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Q To have them arrive anywhere near wells G and H by May of 1979?

A Correct.

Q Thank you, Dr. Guswa.

I have no further questions, your Honor.

Recross-Examination by Mr. Facher

Q Doctor, I hate to trouble you again. You can get your morning exercise.

A Right.

Q Over here.

(Before the jury)

(Pause)

THE WITNESS: Any specific wells?

Q The data on the wells that Mr. Schlichtmann was asking you about. I just want to ask you questions about a couple of these well readings Mr. Schlichtmann asked you about.

Now, this is an overlay that was placed over what was a drawing that was shown to you and then some arrows were drawn on it.

Now, first of all, I want to ask you, you said there had been different data for the various surveys that had been made and you put that form on the board; is that right?

A That is correct.

Q And that data, depending upon the survey, would result in different water levels, ultimate computations; is that correct?

A That is correct.

Q Now, you have data from Weston and you have data from Woodward-Clyde, actually Geraghty and Miller. I think you testified you had the Weston figures first; am I correct?

A Yes.

Q So you used those.

Were you aware, sir, you said you had never seen this underlying drawing before?

A That is correct.

Q Were you aware at the time that Mr. Schlichtmann was questioning what data, that is what water elevations had been used in computing this or making this underlying drawing?

A No, I was not.

Q Now, we have put on the board the data for Geraghty and Miller, that is the result of the survey and the various fractions, and you get the water level; is that right, sir?

A Yes.

Q Now, first of all, Dr. Guswa, you were asked to draw

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an arrow based on a mathematical difference of 1/100ths of a foot, and that is your -- you drew an arrow from Well Cluster 13, which was 42.20, to Well Cluster 14, which was 41.119. That is to the two black numbers; do you remember that?

A Yes, I do.

Q And you first declined to do that and then you said, "Well, if you want me to show it as a matter of mathematics, I will draw it," or words to that effect?

A Yes.

Q Is 1/100ths of a foot a sufficient basis to reach any valid hydrological conclusions as to flow directions on this part of the property?

A No, sir, it is not.

Q Why is that not so?

A First, is the inherent uncertainty in the elevation area; that had been pointed out between the blue and black.

Secondly, the precision technique for making the measurements, which were electric tape, recorders, they're not precise with a hundredth of a foot.

Thirdly, we're looking at two-dimensional sections here and what is truly a three-dimensional system and so, mathematically, you can draw the arrow between the two points if asked to. The numbers are too close to each other to really make a determination for groundwater flow

direction.

Q Would you consider that then, a valid arrow to be drawn if you were trying to show flow direction based upon those two figures?

A No, I would not draw that.

Q Would you indicate the invalidity of that arrow, please, put a line through it.

MR. SCHLICHTMANN: You are drawing on your exhibit?

MR. FACHER: It is not an exhibit. It is a chalk.

MR. SCHLICHTMANN: Can we have another overlay?

THE COURT: You want to put another overlay on?

MR. FACHER: I don't have another overlay, your Honor.

THE COURT: I saw rolls of the stuff floating around.

MR. FACHER: We will have three layers.

THE COURT: Have three layers. You have two layers on the photograph.

MR. FACHER: It is not an exhibit.

THE COURT: It is not an exhibit. But when you're dealing with a blackboard, you can rub stuff on and put it back and move it around. With these ink things --

MR. FACHER: Can we borrow your Honor's scissors

and make a cutting?

THE COURT: Sure.

MR. FACHER: Thank you, sir.

THE WITNESS: I have to overlay this.

THE COURT: I have my eyes on those scissors.

MR. FACHER: You have your eyes on the scissors?

THE COURT: Yes, sir. One of the hazards of working around here is the liberation of hardware.

MR. FACHER: I will borrow Mr. Crowley's.

(Pause)

Q Now, why don't we put on there, first indicate -- Why don't you recopy the Woodward-Clyde numbers.

A Can I borrow your blue, please?

Q Wait a minute.

A There is -- Okay.

MR. JACOBS: Let the record reflect I am returning the Court's hardware.

THE COURT: Thank you.

(Pause)

Q Did you also say in your testimony that -- did it come out?

A It is very faint. I hope it will dry.

MR. FACHER: Maybe we have a darker blue.

(Pause)

Q Did you say that the margin for error was, with tape, at

least 2/100ths of a foot; do you remember?

A I think I said with the electric type, it looked like a tenth of a foot, but that is probably too much. It is probably half a tenth.

Q Or --

A A couple of hundredths.

Q Now, we have had testimony that the Beatrice property had a gradient of .001, that is 1/1000th of a foot. Would you say that that is essentially flat property?

A Yes, it is a shallow gradient, very shallow.

Q And what difference does it make or what is the significance whether you are trying to figure out flow direction based upon well readings, whether you have an extremely flat or basically flat surface with a gradient of only 1/1000th of a foot?

A Well, the significance is the precision of the measurement on it had to be greater than the natural gradient to begin with. If the measurements are precise, then the existing gradient, you can't make those determinations without it.

Q 1/1000th of a foot. I am still not sure I have it right. Is it about a hundredth of an inch?

A Well, an inch is a tenth of a foot. So a hundredth --

Q A hundredth of an inch?

A Approximately.

End B

Q We figure ten inches to a foot. So it is about a hundredth of an inch?

A Yes, that is right.

Q All right. This arrow that you drew, that you were asked to draw that complied with the drawing, would you indicate, then, the invalidity of that arrow by putting a blue line through it?

A A blue line?

Q Blue or black, whatever comes easier.

A (Witness complied.)

Q All right.

Now, put the red arrow under it or the X won't show up.

A Oh. (Witness complied.)

Q Now, put the X on top of it, and we will be all set.

A (Witness complied.)

Q Now, with respect to the Woodward-Clyde readings--

A Yes.

Q --and just following without commenting on the hydrological aspect, following the mathematical aspect Mr. Schlichtmann did, if you take the readings of 41.29, which is the depth of the SW well at 14 and 41.20, which is the depth of the well at SW-13, which way would the arrow go if you were doing it again, following Mr. Schlichtmann's procedure dealing with the mathematics?

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MR. SCHLICHTMANN: I object, your Honor, to the characterization.

THE COURT: I didn't even hear the question. Could I have the question read back?

MR. FACHER: I will rephrase it, and I won't put in a characterization.

Q Following the same directions that Mr. Schlichtmann asked you to make with regard to going to the higher -- no, the lower number at SW-13, what direction would the arrow go?

A It would go to the west (indicating).

Q Now, the difference at the top level, that is the shallowest well, is only two one-hundredths of a foot, and would you say you cannot make any -- would you say you could make any legitimate hydrological opinions based on two one-hundredths of a foot?

A It suffers from the same limitations that the other one did.

Q All right.

Now, with respect to the lower depth, and, again, just concentrating on the mathematical differences, Cluster 14 at CW-14 is 41.31 and at CW-14 is 41.24. Again, just bearing in mind those two mathematical differences, which way would the arrow go?

A It would go to the west.

Q All right.

Would you draw that in, please?

A (Witness complied.)

Q Now, with respect to the river losing water about which you've been questioned, the river, as you indicated, is really a much broader area than just a single stream flowing down the center of the property?

A That's correct.

Q So it is -- I think you estimated how much a hundred feet or something like that?

A Probably several hundred feet.

Q Several hundred feet.

And you showed a picture of the boards that had to be used to get to the well?

A Yes.

Q Now, is the river -- I want to show you the diagram, again, of the losing stream, that is, a stream that is losing water to the aquifer, and it has a kind of radical loss, would that be the correct way to describe it?

A That is what that diagram says, yes.

Q Is the river losing water over its-- Perhaps this isn't a good question, you perhaps won't understand it -- is it losing water over its entire width?

A Yes.

Q So it is, and it is losing water on both sides, if you can characterize it as such?

A That's correct.

Q So it would look something like the diagram? That is, the way the river is losing water or would it not?

A Well, I would draw it, real conditions as a lot of little arrows going vertically down showing loss of water from the river and from the marshy area, that is part of the river.

Q Okay.

There are arrows going down because there is a flow direction vertically and at least based on these head measurements, there is a flow direction of some sort at some levels going horizontally?

A That's correct.

Q Again, this may be an over-simplification. Does the vertical meet the horizontal and cause the arrow to bend or slant when you get into that situation?

A The horizontal -- The vertical and the horizontal are two dimensional representations of what is termed a curve linear or three-dimensional. When we talk about horizontal and vertical, we are talking about a horizontal and vertical component or horizontal or vertical. You mathematically can average those and get a diagonal component, depending upon how far apart those horizontal and vertical are, you get a curve linear path.

THE COURT: That is what we used to call a

vector in grade school?

THE WITNESS: Yes, it is.

Q And you mentioned something I think yesterday, Friday or Thursday about a temporary barrier, which you said you thought existed. Let's see if we can find it.

A That would have been the both pumping tests. Is that the one (indicating)?

Q Yes. I wanted you to explain what you had in mind and where you had it in mind when you talked about the temporary barrier.

A I talked about two. One between G and H themselves, because we had to separate wells pumping here. Two cones of depressions, if you will, on the water table surface with a temporary divide that probably runs horizontally, but I don't know the exact position or orientation between these two sort of ellipses.

In addition, there is another divide, temporary divide between this 40-foot contour and that 40-foot contour. These contours are based on these water level measurements and our best representation of the position of that contour. Similarly, for this 40-foot contour. Somewhere in between these two there exists a point of higher elevation which would be the peak, if you will, of the groundwater divide that separates the flow direction which goes basically toward the south and east and basically

toward the south and west to the different pumping centers.

Q I'm sorry, sir.

A And I cannot draw that divide in here on the basis of the things I talked about before, the precision of the surveying and the precision of the measurements (indicating).

Q Does the -- When we talk about barrier, once again, we are talking about water levels, are we not?

A That's correct.

Q And the higher -- There would be a higher water level somewhere in there which would cause the flow direction to divide?

A That's correct.

Q Now, what is the highest, as far as numbers are concerned, the highest water level that was recorded that you're aware of?

A I will take it off here (indicating).

Q Is it the 42.48 at S-92?

A Well, this map would only be the deeper levels. I don't have the plots of the shallow levels.

Q Here are the shallower levels. I think 42 -- check and see if 42.48 is the highest level of the shallow well within this area that you pointed out. Is it OW-14? I mean, S-92 shallow?

A S-92S has a 42.48 elevation. I am going to BW -- let me see if I can see anything higher than that.

Okay. Within this area to the southwest, if you will, this 40-foot contour, the single highest shallow well measurement that I have is at S-92S (indicating).

Q All right.

And that's the one that's at or in the river?

A That's correct.

Q Now, there is from that point of 42.48, there would be, as indicated on this map, if we had sufficient data to fill it out, there would be contours, descending contours on each side of the river; would there not?

A Yes.

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Q And the 40-inch contour that is shown that you were able to deal with, that is a contour because that was created by the Riley wells; is that correct?

A There is depression in the water level surface in response to pumping of the Riley wells.

Q And you mentioned -- and would that also have an effect on the flow direction in that area and in any contamination that was, and on any contamination that was in the groundwater?

A Yes.

Q And would the Riley wells then, draw groundwater from a given area and any contamination that was in the ground in the southern part of the property, would that be drawn to the Riley wells, in your opinion?

