UNITED STATES DISTRICT COURT

DISTRICT OF MASSACHUSETTS

Civil Action
No. 82-1672-S

SKINNER, D. J.
and a Jury

ANNE ANDERSON, ET AL

V.

W. R. GRACE & CO., ET AL

Forty-Eighth Day of Trial

APPEARANCES:

Schlichtmann, Conway & Crowley (by Jan Richard Schlichtmann, Esq., Kevin P. Conway, Esq., and William J. Crowley, III, Esq.) on behalf of the Plaintiffs.

Charles R. Nesson, Esquire, on behalf of the Plaintiffs.

Herlihy & O'Brien (by Thomas M. Kiley, Esq.) on behalf of the Plaintiffs.

Hale & Dorr (by Jerome P. Facher, Esq., Neil Jacobs, Esq., Donald R. Frederico, Esq., and Deborah P. Fawcett, Esq.) on behalf of Beatrice Foods.

Foley, Hoag & Eliot (by Michael B. Keating, Esq., Sandra Lynch, Esq., William Cheeseman, Esq., and Marc K. Temin, Esq.) on behalf of W. R. Grace & Co.

Courtroom No. 6
Federal Building
Boston, MA 02109
9:00 a.m., Wednesday
May 21, 1986

Marie L. Cloonan
Court Reporter
1690 U.S.P.O. & Courthouse
Boston, MA 02109

(Jury present in the courtroom.)

THE COURT: Good morning, ladies and gentlemen.

What we are going to try and do is finish up with Dr. Pinder this week, meaning by tomorrow.

It's going to be a problem for him to get here next week, and it would be a good deal of difficulty if we don't do that. Mr. Keating's cross-examination is likely to end sometime this morning, and then there will be redirect --

Oh, incidentally, at the end of Mr. Keating's examination I'm going to permit you to ask what questions you want so as the morning goes along if you -- you might be thinking of how you want to phrase a question, if you do. Don't feel obliged. If you have something that's been in your mind, this is the time. Please don't ask a question that's going to take the Professor back to square one and all the way through the entire routine.

Then Mr. Schlichtmann will want redirect examination, and the idea would be to leave tomorrow for recross.

Now, in order to do that, we may have to work this afternoon. Will that present any special difficulty to anybody if we just pick it up again at 2:00 o'clock and work, say, no later than 4:00?

MR. FOX: I'm involved in something else in

the afternoon, and it's not --

THE COURT: Could you make a telephone call and get yourself cleared at the break? Could you do that?

MR. FOX: Yes.

THE COURT: Thank you. I think it will make quite a difference in how this day proceeds. Then we can pick it up next week. We have Wednesday and Thursday of next week. I guess we pick up with Drobinski again.

All right. Well, let's press along this morning and see how well we do. We may get done, but I wouldn't put any bet on it.

Okay.

It's reported there's a breeze starting outside and maybe it will make its way in here.

MR. KEATING: I wonder if I might begin this morning by reading to the jury the Exhibit 560. I think it's easier than having it passed around, and it's only a page and a half.

THE COURT: I thought you read it yesterday.

MR. KEATING: I only read a portion of it yesterday.

THE COURT: All right.

MR. KEATING: Ladies and gentlemen, this is Exhibit G-560, which is entitled "Exhibit 1-12," and it's further entitled "Agreement," and I will read.

It's a page and a half.

It states: "Whereas, Professor George Pinder has entered into an agreement to provide consulting and other services on behalf of persons who are Plaintiffs, (the plaintiffs), in an action in the Middlesex Superior Court of the Trial Department of Massachusetts, entitled Anderson et al versus UniFirst Corporation, Docket No. 85-2098 (hereinafter 'the lawsuit') and in an action in the United States District Court entitled Anderson et al versus Cryovac et al, Civil Action No. 82-1672; District of Massachusetts ('Federal Action'), and whereas UniFirst Corporation, a Massachusetts corporation (hereinafter ('UniFirst') is the Defendant in the lawsuit, and whereas Plaintiffs and UniFirst have entered into a settlement agreement (the 'Settlement Agreement'), under which Plaintiffs have agreed to apply the monies to be given thereunder toward their legal obligation to satisfy the reasonable litigation expenses and disbursements incurred in the lawsuit and in the federal action, which include expert and consulting fees; and whereas pursuant to Section 4 of the Settlement Agreement it has been agreed that UniFirst obligations thereunder are expressly conditioned upon the execution of this Agreement."

Page 2. " Now, therefore, in order to induce UniFirst to fulfill its obligations under the Settlement

Agreement and for other good and valuable consideration the receipt and sufficiency thereof being conclusively acknowledged, the parties hereto agree as follows:

"1. Professor George Pinder promises not to consult, testify or otherwise provide services to any person who is seeking to bring or who has brought any action or claim against UniFirst based on the transactions or occurrences that are at issue in the lawsuit.

"2. UniFirst is hereby expressly granted a right of action for a specific performance of this agreement.

"Dated this September 21, 19 --" Excuse me. "-- September 21 day of September, 1985.

"Signed: George Pinder and Sally Collier,"

And witnessed by Mr. -- hard to read the writing -- Mr. Ronald Furth and Mr. John Bartlett.

GEORGE S. PINDER, RESUMED

CROSS-EXAMINATION BY MR. KEATING, CONTINUED

b-1 vw-pf

Q Dr. Pinder, the first page of this agreement refers to monies to be paid to expert witnesses. Did you receive any monies from the UniFirst Corporation?

A No.

Q What consideration did you acknowledge the receipt of on Page 2 when it says "for other goods and valuable considerations, the receipt thereof being conclusively acknowledged"? What consideration or what did you receive of value from UniFirst to enter into this agreement?

