge through the TWIS would or  
2 would not vent to surface water and, if so, in what  
3 direction?

4 A We determined it would vent to surface water, and to -- and  
5 that would be to the northeast of the TWIS.

6 Q And you've testified about this previously. Is this -- are  
7 these the seeps or -- is that the term you used before?

8 A Yes, they're -- typically they've been referred to as seeps.  
9 They're part of the eastern tributary of the Salmon Trout  
10 River, and they've kind of been referred to either as the  
11 eastern tributaries or the seeps to the northeast.

12 Q And based upon your review of the available hydrogeologic  
13 information at the site, do you have some understanding  
14 of -- as to whether there's a -- any change in, for lack of  
15 a better term, topography as you proceed northeast from the  
16 proposed discharge site towards the tributaries of the east  
17 branch of the Salmon Trout River?

18 A Yes. Where the seeps or the tributaries come out, it sort  
19 of goes from a flat plane, and then there's sort of a  
20 steep -- sort of a steep bank that kind of goes down, and  
21 it's sort of been cut back by these seeps or these channels,  
22 and it's -- and that's where the seeps kind of come out of  
23 the hillside somewhere -- you know, quite often about --  
24 well, from what I've seen, about halfway up. They seem to  
25 just sort of come out kind of, like, in various, you know,

1 areas. There's a lot -- sometimes it's just soggy ground.  
2 Other times there actually seems to be a significant amount  
3 of visible flow coming out.

4 Q Just following up on that last point, sir, in addition to  
5 looking at hydrogeologic information at the site, have you  
6 actually visited the site?

7 A Yes, I have.

8 Q And have you had occasion to observe the areas where these  
9 seeps, as you've just described them, occur?

10 A Yes.

11 Q Do you recall approximately -- would you have done that  
12 before the permit application -- excuse me. Would you have  
13 done that before you made a recommendation with respect to  
14 the issuance of the permit?

15 A Yes.

16 Q Would that have been in 2006, if you recall? I don't need  
17 an exact date.

18 A Boy, my years kind of get fuzzy. I'm not sure. That sounds  
19 about right, though.

20 Q Okay. And so just to -- when you visited the site, what  
21 areas of the site did you look at?

22 A I looked at the -- where the surface facilities would be. I  
23 looked at the area where the TWIS was proposed. Although it  
24 was somewhat rough, we proposed at that time. I looked at  
25 Eagle Rock. I observed the Salmon Trout where it crosses --

1 where Triple A Road goes over the Salmon Trout. And I  
2 walked to the northeast of the proposed TWIS area into the  
3 area where the seeps occur and went down and seen numerous  
4 seeps and, you know, observed the surface water in that  
5 area.

6 Q And in doing that were accompanied by any other DEQ staff,  
7 if you recall?

8 A Kristen Mariuzza was there, and she was the only other DEQ  
9 staff.

10 Q And looking back at this exhibit, sir, 198 and this surface  
11 water venting, there's a box -- there's a line that says,  
12 "Refer to surface water quality division" and a check. What  
13 is that about?

14 A Early on when it was determined that Kennecott would be  
15 required to meet surface water standards, the procedure for  
16 doing that is to put in a request to Surface Water Division  
17 for an evaluation, so to speak, as to what limits would be  
18 acceptable at that surface water body.

19 Q Okay. So this is in a situation such as this, where it's  
20 anticipated there may be venting, it would be standard  
21 protocol to confer with other water bureau staff who deal  
22 with surface water issues; is that --

23 A Yes. It would be the surface water section's decision or  
24 it'd be their responsibility to determine what those -- what  
25 surface water standards would be protective of the surface

1 water body in question.

2 Q And in this case, did you participate in consultations with  
3 staff whose job it is to work on protecting surface water  
4 quality?

5 A Briefly. I sent the original memo requesting, I think, that  
6 staff be assigned with some preliminary information. And  
7 then, further along in the process, we followed it up. Once  
8 staff was assigned, then I think I sent a second memo to  
9 that staff with more detailed information, and so I guess I  
10 was -- I was involved in that I relayed information to  
11 surface water staff, although I was not involved in any  
12 calculations or anything like that.

13 MR. REICHEL: Could we have -- please have  
14 Respondent's Exhibit 167? Okay.

15 Q Okay. I would note for the record that this is an  
16 interoffice communication with the date May 11th, 2006, from  
17 you. It's addressed to Brenda Sayles. do you see that?

18 A Yes.

19 Q What is this document in relation to what we were just  
20 talking about?

21 A That's a document where I sent it over. I just -- I kind of  
22 filled out the basic form, and it was kind of a preliminary  
23 one to get somebody on board. And as you can see, I sent it  
24 to the wrong person. I was -- should have sent it to, I  
25 believe, Jerry Saalfeld so --

1 Q In any event, it went --

2 A Yeah.

3 Q The surface water assessment section, is that -- if you now  
4 know, is that the staff who are assigned to provide reviews  
5 on this kind of issue?

6 A Yes, that's what they do.

7 Q And a moment ago you said something about a form.

8 MR. REICHEL: Could we scroll down in this  
9 document, please? Okay. just hold it there.

10 Q There are a series of typed lines beneath the introductory  
11 paragraph. Again, if you know, sir, is this sort of a  
12 standard fill-in-the-blank kind of form that you've used  
13 within your office?

14 A Yes. It's kind of been developed for consistency, so  
15 it's -- I kind of had to fill it in to send over there to  
16 get someone on board.

17 Q And again, the purpose of this was asking them to assign  
18 someone to evaluate the conditions that the proposed  
19 discharge would protect surface water; is that --

20 A Yes.

21 Q And as a part of that, you're typically asked to provide  
22 some preliminary information; is that right?

23 A Yes.

24 Q Is that what you attempted to do here?

25 A Yes.

1                   MR. REICHEL: Will you scroll down, please?

2       Q       Just so the record is clear, I note on the right-hand column  
3           there's some handwritten notes. Those aren't yours, are  
4           they?

5       A       No.

6                   MR. REICHEL: Keep going down.

7       Q       Okay. And again, this is -- this asked for estimates of --  
8           among other things, of flow. Do you see that?

9       A       Yes.

10      Q       Again, did you intend -- was this intended to be some  
11           definitive estimate of the anticipated flow of water that  
12           was involved here?

13      A       No. This was a bit of a iterative process, because the way  
14           this is usually done is usually we determine Q, which they  
15           ask what the flow is into the stream, and we determine  
16           roughly what the cross-sectional area is that's accepting  
17           the flow. We add the hydraulic gradient and the hydraulic  
18           conductivity, and we come up with an estimation of flow,  
19           which is what I tried to roughly do based on some of the  
20           modeling work and particle tracking. But that gives you a  
21           very different number than what we know is the discharge.  
22           And then with the discharge there are some questions as to,  
23           is it design of the capacity of the TWIS, which is 400  
24           gallons per minute, or was it the anticipated flow of the  
25           treatment system, or do you use the maximum permit limit

1 of -- initially I estimated the KIA, which was one thing,  
2 and then the Q was -- I believe that early number was maybe  
3 the -- what we thought might be the estimated out of the  
4 TWIS. As it turns out, as through several iterations, I  
5 believe our final number is we just -- to be conservative,  
6 we just took what the permit limit was the maximum and  
7 assumed that 100 percent of that water was going to the  
8 tributary, is what we ended up doing. We figured that would  
9 be more conservative because, when you take a KIA estimate,  
10 which is what's typically done, it can give you sort of a  
11 wildly variable number, and a lot of times it's much lower.

12 Q Okay. Again, is this what's in this May 11th document? Is  
13 this preliminary or final in terms of what the input that  
14 you were giving the --

15 A This is somewhat -- it's preliminary. It was to get someone  
16 assigned, and then we would work with them on what would be  
17 the most appropriate values to use and with discussions  
18 with -- our internal discussions.

19 Q And to your knowledge, was a staff person or people in the  
20 surface water assessment section ultimately assigned to  
21 provide some input to the groundwater permitting folks?

22 A Yes, someone was assigned after I sent this memo out.

23 Q And do you recall who that was?

24 A Sarah Wolf at the time. I believe Sarah LeSage now. She's  
25 since been married.

1 Q Before we leave this form, there's a line there about  
2 "hardness of receiving waters." Do you see that?  
3 A Yes.  
4 Q And there's a value stated there of 50 milligrams per liter?  
5 A Yes.  
6 Q Do you have any understanding why the surface water staff  
7 would want information about hardness?  
8 A They use hardness to calculate their water quality  
9 standards. A lot of the compounds are hardness specific, so  
10 that was one of the parameters they requested. And at this  
11 time most of these were kind of estimates, although I  
12 believe 50 stayed. We got supporting data. At the time it  
13 seemed like the most logical, and I believe that number  
14 stayed.  
15 Q But if you recall, was there some -- after this initial  
16 memo, was there some further discussion, among other things,  
17 of the issue of hardness and what value should be used?  
18 A Yes.  
19 MR. REICHEL: Your Honor, this may be a logical  
20 place to take a short break, if that's okay.  
21 JUDGE PATTERSON: Okay.  
22 (Off the record)  
23 Q Mr. Chatterson, before we took our break, I've been talking  
24 to you about communications that you had had with other DEQ  
25 staff relating to the issue of potential impact of

1 groundwater discharge on surface water. Do you recall that?

2 A Yes.

3 Q Again, looking at this time period in 2006 and specifically  
4 after the DEQ determined the application was  
5 administratively complete, do you recall whether or not  
6 there was any further discussion or any discussions between  
7 representatives of the DEQ and representatives of Kennecott  
8 on the subject of potential impacts of the proposed  
9 discharge on surface water? Do you recall that?