A Yes.

Q Now, you had -- you were asked about some triangulation drawing that was shown to you from S-92 -- I think we can use this.

A It was a big exhibit, I remember that.

MR. FACHER: Let's see if we can find that in the mean time. Is that over here?

(Pause)

Q Now, here is S-92 and going east is the well. And you were pointed out, I think, a triangle that was based on 92, 93 and --

A 95.

Q And you said to Mr. Schlichtmann that that was the worst place you could draw a triangle. I think that is a direct quote.

A Yes.

Q Well --

A Probably not the absolute words but it is not inappropriate. I probably said those words.

Q Would you explain why you reached that conclusion, please?

A Yes. The principle that underlies this triangulation method is that everything contained within the triangle is uniform. And there are no variations in the geologic properties, nor are there any additions of water to the system or subtractions of water to the system, if you will; and that there is a constant uniform hydrologic gradient within the area of that triangle; and that is not likely to be the case with a river running through the exact center of the triangle. It is a violation of one of the underlying assumptions.

Q Now, in your opinion, was there sufficient data from the 30-day pump test that could sufficiently simulate or duplicate pumping history for the 15-year period that we have been talking about with respect to the Beatrice property?

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A No, there was not.

Q Now, were you aware, sir, from looking at any of the well data, well logs, well readings, water level reading data, that there had been various kinds of mechanical problems in taking some of these well, water level readings?

A Yes. I wouldn't recall specifically. I know there were problems.

Q Were you aware, and I believe they're in evidence, some of them indicated there had been kinks or kink in the tape?

A Yes.

Q Others indicated that vibrations had caused problems?

A Yes.

Q And still others had indicated that they weren't sure from what mark, black mark or top of casing or top of PBC, the measurements were taken?

A That is the one that I am most familiar with.

Q Are these the kinds of things one had to guard against when you are dealing with an essentially flat area in trying to tell something about it from water level readings?

A Yes.

Q Now, in 1966 -- Srrike that.

After the wells stopped pumping in 1979, the groundwater direction then resumes its normal historic flow; is that correct? That is direction?

A Yes, it is not affected by Wells G and H, anymore.

Q So 'til Wells G and H affect the flow, you have the same north to southeast or north to south flow parallel to the river that you previously talked about?

A That is generally true, yes.

Q And you talked about the conditions that led to formation of the valley. For how long would you say that the normal flow with respect to the Beatrice property had been north to south or southeast and using the river as a drain, so to speak?

A (Pause).

Q Would you say a couple of thousands of years or more?

A Tens of thousands of years.

Q And the E & E, the report that you looked at, and I think was introduced, this is one of the drawings from it on the water table contours. I think they're down at 10-feet intervals?

A Yes.

Q But just showing the arrows, would you point out the flow directions indicated with respect to the west side of the river? This is normal groundwater flow conditions; correct?

A Yes.

This is Route 128, Olympia Avenue.

Q Right.

A And --

Q Just do the arrows that I have drawn, highlight the arrows that I have drawn.

A You want to highlight them?

Q Yes, just go over them. There is a lot of black lines.

A (Witness complies).

Q There is one to the north somewhere.

A (Witness complies).

(Pause)

Q And then the other side of the river is the normal northwest to southwest direction that you have indicated?

A Northeast.

Q To southwest?

A Yes.

Q Why don't you put those in?

A (Witness complies).

(Pause)

Q And then I think there is one that goes all the way down, plain straight north to south and right into the Mystic Lakes, I think that would be it.

A I would say pumping well something, I believe.

Q Looks like in Winchester?

A Yeah, south.

Q And the river is along the direction of that. Is there

some way to put in the river? Would color would be good for that? Blue?

A I think there is a blue one back here.

Q If you can find the river.

A (Witness complies).

Q Does that essentially accord with your indication of flow prior to pumping as you determined it?

A Yes. This map is made from well level measurements over a period of time. The general directions are the same.

Q Did you show that on a pre-pumping map somewhere?

A Yes.

(Pause)

Q And that is essentially the directions that you are showing on the work that you did on G-950?

A Yes.

Q The blue is the river and these other arrows are the flow indications pre-pumping?

A Yes.

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Q And your map doesn't go down quite as far as this one, which goes below the Woburn-Winchester line (indicating)?

A That's correct.

Q It just goes down to Salem Street?

A Right, it goes to about here (indicating).

Q Whereas Salem Street is here on the E&E map, Salem Street is here on your chalk (indicating)?

A This is Salem Street here (indicating).

Q Now, you said that under normal conditions, usual conditions that have existed thousands of years, the river acts as a drain, I believe that was the word. Could you explain that to the jury, please?

A Yes. The drainage area for Salem Street, approximately six square miles, that extends up in this general pattern, up this way, and all the rain that falls in this area either flows as surface water down the Aberjona River Valley or into the groundwater system and moves through the groundwater and flows generally parallel through the Aberjona River Valley to the south. And there is under nonpumping conditions, there is a vertically upward component of flow so some water flows into the river and is carried away in surface water.

Q When it goes into the river, it is carried along with the river?

A That's correct.

Q And then if there is pumping, that puts an unnatural stress on the system and creates different conditions that you described previously?

A That's correct.

Q Now, the water that is coming down here, going from north to south for tens, hundreds, or thousands of years, is carrying with it, is it not, in a dissolved state, any contaminants that it may have picked up as it flowed from north to south?

A It doesn't only have to be dissolved. It can be as a chemical slug, if you will, also be carried along with the water, but, yes, the river is carrying it down the valley.

Q And so is the groundwater?

A That is correct.

Q And that groundwater, and the river, of course, both pass through the Beatrice property?

A That's correct.

Q On the way south to the Mystic Lakes where it ultimately discharges, isn't that correct?

A Yes.

Q Now, in 1979 the wells stopped pumping?

A That's right.

Q And, therefore, the groundwater direction would have resumed this historical flow pattern?

A That's right.

Q So for seven -- six and a half years there would have been no pumping to put any stress on the system between, let's say, May of '79 and December of '85 or '86?

A Just the Beatrice wells.

Q Just the Beatrice wells.

A Yes.

Q And they would be drawing in contamination from the Beatrice property and creating the conditions that you previously described, is that right?

A Yes.

Q So that in 1986, for six and a half years, there had been no pumping stress, at least, on the system which would cause any contaminants to move; if, indeed, they did move from the other side of the river, you would have had natural flow conditions during that period?

A That's correct.

Q Would you resume your seat, please.

A Yes.

MR. FACHER: The exhibit I was using was B-772, E&E ,normal flow direction.

THE COURT: All right.

Q And in 1986, the wells had not been pumping long enough even to draw in any river water from the west, I think you told Mr. Keating, is that correct?

A That's what I think, yes.

Q And is it true that the wells when pumping would draw water from all sides but not necessarily in a perfect circle, that is in a 360-degree area, north, east, south, and west, but not in a perfect circle?

A That's correct.

Q And the area nearest the wells, I take it, would provide the water first to satisfy the wells?

A Yes.

Q And then it would expand out?

A That's correct.

Q And in the case of the pump test in '86, it hadn't even reached the river?

A The water did not come from the river, that's correct.

Q Yes.

A That's correct.

MR. FACHER: I think I have nothing further, your Honor.

Oh, I better mark two exhibits, mark and offer two exhibits that were used. One was the Woodward-Clyde information, which formed part of Mr. Schlichtmann and my examination, and the other is the information which I provided or we provided to Mr. Schlichtmann on the well level measurements used by Mr. Koch. I don't believe there is an objection here.

MR. SCHLICHTMANN: No, no objection.

THE COURT: All right. They are both admitted. What are their numbers?

MR. FACHER: Let's see. I think we are in the 900s.

MR. SCHLICHTMANN: This is the test results and not the correspondence?

MR. FACHER: This one is correspondence.

(Discussion off record between Mr. Schlichtmann and Mr. Facher.)

MR. FACHER: Those are the survey measurements you put on the board.

THE COURT: B-9 what?

MR. FACHER: 904, your Honor, and 905.

MR. SCHLICHTMANN: No objection to this. I do have an objection to the correspondence that are -- I have no objection to the test results, just to the correspondence.

THE COURT: All right. That is Woodward-Clyde test results is 904, and 905 is what?

(Discussion off the record between Mr. Schlichtmann and Mr. Facher.)

MR. SCHLICHTMANN: Just the front page.

THE COURT: What is 905?

MR. FACHER: 905 is a letter from Woodward-Clyde to the EPA with the elevations for W-14.

THE COURT: Any objection to that?

MR. SCHLICHTMANN: No, your Honor.

THE COURT: All right. In evidence, both exhibits. They are admitted.

MR. FACHER: We are going to write on the top of this, instead of correspondence, we're writing on the top of this Geraghty & Miller.

THE COURT: All right, whatever it is. Just get the number right.

MR. FACHER: This is 903, your Honor.

THE COURT: I thought it was 904?

MR. FACHER: 904 is a letter to the EPA and 903 is the test results of Geraghty & Miller.

THE COURT: We just lost a number. Now it is 903 and 904?

MR. KEATING: We have no objection to anything, your Honor.

MR. FACHER: 904 and 905 is right.

THE COURT: All right.

(Defendant Beatrice Exhibit B-904 in evidence, a letter to the EPA from Woodward-Clyde with the elevations for W-14.)

(Defendant Beatrice Exhibit B-905 in evidence, Test Results by Geraghty & Miller.)

MR. FACHER: 906, although I won't offer it at this time, is the overlay that Dr. Guswa just worked on.

That goes on top of P-901, which goes on top of--

MR. SCHLICHTMANN: This is all P-901, the overlay and the exhibit.

MR. FACHER: There is another one.

MR. SCHLICHTMANN: But it is a reproduction, and it is a different scale. They have to go all together.

MR. FACHER: Let me doublecheck my notes, your Honor.

(Pause.)

THE COURT: As a matter of fact, I don't think there is any 902 and 903. It doesn't really make any difference.

MR. FACHER: I don't think there is. I was just trying to leave a gap in case I had forgotten.

I am correct, your Honor, I have no further questions.

THE COURT: All right.

RECROSS-EXAMINATION BY MR. SCHLICHTMANN

Q Dr. Guswa, you were asked some questions on redirect about the bedrock?

A Yes.

Q And the bedrock trends?

A Yes.

Q And you have made no determination, I take it from both questions I asked you and Mr. Keating asked you, how the bedrock trends in that part of the aquifer?

A Do you mean the topographic trends or the --

Q Fracture trends?

A No.

Q How about the fault lines?

A That's correct.

Q Now, Dr. Guswa, you are familiar with the fact that the area was examined by E&E?

A Yes.

Q Particularly bedrock contamination?

A Yes.

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Q Including the fracture lines and fault lines?

A As best that I could map them, yes.

Q And you are also familiar with the fact that the E & E, in analyzing the area, found that the bedrock was highly fractured?

A I believe that I made that statement, yes.

Q Was highly fractured at Wells S-21 and S-22?

A I think that is what they said, yes.

Q They also determined that the fracture and fault lines trended, according to the basic fault lines in the area, which were to -- one was the Bloody Bluff fault zone?

A Yes.

Q An Indian massacre?