A Absolutely nothing that I am aware of.

Q Did you receive monies from any other party in connection with this lawsuit at or about the time that you signed this agreement with UniFirst?

A All of the monies I received in this lawsuit come from Mr. Schlichtmann's office.

Q Could you recall whether or not you have received, you did receive any monies in connection from Mr. Schlichtmann's office at or about the time that this particular agreement was signed with UniFirst?

A You have my financial records. I have no correlation between that activity and -- that I am aware of.

Q Your financial records do not disclose the date when you received money; they only disclose bills that you submitted. Do you know whether or not you received any money from Mr. Schlichtmann on or about the time that you

signed the agreement with UniFirst?

A I have that information if you want me to --

MR. SCHLICHTMANN: That information was provided, your Honor.

MR. KEATING: I will check. It was just given to us a few moments ago.

Q Were you paid for the services that you rendered in the action against UniFirst?

A Sir, I have never even met with anyone from UniFirst. I have had no contact with them that I am aware of.

Q Do you know what consideration therefore UniFirst was receiving in this agreement that you signed with them?

A It is my understanding that what they were seeking was an agreement that I would not at some point after this trial be involved with someone who was attempting to sue them regarding the same basic problem.

Q Your agreement states that you agreed not to consult, testify or provide services to anyone who might have a claim against UniFirst; is that true?

A Those are the words that were in there. That was my interpretation of them.

Q And the transactions or occurrences which are referred to in Exhibit 560 are the transactions and occurrences which are set forth in the complaint that was filed against UniFirst which are the same transactions

and occurrences which were set forth against the defendants in this case?

A Quite honestly, I don't understand what transactions and occurrences mean in the legal context. I took it to mean that I would not be involved in work for someone who was attempting to sue UniFirst. And that seemed perfectly all right with me.

Q The transactions and occurrences which are set forth in the case against UniFirst involved surface, alleged surface and groundwater contamination moving from the UniFirst location to the locations of Wells G and H. Were you aware of that?

A Was I aware of--

Q Of the substance of the complaint in this state court action against UniFirst?

A I thought it was fundamentally the same as here.

Q Involving solvents and groundwater contamination alleged to have moved towards Wells G and H?

A To my knowledge, I never saw the complaint. I have no -- I can only indicate what I have learned from third parties. It seems like it is something of what we are doing here.

Q Well, I have in my hand, Dr. Pinder, a copy of the complaint in the state court action, which states that it is based upon alleged surface and groundwater contamination,

solvent spills and other related matters from UniFirst Corporation, and that those solvents are alleged to have moved on the surface and groundwater and by gravity toward the wells, moving to the aquifer in a plume of tetrachloroethylene. Were you aware of that?

A I don't think I have seen that complaint, sir.

Q You signed that agreement on September 21, 1985. On December 10, 1985 you were deposed for the first time in this case and you were asked whether you had learned anything about contamination at the UniFirst property. You said at that time, "I have seen no documentation to that effect."

And then you go on to say, "I can't remember seeing anything in print. It is my interpretation of information that has come to me from various sources that they use some chemical, organic chemicals at that company; and that at some point in the late '70s there was a spill of some kind. I am not particularly interested in that aspect of the case so I don't remember the details."

Do you remember saying that?

A No. It sounds like it is not an unreasonable statement.

Q In February of this year, after you had completed your work in this area, you were asked again this question: "Have you ever attempted to determine what concentration of chemicals UniFirst or Interstate Uniform made to Wells G

and H?"

ANSWER: "I have done some very cursory examination of that possibility. And based upon a spill in the late '70s, it did not seem probable that they would have contributed to the well by 1979."

QUESTION: "And you have not done anymore work on that question?"

ANSWER: "Nothing more exhaustive than looking at the problem long enough to convince myself that it was not of great significance to me."

Do you remember saying that?

A I can remember that line of questioning. I have no reason to believe you are not reading it correctly.

Q And last week when you were asked about your opinion in this case and you were asked about the UniFirst site, you said at Page 66, and I am referring to possible contaminations, you said also, "Contamination arising from the Interstate site -- " which I take it we mean the UniFirst site?

A Yes.

Q "-- is possible, not moving very far but existing at that point in time, not likely contributing to contamination of G and H."

Do you remember saying that?

A Again, I remember the general line of questioning. I

don't remember the details.

Q That is still your opinion?

A I think everything you said is consistent.

Q And yet, UniFirst, Dr. Pinder, on Page 2 of the agreement, Exhibit 560, specifically reserves the right to sue you if you assist anyone in trying to bring a claim against them in connection with the East Woburn aquifer?

A That is news to me. It is not good news, it is news.

Q That is what it states? You read this before you signed it?

A I am not a lawyer. I don't know the ramifications of the legalese you are reading.

Q UniFirst is expressly granted a right of action for specific performance of this agreement, which is legalese for saying they have a right to sue you if you don't live up to the agreement?

A I think I need a law degree.

Q As I understand it, if the EPA or the Woburn Board of Health or some other government body was conducting an investigation of the East Woburn aquifer, which might involve an inquiry into the activities of UniFirst Corporation, and they wished your help or cooperation, they would not be able to have that cooperation as by virtue of the agreement that you signed with UniFirst?

MR. SCHLICHTMANN: Objection, your Honor.

This is Dr. Pinder's interpretation?

MR. KEATING: I will ask for his interpretation.

MR. SCHLICHTMANN: Is he asking --

THE COURT: We will find out without any coaching.

MR. SCHLICHTMANN: All right.

THE COURT: Make your objection. If you have more to say, say it over here (indicating).