10 A Yes, there were some discussions.

11 Q And did you participate in any of those discussions?

12 A Yes.

13 Q Do you recall whether, as a follow-up to any of those  
14 discussions, Kennecott provided some additional information  
15 to the DEQ in which Kennecott and its consultants analyzed  
16 or offered comments on the issue of potential impact of the  
17 discharge on surface water quality?

18 A Yes.

19 MR. REICHEL: Could we please have Respondent's  
20 Exhibit 180? I note for the record that this is letter  
21 dated September 15th, 2006, from Kennecott addressed to  
22 William Creal of the DEQ. And could you scroll down a bit  
23 to the third line?

24 Q There's a statement on August 25th, 2006:

25 "KEMC and our consultants discussed your ongoing

1 evaluation of the surface water quality standards that  
2 the DEQ believes are applicable to the Eagle Project's  
3 proposed groundwater discharge."

4 Mr. Chatterson, if you recall, first, did such a meeting  
5 occur on or around that time?

6 A Yes.

7 Q And do you recall whether or not you were one of the  
8 participants in that?

9 A You know, I was --

10 Q Do you know, sir?

11 A I can't recall for sure if I was at that meeting. I was at  
12 several meetings around that time frame.

13 Q Fair enough.

14 A My memory's just not that good.

15 Q Understood. Let me ask you this: Have you ever seen this  
16 letter before?

17 A Yes.

18 Q And it references some attached documents.

19 MR. REICHEL: Could you scroll down, please?

20 Okay. We can just stop there.

21 Q There's a memorandum dated September 15th, 2006, from Foth &  
22 Van Dyke to Jon Cherry at Kennecott Eagle Minerals Company.  
23 Do you see that?

24 A Yes.

25 Q Do you recall ever seeing a copy of this memorandum or

1 reviewing its contents?

2 A Yeah, I believe I know which one this is.

3 MR. REICHEL: Can you scroll down further just so  
4 you can --

5 Q There's a discussion, for example, of hardness of the water  
6 at the venting point. Do you see that?

7 A Yes, I do recall that.

8 Q I don't necessarily propose to go through this document in  
9 detail but just to sort of establish some context here. Do  
10 you recall whether or not, after this document was received  
11 by the DEQ, you and other DEQ staff had further discussions  
12 relating to the issue of potential impact of the proposed  
13 discharge on surface water?

14 A Yes. As I recall, I think hardness was -- a hardness value  
15 was something surface water wanted from us, and we were  
16 having internal discussions and had requested additional  
17 data of Kennecott in regards to what the hardness of the  
18 receiving surface water body would be.

19 Q And if you recall, in this letter did Kennecott offer its  
20 view as to what an appropriate hardness value would be for  
21 purposes of this analysis?

22 A I believe that there's some supporting documentation with  
23 this letter that suggested that 50 -- someone had done some  
24 calculations, and I believe it was 50 would be appropriate.

25 Q Again, leaving aside what Kennecott proposed, do you recall

1           whether or not you and other DEQ staff internally discussed  
2           or visited this issue of hardness and the issue of what  
3           would be an appropriate value with respect to hardness to  
4           use or for surface water staff to use as part of their  
5           analysis?

6       A     We had had some internal discussions and came up with 50,  
7           which is why -- which was on sort of that preliminary  
8           request to surface water. We had already put 50, although  
9           we weren't sure if that number was going to stay. That is  
10          what internally we initially thought would -- was what we  
11          thought would be appropriate.

12       Q     And in looking at that issue, again, if you recall, do you  
13          recall other DEQ staff members who were involved in this  
14          discussion?

15       A     It would have been, I think, primarily myself, Jim Janiczek  
16          and Bill Creal.

17       Q     And again -- go ahead.

18       A     I believe it would be the most with probably to a greater  
19          extent, Bill Creal having more experience than that and to a  
20          lesser extent Jim Janiczek and even to a lesser extent me as  
21          far as probably making that decision.

22       Q     Okay. In any event, in the course of your discussions  
23          internally on this subject, did you and your colleagues or  
24          other DEQ staff look at the issue of whether or not -- well,  
25          let me back up here. If you know, sir, did the permit

1 application materials provided by Kennecott indicate or  
2 some -- approximately the -- I don't need an exact number  
3 but approximately the hardness of the water that was  
4 expected to be discharged from their treated water  
5 infiltration system?

6 A The hardness of the water expected had a very low hardness.  
7 What they expect to discharge has -- I forget the number,  
8 but it's very low.

9 Q And did you and other DEQ staff in looking at these issues  
10 consider at all -- well, strike that. As you understand the  
11 discharge that's proposed here and authorized by the permit,  
12 the water that would be discharged through the TWIS into the  
13 groundwater would then -- would -- I think you testified,  
14 would migrate underground towards these seeps or tributaries  
15 of the east branch of the Salmon Trout River; is that  
16 correct?

17 A Yes.

18 Q And in your internal discussions of this, did you give any  
19 consideration to what, if any, impact the movement of that  
20 treated water through the ground between the point where  
21 it's discharged and where -- to the groundwater and where it  
22 ultimately is expected to vent to the surface water -- did  
23 you give any consideration to what processes might occur  
24 that could affect or might potentially affect hardness?

25 A Yes. When you discharge a -- water to the system such as

1 would be at the TWIS, that's very low in hardness and has a  
2 very low degree of mineralization. As it moves through the  
3 aquifer, especially a distance as great as we have here, it  
4 becomes mineralized. It essentially picks up minerals from  
5 the soils in the soil particles within the aquifer -- the  
6 sediments within the aquifer. Eventually it'll reach some  
7 sort of equilibrium. It won't continuously get harder and  
8 harder. It usually reaches a point and then -- well, it  
9 would discharge after picking up, you know, so much -- so  
10 many minerals. We felt that currently the water moving  
11 through that section of aquifer is -- quite a lot of it --  
12 the majority is derived as rainwater, which enters the  
13 subsurface with a very low hardness also. And we felt that  
14 the discharge from the TWIS would behave similarly to the  
15 rainwater, which currently has about a hardness of 50 at the  
16 discharge. So we felt that would be a reasonable  
17 approximation. And I believe we estimated the 50 -- came up  
18 with that logic before the supporting documentation from  
19 Kennecott, which came up with a number of, I think, 50 also.  
20 So between the two it seemed like we were pretty close, and  
21 we went with 50.

22 Q And again, it's your understanding that -- was that an  
23 internal DEQ decision, or was it based solely on Kennecott's  
24 recommendation?

25 A It was initially DEQ, because my memo came out much before

1 this, where we were kind of looking at 50 to begin with.

2 The -- Kennecott had someone do an analysis and came up with

3 50 too, which supported our belief that 50 was appropriate.

4 And we've seen no data to indicate any other number was more

5 appropriate, so we ended up sticking with the 50.

6 Q And in that regard, did you follow up your initial memo to  
7 the surface water staff that we've already talked about,  
8 which went back to May, with a subsequent memo of a parallel  
9 nature, where you essentially updated your request for  
10 review or input from surface water staff on developing  
11 effluent limitations?

12 A Yes. As more data became available, certain data was  
13 updated and sent in. And I sent a second memo. This time  
14 it was directly to Sara Wolf, who at that time had been  
15 assigned to the project, and it had -- some of the data was  
16 updated. Some of the data information such as the hardness  
17 stayed the same, because we felt we would stick with that  
18 number.

19 MR. REICHEL: Could we please have Respondent's  
20 Exhibit 184? Okay. Hold it there, please.

21 Q This has interoffice communication letterhead dated October  
22 11th, 2006, from you to Sara Wolf. Do you recognize this  
23 document, Mr. Chatterson?

24 A Yes.

25 Q Is this the document we were just referring to a moment ago?

1 A Yes.

2 Q Okay. And so again, is this document like the previous one,  
3 essentially trying to put some information into a standard  
4 form?

5 A Yes. It's essentially the exact, same document, only as  
6 sort of the iterative process went on, the data was updated.  
7 Some decisions were made, and that changed the data  
8 slightly, and this was basically the memo giving the  
9 official update of that data.

10 Q To give surface water staff information. They had requested  
11 a complete air analysis; is that --

12 A Yes. I think there was some data that may have been missing  
13 in my first memo, and there was other things we hadn't  
14 decided on; for example, for a Q, what was the appropriate Q  
15 to use? Would it be the maximum -- the design capacity for  
16 the TWIS? Would it be the discharge permit limit, or would  
17 it be what we estimated would be flowing into the seeps  
18 based on cross-sectional area and geologic calculations?

19 Q And this Q is -- basically it's a measurement of flow or  
20 flux -- is that -- or what's the --

21 A Yes, it is. And --

22 MR. REICHEL: Will you scroll down, please?

23 A And it changed a little bit. Coincidentally, I mean, we  
24 were wrestling with some of the Q calculations. A lot of  
25 that stuff -- I think the KIA maybe stayed the same;

1           however, the Q really has no -- we've later found out has no  
2           impact on the surface water standards, so it doesn't matter  
3           what the Q was. But it was a parameter in the form, so we  
4           tried to fill it out to the best of our ability, but it  
5           really isn't taken into account for surface water standards.

6           Q     And you did transmit this document to Ms. LeSage or then Ms.  
7           Wolf; is that correct?

8           A     Yes.

9           Q     Okay. And did you receive or did your unit receive a  
10          response back from her, if you recall?

11          A     Yes. She -- following this memo she then submitted a table  
12          of values.

13          Q     In this part of the document we have up there, there's some  
14          handwriting. You -- is that in your handwriting?

15          A     No, that is not.

16          Q     Okay. There is -- appear to be the following words. It  
17          says, "Will be in permit; should be using" -- can you read  
18          that? Is that "higher" --

19          A     "Higher value in permit application."

20          Q     The reason I'm asking about this is --

21          A     And that's per my request.

22          Q     Okay. Do you recall -- there's a note there 10-17-06. Do  
23          you recall having some discussion with Ms. LeSage on that  
24          subject?