A Yes.

Q In South Wilmington; do you remember that?

A Yes.

Q And another one, another fault zone by Sweetwater Brook?

A Yes.

Q And they all, those trend northeast to west?

A Yes.

Q And they did a drawing of the area and indicated that the fault lines in the center of the aquifer by 21 and 22 there is a fault line there, as well, that parallels the Bloody Bluff fault zone and Sweet Brook?

A Yes.

Q And that is a trend northeast and southwest?

A Correct.

Q And, Dr. Guswa, fault lines and fracture lines trended northeast to southwest could provide a path for contamination, contaminated water to go from northeast to the southwest?

A It would depend on open fractures or closed fractures.

Q But they could?

A If they're open, they could. If they're closed, they couldn't.

Q Do you know if they're open or closed?

A No.

Q Do you know the determination E & E made?

A I don't believe they made a determination for the whole valley.

Q To that area?

A Which area?

Q I am talking about East Woburn aquifer between Salem and Olympia Avenue.

A I don't see how they could have made a determination.

Q But you have made no determination that contradicts their determination of the fault lines and fracture lines that we just went over; is that right?

A That is correct.

THE COURT: Well, are there determinations

that -- Did E & E make any determination whether they were open or closed?

A For the whole area, not that I know of.

THE COURT: For this particular area, for the center of this aquifer?

THE WITNESS: For the center of the aquifer, no. They made a determination S-21 and S-22 were highly fractured. There were test wells on Cryovac that said it is not highly fractured. Fracturing is a very localized phenomenon.

THE COURT: Does that mean it is open or closed when it is fractured?

THE WITNESS: That does not tell you anything. It tells you the rock was broken at one time.

THE COURT: My question is directed to whether there is anything in the E & E report that indicates whether these fractures are open or closed.

THE WITNESS: I don't think there is, your Honor.

THE COURT: Okay.

Q Did you run your model over it?

A I have the bedrock in as an equivalent porous media. It runs as they are open.

Q So you are assuming they are open?

MR. KEATING: I object. That is not what he

said. He didn't say he assumed --

MR. FACHER: Objection.. Argument or objection?

MR. KEATING: Both.

THE COURT: The objection is as to the statement.

I think the substance of it is okay.

In constructing your model, did you make an assumption the faults were open?

THE WITNESS: In constructing the model, I made the assumption there are fractures which transmit water through it.

THE COURT: Open fractures, in short?

THE WITNESS: Open fractures, but no direct pipeline from Cryovac to Wells G and H. That the water will move in response -- We know it moves through the bedrock becaus we have different water levels. We don't know the direction; that is the way it is incorporated in the analysis.

Q Now, Dr. Guswa, in your model you had to make certain assumptions about the pumping histories of the wells in the area; is that correct?

A No.

Q You didn't?

A No.

One assumption that had to be made relating to the 30-day test for the Beatrice wells, but they were

pumping during the 30-day EPA test.

Q They were pumping during the 30-day test?

A Yes.

Q You made that assumption?

A Yes.

Q When you ran your model, did you make assumptions about the historic pumping levels of G and H?

A Yes.

Q You put those in there?

A Yes. That was one analysis.

Q Did you also put in there the historic pumping rates of the Riley well?

A I didn't have the historic pumping rates for the Riley wells. I made an assumption about what those would be.

Q What is that?

A An average rate of 200 gallons a minute.

Q And you got 200 gallons a minute from the Woodward-Clyde report which stated they used about 300,000 gallons a day?

A I think there is a mathematical error in there.

Q Transferring gallons per day to gallons per minute?

A Yes. That only referred to one well, Riley Well 1 or 2. I calculated a number I believe was 150 or 175 average for that well, and then added a little more for the other well; and said, on average over the full 25 years,

about 200 gallons a minute.

Q You are aware the tannery used about 500,000 gallon less per day?

MR. FACHER: Objection. There is no such evidence.

MR. SCHLICHTMANN: Yes, there is on --

THE COURT: There was evidence from Mr. Riley as to the gallonage.

MR. SCHLICHTMANN: And Mr. Foley as well.

THE COURT: I don't remember the exact figure. But it was a lot of water.

MR. SCHLICHTMANN: Three hundred thousand gallons a day.

THE COURT: I don't know that.

THE WITNESS: That is about 200 gallons a minute.

THE COURT: What?

MR. FACHER: There's two wells involved.

THE COURT: I know. This is supposed to be the total.

Q Three hundred thousand gallons a day comes out to about 200 gallons a minute?

A Correct.

Q And that is what you assumed?

A That is right.

Q Now, you are also aware a pump test was done on the

Riley well at the Riley site prior to this pump test?

A Yes.

Q And you are aware of what level the pump was run for that pump test on the Riley well?

A No, I am not.

Q And you are aware of the cone of influence that Woodward-Clyde determined that that well exerted under that pump test, you are aware of that?

A I am sure I have seen it. I know I have seen it. I don't recall it exactly. I would be glad to look at it with you.

Q Well, does it refresh your recollection that when they ran the Riley well, which is located down here at this level, they did on the pump test, that the cone of influence extended no further than, in fact, reached a peak at Well 6 here (indicating)? Are you aware of that?

A I think that is what happened, yes.

Q And you are aware also there is a bedrock high in the property which comes right about that area?

A Well, there is a little rise in the bedrock. I would not characterize it as a bedrock high.

Q Well, Woodward-Clyde characterizes it as a bedrock high. You are aware of that?

A Yes.

Q Now, the level that that well was pumping during that

pump test only extended up to Well 6. Are you aware that they ran that at full capacity of the well, and the full capacity of the well was in excess of 600 gallons per minute?

A Yes, okay. I am not familiar with those details, Mr. Schlichtmann. But --

Q Does that seem right to you?

A Seems about right, yes.

MR. FACHER: That is Well 2.

MR. SCHLICHTMANN: Yes, that is the pump test they did on Riley Well 2.

Q And you are aware that the pump went from 570 to 770 gallons per minute during that pump test?

A The pumping rate fluctuated. Yes, I know there was a variation, yes.

Q Dr. Guswa, what was the average draw-down on the Beatrice site in the first 24 hours of the pump test, approximately?

THE COURT: Which pump test are we talking about now?

MR. SCHLICHTMANN: Thirty-day, between December and January of '86.

THE COURT: All right.

MR. KEATING: You said within the first 24 hours.

A If you would just wait a minute.

Which particular depth, shallow wells, intermediate

or the deep wells?

Q I want a rough approximation.

A This will be a little hard.

End F

mc-pf
G

I think you could say or I would say -- If we have to be precise, I have to go through and look at each of these wells. On the other hand, at the end of 30 days, it was a total change of about two feet, and so I would estimate, again, on the one day that change was less than one foot.

Q And do you know if it was approximately about a foot?

A Pardon?

Q Didn't it rain about a foot on that first day?

A Well, I'm just looking at a couple of hydrographs that we had, and that looks like -- if I had to make a professional estimate right now without going into details on this, that is what I would estimate.

THE COURT: Didn't we have a big black chart that showed that?

MR. SCHLICHTMANN: No, that was precipitation in the drawdown.

Q (By Mr. Schlichtmann) So your professional judgment within the first 24 hours of the pump test, the water levels dropped on the Beatrice site about a foot?

A Yes.

Q Now, Dr. Guswa, you will agree that the change in the water levels, drawdowns, are an indication of the -- in the monitoring well, some distance from a pump well, is an indication of the influence of that pumping well on the

monitoring well, am I right?

A It is an indication that the effects of the pumping affect that area, that is correct.

Q That means it is within the cone of influence of that well?

A The cone of influence meaning the area that is affected by the well, yes.

THE COURT: Is a cone of influence different from a cone of depression?

THE WITNESS: Yes.

THE COURT: How?

THE WITNESS: A cone of influence tells you nothing about groundwater direction. It is a cone of depression you need to look at in order to understand the direction of flow.

Q The next issue is first is it affected and the degrees that one is, is there a gradient going from that well over to the pump well, am I right or wrong about that?

MR. FACHER: I object.

THE COURT: You are objecting, Mr. Facher?

A Would you repeat the question?

(Question read.)

THE COURT: I don't understand the question.

MR. SCHLICHTMANN: No, it was a misunderstanding. Let me see what I can do.

Q One is the influence, is the pump well influencing an area where these monitoring wells are?

A That's correct.

Q Now, there is absolutely no doubt in your mind whatsoever, not even the teeniest bit of a doubt when Wells G and H were pumping there was an influence on the monitoring wells at the Beatrice site, am I right about that?

A That's correct.

Q And there is no question in your mind, not a doubt, not even the tiniest bit of a doubt that the drawdown on the Beatrice site was due to anything having to do with precipitation?

MR. FACHER: Objection, your Honor.

THE COURT: Overruled.

A Drawdown is a term that refers specifically to change in water level response to the pumping, water level change has more factors built into it. So the answer to your question is drawdown is only due to the pumping.

Q It was drawdown, no doubt about it?

A That's correct.

Q So precipitation or the lack of precipitation has nothing to do with that drawdown effect? We are talking about drawdown.

MR. FACHER: Objection, your Honor.

THE COURT: Overruled.

A That's correct.

THE COURT: We are talking about drawdown as opposed to change in the water?

A That's correct.

Q Just so we are clear here. There was drawdown, and drawdown on the Beatrice site means that Wells G and H were drawing down the water at the Beatrice site, am I right?

MR. FACHER: Objection, your Honor, that is not what he is saying.

THE COURT: It may not be what he said, but he can be asked about it. Overruled.

A In my professional opinion, the effects of pumping G and H influenced the west side of the river and caused drawdown on the Beatrice site. The Beatrice wells were also pumping, and they would contribute to that drawdown also. How much to separate out, I don't know.

Q Well, if the pump test at the Beatrice ran at the max at over 600 gpm only reached Well 6 and the well historically only goes at 200 gpm rather than 600 gpm and there was this test at Wells G and H in your opinion has concluded there was drawdown. Would you agree with me, sir, the probabilities are that at least above Well 6 for those wells that the probabilities are that Wells G and H were influencing those wells and were not being affected by the Riley well, which was pumping during the pump test, am I right?

MR. FACHER: Objection, your Honor.

THE COURT: Overruled.

A Would you tell me, refresh my memory, please, the length of the Woodward-Clyde pump test and how much water level change they observed at the well test south of Well 6, please?

Q Are you familiar with the report by --

A I have read it.

(Pause.)

A Okay, the question, again, Mr. Schlichtmann?

(The last question read.)

MR. FACHER: And I object because the assumption is incorrect and the rate is incorrect. It is an average. We are not talking about an average. We are not including Well 13.

THE COURT: I will let the question stand. Can you answer the question?

THE WITNESS: Well, I will try.

The Woodward-Clyde pump test was 27 hours long pumping at a 600 gallon per minute rate, and they made a determination on the basis of the prepumping and the post-pumping water table contour maps that they prepared, they show or indicate no effect of the pumping beyond Well 6, if it is in effect, it is within a tenth of a point. I am assuming they made the determination of less than a tenth of

a foot or not as not affected. What I could not understand from that, when they say "water table contours," whether that is the same as the shallow wells or whether it reflects the deeper wells, and they used the term "water table" when they mean water level. So I don't know how to answer the question to say -- repeat the question, please. It is not a very simple matter, Mr. Schlichtmann, and it's a very difficult thing to compare, so please--

Q Let me ask it this way: Based on this pump test --

A The --

Q -- Woodward-Clyde test --

A Yes.

