In The Matter Of:

The City of Albuquerque, et al. v.
Sparton Technology, Inc.

Robert D. Morrison, Ph.D.
May 2, 1997

Bossard Associates, Inc.
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Original File morr0502.v1, 250 Pages
Min-U-Script® File ID: 2708615092

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[1] IN THE UNITED STATES DISTRICT COURT
[2] FOR THE DISTRICT OF NEW MEXICO
[3]
[4]
[5] THE CITY OF ALBUQUERQUE, and) CIVIL ACTION NO.
[6] THE BERNALILLO COUNTY) CIV-97-0206-LH
[7] COMMISSIONERS,)
[8] Plaintiffs,)
[9] vs.)
[10] SPARTON TECHNOLOGY, INC.,)
[11] Defendant.)
[12]
[13] STATE OF NEW MEXICO, THE NEW) CIVIL ACTION NO.
[14] MEXICO ENVIRONMENT DEPARTMENT,) CIV-97-0208-JC
[15] and THE NEW MEXICO OFFICE OF)
[16] THE NATURAL RESOURCES)
[17] TRUSTEE,)
[18] Plaintiffs,)
[19] vs.)
[20] SPARTON TECHNOLOGY, INC.,)
[21] Defendant.)
[22] DEPOSITION OF ROBERT D. MORRISON, Ph.D.

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[1] UNITED STATES OF AMERICA,) CIVIL ACTION NO.
[2] Plaintiff,) CIV-97-0210-M
[3] vs.)
[4] SPARTON TECHNOLOGY, INC.,)
[5] Defendant.)
[6]
[7]
[8] The deposition of ROBERT D. MORRISON, Ph.D., taken
[9] on Friday, May 2, 1997, commencing at 9:20 a.m., at
[10] the offices of Department of Justice, 1425 New York
[11] Avenue, N.W., 13th Floor, Washington, D.C., before
[12] Katie B. Stewart, Notary Public.
[13]
[14]
[15]
[16]
[17]
[18]
[19]
[20]
[21]
[22]

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[1] APPEARANCES
[2]
[3] ON BEHALF OF THE PLAINTIFFS:
[4] GARY A. O'DEA, ESQ.
[5] City of Albuquerque Environmental Health Department
[6] 1 Civic Plaza
[7] Legal Department
[8] Albuquerque, New Mexico 87103
[9] (505) 768-4500
[10]
[11] ARNOLD ROSENTHAL, ESQ.
[12] MICHAEL DONNELLAN, ESQ.
[13] Department of Justice
[14] 1425 New York Avenue, N.W.
[15] 13th Floor
[16] Washington, D.C.
[17] (202) 514-3446
[18]
[19]
[20]
[21]
[22] (Appearances continued on next page.)

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[1] (Appearances continued.)
[2]
[3] ON BEHALF OF THE DEFENDANT:
[4] JAMES B. HARRIS, ESQ.
[5] Thompson & Knight, P.C.
[6] 1700 Pacific Avenue
[7] Suite 3300
[8] Dallas, Texas 75201-4693
[9] (214) 969-1700
[10]
[11] ALSO PRESENT:
[12] SHARON RICE
[13] Paralegal
[14]
[15] STEVEN AMTER
[16] Hydrogeologist
[17]
[18] R. JAN APPEL
[19] Sparton Corporation
[20]
[21]
[22] (Index appears following the transcript.)

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[1] PROCEEDINGS
[2]
[3] Whereupon --
[4] ROBERT D. MORRISON, Ph.D.,
[5] a witness, called for examination, having been first
[6] duly sworn, was examined and testified as follows:
[7] EXAMINATION
[8] BY MR. HARRIS:
[9] Q: Would you state your name for the record,
[10] please.
[11] A: Robert Daniel Morrison.
[12] MR. HARRIS: Arnold, did you want to have any
[13] agreements?
[14] MR. ROSENTHAL: Whatever you want. We don't
[15] need –
[16] MR. HARRIS: In terms of objections, my
[17] typical practice is to reserve all objections except
[18] to form and non-responsiveness and have signature
[19] before any notary. The third point may be somewhat
[20] problematic here is that I think our response date,
[21] michael, is the 12th, and I think the deposition is
[22] supposed to be available within five days so we're

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[1] hoping to get it Tuesday or Wednesday. We may want
[2] to use Mr. Morrison's unsigned deposition in our
[3] response unless you all object to our doing so.
[4] MR. ROSENTHAL: No, he'll have a chance to
[5] look at it too. We don't object.
[6] BY MR. HARRIS:
[7] Q: Mr. Morrison, you've had your deposition taken
[8] before?
[9] A: Yes.
[10] Q: How many times about?
[11] A: Approximately two dozen.
[12] Q: How many times have you testified at trial?
[13] A: Five or six times.
[14] Q: Let me hand you what I'll mark as deposition
[15] Exhibit 201. It this a listing of all of the cases
[16] in which you've been deposed or in which you've
[17] provided trial testimony?
[18] A: Yes.
[19] (Morrison Deposition Exhibit Number 201 was
[20] marked for identification.)
[21] MR. ROSENTHAL: Could I ask a favor, Jim, just
[22] for the record. We have Bates-stamped all of the

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[1] documents. Would you just refer, for the record, to
[2] the Bates-stamp number.
[3] MR. HARRIS: This is RM – I'm just going to
[4] give the last four numbers – 2355.
[5] MR. ROSENTHAL: Thanks.
[6] BY MR. HARRIS:
[7] Q: Can you mark for me on Exhibit 201 of the
[8] depositions in which of the cases you were testifying
[9] for the plaintiff, if any.
[10] A: Yes.
[11] Q: Could you mark that on Exhibit 201. Just put
[12] a check mark by those cases on which you were
[13] testifying on behalf of the plaintiff.
[14] A: To the best of my knowledge the cases that
[15] I've marked on Exhibit 201 are the cases that I
[16] recollect in which I represented the plaintiff.
[17] Q: And you haven't made any marks in trial
[18] testimony. Is it because you didn't testify on
[19] behalf of any plaintiffs at trial or you just didn't
[20] review that section?
[21] A: That was because the depositions on
[22] Exhibit 201 had already been marked.

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[1] Q: There are no cases in which you testified in
[2] which you had not previously given a deposition?
[3] A: Correct.
[4] Q: Are all of the cases on Exhibit – do all of
[5] the cases in Exhibit 201 involve environmental
[6] issues?
[7] A: Yes.
[8] Q: Could you identify for me by putting a circle
[9] on Exhibit 201 those cases in which you were
[10] testifying about the extent of ground-water
[11] contamination associated with a particular location,
[12] if any.
[13] A: Yes.
[14] Q: Could you mark with a star on Exhibit 201
[15] those cases in which you testified about the use of
[16] an extraction well to contain ground-water
[17] contamination, if any.
[18] You didn't mark anything so you didn't testify
[19] about use of an extraction well as a containment
[20] device in any of these cases?
[21] A: Correct.
[22] Q: And in any of the 23 cases identified on

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[1] Exhibit 201, were you asked to provide any expert
[2] opinion or testimony on whether a plume of
[3] contamination was properly defined or described?
[4] A: Yes.
[5] Q: And which cases were those?
[6] A: How would you like me to mark them?
[7] Q: Mark them with a square, please, or something
[8] close to a square. Thank you. And if I wanted to
[9] get copies of depositions you've marked with a
[10] square, how could I go about doing that?
[11] A: Contact one or more of the parties involved in
[12] the litigation.
[13] Q: You don't keep copies of depositions that you
[14] have – copies of transcripts of the depositions you
[15] have given?
[16] A: No.
[17] Q: Can you then tell me if you recall for those
[18] cases you've indicated with a square who the
[19] attorneys were for the party you were retained to
[20] testify on behalf of?
[21] Maybe, Mr. Morrison, maybe to help you out a
[22] little bit I assume back at your office you have a

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[1] listing of attorneys that would be associated with
[2] those cases?
[3] A: Yes.
[4] Q: If it's okay with Mr. Rosenthal, what I would
[5] suggest is that we just have a blank in the
[6] deposition and once you get back to your office if
[7] you could look up that information and supply it to
[8] the court reporter, either next week or when your
[9] deposition is given to you for signature I would
[10] appreciate that.
[11] MR. HARRIS: Do you have any objection?
[12] MR. ROSENTHAL: You can give it to us, and
[13] we'll give it to him.
[14] (INFORMATION REQUESTED: ___
[15]
[16] BY MR. HARRIS:
[17] Q: Is that agreeable to you?
[18] A: Yes.
[19] Q: Just to make myself clear, for those cases
[20] you've noted a box next to them, please go back to
[21] your office and find out – confirm the name of the
[22] attorney you were working with, and if you would

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[1] supply the name of the attorney, his or her law firm,
[2] the address and telephone number and supply that to
[3] Mr. Rosenthal, then give it to the court reporter; is
[4] that agreeable?
[5] A: Yes.
[6] Q: How are you currently employed?
[7] A: Self-employed.
[8] Q: Do you have a business?
[9] A: Yes.
[10] Q: What's the name of the business?
[11] A: R. Morrison and Associates, Incorporated.
[12] Q: How many employees does that business have?
[13] A: Seven.
[14] Q: And is your business a corporation, sole
[15] proprietorship, partnership? What's the legal
[16] relationship?
[17] A: Corporation.
[18] Q: Are you the president?
[19] A: No.
[20] Q: What's your title?
[21] A: I think I'm secretary treasurer.
[22] Q: Who's the president?

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[1] A: Donna Oba.
[2] Q: Is she related to you in any way?
[3] A: Yes.
[4] Q: How?
[5] A: Wife.
[6] Q: What's her background, technical educational
[7] background?
[8] A: Business, MBA.
[9] Q: She is obviously one of the seven employees?
[10] A: Yes.
[11] Q: What percent of your time in your business is
[12] devoted to what I refer to as forensic type work?
[13] A: Approximately 90 percent.
[14] Q: Have you previously testified on behalf of the
[15] United States?
[16] A: No.
[17] Q: Are you currently working with the
[18] United States on any matter besides this case?
[19] A: Yes.
[20] Q: What matter is that?
[21] MR. ROSENTHAL: Objection, unless he's been
[22] identified as a testifying expert in which we have

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[1] not identified him to both the opposing counsel and
[2] the court, any discussion about his non-testifying
[3] consultation with the government in other cases is
[4] privileged.
[5] **MR. HARRIS:** I don't think I've asked him yet
[6] to share with me any of his testimony. I just asked
[7] him if he had any relationship with the government,
[8] which goes to his credibility.
[9] **MR. ROSENTHAL:** I understand he said that he
[10] has but any identification in the cases would be work
[11] product and privileged information.
[12] **MR. HARRIS:** So are you instructing him not to
[13] answer that question?
[14] **MR. ROSENTHAL:** You ask him if he's been
[15] identified as an expert in any of the cases with the
[16] government. I'll let him answer that.
[17] **MR. HARRIS:** Just to make sure the record is
[18] clear, let me ask the question and if you want to
[19] instruct him, go ahead.
[20] **BY MR. HARRIS:**
[21] **Q:** Are you currently working with the United
[22] States on any piece of pending litigation?

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[1] **A:** Yes.
[2] **Q:** And what piece of litigation?
[3] **MR. ROSENTHAL:** Objection. I'm instructing
[4] him not to answer that question.
[5] **BY MR. HARRIS:**
[6] **Q:** Do you refuse to answer that question on
[7] instruction of Mr. Rosenthal?
[8] **A:** Yes.
[9] **Q:** Have you worked previously with any of the
[10] attorneys that are involved in this case, involved in
[11] Sparton for the United States?
[12] **A:** Yes.
[13] **Q:** Which one?
[14] **MR. ROSENTHAL:** Objection on relevancy
[15] grounds.
[16] **BY MR. HARRIS:**
[17] **Q:** You can answer the question.
[18] **A:** David Fishel.
[19] **Q:** What was the nature of the work that you did
[20] with Mr. Fishel?
[21] **MR. ROSENTHAL:** Objection, same objection that
[22] would be work-product information. I instruct him

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[1] not to answer that question.
[2] **BY MR. HARRIS:**
[3] **Q:** Do you refuse to answer that question,
[4] Mr. Morrison?
[5] **A:** Yes.
[6] **Q:** What do you charge for your work with the
[7] government in this case?
[8] **A:** Are you referring to an hourly rate?
[9] **Q:** If that's what you charge, I don't know. Do
[10] you have some other arrangement with them?
[11] **A:** No.
[12] **Q:** Okay, then what do you charge on an hourly
[13] basis if that's your arrangement?
[14] **A:** $165 an hour.
[15] **Q:** And how much do you charge for your testimony?
[16] **A:** Three hundred.
[17] **Q:** I'm sorry, $300 an hour?
[18] **A:** Yes.
[19] **Q:** Do you have a budget for this case?
[20] **A:** Yes.
[21] **Q:** And how much is that budget at the current
[22] time?

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[1] **A:** I don't know.
[2] **Q:** You're not required to pay a budget in working
[3] with the Department of Justice outlining how much you
[4] expect to charge during the period you were going to
[5] be employed by the Department of Justice?
[6] **A:** Yes.
[7] **Q:** And who in your shop prepared that estimate?
[8] **A:** I did.
[9] **Q:** You don't have any recollection today as to
[10] what you estimated the value of your services would
[11] be during the time you were employed by the
[12] Department of Justice?
[13] **A:** No.
[14] **Q:** How many of the seven employees in your office
[15] are currently actively working on this matter,
[16] business partner?
[17] **A:** One.
[18] **Q:** How many have devoted some attention to this
[19] matter over the last seven or eight months?
[20] **A:** Four.
[21] **Q:** Who's the employee I guess other than yourself
[22] who is actively involved in this matter at the

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[1] current time?
[2] A: Evan Newell.
[3] Q: What's Mr. Newell's background?
[4] A: Geology, mathematics, and geophysics.
[5] Q: Is there somebody with your firm that goes by
[6] the initials RMA?
[7] A: No.
[8] Q: Those initial mean anything to you?
[9] A: Yes.
[10] Q: What do they mean?
[11] A: They stand for Robert Morrison & Associates.
[12] Q: You understand we're here today to talk about
[13] an affidavit or declaration of yours that was
[14] attached to a motion for preliminary injunction that
[15] the United States filed in this matter, do you
[16] understand that?
[17] A: Yes.
[18] Q: When did you first start developing the
[19] affidavit that is attached to that motion for
[20] preliminary injunction?
[21] A: To the best of my recollection it would be
[22] towards the end of February 1997 and during the month

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[1] of 1997.
[2] Q: Would it be fair to say that virtually all of
[3] the work associated with preparing that particular
[4] document occurred during March of 1997?
[5] A: As I testified, my recollection is the latter
[6] part of February and during the month of March.
[7] Q: I was just trying to get an understanding of
[8] over that four- or five-week period of time how much
[9] of the time was spent after March 1 as opposed to
[10] March 1?
[11] A: A greater portion.
[12] Q: Greater being 51 percent, 61 percent, 71
[13] percent?
[14] A: I would characterize it as greater than 50
[15] percent.
[16] Q: Can't be any more specific than that?
[17] A: No.
[18] Q: Why not?
[19] A: I don't recall.
[20] Q: Were you supposed to be at a conference this
[21] week?
[22] A: Yes.

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[1] Q: And did you attend the conference?
[2] A: No.
[3] Q: Somebody fill in for you?
[4] A: No.
[5] Q: Just as a matter of curiosity, did you just
[6] not show up? I'm just curious now.
[7] A: I misunderstood the dates of the conference.
[8] It's actually next month.
[9] Q: Fair enough. Who initially drafted the
[10] affidavit that was attached to the government's
[11] motion for preliminary injunction?
[12] A: I did.
[13] Q: And do you recall approximately when you had a
[14] first draft of that?
[15] A: No.
[16] Q: Did you keep copies of the drafts?
[17] A: I don't believe so.
[18] Q: Who would you have to check with to see if
[19] drafts exist in your office?
[20] A: I would examine the project file.
[21] Q: So sitting here today you don't know whether
[22] drafts may still be in the project file or not?

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[1] A: Correct.
[2] Q: Who did you share drafts of that affidavit
[3] with?
[4] A: The Department of Justice attorneys.
[5] Q: And who in particular?
[6] A: Arnold Rosenthal.
[7] Q: Anybody else that you shared it with? You
[8] don't know who he may have shared it with, but I'm
[9] just asking if there is anybody else you recall.
[10] Sharing your draft affidavit with?
[11] A: I don't recall.
[12] Q: How many drafts did the affidavit go through
[13] until it was in the form it is now?
[14] A: My best estimate would be five or six
[15] revisions.
[16] Q: Was the first draft developed after March 1st
[17] of '97?
[18] A: I don't recall.
[19] Q: What would you have to check to make that
[20] determination?
[21] A: The project file.
[22] Q: Does DOJ require you to keep time sheets for

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[1] this project?
[2] A: Yes.
[3] Q: Would those time sheets reflect when the first
[4] draft was developed?
[5] A: They may.
[6] Q: Why wouldn't they? Do you not keep track of
[7] all your time?
[8] A: I keep track of my time. The time sheets may
[9] or may not provide that level of detail.
[10] Q: So the time – if I understand what you're
[11] telling me, the time sheets, if you worked spent an
[12] entire day developing an affidavit, you're saying you
[13] might not describe that on your time sheets?
[14] A: The time sheets may describe work in
[15] preparation of an affidavit. It may or may not
[16] describe whether an affidavit was actually produced
[17] for that particular day and/or week.
[18] Q: Were you directed to send drafts of any of
[19] your affidavits to anybody outside of the
[20] Department of Justice? For instance, the City of
[21] Albuquerque, somebody with the State of New Mexico,
[22] somebody with EPA?

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[1] A: I don't recall.
[2] Q: Did you receive input about revising your
[3] affidavit from anybody?
[4] A: Yes.
[5] Q: From whom?
[6] A: Arnold Rosenthal.
[7] Q: Anybody else?
[8] A: Not that I recall.
[9] Q: What did Mr. Rosenthal tell you to change?
[10] MR. ROSENTHAL: Could you repeat that
[11] question? I'm sorry.
[12] BY MR. HARRIS:
[13] Q: What did Mr. Rosenthal tell you to change.
[14] MR. ROSENTHAL: Objection. Work product.
[15] BY MR. HARRIS:
[16] Q: Do you refuse to answer that question?
[17] MR. ROSENTHAL: I'm instructing him not to
[18] answer that question.
[19] THE WITNESS: Yes.
[20] BY MR. HARRIS:
[21] Q: Did you receive from Mr. Rosenthal marked up
[22] versions of your affidavit?

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[1] A: I don't recall.
[2] Q: If you did receive marked up versions of your
[3] affidavit from Mr. Rosenthal and they still exist,
[4] would they be in your project file?
[5] A: Yes.
[6] Q: Did you review your project file before you
[7] came to Washington for your deposition today?
[8] A: Yes.
[9] Q: Did you bring everything in your project file
[10] with you?
[11] A: Yes.
[12] Q: So you'd be able to look at your project file
[13] right now and determine whether the drafts were
[14] there?
[15] A: Yes.
[16] Q: Could you do that for me, please?
[17] (Discussion off the record.)
[18] MR. HARRIS: I'm sorry, go ahead.
[19] MR. ROSENTHAL: Let me address this on the
[20] record. Dr. Morrison submitted all of his files to
[21] us for review. As you know, we Bates-stamped them,
[22] copied them for you in the short time that we had to

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[1] do that and, of course, we did it only as a courtesy.
[2] We're not obligated to provide documents to you, but
[3] as a courtesy we did provide about 2,400 pages.
[4] In the course of that in the short time that
[5] we had, we did – I did call those documents that I
[6] considered to be attorney work product. I don't
[7] recall off the top of my head whether any of them
[8] particularly would be covered under the rubric of
[9] drafts which I marked up versions of, but I do know
[10] that there were drafts of his affidavit in that file
[11] that reflected work-product information that we have
[12] called from his project file.
[13] I'm not sure what you mean by – what he means
[14] by project file, but from the documents he gave us we
[15] did call some of those documents. Any work product
[16] documents that he told me that he has relied on for
[17] purposes of his opinion or affidavit we have produced
[18] that, but otherwise internal drafts I have kept.
[19] MR. HARRIS: Let me just make sure that I
[20] understand what I think you just told me which is he
[21] drafted an affidavit, it was reviewed by the
[22] Department of Justice, marked up, went through

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[1] several versions until the final product was attached
[2] to your motion. You're telling me you're not going
[3] to give me those drafts; is that right?
[4] MR. ROSENTHAL: No, that wasn't what I said.
[5] I said that there were drafts of his affidavit, if I
[6] recall a few of them in his files that he sent to us.
[7] I do not know for sure if they were marked up or not.
[8] But regardless any drafts which he had at some point
[9] shared with us are privileged work product
[10] information that we are not going to share with you.
[11] MR. HARRIS: Well, just so my position is
[12] clear, whether he has them or you have them, if there
[13] are marked up versions of the affidavit or drafts of
[14] the affidavit, I am clearly entitled to those
[15] documents. I'm asking that they be produced.
[16] And if you're refusing to produce them on a
[17] work product grounds, that's fine. We'll certify
[18] them to the court and will probably delay our ability
[19] to respond because this information could very well
[20] be critical to our response, and what he has said in
[21] his affidavit. Are you refusing to produce any
[22] drafts that you have of his affidavits?

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[1] MR. ROSENTHAL: Let me first say for the
[2] record we are under no obligation to produce any
[3] documents to you. First of all, under the local
[4] rules no discovery is to be taking place prior to
[5] Rule 16B conference except by court order. The court
[6] order, in this case, is very specific. The only
[7] discovery allowed is very limited to deposition of
[8] Dr. Morrison and Mr. Long. So any documents that we
[9] produce to you, first of all, are simply as a matter
[10] of courtesy. There is no obligation.
[11] Second of all, were the document request valid
[12] as a rule 34 document request, we would have 30 days
[13] to respond to it. We made an effort, as a matter of
[14] courtesy, to respond within a week long period,
[15] within a week. We're under no obligation even if it
[16] were valid to give you documents. And third of all,
[17] the scope of the court order is very limited to
[18] matters only raised in the affidavit.
[19] Now, what I will do is I will go through the
[20] documents that we recalled that were internal drafts,
[21] and if there are any marked up versions of his
[22] affidavit that he will tell me that he relied on in

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[1] forming his opinions in the affidavit, then I will
[2] provide them as a matter of courtesy to you. If they
[3] were not – if there are versions which are either
[4] duplicative or not relied on for purposes of forming
[5] his opinion, then I will not submit them to you
[6] unless – and furthermore if they were strictly
[7] opinion work product, we will also not provide to
[8] you.
[9] MR. HARRIS: Let me just say I hope you made
[10] the same argument to the magistrate. The fact of the
[11] matter is we were provided an opportunity under the
[12] order to take a deposition. As you're well aware, in
[13] a deposition we're entitled to have the duces tecum
[14] attached. That is what we did, and you're obligated
[15] to respond to that, and it is beyond me to understand
[16] how you can claim that a draft affidavit that
[17] suggests changes could not have been relied upon by
[18] him in finalizing his affidavit. But let me ask him
[19] about that.
[20] BY MR. HARRIS:
[21] Q: Did you take a look at the
[22] suggested changes that were provided to you by the

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[1] Department of Justice?
[2] A: Yes, if in fact written changes were submitted
[3] to me.
[4] Q: The fact of the matter is either written
[5] changes or oral changes were requested by the
[6] Department of Justice.
[7] A: I would characterize it as recommended.
[8] Q: And you had to evaluate those recommended
[9] changes and decide which ones you were going to adopt
[10] and which ones you weren't going to adopt?
[11] A: Correct.
[12] Q: Therefore you had to exercise some degree of
[13] whatever expertise you may have in deciding which of
[14] the changes were acceptable and which were not?
[15] A: Yes.
[16] Q: Therefore my ability to talk to you about the
[17] opinions that you reached in this case would be
[18] enhanced by my ability to review with you what the
[19] Department of Justice suggested you change or not
[20] change and what your response was to that, would it
[21] not?
[22] MR. ROSENTHAL: Objection. It goes to the

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[1] attorney work-product privilege, and I instruct him
[2] not to answer.
[3] BY MR. HARRIS:
[4] Q: Are you refusing to answer?
[5] A: Yes.
[6] Q: By the way, do you prefer Mr. Morrison,
[7] Dr. Morrison, Robert, Bob?
[8] A: The former.
[9] Q: Is that the first one?
[10] A: Yes.
[11] Q: What did I say first?
[12] A: Mr. Morrison.
[13] Q: Okay. And I apologize if I've asked this
[14] question before. Did you discuss your affidavit with
[15] anybody outside of your office other than
[16] Mr. Rosenthal?
[17] A: Yes.
[18] Q: Who?
[19] A: My recollection is that during the course of
[20] one or more conference calls with a number of parties
[21] that either it was related to the affidavit or
[22] mentioned and/or discussed.