MR. SCHLICHTMANN: Yes, your Honor.

A The question is?

Q If the EPA or the Woburn Board of Health or some other government agency was conducting an inquiry or an investigation into the East Woburn aquifer and that involved activities of the UniFirst Corporation, and they sought your assistance as a hydrogeologist, you would not be able to render to them any assistance as the result of your signing Exhibit G-560; is that true?

A It is my understanding of the document that it would not preclude me from testifying regarding UniFirst, but that I could not be employed gainfully in any activities that would be on behalf of parties against UniFirst.

Q Well, that is your interpretation?

A That is mine.

Q Provide services to any person seeking, consult,

testify or provide services to any person seeking to bring a claim against UniFirst?

A That is my understanding. I did not think that it precluded me from participating in my capacity as a witness if I was somehow formally engaged by someone else, such as here today.

Q Have you ever signed an agreement, Dr. Pinder, like this agreement before?

A I don't think I have seen an agreement like this before.

Q And you have not signed an agreement like this before?

A I don't think so.

Q Now, when you signed this agreement--

A Maybe I have in terms of private clients who often have a concern over what activities I might be involved in while gainfully employed for them. I certainly signed documents not totally unlike this. I don't think I ever have seen one quite like this.

Q Not on behalf of a client of yours for some confidentiality agreement, you have not signed an agreement of this nature before?

A I don't know what the -- what do you mean by "like this"? I think probably the fact is it is involved in some kind of settlement, which makes it unique. The constraints are not particularly unusual.

Q When you signed the agreement, Dr. Pinder, were you

told that there was information about UniFirst that UniFirst did not want revealed?

A I don't think so.

Q Were you told UniFirst was so concerned about the situation at the site that they were willing to pay people not to assist or testify against them?

A No. I have no knowledge of any of these things.

Q But your examination of the UniFirst site was, using your own terminology, a very cursory examination; is that true?

A I think in the --

Q Your language is very cursory examination?

A We are talking about the deposition or --

Q I am talking about the deposition of February 14, 1986 when you were asked about an investigation of the UniFirst site and you said, "I have given a very cursory examination."

A If we mean by that that I looked at information in a nondetailed fashion and did not do detailed calculations at that time, I would say it was cursory.

Q So you don't know, Dr. Pinder, what information exists beyond that very cursory examination which may establish UniFirst as a possible contaminator of Wells G and H?

A The information available is the information that is in the public domain. I imagine the UniFirst reports are

also in the public domain. I would have UniFirst reports. the general hydrology and chemistry of the aquifer, I think that--

Q Is about it?

A --that constitutes what I know about the site.

Q And you have been paid by UniFirst, or you signed that agreement, so that you would not make any further investigation; is that true?

A The first part of your question was whether I was paid by UniFirst. I told you before I never met anyone from UniFirst to my knowledge.

And the second part of your question was?

end B

c/l l/m

Q So that you would not -- or you signed the agreement so UniFirst could be assured you would not do any further investigation of their site?

A I don't know the details of their motivation. I expressed to you what I thought was the situation, that they basically didn't want me to work for someone who was going to be a plaintiff against them. I guess that normally would not -- would preclude me from -- normally would preclude me from doing additional field investigations on their site unless by some most extraordinary event that I was working for them.

Q And you are, however, being compensated by the plaintiffs to testify for them in this proceeding, isn't that true, or by Mr. Schlichtmann's office?

A I'm being compensated at my normal consulting rates for the time I spend on the case.

Q That comes on behalf of the plaintiffs by Mr. Schlichtmann, or presumably by Mr. Schlichtmann, isn't that true?

A That would be my understanding.

Q And you also, I take it, signed in Exhibit 560 an agreement that acknowledged -- the agreement not to do any work on behalf or against the interest against UniFirst?

A I think that's what I've been saying.

Q Now, let me move to another topic which is related to UniFirst but not the same subject I've asked you about this

morning and that has to do with the concentration of UniFirst -- concentration of tetrachloroethylene or perc which is noted on your long chart -- strike that -- which is noted on the chart of concentrations, I think, on your stick figures at Well G, W3DB, and that's a concentration that is noted there as over 73 hundred parts per billion.

Do you know that figure I'm referring to?

A I know it well.

Q You know the location of the well?

A I don't know the figure. And I know the location, but that number doesn't fit very comfortably with me.

Q The 73 hundred is the UniFirst figure for the concentration of tetrachlorethylene at that particular site?

A At 3DB, sir?

MR. SCHLICHTMANN: I believe he means GW3DB, the Grace well.

MR. KEATING: I'm sorry.

Q I beg your pardon, Doctor. What's the maximum concentration that you found at the UniFirst site, 73 hundred?

A That's my understanding in prior discussions yesterday, and I recall that we were talking about something in the order of 7,000 at UniFirst.

Q Now, the maximum concentration of tetrachloroethylene that was found at the Grace site, I think you testified yesterday, was about a thousand PPBs?

A That's right. I recall that, sir.

Q And that was at Well GW3DB that I referred to a moment ago?

A Yes, sir.

Q And, in fact, that reading, Dr. Pinder, was 11 hundred PPBs?

A I was rounding it out in both cases.

Q Do you know how many readings were made of Well 3DB?

A Not without referring to the records.

Q You have chosen, or Mr. Drobinski, whoever picked that number, has chosen the maximum reading that was made at that particular well consistent with --

A That's correct. That number should represent the maximum.

Q And there were other readings of that well; are you aware of that?

A I would have to look at the records, sir. I don't know how many were recorded for that particular well.

Q Let me show you the readings for Well GW3DB. Let me show you the analysis, organics analysis data sheet which lists the tetrachloroethylene at 11 hundred. And this is the other sheet which ties this in with the Well 3DB.