25          A     Yeah. We were still determining if we should be calculating

1 the Q on the maximum the TWIS was designed for. And what we  
2 decided is they can't go over their permit limit, so we will  
3 do a calculation based on not the average but the -- I  
4 believe the maximum Q value in the permit, and we would just  
5 use that. It would be the most conservative. At that time  
6 I guess we were trying to make the form complete, but like I  
7 said, the value was never used so --

8 Q All right.

9 MR. REICHEL: Could we please go to Exhibit 192,  
10 please?

11 Q This is an interoffice communication dated November 6th,  
12 2006, from Ms. Wolf to you. Do you see that?

13 A Yes.

14 Q Do you recall seeing this document previously?

15 A Yes.

16 Q There's a reference here to a October 31st, 2006, meeting.  
17 Again, whether or not you remember that particular date, do  
18 you recall having some internal discussion in the latter  
19 part of October of 2006?

20 A Yes.

21 Q And this makes referencing to a venting groundwater flow  
22 rate of 0.504 million gallons per day. How does that relate  
23 to what you were just talking about a moment ago about  
24 suggesting or agreeing that the analysis -- that the figure  
25 was needed based upon the maximum flow that would be

1 expected to be authorized?

2 A Well, there was a lot of discussions on what would be most  
3 appropriate, you know. Average was felt -- I think that  
4 wasn't conservative enough, because they were allowed to  
5 discharge at the maximum even though, albeit maybe unlikely,  
6 it was still possible. And we felt the design rate of the  
7 TWIS, the 400 gallons per minute, wasn't really appropriate  
8 because it was -- they could never discharge that much  
9 because their permit would limit them to a lower amount. So  
10 it was decided that the most appropriate value to use that  
11 would still be very conservative would be to use the maximum  
12 allowable discharge in the permit for a Q value and also be  
13 conservative in assuming that 100 percent of that water  
14 would discharge at the venting location. So we were looking  
15 kind of to err on the side of, I guess, caution and be very  
16 conservative in both calculations. So we did the maximum  
17 discharge with 100 percent going to the east tributaries.

18 Q And again, this 0.504 million gallons per day, how does  
19 that -- is there an equivalent of that in gallons per  
20 minute?

21 A That would be the 350 gallons per minute, I believe, in the  
22 permit limit.

23 Q Right; right. Mr. Chatterson, in connection with this case,  
24 the Petitioner have contended, among other things, that the  
25 permit application submitted by Kennecott to the department

1 did not satisfy certain requirements of the Part 22  
2 groundwater rules as they relate to hydrogeologic  
3 investigations or characterization. And one of the  
4 contentions is that the permittee failed to provide  
5 information to establish a three-dimensional flow path  
6 within the groundwater that could be affected by the  
7 groundwater discharge. Do you recall seeing such an  
8 allegation?

9 A Yes.

10 Q And do you want with that contention?

11 A No, I don't.

12 Q Could you explain why you disagree?

13 A Well, the three-dimension depiction is somewhat tricky,  
14 because we're dealing with two-dimensional media when they  
15 turn in a report. A piece of paper's a two-dimensional  
16 media. And so it's very hard to get, I guess, what would be  
17 a true three-dimensional depiction unless you had an  
18 aquarium with a wire or something. But the simple contour  
19 maps, I feel if -- do represent a three-dimensional  
20 depiction. They have contour lines that show flow in the X  
21 and Y direction, in the X and Y plane, and each successive  
22 contour is 10 feet less. I believe it goes over a course of  
23 200 feet, which clearly -- if there was one contour line, it  
24 would represent two-dimensional flow, because you would have  
25 a northeast or something one direction. But since you have

1 successive contour lines and each one is at different  
2 elevation, which would be your Z plane, that clearly  
3 represents the third dimension of flow. You can't get water  
4 from 1500 feet here to 1490 and 1480 without indicating on  
5 that two-dimensional piece of paper that it's going  
6 downhill. Now, to get -- to have the same detail in that  
7 vertical flow as the actual numbers in the gradients, you  
8 might -- you know, you could flip the paper on the side and  
9 show it in a slice. But then once again you're dealing with  
10 two-dimensional media and contour lines and maybe the Y-Z  
11 plane, and now you're missing the X. So you have a bit of a  
12 problem if you want a full three-dimensional depiction, but  
13 in my opinion that, you know, it's the best you can get on  
14 two-dimensional media. When you have contour lines, I feel  
15 all three dimensions are covered there. The Z dimension may  
16 not be perfectly because you may not have perfect contour  
17 lines, but you can't get contour lines in the third  
18 dimension on a two-dimensional piece of paper.

19 Q Let me ask you this: You testified that you've worked on  
20 various projects involving groundwater discharges that are  
21 regulated under Part -- the Part 22 rules; correct?

22 A Yes.

23 Q And based upon your familiarity with the rules and the  
24 requirements, do you understand the language in the rule  
25 with respect to three -- dimensional flow path to

1 necessarily require the use of a numeric model to simulate a  
2 3-D flow path?

3 A No. And that's -- I don't believe that was -- is what's  
4 being said there. Because even a three-dimensional  
5 numerical model you still depict the same contours you do on  
6 a map with or without a model. So I think you can easily  
7 depict the same thing without a model as with a model. And  
8 there is a water table shown or elevations from the 3-D  
9 numerical model that showed the same thing. They show a  
10 drop in the water as it moves away, which is clearly the  
11 third dimension. So I think clearly a three-dimensional  
12 depiction of the -- of groundwater flow has been shown both  
13 with the numeric model and otherwise. I think it's just a  
14 certain amount's been lost in the terminology of this true  
15 depiction, because we run into that problem with -- we're  
16 dealing with two-dimensional media, and it's hard to, I  
17 guess, absolutely show that three-dimensional depiction, you  
18 know, short of having a cube with a wire, you know,  
19 representing groundwater flow. That's the only way I see  
20 you could, you know, do it to -- you know, to fully, you  
21 know --

22 Q At any rate, Mr. Chatterson, just so the record is clear, in  
23 your opinion, based upon your understanding of the Part 22  
24 Rules and your review of the permit application submitted to  
25 you, do you believe that the information by the applicant

1 satisfied the requirements of the Part 22 Rules with respect  
2 to characterization of hydrogeologic conditions for purposes  
3 of this permit?

4 A Yes.

5 Q It's also been suggested that the information provided by  
6 Kennecott in support of its permit application was defective  
7 because groundwater contour intervals on figures that they  
8 provided were not in 1-foot contours. Do you recall that  
9 contention?

10 A Yes.

11 Q And do you agree that, under the circumstances presented  
12 here, that the contour intervals used by Kennecott or  
13 appropriate or inappropriate?

14 A I believe they were appropriate.

15 Q Can you explain why?

16 A Well, a typical rule of thumb in hydrogeology is it's also  
17 understood that, if you have a site, your contour interval  
18 should always -- should never exceed 10 percent of the  
19 overall drop in hydraulic head from one part of the site to  
20 the other. In this situation there's about a 200-foot head  
21 drop. If sort of that basic rule was applied, you would  
22 have a contour interval of 20 feet and would give you 10  
23 contour lines. As it is, Kennecott used a 10-foot interval,  
24 which gave 20 contour lines across a map, which is quite a  
25 few. That would be considered appropriate for the site.

1 Had they used a 1-foot contour, from one side of the site to  
2 the other, there would be 200 contour lines. You would not  
3 be able to discern -- almost impossible to discern any  
4 surface features, where the flow was going. It would  
5 essentially be useless. And had Kennecott submitted a  
6 contour map with 1-foot contours, I would have rejected it  
7 or requested they resubmit the map with a more appropriate  
8 contour interval, likely recommending a 10-foot contour.  
9 So, you know, if it had been submitted, it would not have  
10 been usable, and it would have not aided at all in the --  
11 you know, helping characterize the hydrogeology of the site.

12 Q It's also been suggested during the course of  
13 cross-examination of a previous witness, Mr. Wiitala, that  
14 the presence of some clay lenses or clay formations beneath  
15 the -- or in the vicinity of the proposed TWIS are likely to  
16 cause water to perch and possibly be directed to the  
17 surface. Well, first of all, do you -- were you present  
18 during Mr. Wiitala's testimony?

19 A Yeah. I don't believe he testified to that.

20 Q Okay. I'm sorry. Strike that. I'm not -- I wasn't  
21 suggesting that Mr. Wiitala testified to that. Let me --  
22 just let me restate the question. It has been suggested by  
23 Petitioners that the available hydrogeologic information  
24 suggested there may be clay or areas of clay beneath the  
25 location of the TWIS or between there and the existing

1 groundwater table that may cause water from the TWIS to  
2 perch there and possibly break out to the surface or words  
3 to that effect. Do you believe, based upon the information  
4 available to you, that that is a realistic or well --  
5 scientifically well-founded contention?

6 A No. The data available for the site does not indicate that  
7 that would happen.

8 Q And could you explain further what about the data that  
9 you -- leads you to that conclusion?

10 A Well, upon reviewing all the boring logs around the TWIS, it  
11 does not indicate a laterally extensive confining unit that  
12 would be at a level that would -- extensive enough to create  
13 perched conditions. In addition, I was present during the  
14 drilling of boring continuously -- that was continuously  
15 logged using rotosonic methods, which mean you get  
16 continuous core from the surface down to the water table.  
17 And I, myself inspected and examined it from the surface to  
18 the water table, and there was nothing in that boring that  
19 would indicate a perched condition would exist. There was  
20 varying degrees of permeability within the sediments but  
21 nothing that was thick or extremely low permeability. In  
22 addition, if you do have a perched clay or silt unit that is  
23 capable of mounding water or creating a perched condition,  
24 there's always water in the subsurface, and you generally  
25 get saturated conditions on top of that. And there was no

1 such conditions that I witnessed in that one bearing. In  
2 the other boring logs, I wasn't present during all of the  
3 borings, but the one boring I seen, the description there  
4 was consistent with the other boring logs, and none of them  
5 indicated that such a condition would exist.