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[1] Q: Who was involved in those conference calls?
[2] Let me back up, let me approach it a little bit
[3] differently. How many conference calls do you recall
[4] in which your affidavit or a draft of your affidavit
[5] was discussed?
[6] A: My recollection is that it would be limited to
[7] possibly one or two calls, and it would be to a very
[8] limited basis.
[9] Q: To the best of your recollection today and
[10] when – approximately when did those one or two
[11] conference calls take place? Is it the month of
[12] March?
[13] A: Yes.
[14] Q: And do you recall whether it was – can you
[15] give me within the month of March some general idea
[16] as to when either or both of those calls occurred?
[17] A: No.
[18] Q: Do you recall who was involved in either or
[19] both of the conference calls?
[20] A: No.
[21] Q: If I mentioned any names, would it trigger
[22] your memory do you believe? Let me just try. Was

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[1] Mr. Rodae involved in any of the conference calls?
[2] A: I don't recall.
[3] Q: Could have been?
[4] A: Yes.
[5] Q: Ana Maria Ortiz? Do you know who she is?
[6] A: Yes.
[7] Q: Who is she?
[8] A: It's my understanding she's counsel associated
[9] with State of New Mexico.
[10] Q: Was she involved in either or both?
[11] A: I don't recall.
[12] Q: Could she have been?
[13] A: Yes.
[14] Q: Evan Pierson, does that name mean anything to
[15] you?
[16] A: No.
[17] Q: Robert Bittner, does that name mean anything
[18] to you?
[19] A: Yes.
[20] Q: Who is he?
[21] A: My understanding he's an employee with
[22] CH2M Hill in Albuquerque, New Mexico.

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[1] Q: Do you recall whether he was involved in
[2] either or both of those conference calls?
[3] A: No.
[4] Q: Could he have been?
[5] A: Yes.
[6] Q: Do you recall whether you originated either or
[7] both of these conference calls?
[8] A: My recollection is that they would be
[9] originated outside of our office.
[10] Q: Do you remember if anyone from a consulting
[11] firm A.T. Kearney was involved in either or both of
[12] the conference calls?
[13] A: I don't believe so.
[14] Q: And in particular do you recall whether a
[15] Richard – how does he say his last name?
[16] (Discussion off the record.)
[17] BY MR. HARRIS:
[18] Q: Mr. O'Dea has been kind enough to correct me
[19] about Mr. Bittner's first name is Michael not Robert.
[20] Does that name sound more familiar or were you
[21] focusing on the Bittner portion?
[22] A: The latter.

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[1] Q: So your answer would still be the same with
[2] respect to Michael Bittner, he may have been involved
[3] in either or both of the conference calls?
[4] A: Yes.
[5] Q: Do you, other than with respect to this case,
[6] who else have you had contact with out of your office
[7] about any opinions or conclusions you have reached?
[8] And other than Mr. Rosenthal, obviously.
[9] A: Michael Donnellan, Vince Mallot, Steve Amter,
[10] and Rob Pine.
[11] Q: Do you recall whether Rob Pine was involved in
[12] either or both of the conference calls where your
[13] affidavit may have been discussed?
[14] A: I don't recall.
[15] Q: Could he have been?
[16] A: Yes.
[17] Q: Who's Steve Amter?
[18] A: He's a hydrogeologist who works for Disposal
[19] Safety.
[20] Q: Where are they located?
[21] A: In the Washington, D.C. area. I also recall,
[22] in reference to an earlier question, that

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[1] Mr. Norm Gaume participated in one or more of the
[2] conference calls.
[3] Q: Where your affidavit may have been discussed?
[4] A: Yes.
[5] Q: Do you recall any particular changes to your
[6] affidavit in this case that Mr. Pine suggested?
[7] A: No.
[8] Q: Do you recall any changes to your affidavit
[9] that Mr. Amter may have suggested?
[10] A: No.
[11] Q: Do you recall any changes to your affidavit
[12] that Mr. Gaume may have suggested?
[13] A: No.
[14] Q: Any changes that Mr. Mallot may have suggested
[15] to your affidavit? Do you recall any of those?
[16] A: No.
[17] Q: What knowledge does Mr. Amter have about this
[18] site that you felt compelled to discuss your
[19] affidavit with him?
[20] A: It's my understanding that Mr. Amter is
[21] generally familiar with the site, and that he may or
[22] may not have been present during a conference call in

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[1] which the affidavit was discussed.
[2] MR. ROSENTHAL: May I, Mr. Harris, inject a
[3] question with regard to your line of questioning?
[4] You're referring to the affidavit, two pages that he
[5] signed. Attached to the affidavit were his resume,
[6] exhibits, work plan, and maps. When you're asking
[7] Mr. – Dr. Morrison about what he recalled about
[8] conversations and suggestions and that sort of thing
[9] from other people about his affidavit, are you
[10] construing affidavit to mean the two pages that he
[11] signed of the affidavit or are you asking more
[12] broadly to include the exhibits as well?
[13] MR. HARRIS: I meant everything that is
[14] attached to it I view it as one package.
[15] BY MR. HARRIS:
[16] Q: Were we not communicating well, Mr. Morrison,
[17] in that regard?
[18] A: No.
[19] Q: I would ask then if at any point I ask you a
[20] question and it seems to be unclear to you, would you
[21] stop me and ask me to repeat it or rephrase it,
[22] please?

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[1] A: Yes.
[2] Q: I had assumed since you had been through some
[3] 23 depositions that you were familiar with what we're
[4] doing today and the need for us to be precise in
[5] terms of your understanding my question and my
[6] understanding your answer.
[7] MR. ROSENTHAL: Objection. Argumentative. I
[8] thought you meant the two pages of affidavit too, and
[9] I've been through several hundred depositions. If
[10] you meant to the entire package, you could have said
[11] so.
[12] BY MR. HARRIS:
[13] Q: Are we now clear Dr. – or
[14] Mr. Morrison?
[15] A: Yes.
[16] Q: Good. One of the attachments that's included
[17] in your affidavit and is incorporated – I believe it
[18] is incorporated in your affidavit is the work plan.
[19] Who did you supply copies of the work plan to?
[20] A: The Department of Justice, the Environmental
[21] Protection Agency, and I don't recall specifically if
[22] I forwarded copies to the state and/or city or

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[1] whether they were distributed by the Department of
[2] Justice and/or EPA.
[3] Q: But it's your understanding that a draft of
[4] your work plan did make its way to both the
[5] City of Albuquerque and New Mexico environment
[6] division?
[7] A: Yes.
[8] Q: And who did you – who at the Department of
[9] Justice did you provide a copy of the draft of the
[10] work product?
[11] A: My recollection is either Arnold Rosenthal and/or
[12] Michael Donnellan.
[13] Q: And at EPA who did you supply a work copy to?
[14] A: Vince Mallot.
[15] Q: Just so we're clear, there are a couple of
[16] maps that are also attached to and made part of your
[17] affidavit; correct?
[18] A: Yes.
[19] Q: Did those go through drafts?
[20] A: Yes.
[21] Q: And who did you supply copies of those drafts
[22] to?

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[1] A: The parties I previously testified to.
[2] Q: Same as for the work plan, is my point.
[3] A: Yes.
[4] Q: How many drafts did the work plan go through?
[5] A: To the best of my recollection somewhere in
[6] the order of five to six drafts.
[7] Q: And was the first draft developed after March
[8] 1st to the best of your recollection?
[9] A: I don't recall.
[10] Q: Did you keep – would you have kept copies of
[11] comments on the draft work plans?
[12] A: It's not my normal practice. They may or may
[13] not be in the project file.
[14] Q: Are you going to have the same objection if I
[15] ask for those?
[16] MR. ROSENTHAL: If you ask – I'm sorry?
[17] MR. HARRIS: The drafts of the work plan.
[18] MR. ROSENTHAL: Yes, but I'll make you the
[19] same agreement to the extent that there are any
[20] drafts with comments that he relied on not strictly
[21] opinion or work product I'll turn them over to you.
[22] BY MR. HARRIS:

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[1] Q: Is it true, Mr. Morrison, that you would have
[2] received comments either orally or in writing to the
[3] work plan, you would have evaluated those and decided
[4] whether to incorporate the comments or not in the
[5] final product?
[6] A: Yes.
[7] Q: Do you make it a practice to take notes of
[8] conversations you have with individuals that you were
[9] talking to about the development of an opinion or
[10] conclusion on which you're working that's going to
[11] trial?
[12] A: No.
[13] Q: Did you take any notes during the conference
[14] calls? Let me be more specific. In particular, did
[15] you take notes during the conference calls in which
[16] your affidavit or work plan were discussed?
[17] A: I don't recall.
[18] Q: What would you have to review to determine if
[19] such notes exist?
[20] A: The administration binders.
[21] Q: Where are they?
[22] A: They have been produced.

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[1] MR. ROSENTHAL: I do not see any notes that
[2] Dr. Morrison took with regard to the conference call
[3] and ask either that we turn it over or we called for
[4] privilege.
[5] MR. HARRIS: I'm assuming then at some point
[6] in the very near future I'm going to be getting a
[7] privilege law call?
[8] MR. ROSENTHAL: Again, we don't believe we're
[9] under any obligation to it, but as a matter of
[10] courtesy at some point we'll go ahead and provide
[11] that as long as you extend the same courtesy in
[12] providing us any documents and privilege that we
[13] request from either side.
[14] BY MR. HARRIS:
[15] Q: Let me make sure kind of where we are. You
[16] don't remember whether you made notes but, you had
[17] some binders you referred to as what, administrative
[18] binders?
[19] A: Yes.
[20] Q: And what's this administrative binder?
[21] A: They would be binders that would include
[22] information related to the project including time

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[1] sheets, billings, notes, faxes, and correspondence.
[2] Q: And Arnold, if I understand you correctly,
[3] sitting here today you don't recall any notes of
[4] conversations that were included in the
[5] administrative binder?
[6] MR. ROSENTHAL: Well, what we copied and
[7] Bates-stamped for you were his binders with the
[8] exception of a handful of documents that we called
[9] that were privileged. I believe the question was
[10] were there any notes that Dr. Morrison took with
[11] regard to any conference calls he testified about and
[12] there were none in there of that nature.
[13] MR. HARRIS: Okay, thank you.
[14] BY MR. HARRIS:
[15] Q: Mr. Morrison, what's the difference between a
[16] confined and unconfined aquifer? I notice that
[17] you're referring to some definitions that I guess the
[18] Department of Interior has developed. Are you saying
[19] after having worked in this field for 23 years you
[20] can't just tell me you don't have your own definition
[21] of those terms?
[22] A: Yes.

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[1] Q: You do not?
[2] A: Yes, I have my own definition. The reason I
[3] was referring to the geological water survey supply
[4] paper 1988 which contains definitions to be more
[5] precise in my answer so that the reader of the
[6] transcript has no ambiguity in terms of the
[7] definition that I'm working from.
[8] Q: Okay, go ahead.
[9] A: Confined ground water is defined in the
[10] definitions of selected ground water terms and
[11] revisions and conceptual refinements. Geological
[12] supply survey paper 1988 confined ground water under
[13] pressure is significantly greater than atmospheric
[14] and its upper limit is at the bottom of the bed, bed
[15] of distinctly lower hydraulic conductivity, that of
[16] the material in which the confined water occurs.
[17] Q: You quoted verbatim from that document;
[18] correct?
[19] A: Correct.
[20] Q: I'll move to strike as non-responsive. My
[21] question is what's the difference between a confined
[22] and unconfined aquifer?

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[1] A: In reference to the definition which I just
[2] shared with you, a confined would be an aquifer under
[3] pressure and unconfined would be one that is not
[4] under pressure.
[5] Q: And what difference does that make in terms of
[6] determining how one addresses contamination in an
[7] aquifer? What difference does it make to you whether
[8] it's confined or unconfined if you're asked to clean
[9] up an aquifer, if any?
[10] MR. ROSENTHAL: I'm going to object in regard
[11] to questions about cleaning up an aquifer inasmuch as
[12] the court order limited the deposition specifically
[13] to the issues that were raised in the affidavit, and
[14] Mr. Morrison did not express any opinions in the
[15] affidavit with regard to cleaning up an aquifer.
[16] BY MR. HARRIS:
[17] Q: Do you consider restoration to be cleaning up,
[18] Dr. – or Mr. Morrison?
[19] A: As I understand the terms they would be
[20] similar.
[21] Q: How do you define restoration?
[22] A: It would be the treatment of a media to some

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[1] prescribed standard.
[2] Q: And I think in your affidavit you made
[3] reference to the fact that restoration can take a
[4] long time.
[5] A: I've stated that it's a more time consuming
[6] process and more involved as contracted to
[7] containment.
[8] Q: So my question relating to that statement is
[9] what difference from a restoration standpoint does it
[10] make whether an aquifer is confined or unconfined?
[11] MR. ROSENTHAL: Same objection but I'll let
[12] him answer the question.
[13] THE WITNESS: It would depend on many
[14] site-specific issues.
[15] BY MR. HARRIS:
[16] Q: Such as? Let me ask the question another way.
[17] Let me see if I can get your understanding. Would
[18] you agree that containment can be one form of
[19] restoration?
[20] A: Depending on the selection of the technology
[21] that's a possibility.
[22] Q: Let's focus on containment then or for a

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[1] second. What difference does it make in designing a
[2] containment system whether an aquifer is confined or
[3] unconfined?
[4] A: I don't understand the question.
[5] Q: Would you approach the design of a containment
[6] system in a confined aquifer the same way you would
[7] approach the design of an aquifer in an unconfined
[8] system?
[9] A: It would depend.
[10] Q: On what?
[11] A: Remediation goals, the technology selected,
[12] and the chemicals of concern.
[13] Q: Well, let's just be very specific, as applied
[14] to this site, does it make any difference in
[15] developing a containment system whether the aquifer
[16] is considered confined or unconfined?
[17] A: Are you referring to the leading edge of the
[18] off-site plume, the Sparton site?
[19] Q: Yes.
[20] A: My understanding is that the aquifer off-site
[21] is unconfined in the vicinity of the leading edge of
[22] the chlorinated solvent plume.

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[1] Q: That wasn't my question. In approaching the
[2] design it does it make any difference to you whether
[3] you consider it at this site confined or unconfined?
[4] A: I haven't considered a confined scenario given
[5] that the aquifer in the vicinity of the leading edge
[6] of the chlorinated solvent plume is unconfined.
[7] Q: If I asked you to consider that it was
[8] confined, what would you do differently in designing
[9] a containment system at the leading edge? How would
[10] you approach the design differently, if at all?
[11] A: In your hypothetical I would probably include
[12] consideration of a larger universe of containment
[13] technologies.
[14] Q: Why?
[15] A: Because in your hypothetical containing – a
[16] contaminant in a contained – excuse me. A confined
[17] aquifer may be more complex than containment of
[18] contaminants in an unconfined aquifer due to the
[19] added variable of pressure of the water in the
[20] confined system.
[21] Q: Is the calculation of the capture zone any
[22] different in confined and unconfined aquifer?

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[1] A: Are you referring to the mathematics?
[2] Q: Yeah, let's start there.
[3] A: The approach would be similar with the caveat
[4] that an added variable would be included which is the
[5] confining pressure of the water in a confined
[6] aquifer.
[7] Q: And why do you have to add that variable to
[8] the calculation?
[9] A: Because the water is under pressure.
[10] Q: My question really went to how does it change
[11] the calculation?
[12] A: The calculation would be changed and/or
[13] different from the calculation for an unconfined
[14] aquifer because the water in the confined aquifer is
[15] under pressure and so that variable needs to be
[16] accounted for in the mathematics.
[17] Q: How does it affect the size or shape of the
[18] capture zone if at all? In other words, my question
[19] is simply I've got two aquifers, all other
[20] characteristics being the same except one is confined
[21] and the other isn't. What I'm trying to understand
[22] is how this confining pressure, the addition of the

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[1] confining pressure affects the size or the shape of
[2] the capture zone using whatever mathematical formula
[3] you would be applying. Does it make it bigger,
[4] smaller, and to what extent?
[5] A: I would need additional information before I
[6] could answer that.
[7] Q: What would you need?
[8] A: The difference in pressure between the
[9] confined versus unconfined aquifer.
[10] Q: And at what point would the difference in
[11] pressure be great enough to make a difference in the
[12] size and shape of the capture zone?
[13] A: I don't know what that threshold difference
[14] would be.
[15] Q: When you use the term isotropic in talking
[16] about an aquifer, what do you mean? Are you just
[17] going to read me the definition again, Mr. Morrison?
[18] A: I would prefer to.
[19] Q: You don't feel – let me make sure I
[20] understand this without being too argumentative. If
[21] I'm another ground water guy and you and I are
[22] talking and I say, "Hey, do you think this aquifer is

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[1] isotropic?" you have to go back and take a look at
[2] this definition before you can respond?
[3] A: No.
[4] Q: Okay. I'm just trying to get the way you use
[5] the term when you're talking with other people in
[6] your field and explain to me in laymen's terms, if
[7] you could, so I can understand what the phrase
[8] isotropic means.
[9] A: In laymen's terms it would be the similarity
[10] of properties in three dimensions.
[11] Q: And again in laymen's terms, what does
[12] anisotropic mean?
[13] A: It would be the opposite of isotropic, that
[14] means dissimilar in three dimensions.
[15] Q: So if ground water flows differently in a
[16] horizontal direction than the vertical direction, or
[17] to put it I guess in cartesian coordinates,
[18] Mr. Morrison, if it flows one way in the X and Y
[19] direction and another way in the Z, if I'm getting
[20] that correct, that would be anisotropic?
[21] A: Yes, relative to that property.
[22] Q: And in laymen's terms what do you understand a

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[1] homogeneous aquifer to be?
[2] A: Conceptually similar to the term isotropic.
[3] Q: So again, just so you and I are communicating
[4] not on the same technical level you typically operate
[5] on, if an aquifer was anisotropic, it would also be
[6] non-homogeneous as far as you're concerned?
[7] A: Yes.
[8] Q: Have you had a chance to review logs, boring
[9] logs of the geology pattern near the Sparton plant?
[10] A: Yes.
[11] Q: And have you been able to reach any
[12] conclusions about whether if there's any significant
[13] percentage of silt and clay in that aquifer? That is
[14] the portion of the saturated zone, Mr. Morrison,
[15] that's been impacted by materials from the Sparton
[16] plant?
[17] A: What do you mean by significant percentage of
[18] the portion?
[19] Q: Something more than 10 percent?
[20] A: Silts and/or clays were described in boring
[21] logs on and/or off-site of the Sparton plant. I'm
[22] unable to characterize the percentage in a particular

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[1] bore hole with the information I have available to
[2] me.
[3] Q: That's fair enough. What you're telling me is
[4] you haven't had a chance to sit down and review the
[5] data to answer that question then just tell me that.
[6] I'm trying to figure out if you've reached a
[7] conclusion on this point or not.
[8] A: No.
[9] Q: Would you agree that based upon the
[10] information you have reviewed to date that the
[11] saturated zone in the vicinity of the Sparton plant
[12] that's been impacted by materials from the Sparton
[13] plant is anisotropic?
[14] A: Yes.
[15] Q: And in which direction is it anisotropic as
[16] far as you're concerned? We have two horizontal
[17] directions and a vertical direction; right? We're
[18] moving straight ahead or could be moving forward or
[19] to the sides, and it could be moving upward or
[20] downward, and I'm trying to understand – is my
[21] question at all clear to you, Mr. Morrison?
[22] A: No.

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[1] Q: Okay. Let me see if I can restate it in a way
[2] I understand it and hopefully you will too.
[3] I think you agree – you told me that based on
[4] the review of information made available to you so
[5] far you believe that the saturated zone impacted by
[6] materials from the Sparton plant is anisotropic and
[7] is there a particular direction in which you believe
[8] it is anisotropic?
[9] A: For clarification, the anisotropic reference
[10] was to the soils within the aquifer.
[11] Q: In the saturated zone?
[12] A: Yes.
[13] Q: And would that – forget it. I can never say
[14] that word but if you understand what I'm getting at,
[15] it's anisotropic in the soil so does that impact the
[16] flow of ground water in a particular direction? Does
[17] it cause it to be different in one direction than in
[18] another? That area that's been impacted by materials
[19] from the Sparton plant?
[20] A: It may.
[21] Q: Which direction?
[22] A: It would depend on the gradient of the ground

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[1] water flow.
[2] Q: Explain that to me, please.
[3] A: The direction of flow on the horizontal axis
[4] is dictated to a large part on the gradient.
[5] Q: I still don't understand that. Why don't you
[6] explain that to me.
[7] A: The slope of the line describing the ground
[8] water in an unconfined aquifer is the most
[9] significant factor in controlling which direction the
[10] ground water flows.
[11] Q: Is it your understanding that ground water in
[12] the vicinity of the Sparton plant that's been
[13] impacted by materials from that plant is moving
[14] faster in the horizontal direction than in the
[15] vertical direction?
[16] A: Yes.
[17] Q: And do you have any understanding of the
[18] relative difference between those two flow
[19] directions? Is it moving, at least based on your
[20] review of available information, twice as fast
[21] horizontally as opposed to vertically, ten times as
[22] fast, 100 times as fast?

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[1] A: That issue seems to be in dispute in regards
[2] to that data that's been collected at the Sparton
[3] site.
[4] Q: Okay.
[5] A: But I would characterize the ground water flowas
[6] moving faster in a horizontal than in a vertical
[7] direction.
[8] Q: Have you been able to reach a conclusion as to
[9] how much faster it's moving horizontally than
[10] vertically?
[11] A: I haven't specifically looked at that issue on
[12] the Sparton site.
[13] Q: So at least as of today, Mr. Morrison, you
[14] don't have an opinion on the relative difference
[15] between the horizontal flow rate and the vertical
[16] flow rate in the saturated zone that's been impacted
[17] by material from the Sparton plant?
[18] A: Correct.
[19] Q: You graduated from or you got your Ph.D in
[20] what year?
[21] A: I believe it was 1988 or 1989.
[22] Q: You got your undergraduate degree what year?

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[1] A: 1972.
[2] Q: And you received your first MS when?
[3] A: Approximately 1978 or '79.
[4] Q: And your second MS?
[5] A: 1982 or 1983.
[6] Q: During the time that you worked in the ground
[7] water area, have you ever been called upon to design
[8] a monitor well network in an effort to delineate the
[9] extent of contamination in a saturated zone?
[10] A: Yes.
[11] Q: Can you describe for me in general terms how
[12] you currently approach such a problem? In other
[13] words, if I come to you and say we have reason to
[14] believe that organic materials have entered the
[15] saturated zone and we're trying to figure out where
[16] they are, explain for me what you would recommend for
[17] me to do in order to solve that problem.
[18] A: I would first need to know the chemical of
[19] concern.
[20] Q: Okay.
[21] A: Based on that information, I would examine
[22] technologies which could provide plume delineation

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[1] prior to the installation of monitoring wells. Based
[2] on that analysis, recommendations would be made
[3] concerning the placement of monitoring wells and/or
[4] temporary monitoring points.
[5] Q: Okay. And then what would we do?
[6] A: Based on the results of the chemical testing
[7] from the temporary and/or monitoring wells, a
[8] determination would be made as to whether the
[9] existing system is sufficient for defining the
[10] horizontal and vertical extent of the contaminant
[11] plume.
[12] Q: Let's assume then that the chemical of concern
[13] is TCE. Have you ever been asked to develop a
[14] program for identifying the extent of TCE
[15] contamination associated with some past contamination
[16] activities?
[17] A: Are you referring to ground-water
[18] contamination?
[19] Q: Yes.
[20] A: Can you give me some examples of sites and
[21] clients you have done that work for?
[22] A: Yes.

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[1] Q: Who are they and where are they?
[2] MR. ROSENTHAL: I'll let him answer this so
[3] long as any of the examples do not concern any work
[4] that he's been doing as a non-testifying expert for
[5] the Department of Justice.
[6] THE WITNESS: One example would be a
[7] chlorinated solvent plume in the San Jose area.
[8] BY MR. HARRIS:
[9] Q: Who's the client?
[10] A: Jolen Way Partners.
[11] Q: And did you prepare a plan, a work plan for
[12] them?
[13] A: I don't recall.
[14] Q: Is the work completed? Have you delineated
[15] the extent of the contamination?
[16] A: Yes.
[17] Q: When was the work completed?
[18] A: Within the past five years.
[19] Q: And is the Jolen Way partnership based in
[20] San Jose?
[21] A: I believe so.
[22] Q: Is this work done in connection with

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[1] litigation or not?
[2] A: At one point there was a litigation component
[3] to the engagement.
[4] Q: Let me ask the question this way: At this
[5] particular site, were you the person responsible for
[6] developing a work plan and implementing the work plan
[7] and preparing and finalizing a report to describe the
[8] extent of the contamination?
[9] A: It wasn't a situation where there was a formal
[10] process of reporting the charts. What I was given
[11] was to characterize the plume then to remediate the
[12] chlorinated solvents in the ground water.
[13] Q: How large was the plume?
[14] A: My recollection is that it was a mile or mile
[15] and a half in length.
[16] Q: Would your office have kept a copy of any
[17] report that you prepared on that project?
[18] A: No.
[19] Q: What other sites involving TCB have you been
[20] involved in where you were asked to define the extent
[21] of contamination in ground water?
[22] A: A non-litigation setting? Another project

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[1] that comes to mind was a site located in Arlington,
[2] Oregon.
[3] Q: Who did you do that work for?
[4] A: My recollection is that the company was
[5] Chem-Waste Management, and it was while I was
[6] employed with Woodward-Clyde Consultants.
[7] Q: And did you have the responsibility for
[8] identifying technologies that would assist in
[9] locating or developing locations for monitor wells?
[10] A: Yes.
[11] Q: And did you select the location for the
[12] monitor wells?
[13] A: In part.
[14] Q: Did you evaluate the results of the analytical
[15] result from those monitor wells to determine whether
[16] additional monitor wells were needed?
[17] A: Yes.
[18] Q: Was there a report prepared in connection with
[19] that project?
[20] A: I believe so.
[21] Q: You probably don't have a copy of it though,
[22] do you?