You take a look at those, if you would.

I think those came out of the boxes behind you, Dr. Pinder.

A Yes. I agree with you. I think they did. I was just

looking to see how much information was on these documents.

Can I just take a moment to look at what we have?

Q Yes. Take a moment. As long as you need.

(Pause.)

A Okay. I think I have some idea what's here. You want these back?

Q Yes.

Now, the 11 hundred tetrachloroethylene reading is set forth on this particular chart, eleven hundred, where it's highlighted in yellow?

A This is the reading, yes. Whether it's the only reading, I'm not sure.

Q Well, I want to show you some other readings. If you could come over to the jury area.

Are you aware, Dr. Pinder, that there were eight and only eight other readings of Well 3DB made?

A No. I think I indicated I didn't know the number of readings that we had of that well.

Q Now, I want to show you first the readings of Well 3DB for tetrachloroethylene that were made by ETC, which is one of the labs, the Grace lab, that a lot of the data in those boxes is from, and ask you to read for the jury the readings that they received on Well 3DB, if you can see the one I'm referring to, and the date of these readings.

e/l l/m

Q Well, I appreciate it's a matter of judgment, but to the extent that you are seeking to draw inferences, to the extent that you are seeking to make comparisons, to the extent that you are seeking to put before the jury in this case information that will be helpful to the jury in coming to a decision, wouldn't it be fairer to use a figure for the Grace Well 3DB more like 47 to 50, since that's what seven of the measurements were, rather than the 11 hundred which was the only other measurement?

A I think they all have to be considered, sir.

Q All right.

New topic. When you testified on direct examination about travel time for the particular chemicals from the Grace site, and you gave figures, you did not tell the jury how you actually calculated the specific travel times. In other words, you did not set forth for them the mathematical calculation that you made and --

A Well, I don't think it's one particular calculation that leads me to those numbers, but numerous calculations.

Q What I'd like to do now is explore with you that calculation.

A Fine.

Q Now, your opinion of travel time, as you testified several times at your deposition, is based on what is known as a one dimensional model?

A That constitutes part of it, sir.

Q All right.

And it is one dimensional in the sense that it is a line between two points, Point A and Point B, or whatever? Is that why they use the expression "one dimensional"?

A It purports to represent behavior along one line connecting two points.

Q All right.

Now, in determining groundwater velocity, you first calculate the distance between two points -- and let me just suggest to you A and B. Can you see this, Doctor? Maybe I can turn it so you can see it. I think you'll know what I'm talking about anyway.

You calculated a distance between A and B, and then you calculate what is known as the hydraulic gradient, which is the difference between the water table elevation at two particular points in the direction of which the water, groundwater, is flowing.

I recognize this is simple--

A That's one way of doing it.

Q All right.

Now, when you calculate -- let's call this Point X and this Point Y -- when you calculate the hydraulic gradient, that is a ratio between the perpendicular drop in the water table, the difference between X and Y, and the

lateral movement of the water which is between A and B; is that a fair statement?

A That's the slope of that line.

Q That's the slope. The hydraulic gradient is actually the slope.

Okay. Then you also determine, do you not, what is known as hydraulic conductivity, and the hydraulic conductivity is a statement that the hydrogeologist is making as to the permeability of the material through which the water is moving?

A Yes.

Q So in order to calculate the groundwater velocity, you use an equation which I have recently learned is called D'Arcy's Law?

A Yes.

Q And D'Arcy's Law is where you multiply the hydraulic gradient times the hydraulic conductivity value that you determine; so it's called the sub V, which is D'Arcy velocity equals K, which is what, which of those two?

A Hydraulic conductivity.

Q One, or I, which is hydraulic gradient?

A Yes. Some people will use I. You have to be careful with the sign, but that's not a problem here. That's not the velocity of the fluid, you realize.

Q Yes, that's what's known as the D'Arcy velocity.

Now, in the case of W. R. Grace and the wells, you used a D'Arcy -- you used a hydraulic gradient of .018, is that correct?

A Yes. That's one of the calculations I made using that number, sir.

Q And you selected -- I'll show you this. I don't think you have to get up for this because I think it's pretty simple stuff. You selected a distance between the Grace site and the well, or Well G as 2840 feet. Does that ring a bell?

A That's close. That's one of the ones I made, one of the calculations I made.

Q So your hydraulic gradient was .018 which represented the drop between the water table elevation at the Grace site and the drop at the -- and the water table elevation at the well?

A I calculated this in different ways, but the way you did it will give us approximately the same.

Q Okay. So you did not measure the water table levels at these two points to come up with the .018?

A I did it a couple different ways. One was taking two points and dividing by the difference, and the other is to take all those vectors we looked at and average the gradient to each of these vectors to give me another check on the numbers.

Q Now, you have a hydraulic gradient of .018, and I'll move this over for the jury, but I wanted you to see it first, at a distance of approximately 2840 feet, and you selected as your hydraulic conductivity figure the figure 75 feet per day, correct?

A That was one of the numbers I used, sir.

Q And that was the only hydraulic conductivity figure that you used, Dr. Pinder, for the entire distance between the Grace site and the well field, isn't that true? That was the hydraulic conductivity figure that you used in your one dimensional model?

A That was considered to be an average value for that distance.

Q All right. Now, --

A You realize, of course, this is not a straight line, but turning.

Q Well, the gradient, however, is a gradient that determines from the Grace site to the well field a straight line which is measured on .018 which is the difference between the elevation and the lateral movement?

A In this particular calculation I may have been looking at flow lines that were close to straight. I have done other calculations where the flow lines are more westerly and southerly but the answers come out to be basically the same.