6 Q Just to clarify for the record, you said you observed a  
7 boring being advanced at the site. First of all, where did  
8 this boring take place? Can you describe the location? And  
9 when did you make this observation?

10 A I believe it was QAL008. I believe it was the deep boring  
11 at QAL008, or maybe it was a shallow one. I think it was  
12 part of the nested set. I think there was one right there,  
13 and they added a nest, if I remember correctly. There was a  
14 couple borings going on that day, so I was kind of running  
15 back and forth. One wasn't by the TWIS. One was to the  
16 west, and one was at the TWIS. I believe this was in -- as  
17 part of their requirement to install the additional  
18 monitoring wells for the TWIS, which would have been in -- I  
19 don't know my dates exactly. I do have the notes on it.  
20 But I believe it was in March of this year.

21 Q Let's back up just so the record is clear. Mr. Chatterson,  
22 if you know, does the permit as -- did the permit as  
23 issued -- the groundwater permit require Kennecott or its  
24 contractors to install some additional monitoring wells in  
25 the vicinity of the TWIS?

1 A Yes, it did.

2 Q And under the permit, was there a requirement that Kennecott  
3 provide the department with a work plan for installation of  
4 these additional wells?

5 A Yes.

6 Q And was that work plan made available to you?

7 A Yes, it was made available to me, and I approved it.

8 Q And so was that the context, then, in which you made this  
9 observation you described?

10 A Yes. Upon approving the work plan, they have 60 days to  
11 install the wells, and it was within that time frame where  
12 they went out to install the wells -- were installing the  
13 wells, and I visited the site to be on-site and observe the  
14 installation of these wells and the borings that were being  
15 advanced in those -- at those locations.

16 Q And in addition to your direct observation that you  
17 testified to, in any of the boring logs that you've seen  
18 either from this recent drilling or drilling previously in  
19 the vicinity, have you observed reports of saturated  
20 conditions or extensive saturated conditions above clay  
21 layers that would indicate that water is being confined and  
22 perching?

23 A At some locations there are. Site wide are you talking  
24 or --

25 Q No. I'm talking now in the vicinity of the TWIS.

1 A In the vicinity of the TWIS, no, I have not seen that.

2 Q Mr. Chatterson, earlier on in this case -- in fact, it may  
3 have been the first day of testimony -- one of the witnesses  
4 for the Petitioners, Mr. Torreano, testified about some  
5 property that he owns, located some distance generally  
6 northeast of the proposed mine site. And he testified that  
7 he had taken a look at some of the groundwater modeling  
8 information submitted by Kennecott in support of the permit  
9 application. Have you had an opportunity to look at the  
10 transcript of his testimony?

11 A Yes, I have.

12 Q And in Mr. Torreano's testimony, he testified in substance  
13 that he believed that there was a concern that his property  
14 could potentially be flooded or that water, he believed, was  
15 likely to come to the surface of his property based upon his  
16 review or his understanding of some modeling work that  
17 Kennecott had submitted to the DEQ. Do you recall -- do you  
18 understand that was the substance of his testimony?

19 A Yes; yes.

20 Q Now, have you, during the course of your work on this  
21 project, reviewed what you understood to be the same  
22 modeling information that Mr. Torreano testified about?

23 A Yes. He was referring to the mounding contours for the  
24 numeric groundwater flow model representing the TWIS  
25 mounding.

1 Q Based upon your review of that information and your  
2 understanding of the hydrogeology in the vicinity of the  
3 site, do you believe that Mr. Torreano's expressed concern  
4 about an increase in water elevation on his property --  
5 groundwater elevation on his property in the range of 2 to 4  
6 feet is scientifically plausible?

7 A No.

8 Q And can you explain why you disagree?

9 A I can understand where he would, I guess, get that, because  
10 there is a 2-foot contour that goes past his property;  
11 however, the modeling that was done was focused on the TWIS,  
12 and the surface water features of the seeps were not  
13 modeled. If the attempt was to fully characterize the  
14 downgradient, I guess, discharge area and groundwater rise  
15 in that area, you would have to then model the seeps. If  
16 that happened, those groundwater contours would shrink to  
17 essentially zero as they converged on those seeps and the  
18 water is discharged into those seeps. The way it was  
19 modeled with the seeps not being modeled, it was as though  
20 the seeps weren't there, so there was no way for the water  
21 to discharge, and in that event it may be hydrogeologically  
22 possible to realize a 2-foot increase. But based on known  
23 geologic conditions, that map's essentially misleading, and  
24 I can say after reviewing the data that -- with a high  
25 degree of scientific certainty, that there will be no

1 appreciable impact to his property in regards to a water  
2 level rise.

3 MR. REICHEL: Your Honor, at this time I want to  
4 move for the admission of some exhibits. First is  
5 Respondent's Proposed Exhibit 166, which this witness  
6 testified to.

7 MR. EGGAN: Are we starting in reverse order? You  
8 said 166?

9 MR. REICHEL: I'm basically in the sequence which  
10 I asked him about these things. 166 -- I mean, some of the  
11 ones I asked him about were already in evidence. 166,  
12 Counsel, was Mr. Chatterson's May 10th, 2006, memo regarding  
13 the groundwater modeling effort.

14 MR. EGGAN: This is Mr. Chatterson's memo?

15 MR. REICHEL: Correct.

16 MR. EGGAN: No objection.

17 MR. BRACKEN: No objection, your Honor.

18 MR. REICHEL: Next I would move for admission --

19 JUDGE PATTERSON: Wait.

20 MR. REICHEL: I'm sorry? Oh, I'm sorry, Counsel.

21 MS. HALLEY: No, no objection.

22 MR. REICHEL: Thank you. I didn't mean to exclude  
23 you.

24 (Respondent's Exhibit 166 received)

25 MR. REICHEL: Next I would move for admission

1 of -- simply to establish that it was received, of  
2 Respondent's Proposed Exhibit 178, which was a memorandum  
3 dated July 11th, 2006, from Kennecott responding to the  
4 issues raised by Mr. Chatterson in Exhibit 166. Again, I'm  
5 not offering this necessarily for the proof of the matter  
6 asserted; simply to establish that it was submitted and  
7 received.

8 MR. EGGAN: I would object. I think that is  
9 clearly a hearsay document. It was created by someone else,  
10 and that person is not here to testify.

11 MR. REICHEL: Well, respectfully, Counsel, I --  
12 maybe I didn't make it clear. I'm not necessarily offering  
13 that document, the Kennecott document, for the truth of the  
14 matter asserted. I'm offering it essentially on the same  
15 basis that this tribunal has previously allowed submittals  
16 by Kennecott considered by the DEQ to go into the record.

17 MR. EGGAN: I understand, and I believe that it is  
18 being offered for the truth of the matter asserted, and I  
19 think it would be very easy to use it for that purpose, and  
20 so I'm going to object.

21 MR. BRACKEN: I have no objection, your Honor.  
22 That's -- I agree with Mr. Reichel's characterization. It's  
23 something that this witness has relied upon in response to  
24 some concerns he had expressed and received this exhibit  
25 back from Kennecott or its consultants, and he relied upon

1 it to answer some of the questions he had.

2 JUDGE PATTERSON: And it's part of the  
3 department's review file, so I'll overrule the objection.

4 (Respondent's Exhibit 178 received)

5 MR. REICHEL: Next I would move for admission of  
6 Respondent's Proposed Exhibit 198, which was the  
7 hydrogeological summary document prepared by Mr. Chatterson  
8 dated January 19th, 2007.

9 MR. EGGAN: No objection, Judge.

10 MS. HALLEY: No objection.

11 MR. BRACKEN: No objection.

12 JUDGE PATTERSON: Okay. Thank you.

13 (Respondent's Exhibit 198 received)

14 MR. REICHEL: One moment, your Honor. Next I  
15 would move for admission of Respondent's Proposed Exhibit  
16 167, which is a memo prepared by Mr. Chatterson dated May  
17 11th, 2006, to the surface water section of the DEQ.

18 MR. EGGAN: No objection.

19 MS. HALLEY: No objection.

20 MR. BRACKEN: No objection.

21 JUDGE PATTERSON: Okay. Thank you.

22 (Respondent's Exhibit 167 received)

23 MR. REICHEL: Next, Your Honor, I would move, if  
24 it's not already in -- I don't believe it is -- move for  
25 admission again for the limited purpose of establishing that

1 it is part of the materials submitted by Kennecott to the  
2 DEQ for Respondent's Proposed Exhibit 180, which is the  
3 September 15th, 2006, communication from Jon Cherry to Bill  
4 Creal of the DEQ that this witness testified he considered  
5 as a part of his review of some of the issues involved.

6 MR. EGGAN: That's 180, Counsel?

7 MR. REICHEL: That's correct. It's the 9-15-2006  
8 transmittal from Mr. Cherry to Mr. Creal. Again, I  
9 acknowledge this is a document prepared by Kennecott. It's  
10 being offered simply to establish that the document was  
11 submitted by Kennecott to the DEQ and considered by it, not  
12 necessarily to prove the truth of all the matters asserted  
13 therein.