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[1] A: No, it was a situation which I left the firm
[2] prior to the report being finalized.
[3] Q: Any other sites that you recall today in which
[4] you had responsibility for identifying the extent of
[5] TCE contamination?
[6] A: You're referring to a non-litigation
[7] situation?
[8] Q: Yes. And let me make myself clear,
[9] Mr. Morrison. By non-litigation I mean a situation
[10] where you were not hired – at the time you were
[11] hired, it was not with the intent that you would
[12] probably be testifying in the case. I understand the
[13] distinction is not always clear, but what I'm
[14] interested in are those cases where you were hired
[15] primarily just to provide technical guidance without
[16] the thought at the time you were hired that this
[17] would lead to your being deposed at some point in the
[18] piece of litigation. Am I making myself clear enough
[19] to where you can answer the question?
[20] A: Yes. While I was employed with Woodward-Clyde
[21] there were numerous projects that I became involved
[22] in which included chlorinated solvents and plume

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[1] delineation. One project that comes to mind was the
[2] Four Corners Pipeline refinery in Long Beach,
[3] California.
[4] Q: Who was that owned by, the refinery, that is,
[5] if you recall?
[6] A: Yes. Four Corners Pipeline.
[7] Q: And did you have responsibility, were the
[8] persons responsible in that project for determining
[9] where monitor wells should go and whether additional
[10] monitor wells were necessary?
[11] A: Yes.
[12] Q: Any other projects?
[13] A: There were a number of landfill projects that
[14] involved chlorinated solvents and monitoring well
[15] and/or plume delineation while I was employed with
[16] SCS and with Woodward-Clyde, SCS projects including
[17] primarily landfills located through out the country,
[18] and I recall sites in Nebraska, Michigan, Texas,
[19] Louisiana, New Jersey, California, Utah.
[20] Q: And reports that you had some involvement -
[21] did you keep copies of any of the reports from any of
[22] those projects that you had involvement in?

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[1] A: No.
[2] Q: I think you told me a few minutes ago that
[3] after you put in a monitor well, whether they're
[4] temporary or permanent, you then have to evaluate the
[5] analytical results from the sampling of those wells
[6] and determine whether that system is sufficient to
[7] define the horizontal and vertical extent of the
[8] contamination.
[9] Did I understand what you told me correctly?
[10] A: Yes, with the caveat that's assuming that the
[11] goal is to define the horizontal and vertical extent
[12] of the contaminant plume.
[13] Q: And you're saying that in some cases there
[14] isn't that goal?
[15] A: That's correct.
[16] Q: Why not?
[17] A: There may be situations and/or projects in
[18] which there the goal is simply to answer whether a
[19] contaminant is present or not present.
[20] Q: How do you go about determining whether the
[21] analytical results from the sampling of the monitor
[22] wells installed is sufficient for defining the

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[1] horizontal and vertical extent?
[2] A: It would depend for what purpose the
[3] horizontal and vertical extent of the plume is
[4] relative to the purpose of the project.
[5] Q: Explain that to me, if you could.
[6] A: If the purpose in defining the leading edge of
[7] the plume is for the purpose of designing a
[8] containment system, that may require a certain level
[9] of perspective of analysis. If defining the leading
[10] edge of the plume, for example, has a goal of
[11] determining its proximity to a drinking water supply,
[12] that may have a different type and/or level of
[13] analysis.
[14] Q: Any other situations that you can think of
[15] that would require different - would cause
[16] sufficient to be defined differently for you?
[17] A: Yes.
[18] Q: What?
[19] A: If a goal in detaining the leading edge of the
[20] plume is to examine issues related to the migration
[21] of the leading edge of the plume, that may require a
[22] unique level of analysis and/or evaluation.

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[1] Q: Any others?
[2] A: Those three are goals that come to mind.
[3] There may be others.
[4] Q: But none that come to mind right now, no
[5] others that come to mind right now?
[6] A: A fourth would be definition of the leading
[7] edge of a contaminant plume for allocation
[8] purposes.
[9] Q: Any others?
[10] A: Not that I recall or can think of as I sit
[11] here today.
[12] Q: Each one of those four categories tell me then
[13] how you determine at what point you have sufficient
[14] information.
[15] A: I would generally characterize it as a
[16] professional judgment evaluation.
[17] Q: What does that mean?
[18] A: That means that once a certain level of
[19] analytical information is available, one uses his or
[20] her professional judgment in terms of the adequacy of
[21] that information for responding to the particular
[22] goal of the project.

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[1] Q: And what do you mean by a certain amount of
[2] information is available? What constitutes a certain
[3] amount?
[4] A: Again, that would be depending on the goal of
[5] the characterization.
[6] Q: You've given me four different goals. Tell me
[7] for each one of those goals what's the certain amount
[8] of information you need and how it differs from one
[9] to the other?
[10] A: An example would be if the goal is to simply
[11] define the presence or absence of the contaminant in
[12] the ground water a single well may be sufficient.
[13] Q: That wasn't one of the four categories you
[14] gave me. You talked to me about defining –
[15] developing a containment system, preventing impact to
[16] the water supply well, that was the second one.
[17] Defining the migration of the leading edge of the
[18] plume that was the third one. The four one was for
[19] allocation purposes.
[20] What I'm asking you is for each one of those
[21] four goals, what's the certain amount of information
[22] you need to accomplish each one of those goals and

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[1] how does that certain amount of information differ
[2] from one goal to the other?
[3] A: My example was in reference to the second goal
[4] where a single well would provide information
[5] regarding the presence or absence of a contaminant
[6] and its proximity to a monitoring well. And in that
[7] case one well may or – would be sufficient to
[8] determine whether the contaminant was present and
[9] then depending on the site, specific nature, and the
[10] chemical of concern, additional wells would be
[11] required to determine the plume's proximity to the
[12] drinking water supply well.
[13] Q: You've confused me a little bit. I'm
[14] presupposing in your second situation there already
[15] exists a water supply well otherwise you wouldn't
[16] have to worry about protecting it, would you?
[17] A: Correct.
[18] Q: Wouldn't that water supply well tell you
[19] whether the material was present or not?
[20] A: Correct.
[21] Q: So would that be your one well?
[22] A: No.

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[1] Q: How would you then go about determining where
[2] to put this additional well?
[3] A: For the second goal in a hypothetical where
[4] the drinking water supply well has been tested and is
[5] found to be uncontaminated and the goal is to
[6] determine the proximity and rate of contaminants
[7] within the ground water relative to that drinking
[8] water supply well.
[9] A single well installed would provide and,
[10] again, assuming that it's in some proximity of
[11] gradient to the drinking water supply well would
[12] provide information whether the contaminant was at
[13] that particular location or not based upon the
[14] results of that sample from that particular
[15] monitoring well, it would be a common practice that
[16] additional wells would then be added to further
[17] define the leading edge of the plume and/or its rate
[18] of migration towards the drinking water supply well.
[19] Q: You're not telling me one well wouldn't be
[20] enough, if I understood what you just told me. You
[21] put in one, then you'd have to put in some more?
[22] A: That would be a reasonable approach.

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[1] Q: So, again, at what point do you have – what's
[2] the certain amount of information that you say you
[3] need? When do you reach that certain amount of
[4] information in just this one situation where you're
[5] trying to determine how close the contamination is to
[6] a public water supply?
[7] A: Would be site-specific and whether or not the
[8] wells that are being installed are being placed or
[9] positioned in a manner which is defining the leading
[10] edge of the plume.
[11] Q: Tell me the site-specific conditions you would
[12] look at? What do you want to know about the site in
[13] determining whether more wells are necessary?
[14] A: The scale of the site.
[15] Q: Meaning what?
[16] A: The X and Y direction or size of the
[17] contaminant plume in the area in which one is
[18] examining the contaminant plume. For example, if the
[19] plume is a mile wide, that may require a higher
[20] density of wells to define that leading edge versus
[21] if the plume is 50 feet wide.
[22] Q: On the other hand, even if it was a mile wide,

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[1] we may be able to use the same number of wells as if
[2] it were 50 feet wide?
[3] A: That possibly exists. I don't think it's a
[4] reasonable one.
[5] Q: What else besides – what you're telling me is
[6] the bigger the plume there's a greater likelihood
[7] you'll need more wells, the smaller the plume the
[8] greater the likelihood you'll need fewer wells?
[9] A: Generally that's correct.
[10] Q: Other site-specific conditions besides the
[11] size of the area that's been impacted?
[12] A: The depth of the contaminant plume.
[13] Q: Why does that impact the number of wells that
[14] you need?
[15] A: The depth of the contaminant plume may require
[16] wells separate and distinct from those used to define
[17] the horizontal extent.
[18] Q: Wasn't that just a function of how many times
[19] you sample as you're going down?
[20] A: It would be a function of the screened
[21] interval of the permanent monitoring wells.
[22] Q: Can't you have multiple screened intervals in

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[1] a well?
[2] A: Yes, but it's my professional preference not
[3] to use that approach because of the issues of cross
[4] contamination between the screened intervals.
[5] Q: What else besides depth?
[6] A: The presence or absence of the chemical of
[7] concern in the wells.
[8] Q: Why does that make a difference?
[9] A: Because the presence or absence of a chemical
[10] in a well will determine where one defines the
[11] leading edge of the plume.
[12] MR. ROSENTHAL: Jim, could we take a break
[13] soon?
[14] MR. HARRIS: Yeah, in half a second. Let me
[15] just go through this line, then we'll take a break.
[16] BY MR. HARRIS:
[17] Q: You've identified aerial extent, depth, and
[18] that's basically the same thing whether you find it
[19] in the well or not. Any other site-specific
[20] conditions?
[21] A: Well, obviously the geology and the number of
[22] aquifers would play an important part.

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[1] Q: What about the geology?
[2] A: The impact of the geology would be whether or
[3] not the screened interval of the monitoring wells was
[4] intersecting those portions of the aquifer through
[5] which the contaminants were being transported.
[6] Q: What else?
[7] A: I previously mentioned the number of aquifers.
[8] Q: And explain to me what you mean by that.
[9] A: If contaminants are being transported through
[10] more than one aquifer, it would be important to
[11] monitor the contaminants of concern within each of
[12] those distinct aquifers both horizontally and
[13] vertically.
[14] Q: What do you consider to be distinct aquifers?
[15] A: An example would be a confined versus an
[16] unconfined aquifer.
[17] Q: I'm sorry, what do you mean by that?
[18] A: An example would be a ground water system
[19] which consists of numerous aquifers.
[20] Q: My question really was you've got a saturated
[21] zone. How do you determine within that saturated
[22] zone whether you have distinct aquifers or not?

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[1] A: It would be defined by both the geology and/or
[2] piezometric measurements in the monitoring wells.
[3] Can we take a break now?
[4] Q: Yes.
[5] (A brief recess was taken.)
[6] BY MR. HARRIS:
[7] Q: Mr. Morrison, I think the last fact you
[8] identified is something you would consider in
[9] determining when you had a sufficient delineation of
[10] plume was the number of aquifers that were involved
[11] in a characterization, just to get you back on where
[12] we were. Is that where you remember we were when you
[13] left?
[14] A: The number of aquifers would impact the number
[15] of wells that would be required for plume delineation
[16] for the entire system.
[17] Q: Any other – I think we've identified a number
[18] of aquifers, the aerial extent, the depth, and the
[19] underlying geology of the saturated zone. Did I get
[20] those factors down correctly?
[21] A: Yes, as a presence or absence of the
[22] contamination in the monitoring well.

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[1] Q: Any others?
[2] A: None that come to mind.
[3] Q: Those are the factors you would consider if
[4] you're trying to protect a public water supply well
[5] or at least determine how close contamination was to
[6] that water supply well. Are there any additional
[7] factors that you would consider in a circumstance
[8] where you're trying to identify the migration rate of
[9] the leading edge of the plume?
[10] A: Depending on the urgency of the information,
[11] the higher density of wells may be required for
[12] determining rate of expanse of a plume.
[13] Q: I'm not asking how you evaluate the factors,
[14] I'm just asking are there any other factors that you
[15] would consider besides the five we've been talking
[16] about, the number of aquifers, the sizes, the depth,
[17] the geology and the presence or absence of
[18] contaminants in the wells?
[19] A: Those are the factors that come to mind.
[20] Q: And if you were trying to characterize
[21] contamination for allocation purposes, any other
[22] factors besides the five we've talked about? I'm not

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[1] asking you how you would evaluate those factors in
[2] that situation, I'm just saying are there any other
[3] factors you would take into account?
[4] A: I understand, for allocation purposes the
[5] concentration gradient near the leading edge of the
[6] plume would be another factor.
[7] Q: Won't than determined by the number of wells
[8] that you put in related to size, depth, geology?
[9] A: It would be related to the chemistry from
[10] those wells that have been installed.
[11] Q: And again, I'm not asking is there some reason
[12] you think it might be put in a different number of
[13] wells, I'm just asking in the abstract is there some
[14] additional site-specific factor that you would take
[15] into account in determining the number of wells for
[16] allocation purposes?
[17] A: No.
[18] Q: And with respect to defining a containment
[19] system, again, any additional site-specific factors,
[20] not how would you evaluate those site-specific
[21] factors and what they tell you the about the number
[22] of wells you need, but are there any other

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[1] site-specific factors you want to take into account
[2] in that setting?
[3] A: Not that I can think of.
[4] Q: Now, in the four situations you've just talked
[5] about, do you believe that there are different levels
[6] of precision that are required with respect to the
[7] definition of the horizontal and vertical extent of
[8] the plume?
[9] A: Can you explain what you mean by precision?
[10] Q: Yeah. How certain that you are that the
[11] concentrations are at a particular level and a
[12] particular point at the leading edge of the plume?
[13] A: It would have to be related to the goal and/or
[14] purpose of defining the leading edge of the
[15] plume.
[16] Q: Then that was my question. You've identified
[17] four different situations, and my question to you is
[18] is the level of precision, using my definition of
[19] precision, that you'd like in terms of horizontal and
[20] vertical extent different for each one of these four
[21] situations? And if so what's the difference in
[22] precision?

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[1] A: As I understand your question, the level of
[2] precision would be related to the goal for defining
[3] the leading edge of the plume.
[4] Q: And I've asked you sort of like taking a test
[5] in college, Mr. Morrison, please compare and contrast
[6] the level of precision required for each one of these
[7] four categories.
[8] A: I understand, I believe I understand your
[9] question. My answer is that it would be dictated by,
[10] for example, the client's requirement and purpose in
[11] asking the consultant to define the leading edge.
[12] Q: So if I understand what you're telling me in
[13] the allocation situation, you could be asked to
[14] delineate a plume for allocation purposes and the
[15] number of wells you put in would be a function of the
[16] amount of precision that the client wanted?
[17] A: Yes.
[18] Q: Tell me a little bit about your personal
[19] experience in designing and operating containment
[20] systems?
[21] A: Can you be more specific?
[22] Q: Do you understand what a containment system is

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[1] in ground water?
[2] A: Yes.
[3] Q: Have you ever designed such a system?
[4] A: Yes.
[5] Q: Have you ever been responsible for supervising
[6] the operation of such a system?
[7] A: Yes.
[8] Q: Tell me, if you would, give me how many
[9] containment systems for organic compounds have you
[10] had personal responsibility to design?
[11] A: To the best of my recollection half a dozen to
[12] a dozen separate projects, six to twelve that I can
[13] recall.
[14] Q: Over what, a 25-year period of time?
[15] A: Yes. It's very probable there is additional
[16] projects. Those are just the ones I can recall as I
[17] sit here.
[18] Q: In any of those did you construct a
[19] containment system in any of those situations without
[20] having first conducted a pumping test?
[21] A: For those projects which I can recall a
[22] pumping test and/or that data was available prior to

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[1] designing and implementing the containment system.
[2] Q: And when you say and/or that data, are you
[3] suggesting that information on transmissivity and
[4] gradient was available from some other source than a
[5] pumping test at that location?
[6] A: I was referring that in several instances
[7] another party had performed a pumping test in that
[8] exact location upon which I relied upon.
[9] Q: Based upon what information from these pumping
[10] tests did you use in – if I understand your
[11] testimony, in every case that you recall sitting here
[12] today there was some information from a pumping test
[13] that you relied upon in designing the containment
[14] system.
[15] A: Yes, if I could clarify, by pumping test
[16] defining that to include any type of testing that
[17] would develop aquifer information.
[18] Q: Give me some – you're obviously concerned
[19] about your choice of those words, I guess, because
[20] perhaps different geologists would use the term pump
[21] test differently. Is that part of your reason for
[22] carefulness in choice of words?

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[1] A: Yes. My concern is that by pump test I do not
[2] mean that to exclude data which may have been
[3] developed from slug tests.
[4] Q: Or what other types of tests did you have in
[5] mind that you were including in a pump test that
[6] somebody else might not?
[7] A: In situ permeator.
[8] Q: What else?
[9] A: Those were the three I was using all inclusive
[10] when I use the term pump test.
[11] Q: And what information from – whether it be a
[12] pump test, a slug test, or an in situ permeator, am I
[13] saying that correct?
[14] A: Yes.
[15] Q: What information would you have used from
[16] those tests in designing the containment system?
[17] A: The information includes the transmissivity,
[18] storagetivity, and the saturated hydraulic
[19] conductivity.
[20] Q: And explain to me how you'd used each one of
[21] those factors in designing the containment system?
[22] A: If the containment system selected was a

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[1] ground-water extraction system.
[2] Q: That's a good point. Let me stop you there.
[3] When I'm talking about – there are various types of
[4] containment systems. You can put in a barrier wall
[5] or a variety of things; correct?
[6] A: Correct.
[7] Q: For the purpose of this deposition, let's
[8] focus on extraction wells as a sole type of
[9] containment system that we're talking about. And
[10] limiting it as such, how many of the six to twelve
[11] projects you recall involve the use of an extraction
[12] well as a containment system?
[13] A: All of them.
[14] Q: With respect then to use of an extraction well
[15] as a containment system, explain to me how you'd use
[16] transpositive storagetivity and the saturated – I
[17] can't read my own hand writing, what was that,
[18] Mr. Morrison?
[19] A: Hydraulic conductivity.
[20] Q: In designing a system?
[21] A: Those would be parameters that could be used
[22] in the modeling of a ground-water extraction system.

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[1] Q: Am I not correct that there are only three
[2] things you need in order to design a containment
[3] system using an extraction well and that is the
[4] transmissivity, the gradient, and the pump grate?
[5] A: Are you referring to modeling or designing?
[6] Q: Designing.
[7] A: I think it would be helpful if I can design
[8] how I am using those two terms. Much of the modeling
[9] would be a component of the design phase which would
[10] include taking these hydraulic parameters and
[11] modeling different scenarios such as changing the
[12] pump grate, the number of wells and so forth.
[13] The design would also include the actual
[14] construction which would not include the use of these
[15] input parameters. It would include situations such
[16] as the geology, the depth of the well, the well
[17] materials, the infrastructure at the ground surface,
[18] and those type of considerations.
[19] Q: Let me put the question to you a little bit
[20] differently. If I came to you and said I want to
[21] install one or more extraction wells to contain a
[22] particular plume of contamination, would you need

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[1] anything more than the transmissivity and gradient at
[2] the leading edge as well as the thickness of the
[3] saturated zone that had been impacted in order to
[4] determine the location and size of a well that would
[5] capture that plume?
[6] A: Yes.
[7] Q: What else would you need?
[8] A: I would need to be confident that the vertical
[9] and horizontal extent of the contamination in the
[10] area for which the containment wells were to be
[11] placed had been adequately defined.
[12] Q: I'll just ask you to assume that, that it has
[13] been.
[14] A: From the hydraulic perspective, those three
[15] parameters, storagetivity, transmissivity, saturated
[16] hydraulic conductivity, I'm assuming the values that
[17] would be available would be the hydraulic information
[18] that would be required for modeling different
[19] extraction scenarios based upon those results. Then
[20] I would examine different design considerations on
[21] how to accomplish or reach those modeled results.
[22] Q: Move to strike as non-responsive. My question

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[1] was I come to you, I ask you to assume that the
[2] vertical and horizontal extent is well defined. Do
[3] you need to have any other information other than
[4] transmissivity and gradient at the leading edge in
[5] order to design a containment system based on
[6] extraction well?
[7] A: Yes.
[8] Q: What other information do you need?
[9] A: Storagetivity, the effectiveprosity and
[10] whether the aquifer is marked confined or unconfined
[11] and aboveground issues such as accessibility.
[12] Q: What's the relevance of storagetivity in
[13] determining the capture zone?
[14] A: It would be a primary that would be used in
[15] the modeling phase of the engagement.
[16] Q: What does it tell you that you don't already
[17] know from the transmissivity?
[18] A: A storagetivity provides information on the
[19] volume of water that the aquifer will yield.
[20] Q: That's the classic definition of
[21] storagetivity, but what information does that tell
[22] you about the capture zone? Why do you need that?

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[1] You have yet to answer that question. Why can you
[2] not define a capture zone or a containment system
[3] using extraction well without storagetivity?
[4] A: I am assuming from your question that as part
[5] of the design that there will be modeling being
[6] performed as part of the design of the extraction
[7] system?
[8] Q: What difference does that make?
[9] A: If one does not include that component,
[10] aquifer parameters are really not of any importance.
[11] If you want to model and design a system properly,
[12] then you would need the input parameters including
[13] transmissivity, storagetivity, effectiveprosity and
[14] saturated hydraulic conductivity.
[15] MR. HARRIS: Can you go back to my question
[16] before we got off on this discussion about why you
[17] need storagetivity, please?
[18] (The record was read as requested.)
[19] BY MR. HARRIS:
[20] Q: Why can't you do it? Let me rephrase the
[21] question. Are you telling me, Mr. Morrison, that you
[22] are incapable of designing a containment system using

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[1] an extraction well without knowing the storagetivity
[2] of the aquifer?
[3] A: No.
[4] Q: Then what marginal benefit do you get from
[5] storagetivity in designing a containment system using
[6] an extraction well from storagetivity?
[7] A: I wouldn't characterize it as marginal. It would
[8] be a very significant benefit to have that
[9] information -
[10] Q: Let me rephrase the question. What additional
[11] benefit, if any? You've taken, I assume, some
[12] economic courses. Do you understand the term
[13] marginal in the economic sense?
[14] A: No.
[15] Q: Fine. That helps me. I'll use the word
[16] additional. What additional benefit, if any, do you
[17] get from the storagetivity number in designing a
[18] containment system using an extraction well?
[19] A: The benefit is that that hydraulic perimeter
[20] allows one to model the extraction-well system prior
[21] to installation.
[22] Q: I guess I'm missing something there. Are you

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[1] telling me there is a formula that has it in
[2] storagetivity and in order for that formula to work,
[3] in your estimation, you have to have the number?
[4] A: Yes.
[5] Q: And what's the formula?
[6] A: There are numerous formulas that are
[7] available.
[8] Q: And are there formulas that can be used to
[9] design a containment system using an extraction well
[10] that do not rely on storagetivity as a component in
[11] that formula?
[12] A: Not that I'm familiar with.
[13] Q: But I thought you told me earlier that you
[14] could design a containment system using an extraction
[15] well without storagetivity?
[16] A: Yes.
[17] Q: How would you do that?
[18] A: One could simply install an extraction well
[19] without any modeling and then install several
[20] concentric circles of monitoring wells at some
[21] distance from the extraction well and introduce
[22] different dyes or tracers into those wells when the

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[1] extraction well was extracting water from the ground
[2] water, and by trial and error determine what the
[3] capture zone is of that extraction well.
[4] Q: I just want to make sure I'm clear on this
[5] point. You're telling me there is no way to predict
[6] the capture zone of an extraction well using the
[7] containment system unless you know the storagetivity?
[8] A: The formulas that I'm familiar with include
[9] storagetivity as a component. There may or may not
[10] be other formulas that's I'm unaware of.
[11] Q: And what you're telling me then is it your
[12] experience that without storagetivity and the
[13] formulas you know you cannot accurately predict what
[14] the capture zone would be with an extraction well?
[15] A: Yes, assuming that I'm performing that
[16] modeling exercise and not using the approach of an
[17] extraction well and numerous concentric wells around
[18] that well.
[19] Q: And your statements continue to be true what
[20] you've just described for me whether we're talking
[21] about an unconfined or confined aquifer?
[22] A: I don't know.

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[1] Q: Why not?
[2] A: I would need to go back and look at the
[3] different formulas that are available. I don't
[4] recall those as I sit here today.
[5] Q: And what formula would you typically rely upon
[6] in predicting - what's the name of the formula you
[7] typically rely upon in determining the capture zone
[8] for an extraction well used in a containment system?
[9] A: I would rely several models, including a
[10] second order particle tracking algorithm, visual MOD
[11] flow, and the -
[12] Q: And what else?
[13] A: And the mathematics associated with the two
[14] dimensional model quickflow.
[15] Q: You're saying all of those formulas, I tend to
[16] think of an algorithm as a formula but all of those
[17] formulas require storagetivity?
[18] A: That's my recollection.
[19] Q: Is it necessary as far as you are concerned to
[20] have the storage coefficient in order to design an
[21] extraction well that is going to serve as a
[22] containment system?