Q Let me be clear about this. The one dimensional model

upon which you base this opinion is based on, at least in part, because there are other calculations you have to make, I know, with respect to this, but it's based on this particular figure that I put up on the board in front of the jury?

A You're speaking now to my current opinion on travel time, sir?

Q Well, I'm speaking upon what you based your opinion which is, I understood from the deposition, was based on this so-called one dimensional model which I have tried to describe.

A I understand. That information that you're looking at there constitutes the information that I had available or was using along with other information, of course, at the time of that deposition.

Q Well, in fact, that's the information that you said, and I won't belabor it, Dr. Pinder, but you said several times in your deposition that you were basing your opinion on the one dimensional model. You might have done your calculations to illustrate your opinion, but, in fact, your opinion was based upon the one dimensional model. Do you remember saying that several times?

A Well, I'm saying to you now that the opinion I presented at the time of the deposition was basically --

Q And that's the one that I'm dealing with .

A And that's -- Then subsequently examined

with other calculations.

Q Well, when was it examined with other calculations?

A Well, I continued to work with the data as it becomes available for me to substantiate and verify that the things that I calculated at that time were consistent.

Q Did you do other calculations that you are relying upon for your opinion of travel times after your -- after the last day of your deposition on February 15, 1986? Did you make any other refinements, add new numbers, do different calculations based upon information, or based upon activities that you undertook after February 15, 1986?

A I don't think that those calculations have influenced my basic opinion, sir.

Q Okay. So the basic opinion is what we heard at the depositions, and that's what I'm trying to explore right now.

A All right. Good.

Q Now, you did not, Dr. Pinder, you did not calculate a different velocity for different portions of the distance between the Grace site and Wells G and H?

A Not in this particular calculation.

Q All right. And you would agree with me, would you not, that the velocity of groundwater would, in fact, in real life vary depending upon the hydraulic gradient and the hydraulic conductivity of the particular portion of the area

Q The Grace site is here (indicating)?

A I'm sorry.

Q Go ahead.

A The Grace site has more of the less permeable material. As you go towards G, you get into more permeable material. At the Grace site we have a combination of this material, as you can see from the well logs, and as we get toward Well G we are almost exclusively up in here (indicating). So what I do, because we are working with averages, I use the average taken from the low end of the area and high end of the area to come up with one representative value for the permeability along that line.

Q All right. Now, I think I asked you before, Dr. Pinder, if you could tell us what were the different hydraulic conductivity values that you selected along the way to come out with the 75 foot per average figure, and I thought you said that you could not tell us the specific hydraulic conductivity values that you selected for those differing subsurface conditions that you've just referred to.

Did I misunderstand that?

A I don't think you asked that question.

Q Well, I'll ask you now.

A I did average specific values. I don't happen to have those calculations with me, but I did precisely what you said, I took into consideration each of the different materials and did an average.

Q You don't have them with you?

A No. It wasn't something that I saved since I was just working with the average.

Q So we have no way of knowing whether or not the figure that you selected for the area under the Grace site is consistent with what other hydrogeologists would select for the area between Grace and Cummings or the rifle range. We just have to take 75 feet?

A No. No.

Q Well, we don't have the figures?

A No, I don't think my ideas have changed any since I did

those calculations, and the numbers that I would represent to you today are probably quite close to what I would have represented to you then.

Q Well, I'm going to show you something else, Doctor, so if you don't mind, why don't you stay there.

You know or are familiar with Dr. David Todd?

A I've met him. I'm not as familiar with him as I am with the other two.

Q He is a geohydrologist, I think, at the University of California, Berkley?

A I believe that's correct.

Q He is a well known and well respected member of your profession?

A I don't know him very well so I can't speak to that.

Q Are you familiar with his book, "Groundwater Hydrology"?

A I have that book on my shelf, sir.

Q And that book is a reliable source of information for people in your profession?

A Yes, I think so.

Q Now, on Page 29 of Dr. Todd's book he discusses soil classifications, and he also discusses representative values -- I've got the wrong page -- Page 71 -- representative values of hydraulic conductivity, and he says, after Morris & Johnson -- Do you know who Morris and Johnson is?

A No, I don't.

Q I'll tell you who they are. They're a group that reports to the United States Geological Survey.

Now, on this particular diagram I have converte the hydraulic conductivity from meters per day to feet per day by going through a multiplication table that you're probably much more familiar with than I am, and I draw your attention first of all to the range of hydraulic conductivity that Dr. Todd points out exists for subsurface conditions.

There is quite a range even in the meters per day, right, between gravel, coarse and granite?

A Are those average values? I don't quite understand what these values are.

Q He says they are representative values of hydraulic conductivity, and there is quite a range, and that's what we've been talking about, right?

A Yes, sir.

Q Now, I direct your attention specifically to what Dr. Todd's table states about till, predominantly sand, and I believe your testimony was, and we looked at some boring logs from Weston, that much of the area underneath the ground, the saturated zone between Grace and the well field is till, sandy till; or I would take it, till, predominantly sand. Is that fair to say?

A No. I think that that's misleading.

Q Well, you would at least acknowledge that according to Dr. Todd, after Morris and Johnson, that when you have till predominantly sand, he suggests a hydraulic conductivity figure of 1.61 feet per day?

A Yes.

Q Now, --

A I have no reason to believe your arithmetic isn't right.

Q The arithmetic, I'll represent to you, is right.

What do you know about the 1.61 feet per day for till?

A Well, for a sandy till, now, we're talking about till which is a very tightly consolidated material, I think that that number is not an unreasonable number for that particular material.