Q -- which made the well go to its max, 600 gpm, and based on what we saw during the pump test of Wells G and H, I'm asking you if you can form an opinion based on probabilities, based on what you know, based on the results of those two pump tests, is it not true in your opinion that the probabilities are that at least above Well 6 that the wells on the Beatrice site above Well 6 were influenced predominantly, substantially, by Wells G and H and that any effect by the Riley well was minimal or non-existent during that pump test?

MR. FACHER: Objection, your Honor. There are far too many parts to that question.

THE COURT: Overruled.

END G

H

A I think that with the effects of G and H, they are more likely to be fed predominantly on the northern side of the Beatrice property on the west of the river; on the southern side of the Beatrice property, it is the effect of the Riley wells.

Q And that area, in your opinion, that area, based on what we know on these two pump tests, that G and H at least go down to six in the north. In other words, the northern influence area will be at least down to six?

MR. KEATING: Objection.

Q Just to be clear.

THE COURT: Overruled.

A I think G and H affect even down to Well S-46, the Riley pumping well.

MR. SCHLICHTMANN: No more questions. Thank you very much.

MR. FACHER: Can I have one question based on the difference between the cone of influence and the cone of depression and the flow?

THE COURT: Well, I think your witness had explained it. I am going to, with this kind of testimony, I will stay with the two-round rule. There is no end to it, no end to the complexities that can be unraveled with each succeeding question.

MR. FACHER: I only wanted one question.

THE COURT: Nobody ever gets by with one question because one question produces one answer which leads to another question.

We will now go to the jurors' questions. Maybe you will get your question answered that way.

MR. FACHER: Do you want to recess first?

THE COURT: No. We got a late start.

(CONFERENCE AT THE BENCH AS FOLLOWS:

THE COURT: Well, the first one, I think the first one is a question that I already asked him and he said he can't answer with any particularity. But if you want, I will ask him again.

If approximately 50 percent of the water from Wells G and H came from the river, where did the remaining water come from by direction and percentage?

MR. KEATING: Good question.

MR. SCHLICHTMANN: It is very good.

THE COURT: I think he had been asked it and can't answer it.

During the period --

MR. FACHER: This is during the pump test, I assume.

MR. KEATING: I think he means generally.

THE COURT: He means historically, not during the pump test. He said none of the river water.

H3

MR. KEATING: That is right.

MR. SCHLICHTMANN: That is right.

THE COURT: During the period when Wells G and H were not pumping but the Riley wells were, would groundwater from the Riley or Hemenway properties flow to the river/marsh, and then be drawn to Wells G or H when they resumed pumping?

That is a good question, too.

The third one is: Dr. Braids described a process of chemical breakdown in the ground due to the actions of microorganisms. Comment on the status and use of this theory by hydrologists and geochemists, the tetra and TCE to trans-di to vinyl chloride process, and Dr. Braids' contention that vinyl chloride would appear in three to six years after deposited tetra or TCE in the ground in the -- I guess Aberjona River aquifer. I am not sure he is qualified to answer that.

MR. KEATING: I think he would probably say he is not a chemist and --

THE COURT: He had not said anything about that.

MR. KEATING: I don't think he can answer it.

THE COURT: I won't give that one.

MR. KEATING: Will you explain to the jury why?

THE COURT: Yes.

Since there is no evidence that vinyl chloride

was used at the Cryovac plant or could have entered through the ground because of the groundwater divide, up-flow --

MR. SCHLICHTMANN: Up-gradient --

THE COURT: Groundwater divide upflow.

MR. SCHLICHTMANN: That is probably up-gradient.

THE COURT: Can you think of any source for its presence. If so, what are they?

MR. KEATING: That may lead to the one you just struck.

MR. SCHLICHTMANN: It is a little different.

THE COURT: Yes.

Well, that will get us into this biodegradation question. I dozt think that is a question we should ask this fellow, particularly.

Would you discuss fingerprinting as a detective tool, including what factors would allow you to include or exclude locations as possible sources of chemical contamination of well water?

All right.

On the basis of fingerprinting alone, discuss the following as sources of contamination at Wells G and H: The Hemenway property, the Riley 15 acres, the industries along the drainage ditch, the Cryovac site, how long would

each of the five modes of chemical transport you used contaminate the water of Wells G and H?

Use the water level data of Geraghty and Miller, and Weston Geo individually. Place the groundwater divide on the Hemenway and Riley sites; make the line as thick as necessary to accommodate for the uncertainty of the data.

Now, we have something passing strange and wonderful here.

It looks like recompetent DNA.

With attainable data, would you determine the levels of contamination of a Well X, from a location Y, over time as in the graph below or any other form?

MR. SCHLICHTMANN: Could you read the question? I didn't hear.

THE COURT: With attainable data, would you determine the levels of chemical contamination of a Well X from a location Y over time as in the graph below or on any other form?

MR. KEATING: What is the graph?

MR. NESSON: Where is this Y axis?

MR. KEATING: It looks like zero to --

MR. SCHLICHTMANN: Concentration.

It varies over time from '77 to -- they want to show --

MR. FACHER: Can I look at it?

(Pause)

MS. LYNCH: I don't understand it.

THE COURT: I think this doesn't tie it. I don't think he had enough cases to answer it. I am not inclined to give that one.

MR. SCHLICHTMANN: Would you resubmit it to the jury, your Honor?

THE COURT: No.

MR. SCHLICHTMANN: You don't want to present it? You don't think it is clear enough to the witness?

THE COURT: No. I don't understand it. No one here had told me what it means.

MR. SCHLICHTMANN: If I might, and see if my brothers and sisters agree, what they would like to know: They want him to graph how chemical concentration changes over time from the location, from a location.

THE COURT: How would he have any basis for doing that?

MR. SCHLICHTMANN: I think it is just theoretical.

THE COURT: Well, that is the problem.

MR. SCHLICHTMANN: It is just a principle. How does concentration --

THE COURT: You couldn't have it without knowing an awful lot of variation.

MS. LYNCH: A lot of variables.

THE COURT: I don't think you can make a meaningful paragraph. I will not give that one.

MR. FACHER: Can I have the first two again?

MR. KEATING: I think you have a couple of others.

MR. FACHER: I am trying to figure which ones I should object to.

THE COURT: If river water gets to Wells G and H, do you believe the water comes from the main stream of the river or the river tributaries?

Second one: Would acid or acidic water cause any significant change to volatile organics in water? If so, what would that change be?

That is a good question. I am not sure the man is qualified to answer it.

Would acid or acidic water cause any significant change to volatile organics in water? If so, what would that change be?

MR. SCHLICHTMANN: What was that?

THE COURT: You recall when they went plowing upstream, they came upon high --

MR. KEATING: High acids.

MS. LYNCH: There was one point of pure acid going in the drainage ditch.

THE COURT: I think I will -- I don't know if

he is qualified. But he can say. It sounds like he might have something to say about that. I think I will ask him that.

MR. FACHER: Can I look at the earlier ones or listen to them?

THE COURT: Why don't you read them?

(Pause)

MR. KEATING: Off the record.

(Discussion off the record.)

MR. FACHER: I would like to object. Your Honor had indicated the ones you would not give so I won't be objecting to those because they won't be given.

THE COURT: I put a line through the ones I won't give just to remind me not to give them.

MR. FACHER: I would object to -- I don't object to the last two that were read about acid and river coming from the main stream. I object to the remaining questions on the lack of foundation, in some cases, relevance.

THE COURT: Okay.

MR. FACHER: And to the chemical question on fingerprinting, on lack of qualification and foundation.

MR. KEATING: We have no objection.

MR. SCHLICHTMANN: No objection.

END OF CONFERENCE AT THE BENCH.)

THE COURT: I have most of these questions. I

am not going to give two questions that have to do with biodegradation. And the reason that I am not going to give those questions is this witness had not demonstrated any qualifications or any particular training with microorganisms and biodegradation.

I am also not going to give the question with the graph, but I appreciate the work that went into it, because it is so abstract. I don't think we can get any kind of answer that will relate to the issue at hand. There are many variables that have to be put in the equation that, in order to answer the question, and we don't have any basis for doing that.

But I will ask the other questions.

I think this first one relates to the historic pumping period because it refers to water from the river coming into the wells.

This is: If approximately 50 percent of the water from Wells G and H came from the river, where did the remaining water come from by direction and percentage?

THE WITNESS: The remaining water would come from lateral movement through the ground parallel to the Aberjona River in the coarse grain material, general outwash. It is coming down from the north. It would also come from the east, from the vicinity of the Cryovac plant and along that ridge flowing down, the result of rain falling

on the ridge, falling down to the center of the vatley and going in the area affected by the cone of depression of pumping wells, and there would be some coming from the west side of the river in its position. However, it is not known to me.

End H

THE COURT: You can't give percentages, then?

THE WITNESS: Oh, percentages? Well, I think of the remaining 50 percent, just as an estimate, probably 20 to 25 percent would be coming from the east, the remainder coming down from the north and the west. From the east, I mean, everything from the edge of the Washington Street and east and all the rain that falls down on the area to the east of Wells G and H.

THE COURT: During the period when Wells G and H were not pumping but the Riley wells were pumping, would groundwater from the Riley or Hemingway properties flow to the river or marsh and then be drawn to Wells G or H when they resume pumping?

THE WITNESS: I'm sorry, go over that, again?

THE COURT: During the period when Wells G and H were not pumping but the Riley wells were, would the groundwater from the Riley or Hemingway properties flow through the river or marsh and then be drawn to Wells G or H when they resumed pumping?

THE WITNESS: When the G and H are not pumping but the Riley wells are pumping, the water that is coming from the Riley wells -- coming to the Riley wells would come from close proximity to that well and move out

laterally. Some of the water will come from the river, some of the water will come from the west and north and south. The Hemingway property will probably be discharging up into the river, perhaps even the northern part of the Riley property itself discharging up into the river. Whether or not -- So that is generally what is happening hydrologically when just the Riley wells are pumping.

Then when the Wells G and H are pumped, depending upon the length of that pumping period and how large a cone extends to the pumping period, the Hemingway property or the water that came from the Hemingway property as well as anything else that discharged up into the river would induce the flow into the aquifer, but whether it makes it to the wells or not is a function of how long Wells G and H pump, and, therefore, it will affect whether or not they get to the wells.

THE COURT: Would you discuss fingerprinting as a detective tool, including what factors would allow you to exclude or include locations as possible sources of chemical contamination from well water?

THE WITNESS: Okay. Fingerprinting is a general tool that we use or that I use or that I think most people would use in a qualitative sense trying to understand sources of contamination. It is not a precise laboratory technique or a precise method of determination, but there

are certain characteristics that we look for. For instance, on the -- Just as an example of where we have done this before successfully where one site was known to have a rather unique chemical, hexachlorobutadyne, which is not commonly used and was characteristic of one particular source area, so we're finding that chemical elsewhere was a fingerprint or tracer, if you will, of that source.