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[1] A: I'm using the storage coefficient and
[2] storagetivity synonymously.
[3] Q: I'm sorry, what are you using?
[4] A: I have used the coefficient of storage and
[5] storagetivity synonymously.
[6] Q: Explain to me why the specific yield is of any
[7] relevance in determining the size or placement of an
[8] extraction well that is being used as a containment
[9] system?
[10] A: It will influence the pumping rate and the
[11] depth of the screen of the extraction well to some
[12] degree.
[13] Q: So if you simply screen through the entire
[14] impacted zone, it would be unnecessary to look at the
[15] specific yield?
[16] A: I would still need to look at the specific
[17] yield.
[18] Q: Why?
[19] A: For example, if you have an aquifer that's
[20] very low yielding, screening through the entire
[21] aquifer versus multiple wells screened at discrete
[22] intervals in the aquifer would be modeled to evaluate

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[1] different extraction-well scenarios.
[2] Q: Explain to me why you'd expect a different
[3] response in a low-yielding aquifer between one well
[4] screened through the entire impacted area and
[5] multiple wells completed, I assume, screened at
[6] different depths is what you're talking about?
[7] A: Yes. There may be more benefit to have
[8] multiple wells screened across one highly permeable
[9] zone then a single well screened across, for example,
[10] one bounded vertically by dense clays.
[11] Q: And what's the benefit?
[12] A: Larger volume of extracted water would be one
[13] benefit.
[14] Q: There's also a cost differential between one
[15] well screened over the entire and several wells;
[16] correct?
[17] A: Yes.
[18] Q: So you'd have to trade off the difference
[19] between that additional cost versus the difference of
[20] volume recovery?
[21] A: Yes, and there would be considerations such as
[22] the desire to clean up or to extract a certain volume

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[1] and conceivably clean up the aquifer in that
[2] permeable zone over a certain time frame and other
[3] institutional type of controls.
[4] Q: We're just talking about containing it right
[5] now; correct?
[6] A: Yes.
[7] Q: So my question really went from a containment
[8] standpoint you would have to take a look at the
[9] additional cost versus the additional volume of
[10] water?
[11] A: Yes.
[12] Q: And couldn't you design a single well screened
[13] over the entire interval by setting an appropriate
[14] pumping rate to get a capture zone that would contain
[15] the contaminants as effectively as the multiple
[16] wells?
[17] A: That may or may not be the case.
[18] Q: What would you need to know to determine
[19] whether it was the case?
[20] A: Specific yield would be one variable.
[21] Q: Anything else?
[22] A: Well, ideally one would need all the hydraulic

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[1] parameters that I mentioned and would factor those
[2] into the modeling.
[3] Q: You did not develop any of these formulas that
[4] you're relying upon in helping you design a
[5] containment system involving an extraction well?
[6] A: No.
[7] Q: And can you explain for instance in those
[8] formulas why the storagetivity number is present in
[9] them, any of them, how it gets there?
[10] A: No, I would need to go back and look at the
[11] various methods.
[12] Q: And I take it your answer would be the same
[13] then for the other aquifer parameters that you
[14] believe are necessary to design and place an
[15] extraction well to service a containment system?
[16] A: Yes.
[17] Q: You don't know – you can't explain to me
[18] sitting here today why those numbers are in the
[19] formula, all you know is that they're in the formulas
[20] that you use?
[21] A: Yes.
[22] Q: And sitting here today there may be formulas

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[1] that can be used to design an extraction system in an
[2] unconfined or – excuse me, can be used to determine
[3] the pumping rate and placement of an extraction well
[4] for a containment system in an unconfined aquifer
[5] that needs only transmissivity and gradient and
[6] pumping rate, you're just not familiar with them?
[7] A: Correct.
[8] Q: And if a hydrogeologist said that he only
[9] needed transmissivity in gradient and pumping rate in
[10] order to determine the size and placement of an
[11] extraction well to develop a containment system, you
[12] wouldn't then have a basis to disagree with that
[13] conclusion?
[14] A: For – no, for clarification –
[15] Q: Hold on a second, the answer is no. Now you
[16] want to clarify an earlier answer you gave me?
[17] A: Yes. I examined one of the exercises which a
[18] staff at the office had gone through to look at
[19] different capture zone scenarios, and I noticed that
[20] an equation I believe it's out of the Lohman
[21] publication has equations for a stagnation point
[22] which simply rely on transmissivity, hydraulic

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[1] gradient, and pumping rate.
[2] Q: And that could be applied in either an
[3] unconfined or a confined aquifer?
[4] A: Yes. They would be equations without the
[5] storagetivity function that could be used for
[6] confined and unconfined.
[7] Q: And in sitting here today you can't tell me at
[8] any rate what the difference of any of those two
[9] equations might provide with respect to the size and
[10] placement of an extraction well to run a containment
[11] system?
[12] A: I don't understand your question.
[13] Q: I think you told me – I think when we started
[14] this whole discussion, Mr. Morrison, you indicated to
[15] me that you were only familiar with formulas that
[16] included storagetivity and several other aquifer
[17] parameters for purposes of determining the size and
[18] placement of an extraction well to be used as a
[19] containment system; correct?
[20] A: Yes.
[21] Q: And we've now after several minutes determined
[22] that, in fact, there is a formula out there that

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[1] allows you to determine the size and placement of an
[2] extraction well to be used in a containment system,
[3] use being only transmissivity, gradient, and pumping
[4] rate?
[5] A: Correct.
[6] Q: My question is do you know whether for a given
[7] situation whether those two formulas would produce
[8] different results?
[9] A: I don't know.
[10] Q: So you also don't know if they did produce
[11] different results why they would be different?
[12] A: Not without going through the exercise.
[13] Q: So for all you know sitting here today it is
[14] possible to design a size and placement of an
[15] extraction well using only transmissivity, gradient,
[16] and pumping rate?
[17] A: Yes.
[18] Q: And with respect to transmissivity, we already
[19] have information, do we not, about that perimeter at
[20] the leading edge of the Sparton plume?
[21] A: We have estimations of what various parties
[22] feel is a representative value for transmissivity at

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[1] the leading edge of the plume.
[2] Q: Do we not have a pump test that was run at the
[3] site?
[4] A: On the site.
[5] Q: Correct. By on the site I mean the Sparton
[6] property value.
[7] And you already reviewed that pump it test,
[8] didn't you?
[9] A: Yes.
[10] Q: After reviewing that pump it test, you came to
[11] the same conclusion that Black & Veatch or Hard &
[12] Lawson came to about what the results were in terms
[13] of transmissivity?
[14] A: Different interpretations by different
[15] consultants provided different transmissivity values.
[16] Q: Let me just show you what I've marked as
[17] deposition Exhibit 202, Mr. Morrison, and tell me if
[18] these documents together represent your office's
[19] review of the pumping test that was attachment 10 to
[20] the RFI for the Sparton facility.
[21] (Morrison Deposition Exhibit Number 202 was
[22] marked for identification.)

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[1] MR. ROSENTHAL: Mr. Harris, could you read the
[2] Bates-stamp numbers?
[3] MR. HARRIS: Let's see, 213, 212, 210, 211,
[4] 209, 208, 206.
[5] THE WITNESS: They appear to be the documents
[6] associated with.
[7] BY MR. HARRIS:
[8] Q: With the exception of what was that Bates No.
[9] 297; correct?
[10] A: Correct.
[11] Q: Based op looking at 202, what conclusion did
[12] Hard & Lawson reach about the transmissivity based on
[13] the results of that pumping test?
[14] A: The pumping test resulted in transmissivity
[15] values for the two aquifers identified on site based
[16] on the aquifer test from the Hard & Lawson Associates
[17] report Bates-stamp number 001089.
[18] Q: That is from the administrative record, I
[19] believe. Go ahead.
[20] A: The transmissivity of the low aquifer was
[21] identified to be between 60 and 70,000 gallons per
[22] day per foot. Table 7 of that aquifer test report

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[1] also lists different transmissivity, saturated
[2] hydraulic conductivity values, and storage
[3] coefficient values for different wells.
[4] Q: I'm just asking what you understood the
[5] transmissivity to be involving the pump test that was
[6] attachment 10 which, as I understand it, involved
[7] PW 1 and monitor wells 12, 13 and 14; is that your
[8] understanding of the pump it test?
[9] A: Yes.
[10] Q: Let's just focus on monitor wells 12, 13, and
[11] 14.
[12] A: Okay.
[13] Q: And it's your understanding that the
[14] transmissivity for those four wells ranged from
[15] 13,200 to 66,200?
[16] A: Yes.
[17] Q: And did you independently calculate for those
[18] same wells 12, 13, and 14 in your office what you
[19] believe this transmissivity is to be?
[20] A: Our office used a range of different
[21] transmissivities for the lower and upper aquifer.
[22] Q: My question was for 12, 13, and 14.

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[1] A: No.
[2] Q: You keep referring to different aquifers.
[3] Again, what do you mean by different aquifers?
[4] A: Based on the results of the on-site pump test
[5] two different aquifers would be present on site.
[6] Q: And what do you mean by two different
[7] aquifers?
[8] A: Two aquifers separated by a less permeable
[9] zone and distinguished by changes or differences in
[10] hydraulic head.
[11] Q: If you would try to explain that to me in
[12] laymen's terms. In fact, why don't you draw me a
[13] picture, if you would, sort of a side view of what
[14] you're trying to say is going on on site.
[15] A: Actually, I think I can explain it clearer by
[16] referencing the Hard & Lawson report, Bates-stamp
[17] number 00103 which reads, quote, "Sparton site is
[18] already lined by at least two distinctly different
[19] aquifers. The upper aquifer is a relatively thin
[20] unconfined system which is present above a fine
[21] gradient of current elevation 4960 to 4970. Another
[22] aquifer is present beneath this unit which exhibits

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[1] semi-confined characteristics.
[2] Hard & Lawson then went on to summarize,
[3] "Hydraulic properties in these two aquifers which
[4] they've identified as the upper and lower aquifer on
[5] site.
[6] Q: Again, just so I understand, Mr. Morrison,
[7] could you conceptually draw for me a picture of what
[8] you think those words describe? If I'm able to take
[9] and cut away the earth to a depth of 60, 70 feet or
[10] more at that site, what am I looking at on the site
[11] when you're talking about two aquifers separated by
[12] something?
[13] Let me show you what's been marked as 212.
[14] Does that help or – it is part of Exhibit 202 but
[15] it's Bates No. 212.
[16] A: Yes.
[17] Q: Could you mark for me on 212 where this
[18] upper – where you understand this upper aquifer to
[19] be and where the lower aquifer is?
[20] A: Yes.
[21] Q: Mark with an X the upper and with a Z – what
[22] did I say to mark with an X, the upper?

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[1] A: Yes.
[2] Q: And the lower with a Z. Is it your
[3] understanding that the area that is marked as a silty
[4] sand is this relatively impermeable layer that
[5] separates the two?
[6] A: Yes.
[7] Q: And do you know whether what is depicted on
[8] Bates No. Document 212 on Exhibit 202 continues off
[9] of the Sparton report property and if so how far?
[10] A: It is my understanding based on my review of
[11] the boring logs that it does not continue off site,
[12] and I do not know at what point that boundary occurs.
[13] Q: Now, on Exhibit 202 Bates No. 209 there are
[14] some calculations. What are those?
[15] A: First off let me ask you, did do you those
[16] calculations?
[17] A: No.
[18] Q: Do you know who did?
[19] A: No.
[20] Q: Do you know what they are?
[21] A: No.
[22] Q: Do you know what the formula is up at the top

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[1] of the page? Do you recognize that formula? As I
[2] recall you're the expert, Mr. Morrison.
[3] A: Yes.
[4] Q: What is it?
[5] A: That appears to be a formula for calculating
[6] transmissivity from pump test data.
[7] Q: And it would appear to me that the formula is
[8] being applied to monitor 12, 13 pair then monitor 12,
[9] 13, 14, pair then monitor 12, 14 pair. Is that what
[10] it appears to be to you?
[11] A: That is what I'm unable to sort out, if the 12
[12] and 13 actually refers to these different well pairs
[13] on site.
[14] Q: Well, the flip side of 209 is 208. Did you do
[15] those calculations?
[16] A: No.
[17] Q: Was that done in your office?
[18] A: Yes.
[19] Q: And were the calculations on 209 which is part
[20] of 202 done in your office?
[21] A: Yes.
[22] Q: But you don't know sitting here today who did

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[1] those calculations?
[2] A: No.
[3] Q: Do you know why they were done?
[4] A: I would expect that they were performed as
[5] part of our modeling exercise in August, September
[6] 1996 time period.
[7] Q: And modeling of what?
[8] A: Our office looked at various parameters and
[9] performed modeling to estimate capture zones.
[10] Q: Associated with an extraction well as part of
[11] a containment system?
[12] A: Yes, well and/or wells.
[13] Q: On that Bates No. 208 as part of Exhibit 202
[14] is that also a formula used to conduct
[15] transmissivity?
[16] A: Yes.
[17] Q: And if I understand the calculation and the
[18] drawing correctly, Bates number 208 which is part of
[19] 202, correlates that the transmissivity, I assume
[20] overall for both of the upper - what you refer to
[21] the upper and lower aquifer is about 17,000 gallons
[22] per day per foot?

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[1] A: Yes.
[2] Q: And would there be a different drawing if you
[3] were just looking at the upper and what you refer to
[4] the upper and lower aquifer separately in determining
[5] transmissivity? what I'm trying to get at,
[6] Mr. Morrison, I think you just told me that 17,000
[7] number represents an overall transmissivity for both
[8] what you refer to the upper and lower aquifer and the
[9] other data that you have pointed to me to suggest
[10] that there is one transmissivity for the upper
[11] portion and a different transmissivity for the lower
[12] portion.
[13] And I'm just trying to make sense of the
[14] calculation that's Bates number 208 of Exhibit 202
[15] and the information that you've shared with us from
[16] the Hard & Lawson report. You understand my
[17] confusion in what I'm trying to understand?
[18] A: Yes, the exhibit - yes, I understand your
[19] confusion and the figure on Bates-stamp number
[20] RM 0000208 appears to be the calculation of
[21] transmissivity for three wells which, according to a
[22] geologic cross section from B to B prime, intersect

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[1] the upper and lower aquifer. The information
[2] reported in HLA reports values which are distinct for
[3] the upper and lower. This particular work is taking
[4] wells that are screened across both of those systems
[5] so it is very confusing depending on the
[6] interpretation on which data one uses to develop, in
[7] this case the transmissivity value.
[8] Q: Can you tell me what your office was
[9] attempting to do on Bates number documents 210 and
[10] 211 which is part of Exhibit 202?
[11] A: It appears to be drawdown plots for a number
[12] of wells associated with the Hard & Lawson Associates
[13] pump test, and I'm not clear exactly what the purpose
[14] was for plotting this data or replotting the data.
[15] Q: Does the information on Bates number 210 or
[16] 211 tell you anything about the transmissivity of the
[17] saturated zone over which the wells involving the
[18] pump test were screened?
[19] A: If this, in fact, is measured data which is
[20] reported on these two figures, one could calculate
[21] transmissivity.
[22] Q: Now, did you use information from the pump

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[1] test, the Hard & Lawson pump test in doing a report
[2] on the capture zone for an extraction well that could
[3] be placed at the leading edge of this part of the
[4] saturated zone and impacted by Sparton's operations?
[5] MR. ROSENTHAL: It's about 12:20. We talked
[6] about breaking.
[7] MR. HARRIS: Just let me introduce this.
[8] THE WITNESS: From my review of the
[9] September 23, 1996 report it appears that we have
[10] used a range of transmissivity values.
[11] BY MR. HARRIS:
[12] Q: Let me just for the record, Mr. Morrison, let
[13] me hand you what I marked as Exhibit 203. Is that a
[14] report dated September 23, 1996 that you sent to
[15] Mr. David Fishel with the Department of Justice that
[16] takes a look at the size and placement of a
[17] containment well that would capture the contaminants
[18] associated with the Sparton plant?
[19] (Morrison Deposition Exhibit Number 203 was
[20] marked for identification.)
[21] MR. ROSENTHAL: Could you please read the
[22] numbers?

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[1] MR. HARRIS: Oh, sure. Just the last four
[2] numbers are 2312 through 2345.
[3] BY MR. HARRIS:
[4] Q: That's generally correct?
[5] A: And I think, for instance, if you take a look
[6] at page 2315, Mr. Morrison, you're using
[7] transmissivity values this matrix that are consistent
[8] with, I believe, the pump test that were conducted on
[9] site at Sparton.
[10] A: Well, in part, that's correct. It obviously
[11] isn't considering the transmissivity values for the
[12] lower aquifer which HLA reported to be in the of 0 to
[13] 70,000 range.
[14] Q: And we're going to take a break and come back
[15] to this, but I wanted to clarify one issue. I had a
[16] chance to glance at this report, I guess it was early
[17] this morning – very early this morning. Did, if I'm
[18] understanding it correctly, it appears to me that you
[19] concluded that a single extraction well placed
[20] somewhere to the northwest of monitor well 60 and 61,
[21] if screened through the entire impacted interval and
[22] pumped at a rate of no more than 250 gallons per

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[1] minute should contain the contaminant associated with
[2] the Sparton plant?
[3] A: No, those were not the conclusions I came to
[4] after we had gone through this exercise.
[5] Q: We'll talk about that more after.
[6] (Luncheon recess taken from 2:23 P.M. to
[7] 1:40 P.M.)
[8] BY MR. HARRIS:
[9] Q: I think when we broke, Mr. Morrison, you were
[10] talking about Exhibit 203 which is a report dated
[11] September 23, 1996. Who requested that you do that
[12] report?
[13] A: David Fishel.
[14] Q: Did you actually prepare the report?
[15] A: Our office prepared the report.
[16] Q: You may be able to move forward a little bit
[17] more quickly this afternoon if you try and answer my
[18] questions. My question was did you prepare the
[19] report?
[20] A: No.
[21] Q: Who in your office prepared the report?
[22] A: Evan Newell and Justin Schimnowski.

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[1] Q: Was your involvement in the report limited to
[2] reviewing it for content and form?
[3] A: Yes.
[4] Q: Do you recall any changes you proposed to the
[5] report?
[6] A: Not specifically.
[7] Q: And I notice that the report is still styled
[8] as a draft. I take it it has yet to be finalized?
[9] A: Correct.
[10] Q: Have you received any comments from the
[11] Department of Justice or anyone else about this
[12] report?
[13] A: Are you referring to written comment?
[14] Q: Let's start with written comments.
[15] A: Not that I recall.
[16] Q: And if you had those written comments, they
[17] would have been in your administrative binder?
[18] A: Yes.
[19] MR. HARRIS: Arnold, same question, do you
[20] recall –
[21] MR. ROSENTHAL: I didn't see any.
[22] BY MR. HARRIS:

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[1] Q: Have you received oral comments regarding this
[2] report which is Exhibit 203?
[3] A: I don't recall.
[4] Q: You don't recall whether you received any or
[5] you just don't recall one way or the other?
[6] A: The latter.
[7] Q: And I apologize. I may have asked you this
[8] question. Who asked you to prepare the report?
[9] A: David Fishel.
[10] Q: And what were his instructions to you? What
[11] did he want you to do? Let me ask the question a
[12] different way. Why did he want the report prepared?
[13] At least what did he tell you?
[14] MR. ROSENTHAL: Objection, on grounds of
[15] speculation. He doesn't know what David's state of
[16] mind is, why he would be asking.
[17] MR. HARRIS: That is why I clarified the
[18] question, to ask him what Mr. Fishel told him about
[19] why the report was prepared.
[20] THE WITNESS: My recollection is that we were
[21] asked to examine whether one could reasonably
[22] estimate the capture zone in the vicinity of the

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[1] leading edge of the plume off site of the Sparton
[2] site with the various hydraulic parameters that had
[3] been presented in the environmental report associated
[4] with the Sparton site.
[5] BY MR. HARRIS:
[6] Q: And did Mr. Fishel tell you why he was
[7] interested in having an answer to that question?
[8] A: My recollection is that it was associated with
[9] allegations by Sparton and/or their consultants that
[10] one well capture system could be used to provide
[11] containment at the leading edge of the off-site
[12] plume.
[13] Q: And you understood from Mr. Fishel that the
[14] United States disagreed with that position that had
[15] been taken by a Sparton consultant?
[16] MR. ROSENTHAL: Objection, work product. Also
[17] you're asking him to speculate.
[18] BY MR. HARRIS:
[19] Q: Did Mr. Fishel indicate to you that the
[20] government, the United States disagreed with
[21] Sparton's consultant?
[22] A: I don't recall.

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[1] Q: Could have said that?
[2] MR. ROSENTHAL: Objection, speculation.
[3] MR. HARRIS: I'm just asking for his memory.
[4] THE WITNESS: I don't recall.
[5] BY MR. HARRIS:
[6] Q: You don't recall whether you
[7] can recall or you just don't recall what he said?
[8] A: I don't recall whether there was communication
[9] by Mr. Fishel to me regarding the government's
[10] position.
[11] Q: Prior to the finalization of this report, did
[12] you have an opportunity to discuss with either
[13] representatives of the United States or the City of
[14] Albuquerque or the State of New Mexico their position
[15] on Sparton's proposal to install an extraction well
[16] to serve as a containment system at the site?
[17] A: My recollection of the conference calls were
[18] that this was a proposal that Sparton had – that had
[19] been presented to them and that is the extent of my
[20] recollection.
[21] Q: Sitting here today you don't recall any
[22] statements from any of those representatives

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[1] indicating skeptism or disbelief that what Sparton
[2] proposed could work?
[3] A: My recollection of the conference calls were
[4] that the matter was discussed was that the parties
[5] didn't seem to have a clear understanding whether the
[6] proposal would be viable or not.
[7] Q: And who do you recall being involved in those
[8] conversations where the Sparton proposal was being
[9] discussed prior to the time this report which is
[10] Exhibit 203 was issued?
[11] A: I don't recall who the various representatives
[12] were present during that conference call.
[13] Q: Do you recall if I mention the names again
[14] Mr. Pine, for instance, do you recall his involvement
[15] in the conference calls about the one well
[16] containment system?
[17] A: No, that doesn't refresh my recollection.
[18] Q: Mr. Gaume?
[19] A: No.
[20] Q: Turning to the report for a second, why don't
[21] we flip over to the figures. Take a look at figure
[22] one which is Bates number 2321. That figure depicts,

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[1] does it not, a capture zone that would appear to
[2] encompass the area impacted least in which you refer
[3] to as the upper flow zone?
[4] A: Yes.
[5] Q: How did you decide where to place the
[6] containment well?
[7] A: That was a judgment I had made in terms of
[8] modeling purposes that that seemed to be an
[9] appropriate location as a first step to collecting
[10] information concerning the leading edge of the plume
[11] and/or a location for providing containment.
[12] Q: Did you understand whether Sparton's proposal
[13] included a location for the containment well?
[14] A: Yes.
[15] Q: And did your point for the containment well
[16] was that the same or different than the point
[17] proposed in the Sparton proposals?
[18] A: Actually, it came out to be very close in
[19] terms of location.
[20] Q: But independently reached by you is what
[21] you're telling me?
[22] A: Yes.

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[1] Q: You're sort of smiling. Is there more to this
[2] story?
[3] A: I found it coincidental.
[4] Q: And not simply because two engineers looking
[5] at the same problem might reach the same result?
[6] A: That's a possibility.
[7] Q: On figure one, what's the pumping rate that
[8] was used?
[9] A: It appears to be .007 times the
[10] transmissivity.
[11] Q: Which is what?
[12] A: It would be whatever value one elected to use
[13] for a value of transmissivity.
[14] Q: You've lost me. Maybe I'm missing something
[15] here, Mr. Morrison. There's a line drawn here that
[16] depicts, as I understand it, a capture zone. Is that
[17] capture zone independent of the pumping rate?
[18] A: Figure one, if one refers to Bates-stamp
[19] number RM 000216, was simply a line that was drawn to
[20] represent the 800-foot capture zone based on the
[21] location of a proposed withdrawal well.
[22] Q: Could you repeat that for me? I was trying to

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[1] find the page going through.
[2] A: Figure 1 depicts an 800-foot capture zone down
[3] gradient from the location of containment well, and
[4] then it's presented on Bates-stamp number RM 0000217.
[5] It shares with the reading how one would go about
[6] calculating an 800-foot capture zone and the
[7] different variables that would be used for that.
[8] Q: So, again, and I must be missing something,
[9] are you telling me that the capture zone drawn here
[10] was simply called at 800 feet, it wasn't derived from
[11] a formula?
[12] A: Correct.
[13] Q: And how did you know – I assume the 800 feet
[14] is the width at the containment well?
[15] A: Yes.
[16] Q: And how did you determine if you hadn't
[17] calculated it, how did you determine how the capture
[18] zone opened up or how did it closed? How did you
[19] determine the parabola?
[20] A: It was drawn based upon a general knowledge of
[21] what we expected the extent of the contamination to
[22] be northwest of the containment well. And that this

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[1] would be the area that would be contained.
[2] Q: In other words, if I understand, figure 1 is
[3] simply a - an aid really to describe what a capture
[4] zone would have to look like, as far as you were
[5] concerned, to actually contain any of the solvents
[6] that might be associated with the Sparton plant.
[7] A: Correct, with the caveat that it would be
[8] primarily for the leading edge, and that we're
[9] portraying on figure 1 a two-dimensional portrayal of
[10] the leading edge.
[11] Q: So that would explain why there is no pumping
[12] rate?
[13] A: Correct.
[14] Q: And why is it limited to what you refer to as
[15] the upper flow zone?
[16] A: Because it's a two-dimensional portrayal.
[17] Q: The upper flow zone is in three dimensions,
[18] isn't it?
[19] A: Correct.
[20] Q: Why did you stop with just one part of the
[21] third dimension with the upper flow zone?
[22] A: Because we're looking in figure 1 at just the

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[1] horizontal extent of the capture zone at the top of
[2] the water table.
[3] Q: So is figure 1 mistitled when you say -
[4] you're very specific in this deposition,
[5] Mr. Morrison, so I would have expected you to be very
[6] specific in your figures, and the upper flow zone
[7] actually encompasses, depending on whose defining it,
[8] is more than just the top water table?
[9] A: Correct.
[10] Q: And if I understand what you're telling me,
[11] figure 1 is simply an idealized description of an
[12] 800-foot capture zone as it would appear on top of
[13] the water table?
[14] A: Correct.
[15] Q: With no depth to it whatsoever?
[16] A: Correct.
[17] Q: Turning to figure 2, am I reading this figure
[18] correctly that it suggests that at pumping rates -
[19] pumping rates of a single containment well up to 250
[20] gallons per minute would create an 800-foot capture
[21] zone for transmissivities between 0 and 35,000 and
[22] with a gradient of 0.002?