Q All right. Now, --

A But that's not what we have.

Q What I would like you to do, Doctor -- excuse me, Doctor --

Oh, incidentally, my attention is called to another figure that I wanted to mention to you and I forgot. There's a figure for peat here. Peat. And that has a representative value of hydraulic conductivity for peat of 18.7 feet per day. Would you agree with that, Dr. Pinder?

A Would you remove your hand?

Q I'm sorry.

Is that a representative value of the hydraulic conductivity of peat?

A That appears to be this gentleman's interpretation.

Q After Morris and Johnson?

A After Mr. Morris and Mr. Johnson, yes.

MR. KEATING: Have the jurors seen this?

Q Now, Doctor -- Why don't you resume your seat if you would, Dr. Pinder.

Would you, Dr. Pinder, calculate for me a D'Arcy velocity using the hydraulic gradient that you used in the Grace model, but instead of using your 75 feet per day would you take the hydraulic conductivity figure that Dr. Todd uses in his figure, which is 1.61 feet per day, and tell us what you get for D'Arcy's velocity if you used that figure?

A The numbers that you've asked me to calculate give an answer of .029, I believe.

Q All right. So .029 feet per day as compared to the D'Arcy velocity on this particular diagram of 1.35 feet per day. So by changing the figure of conductivity to the figure shown on the Todd chart you make a 46-fold change in the D'Arcy velocity?

A That's right. Because we have material that's 46 times more permeable than that.

Q And if you were then to translate the D'Arcy velocity figure of .029 feet per day that you obtained by using the

figure I asked you to use from Dr. Todd, and you held everything else constant in your calculations that you used to get travel time, would you not, sir, get a chemical transport time for chemicals from Wells G and H -- Strike that -- from the Cryovac site to Wells G and H which would be 46 times longer than the calculations that you testified to?

A If we assume that the numbers that you have provided to me somehow represent the material between the Cryovac site and Well G, and that the gradient .018 would be the same if such materials in fact existed there, your calculations indicate that it would take a much longer time.

Q And if we put it in years, it might even take a hundred years?

A I can go through the arithmetic if you wish, but it would take a long time.

Q Now, your model, sir, does not include net infiltration, does it? And by "net infiltration" I mean the amount of water which is added to the ground between the Grace site and the wells either by rain or other forms of precipitation.

A Well, it does in essence, but I can understand how you would think it doesn't. The potential gradient that we see, the water table, we'd see a reflection of reality, and that water table has in it whatever hydrologic forces are at work; and since we're looking here at non-pumping conditions, we're looking at the natural system, in that sense it does help

infiltration in that.

Q Well, Doctor, your gradient figure is merely a gradient figure of distances. I'm talking about net infiltration, which means the addition of water to this chemical which is going down the hose.

A I think I represented the situation fairly clearly. The infiltration of water into the groundwater system is reflected in the geometry of the water table, whatever it is, and if we take values from the field as we've done in this case to compute that gradient, then in a hydrodynamic sense we have infiltration accommodated, not accommodated in the same sense as we do in a larger model where we have to create those gradients, because they are not given to us, but in the sense that they reflect that, I believe so.

Q But in the manner in which the expression "net infiltration" is used by people in your profession, Doctor, you have not included net infiltration in your one dimensional model, isn't that fair, according to the commonly accepted principles that your profession accepts, isn't that true?

A No. I think that what I stated to you is the correct and appropriate way that net infiltration in the sense that you're using it would be incorporated in a one dimensional model. Basically, the potential reflects that infiltration, net infiltration or any other kind of infiltration.

H
vw-pf

Q Now, your model does not include lateral or vertical dispersion? And by that I mean, if I could continue on that, the contaminants to spread out both laterally and vertically?

A That is right. This calculation does not accommodate that.

Q That calculation further does not accommodate the addition of water to the aquifer, for instance, as a result of the Aberjona River, does it?

A Yes, sir, it does in the same sense that the infiltration is accomplished. Because whatever the river does in this system, we know that its influence is reflected in the groundwater surface as we see it. And since we use direct measurements from the field in determining our gradients and consequently our velocity, it is my opinion we accommodated the river in that sense.

Q Now, your model assumes a uniform gradient, right?

A It assumes uniform gradient.

Q It assumes a uniform hydraulic conductivity, right?

A We use a constant value.

Q Right.

A When you say assume--

Q You used a constant value?

A I think that is representative, yes.

Q You used a constant value for porosity?

the Grace building, excavation which was looking for barrels which were purportedly -- drums which were purportedly buried; and as a result of that excavation a half a dozen or so drums were discovered.

Do you remember that? Do you remember hearing about that?

A Yes, I have knowledge of parts of that.

Q All right. Now, you have testified or stated twice under oath that that location is not a probable source of contamination to Wells G and H. Is that still your opinion?

A I don't remember that I said it exactly like that, but I can tell you what my opinion is if that's what you'd like to hear.

Q Well, you stated in an affidavit that you have referred to during this particular case that the contamination did not come from the pit.

A May I see the document, please?

Q Yes.

A Is there a particular paragraph that's of interest to you?

Q "The most recent chemical data indicates that the area which was excavated by Grace's engineers in which six drums were found is not the probable source of contamination at the site."

Do you remember saying that?

A I can see it in front of me. I have no reason to believe that I didn't write that.

Q And that was an affidavit that was furnished to the Court in this particular case?

A Yes, sir.

Q And at your deposition you were also asked about the pit. You were asked -- this was in January -- Question: "Is it still your opinion that the most recent chemical data that the area which was excavated by Grace engineers and which six drums were found is not the probable source of contamination at the site?" And your answer is, "Yes."