14 MR. EGGAN: With that limited use, Your Honor, I  
15 have no objection.

16 MS. HALLEY: No objection.

17 MR. BRACKEN: No objection, Your Honor. And I  
18 state for the record that the contents of that -- some of  
19 the contents have already been testified to. But Mr.  
20 Reichel --

21 MR. REICHEL: Yes, I believe that's true. And I  
22 may be -- it may already be in evidence. I'm simply trying  
23 to --

24 JUDGE PATTERSON: Better twice than not at all.

25

1 (Respondent's Exhibit 180 received)

2 MR. REICHEL: Next, Your Honor, I would move for  
3 admission of Respondent's Proposed Exhibit 184, which is a  
4 memo dated October 11th, 2006, from Mr. Chatterson to Sara  
5 Wolf regarding a request for review of potential surface  
6 water impacts.

7 MR. EGGAN: No objection.

8 MS. HALLEY: No objection.

9 MR. BRACKEN: No objection.

10 JUDGE PATTERSON: Okay. Thank you.

11 (Respondent's Exhibit 184 received)

12 MR. REICHEL: And that concludes my offer of  
13 exhibits through this witness at this time.

14 JUDGE PATTERSON: Okay. Take a quick break  
15 before.

16 (Off the record)

17 MR. EGGAN: Ready when you are, Your Honor.

18 JUDGE PATTERSON: I'm ready.

19 MR. EGGAN: Is Kennecott going to defer at this  
20 point?

21 MR. BRACKEN: We're deferring.

22 MR. EGGAN: You will defer. All right.

23 JUDGE PATTERSON: I assumed that.

24 MR. EGGAN: Me too. Mr. Chatterson, my name is  
25 Eric Eggan. We've met a couple of times as these

1 proceedings have gone on. I represent some of the  
2 Petitioners in this matter primarily related to groundwater  
3 issues. I have some questions and then my colleague, Ms.  
4 Halley, is likely to have some questions for you, too.

5 CROSS-EXAMINATION

6 BY MR. EGGAN:

7 Q But I want to begin with just a question or two about your  
8 resume. It shows a BS in geology from Grand Valley State  
9 University, and then a master's degree. Are you working  
10 toward a Ph.D. or have you -- do you have a Ph.D.?

11 A No.

12 Q "No"? Now, I'm also looking at your fields of competence  
13 noted on your resume. And I was particularly interested in  
14 the various techniques -- groundwater techniques and the  
15 codes that you're familiar with. And I see a number of  
16 them, including MODFLOW, but I don't see FEFLOW. Your  
17 competencies don't list FEFLOW as one of the groundwater  
18 modeling techniques that you at least note among your field  
19 of competence?

20 A True.

21 Q Okay. So while you are at least according to your resume  
22 competent in the use of MODFLOW and MODPATH, et cetera,  
23 FEFLOW is not one of them?

24 A No. I said it's not listed, but I am familiar with it.

25 Q Okay. You've indicated that you have actually been to this

1 site. I'm interested in how it was that you did go to the  
2 site. Were you invited there? Was it part of your  
3 activities?

4 A When this, I guess, process started and we were told the  
5 groundwater -- when it became clear that a groundwater  
6 permit would be necessary, I requested -- I called the -- I  
7 think the DEQ office or I contacted Kristen and said I was  
8 going to be up there and asked if she wanted to come along  
9 or it was up to her. But considering the scope of the  
10 project and all that was involved, I wanted to at least  
11 visit the site and familiarize myself with it.

12 Q When I visited the site, I ran into a gentleman up there by  
13 the name of Chauncey Morgan who said, "Oh, I know Eric  
14 Chatterson. I'm the guy that invited him up here and gave  
15 him a guided tour of the area." Did he give you the guided  
16 tour of the area?

17 A No.

18 Q No, he did not?

19 A No.

20 Q You didn't go out with Chauncey at all? Did you see him  
21 while you were there?

22 A No.

23 Q Don't recognize the name?

24 A I do know Chauncey, yes.

25 Q Okay. Having been to the site, I'm sure that when you were

1 on the site you saw that it was a site that has wildlife on  
2 the site?

3 A Yeah; yeah. I assume so. It's pretty wild terrain.

4 Q Obviously some surface waters that you saw?

5 A Yes.

6 Q The seeps and the Salmon Trout, the Yellow Dog Rivers?

7 A Yes.

8 Q Scenic area?

9 A Yes.

10 Q And a sensitive area, would you agree?

11 A I guess I wouldn't know how to answer that. Sensitive to  
12 what?

13 Q Well, what does the term "sensitive" mean to you?

14 A I don't know. I guess it would have to be in some sort of  
15 context. I mean, I guess --

16 Q I hate to, well --

17 A -- you can have a sensitive person. I guess I'm not real  
18 clear what you mean. Are you talking ecologically  
19 sensitive?

20 Q I think I'm talking environmentally sensitive. This is an  
21 environmental case, so I think I put it in that context.

22 A Oh, I don't know if I could say that. I'm a geologist.  
23 Geologically it isn't sensitive.

24 Q And if Mr. Janiszek had indicated that it's a sensitive  
25 site, would you agree or disagree with him?

1 A That's up to him. I guess I'd have to know what context.

2 Q All right. I understand.

3 A I mean --

4 Q There's no industry at this site right now?

5 A No.

6 Q Okay. In fact, there's no electricity at the site right  
7 now?

8 A No, I don't believe so.

9 Q Okay. Did you have your cell phone with you? There weren't  
10 any telephone lines, were there, while you were there that  
11 you saw?

12 A No.

13 Q Okay. Did you have your cell phone with you?

14 A Yes, I believe I did.

15 Q Do you recall whether it worked there?

16 A I don't recall.

17 Q You don't have any contractual relationship presently with  
18 Kennecott, do you?

19 A No.

20 Q If you had a contract with Kennecott, some sort of a  
21 contractual relationship with Kennecott, I assume that you  
22 would have disclosed it?

23 A Yeah. I mean, I guess it's a -- yeah. I mean, I don't have  
24 one, so I guess I'd have to have one to answer that  
25 question.

1 Q Well, let's assume for a minute, you and I, that you had a  
2 contractual relationship with Kennecott as this matter went  
3 on. And somebody said, "Well, we'd really like you, Eric  
4 Chatterson, to review this site" and you knew you had a  
5 contractual relationship with them. You would have  
6 immediately disclosed that to the person who would have made  
7 the request, I take it?

8 A I mean, you're saying if Kennecott -- oh, the person who --  
9 you're saying someone within the DEQ requested --

10 Q Let me -- yeah. I need to --

11 A I guess --

12 Q I need to be a little clearer. Okay. MDEQ is an  
13 independent agency, needs to be independent of the people  
14 that they're regulating?

15 A Absolutely.

16 Q Absolutely. And you as the person who is doing an analysis  
17 of this project, you too need to be independent. You don't  
18 need to be somehow have a conflict of interest with respect  
19 to the company that you're looking at; am I right?

20 A True.

21 Q Okay. And so if -- and I'm sure that you don't. But if you  
22 did have a contract with Kennecott for some other matter,  
23 you would have disclosed that?

24 A To the DEQ?

25 Q Yes.

1 A Yes; absolutely.

2 Q And you probably would have disclosed it in direct  
3 examination to all of us?

4 MR. BRACKEN: Well, objection, Your Honor.

5 A Certainly, if I was asked, yes.

6 MR. BRACKEN: It calls for speculation.

7 MR. EGGAN: Thank you. He's answered.

8 Q You probably would have had to have recused yourself from  
9 regulatory consideration, wouldn't you?

10 MR. BRACKEN: Objection. First of all, it calls  
11 for speculation. Second of all, it's asking this person to  
12 apparently interpret rules of the DEQ. And you haven't said  
13 he's a qualified person to interpret rules about these kind  
14 of issues.

15 MR. EGGAN: Well, I think all state employees are  
16 competent to answer questions about the State Employees  
17 Ethics Act or --

18 MR. BRACKEN: That's not relevant with respect to  
19 him. And he's not an expert witness testifying about these  
20 rules. With respect to him, he says he doesn't have the  
21 relationship and, therefore, is not talking about it. He  
22 can't really talk about it on personal information.

23 MR. EGGAN: I think I'm entitled to ask this  
24 witness about conflicts of interest.

25 MR. REICHEL: I join in the objection. I mean,

1 this witness has already established that he has no such  
2 contractual relationship. He's already answered a series of  
3 questions on this. There's no foundation for further  
4 inquiry with this witness on this entirely hypothetical  
5 subject as relates to him.

6 MR. EGGAN: Well, as we know, it's not entirely  
7 hypothetical in this case.

8 MR. BRACKEN: But it is to him, and you've been  
9 able to ask those questions.

10 JUDGE PATTERSON: I agree. I'm going to sustain  
11 the objection.

12 MR. EGGAN: All right. I'll move on, Judge.

13 Q Let's talk for a second about modeling at this site. Okay?  
14 Because there's been some modeling. And my question is, and  
15 I think I understood your prior testimony, but did I  
16 understand you to say that you actually did your own  
17 modeling at the site of this particular site?

18 A I didn't create my own model, but I ran the model provided  
19 to me with different parameters. So I guess I'm not sure if  
20 that answers your question. But I did some modeling of the  
21 site, but I did not create my own model, at least not from  
22 the ground up other than altering a few parameters.

23 Q Okay. So you used essentially the information that had been  
24 provided by Kennecott and ran your own model?

25 A Yes.

1 Q Tweaking in some respects some of the parameters that had  
2 been provided?

3 A Correct.

4 Q Okay. And I honestly don't mean this to sound silly, but  
5 did you or did you not do your own modeling? Would that be  
6 considered to be your own modeling or would that just be  
7 considered a --

8 A I think the term "your own modeling" would be accurate. I  
9 didn't build my own model but, I mean, you're kind of, you  
10 know, splitting hairs a little bit with terminology there.  
11 But I did do my own modeling. I think that's accurate.