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[1] A: Correct.
[2] Q: So if I understand correctly, if the
[3] transmissivity of the saturated zone that's been
[4] impacted at the leading edge of the plume is
[5] somewhere between 0 and 35,000, in putting in a
[6] single containment well that can pump up to 250
[7] gallons per minute would create an 800-foot wide
[8] capture zone. That's what that figure shows?
[9] A: That's correct.
[10] Q: In turning to figure 3, you're using slightly
[11] different - well, not slightly, you're using a
[12] different perimeter along the X axis on those graphs
[13] than what you're use on figure 2; correct?
[14] A: Yes.
[15] Q: Is there any way to - I guess hydraulic
[16] conductivity is related to transmissivity?
[17] A: Yes.
[18] Q: And the formula is?
[19] A: Transmissivity times - is the depth of the
[20] aquifer times the saturated conduct -
[21] hydroconductivity.
[22] Q: T equals K times A, is that it or not? So in

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[1] this situation if we wanted to convert hydraulic
[2] conductivity to transmissivity, we would multiply the
[3] figures along the X axis by the thickness of the
[4] aquifer times its width? Maybe can you help me here
[5] I'm trying to understand how we can make the figure 2
[6] and figure 3 comparable.
[7] A: Figure 2 is using as the X axis
[8] transmissivity, so for figure 3 if one wanted to
[9] convert the hydraulic conductivity to transmissivity,
[10] you would multiply it time the thickness of the
[11] aquifer.
[12] Q: And did you attempt to try and compare capture
[13] zones depending on different boundary conditions may
[14] be the right phrase in figure 4?
[15] A: Yes.
[16] Q: And if I look at the bottom of that figure 4,
[17] could you - the pumping rate that you have is 19,250
[18] but - no, it's - is that cubic feet per day or what
[19] are the units? It looks like - I'm not familiar
[20] with feet.
[21] A: I'm not sure what that unit is either.
[22] Q: If it's cubic feet per day, do you have any

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[1] idea what number gallons per minute we're talking
[2] about that pumping rate?
[3] A: I'd have to go through the conversion.
[4] Q: The length of the well under the 3-D version
[5] you had is 75, and you had the depth of the well as
[6] being zero. What's that supposed to mean?
[7] A: I believe the depth of the well in terms of
[8] elevation is arbitrarily set at zero elevation. And
[9] in terms of the modeling, the 75 would be minus 75
[10] feet from that reference point.
[11] Q: I'm sorry, the depth of the well –
[12] A: Maybe an easier way to explain it, the length
[13] of the well is simply 75 feet below the ground
[14] surface.
[15] Q: So that may not even be in the saturated zone?
[16] A: The 75 feet was assumed to be from the top of
[17] the water table below the saturated zone.
[18] Q: How much of that well was screen? I assume
[19] that all of it was screened?
[20] A: Yes, it was fully penetrating.
[21] Q: And when you say fully penetrating what you're
[22] saying through the part of the saturated zone we're

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[1] interested in getting a response to it was screened
[2] throughout that part?
[3] A: Correct.
[4] Q: So we could assume all the flow lines were
[5] horizontal to the well?
[6] A: Actually, it's a 3-D portrayal, so the stream
[7] lines are three-dimensional.
[8] Q: You didn't include depth of the well or length
[9] of the well for the 2-D confined or 2-D unconfine.
[10] Is that because the formulas for those two require
[11] different –
[12] A: My recollection is that for those programs it
[13] assumes fully penetrating for the depth of the
[14] aquifer.
[15] Q: And in figure 4, tell us anything about the
[16] size of the capture zone under each one of those
[17] three conditions, 3-D, 2-D confined or 2-D
[18] unconfined.
[19] A: Yes.
[20] Q: And what does it tell us? Let me ask the
[21] question this way, Mr. Morrison. If you take a look
[22] at the Exhibit 4, at some point you get to zero which

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[1] is the extraction well; correct?
[2] A: Correct.
[3] Q: Am I correct that the wide distances, again,
[4] the width of the capture zone at the extraction well?
[5] A: Yes, that's my understanding.
[6] Q: And isn't that typically how one describes
[7] amongst hydrogeologists when they talk about the
[8] width of a capture zone they mean the width at the
[9] extraction well point?
[10] A: The width that's measured from the extraction
[11] well point.
[12] Q: Okay. And if I'm understanding figure 4
[13] correctly, it's saying that in three different
[14] scenerios in 3-D, the width of the capture zone
[15] measured at the extraction well is 2,137 feet?
[16] A: That is my understanding.
[17] Q: Which is greater than the 800-foot target that
[18] you set. Are you having some difficulty with whether
[19] or not 2,137 is greater than 800?
[20] A: No.
[21] Q: Why don't we start with that question, then we
[22] can figure out where your problem is. Am I not

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[1] correct that figure 4 shows that under the 3-D
[2] assumption that the width of the capture zone
[3] measured at the extraction well is 2,137 feet?
[4] A: That is what I am examining the text to
[5] clarify.
[6] Q: Well, forget the text for a second, is that
[7] what the figure shows?
[8] A: That is what I'm attempting to clarify by
[9] looking at the text.
[10] Q: Well, I – we'll get to that. I'll let you
[11] explain that in a second. First let me establish
[12] that the figure 4 says the distances are in feet.
[13] I'm just reading figure 4. Does it not tell me that
[14] at the extraction well under the 3-D assumptions that
[15] the width of the capture zone measured at the
[16] extraction well was 2,137 feet?
[17] A: That is what figure 4 says.
[18] Q: Wouldn't you agree with me that that would –
[19] then one could conclude at least from this figure
[20] that that is greater than the 800 feet that you felt
[21] was necessary to capture the contaminants from the
[22] Sparton plant?

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[1] MR. ROSENTHAL: Objection. He said he felt X
[2] number of feet was necessary.
[3] BY MR. HARRIS:
[4] Q: You can go ahead and answer the question.
[5] A: That is what I'm unable to answer - answer
[6] without looking at the text.
[7] Q: And why can't you answer that without looking
[8] at the text?
[9] A: The reason is that I did not prepare this
[10] report. I essentially looked at various groups of
[11] information and the report that assisted me in
[12] evaluating whether representative hydraulic
[13] parameters were available to do this type of modeling
[14] in the leading edge vicinity of the Sparton plume. I
[15] came to the conclusion that direct measurements were
[16] required.
[17] Q: Well, I'm sure we'll get to that in a second,
[18] but I thought figure 1 was drafted by your office and
[19] depicted the size of a capture zone that would be
[20] necessary in your office's belief to deal with any
[21] contaminants that were introduced in the saturated
[22] zone from the Sparton plant?

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[1] A: Yes, from a two-dimensional perspective.
[2] Q: And all I'm getting at is if we assume
[3] figure 1 accurately depicts the size the capture zone
[4] that's necessary to deal with the contaminant, then
[5] figure 4 is saying that under the 3-D assumptions,
[6] you are making - the size of the capture zone would
[7] be almost three times as wide as was necessary at
[8] least based on figure 1.
[9] A: That's why I'm having difficulty answering.
[10] Q: I'm just asking you if I look at these
[11] figures, and I'll let you go back and take a look at
[12] the text, would it not be a fair reading of figure 4
[13] compared to figure 1 that what you're saying here is
[14] that with a 19,250 I assume cubic feet per day
[15] pumping rate and with those parameters in the
[16] aquifer, you're going to have under the 3-D model a
[17] 32,137 foot wide capture zone as measured at the
[18] containment well which is greater than the 100-foot
[19] which your office suggested was - thought was
[20] necessary to deal with the contaminants from the
[21] Sparton plume?
[22] A: I understand your question. I'm unable to

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[1] answer it.
[2] Q: Just looking at the figures you can't answer
[3] that?
[4] A: Looking at figure 4 I cannot answer it.
[5] Q: Because you don't know whether 2,137 is
[6] greater than 800?
[7] A: I understand that I'm having a little
[8] difficulty on whether the axises that were used on
[9] figure 4 -
[10] Q: And you need to refer back to the text to
[11] clarify that?
[12] A: Right, to be precise in my answer to you.
[13] Q: And when you say the axises that were used,
[14] what do you mean by that?
[15] A: Well, I'm unsure in terms of X, Y, and Z
[16] axises if those were labeled correctly. That's what
[17] I'm interesting in checking on in the text.
[18] Q: Okay. Why don't you go ahead and check. Let
[19] me ask you one other question. Just looking at
[20] figure 4, the left hand column says, "Distance down
[21] gradient from the extraction well." You would assume
[22] that would be in the X direction?

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[1] A: Correct.
[2] Q: And therefore Y would be at a right angle to
[3] what's down gradient and so one would assume just
[4] looking at figure 4 that Y represents the width of
[5] the capture zone at any point down gradient from the
[6] extraction well?
[7] A: Correct.
[8] Q: But you think that - all right. Let me get
[9] back then. If that assumption is correct, if
[10] figure 4 is accurate in that regard and we get back
[11] to my question, doesn't figure 4 demonstrate that
[12] under the 3-D scenario you created a capture zone
[13] under the conditions you set forth in figure 4 that's
[14] almost three times wider than the capture zone that
[15] you had drawn on figure 1?
[16] A: If those assumptions are correct, that appears
[17] to be the case.
[18] Q: Okay. So why don't you take a look at the
[19] text now and try to explain to me why what seems
[20] reasonable for figure 4 may not be the case.
[21] Let the record reflect that Mr. Morrison is
[22] going back to review the report, and we've taken a

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[1] short hiatus while he does that.
[2] Mr. Morrison, you've had four minutes, four or
[3] five minutes. Are you any closer to resolving the
[4] concern you've got?
[5] A: No.
[6] Q: So you found nothing in the text that would be
[7] inconsistent with the conclusions you and I just
[8] discussed a few minutes ago?
[9] A: The conclusion I've come to is I would need to
[10] talk to Evan Newell and understand the assumptions he
[11] used for figure 4.
[12] Q: That's fine, but I think you told me that you
[13] had reviewed this report and believed it to be
[14] accurate and sent it on to the Department of Justice?
[15] A: Correct.
[16] Q: And it is not a practice of your office to
[17] send out reports that you believe misrepresent what
[18] the facts are, is it?
[19] A: No.
[20] Q: So to the best of your knowledge figure 4
[21] represents what your company concluded was the
[22] condition at the site using the parameters that are

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[1] set forth on that figure?
[2] A: Yes, relative to comparing the 2- and 3-D
[3] capture zone results.
[4] Q: If we take a look at the capture zone for
[5] confined and unconfined, we also find that the width
[6] of the capture zone is measure at the extraction
[7] levels, in one case 2,139 feet for the confined
[8] scenario and 1,734 feet for the unconfined, both of
[9] which are much greater than the 800 feet that figure
[10] 1 suggests is appropriate for the site.
[11] A: That statement is correct.
[12] Q: Let's go back to the question I left you with
[13] just before we went to lunch. Does figure 4 not
[14] demonstrate that if we put in a single containment
[15] well at the location you have selected and ran it at
[16] some rate less than 250 gallons per minute that it
[17] would effectively capture the contaminants associated
[18] with the Sparton plant?
[19] A: I can't answer that question because I don't
[20] clearly understand figure 4. The other part of your
[21] question deals with –
[22] Q: Wait a second, this is your report. It is

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[1] your report. Are you telling me you don't understand
[2] your own report?
[3] A: I have some difficulty in explaining figure 4
[4] without going back and talking to the office.
[5] Q: Would you agree with me that figure 4 is not
[6] consistent with the testimony you provided to me
[7] before lunch?
[8] MR. ROSENTHAL: Objection. I mean, what
[9] testimony are you referring to?
[10] MR. HARRIS: When he told me that this report
[11] did not demonstrate that a fully penetrating well
[12] placed at the location he chose pumped at a rate up
[13] to 250 gallons per minute would not effectively
[14] capture contaminants associated with the Sparton
[15] plant.
[16] THE WITNESS: Could you repeat the question?
[17] BY MR. HARRIS:
[18] Q: Is figure 4 not inconsistent with the
[19] testimony you gave me just before we went to lunch in
[20] response to my question as to whether this report
[21] didn't demonstrate that a fully penetrating well at
[22] the location you chose pumped at a rate up to 250

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[1] gallon per minute would effectively capture all the
[2] contaminants associated with the Sparton plant?
[3] A: As I sit here today, I need further
[4] information before I can describe figure 4. What is
[5] in this report is inconsistent with the statement
[6] that a well pumping at 250 gallons per minute can
[7] capture the leading edge of the Sparton plume with
[8] one well.
[9] Q: I'll move to strike as non-responsive, and I
[10] didn't understand your answer. Again, focusing on
[11] figure 4, if figure 4 is what you and I have
[12] discussed, is it not – are the results in figure 4
[13] not inconsistent with the testimony you provided to
[14] my last question to you before we broke for lunch,
[15] yes or no? It's susceptible to a yes-or-no answer,
[16] Mr. Morrison.
[17] A: I don't know how to answer. I'm unable to
[18] answer your question.
[19] Q: Haven't we agreed that figure 4 says for all
[20] of the scenarios you looked at, 3-d, 2-D confined and
[21] 2-D unconfined for the parameters that are set forth
[22] there that you would create a capture zone greater

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[1] than 800 feet measured at the containment well point?
[2] A: That's what I'm needing clarification on, and
[3] I don't understand this.
[4] Q: I understand that you want to go back and try
[5] to figure this out and change it, but my point is if
[6] we just take a look at what's on figure 4, isn't that
[7] data on its face inconsistent with the testimony you
[8] gave me in my last question to you before we broke
[9] for lunch?
[10] MR. ROSENTHAL: Objection, this is – he's
[11] asked and answered. He says he doesn't understand,
[12] needs to go back.
[13] MR. HARRIS: He understands it. You may not
[14] want to answer the question, Mr. Morrison, but I
[15] would appreciate your responding to my question which
[16] is we've already talked about what figure 4 says on
[17] its face. You may not agree with what it says on its
[18] face and seek clarification, but based on what it
[19] says on its face, would you not agree with me that it
[20] is inconsistent with the testimony you provided to me
[21] to the last question I asked you before we broke for
[22] lunch?

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[1] A: I don't fully understand figure 4. The rest
[2] of the report is consistent with my answer to your
[3] question before we broke for lunch. Figure 4 may or
[4] may not be. Before I can answer your question
[5] relative to figure 4, I would need to go back and
[6] clarify how it was developed in the office.
[7] Q: Based upon what you know right now it's
[8] inconsistent?
[9] A: My answer is I don't know whether it's
[10] consistent or inconsistent.
[11] Q: Okay. In figure 4, are there any parameters
[12] that are used there that you believe are
[13] inappropriate for the aquifer at the leading edge of
[14] the plume?
[15] A: The parameters on figure 4 in the lower
[16] portion of figure 4 were simply values that were
[17] assigned given the fact that there are no measured
[18] vehicle used in the lead leading edge of the plume,
[19] they may or may not be representative.
[20] Q: How were they selected?
[21] A: Generally by taking various ranges as reported
[22] in the environmental reports. For example, on figure

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[1] 2A, you will notice that transmissivity values ranges
[2] from 0 to 35,000 gallons per day per foot. HLA
[3] report has transmissivity values ranging to 60 and
[4] 70,000 gallons per day per foot, which if one were to
[5] draw the K line would bring the figure to a much
[6] higher level than 250 GPM. The purpose was simply to
[7] use different values and to see what the results
[8] were.
[9] Q: Let me make sure I understand something.
[10] You're not suggesting to me that somebody in your
[11] office would suggest or select a figure that they
[12] didn't believe represented conditions at the leading
[13] edge?
[14] A: Our office use conductivity values and
[15] developed them as a range of what may or may not be
[16] representative of the leading edge. Given that no
[17] one has measured the leading edge, we're just
[18] estimating what a reasonable range might be.
[19] Q: Let's step back for a second. You told me the
[20] purpose of this exercise was to essentially test
[21] whether what Sparton had proposed would work. So are
[22] you now telling me that you were gauging the results

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[1] by trying to select a number that would either prove
[2] or disprove it to get to a particular result?
[3] A: No.
[4] Q: Then you would agree with me that the K value
[5] was selected as the most likely number to represent
[6] conditions at the leading edge?
[7] A: K values were selected that would be
[8] reasonable for hydraulic conductivity values at the
[9] leading edge of the plume. These values may or may
[10] not be accurate given that no measured values are
[11] available for comparison.
[12] Q: But the point is based upon – you had an
[13] opportunity to review all of the data that was
[14] available on the conditions in the aquifer at the
[15] time this report was put together, you or your
[16] office?
[17] A: Conditions in the aquifer under the site?
[18] Q: Right. I'm sorry, under the site that were
[19] impacted by the activities from Sparton; correct?
[20] A: Correct.
[21] Q: And this number represents somebody in your
[22] office's best estimate of what the conditions are at

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[1] the leading edge?
[2] A: An estimate of a range of conditions on the
[3] leading edge.
[4] Q: But within that range they had to select a
[5] particular number, and they used what you've referred
[6] to as their best professional judgment to identify
[7] what they thought the conditions were at the leading
[8] edge based upon all the information that had been
[9] generated by the impacted saturated zone associated
[10] with the Sparton plant?
[11] A: It was an estimated range of what we
[12] considered to be reasonable.
[13] Q: The number selected on figure 4 for K was 15.
[14] That is not a range, is it?
[15] A: No, but if you refer to page 4, you will see
[16] that there is a range from 1 to 100, two orders of
[17] magnitude.
[18] Q: Somebody believed in your office that 15 was
[19] the most appropriate number in that range for design
[20] purposes?
[21] A: No.
[22] Q: So the 15 for K doesn't represent their best

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[1] professional judgment as to what the numbers should
[2] be?
[3] A: There's a misunderstanding. If you look at
[4] page 4, for example, you can see that we used a
[5] variety of K values. There are no measured values on
[6] the leading edge of the plume, and as a result, we're
[7] relegated to using approximate values. In the
[8] particular figure on figure 4, one particular value
[9] is used that may or may not be representative.
[10] Another way to examine it –
[11] Q: Let me –
[12] A: Excuse me, can I answer my question, please?
[13] Q: Sure, if you would answer it.
[14] A: The rest of my answer, to clarify your
[15] question, might be examined by looking at the CH2M
[16] Hill report dated January 1996. If one examines
[17] page 5 table 1, you will see a lifting of different
[18] transmissivity conductivity hydraulic gradient
[19] reciprocity and velocity values. You can see that by
[20] reviewing that this is a significant range of values
[21] that have been recorded for on-site.
[22] On our particular report we took values that

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[1] were generally within that same range and used
[2] different values for the modeling exercise. And so
[3] that's how these particular values were used in terms
[4] of model input.
[5] Q: Did you select a value for K that you believe
[6] not to be representative of conditions at the leading
[7] edge?
[8] A: Values of K were selected which represented a
[9] range which may be or may not be accurate for the
[10] leading edge of the plume.
[11] Q: Did you select the value for K on figure 4?
[12] A: Are you referring to me personally or staff?
[13] Q: In this case you is you.
[14] A: No.
[15] Q: And who on your staff selected that number?
[16] A: For that particular simulation Evan Newell
[17] selected that value.
[18] Q: And he had to select a number out of the
[19] range, didn't he?
[20] A: Correct.
[21] Q: And the number he selected based upon your
[22] working with Mr. Newell would have been the

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[1] number that he thought was most representative of
[2] conditions at the leading edge?
[3] A: No, that's not correct.
[4] Q: Was it the number that was least
[5] representative of conditions at the leading edge?
[6] A: For this particular simulation we used
[7] numerous values not only for K, but numerous values
[8] for hydraulic, gradient, transmissivity, and so
[9] forth. This is simply one simulation using that
[10] particular value for K.
[11] Q: Where are the other figures that compare the
[12] capture zone between 3-D and the 2-D to subset
[13] conditions for different K values?
[14] A: Well, in figure 5, for example, there are
[15] different K values ranging from 15 to 45.
[16] Q: Let's talk about figure 5 for a second. We've
[17] already agreed, I believe, that the thickness of the
[18] impacted zone at the leading edge is approximately 75
[19] feet; correct?
[20] A: Could you repeat that?
[21] Q: Take a look at figure 4. You had the aquifer
[22] thickness at 75 feet.

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[1] A: Yes, for one scenario.
[2] Q: There are no other scenarios that are reduced
[3] to figures, are there?
[4] A: Figure 4 that's 32 and a half and 75 feet.
[5] Q: Okay. But nothing greater than 75 feet?
[6] A: Not on figure 4.
[7] Q: Let me hand you what I've marked as
[8] Exhibit 204. This is a document that your office
[9] generated, isn't it?
[10] (Morrison Deposition Exhibit Number 204 was
[11] marked for identification.)
[12] THE WITNESS: Yes.
[13] BY MR. HARRIS:
[14] Q: Your office estimated you told me before.
[15] MR. ROSENTHAL: Excuse me, could you just read
[16] the number?
[17] MR. HARRIS: Oh, yeah, 2172.
[18] BY MR. HARRIS:
[19] Q: You told me before that RMA stands for your
[20] firm?
[21] A: Yes.
[22] Q: So what we have on Exhibit 204 is Balleau's

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[1] estimate which was a Sparton expert, then we have
[2] RMA's estimate which is Robert Morrison and
[3] Associates estimate; correct?
[4] A: Yes.
[5] Q: Did you develop those numbers?
[6] A: Our office did.
[7] Q: Who in your office?
[8] A: I believe Sheri Komelyan.
[9] Q: And according to Sheri Komelyan of your
[10] office, the impacted aquifer thickness is 25 to 75
[11] feet?
[12] A: That's what the range I asked her to assume.
[13] Q: Well, wait a second. You told me she
[14] developed the number. Are you now telling me you
[15] told her what range to put it in?
[16] A: Yes.
[17] Q: So that number represents your opinion as to
[18] the thickness of the saturated zone that's been
[19] impacted by activities at the Sparton plant?
[20] A: It represents a conservative estimate on my
[21] part.
[22] Q: Where does it say that on Exhibit 204?

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[1] A: It doesn't.
[2] Q: And when you say conservative, you mean that
[3] it could actually be less than 25 to 75 feet?
[4] A: In some portions of the site it's conceivable
[5] it could be less. It's as conceivable that in
[6] portions where vertical delineation has not been
[7] performed that it could be greater than 75 feet.
[8] Q: When you use the term conservative when you're
[9] doing the work, it means you've overstated the amount
[10] of saturated zone that's been impacted?
[11] A: That would be the converse.
[12] Q: So at any rate, let's turn to figure 5 then.
[13] At least in figure 204 it was your belief that at the
[14] time it was appropriate to assume that the aquifer
[15] that had been impacted, the portion of the saturated
[16] zone that had been impacted was no more than 75 feet.
[17] If we follow through on that belief in figure 5, am I
[18] not correct that the pumping rate that's necessary to
[19] achieve an 800-foot capture zone both at the water
[20] table surface of 50 feet below is with one exception
[21] less than 250 gallons per minute from one well?
[22] A: For these particular parameters that's

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[1] correct.
[2] Q: For the parameters that we're talking about a
[3] gradient of 0.02 and that 0.02 is taken directly from
[4] the water level measurements in the information that
[5] was supplied to you?
[6] A: That was within the range.
[7] Q: You don't have any information that shows that
[8] gradient number is inaccurate in any way?
[9] A: It's within the range of gradients.
[10] Q: Well, wasn't it in fact based upon the actual
[11] water level measurements at the leading edge?
[12] A: That depends on when one takes a measurement
[13] whether it's irrigation season, or the non-irrigation
[14] season. The gradient, for example, in the vicinity
[15] 6061 changes. That's why on page 3 there was a range
[16] of hydraulic gradients used ranging from .001
[17] to .003.
[18] Q: Did you attempt to average those numbers over
[19] time to see whether, in fact, they would tend towards
[20] the 0.002 number?
[21] A: No.
[22] Q: What was the range of K values you were

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[1] assuming again, Mr. Morrison?
[2] A: 15 to 45 for this particular simulation.
[3] Q: Well, in fact, I also stand corrected as we
[4] take a look at it, the one instance in which for 75
[5] feet of thickness it's over 250 you've actually
[6] changed the gradient, haven't you, because there's
[7] also a gradient of 0.003 for two cases?
[8] A: Correct.
[9] Q: And what effect does increasing the gradient
[10] have on the size of the capture zone if the pumping
[11] rate remains constant?
[12] A: To reduce the capture zone.
[13] Q: Then I also note that you have a horizontal K
[14] and a vertical K equal 100. What does that mean?
[15] A: Those are just different relationships between
[16] the horizontal saturated conductivity and the
[17] vertical saturated conductivity.
[18] Q: Does 200 mean it's two to one? What does the
[19] 200 represent?
[20] A: It represents dividing the horizontal
[21] saturated conductivity by the vertical saturated
[22] hydraulic conductivity.