With solvents such as TCE and tetra and 1,2 trans, those are so common that they cannot in and of themselves be used as a fingerprint. So we use other kind of fingerprint indicators. For example, on the Cryovac plant, and I think this is a very important fingerprint indicator, on the Cryovac plant we have almost equal parts of 1,2 trans and trichloroethylene. But in May of 1979, 1,2 trans -- excuse me, is the faster moving of all three of those chemical species. In May of 1979, there was no 1,2 trans in Wells G and H. I'm puzzled in the sense that if someone were to say the chemicals came from Cryovac, why wouldn't the fastest moving chemicals get there first? They didn't.

Secondly, if we look at Well S-64, which is located approximately three or four hundred feet to the north and to the east of Well H, that well contains TCE, and it contains tetra and 1,2 trans. If I just look at those chemicals, as I mentioned Friday afternoon, I guess,

the pattern wasn't consistent for the Cryovac being a source because we have this decreasing level of concentration as you move away from the Cryovac plant and then all of a sudden we have an increase in concentration. Now, in addition to finding higher levels of the complaint chemicals, there are also higher levels of chlorobenzene, which is not found anywhere near in between the Cryovac plant and Well S-64. That is a fingerprint to me to indicate that somewhere at the southern edge -- excuse me, the western edge of the Cummings property or along that drainage way that goes from Olympia Avenue and flows down toward Wells G and H, that there is an indication of another possible source of chemicals that needs to be investigated. And the principal recognition of that is the fact that there are new chemicals that were not, that didn't exist further to the east. But that is in a general sense how we have to use the fingerprint technique, if you will.

THE COURT: On the basis of fingerprinting alone, discuss the following as sources of contamination at Wells G and H. The Hemingway property, the Riley 15 acres, the industries along the drainage ditch, the Cryovac site.

THE WITNESS: On the basis of fingerprinting alone, discuss these potential sources of contamination?

THE COURT: Yes.

THE WITNESS: Those were Hemingway --

THE COURT: Hemingway, Riley 15 acres, the industries along the drainage ditch, and the Cryovac site.

THE WITNESS: Okay. For the Cryovac site, on the fingerprinting, I think that is an indication that the chemicals from the Cryovac plant didn't get to Wells G and H by May, 1979. As I stated earlier, the fastest moving chemical that we know that exists on the Cryovac plant of the three complaint chemicals wasn't in Wells G and H.

The Hemingway, the Hemingway barrels that were found and sampled, I guess early this year but had been known to exist as early as 1980, the fingerprint is very similar, identical to what we found in Wells G and H in May of 1979; that is, TCE and tetra and TCA but no 1,2 trans. That is an indication that that is a potential or probable or possible source of the chemicals to Wells G and H.

With respect to the Riley 15 acres and the industries along the drainage ditch, I don't think I can say anything of real substance because I'm not extremely familiar with the chemistry on the Riley 15 acres. I have not been asked to look at it, and I have not looked at it in a lot of detail.

In terms of the industries along the drainage ditch and to the north, I think that it's less clear how one would use fingerprinting to discuss them as

being possible sources of contamination. I don't see any clear way in which that actually can be done because there are a wide variety of chemicals found in the industrial area to the north, and in the mechanisms of transport which we print by surface water transport from the north to the south and in the vicinity of Wells G and H, the types of mixing, the same transport phenomena, velocity comparisons that we make in groundwater transports aren't the same, so I really can't make any conclusion about the industries to the north on the basis of fingerprinting alone.

THE COURT: All right.

How long would each of the five modes of chemical transport we discussed contaminate the water at Wells G and H?

THE WITNESS: I think the principal concept to try and understand is that in looking for the potential sources of chemicals to G and H, we look for areas that are hydrologically upgradient. And for the groundwater flow, that is a relatively easy determination to make. We look at our water table contour maps and we draw arrows, and you see that.

This source of the river being a source of the contamination, we focused through the testimony and the cross-examination principally on the pumping of Wells G and H during the pump test and the pumping of the Riley

wells. In fact, historically that is a very complex pattern, and, in addition to Wells G and H pumping and the Riley wells pumping, we also have the industrial wells for Stauffer Chemical or Consolidated Chemical located north of Route 128. Those also have the same hydrologic effect of drawing chemicals in water down into the aquifer system north of Route 128. Once the chemicals get into the groundwater system, they will persist for a long period of time and so a rather rapid transport, let's say, during the flood of 1979, which can bring chemicals down the river in a matter of hours if they are deposited on the ground and pulled into the ground in response to pumping, they can persist in the groundwater system for several years and may take tens of years to flow past Salem Street to Olympia Avenue or five years or ten years to flow past from Olympia Avenue -- excuse me, to Salem Street as part of the groundwater system. The rates of movement are very slow.

end I

VW/kr

A So in terms of the potential mechanisms, once it gets in the groundwater system, regardless of how it enters and how fast it travels before it gets in the groundwater system. The general conclusion we can only draw at this point is the groundwater contamination in the vicinity of G and H is there today, and may have been there five or ten years ago.

THE COURT: Using the water level data in Geraghty and Miller and Weston Geo individually, place the groundwater divide on the Hemenway and Riley sites. Make the line as thick as necessary to accommodate for the uncertainty of the data.

Can you do that?

THE WITNESS: Well, I will do it if I can also explain what assumptions we have to make when we do that.

THE COURT: Sure.

THE WITNESS: I have notprepared, based on the Weston Geophysical data, I don't have the same material for the Geraghty and Miller data.

THE COURT: Do the best you can.

THE WITNESS: That would be the post pumping.

MR. FACHER: Do you want an overlay?

THE WITNESS: I guess if you have an overlay, that might be better.

MR. KEATING: Is this big enough?

THE WITNESS: If you put it in the right spot, yes.

(Pause)

THE WITNESS: Now, the way we normally do this is identify -- actually, we usually have less data when we try to draw the divide. We identify the highest point. You remember this is the, these are the water levels that correspond to the wells at the same interval as the pumping well. So there is about 60 to 80 feet below land surface.

(Pause)

THE WITNESS: If we draw groundwater flow directions here, you see inside the cones of depression and draw them this way. The point is to try to identify the high point between these two areas, the boundaries between these two areas.

I am trying to eyeball a 41-foot contour. If I could draw a 41-foot contour and 42-foot contour, it would give information about where the groundwater divide would be.

MR. FACHER: Here are Geraghty and Miller's levels if you need those.

THE WITNESS: Okay.

(Pause)

THE WITNESS: That would be a 42-foot contour. That would be a 42-foot contour over there (indicating). 42-foot contour there. 42-foot contour would have to go around this whole 40-foot contour. I will use dash lines where

I have the most control and dotted lines where we have the least control.

(Pause)

THE WITNESS: So this is a 41-foot contour. We have one well, BW-2, which is enclosed within the one 41-foot contour, but it is about a foot and a half above everything else. So I don't know how to incorporate that in the contour line.

If I can use green, the groundwater divide, this is another sort of independent interpretation here. Trying to connect the points, highest elevation between those within any contour interval, and drawing a line that connects them. What to do in there, I really don't know what to do.

On the basis of this, if I were to draw a shadow zone, it would be several hundred feet wide, a hundred feet or so wide, as to what constitutes the actual boundary of the groundwater divide.

It comes down generally in this direction, the water up here will flow in this direction and this direction. This is approximately, on the basis of this information, this is where I put the divide, with the understanding that, you know, that could be off by a hundred or 200 feet in terms of the lateral position.

The other thing that is important to understand

is the position of this divide varies as a function of the pumping rate of the different wells and the length of time of the different pumping wells. So we see at the end of the 30-day test it may or may not be representative of anything that happened prior to 1979.

(Witness resumes the stand.)

THE WITNESS: That is with the Weston data.

THE COURT: Any more on that?

JUROR: he does not have the Geraghty and Miller evidence?

THE WITNESS: We will plot it on the map. We get another overlay.

End J

(Pause)

I will put the same boundaries on (drawing on the overlay).

I am going to plot the same depth wells that are on the first map. In that case, that would be the wells that are indicated by CW-13 or CW being the cobblestone which is down at the same interval as the pumping well. 13, 41.24. W-14, 41.31. S-92 deep, 40.9. That is the same, so I'm just going to circle it.

Your Honor, this table doesn't have the water level data for the same wells that I used for the first map. These are basically the shallow wells, so I don't think I can complete the illustration.

THE COURT: The shallow wells?

THE WITNESS: These are the shallow wells --

THE COURT: Can you use that data to generate --

THE WITNESS: A shallow well map?

THE COURT: --a water level divide?

MR. SCHLICHTMANN: Your Honor, I believe there is no dispute about the wells that are not on there. So the medium and deep wells are not disputed except the ones that are listed. You can use the numbers.

THE COURT: So that the result would be the same as the one that you've already done.

THE WITNESS: There is a difference here at

W-14.

MR. FACHER: I would like to see the shallow well divide, because that is something I would ask him in any event. That is what I was inquiring about.

THE COURT: Can you generate a shallow well divide?

THE WITNESS: Yes.

THE COURT: All right, why don't you do that.

MR. FACHER: What do you need?

THE WITNESS: I would like a piece of paper so I can erase these blue lines.

MR. FACHER: Wait a minute, I have a towel.

THE COURT: Generally speaking the deep well divide would be the same using the both figures. If there is no dispute about the figures, you will come up with the same divide?

THE WITNESS: Actually, maybe -- if Mr. Schlichtmann said there is no difference and I have no reason to doubt that -- I know W-14 is different. If you get these two gentlemen to agree to make that the only difference, I would draw the deep divide on the basis of that change.

THE COURT: Is that the only difference, gentlemen?

MR. SCHLICHTMANN: That is my understanding.

MR. FACHER: I don't know.

MR. SCHLICHTMANN: My understanding is that is the wells that there is any kind of a dispute on. The only one on there that I know that is different is 14. Correct me if I'm wrong.

THE COURT: Does the difference in 14 make any difference in your divide?

THE WITNESS: Yes, it would.

THE COURT: In what respect?

THE WITNESS: 14 in this case is one-tenth of a foot higher using the Geraghty & Miller data versus the Weston data.

THE COURT: Where does that put the divide?

THE WITNESS: Well, it may make the hundred foot zone 200 feet wide or 150 feet wide.

THE COURT: It is generally in the same area?

THE WITNESS: The area of the greatest uncertainty, generally the same area.

THE COURT: All right, I don't think we need to develop any further uncertainties.

Why don't you go ahead with the shallow water divide?

THE WITNESS: Okay.

(Marking on the overlay.)

MR. SCHLICHTMANN: While he is doing that, just for housekeeping, we should probably make these J-1 and J-2.

THE COURT: Mark them any way.

MR. SCHLICHTMANN: As jury exhibits.

THE COURT: Jury exhibits, all right. J-1 is the divide using the Weston Geophysical figures.

J-2 will be the shallow water divide using the Geraghty & Miller figures.

THE WITNESS: May I sit in the chair while I do this?

THE COURT: The clerk will keep custody of the jury exhibits. The parties keep custody of their own. Leave the jury exhibits with Mr. Lyons.

(Pause.)

MR. SCHLICHTMANN: Just for housekeeping, the overlays, these J-1 and J-2, go over G-952, for the record. Those overlays go over that exhibit.

THE COURT: All right.