12 Q Okay. But the bottom line is the data that was -- that you  
13 utilized was Kennecott's data?

14 A Yes.

15 Q Okay. All right. And so the building blocks for the model  
16 that you utilized were the building blocks that Kennecott  
17 provided?

18 A Yes.

19 Q And you did that for purposes of analysis of the model to  
20 show whether it was accurate or not accurate?

21 A Yeah. Generally when reviewing a model you look at it to --  
22 or at least I prefer to look at all the input files. You  
23 can open them up numerically and look at them. You kind of  
24 need a preprocessor for that. And then to run the model  
25 there's certain things that may show up when you run the

1 model that may not be revealed when you're presented with  
2 output files, you know, things like possibly cells going dry  
3 or something like that that wouldn't show up. So just for  
4 basic reasons such as those.

5 Q I understand. Now, I have some questions about the modeling  
6 that was done by the companies hired by Kennecott. Okay?  
7 And I first want to ask you about the models that were  
8 utilized for dewatering the mine. Okay?

9 A Yes.

10 Q All right. We have three companies that modeled mine  
11 dewatering; am I right?

12 A I believe so.

13 Q Okay. And those companies would have been Golder, Fletcher  
14 Driscoll, and then in 2008 we had GeoTrans do some  
15 additional modeling; am I right?

16 A Yes.

17 Q Now, the Golder modeling that was done -- and I just want to  
18 make sure I've got the dates straight here. We've got the  
19 preliminary model done by Golder in 2005; is that right?

20 A I believe so. That sounds about right.

21 Q Then we have a supplemental model done by them in 2006; is  
22 that right?

23 A I really couldn't say.

24 Q Okay. And then we had some supplemental modeling that was  
25 ostensibly done by them in 2008; does that sound right?

1 A Yes, I believe.

2 Q Just a question for you on the supplemental modeling, the  
3 supplemental modeling that was done in 2008. Have you  
4 reviewed that modeling? Has it been presented to you?

5 A I have a copy of it that was sent to me just to look at,  
6 which was during these proceedings. I have not given it a  
7 technical review, though.

8 Q Okay. All right. Now, the Golder modeling, Golder used  
9 FEFLOW modeling; am I right?

10 A I believe so.

11 Q And Golder also used what's called transient state modeling,  
12 didn't they?

13 A I have not reviewed those models, so I really can't --

14 Q Okay. So you don't know whether it was transient --

15 A -- say.

16 Q -- state or not?

17 A No. I have not giving -- I have not given any of those  
18 models a technical review, no.

19 Q Okay. Well, I want to ask you a question or two about the  
20 Fletcher Driscoll modeling that was also done, and that was  
21 done -- that was mine dewatering in the bedrock in 2005.  
22 Are you familiar with that modeling?

23 A I have not given that a technical review either.

24 Q My understanding was that you were to assist Chuck Thomas in  
25 the analysis of those models.

1 A That was not my understanding.

2 Q Okay. There was some modeling done by GeoTrans. And again,  
3 to be fair to you, this is mine dewatering. They modeled  
4 the A and D aquifers. Okay?

5 A Uh-huh (affirmative).

6 Q And it was done by GeoTrans. And the materials that we  
7 received were received in April of 2008. Did you do a  
8 technical review of that modeling?

9 A No. I've received that model via an e-mail I believe in  
10 June 2008 or a couple weeks ago. And I looked over it, and  
11 I think, you know -- but I was never asked to give it a  
12 technical review, nor have I given it a technical review.

13 Q To your understanding, has the MDEQ's staff done a technical  
14 review of that modeling?

15 A I would not know that.

16 Q In any event, it certainly wasn't you?

17 A I did not. That's all I can tell you.

18 Q Did you talk to Chuck Thomas about it? Do you know whether  
19 he did?

20 A I do not know that.

21 Q Okay. Were you here when there was some criticism of the  
22 Fletcher Driscoll modeling?

23 A What do you mean by "some criticism"?

24 Q Well, one of the witnesses who testified for the company and  
25 who was testifying about other models, indicated that those

1 models did not -- were not consistent with ASTM standards.

2 A Okay.

3 Q Were you aware of that?

4 A I may have been there for some of that testimony, I believe.

5 It was at Mr. Council's testimony?

6 Q Yes, it was.

7 A Okay. I do believe I heard that, yes.

8 Q Okay. Would the fact that a model does not comply with ASTM

9 standards likewise cause you concern?

10 A It would depend. A lot of the ASTM standards are there for

11 creating a model to fully characterize all inputs and

12 outputs of a groundwater flow regime. I would say better

13 than 90 percent of modeling exercises have different objects

14 that do not require the full characterization of all inputs

15 and outputs of a groundwater flow regime. And in that

16 respect, they can fully fulfil the objective for what

17 they're intended for without complying to ASTM standards.

18 So I would say there's a narrow scope of models which would

19 require ASTM standards. And I'm not sure if since that is

20 not a model I gave a technical review I cannot say if that's

21 a model that would require those.

22 Q Okay. Would you be in a position to disagree with Mr.

23 Council who did have the opportunity to review that model

24 and criticized it on the basis of noncompliance with ASTM?

25 A I would have no basis to disagree with him or agree with

1           him.

2       Q     Well, I do want to talk to you too about the modeling that

3           was done in the vicinity of the TWIS.  Okay?

4       A     Okay.

5       Q     Which modeling I believe you did have an opportunity to

6           thoroughly analyze?

7       A     Yes.

8       Q     By the way, when you conduct an analysis of a model, let's

9           say you receive a modeling report, how long does it take you

10          to analyze a model, to really give it a good thorough

11          analysis?

12       A     I guess it would have to depend on the size of the model.

13           It would have to depend on the complexity of the model.  And

14           it'd have to depend, I guess, a lot on the objectives of the

15          model.

16       Q     Okay.  Can you give me any sort of an average?  Is it a

17          week?

18       A     Well, it also -- it depends, I guess, on how much time I

19          could devote to it.  If it was a simple model and with

20          modeling software and code that I understood well, I

21          could -- and I was not distracted, the phone wasn't ringing,

22          I could probably sit down and get through it quite

23          reasonably quickly.  And in a simple model a matter of, you

24          know, several hours would not be unreasonable to.

25       Q     What about a more complex model, a more complex site?

1           What's the outside? Might it take -- might it take a couple  
2           of days or a couple of weeks?

3       A     It could. It would --

4                       MR. BRACKEN: I'm going to object. I'm going to  
5           object to the question because I think it lacks foundation.  
6           It's really -- this witness has testified that it depends on  
7           the size and complexity of the model. And then you say,  
8           "Well, if it's a simple one he said it might only take a  
9           couple hours." Then you said, "Well, what if it's not so  
10          simple?" Well, depending on what those parameters are I  
11          think before this person has enough foundation to answer the  
12          question.

13                      MR. EGGAN: I don't think that was a very  
14          difficult question. I think it's a -- I'm just asking how  
15          long it takes to review a more complex model.

16                      JUDGE PATTERSON: Can you answer that?

17                      THE WITNESS: Yeah.

18                      JUDGE PATTERSON: Go ahead.

19       A     It's practically impossible to say. There's models, for  
20          example, the Yucca Mountain where they proposed to store  
21          nuclear waste, that model's been probably reviewed for years  
22          and years by many people. So the upper end is almost  
23          limitless. And on the lower end, if you're simple enough,  
24          you could probably review a model in a half hour. So I  
25          really -- without knowing what model you're talking about,

1           it's a question I really can't answer.

2       Q     All right. Well, let's talk about the Fletcher Driscoll  
3           2006 TWIS infiltration model. How long did it take you to  
4           review that?

5       A     Are you talking cumulative hours? I mean, I reviewed it  
6           over a course of months, you know.

7       Q     I don't think this is -- how long did it take you to analyze  
8           that and reach conclusions about the model?

9       A     It's a difficult question to answer, because it's an  
10          iterative process. I reviewed it, I sent back a list of  
11          comments, I spent -- I got some comments back. I spent, you  
12          know, a few more hours reviewing it, sent some comments  
13          back, got some back. From beginning to end a cumulative  
14          time spent on the model, is that what you're talking about?  
15          I don't --

16      Q     Well, it sounds to me --

17      A     It went over the course of --

18      Q     -- like the process of sending information out --  
19          information requires out, that certainly took a time period.  
20          Let me ask you this: How long did it take you to analyze  
21          the model and formulate the questions that you had that were  
22          eventually sent out on that model?

23                   MR. BRACKEN: Eric, excuse me. I think we need a  
24          clarification. The model that he's testified to I believe  
25          is a Golder model. And you're talking about Fletcher

1 Driscoll model. I could be mistaken, because I haven't --

2 MR. EGGAN: You're probably right.

3 THE WITNESS: No. You are correct. You are

4 correct. I just let it go, but you are correct.

5 Q Then let's make sure we're talking about the right model.

6 Fletcher Driscoll model 2006, did you review it?

7 A No.

8 Q You did not review that model?

9 A No. I guess I'm confused. Is that the initial model?

10 Q Yes. Well, there's a --

11 A I did not give that a technical review, no; a full technical

12 review, no.

13 Q Why not?

14 A Because that model was for the 632 mine permit, I believe.

15 Q No. This was for TWIS infiltration.

16 A In 2006?

17 Q Yes.

18 A Is a Fletcher Driscoll model?

19 Q Yes.

20 A Numerical model?

21 Q Yes.

22 A I guess I'm not aware. I thought it was a Golder -- I

23 thought Golder did the modeling for the TWIS, the numeric

24 modeling for the TWIS.

25 Q Well, Golder did a couple of models themselves. They did

1           one in April of 2006 and they did one in July of 2006. Does  
2           that refresh your recollection?