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[1] Q: Are you saying that in this situation you're
[2] assuming that the horizontal conductivity is 200
[3] times greater than the vertical conductivity?
[4] A: Yes.
[5] Q: And in the last scenario you're saying that
[6] they're the same?
[7] A: I'm saying it's 100 times.
[8] Q: I'm sorry, 100 times greater.
[9] What source of information did you have to
[10] base those numbers on? Where did you get the
[11] horizontal conductivity and vertical conductivity?
[12] A: Given that there is no measured values out in
[13] the leading edge, these are just estimates.
[14] Q: Based on what?
[15] A: Just based on our professional experience at
[16] other sites in these types of geologic environments.
[17] Q: Would you not agree with me that figure 5,
[18] except for the one situation which is 75 feet of
[19] thickness, gradient of 0.003 horizontal at K
[20] divided –
[21] THE REPORTER: Wait.
[22] BY MR. HARRIS:

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[1] Q: Would you agree with me, Mr. Morrison, that
[2] except for the situation where you've got a gradient
[3] of 0.003 and a horizontal K divided by a vertical K
[4] of 200 and a K of 45 that in all other situations on
[5] figure 5 it gives – it establishes that pumping a
[6] single extraction well of a location you selected at
[7] 250 gallons per minute or less would create a hundred
[8] foot capture zone?
[9] A: Correct, for these different parameters.
[10] Q: And those findings again would be inconsistent
[11] with the testimony you gave to my last question just
[12] before lunch?
[13] MR. ROSENTHAL: Objection, what testimony are
[14] you talking about?
[15] THE WITNESS: No, it is not.
[16] BY MR. HARRIS:
[17] Q: Why not?
[18] A: What you're omitting in your questions is
[19] that, for example, 55 is simply for one group of
[20] parameters which we used. I could just as easily
[21] have used K values, let's say from 45 to 100. I
[22] could have changed gradients, I could have changed

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[1] horizontal and vertical relationships that would have
[2] changed different pumping rates.
[3] The results of this modeling exercise
[4] demonstrated to me that in the absence of measurable
[5] values that there was such uncertainty in these
[6] parameters that one needed to actually go out and get
[7] some measured values before one could reliably model
[8] what a pumping rate could be and whether or not one
[9] well would be adequate.
[10] Q: Well, I guess you could have put in any
[11] numbers that you wanted but wasn't the point of
[12] figure 5 to try and estimate the most realistic
[13] numbers that were found at the leading edge based on
[14] the information available to you?
[15] A: Figure 5 is just one particular subset of
[16] variables that were used. We use numerous
[17] combinations. This just happened to be one that was
[18] printed up.
[19] Q: It just happened to be printed up and happened
[20] to be labeled figure 5 and just happened to be sent
[21] to the Department of Justice as your report?
[22] A: Yes, to illustrate the work we had done and

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[1] why measurements were needed at the leading edge.
[2] Q: Where does it say all that in this report?
[3] A: I don't think it includes that on – in the
[4] text.
[5] Q: In fact, it doesn't say that anywhere, does
[6] it?
[7] A: No.
[8] Q: Would you point me to where in the report you
[9] specifically say that you need more information about
[10] the parameters that are to be input into the formula
[11] that you used?
[12] A: That was my conclusion based on looking at
[13] this information.
[14] Q: Where is that conclusion in the report?
[15] A: It's not put into the report.
[16] Q: Do you make it a practice of not including
[17] conclusions in reports you prepare for the United
[18] States government?
[19] A: The purpose of this particular exercise was to
[20] model various extraction-rate scenarios near the
[21] leading edge to see if they would be useful in
[22] estimating the capture zone. After going through

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[1] this exercise I came to the conclusion that measured
[2] values were needed because of the uncertainty.
[3] The purpose of this report was simply
[4] therefore to share with the Department of Justice the
[5] exercise we had gone through, and I reported verbally
[6] on the conclusions after looking through this data
[7] and the various simulations.
[8] Q: So it's your testimony here today,
[9] Mr. Morrison, that the pump test that was conducted
[10] on site tells you nothing about the conditions at the
[11] leading edge?
[12] A: Correct.
[13] Q: And have you personally compared any of the
[14] boring logs in the vicinity of the leading edge with
[15] the boring logs where the pump test was run on site?
[16] A: Yes.
[17] Q: What boring logs are those?
[18] A: In the vicinity of the – on site it would be
[19] PW1 and on the – in the area of the vicinity of the
[20] leading edge it would be 60, 61, 68, 69, 57, 66, 52,
[21] 65.
[22] Q: And you personally looked at all of those?

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[1] A: Yes.
[2] Q: And based upon your review, your testimony
[3] today is that the subsurface geology at PW1 had no
[4] similarity to the surface geology at 61, 57, 62, and
[5] 56?
[6] A: That is an obvious – certainly soil and soil
[7] description are similar properties related to the
[8] hydraulic properties of those formations are known in
[9] the vicinity of the Sparton site from the pump and
[10] slug test. Given that measurements have not been
[11] performed down gradient in the vicinity of the
[12] leading edge, those hydraulic properties are not
[13] known.
[14] Q: Move to strike as non-responsive. I wasn't
[15] asking you hydraulic properties, I was asking you
[16] about the geology. Isn't your undergraduate degree
[17] in geology?
[18] A: Yes.
[19] Q: It is not uncommon for you to review boring
[20] logs or make conclusions about the similarities of
[21] boring logs? Do you understand what I'm asking you?
[22] A: I do.

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[1] Q: I take it you look at the offering bag are PW1
[2] and compared to the one of the several other wells in
[3] the leading edge?
[4] A: Correct.
[5] Q: Are you telling me your review of those logs
[6] led to you the conclusion that they were so
[7] dissimilar that the leading edge would not exhibit
[8] any of same hydraulic properties as PW1?
[9] A: You're asking me about two different
[10] comparisons. One is the geology, one is the
[11] hydraulic parameters.
[12] Q: Fair enough. Let's start with the geology.
[13] A: Similar soil types are described on both – in
[14] both on-site boring logs and off-site boring logs in
[15] the vicinity of the leading edge of the Sparton
[16] plume.
[17] Q: And how are they different geologically, if at
[18] all?
[19] A: What do you mean by geologically?
[20] Q: Well, what I'm trying to understand is from
[21] what little I know about geology, one would assume
[22] that if you had similar soil types at both locations

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[1] you would have similar physical characteristics in
[2] the ground under the surface; am I correct or
[3] incorrect about that?
[4] A: A little of both.
[5] Q: Well, let's take it a step at a time then.
[6] Were the relative proportions of soil types the same
[7] at PW1 and at the wells you looked at at the leading
[8] edge?
[9] A: It's not possible to make that determination
[10] with the available information.
[11] Q: How would one go about - you're the expert,
[12] Mr. Morrison. How would one go about trying to tell
[13] me whether the subsurface geology at PW1 was similar
[14] or dissimilar to these other points you looked at at
[15] the leading edge?
[16] A: There are several layers, a gross layer would
[17] simply be looking at soil types, a more refined
[18] analysis would be to take soil cores and to perform
[19] physical testing to see - to examine the similarity
[20] of the physical properties.
[21] Q: And you haven't done the second analysis with
[22] respect to comparing PW1 to these other points?

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[1] A: That testing has not been performed.
[2] Q: And is there anything that leads you to
[3] believe that the physical characteristics at the
[4] leading edge for the soil types that you've already
[5] told me are similar at the two locations or the two
[6] points would result in different physical
[7] characteristics?
[8] A: The soil types are similar in terms of
[9] description, in terms of issues of compaction,
[10] cementation. Other physical properties would be
[11] there is not that information available to compare
[12] that level of similarity between on site versus off
[13] site.
[14] Q: Though am I correct that you are saying that
[15] the saturated zone that's been impacted is
[16] heterogeneous?
[17] A: Yes.
[18] Q: And what do you base that conclusion on?
[19] A: A review of the boring logs.
[20] Q: And what in particular in the boring logs
[21] leads you to that conclusion?
[22] A: Are you referring to on site and off site?

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[1] Q: Yes, I'm sorry. I'll be more specific. I'm
[2] referring to PW1 and the boring logs you looked at at
[3] the leading edge.
[4] A: Differences in the soil texture description.
[5] Q: Anything else?
[6] A: That's the primary information that's
[7] available from the boring logs.
[8] Q: So if I understand your testimony,
[9] Mr. Morrison, even though the soil types at PW1 are
[10] similar to the soil types in the boring logs at the
[11] leading edge of the plume, differences in soil
[12] texture between those two locations led you to
[13] conclude that the subsurface geology is heterogeneous
[14] and therefore you can't use the pump test information
[15] associated with PW1 to make any predictions about how
[16] a containment well would operate at the leading edge
[17] of the plume?
[18] A: Yes.
[19] Q: Mr. Morrison, it is your professional opinion
[20] that the horizontal and vertical extent of the plume
[21] is adequately defined, isn't it?
[22] A: No.

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[1] Q: Well, let me hand you what I'll mark as
[2] Exhibit 205 and 206, Bates numbers 2292 and 2293.
[3] Did you prepare Exhibit 205 or did somebody in
[4] your office do that?
[5] (Morrison Deposition Exhibit Numbers 205 and
[6] 206 were marked for identification.)
[7] THE WITNESS: The latter.
[8] BY MR. HARRIS:
[9] Q: Who was it?
[10] A: Sheri Komelyan.
[11] Q: And she in Exhibit 205 described what she
[12] believed to be the extent of the plume in 1996 and
[13] 1991 for TCE?
[14] A: That's not accurate. What has been prepared
[15] in Exhibit 205 was that I asked Ms. Komelyan to
[16] outline the parameter of the plume in 1991 and 1996
[17] as represented in the Black & Veatch figure.
[18] Q: How come portions of the area encompassed by
[19] Black & Veatch is not blacked out and why are other
[20] portion that's were not included in the Black &
[21] Veatch area blacked out?
[22] A: Because they represented two different points

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[1] in time.
[2] Q: No, no, let's start with each point in time.
[3] Take a look at the 191. Is there not a portion of
[4] the Black & Veatch area that is not included?
[5] Is there not a portion of the Black & Veatch drawn
[6] area on the 1991 plume that is not included?
[7] A: The Black & Veatch figures provide the limits
[8] of the TCE plume for 1991 and 1996 data.
[9] Q: And again, do you mind if I look over your
[10] shoulder, Mr. Morrison? You don't have to get up,
[11] you can stay seated. I didn't want to invade your
[12] personal space there.
[13] What I'm getting at is if you take a look at
[14] your - at figure Exhibit 205 which is Bates 2292, do
[15] you not see for the 1991 a line that's depicted on
[16] that exhibit, and that line does it not represent the
[17] of the Black & Veatch outline of the extent of the
[18] plume below the drinking water limit?
[19] A: Yes.
[20] Q: And her darkened area does not coincide with
[21] that, does it?
[22] A: Correct, it coincides with the 1991

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[1] plume.
[2] Q: So you were over laying one of the Black &
[3] Veatch drawing on top of another; is that right?
[4] A: No.
[5] Q: Now I'm more confused than I was, Mr.
[6] Morrison. I apologize.
[7] A: The figure is 3-74 which presents the plume in
[8] 1991 and the plume in 1996. Exhibit 205 simply takes
[9] that figure and darkens the plume in 1991 and the
[10] plume in 1996.
[11] Q: Here's the difficulty I'm having and I know it
[12] may seem like a minor point, but I still need to get
[13] it clarified. Let me mark for you two other
[14] exhibits. I'm marking this 207 and 208.
[15] (Morrison Deposition Exhibit Numbers 207 and
[16] 208 were marked for identification.)
[17] Mr. ROSENTHAL: The administrative record or
[18] anything that we gave you?
[19] MR. HARRIS: They are part of the
[20] administrative - they're part of the hearing record.
[21] MR. ROSENTHAL: Are they identified with any
[22] Bates stamps?

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[1] MR. HARRIS: No. These were exhibits that
[2] were used at the administrative hearing on the
[3] initial administrative order, and were admitted in
[4] that proceeding.
[5] BY MR. HARRIS:
[6] Q: Here's what I'm struggling with, Mr. Morrison.
[7] I've marked Exhibit 207 which is the 1991 plume
[8] limits drawn by Black & Veatch and that was an
[9] exhibit of another hearing we had with EPA and won.
[10] You agree with me that the outline of the plume
[11] depicted on 207 is different than the outline of the
[12] plume that you are saying on Exhibit 205 represents
[13] the 1995 Black & Veatch plume?
[14] MR. ROSENTHAL: Mr. Morrison, have you seen
[15] this Exhibit before?
[16] THE WITNESS: I've seen a reduced version of
[17] this and it wasn't very clear.
[18] MR. ROSENTHAL: Okay.
[19] THE WITNESS: The shapes appear to be
[20] different.
[21] BY MR. HARRIS:
[22] Q: And take a look at 20. Would you also not

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[1] agree with me that 208 represents the plume limits
[2] developed by Black & Veatch as of July 1996 and is
[3] that shape not different than the shape you used in
[4] Exhibit 205?
[5] A: It appears to be different.
[6] Q: Can you explain why it appears you're using
[7] and representing what is a Black & Veatch plume that
[8] is not consistent with what Black & Veatch says their
[9] outline of the plume is?
[10] A: Well they're both Black & Veatch drawn plumes.
[11] so that question would need to be asked to Black &
[12] Veatch.
[13] Q: So you're saying that these figures
[14] represent - and do you know the date of the 1996 day
[15] out of this reference on that one Black & Veatch
[16] drawing?
[17] A: No, I would need to go back and review the
[18] document.
[19] Q: Do you know if these documents came from - do
[20] you know if these documents came from the CMS
[21] corrective-measure study?
[22] A: Yes. It is my understanding that is the

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[1] May 1996 version.
[2] Q: They were on aerial photographs; correct?
[3] A: Yes.
[4] Q: Did you check to see whether the drawings on
[5] those aerial photographs were designed to be as
[6] precise as the drawings that were included in the RFI
[7] and the drawings that were submitted to the
[8] government at the hearing?
[9] A: I assume that they were more accurate than
[10] what was submitted in the RFI given that 1996 data
[11] was available for the CMS.
[12] Q: My point is you don't know whether they were
[13] designed for demonstrative purposes or for some other
[14] purpose that is on the aerial photograph.
[15] MR. ROSENTHAL: Objection. You're asking him
[16] to speculate.
[17] BY MR. HARRIS:
[18] Q: Do you know?
[19] A: No.
[20] Q: Do you recall whether particular well
[21] locations were included in the aerial photographs?
[22] A: No.

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[1] Q: So for all you know the aerial photograph
[2] drawings that you used may have been solely for
[3] demonstrative purposes in a generalized description
[4] with the plume which may not comport with being Black
[5] & Veatch actual drawing based upon actual well
[6] locations?
[7] MR. ROSENTHAL: Objection. You're asking him
[8] to speculate again.
[9] BY MR. HARRIS:
[10] Q: Again, if you – don't speculate if you
[11] don't – can't answer that question, just tell me you
[12] don't know.
[13] A: I don't know.
[14] Q: Let me show you what I marked as Exhibit 206.
[15] Who developed those numbers?
[16] A: Sheri Komelyan.
[17] Q: And I assume what she did was the parameter,
[18] the area of the plume?
[19] A: Correct, in 1991 and the 1996 plume.
[20] Q: Exhibit 205? I think we've lost 205 at this
[21] point. There it is.
[22] A: Yes.

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[1] Q: What did she use as the thickness of the
[2] impacted saturated plume?
[3] A: There were 2, 25 feet, and 75 feet.
[4] Q: You relied upon that exhibit for reaching a
[5] number that was contained in your affidavit, did you
[6] not?
[7] A: A range of numbers in my affidavit.
[8] Q: And you would not have relied upon the numbers
[9] in Exhibit 206 unless you felt they were accurate?
[10] A: They represented a range based on the Black &
[11] Veatch portrayal in Exhibit 205.
[12] Q: You're not going to include in your affidavit
[13] a range of numbers that you didn't think accurately
[14] portrayed the situation at the site?
[15] A: Correct.
[16] Q: So for purposes of swearing to the truth of
[17] those figures you were willing to rely upon the Black
[18] & Veatch delineation of the plume at least as you
[19] understood it to be delineated in these aerial
[20] photographs that are depicted on Exhibit 205?
[21] A: Yes.
[22] Q: So for purposes of swearing to the truth of

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[1] something, you were willing to rely on Black &
[2] Veatch, but you're not willing to rely on this for
[3] the purpose of designing the containment well?
[4] MR. ROSENTHAL: Objection. Can you define
[5] what you mean by swearing to the truth of something?
[6] MR. HARRIS: Usually my understanding is that
[7] when you sign an affidavit you're swearing to the
[8] truth of the matter stated there in. And he has said
[9] that under oath he believes a certain amount of the
[10] saturated zone is being additionally impacted every
[11] hour, and you based that on some figures of some
[12] aerial photographs that were prepared by
[13] Black & Veatch.
[14] BY MR. HARRIS:
[15] Q: And I just wanted to make sure I understood you
[16] were willing to swear to those numbers based upon
[17] that information, but you don't believe those
[18] numbers, that that depiction is sufficiently accurate
[19] to find the containment well – for extraction well
[20] for containment zone?
[21] A: 205 was used simply to develop the
[22] expanse-rate calculation. I relied on other figures

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[1] to examine the issue of adequacy of the existing
[2] monitoring well system for containment purposes.
[3] Q: Again, the point I'm trying to make,
[4] Mr. Morrison, you were willing to rely upon
[5] Black & Veatch's delineation of the plume for
[6] purposes of completing your affidavit, but you
[7] weren't willing to rely upon that same delineation as
[8] being complete for purposes of designing a
[9] containment well?
[10] A: Correct.
[11] MR. ROSENTHAL: Jim, whenever you want we have
[12] the documents that you have requested regarding
[13] drafts, affidavits.
[14] THE WITNESS: Can we take a short break here?
[15] (A brief recess was taken.)
[16] MR. ROSENTHAL: This morning, Mr. Harris, you
[17] had demanded that the government turn over to you
[18] copies in Dr. Morrison's file of all draft affidavits
[19] and work plans with comments on those plans from
[20] other parties, and we said then we still maintain the
[21] position that we are under no – we are under no
[22] legal obligation to turn those over to you at this

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[1] time. But during the break we went ahead and did
[2] Bates-stamp a copy and turn it over to you.
[3] All such documents with the exception of a
[4] very small set of documents that contain attorney
[5] opinion work product and that specifically refer to
[6] strategy for the preliminary injunction, otherwise
[7] you have now a complete file including all drafts and
[8] other internal documents. And we're providing this
[9] to you only as a courtesy and in effort to move this
[10] deposition along in this case alone.
[11] MR. HARRIS: Okay, thank you.
[12] BY MR. HARRIS:
[13] Q: Mr. Morrison, let me hand to you what I've
[14] marked as Exhibit 209. It's a copy of a fax cover
[15] sheet to Mr. Fishel from Evan Newell. I believe it's
[16] 145 through it looks like 153. First off there's a
[17] reference there to cancer rates in Louisiana. That
[18] doesn't have anything to do with this case, does it?
[19] (Morrison Deposition Exhibit Number 209 was
[20] marked for identification.)
[21] THE WITNESS: No.
[22]

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[1] BY MR. HARRIS:
[2] Q: It has to do with the other case you're
[3] working on with Mr. Fishel?
[4] MR. ROSENTHAL: Objection.
[5] MR. HARRIS: Just to move things along, I'll
[6] point out that the information supplied to me is
[7] already identified in the other case as the board
[8] case that is in Louisiana, so it seems to be somewhat
[9] obvious. But without waiving your claim of privilege
[10] understanding that.
[11] MR. ROSENTHAL: I understand.
[12] BY MR. HARRIS:
[13] Q: I just want to make sure is doesn't apply to
[14] this site. The remaining drawings reflect plume
[15] diagrams – I don't know what you want to call
[16] them – that your office developed, did they not?
[17] A: Correct.
[18] Q: And it's interesting that there are on there
[19] drawings based both upon April 1996 data and
[20] July 1996 data, aren't there?
[21] A: For TC for the upper flow zone, lower flow
[22] zone, that's correct.

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[1] Q: And getting back to deposition Exhibit 205,
[2] again you don't know whether the plume limits
[3] depicted on those drawings were based upon the April
[4] '96 or July '96 data, do you?
[5] A: No, I would need to go back to the CMS.
[6] Q: Am I not correct that the drawings that are
[7] part of Exhibit 209 your staff felt comfortable
[8] enough, based upon the July data, to close all of the
[9] contour lines? There are no dashed lines – I'm
[10] sorry, there is one dashed line. Other than for the
[11] upper lower flow zone, aren't all the other lines
[12] based on the 796 data non-dashed?
[13] A: Actually dash flow lines are included in the
[14] upper flow zone for 496.
[15] Q: I said July of 96 is my question. If you
[16] could limit yourself to July of '96.
[17] A: For the 3 July '96 TC contours, two of the
[18] graphs have closed-contour lines, one has dashed.
[19] Q: And for the two that were closed, your staff
[20] felt as though there was sufficient information to
[21] describe the extent of the plume at least in two of
[22] the three flow zones?