(Pause.)

THE WITNESS: There are a few wells missing, the shallow -- I think my water level summary sheet, I have the end of the pump test shallow wells, if I could put those on?

THE COURT: All right.

(Pause.)

MR. SCHLICHTMANN: Would you use another color, Dr. Guswa?

THE WITNESS: I don't mind using a different color, but I would like a different point. I have already used blue.

MR. SCHLICHTMANN: Here is a fine point red.

THE WITNESS: All right. So the blue represents the Geraghty & Miller shallow water level data, and the red represents our recording of it. I don't know who measured all of these, but our data base, if you will, for the shallow water level data at the end of the test.

MR. SCHLICHTMANN: That will be Weston.

THE WITNESS: Well, I don't know. I don't know. Weston land surveyed, yes, that's right. I was thinking who measured it. But it is based on the Weston land survey.

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A I put one water level for S-80 with an asterisk beside it because it represents a January 2 measurement. It was not measured on January 3. I marked it in red and I marked it with an asterisk and put the asterisk on the explanation.

(Pause.)

THE COURT: How long do you think you will be, Dr. Braids?

THE WITNESS: Fifteen minutes.

THE COURT: Let's take a break, morning recess.

(Recess.)

End L

THE COURT: All right, Dr. Guswa, have you completed your diagram of the water level divide there in the shallow wells?

THE WITNESS: Yes.

THE COURT: Okay, do you want to explain what it shows?

THE WITNESS: Yes. The blue numbers refer to the shallow water level measurements based on the Geraghty & Miller land survey elevation data and then the water level measurements made at those wells. I've supplemented that information with a few wells shown in red, which are based on the Weston Geophysical land survey data and additional water level measurements, and on the basis of -- and I plotted those water levels at the wells on this diagram, and on the basis of those water level measurements, the groundwater divide, if I were to connect the wells, would be -- Well S-77 to 95 to 92, approximately parallel to the Aberjona River.

THE COURT: All right. Thank you.

I have yet two more questions resulting from the jury's --

MR. FACHER: New ones?

THE COURT: No, these are the same ones.

If river water gets to Wells G and H, do you believe the water comes from the mainstream of the river

or from the river's tributaries?

THE WITNESS: Repeat that, please?

THE COURT: If river water gets to Wells G and H, do you believe the water comes from the mainstream of the river or from the river's tributaries?

THE WITNESS: I think the first water that gets to Wells G and H comes from the marshy area directly above Wells G and H. There are some times of year, however, when that marshy area may be dry, in which case then the bulk of the water, the initial water would come from the center of the channel.

THE COURT: Well, I think this question may be directed toward sources like Hall's Brook and the drainage ditch as opposed to the mainstream of the river coming down from Reading.

THE WITNESS: Okay. Once the waters join the tributary, Hall's Brook joins the Aberjona River or the drainage ditch joins the Aberjona River, it is indistinguishable from one another, and you have a main body of water which is called the Aberjona River, which is in the vicinity of Wells G and H, and that is a mixture of water which comes out of each of those tributaries as well as water which originates in the Aberjona River at the upstream end.

THE COURT: Would it mix in a fairly uniform way?

THE WITNESS: In the surface water, it would.

THE COURT: Would acid or acidic water cause any significant change to volatile organics in the water? If so, what would that change be?

THE WITNESS: I'm afraid I don't know how to answer that question. It seems like a chemist's question to me.

THE COURT: You don't have training that would then enable you to answer that question?

THE WITNESS: No, no.

THE COURT: All right. Then that completes the questions submitted by the jury.

Now, I suppose in accordance with the rules that I mentioned earlier, everybody gets one more chance.

MR. KEATING: I waive my one more chance.

THE COURT: Mr. Facher?

Now, the questions now will be--

MR. FACHER: Just on what he was asked.

THE COURT: On what he was asked by the jury.

MR. FACHER: I would like to ask a couple of questions just to clear up something that he said, perhaps it would be helpful.

FURTHER EXAMINATION BY MR. FACHER

Q I think the first question asked about percentages, 50 percent came from the river, where would the rest come from?

A Yes.

Q And you said 25 percent would come from the east, is that what you said?

A I was trying to break it down.

Q Very approximately?

A Yes, right.

Q And the remaining 25 percent would come from the north --

THE COURT: 75 percent.

MR. FACHER: No, 50 came from the river. I'm just using -- I think -- that is what I didn't understand.

Q (By Mr. Facher) We start with the other half, 50 percent. 25 came from the east wells?

A Yes.

Q So on this side of the wells, on the sort of right-hand side of the wells, is that the idea?

A Could I stand up a minute?

Q Yes.

THE COURT: I wasn't clear whether it was 25 percent of all that remained or 25 percent of the total.

MR. FACHER: I was intepreting 25 percent of what remained. That is what I want to clear up with the

witness.

THE COURT: 25 percent of what remained and the rest of it is 75 percent. If it is 25 percent of the total, then the rest of it is 75 percent.

MR. FACHER: I was assuming we started with 50 from the river, 25 he says from the east and 25 north and west, but he couldn't figure out which --

THE COURT: Is that what you meant?

THE WITNESS: What I meant, could I use this map, here?

Q (By Mr. Facher) All right.

THE COURT: I got entirely different measurements.

MR. FACHER: I want to make sure I understood it, which may be wrong, too.

A The 25 percent that I was saying came from the east comes from an area approximately outlined this way and would go up here, that drains into but not -- gets to the river, would drain into the cone of depression, if you will, of Wells G and H. So that there is a large surface area on which there is rainfall. This is about the approximate position of the divide as some water enters the ground up here, some more water enters the ground up here, up here, all along this whole area (indicating).

THE COURT: That is what you mean by the

east?

THE WITNESS: That is what I mean by the east.

THE COURT: That would be 25 percent of all of the water multiplied by Wells G and H?

THE WITNESS: That is plus or minus 5 or 12 percent precision.

THE COURT: Mr. Facher is right about that.

end M

The remaining would be coming from the main body coming down, the aquifer coming from the north and some pulled from the west side of the river in response to the pumping. How far west would be a function of where this groundwater divide is.

Q Would that, when you say west, that is the marsh area that you were talking about, just using this photograph for a moment and relating it to the land surface area, when you talk about the marsh area, what is it you are talking about?

A The marsh area --

Q Do you understand the question?

A When you say west of the river, meaning this marshy area in here (indicating), that is on the west of the main channel of the river.

Q Your definition of the river, it could also include the marsh area; it would not be west of it?

A That is right.

Q And that would be, it is not shown on the diagrammatic map, but if it were shown on the white map, you would have the little tufts in there to indicate marsh?

A That is right.

Q This outline is land area and the white part is marsh as indicated on this photograph?

A That is correct.

So if we define the whole channel of the river

to be this, there is, it is coming from the river.

Q That is what I want to know. It really depends on how you define river. And in your definition, it is coming out of the river, which includes the marsh area?

A That is correct. It is easier to relate to the physical picture. But, in fact, the river spreads out over the whole marsh area.

THE COURT: You were saying it is not coming from the drylands area to the west of the river?

THE WITNESS: The drylands area to the west of the river, no, sir. It is coming from west of the river beneath the marsh area, but not coming from this area west of the railroad tracks.

THE COURT: Didn't you indicate earlier that the Hemenway property was a, by reason of the fingerprints, was a potential candidate for source?

THE WITNESS: Yes.

THE COURT: That is up on the, that is low-lying upland?

THE WITNESS: There is hills that site in the marsh area, yes.

THE COURT: So it is not part of the marsh area?

THE WITNESS: Well, some of the barrels are in the river that I have seen. And some of the land is up

above the marsh area five feet.

THE COURT: Is that included as the source of your water?

THE WITNESS: Yes. That would be the part of the water that comes from either -- You can put it in either of the categories, the northern portion that comes from the aquifer or some coming from the west.

THE COURT: What about the Riley property?

THE WITNESS: The Riley property, there is some water that will come from the west side of the river, will move towards Wells G and H. Whether it gets there or not, I can't answer because that really requires an analysis of the pumping schedules of both the Riley wells and G and H.

THE COURT: Okay.

Q The Hemenway, just to remind us, this is the location of the Hemenway you were talking about?

A Yes.

Q That had a, that is five feet higher, did you say?

MR. SCHLICHTMANN: I think that is Mr. Maslansky's picture of stuff along the river edge.

MR. FACHER: What is the blue dot?

MR. SCHLICHTMANN: That is the picture Mr. Maslansky took of trash.

THE WITNESS: The Hemenway is the drainage ditch

that comes in through here and the Hemenway area is right here (indicating).

Q That is five feet higher?

A Yes. There are areas that are five feet higher but you get your feet wet when you walk through the area.

THE COURT: Okay.

Q Now, the next question I have relates to a question that was asked and that had to do with the fingerprints. I think you will recall you said that with a chemical like TCE or some of these solvents being so ubiquitous or wide-spread, it can't be used very reliably as fingerprints or words to that effect. I wanted you to explain that.

A Well --

Q I would ask you to explain that.

A Yes. As it relates to my analysis and looking at, you know, what are the possible sources of chemicals to Wells G and H, we focus first on what is upgradient, hydrologically upgradient, and you look at, in addition to -- Well, you look at where are the septic systems, where are there areas where these chemicals may have been disposed as a result of barrel-dumping or as a result of machine shop or as a result of, there are so many different possible sources of TCE. It is not a unique chemical found in industrial areas. It is found pretty much everywhere. That is what I meant by it is not a reliable

tracer in the sense of saying if I find TCE-A and TCE-B, I have to further find the source of the TCE.

Q All right.

Now, you said that it was helpful to you that you, although you found 1,1,1_trans-di on Grace, you did not find it in the wells in May of '79. Did I understand correctly?

A That is correct.

Q And that is some indication to you -- What is your value of, what is your relative emphasis that you place on that?

A Well, if you had both chemicals on the property, the 1,2-trans would move the fastest of the two. Not finding 1,2-trans at the wells, I find it hard to believe TCE would get there since it moves slower.

Q And that same, in terms of relative speed, that same analysis would apply to the Beatrice properties as well?

A Would apply anywhere, yes.

Q The groundwater divide, you said, went from -- I want to make sure I understand. The shallow one you just did, and using the assumptions and the qualifications, can you explain to the jury -- it ran from 77 to 95 to 92, roughly parallel to the river?

A Yes.

Q And nothing in any of the answers to the questions changes the normal flow of the river under non-pumping

conditions? I mean the river, the normal flow of the groundwater; it is still north to south or north to southeast on the west side of the river?

A That is correct.

THE COURT: Mr. Schlichtmann?

Further Recross-Examination by Mr. Schlichtmann

Q Dr. Guswa, you put contours on this map, is that right? Is that what these dotted lines are, contours?

A Yes.

Q And in your profession, you draw flow lines perpendicular to flow lines?

A Yes.

Q We now have on here a 41, just so the jury can see, a 41 countour line here?

A Yes.

Q And then we have behind it a 42 contour line?

A Yes.

Q And so, in your profession, you would be able to draw arrows perpendicular, flow arrows perpendicular to the contour lines to show the flow between those contour lines; am I correct about that?