3                       MR. BRACKEN: You just asked him a lot of  
4           questions.

5    A    They did an updated one; correct.

6    Q    Okay. They did a model in 2006 and then they did the update  
7           in July?

8    A    I think they were just addressing my concerns in July. I  
9           believe it was the same model by Golder.

10   Q    Okay. In any event, you did not review a Fletcher Driscoll  
11          model from 2006?

12   A    Initially I believe they were going -- the Fletcher Driscoll  
13          model was going to be used possibly for the TWIS. There may  
14          have been -- but I don't think it was ever submitted as part  
15          of the groundwater application.

16   Q    Oh, not submitted? Okay. Well, then let's focus on that  
17          Golder model and the supplement. Okay? First of all, let's  
18          go back to the question I was getting to. When you  
19          initially reviewed the Golder model -- okay -- the initial  
20          one, the one that was -- that generated your questions --  
21          okay -- how long did it take you to review that and then  
22          generate the questions?

23   A    Probably about an hour and a half, two hours maybe.

24   Q    Now, the April of 2006 model, not calibrated or calibrated?

25   A    Not calibrated, I believe.

1 Q Okay. All right. MODFLOW?

2 A Yes.

3 Q Steady state?

4 A Yes.

5 Q And in the effort that they did to supplement it, which I  
6 think was in July -- okay --

7 A Yes.

8 Q -- so we're looking at July of 2006, again, a Golder model  
9 of the area of TWIS infiltration?

10 A Yes.

11 Q All right. We're both on the same page --

12 A Yeah.

13 Q -- and we're talking about the same thing? Calibrated or  
14 not calibrated?

15 A Not.

16 Q Steady state?

17 A Yes, I believe.

18 Q MODFLOW?

19 A Yes.

20 Q Okay. Was there any uncertainty analysis in that model?

21 A They did do a sensitivity analysis in the model.

22 Q Do you know whether they did a worst case configuration in  
23 that model?

24 A I believe they did. However, they were -- there was a lot  
25 of iteration, so I hope I'm not off on which iteration we're

1 talking about. But there was one where they did not model  
2 infiltration from recharge from precipitation. So I don't  
3 think you could call it worst case if they weren't modeling  
4 rainfall. You know what --

5 Q Okay. So are you saying that you think the July modeling  
6 did or did not have that?

7 A Did not. Wait. The July? No. I think the July did. It  
8 was the April that didn't. Sorry about the dates. This  
9 is --

10 Q That's okay.

11 A There's been a lot of iterations. It's hard to --

12 Q That's okay. No. I think that's -- believe me, I  
13 understand completely.

14 A Okay.

15 Q The GeoTrans modeling of April of 2008, you indicated you  
16 were only able to do kind of a cursory review of it, I take  
17 it?

18 A Uh-huh (affirmative).

19 Q Okay.

20 MR. REICHEL: Mr. Chatterson, you need to give a  
21 verbal response.

22 A Oh, yes. Sorry.

23 Q Was there, do you happen to recall worst case configuration  
24 of that model?

25 A No, I didn't review --

1 Q Did you look?

2 A -- it to that degree.

3 Q Okay. Was that a MODFLOW model or a FEFLOW?

4 A MODFLOW, I believe.

5 Q Okay. Steady state?

6 A I believe that was transient, although, like I say, I didn't  
7 give a full review so I'm just trying to recall from my  
8 brief overview. So I could be incorrect on that. I believe  
9 it was steady -- or transient, though, if I remember  
10 correctly.

11 Q Just so that we're all sure, which model was it, then, that  
12 you relied on to recommend the approval of this permit? The  
13 Golder modeling?

14 A Yeah. That's the only one I reviewed.

15 Q Okay. And the GeoTrans model in April of 2008 has not been,  
16 as far as you know, submitted to the Department of  
17 Environmental Quality, at least your team for analysis or  
18 review?

19 A No. To the best of my knowledge, it has not.

20 Q So there has been no official comment from the MDEQ on that  
21 modeling?

22 A To my knowledge, no.

23 Q Now, when a groundwater investigator is doing modeling, we  
24 can agree that data collection is very important, can't we?

25 A Yes.

1 Q You need both accurate information; am I right?

2 A Yes.

3 Q And also you need a sufficient amount of data?

4 A Correct.

5 Q I think the goal is to know something about what the impact  
6 is of the -- or the impact is on the area that is being  
7 modeled, flow direction, that sort of thing?

8 A That would be more -- well, the impact would be more result  
9 of the modeling, not so much a background information or  
10 background data.

11 Q True; true. But modeling itself is intended to look at  
12 those kinds of issues, flow direction, speed of flow?

13 A Yes. As far as predictive, travel time would be something  
14 that the model would come up with. Flow direction is  
15 something that's usually put in because you kind of know --  
16 that's kind of what you build the model with. And you would  
17 run the model to get travel time, so one of those components  
18 I think is more something put into the model and the other  
19 one's more result of it.

20 Q I see. Okay. Very good. In any event, there's certainly  
21 no disagreement between you and I that it's important to get  
22 accurate and sufficient data?

23 A Yes.

24 Q Okay. Mr. Chatterson, this is a document that shows A Zone  
25 elevation contours. It is part of the -- it's actually part

1 of MDEQ Exhibit Number 32. And again, it shows the A Zone  
2 elevation contours. Can you see the contour lines on  
3 this --  
4 A Yes.  
5 Q -- on this particular map?  
6 A Yes.  
7 Q Okay. My first question for you, sir -- and again, what  
8 we're looking -- what I'm interested in talking to you about  
9 is the amount of information that was available. And what  
10 I'm interested in having you show us on this map -- and  
11 perhaps you can even get up and point to it -- is where on  
12 the map is the TWIS located on this particular map?  
13 A I believe the TWIS would be right in this area right here  
14 (indicating).  
15 Q Okay. So it's in the area where the -- I believe the  
16 particular well number is QAL008A/D? Does that sound right?  
17 A Yes; yes.  
18 Q Okay. Are you actually familiar enough with this site so  
19 you know where that particular well is?  
20 A I was there when it was installed.  
21 Q Okay. Good. Now, where are the seeps on this particular  
22 map?  
23 A They're the blue lines that you can see right here. And  
24 there's actually -- they kind of branch off of there a  
25 little bit. The blue lines are a little bit kind of the

1 larger streams. But the seeps kind of come off as little  
2 fingers or little fringes off of the sides here and here.

3 Q Is it fair to depict the seeps in the areas where those  
4 monitoring locations are that are up to the northeast -- to  
5 the north and to the northeast?

6 A Up here?

7 Q Yes.

8 A I'm sure there's seeps up there. But I think those are a  
9 little beyond where we would expect the groundwater to  
10 discharge.

11 Q Okay. So they're slightly beyond perhaps or maybe -- I  
12 don't know -- maybe not so slightly, but beyond?

13 A Yes. There could be seeps in those areas. Are you talking  
14 these areas right here?

15 Q Yes, I am.

16 A Yeah. Those -- I would say, yeah. This one I would think  
17 they're -- most of the groundwater as far as from the TWIS  
18 would probably be -- the majority would be discharging in  
19 this area up here.

20 Q Can you show me -- and again, this has to do with the  
21 accuracy of the information. Can you show me where the  
22 wells are that are between the TWIS and the seeps? Where  
23 are the monitoring wells?

24 A They are -- for the groundwater discharge permit --

25 Q Yes.

1 A -- the compliance -- they're -- if the TWIS was right here  
2 (indicating), they would be in the downgradient direction at  
3 150 feet.

4 Q Okay. So beyond that are there -- there are no --

5 A There are no wells beyond that.

6 Q There are no wells beyond that?

7 A No, not between there and the seep.

8 Q Okay. So between the monitoring wells that are 150 feet  
9 from the TWIS and the seeps there are no monitoring wells at  
10 all, are there?

11 A No.

12 Q Okay. And we're not going to have any scientific data  
13 between those points, are we?

14 A Geologically speaking in the subsurface, if you don't have a  
15 well or a boring, you would have no data.

16 Q That's right. We don't have any groundwater flow data  
17 between those points and the seeps, do we?

18 A Direct groundwater flow data?

19 Q Right.

20 A No.

21 Q What is the distance between that 150 feet from the well  
22 there at the TWIS and the seeps?

23 A I guess I'd have to scale it out. I could approximate,  
24 but --

25 Q Well, if I said -- if I said between 3,- and 5,000 feet,

1           would you agree?

2       A     That sounds about right.

3       Q     Okay.  Some of them are farther away than a mile, aren't

4           they?

5       A     Some of what?

6       Q     Some of the seeps are farther away than a mile?

7       A     Well, I'm sure -- well, there's, I guess, seeps all over.

8           Which seeps are you talking about?

9       Q     Some of the areas where groundwater that is discharged from

10          the TWIS will surface more than a mile from the area of the

11          TWIS, won't they?

12      A     I wouldn't know if -- I wouldn't say that's absolutely

13          correct.  I would have to look at a map.  I would assume

14          most of it would have discharged to some seeps before that.

15          But I guess I'd have to analyze that question independently.

16      Q     Bottom line is we really don't have any groundwater

17          chemistry data between this point which is 150 feet from the

18          seep -- or from the TWIS and these areas up here where the

19          TWIS is?

20      A     Correct.

21      Q     Okay.  Now, let me ask you, if you can -- can you see the

22          contour lines and what the contour lines say about these

23          contours and the depth of the groundwater or the groundwater

24          flow?

25      A     Yes.

1 Q What are these numbers here (indicating)? What do they  
2 mean?

3 A That's the -- an equalpotential line, which this essentially  
4 a line of assumed equalpotential hydraulic head along that  
5 line where the groundwater rises to the same elevation.

6 Q Okay. Now, I assume that you carefully reviewed the  
7 information that was provided by Kennecott with respect to  
8 this kind of issue? For instance, did you look at this A  
9 Zone groundwater elevation contour?