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[1] A: I don't know if that was the case or if the
[2] purpose was to approximate the contours. I don't
[3] understand what the purpose was when this was
[4] forwarded to Mr. Fishel.
[5] Q: Well, the fax cover sheet said there were some
[6] rough contour maps of the TCE plume?
[7] A: Correct.
[8] Q: They felt - I'm just trying to understand,
[9] would you not agree we in that your staff would not
[10] show a solid line unless they felt relatively
[11] comfortable that there was sufficient information to
[12] describe the extent of the plume for that
[13] contaminant?
[14] A: I would need to ask staff.
[15] Q: Again, it isn't the practice of your
[16] employees, is it, to send material out to a client
[17] indicating they're certain about something when
[18] they're not?
[19] A: If you will notice, all of the figures have
[20] the word draft on them, and I take that at face value
[21] that these are draft and not final depictions.
[22] Q: Again, even on draft documents they're not

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[1] going to send out something they believe is
[2] inaccurate, are they?
[3] A: Correct.
[4] Q: And the date of Exhibit 209 is what?
[5] A: December, 1996.
[6] Q: Take a look, if you would, at Exhibit 207. Do
[7] you believe that as of the date of that - not the
[8] date of the drawing but based on that in June of 1991
[9] that the drawing there is accurate, that it properly
[10] depicts the plume, and it defines the vertical and
[11] horizontal extent?
[12] A: The vertical extent is not displayed on this
[13] figure on Exhibit 207.
[14] Q: Is it not on the side drawings cross sections?
[15] A: Yes, and interpreted vertical extent is shown
[16] on the cross sections.
[17] Q: And would you agree with me that the vertical
[18] and horizontal extent of the plume is
[19] adequately defined through data developed through
[20] June of 1991?
[21] A: I would characterize this as an approximation
[22] of what the plume may have looked like in June of

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[1] 1996. Clearly there are areas where there has been a
[2] fair amount of extrapolation and interpretation in
[3] both the vertical and horizontal axis.
[4] Q: If you would point those out to me, if you
[5] would just go ahead and mark on 207 the areas that
[6] you believe involve, what were your words,
[7] substantial extrapolation?
[8] A: How would you like me to mark them?
[9] Q: Probably with a pen. Here you go. Are you
[10] finish, Mr. Morrison?
[11] A: Yes.
[12] Q: You've marked on 207 with several question
[13] marks. Can you tell me what you intend those
[14] question marks to signify?
[15] A: Yes.
[16] Q: What do they signify?
[17] A: They would signify areas that I have
[18] disagreement with the Black & Veatch interpreted
[19] vertical and horizontal extent of the plume as of
[20] June of 1991.
[21] Q: And in which of those question marks do you
[22] believe additional monitor wells would be necessary

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[1] to resolve our - strike that.
[2] Do the question marks represent a situation
[3] where you would draw the line differently or a
[4] situation where you believe additional wells are
[5] necessary to define the plume at that location?
[6] A: Both.
[7] Q: For every point?
[8] A: In some cases additional wells would be
[9] required for delineation, in other cases it would be
[10] an issue of the refinement of the delineation
[11] required.
[12] Q: Why don't you put a triangle around those
[13] points where you believe additional monitor wells
[14] would be required.
[15] A: As of 1991?
[16] Q: Yeah. If you were looking at this, if this
[17] had come to you back in sometime after June of '91,
[18] where would you have requested additional monitor
[19] wells be put in?
[20] MR. ROSENTHAL: Objection as being beyond the
[21] scope of the issues raised in his affidavit.
[22] MR. HARRIS: I think it all will be linked up

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[1] so I'd ask you to go ahead.
[2] **MR. ROSENTHAL:** I'm not instructing him not to
[3] answer.
[4] **THE WITNESS:** Would you read the record.
[5] (The record was read as requested.)
[6] (Discussion off the record.)
[7] **BY MR. HARRIS:**
[8] **Q:** Finished, Mr. Morrison?
[9] **A:** Yes.
[10] **Q:** I noticed that you've added four boxes, if I'm
[11] counting correctly. Do those represent four wells or
[12] one or more wells just in different cross sections?
[13] **A:** They represent two wells at cross section.
[14] **Q:** Could you, just so the Exhibit 207 is clear,
[15] could you label the wells A and B so we know which
[16] ones are which? If I understand correctly we'll have
[17] two A's and two B's as being the same well, and the
[18] B's being the same well.
[19] One final request. On 207 could you also
[20] indicate on the horizontal plan view where A and B
[21] would be located.
[22] **MR. ROSENTHAL:** I have a question four, this

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[1] is three A's and one B; is that correct?
[2] **THE WITNESS:** Correct.
[3] **BY MR. HARRIS:**
[4] **Q:** Three separate cross sections. Could you mark
[5] those A and B for me, please. Tell me why you would
[6] have requested a well be installed or well be
[7] installed?
[8] **A:** Because the vertical delineation of the plume
[9] was not defined by the monitoring wells on 6/91 in
[10] that area.
[11] **Q:** And what would be your reason then for
[12] requesting the installation of well A?
[13] **A:** It would be similar to assist in defining the
[14] vertical extent of the plume as of June 1991.
[15] **Q:** Would you not agree with me, Mr. Morrison, if
[16] you installed A and it came back non-detect at the
[17] point where the vertical extent has been drawn, that
[18] it would be unnecessary to then install B?
[19] **A:** No, I would not agree with that.
[20] **Q:** Are you saying that in your professional
[21] judgment it's unreasonable to assume that the
[22] contaminants would behave in a relatively consistent

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[1] fashion between the last down gradient or - sorry,
[2] the last up gradient point of non-contamination to a
[3] set of vertical points and wherever in A it was shown
[4] to be non-detect?
[5] **A:** I don't understand your question.
[6] **Q:** What I'm getting at and it was a poorly worded
[7] question, I apologize, on Exhibit 207 if we look at
[8] cross section A, if I understand correctly if we drop
[9] the well and its your location A and it was
[10] non-detect just below where the line is drawn, we
[11] could go back to - can you make out the number on
[12] that well what the last non-detect is? It looks like
[13] 24, 26, something like that. See what I'm getting
[14] at?
[15] **A:** Yes, I can't make out the well.
[16] **Q:** But it's the first non-detect on cross section
[17] A, down gradient or up gradient. I'm sorry, up
[18] gradient of what would be new well A. What I'm
[19] trying to understand is what is it about the
[20] geological conditions between that point which for
[21] purposes of clarification we'll just label X, what is
[22] it about the geology between point X and where the

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[1] well would go in at A that would cause you not to
[2] believe could you drawn draw a line between those two
[3] points roughly in the way depicted?
[4] **A:** Simply there is no information that allows one
[5] to draw a line, especially I have - even that is not
[6] a dashed line or any notation, that is approximation.
[7] **Q:** I move to strike. My question really again is
[8] what is it about the subsurface geology that suggests
[9] to you that the contaminants won't exhibit
[10] characteristics that would be consistent with the
[11] line that was drawn if the well at A is non-detect
[12] and if the well at X is non-detect?
[13] **A:** Simply that there is no evidence, that there
[14] is certainly mechanisms for contamination over that
[15] horizontal distance to be introduced at a deeper
[16] level between those two points.
[17] **Q:** And what are those mechanisms? What is it in
[18] the subsurface geology that would suggest that all of
[19] a sudden the contaminants moving from point X to
[20] point A would dip down and then come back up?
[21] **A:** I don't agree with that interpretation to A.
[22] Also it is more realistic that the contamination down

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[1] gradient of point X on Exhibit 207 can be introduced
[2] at a deeper level on its pathway down to A, and it
[3] may or may not have reached point A.
[4] So as a result, one would have to put a well
[5] at B not only to see the vertical but horizontal
[6] extent of depth of contaminant at that location.
[7] Q: Are you done?
[8] A: Yes.
[9] Q: You've reviewed the boring logs at the site;
[10] correct?
[11] A: Yes.
[12] Q: What about the geology there - based on your
[13] review of that geology, what do you think the maximum
[14] amount of difference could be between point X and
[15] point A without putting a well in at that location?
[16] How much could that line be off, five feet, ten feet
[17] 100 feet?
[18] A: There is no way to estimate, that's the reason
[19] for putting in another well so you have some
[20] information to scientifically draw a line.
[21] Q: So if I understand your testimony, it's that
[22] even though you're familiar with the subsurface

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[1] geology, you don't feel comfortable, based upon your
[2] knowledge of that subsurface geology and your
[3] knowledge of the type of contaminants in the
[4] saturated zone, of assuming that they would generally
[5] follow the line that's drawn from point X to point A?
[6] A: That's correct. That's the reason why another
[7] well would be needed so you can answer that question.
[8] Q: And what's the maximum amount you think, based
[9] upon your knowledge of the characteristics of TCE and
[10] your knowledge of the subsurface geology why that
[11] line there was currently drawn when X and A, assuming
[12] that A is non-detect, could be off how many feet?
[13] You've been at this business for 25 years,
[14] you've seen any number of sites, and are you telling
[15] me you can't reasonably tell me how far you think
[16] that line would drop below where it is right now
[17] based upon all of the information you've seen at the
[18] site?
[19] A: No, I would be speculating.
[20] Q: Okay. Let me show you Exhibit 208. Would you
[21] go through the same exercise for me on Exhibit 208,
[22] identify points but to simplify matters, why don't

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[1] you simply include there - no, I'm sorry. Do both
[2] things, tell me where you disagree with a question
[3] mark, then go back and show me where you would put in
[4] additional wells.
[5] A: Apparently Exhibit 208 has been misdrawn in
[6] the vicinity of MW62. It has it circled as a
[7] non-detect well. At the date I reviewed indicates
[8] that T11DCE and 111TCA was detected.
[9] Q: I'm sorry, are you done?
[10] A: Yes.
[11] Q: Sorry about that. All right. No question
[12] marks?
[13] A: As I earlier -
[14] Q: Other than the one -
[15] A: - testified there are inaccuracies on the
[16] plume limit line drawn by Black & Veatch.
[17] Q: With respect to the monitor well 62?
[18] A: That was one which I checked. I didn't go
[19] through and check the rest of the data to see if it
[20] was correct or not.
[21] Q: And you're showing three squares that
[22] represent how many wells?

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[1] A: Five.
[2] Q: Consistent with what you've said in your
[3] affidavit?
[4] A: Yes, and I'm assuming in my answer that the
[5] five wells have been installed subsequent to 1991,
[6] well 65 through -
[7] Q: The date of this map is July '96; right?
[8] A: Correct.
[9] Q: And explain, if you would - if you would go
[10] ahead and mark on Exhibit 208 the three new
[11] locations, five wells total, just mark them X, Y, and
[12] Z please. The locations X and Y, what's the
[13] deficiency in the current monitoring network at the
[14] leading edge of the plume that led you to conclude X
[15] and Y were necessary?
[16] A: For the location X, the deficiency is as
[17] follows: One, there is no evidence or no monitoring
[18] wells located between MW68 and MW52 and MW65. Data
[19] in July of 1996 and later in October detected TCE in
[20] well 65 which would indicate the leading edge of the
[21] plume in that area at those points in time in 1996.
[22] Therefore, there is no information northwest of 52

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[1] and 65 to delineate the extent of the plume since
[2] October of 1996, and that would be the reason for the
[3] wells in location X.
[4] The location of the wells in location Y on
[5] Exhibit 208 are similar in nature in terms of the
[6] absence of wells between 66 and 57 and wells 68 and
[7] 69. This would also form the expected area of the
[8] expanse of the plume into this area over time since
[9] the 1996 data.
[10] Q: Is there anything in the borings you reviewed,
[11] soil borings you reviewed at the leading edge of the
[12] plume as depicted by Black & Veatch that suggest that
[13] the subsurface geology is not relatively constant in
[14] that semicircle from 57 to 65 and through it looks
[15] like 68?
[16] A: What were the three wells?
[17] Q: Well, they're actually six wells. We're
[18] talking about six wells that are in front of the
[19] leading edge of the plume. You've looked at the
[20] borings in all of those wells, I believe,
[21] Mr. Morrison. Is there anything from those borings
[22] that suggest to you that there's any significant

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[1] change in the subsurface geology, if you traced a
[2] semicircle through those three points?
[3] A: Actually, there are only four wells, if I use
[4] the 1996 data, which were non-detect.
[5] Q: My question had to do with the geology, not
[6] with the presence of contaminants. Did you not look
[7] at that issue prior to your deposition here today,
[8] Mr. Morrison?
[9] A: Yes, I did. And are you asking me for that
[10] portion in that leading edge below the water table?
[11] Q: Yes.
[12] A: On 68, in monitoring well 68, the soil that's
[13] described as the sandy clay in well 69 it's described
[14] as a pail yellow brown sand, in 66 it's described as
[15] a light brown gray sand to gravel, and 57 is
[16] described as a black and gray sand.
[17] Q: Is that over the entire area below the water
[18] table?
[19] A: It's in the area through which the monitoring
[20] well screen was installed.
[21] Q: Maybe I can kind of cut through this since
[22] it's getting late in the day. Are you suggesting,

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[1] Mr. Morrison, that you believe from a geological
[2] perspective that ground water could move at a
[3] different rate between the furthest well 68 and 69?
[4] I was asking you that question, if you know the
[5] answer.
[6] A: Yes, I would expect it to move differently at
[7] a different rate through those two layers. In 68 is
[8] described as a sandy clay, 69 is described as a sand.
[9] Q: Aren't 68 and 69 next to each other clustered?
[10] A: Yes.
[11] Q: And how does that cluster compare from a
[12] geological standpoint to the cluster I guess at 65
[13] and is it 52?
[14] A: Yes. You 65 is described in terms of the
[15] screened interval soil adjacent to the screened
[16] interval is described as a sand to gravel, and in
[17] monitoring well MW52 it's described as a tan sand.
[18] Q: How does that compare with 68 and 69? Are you
[19] saying they're differences that you believe exist in
[20] the soil makeup and soil texture between those two
[21] locations, 68 and 69, and 65 and 52?
[22] A: Well, according to the boring logs, there are

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[1] textural differences between those four wells
[2] adjacent to the well screen.
[3] Q: Let me ask you this: Why would you believe
[4] that contaminants would have reached point X and Y if
[5] they've not yet reached 68 and 69?
[6] A: For the very reason that these boring logs
[7] indicate different zones of transmissivity or
[8] velocity, so you're having preferential movement
[9] through zones of higher permeability. So it's very
[10] likely that you can have a fingering or proportion of
[11] the plume moving out at different velocities through
[12] these more permeable layers.
[13] Q: Any other reasons other than the logs that you
[14] base that conclusion on?
[15] A: Yes.
[16] Q: What's that?
[17] A: In the example of well cluster Y on
[18] Exhibit 208, the nearest up gradient well, well MW64
[19] has detected TCE since October of 1994. Part of that
[20] the next earlier reading was December of 1993, so
[21] depending on the velocity of ground water flow
[22] between October 1994 and the present there's a very

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[1] high probability that the leading edge is getting
[2] close to the 5766 well cluster.
[3] In the case of well cluster X, TCE has been
[4] detected in July and October of 1996. In well MW65,
[5] which is cross gradient somewhat up gradient of well
[6] cluster X, so that there is no information to
[7] determine how far the plume - leading edge of the
[8] plume has extended beyond that point in time and/or
[9] if it has already reached the area and vicinity of
[10] well cluster X on Exhibit 208.
[11] Q: Any other reasons that explain your selection
[12] of X and Y?
[13] A: X and Y have also in terms of the affidavit
[14] proposed locations consist of two wells which are
[15] screened intervals which would provide the high
[16] likelihood of detecting the contaminants as it
[17] expands into this area. It would also complement the
[18] screened intervals of well cluster 68, 69, and 66 and
[19] 57 in terms of detecting chlorinated solvents
[20] expanding into this area.
[21] Q: Any other reasons? And you're referring just
[22] to well clusters X and Y on Exhibit 208?

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[1] A: The other evidence would be the very high
[2] concentrations of TCE found in wells 60 and 61 which
[3] would be up gradient of locations X and Y on
[4] Exhibit 208. Contaminants in terms of TCE have been
[5] detected in well MW60 since July 27th of 1993 and in
[6] well 61 in July of 1993 at very high concentrations.
[7] This would suggest that a very large mass of those
[8] particular chlorinated solvents TCE and 11DCE are up
[9] gradient of the proposed locations X and Y.
[10] Q: Any other reasons?
[11] A: No.
[12] Q: Tell me why you selected location Z.
[13] A: Location Z was selected to define the vertical
[14] extent of the chlorinated solvent plume in the
[15] vicinity of 60 and 61, and it's designed to
[16] complement the well cluster at 60 and 61. The reason
[17] a well is needed in that area to define the vertical
[18] extent is that in well cluster 9, comprising wells
[19] 48, 56, 55, and 67, 11, DCE and TCE have been
[20] detected to a depth of MSL 4909.
[21] Concentrations of TCE detected in October of
[22] 1996 being as high as 640 micrograms per liter. This

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[1] indicates that the center of the mass of this well
[2] cluster number 9 reaches down to this particular
[3] depth, and there is the next closest well below that
[4] is approximately 100 feet deeper with the three foot
[5] clay layer above its particular screen.
[6] Well 60 and 61 have had high concentrations of
[7] TCE down to a level of 4944 MSL which indicates that
[8] the TCE is already present at a very high
[9] concentration at that level, therefore we have well
[10] cluster 9 where we've had high concentrations to a
[11] depth of 4909 over time with what I'd characterize as
[12] port vertical delineation below it. And in the
[13] vicinity of 60 and 61, no vertical delineation below
[14] MW 60 as far as the vertical extent of the
[15] chlorinated solvent plume in that area. So that
[16] would be the reason for putting in well Z in
[17] Exhibit 208.
[18] Q: What from a geological perspective leads you
[19] to conclude that the contamination at Z which in 60
[20] and 61 is going it be any deeper than the cluster at
[21] 48, 55, 56, and 57?
[22] A: Two fold, one is that the cluster at 60 or 61

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[1] is down gradient or cross gradient of well cluster 9,
[2] and in terms of the geology of 60 and 61, the wells
[3] are screened right below gravel layers.
[4] Q: And what does that mean?
[5] A: That would mean that the geology is such that
[6] you would have a high probability of contaminants in
[7] the sand and gravel layer through which the screen
[8] intercepts to flow into that area and down into
[9] deeper areas.
[10] An example would be if one looks at the
[11] geology in well cluster 9 between MW55 and MW67, you
[12] will find that there's roughly 100 feet of soil
[13] that's defined as sand to gravel, sand to gravel,
[14] sand to gravel, yellow brown sand. So that you have
[15] transmissivity zones below MW55 which would allow the
[16] contamination to move deeper in the aquifer in that
[17] up gradient position of MW60 and 61.
[18] Q: What's your best professional judgment as to
[19] how much deeper the contamination may be at point Z
[20] than it is at cluster 9?
[21] A: I don't know. It would be speculating. That
[22] is the reason for putting in the well.

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[1] Q: How much deeper would it have to be at that
[2] location before it would impact the pumping rate at
[3] an extraction well used in a containment system at
[4] the leading edge?
[5] A: I don't understand the question.
[6] Q: You're familiar with sensitivity analysis from
[7] engineering?
[8] A: Familiar with it from a ground water modeling
[9] standpoint.
[10] Q: What I'm getting at here is how does
[11] increasing vertical contamination at point Z impact,
[12] if at all, the size or location of the containment
[13] well or have you done that analysis? Let me ask the
[14] question a little bit differently.
[15] Mr. Morrison, have you sat down and calculated
[16] for each ten feet deeper the contamination is at Z
[17] than what has been projected what effect, if any,
[18] that has on the size or location of your containment
[19] well?
[20] A: First one needs to determine if the
[21] contaminant is present at that location, then whether
[22] it is or is not present. Then if it is present, the

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[1] level would then impact the extraction rate of your
[2] extraction wells in terms of if you need to draw it
[3] up from that location or not.
[4] Q: Move to strike as non-responsive. My question
[5] I thought was a little bit more simple. Have you
[6] done any analysis to identify the relationship
[7] between the contamination being deeper at point Z
[8] than currently projected and how that affects either
[9] the pumping rate or the location of the containment
[10] well? Just asking if you've done that analysis.
[11] A: No.
[12] Q: And would you not agree with me that if the
[13] contamination of point Z could be 100 feet deeper and
[14] not have any impact on the size or location of the
[15] containment well, that there's no reason to put Z in?
[16] A: No, I would disagree with that statement.
[17] Q: Why?
[18] A: Well, very simply one needs to know the
[19] geometry of the plume before one can design an
[20] extraction system to capture it.
[21] Q: So you are going to design a capture system so
[22] fine that you are within a foot of where the

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[1] contamination actually is?
[2] A: No, there isn't that level of resolution even
[3] with the additional wells.
[4] Q: In fact, what's an appropriate - what's the
[5] fudge factor on these things, plus or minus what?
[6] You said you've designed some, Mr. Morrison. I don't
[7] believe you've gone in and said, we're going to be at
[8] this rate, we're going to be right on top of the
[9] contamination. We'll generally build in a certain
[10] level of safety which may be 100, 150, 75 feet below
[11] where the contamination actually is.
[12] A: I'm still unclear as to your question. Are
[13] you asking me to assume that contamination is found
[14] at well Z or not found at well Z.
[15] Q: If I understand your concern is that you're
[16] saying at point Z you don't know how deep the
[17] contamination is; correct?
[18] A: Yes.
[19] Q: And therefore you want to put a well in to
[20] identify how deep it is; correct?
[21] A: Yes.
[22] Q: And what I'm saying is given the roughness of

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[1] the calculation on the containment well, does it make
[2] any difference or when does it begin to make a
[3] difference how much deeper the contamination is then
[4] what Black & Veatch believes it to be? Do you
[5] understand the concept?
[6] A: I understand the concept. There are numerous
[7] assumptions that I'm having difficulty in answering
[8] your question. First of all, you're assuming that
[9] the Black & Veatch delineation vertically of the
[10] plume is known, which I disagree with.
[11] Q: Yes, know it at one point, don't we know it at
[12] cluster 9?
[13] A: At cluster 9 we know that the contamination is
[14] within 100-foot interval.
[15] Q: Okay, but it's not below that?
[16] A: Correct.
[17] Q: So we know that in designing the containment
[18] system we at least have to have a capture zone that
[19] gets to that point; correct?
[20] A: Correct.
[21] Q: And you're not, I think by your own testimony,
[22] you're not going to design a containment system that

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[1] captures only the water at exactly the point of
[2] non-detection, you're going to go significantly –
[3] not significantly, but you're going to go some point
[4] below that?
[5] A: Well, that would be an issue that once you get
[6] to the design phase you determine whether you would
[7] want to proceed with that type of a design or to
[8] further define that 100-foot interval. Because each
[9] gallon of water extracted from that 100-foot interval
[10] has a dollar value attached to its extraction and
[11] treatment.
[12] Q: And what, we put in monitor wells for free?
[13] A: The cost benefit analysis would be what is the
[14] value of over designing a system, for example, in
[15] this case, in well cluster 9, to capture
[16] theoretically 100 feet of clean water or estimating
[17] what volume of that is contaminated. And if the cost
[18] of putting in a monitoring well to further define,
[19] that is related to the cost benefits of the cost of
[20] pulling up water through over design over a very long
[21] period of time.
[22] Q: Have you done that analysis?

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[1] A: Not for this site because the vertical
[2] delineation has not been provided.
[3] Q: Likewise, you could go through the same
[4] analysis at point Z, couldn't you?
[5] A: Correct.
[6] Q: And likewise, what you are at X and Y you're
[7] assuming that the leading edge of the plume is not
[8] beyond point X and Y, otherwise you wouldn't have
[9] selected those locations?
[10] A: I do not know if the leading edge is or is not
[11] present at locations X and Y, and that is the reason
[12] those wells are needed.
[13] Q: Aren't you going to try to pick a location at
[14] X and Y that you believe to be beyond the edge of the
[15] contamination?
[16] A: Yes.
[17] Q: So your best professional judgment was that
[18] X and Y represent a location where contaminants
[19] currently aren't present?
[20] A: It represents locations where contaminants are
[21] not believed to be present.
[22] Q: And again, if – can we not define and didn't

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[1] you in Exhibit 203 design a containment system that
[2] would capture anything back to 68 and 6, wasn't that
[3] inherent in the 600, 800 gallon per minute system?
[4] A: It wasn't 600 gallons per minute.
[5] Q: I'm sorry, you're right. 800-foot capture
[6] zone as measured at the extraction zone.
[7] A: That was the assumption in that modeling.
[8] Q: And therefore if that was the system that was
[9] put into place, it would by definition capture
[10] everything that you say has yet to reach X and Y?
[11] A: On the horizontal plane, that's correct. And
[12] there's also the unknown of whether the contamination
[13] is or – is or is not there and at what depth.
[14] Q: And then the next step would be to do the same
[15] cost-benefit analysis, the cost of the monitor wells
[16] versus the likelihood it's at that location before
[17] you, as you state it, over design the extraction well
[18] containment system?
[19] A: That's not quite right. X, Y, and Z on
[20] Exhibit 208 need to be installed prior to the pump
[21] test and the design of the extraction system. The
[22] purpose of X, Y, and Z is to define the plume. The

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[1] next step is to develop the parameters which have not
[2] been measured the leading edge of the plume.
[3] Once that information is obtained, then to
[4] design the extraction well or wells and as that –
[5] part of the design I'm going to go through this
[6] cost-benefit analysis of whether additional wells are
[7] needed or not.
[8] Q: Move to strike as non-responsive.
[9] For the wells at X and Y why are there
[10] different depth intervals?
[11] A: To complement the existing well network and to
[12] provide a screened interval that has the greatest
[13] opportunity of detecting contamination.
[14] Q: Why wouldn't you just screen it over the
[15] entire interval?
[16] A: One reason would be that you would be
[17] providing a conduit for contaminants entering a
[18] permeable layer at a shallow depth and introducing
[19] those contaminants into a deeper depth, therefore
[20] exacerbating, creating a larger problem than if you
[21] have a more discretely screened monitoring well.
[22] Q: Any other reasons?

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[1] A: With the longer screened well you have no
[2] resolution in terms of wherever the contaminant is
[3] entering the screened interval of the well.
[4] Q: Could you not engage in depth interval
[5] sampling to eliminate both of those problems?
[6] A: The latter problem can be addressed in part by
[7] the depth interval sampling, the former is not.
[8] Q: Why not?
[9] A: The depth interval sampling has no impact on
[10] cross contamination of permeable layers across the
[11] screened interval, i.e. entering at shallow depth and
[12] mixing with ground water at a deeper depth within the
[13] screened interval.
[14] Q: Let's talk for a minute about the pump test
[15] you're proposing.
[16] MR. ROSENTHAL: Would this be a good time for
[17] a little break?
[18] (A brief recess was taken.)
[19] MR. ROSENTHAL: I just wanted to clarify to
[20] the extent that I did not with regard to our turning
[21] over work product documents including internal drafts
[22] and internal comments that we have done so as a

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[1] courtesy to, and we are not waiving any objections
[2] for work-product privilege.
[3] MR. HARRIS: Okay.
[4] BY MR. HARRIS:
[5] Q: I think we were talking about the pump test,
[6] Mr. Morrison. Would you describe for me what you –
[7] how that test will run, what is the first thing
[8] you'll do, how long will it occur, what is the next
[9] thing you'll do, how long will that occur?
[10] A: Are you referring to the information in
[11] Exhibit A of my affidavit or, I'm sorry, Exhibit B?
[12] Q: It describes a pump test. I just want to
[13] know if – just tell me about it. Is the first step
[14] a step drawn down test?
[15] A: Are you referring to the pump test itself or
[16] the installation of the monitoring wells prior to the
[17] pump test?
[18] Q: No, I'm sorry. Let's talk about the pump it
[19] test. We'll get to the observation wells at a later
[20] time. I just want to know about the mechanics of the
[21] test itself. You put in a well; correct?
[22] A: Yes.

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[1] Q: That may serve as an extraction well at some
[2] point in the future?
[3] A: Correct.
[4] Q: And you start pumping from that well. What's
[5] the first pump test you run from that well?
[6] A: The first step would be a step drawdown test,
[7] and it would be performed at different pumping rates.
[8] Q: How long do you anticipate that test would
[9] run?
[10] A: It would depend on the results in the field.
[11] Q: What's the shortest and what is the longest
[12] time, based on your experience of working in this
[13] area that, would you anticipate that test taking? I
[14] don't know for purpose of cost estimates did you have
[15] some period of time in mind?
[16] A: No.
[17] Q: In fact, Mr. Morrison, the cost estimates that
[18] you received did not include any estimate for a step
[19] drawdown test, did they?
[20] A: That's what I'm unclear about whether that's
[21] included as part of the 14-day test or not. I would
[22] need to clarify that with Fluor-Daniel.