A Yes. I think there are other much more substantial sources. Mr. Keating, you said "pit" and then you used that synonymous with drums.

Q I'm speaking of drums.

A Thank you.

Q Okay. Going back, Dr. Pinder, to the beginning of your work in this case, you characterized your role as a-- as to come to an understanding of the hydrogeological conditions of the Aberjona River Valley. Do you remember saying that at a deposition?

A I don't remember the details, but certainly we were talking about things like that.

vw-pf

Q In fact, you characterized it as your mandate. You said your mandate was to try to determine the basic physical processes that govern the flow of liquids in the subsurface area of Wells G and H. Do you remember saying that?

A Again, I don't remember the details. I have no reason to believe I wouldn't have said that.

Q Now, of particular interest in coming to an understanding of the hydraulic, hydrogeologic conditions of the Aberjona River Valley would be to understand the hydraulic connection between the Aberjona River and the aquifer; is that true?

A I think it depends on what we are talking about. But in its entirety I think it is part of the system and we should have some understanding of how the system and aquifer interact.

Q You testified on the last day of your deposition in February of this year, Dr. Pinder, in your opinion, the connection between the Aberjona River and the aquifer was, in your own words, not well established? Do you remember saying that?

A No. I think, considering the information that was available to me there, I would have been thinking about that particular aspect in the system and probably had not formulated what I thought to be a complete understanding

of that particular aspect. Probably I felt I knew enough about it that I could still have difficulty in presenting my opinions on the contamination.

Q Well, at the time I am speaking about, which is February 15, 1986, which was a year and a half at least after you were retained to form an opinion about the hydrogeological conditions in the Aberjona River Valley, on that occasion in February of 1986 you said that your opinion, Dr. Pinder, the connection between the Aberjona River and the aquifer was not well established?

A I think you said I said that. I don't have a particular problem with it. I think that we have seen the pump test results at that point. It was very clear the cone of depression went under the river. It was clear to me from field information that was water was being discharged into the river under nonpumping stresses; that the river was as a whole, the river sediments and intervening material between river and aquifer were relatively impermeable that I knew from calculations. But in spite of all that knowledge, I think it was fairly complete. I still felt that it would be nice to have additional information. That is the sense in which I answered that question.

Q When you said it was not well established, you mean not well established in my mind of did you mean it was

not well established based upon hydrogeological information which is published, recorded, circulated among hydrogeologists? What did you mean when you said not well established?

A What I meant was that I had in my hands at that time a lot of information. The information was still coming in, as I am sure you are aware. And I had what I thought was a fairly good understanding of the system and the role of the river. But it was one part of the system that I still felt I would like to see additional data on before I felt I understood everything completely.

Q Well, did you suggest to Ms. Woodward, the lady on my right, who took your deposition, in response to that question that you wanted more time or you needed more information or that your testimony about the river not being well established was somehow a connection between the aquifer and the river not well established, somehow equivocal or tentative or temporary? Did you make any suggestions to her along those lines that are set forth in your deposition that you can point out?

A I don't think I felt equivocal or many of the adverbs you had listed in the statement. I think what I was getting across to Ms. Woodward, I felt I had a sufficiently strong handle on exactly what was going on in that system I could give my opinions without

reservations. I believe that is what I did. That does not mean I know everything there is to know about the system. I was trying to explain to her that as more information became available, I would learn more. I would, in all likelihood, feel comfortable with my opinions and that was the extent of it.

Q Dr. Pinder, you had some very important and relevant information available to you from the U. S. Geological Survey, which is sitting in those boxes behind you that you did not even bother to look at until about the fifth day that you were on the witness stand; and that related directly to the connection between the Aberjona River and the aquifer, which were those flow tests; is that true?

A I have no idea when that data became available to the general public.

Q That data--

A May I finish?

Q Yes.

A As far as I knew, that information became available to me within the last 30 days or so.

Q The information, Dr. Pinder, on the Aberjona River Valley flow had been recorded by the USGS for years and it had been -- it had been available as public information. Aren't you aware of that?

A Mr. Keating, I called USGS yesterday and--

Q No, no.

A --they had no knowledge--

Q Please.

A --of these sites.

MR. KEATING: Your Honor--

THE WITNESS: I think that was responsive.

MR. KEATING: I would ask that that go out. He asked-- I didn't ask if he called them.

THE COURT: Was he aware of the existence of these reports for years and years?

The answer is yes or no.

THE WITNESS: I would say the answer in this particular instance is no.

Q Now, are you aware the Aberjona River is described by most people, if not all people, who study it as a leaky river it?

A No, I am not aware of that.

Q Do you know what a leaky river is?

A It may leak out or it may leak in. I don't know which people are referring to.

Q Would you agree with me if I told you a leaky river is a river that both discharges water to the aquifer and receives water from the aquifer?

A I think that would cover it.

Q Have you reviewed the report of the Massachusetts Water

Resources Commission on the Mystic River Basin, published in 1973? And the Mystic River Basin is a river basin in this area in which the Aberjona River is a part.

A May I review the document, please?

Q Let me ask you, first of all, have you ever seen this document?

A May I look at it first?

Q Sure.

(Pause.)

A I have seen this document.

Q Now, on Page 29 of this document, Dr. Pinder, there is a paragraph which reads under the words Aberjona River, "The Aberjona River is somewhat unique in that by nature it is a leaky river. Generally, river systems accumulate flow traveling downstream, as their upstream drainage area increases. The opposite has been observed on the Aberjona River in certain areas. It is known the groundwater and surface water hydraulic systems within the basins are closely related. Withdrawal of groundwater from municipal and industrial usages, well fields adjacent to the river are therefore reflected in the abnormal stream flows."