A Except we have the groundwater divide that goes up here. So if we draw a flow line and understand these contour lines

are best estimates, if we draw a flow line and come across this at right angles and go parallel to the divide and come down and go at right angles.

Q How about between the divide and this contour line (Indicating)?

A Between this and --

Q Yes.

A You draw in this direction.

Q Just like that?

A Yes.

Q So now, you drew your line at S-78; is that right?

A Yes. And also said the position could vary a hundred or 150 feet.

Q But you have drawn it as best you can estimate, based on the data?

A Yes.

Q Between this green line and this red line, you would be able to draw an arrow in the direction of flow?

A That is right.

Q Would you be able to do that for us?

MR. FACHER: Let's have another overlay.

MR. SCHLICHTMANN: You want it on another overlay.

THE COURT: I suppose if that is the way we're going to do it, if it is important to preserve each of the

overlays in which, in various stations of the exam, I suppose that is the process you should use.

MR. SCHLICHTMANN: All right.

THE COURT: Counsel will use these in argument. You can pull out the overlay you want without confusing all the others.

Q Would you be able to draw those flow arrows based on the contours?

THE COURT: I doubt I will permit arguments long enough to use all the overlays.

Q How about up here (indicating)?

A (Witness complies).

Q Up here?

A (Witness complies).

MR. SCHLICHTMANN: We will have this marked P-913. We will do the trimming afterwards.

Q That P-913 goes over J-1 and G-932. Have you marked off so we will be able to --

A You put the lines here.

Q The other thing is on this direction, it is for the medium and deep layers of the aquifer?

A That is right. This is deep layer under it, at the end of the pumping test.

Q Does that also apply for the shallow wells as well in that area?

MR. FACHER: Objection. You need the other overlay?

THE COURT: I am sorry?

MR. FACHER: I said objection. The shallow well is not on there.

THE COURT: It is on a different map.

Q How about between the divide, between the railroad tracks and the divide, which way is the shallow moving?

A In this case, this one would indicate movement in this direction, and this side in that direction. That is the significance of the divide.

Q Now, this divide, you said that, correct me if I am wrong, these arrows at the groundwater divide are going to go vertical?

A Yes.

Q Is that correct?

A That is what -- the conceptual significance is right, vertical movement only.

Q Now, this river, that is recharging the aquifer so the water will go the shortest possible distance, which is to try to go down.

MR. FACHER: I object. I think this is off the question --

THE COURT: I will permit it.

A Yes.

Q And that is how you have drawn it here on this overlay here, which is, excuse me, which is 901. You indicate how the water moves?

A Vertical down components.

End

Q Vertical down component. Thank you.

And, Dr. Guswa, transdichloroethylene was detected at Well G in 1979, you are aware of that?

A I believe it was the latter in '79, September, October.

Q Yes, it was detected in 1979?

A In October of '79.

THE COURT: In October of '79 but not May?

THE WITNESS: Yes.

Q September of '79?

A September.

Q Doctor, each chemical is going to move differently than another chemical depending upon where it's disposed of on the ground or where its source area is and how it travels through the aquifer, am I right about that?

A That's correct.

Q Each chemical is going to travel differently than every other chemical?

A Well, if they're disposed of at the same location, they will travel in the same general path. If they are deposited in different locations, they will travel in different paths.

Q If they are deposited in different locations, they will travel in different paths, and if they are deposited in different concentrations, they will flow in different concentrations along different paths? Am I right about that?

A Well, they are deposited -- Let me think this out for a

minute. Depending upon how much of the chemical is deposited, that's correct.

Q So that how much shows up at Wells G and H is going to depend upon many factors, including source area, concentration at that particular source area?

A Yes.

Q And, there were lots of chemicals detected up at the east drainage ditch, aside from trichloroethylene, is that correct?

A Yes.

Q For instance, toluene?

A Yes.

Q But none of that was ever found in the Aberjona River down in this area, was it, in the river (indicating)?

A Well, I think what we're dealing with here is a sample of the drainage ditch that was made in 1981 or '80 or '82, and we are trying to compare it to a groundwater sample collected in the wells in 19 -- There were phenols deposited at Olin. There are phenols found in Wells G and H in the pump test recently. I find it difficult and I find it hard to correlate samples from a surface water body made through years after we're talking about groundwater samples in a well.

Q Well, --

A Patterns, that's why I said I couldn't make any

fingerprint analysis, so to speak.

Q What I'm saying is these results that you put on a graph for the jury had to do with trichloroethylene from the north, do you remember, you traveled down through the Aberjona River?

A Yes.

Q What I'm saying there are lots of other chemicals, toluene was one?

A Yes.

Q There was never any toluene detected at any time since 1979 in the Aberjona River in this surface water, am I right?

A I am not as familiar with the data as you are. That may be right.

Q You have no recollection of that?

A That's correct.

Q But to you, just because one chemical wasn't found in the river, that chemical from the north doesn't preclude you from saying that this other chemical, trichloroethylene, might have come from the north and came down?

A That's correct.

Q So you don't use one chemical to check off whether another chemical is there, you look at each chemical by itself, am I right?

A I look at the chemical in the drainage ditch and the

history of the operation that went on in the north. To me that is a logical probable pathway for chemicals to get into G and H, coming down through the --

Q You don't have a checklist and say I found 25 chemicals in the east drainage ditch and I want to find the same 25 chemicals in the Aberjona River in the same relative concentrations for me to come to that opinion, you don't do that?

A No.

Q You look at each chemical and stand on its own merits and try to understand how it traveled?

A I use the drainage ditch chemicals as an indication of what was going on in that area. Those chemicals were all collected, as all samples were, all collected after Wells G and H were closed.

MR. SCHLICHTMANN: No more questions.

THE COURT: All right, that completes the round.

MR. KEATING: I have nothing further for Dr. Guswa, your Honor.

I want to know if I can have a moment before you recess for the day?

THE COURT: I have no intention of recessing for the day. We didn't get started until 9:30.

MR. KEATING: If I could consult for one

minute.

(Pause.)

MR. KEATING: I have nothing further for Dr. Guswa.

MR. SCHLICHTMANN: Thank you, Dr. Guswa.

THE COURT: Dr. Guswa, you are excused.

MR. KEATING: Your Honor, the defendant, W. R. Grace, rests.

THE COURT: Do you intend to put on any rebuttal evidence?

MR. SCHLICHTMANN: May I just have 30 seconds, your Honor?

THE COURT: Certainly. That is quite a decision to make in 30 seconds.

MR. SCHLICHTMANN: We may need 45 seconds.

THE COURT: All right.

MR. SCHLICHTMANN: May we see you at the side bar, your Honor?

(CONFERENCE AT THE BENCH AS FOLLOWS:

MR. SCHLICHTMANN: Your Honor, I may wish to put some chemical results actually into evidence. I'm just wondering if you could give me until tomorrow morning to make some final decision. It would probably be --

THE COURT: It would be pointless to bring

the jury in just to put in -- Some of these things that have already been kicking around? It will not take very long?

MR. SCHLICHTMANN: No.

THE COURT: Because you already put in all of the underlying testimony.

MR. SCHLICHTMANN: That's right.

MR. KEATING: Can I just ask you what data you are talking about?

MR. SCHLICHTMANN: Some of the samples that were not put into evidence yet. They were 703 material, and some water quality analyses?

MR. KEATING: One of the sites, Grace or Beatrice or what?

MR. SCHLICHTMANN: No, these would be water test results on Wells G and H, which were not put into evidence, a couple of those and some other water quality results, groundwater quality results that have not been actually put into evidence.

THE COURT: Groundwater results other than from G and H; from where?

MR. SCHLICHTMANN: In the East Woburn aquifer.

THE COURT: I understand that. We are talking Grace's area or --

MR. SCHLICHTMANN: It will cover both the

whole general area between Washington Street and Olympia.

THE COURT: The thing is to bring the jury back I think tomorrow we ought to go on a view.

Can you arrange a view for tomorrow?

MR. KEATING: Is Mr. Lyons the one?

THE COURT: It is pretty much up to the parties.

MR. FACHER: I'm not sure. Mr. Jacobs has been handling it.

MR. JACOBS: I would have to call this afternoon and see if we can get access to the 15 acres.

THE COURT: Can we get a bus?

MR. FACHER: I thought the marshal would take care of it.

MR. SCHLICHTMANN: It is not a problem.

THE COURT: Apparently the marshal's bus is very small, cramped, and would leave the jurors with the distinct impression that they were prisoners of the government.

MR. SCHLICHTMANN: We will arrange for the bus.

THE COURT: Have it here by nine o'clock tomorrow.

MR. JACOBS: We will have to check to find out about access. Are we going into the tannery itself?

THE COURT: They want to go into the tannery.

MR. JACOBS: They want to go in and walk around? We have to -- I believe the tannery right now is on vacation, so I have to find someone who has keys to the tannery and someone with keys to the 15 acres.

MR. FACHER: The tannery is on vacation, however.

THE COURT: Somebody better get in touch with Mr. Andy Hogeland to see what we're not supposed to do.

MR. SCHLICHTMANN: They have been talking to us and the other side.

MS. LYNCH: Not to us.

MR. FACHER: They have not been talking to me, not a word to us.

THE COURT: What I have in mind, as far as the Beatrice site is concerned, as a matter of fact, I think they ought to start down at the Aberjona Auto Works and walk up the access road to Olympia Avenue, and pick them up at Olympia Avenue.

MR. FACHER: That is a long walk.

THE COURT: How long?

MR. JACOBS: A couple of miles.

MR. FACHER: Not a couple of miles, but walk along the railroad tracks and get up --

MR. SCHLICHTMANN: The access road.

MR. FACHER: You can't get to Olympia from the access road. There is a fence there.

MS. LYNCH: You might want to check with the jurors. Mr. O'Rourke indicated he had some problems walking over a great distance.

MR. SCHLICHTMANN: What I can say about the trip, we can walk the access road, go up to the Hemingway site and come back. There is a commuter stop at the top of that Beatrice site. We can have the bus go into the parking lot. It is a 300-foot walk or 500-foot walk.

MR. FACHER: Longer than that, over a thousand.

THE COURT: All right.

MR. FACHER: You can't get through that way, you have to walk up back and all the way around. There is a fence there, Jan.

MR. SCHLICHTMANN: No, no.

MR. FACHER: You can't get over the fence with the bus.

THE COURT: They walk back down, again.

MR. FACHER: The other thing, when they go in the tannery, they have to walk back through the tannery and then down the hill where one and two is and across the back way --

MR. SCHLICHTMANN: You don't want to go

across the railroad tracks, Jerry?

MR. FACHER: Sure, there is.

THE COURT: There is a fence when you get there?

MR. FACHER: There is a fence when you get there, you can then see how they get there from the testimony.

THE COURT: You can see that without actually going there.

MR. FACHER: Well, you can. You do have to go to the back and there is a lot of walking involved.

THE COURT: All right.

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THE COURT: It is fine with me. I like the exercise. Just tell them to dress appropriately.

MS. LYNCH: May the lawyers wear sensible walking shoes?

MR. SCHLICHTMANN: What kind of clothing? We don't have to come with suits? Bush outfits?

THE COURT: I will wear something like a bush outfit myself and overshoes.

You get together the things you want to put together and we will discuss whether we will get them in or not.

MR. FACHER: They would have to go to the Grace property. I think it will be all day.