10 A Yes.

11 Q It was part of your analysis?

12 A Yes.

13 Q Okay. Now, you're aware, I take it -- and you talked about  
14 this with Mr. Reichel earlier -- of the requirement in the  
15 DEQ's rules, in the groundwater rules, and I'm talking about  
16 Rule 323.2221(4)(g)(IV) -- and I'm sure you've got these  
17 memorized; right? --

18 A Oh, that one.

19 Q -- that it requires a groundwater contour overlay indicating  
20 groundwater flow direction with a maximum contour interval  
21 of one foot. It requires a groundwater contour interval of  
22 one foot, doesn't it?

23 A That's what that --

24 Q That's what the rule requires?

25 A -- rule says, yeah.

1 Q That's what it says. Okay. And I believe that on Exhibit  
2 198, which was the little checklist that you did --

3 A Yes.

4 Q -- as you went through this, you checked the box indicating  
5 that they had provided a map that was in compliance with  
6 this particular rule; am I right?

7 A I don't think it said that, to be honest; that it's going to  
8 apply to that exact rule that refers to the one foot  
9 interval?

10 Q It does, yeah. It does.

11 MR. EGGAN: Can we call up Exhibit 198?

12 A I believe there's a list, though, of things and the one foot  
13 interval's in there; is that correct?

14 Q Well, we can call it up, if you want to.

15 MR. EGGAN: Do you have a -- do you have a hard  
16 copy of that, Mr. Reichel?

17 A I wasn't -- I wasn't -- I can look at a hard copy. I wasn't  
18 aware that that box referred directly to the one foot  
19 contour interval.

20 Q It doesn't say that. It says in compliance with that  
21 particular rule. And that's --

22 A Well, the larger rule; correct?

23 Q No. I'm looking and I'm going to show you Exhibit 198. And  
24 what it says is, "Are you following rule requirements  
25 provided?" And then there is a box that you check "yes"

1           where it says, "Maps providing information required in Rule  
2           2221(4)(g)(IV)."

3       A     Okay.  Yes.  I understand, yes.

4       Q     Yes.  So you checked that box?

5       A     Yes, I did.

6       Q     Okay.  But we know, to be completely accurate, that the  
7           applicant didn't provide contour maps at one foot.  You've  
8           already indicated that they didn't?

9       A     Correct.

10      Q     And you've indicated why.  To be fair, you've indicated why.

11      A     Yeah.

12      Q     Okay.  But the bottom line is they did not?

13      A     That's true; yes.

14      Q     Okay.  Now, we can agree that the intervals on this  
15           particular map are ten feet?

16      A     Yes.

17      Q     Did you at any time plot the surface elevations on any of  
18           these maps to see what the surface elevations were, by any  
19           chance?

20      A     The surface of what?  The land?

21      Q     The surface of the land.

22      A     Did I plot them?  That map right there has elevations.  
23           That's a topo map and it should have elevations of the land  
24           surface on it.

25      Q     Okay.  Well, my question for you, sir, is did you use a GIS

1 system of any kind to plot the ground elevations to just see  
2 whether that gave you any information about the contours on  
3 the map?

4 A I wouldn't have to plot them, because that's a topo map and  
5 it has groundwater contours plotted on it.

6 Q Okay. Well, are you aware that if you were to plot the  
7 contours on that map, the ground elevations on that map, and  
8 compare them to the contours, --

9 A Yes.

10 Q -- that those contours would show you that the groundwater  
11 is 30 feet above the surface of the land?

12 A In the area of the sort of the drainage ditches or the  
13 seeps; correct.

14 Q Probably to the north or northeast of this particular -- of  
15 the site, yes.

16 A Well, this is -- that's because this is a groundwater  
17 elevation contour map. And when you're plotting groundwater  
18 elevations, that's a certain dataset and contains  
19 groundwater elevations. And when it's plotted, it should be  
20 plotted with only data points within that dataset. Now,  
21 there's two ways of doing it. I actually prefer this way  
22 where you keep the dataset pure and you don't add in what  
23 you kind of know or feel what happened. Some people like  
24 to, when they see these surface waters, they bend the  
25 contours back towards -- and be up by the streams. However,

1 those aren't parts -- they're not actual data points within  
2 the dataset because they're not groundwater elevation  
3 contours. They're surface water. By plotting it like this,  
4 you're actually keeping the dataset essentially pure and  
5 you're only plotting a groundwater elevation contour and  
6 you're not mixing with surface water. The reason that's  
7 important is because that is plotting an equipotential  
8 head, and it is possible to get an equipotential head  
9 that's higher than the surface. I don't believe that to  
10 probably be the case here. But if you mix groundwater  
11 elevations with surface water elevations, you are -- you  
12 have to have the assumption that the two are directly  
13 connected. And certainly in the case of, as we know, we  
14 have artesian wells which flow, sometimes that's not always  
15 the case that there is a direct connection. So what they  
16 were contouring was a dataset of groundwater elevation  
17 contours and they weren't mixing and matching with surface  
18 water, which is appropriate even though you could stand back  
19 and say, "Well, this elevation is far above the surface,"  
20 which maybe would be the case if there was an artesian well  
21 with that much head in it. Likely we know that's probably  
22 not the case and it probably crops out. But for what the  
23 map -- the title of the map isn't for what it's depicting  
24 it's appropriate.

25 Q All right. So from your perspective, just so that I

1 understand your testimony, because there may be some more  
2 testimony offered in this case, from your perspective using  
3 this map, it is okay that the groundwater is depicted as  
4 being 30 feet above the surface of the land? That would be  
5 your testimony in this case applying it to this map?

6 A Yes, with the understanding that the map is to depict  
7 groundwater elevation contours and not to trying to  
8 characterize the groundwater-surface water flow system and  
9 interactions.

10 Q Okay. Now, the rules also -- and you've testified about  
11 this earlier. We know that the rules also require a  
12 three-dimensional flow path, don't they?

13 A Yes.

14 Q Okay. That's Rule 323.2221(2)(c); am I right?

15 A I'd have to take your word on that one.

16 Q All right. Well, please do, because we don't want to have  
17 to go to the rule. Three-dimensional flow paths tell us  
18 where to monitor, doesn't it?

19 A It can be beneficial in that regard.

20 Q Okay. Part of the conceptualization of the area?

21 A Yes.

22 Q It's really -- it allows an aquifer to be accurately  
23 characterized so that the impacts of a withdrawal of  
24 groundwater or an addition of groundwater can really be  
25 fully understood, doesn't it?

1 A It certainly helps, yes.

2 Q Okay. But we know that whether you were able to sort of  
3 divine this from the information that they provided they did  
4 not provide a three-dimensional flow path of that site, did  
5 they?

6 A I believe they did.

7 Q Can you show us where specifically in the document, in their  
8 materials, they show you a document that says  
9 three-dimensional flow path?

10 A They maybe don't have it titled that, but I can certainly  
11 show you where it's depicted.

12 Q Was this something that you interpreted?

13 A No. I think it's right in front of us. Here we've got a  
14 two-dimensional representation. These red arrows I think  
15 we'd all agree are showing on an X-Y axis which way  
16 groundwater is flowing. That's the first two dimensions.  
17 The third plane would be the Z plane which goes into the  
18 stream, and each one of these lines, as we said earlier, is  
19 ten feet lower than the one before it. Obviously if there  
20 was one contour line here and we had these red arrows, it  
21 would be a two-dimensional flow path. But obviously water  
22 from here that's maybe at 1500 foot elevation and over here  
23 at 1400 foot elevation, we have seen a drop vertically of  
24 100 feet, --

25 Q Well, that's --

1 A -- which is certainly the third dimension, the Z plane.

2 Q Okay. So you were sort of interpreting that from the  
3 information that was provided?

4 A No. It says that. The numbers are right on the contour. I  
5 mean, it's 1500, 1490, 1480. It's clearly -- I mean, the  
6 arrow shows us our X and Y direction and the number in each  
7 consecutive line shows the drop as it moves to the  
8 northeast.

9 Q Well, the rules don't say you should either provide a  
10 contour map or a three-dimensional flow path. They are  
11 actually rules that require both of those things; am I  
12 right?

13 A Yeah. But this is showing you a three-dimensional flow path  
14 right here.

15 Q Well, that's a contour map, isn't it?

16 A Right. But by definition a contour map shows flow in the  
17 X-Y plane, which is the red arrow, and each consecutive  
18 shows a drop in elevation which is the Z plane.

19 Q Well, we've already agreed that the contour map doesn't  
20 comply with the rules. Okay?

21 A Who's established that?

22 MR. BRACKEN: Objection, Your Honor. I think that  
23 mischaracterizes his testimony.

24 JUDGE PATTERSON: Sustained.

25 Q We've already agreed that the contour map does not have

1 contours with one foot intervals. It's ten foot intervals;  
2 correct?

3 A I agreed to that, yes.

4 Q All right.

5 A Absolutely.

6 Q And you also agree that the rules require both a  
7 three-dimensional flow path and contour maps, don't they?

8 A Yes.

9 MR. EGGAN: Okay. Your Honor, I have a few more  
10 issues to go into. It's 5:00 o'clock. What is your  
11 pleasure?

12 JUDGE PATTERSON: I was just going to ask.

13 MR. EGGAN: This would be a good time to break if  
14 we were going to break.

15 JUDGE PATTERSON: Okay. Yeah. Let's do it, if  
16 you're not close to finish it.

17 MR. EGGAN: I'm probably a half hour or 45 minutes  
18 away.

19 JUDGE PATTERSON: Okay. Let's break now, then.

20 MR. EGGAN: Thank you.

21 (Proceedings adjourned at 5:00 p.m.)

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