Now, did you read that paragraph before you told Ms. Woodward that the connection between the Aberjona River and the aquifer was not well established?

A I don't believe I saw that document before I spoke

to Ms. Woodward. I don't think what they say is in any way in conflict with what my current understanding of the system is.

Q Did you review, Dr. Pinder, the Hydraulic Investigation Atlas, which is prepared by the U. S. Geological Survey, which is a division of the Department of the Interior and is entitled Hydrology and Water Resources of the Coastal Drainage Basins of Northeastern Massachusetts from Castle Neck River, Ipswich to Mystic River, Boston, prepared by David S. Delaney and Frederick B. Gay?

A May I see the document, please?

Q Yes.

(Pause.)

A I don't remember seeing this particular document.

Q Now, a hydrologic atlas, Dr. Pinder, is a report which summarizes surface and groundwater resources within a given area; isn't that true?

A It means many things. That seems like a reasonable statement.

Q Would you consider a hydrologic atlas to be an authoritative source of information for the area that it is depicting?

A I think it depends on what you mean by a source. A source of what?

Q Information.

A Well, some information I am sure it is useful for, like large regional trends. I would think it would be of marginal utility when you come down to very small areas.

Q Isn't a hydrogeologic atlas, Dr. Pinder, a document which people in your profession routinely read and rely upon when they are trying to get an understanding of a particular aquifer for a particular hydrogeological area? Isn't this a very typical standard document that is used by people in your field?

A I personally don't use them very often. They are normally very broad in scale. They are not much use to me. I can see in certain instances where people are interested in particular problems in a regional scale that is consistent with that atlas. You can see it is not very detailed. I am looking for more concrete information about the area than I am interested in.

Q This atlas is prepared for the USGS. Would you agree with me that the USGS has a high reputation of reliability as any government agency; is that true?

A Well, first of all, is it for the USGS or by USGS?

Q Let me look at the title. It carries the headnote of Department of Interior, U. S. Geological Survey.

A In all likelihood, it was prepared by USGS rather than for them.

Q Yes.

A I think the work the USGS does -- and I worked for them and I think I know them. I think it is very carefully done by and large. When it comes out in a document like that, you can feel whatever was behind that document was consistent with what they knew at that time.

Q And this document has an area characterized as Northeastern Massachusetts from Castle Neck River, Ipswich to Mystic River, Boston. That included the Aberjona River Valley, which is located in Burlington, Woburn and Winchester?

A If I can look at it.

Q Certainly.

A It seems reasonable.

Q The document states, Dr. Pinder, the most productive aquifers lie in the Aberjona River Valley where well fields in excess of 500 gallons per minute has been developed from municipal and heavy industrial use. Additional groundwater supplies can be developed in the valley. However, heavy groundwater pumping already reduces the flow of the Aberjona River. Use of additional groundwater and its discharge outside the basin would further reduce stream flow.

A I think that the statement you just made is completely consistent with our current understanding of the system. When you pump groundwater you are going to

capture water that otherwise would have went to the system in the first instance, and that will reduce the flow in the river. If you pump the system sufficiently hard, you actually draw water from the river. I think because the USGS is by and large, has understood those kinds of concepts, that is what they were interpreting.

Q Have you had occasion to review a document prepared by the United States Geological Survey entitled Gazetteer of Hydraulic Characteristics of the Streams of Massachusetts, Coastal River Basins of the North Shore and Massachusetts.

A May I see it, please?

(Pause.)

THE WITNESS: I don't believe I have read this document, sir.

Q Are you familiar with the kind of document this is, a publication of the U. S. Geological Survey?

A Again, it not the kind of document I normally rely upon. I am not aware of that particular series.

Q Well, with regard to the Aberjona River on Page 29, it has Mystic River basin, Aberjona River. It says, "Flow affected by diversion for industrial use and for municipal supply of Woburn and Winchester, and leakage from Winchester's north reservoir."

Now, is that statement consistent with

your statement at your deposition that the connection between the river and the aquifer is not well established?

A Yes. I think it certainly is. What they are talking about is a very broad understanding. That is a huge area they are talking about there. What I am talking about is really understanding very subtle details of the system at a level quite different than what they are talking about. I don't think the person who wrote that would purport to understand this stretch of river anywhere close to what we understand right now.

Q If you do not understand the connection between the river and the aquifer, Dr. Pinder, you also do not understand groundwater flow in the Aberjona River Valley?

A I think that the level of understanding I have had with the river at the time of my deposition and currently gives me more than adequate information on which to understand the groundwater system.

Q If you do not understand the groundwater flow on the Aberjona River Valley, then you do not understand the time that it takes for contaminants to be transported by that groundwater within the Aberjona River Valley; isn't that true?

A If I didn't know anything about--

Q No, as a general proposition. I am not saying you -- I am saying if you don't understand the groundwater flow

in the Aberjona River Valley and you don't understand the hydraulic connection between the river and the aquifer, then you don't understand the time it takes for the groundwater to carry contaminants through the Aberjona River Valley; isn't that true?

A Well, if you are talking about the area between basically the upper and lower bounding streets, if we did not understand the fundamental features of that groundwater flow system to the degree we did not understand them, we would have a poor representation of the system and we would have -- and we would have less certainty in time of travel associated with that system.

Q At your deposition, Dr. Pinder, you were asked the following question: "Does the existence of that river play any part in your opinion? Does that river, its flow or what happens to that river when it is pumped play a part in the opinion that you have just given us?"

What was your answer to that question?

A According to your notes, it was no.

Q The answer was no?

A According to your notes.

MR. KEATING: Thank you very much.

Your Honor, that is all I have.