THE COURT: Sure.

MR. FACHER: Morning and afternoon?

THE COURT: Yes. I think I have something listed for tomorrow afternoon. The last I knew you had 76 more witnesses to go.

MS. LYNCH: Isn't it a pleasant surprise?

MR. SCHLICHTMANN: Can we go over it tomorrow after the view, put it all together for you?

THE COURT: Can't you do it now?

MR. SCHLICHTMANN: I don't know.

THE COURT: So we don't have to come back.

Wednesday we can start thinking about questions

and instructions.

MR. SCHLICHTMANN: I can show them to you tomorrow during the view without letting them know about it, if you get a stenographer.

MR. KEATING: Let us know before you let them in.

THE COURT: I am afraid I won't do that. It is hard enough to make these decisions sitting here without trying to do it on a bus or flying around in the middle of rhubarb.

MR. SCHLICTMANN: If you can give me -- I didn't expect him to rest right here. I need a little bit. I will try to keep it simple.

MR. FACHER: The other possibility is take it Wednesday. We have enough to do with the exhibits and chalks.

THE COURT: I had hoped not to be in the neighborhood on Wednesday.

MR. FACHER: That is right.

MR. SCHLICHTMANN: Can we go in first thing in the morning? We can have a conference before we get on the bus.

MS. LYNCH: We want to see it first.

THE COURT: I will tell you what. Come back here at 4 o'clock this afternoon.

MR. SCHLICHTMANN: I can do that if you want.

MR. KEATING: Oh, no.

MR. SCHLICHTMANN: Tomorrow is not --

MR. KEATING: I can't if you do it tomorrow morning --

THE COURT: We will do it in 15 minutes tomorrow morning.

MR. FACHER: Before you leave, sir, Wednesday you are scheduled to work from nine to one on what? We don't have anything to present to you in terms of requests.

THE COURT: We can certainly work on the questions. And the requests. I suppose it is going to be molded around the questions, I would think.

MR. FACHER: We have a lot to do with the exhibits. We have a huge discussion about which exhibits and chalks.

THE COURT: We can take up the question of what chalks will become exhibits on Wednesday.

MR. SCHLICHTMANN: Fine.

MR. FACHER: Yes.

MR. SCHLICHTMANN: And have a general discussion about it.

THE COURT: We will take the view and release

the jurors 'til further notice.

MR. NESSON: Did you say you don't want to be in the neighborhood Wednesday?

THE COURT: Afternoon. I am prepared to stick around 'til noon.

You know, the Supreme Court, last day of the Supreme Court is dependent upon Justice Brennan's reservation to get on the steamboat to get to Nantucket. That is true. He makes his reservation when he gets the sheet back from the steamship authority. He notifies the chief.

I have reservations on a ferry to New Haven, you see.

MR. KEATING: Could we get the results this afternoon, Jan?

MR. SCHLICHTMANN: Yes.

THE COURT: All right. I will tell the jury.

END OF CONFERENCE AT THE BENCH.)

THE COURT: I have been advised the fact that the defendants have rested.

The further material from the plaintiffs, the material will be entirely documentary. And I will try to deal with that first thing tomorrow morning. And then we are going to take a view.

Now, the view will require, I think we will

spend the day out there. And the view will require a certain amount of walking around. Much of the area that you will walk in will be wet. So I suggest that tomorrow's uniform of the day is old, heavy shoes and lightweight, but sturdy clothing that you don't care an awful lot about. And nobody will be critcal about matters of style or fashion. So that is the schedule for tomorrow. I think we will be all day. I have a list for tomorrow afternoon but I am about to scratch it. I don't think we will cover it.

We are going to the tannery if we can get into it. It is on vacation. The 15 acres. I suppose we ought to drive up, at least upstream some and take a look at all these other locations that, up above Olympia Avenue. And then go to the Cryovac site, take a look at that.

MR. FACHER: Do you want to look at the wells, too?

THE COURT: And look at the wells. You can drive in the wells.

Now, some things, I will tell you now, will be different. There used to be little puphouses over the wells. For reasons not clear, about the third day of this trial, the town, the City of Woburn, knocked them down. So that they will not appear as they used to. There

is a fence around the 15 acres or around most of it that was constructed in, I think, 1983.

MR. SCHLICHTMANN: 1985.

THE COURT: There is a little fence that is not the way it was. I guess those are the principal changes.

MR. SCHLICHTMANN: Maybe we better see you at the side bar. There is one other one.

(CONFERENCE AT THE BENCH AS FOLLOWS:

MR. SCHLICHTMANN: I think they should know about the changes behind the Grace site.

MR. CHEESEMAN: It looks more like during the events in issue than the intervening period when it was dug up.

MS. LYNCH: They restored the back and the vegetable gardens you heard about.

MR. KEATING: It looks as it did without the digging of the cross-sections.

THE COURT: You think it is prettier?

MR. SCHLICHTMANN: It is landscaped with picnic tables. The jury --

MR. CHEESEMAN: The aerial photographs from '82 to '85 --

MR. SCHLICHTMANN: It was landscaped in the last six months.

MS. LYNCH: No.

MR. KEATING: I don't want anything said to the jury that suggests that we manicured that place to make an impression upon them. I really mean this. The place had been cleaned up. The ditches have been put back together.

MR. FACHER: The whole area is different than '64.

END OF CONFERENCE AT THE BENCH.)

THE COURT: As you recall the testimony, most of the Cryovac site was dug up and people were digging ditches and making holes and drilling wells and pretty well chewing up the whole place. That had been restored. That is, the company had filled in all the ditches and filled in all the holes and smoothed the place up. I guess they planted some grass and other amenities of various sort in back of the property. So that is probably more or less the way it was before they started digging, but not necessarily exact. And so you should rely, with respect to that, on the photographs of the evidence that you had, which goes back to the critical times and keep thinking of the Cryovac property in terms of the general character of the property and the relationship of all of these properties to another and to the river valley and to the

wells. That is something, probably most valuable part of the view-taking.

Now, there will not be communication from counsel during the view, except to point out a particular item. Someone can identify the various things that we had testimony about, the Hemenway site. The debris pile F or debris pile E, or the sewer mains, just to identify them.

There will be no discussion and no comment other than simply to say, "That is a Woburn, City of Woburn sewer manhole cover" or "That is debris pile E," period. So that is how that will work. We will have a brief session here in the courtroom in the morning and then, at least we contemplate it now, the bus.

I suppose we better find a place to have lunch. Somewhere in the City of Woburn I am sure there is a place to have lunch and we will --

MS. LYNCH: There is various Burger Kings and McDonalds.

MR. FACHER: With respect to changes, you will mention the fact, the distinction between 64 and --

THE COURT: Oh, sure.

MR. FACHER: With respect to the Beatrice property.

THE COURT: It will be obvious. The countryside

had changed. You have had the pictures. You have had evidence and you have to keep all of that in mind.

I think it would be just as well to have a court reporter on the view, in case there comes a point at which we should stop and put something on the record.

Do we need a reporter?

MR. SCHLICHTMANN: I think it would be a good idea.

MR. KEATING: I think it would be a good idea.

THE COURT: I think so, too.

If you would arrange for just one reporter.

MR. SCHLICHTMANN: With boots.

THE COURT: On Wednesday morning, counsel will gather again and we will run through the problem of what chalks will be admitted as exhibits. And then, after that, we have the question of formulation of specific questions to be asked of the jury and the submissions are, the request for rulings of law. And that is likely to take some time. So I am thinking I will have to put you on short notice and say after we get through tomorrow you are free, subject to telephone call, to come in the next day. That will not be before Wednesday of next week and probably not that day or not Thursday; probably Thursday or Friday of next week but maybe not. Nothing takes, nothing goes as quickly as we

hope in this case. So that it is indefinite when you will be called back.

When you are called back, it will be for the purposes of hearing argument and charge, and then commence your deliberations. Once you start your deliberation, I will ask you to be here all day. Obviously, you are not going to do this in one day. And I will not, you know, keep you late at night or anything of that kind. But we will be working on basically nine to five during deliberations, because there is a momentum you get in your deliberation that is a pity to interrupt. You will have to start all over.

Now, one of the subjects that we will consider is what role, if any, the alternate jurors will play and I will tell you more about that.

Okay. We will see you tomorrow in your country clothes, good style shoes and be ready to do a little walking. Does that create a problem for anybody?

End P

(Whereupon the jury left the courtroom.)

THE COURT: There is one thing I want to put on the record.

(CONFERENCE AT THE BENCH AS FOLLOWS:

MR. KEATING: I have one thing I would like to ask your Honor off the record.

(Discussion off the record.)

THE COURT: I was really quite distressed Friday by the nature of a bench conference, and perhaps Mr. Nesson ought to be here. Mr. Nesson.

Now, it seemed to me we had a bench conference on the use of the title that was printed on the printouts, and it seemed to me that that really got out of control. I am pretty relaxed about bench conferences. I like people to tell me what they think. That seemed to get a little out of whack. Rulings in the course of a trial initially are largely instinctive. Based on counsel knows it, they are on their feet to object without necessarily having articulated chapter and verse, and the same is true of the judge.

At the bench conferences when we have them, we try to articulate them, but it does not come to a good result if everybody is rushing up here and making an angry assault upon the bench. I am not anybody's enemy.

I get paid daily to try and do a job. There is no reason to come up here with that kind of an approach. It has a bad effect, aside from the fact by reason of being the judge, I am entitled to a certain amount of at least civility if nothing more.

MR. SCHLICHTMANN: Did you think I was uncivil, your Honor?

THE COURT: Yes.

MR. SCHLICHTMANN: I apologize for that.

THE COURT: The problem is, among other things, we end up without getting the careful analysis that probably makes for a better transcript. In fact, with respect to that particular thing, we all missed the boat, we all missed the boat. There is a relevance question, but the basic problem was one of hearsay and nobody ever got around to that because I asked you what you wanted that for, and you said somewhere in here you wanted to show it was a three-dimensional model. The statement on its face says it is a three-dimensional model. Bingo, you were trying to introduce it for the truth of the statement. You also said you were entitled to it, but clearly you were not.

MR. SCHLICHTMANN: Right. I have a sense of entitlement, as your Honor has indicated on several occasions.

THE COURT: That is a problem.

Also a very short fuse.

MR. SCHLICHTMANN: I apologize.

THE COURT: I have one of those myself. I know what the problem is. We are now at the end of the things, so my little speech isn't of any particular consequence, but depending upon what the jury does we may be at this again in an even more difficult and complicated phase, and I just want to make it clear that I do expect a reasonable level of civility, though I do encourage free discussion. And if we don't get it, if that level isn't maintained, then we'll try to plow along without bench conferences. Obviously, there is no right on evidentiary points to any argument or any conference at all.

I find them useful because it is a complicated area and very often I get instructed.

MR. SCHLICHTMANN: Your Honor, if it means anything, at the end of it Mr. Nesson said much the same thing you did, but he didn't say it as nicely as you said it.

so if you give me another 70 days, I promise you--

MR. KEATING: Take it somewhere else, Jan.

THE COURT: Okay.

Thank you very much. See you tomorrow.

END OF CONFERENCE AT THE BENCH.)

(Whereupon the 71st day of trial was concluded.)