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[1] Q: Fluor-Daniel says a 14 day and 38 constant
[2] rate is different than a step drawdown test, is it?
[3] A: Correct. They also state on page 2 that a
[4] minimum of 7 days will lapse between the step test
[5] and beginning the pump test, so I don't know how the
[6] how they allocate the resource orders what time they
[7] allocated them.
[8] Q: I'm sorry, page 2.
[9] A: Yes, of the March 28, 1997 correspondence
[10] under cost estimate.
[11] Q: There is nothing in the detail that suggests
[12] they took into account any step test; correct?
[13] A: No, it wasn't broken out as a separate task.
[14] Q: Did you give them any indication as to how
[15] long you thought the step test would take?
[16] A: No, my recollection is that I left it to
[17] their –
[18] Q: Their what, their discretion?
[19] A: To their discretion.
[20] Q: So if I understand the procedure, we have a
[21] step test of so far indeterminant length then we've
[22] got seven days off and then we've got a 30-day

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[1] constant rate test?
[2] A: Yes. And again, this is assuming that the
[3] actual test works out in this manner you really never
[4] know how long any of these tests will be until you're
[5] actually doing the work.
[6] Q: But, what would be the minimum time you would
[7] think would be necessary at this site for the step
[8] drawdown test?
[9] A: I don't know.
[10] Q: No idea whatsoever?
[11] A: I would be guessing.
[12] Q: How is Fluor-Daniel supposed to estimate the
[13] cost?
[14] A: That's what I need to clarify with them how
[15] and where they included those particular costs in
[16] their cost estimate.
[17] Q: If they did at all.
[18] A: Correct.
[19] Q: Have you ever run a step drawdown test before?
[20] A: Yes.
[21] Q: What's the shortest it's ever taken you to run
[22] such a test?

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[1] A: My recollection is one day at I believe two
[2] pumping rates.
[3] Q: And what's the longest it's taken you to run
[4] such a test?
[5] A: It would be on the order of days.
[6] Q: A thousand days?
[7] A: No.
[8] Q: When you say days, we can get through this a
[9] little bit more quickly if you would try to be
[10] responsive to my questions. When you say in order of
[11] days, that tells me absolutely nothing. It could be
[12] two days, that could be 5,000 days. You've been at
[13] this for 25 years. You should be able to give me
[14] some estimation of what the range is.
[15] MR. ROSENTHAL: Argumentative. Seven days
[16] equals a week. I think that the court will take
[17] judicial notice of that.
[18] MR. HARRIS: The difficulty is we have been
[19] laboring through this deposition with this witness
[20] being non-responsive, and I'm just about at the end
[21] of my rope with it. So all I'm asking for is a fair
[22] response to a fair question.

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[1] THE WITNESS: Another project in New Jersey
[2] involved a step test I believe at three or four
[3] extraction rates, and I believe that took somewhere
[4] in the order of 72 to possibly 100 hours to perform.
[5] And some of that time was down time setting –
[6] setting equipment up and other activity.
[7] BY MR. HARRIS:
[8] Q: Can you in laymen's terms describe for me when
[9] you know you're done with the step test?
[10] A: I would characterize it as a professional
[11] judgment call by the geologist in the field.
[12] Q: What is he going to base that judgment on,
[13] what piece of information from the test?
[14] A: That person will be looking at the responses
[15] in the observation wells associated with the pump
[16] test.
[17] Q: And what is it that you're going to get from a
[18] step drawdown test that you're not going to get from
[19] a constant rate test?
[20] A: It will give you information concerning the
[21] response of the water levels to different extraction
[22] rates.

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[1] Q: And why is that information necessary to you
[2] in designing an extraction well for a containment
[3] system?
[4] A: It provides base line information that is
[5] useful for developing the constant rate test.
[6] Q: What base line information?
[7] A: Extraction rates.
[8] Q: And what do you mean by extraction rates?
[9] A: By extraction rates I mean the volume of
[10] ground water pumped from the extraction well.
[11] Q: Isn't the extraction rate determined by the
[12] pump rate?
[13] A: They're one and the same.
[14] Q: So how does a step drawdown test tell you
[15] anything more than what you've said the pump had?
[16] A: It's the information or set the pump at,
[17] including the extraction rate and the type of – the
[18] type and extent of response in the observation wells
[19] at that particular pumping rate. And so the
[20] geologist would look at that information and it would
[21] provide useful information in the design of the – a
[22] longer constant rate pump test.

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[1] Q: What particular piece of information that you
[2] insert in these formulas you talked about do you get
[3] from the step drawdown test?
[4] A: You can develop similar information concerning
[5] drawdown at particular pumping rates versus a
[6] constant rate test would be one pumping rate over a
[7] very long period of time.
[8] Q: Again, does it tell you anything about
[9] transmissivity that you don't get from the constant
[10] rate test?
[11] A: It also would provide transmissivity values.
[12] Q: What does it tell you that you don't get from
[13] the constant rate test in terms of transmissivity?
[14] A: It would give you values of transmissivity
[15] over a smaller area versus a constant rate test given
[16] that the pumping rates in both test were the same,
[17] would normally be expected to be integrated over a
[18] much larger volume of the aquifer.
[19] Q: How does that help you in designing an
[20] extraction well for a containment system?
[21] A: It would provide information concerning and
[22] selecting a pumping rate for the constant rate pump

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[1] test.
[2] Q: How so?
[3] A: By looking at the response of the water level
[4] in various observation wells at different pumping
[5] rates, the field person would make a determination on
[6] an extraction rate for the constant rate pumping
[7] test.
[8] Q: Any other information it gives you other than
[9] what you've just shared with me which I now
[10] understand to be it allows you to be more selective
[11] about the pumping rates you're going to use for the
[12] constant rate test?
[13] A: Correct.
[14] Q: Anything else?
[15] A: I'd characterize that as the primary value.
[16] Q: Why do you believe rates up to 600 gallons per
[17] minute are necessary for that test?
[18] A: Two reasons. The modeling exercise contained
[19] in the September 23, 1996 report indicated that
[20] depending on what variables one used or modeled,
[21] extremely high extraction rates could conceivably be
[22] required to affect the one well capture zone that

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[1] would encompass the entire plume. The second reason
[2] is that the larger the rate, the greater area is
[3] being encompassed in terms of integrating a larger
[4] area from which the values of hydraulic perimeter
[5] values are derived.
[6] Q: Any other reasons?
[7] A: The third reason would be that we have the
[8] opportunity to discharge up to 600 GPM in this area.
[9] Q: So if we could discharge 1,200 GPM you'd
[10] suggest going up to 1,200 gallons per minute?
[11] A: I would consider that.
[12] Q: If I understand your testimony, Mr. Morrison,
[13] the performance characteristics that you determine
[14] from the step drawdown test will not have a direct
[15] impact on determining the capture zone for the well?
[16] A: It may or may not. It really depends on the
[17] results of the test, what is collected in the field.
[18] Q: Well, I thought you characterized for me that
[19] the primary purpose was to select the most
[20] appropriate rate for the constant or the most
[21] appropriate rate of the constant rate test?
[22] A: Yes.

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[1] Q: And if that's all it's doing or if that's
[2] primarily what it's doing, then really it's the
[3] information from the constant rate test at whatever
[4] pumping rate is selected that gives you the
[5] information you need to design the containment
[6] system.
[7] A: I'd characterize it as developing the most useful
[8] information that would be used for the capture zone
[9] analysis.
[10] Q: What other – and if you would, describe for
[11] me specifically how the results from the step
[12] drawdown test impact the determination of the capture
[13] zone. Setting aside that it helps you set the pump
[14] rate for the constant rate test, set that aside, how
[15] else does it impact the determination of the capture
[16] zone?
[17] A: It would really be linked to the constant rate
[18] test in terms of assisting one in designing or
[19] selecting an appropriate discharge rate for the
[20] constant rate test.
[21] Q: Any other impact you could see it would have
[22] on determining the capture zone?

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[1] A: Not that I can think of.
[2] Q: How many data points did you recommend be
[3] generated during the first 600 seconds of the step
[4] drawdown test?
[5] A: Half a second.
[6] Q: So we're going to have 1,200 data points in
[7] 600 seconds?
[8] A: Correct.
[9] Q: What do you plan to analyze from those 1,200
[10] data points?
[11] A: It would be the rate of drawdown in the wells
[12] which are being monitored.
[13] Q: Anything else?
[14] A: No.
[15] Q: I understand the pump test we could have one
[16] to it sounds like five days for the step drawdown
[17] test, at least that would be in the range of your
[18] experience?
[19] A: Yes.
[20] Q: We have seven days for recovery?
[21] A: Yes.
[22] Q: And we've got a 30-day constant rate test;

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[1] right?
[2] A: Yes, with the caveat that the 30 day – that
[3] the constant rate pump test may or may not extend the
[4] full 30 days.
[5] Q: I understand, but it could?
[6] A: Yes.
[7] Q: So we're looking at – we could be looking at
[8] a maximum just to run the pump test of 42 days, based
[9] on your experience?
[10] A: That's a possibility that would more likely
[11] than not be the higher end.
[12] Q: If you would mark on 208 where you want your
[13] proposed extraction well to go in, and would you also
[14] locate for me where you're going to put the three
[15] observation wells. Here you go, here's a red pen.
[16] Q: You've got a big, relatively big red square
[17] and what's supposed to be within that square?
[18] A: The extraction well and/or the three
[19] observation wells.
[20] Q: And where would you propose to have the
[21] observation wells in relationship to the extraction
[22] well? Are they going to be on a semicircle, are they

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[1] going to be in line, how are they going to be put
[2] together?
[3] A: Ideally they would be in a single line down
[4] gradient of the extraction well.
[5] Q: And completed at what depths?
[6] A: Over the same interval as the extraction well.
[7] Q: And are you anticipating that the extraction
[8] well will be screened over the entire impacted part
[9] of the saturated zone?
[10] A: Yes, as determined by well Z.
[11] Q: Well what?
[12] A: Well Z on Exhibit 208.
[13] Q: And why did you select the area that you
[14] marked with the red box as the location for the
[15] extraction well?
[16] A: Three reasons. One, it's located near the
[17] center of the mass of the chlorinated solvent in the
[18] plume, two, it appears to be an area where access was
[19] available. Three, depending on the results of the
[20] pump test, the intent was that this well would be
[21] designed to complement or to act as a containment
[22] well to capture the leading edge of the plume.

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[1] Q: And if you wanted to use your term, slightly
[2] over design the system because of uncertainty about
[3] the leading edge, which direction would you move the
[4] containment well, up gradient or down gradient?
[5] A: It would depend on the results of the pump
[6] test.
[7] Q: If you move the containment well further down
[8] gradient, does it not have the effect then of
[9] broadening the width of the capture zone up gradient
[10] of that point?
[11] A: That's a possibility.
[12] Q: Is there another possibility?
[13] A: Yes. Given the discharge in the Corrales and
[14] Rio Grande, there is a possibility that steady state
[15] will be reached between those surface water bodies
[16] and the extraction well so that moving the extraction
[17] well significantly down gradient may not have the
[18] impact of expanding the lateral extent of the plume,
[19] in which case one would need to assess different
[20] options, possibly multiple extraction wells.
[21] Q: Wouldn't you agree that if a capture zone –
[22] excuse me, if a capture zone can be developed that

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[1] encompasses known or likely areas of contamination of
[2] some margin of safety, it is not necessary to have a
[3] detailed definition of the contamination?
[4] **A:** Are you referring after the five wells have
[5] been installed?
[6] **Q:** I'm saying without the five wells.
[7] **A:** And after the pump test has been performed?
[8] **Q:** Well, let's go first before the pump test is
[9] performed. Let's start with that, without the wells
[10] and without the pump test, is it your – are you
[11] saying that you think it's not possible to design an
[12] extraction well that will have a containment system
[13] with sufficient margin of safety to encompass the
[14] known or likely areas of contamination?
[15] **A:** I'm not sure I understand your question.
[16] That's assuming that a pump test has not been
[17] performed.
[18] **Q:** Let's start that way, yes. Yeah, without a
[19] pump test?
[20] **A:** And you're assuming one well?
[21] **Q:** Yes.
[22] **A:** No.

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[1] **Q:** If one believes that the pump test that was
[2] conducted on site is representative of conditions at
[3] the leading edge, would you agree that you could
[4] design an extraction well with the sufficient margin
[5] of safety to cover the areas both known and likely
[6] contamination without putting in X, Y, and Z?
[7] **A:** On your hypothetical one could and assuming
[8] that the pump test results on the property side of
[9] Sparton are identical to the leading edge of the
[10] plume, one could theoretically design a massively
[11] constructed extraction well which could encompass
[12] very likely this entire region.
[13] **Q:** I'm not asking about the entire region. Don't
[14] you think someone with as much background and
[15] experience as you have in ground water contamination
[16] could reach some reasonable conclusions about where
[17] the contamination most likely is without having those
[18] monitor wells and then develop an extraction system
[19] that would encompass that area?
[20] **A:** No. That's just outside of my professional
[21] experience and judgment. The corollary would be the
[22] reason Sparton performed the pump test and spent the

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[1] resources analyzing that data was so that an
[2] extraction system could be designed on the property
[3] itself. It's the same methodology as –
[4] **Q:** I was asking you to assume that the
[5] information from that pump test was different. Two
[6] different questions.
[7] **MR. ROSENTHAL:** I don't know if you finished
[8] the answer to that. You cut him off.
[9] **MR. HARRIS:** Yeah, I did because I don't think
[10] we're communicating. The point I was trying to make,
[11] Mr. Morrison, is and I all I was getting at was
[12] assume that the information developed on the pump
[13] test on site applies to the leading edge, couldn't
[14] one reach some, using the best professional judgment,
[15] your phrase, some conclusions about a safety zone
[16] around the areas of established non-contamination and
[17] design a containment well that would encompass both
[18] the known contamination and an area of potentially
[19] likely contamination without putting in X, Y, and Z?
[20] Again, if the information on site reflects the
[21] conditions at the leading edge?
[22] **A:** If one wanted to do that, that's certainly

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[1] available. It's certainly not common engineering
[2] practice, and it's certainly not prudent, and I would
[3] not recommend it to a client.
[4] **Q:** And what criteria guided you in determining
[5] where an extraction well should be located relative
[6] to the containment – generalized factors you had in
[7] mind?
[8] **A:** There were the three factors I shared with you
[9] earlier.
[10] **Q:** Okay.
[11] **MR. ROSENTHAL:** Dr. Morrison, did you – I
[12] know you were cut off in answering a question. Do
[13] you want to finish your sentence that you were
[14] talking about earlier?
[15] **THE WITNESS:** Yes. What I wanted to share was
[16] that the same methodology used in developing and
[17] designing ground water extraction system on the
[18] Sparton site is the same methodology that is required
[19] on the leading edge of the down gradient plume. It's
[20] the same methodology, same engineering, same type of
[21] analysis, actually even the same type of equipment.
[22] **BY MR. HARRIS:**

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[1] Q: I understand. The only reason you're not
[2] applying what's on site to the leading edge is
[3] because you think the geological conditions are
[4] dissimilar at the leading edge?
[5] A: The more basic answer is that one doesn't know
[6] what those parameters are. In the vicinity of the
[7] leading edge, measurements are required.
[8] Q: Move to strike as non-responsive.
[9] My question went to if the geology at the
[10] leading edge is the same as the geology on site, then
[11] can't one, using best professional judgment, assume
[12] that the parameters determined in that pump test
[13] equally apply to the leading edge?
[14] A: Based solely on geology and not hydraulic
[15] properties?
[16] Q: Yes.
[17] A: The difference is that the geology can be
[18] similar, but the hydraulic properties dissimilar, and
[19] the way to develop the hydraulic properties is
[20] through these pump tests. So it's simply not an
[21] issue of the geology being similar.
[22] Q: Did you get any estimate as to how long it

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[1] would take to drill the five monitor wells?
[2] A: Not individually.
[3] Q: Well, in a gross sense?
[4] A: The driller informed me that the five
[5] monitoring wells, the extraction well, and the three
[6] observation wells would take one month.
[7] Q: How many rigs was he planning to use?
[8] A: It was my understanding one rig.
[9] Q: So he was going to drill nine wells with one
[10] rig in one month; is that right?
[11] A: Correct. I would also add that in the
[12] March 28, 1997 letter from Fluor-Daniel to myself
[13] that Susan Field said, quote, "A local driller
[14] familiar with this area indicated that it would take
[15] 30 working days to complete the well specified."
[16] Q: And you don't know who she talked to?
[17] A: No.
[18] Q: You're relying on a statement somebody made to
[19] you as based on a statement somebody made to them?
[20] A: In part, and also my communications with
[21] Bill Walley of Beylik Drilling.
[22] Q: Let me hand you what's mark as Exhibit 209A.

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[1] What is that?
[2] (Morrison Deposition Exhibit Number 209A was
[3] marked for identification.)
[4] THE WITNESS: It's a cost estimate provided to
[5] me by Beylik Drilling dated March 21, 1997.
[6] MR. ROSENTHAL: Do you have the Bates number?
[7] MR. HARRIS: That is what I was looking for.
[8] 164, 165, 166, 167, and 168.
[9] BY MR. HARRIS:
[10] Q: Let me hand you what's been marked as
[11] Exhibit 210. What is that?
[12] (Morrison Deposition Exhibit Number 210 was
[13] marked for identification.)
[14] THE WITNESS: It's a facsimile to myself from
[15] Susan Fields of Fluor-Daniel, dated March 28, 1997,
[16] March 28, 1997?
[17] MR. ROSENTHAL: Could you we read the Bates
[18] stamp into evidence?
[19] THE WITNESS: Bates stamp RM 0002258, Bates
[20] stamp RM 0002186. RM 0002187, RM 0002189. RM 0002188,
[21] RM 0002261, RM 0002262, RM 0002259, and 2260.
[22] BY MR. HARRIS:

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[1] Q: Now, in looking at those exhibits if I'm
[2] totaling up the cost, Beylik is saying it's going to
[3] run approximately $246,000 to put in the wells, and
[4] if I understand Fluor-Daniel they're saying that
[5] their cost is going to be approximately $188,000.
[6] And when I add those two things up I get $434,000,
[7] Mr. Morrison. Is that what you get?
[8] A: No.
[9] Q: Okay. Tell me what I added in that I
[10] shouldn't have?
[11] A: On the Beylik Drilling the estimated grand
[12] total is 138,158.
[13] Q: Okay. So if I'm now understanding
[14] Mr. Beylik's proposal correctly, the ten-inch well is
[15] going to cost around $30,000 and each of the four
[16] inch wells is going to run about 12,000, 12 to 13
[17] thousand dollars. The total – am I looking at that
[18] correctly?
[19] A: The eight additional wells would be 108,000
[20] total.
[21] Q: He has them at 4-inch wells. They're not
[22] going to all be 4-inch wells?

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[1] A: No, they're all four inch wells. The
[2] difference is that some will have different length
[3] screens and be drilled to different depths. Some may
[4] be slightly more. I'm just saying the average cost
[5] of the eight four-inch wells is going to be in the
[6] neighborhood of 12 to 13 thousand dollars?
[7] A: Yes.
[8] Q: And what do you believe to be a reasonable
[9] time for completing reports after the pump test had
[10] been completed?
[11] A: The affidavit – by the affidavit I mean the
[12] work plan specifies 15 days.
[13] Q: And you believe that to be reasonable?
[14] A: That is an aggressive reporting requirement.
[15] Q: Did somebody suggest you put that period in?
[16] A: I believe the question was asked during one of
[17] the conference calls what would be the – what would
[18] be an aggressive time table for completing that
[19] analysis. My recollection is that I answered 15 days
[20] is possible.
[21] Q: And given your experience over of the last 25
[22] years, what do you think is reasonable?

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[1] A: Really depends on the organization, if there's
[2] a lot of oversight and QAQC, 15 days would be
[3] aggressive. If it's a smaller organization, 15 days
[4] would be reasonable but still on an aggressive
[5] schedule.
[6] Q: Typically in projects that you have, I assume
[7] you have to put reports together after completing
[8] pump tests?
[9] A: Yes.
[10] Q: What do you typically ask for from the client
[11] in terms of a period to complete the report after the
[12] pump test is completed?
[13] A: Ideally 30 days, 20 to 30 days depending on
[14] the complexity of the pump test. If the client would
[15] require it in 15 days, that's something we could
[16] accomplish.
[17] Q: And do you consider the pump test you laid out
[18] to be a relatively complex pump test?
[19] A: It would result – it would depend on the
[20] results of the pump test.
[21] Q: How long after the wells are completed do you
[22] have to let them sit before you can run the pump

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[1] test, any pump test?
[2] A: It would depend how fast the wells recover.
[3] Q: I'm saying after they're installed. Maybe I'm
[4] not making myself clear. You drill the well, you set
[5] everything in. Is there some period of time you have
[6] to just leave them alone before you can start a pump
[7] test?
[8] State it another way, Mr. Morrison. If I just
[9] had one well could I go out there, drill the well and
[10] as soon as the driller said it's done, the concrete
[11] is not quite dry at the surface, I could rush in and
[12] run the pump test? Would that be good engineering
[13] practice as far as you're concerned?
[14] A: No.
[15] Q: My question is how long, exercising good
[16] engineering judgment, should you wait after you
[17] completed the well before you begin a pump test?
[18] MR. ROSENTHAL: Objection on the grounds that
[19] he's not an engineer and not qualified to answer the
[20] question.
[21] BY MR. HARRIS:
[22] Q: A good hydrogeologic practice, Mr. Morrison.

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[1] A: It would depend on how soon equilibrium was
[2] reached in that well.
[3] Q: Give me a range based on your experience how
[4] long that's taken, shortest to longest time.
[5] A: An average might be several days.
[6] Q: Would it be unreasonable to build in a week
[7] for equilibrium to be reached?
[8] A: That's a possibility. It's really dependent
[9] on how fast the water recovers.
[10] Q: And under your work plan would you want to put
[11] in the extraction well and the observation wells
[12] first or last? In other words, in comparison to the
[13] monitor wells, do you understand what I'm getting at?
[14] What's the sequence?
[15] A: The sequence would be the five additional
[16] monitoring wells to define the vertical and
[17] horizontal extent in the vicinity of the leading edge
[18] followed by the installation of the pumping and
[19] observation wells.
[20] Q: Would before you put in the pumping and
[21] observation wells, would you have wanted to take
[22] samples from the monitor wells to confirm the

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[1] vertical and horizontal extent of the contamination?
[2] A: Yes, and that's included on page 2 of
[3] Exhibit B of my affidavit.
[4] Q: Is there some reason that you couldn't use the
[5] extraction well in place of monitor well Z? In other
[6] words, couldn't you complete it first as a monitor
[7] well, sample it, prove up the point you want at Z,
[8] then use it as the pump well?
[9] A: One could certainly substitute the observation
[10] well location for well Z, but I see no merit in it.
[11] Q: What I'm saying is you're going to be
[12] completing the production well somewhere in that red
[13] box. Why can't it be completed to the same point
[14] that you've got for Z, seeing as how you told me
[15] earlier the production well is going to have to be
[16] screened through the entire area of contamination,
[17] and just replace Z?
[18] A: The reason is that you will not know the depth
[19] of the contamination in area Z until you install the
[20] well and sample it such that if you install well Z
[21] and design it, for example, as a ten-inch well to
[22] also be used for extraction and after sampling find

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[1] out that the water at that depth is contaminate,
[2] you're still at the same point that you don't know
[3] how deep the contamination is.
[4] Q: Why don't you just keep going until you reach
[5] clean water? Can't you sample as you proceed?
[6] A: I considered that, and I didn't find that
[7] sampling with the mud rotary rig to be a reliable
[8] method.
[9] Q: You're not aware that's been used successfully
[10] in the Albuquerque area?
[11] A: Mud rotary?
[12] Q: I don't know about mud rotary, but a technique
[13] for sampling as you advance.
[14] A: There are percussion techniques that have been
[15] used for that purpose.
[16] Q: And why can that not be used here with respect
[17] to the production well?
[18] A: I considered that and I believe the
[19] information was that the depths required would be
[20] prohibitive and the second consideration was that the
[21] noise factor of a percussion rig over the time that
[22] this would require to achieve these depths would be a

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[1] considerable nuisance to the residential area.
[2] Q: Where is the nearest residence, by the way?
[3] A: Based on the – I would need to consult and
[4] aerial photograph.
[5] Q: Let me just review with you then the time
[6] frame you've talked about to undertake this work set
[7] forth in your work plan. The first thing you have to
[8] do is go in and drill five new monitor wells;
[9] correct?
[10] A: Yes.
[11] Q: And then you need to let those sit for one or
[12] two days to a week, correct, before you can sample
[13] them?
[14] A: Possibly.
[15] Q: Then you've got to sample them, right? It
[16] takes a day?
[17] A: Actually, equilibrium, one could sample the
[18] wells after they're completed and purged and have a
[19] one or two day turnaround then allow the wells to
[20] equilibrate.
[21] Q: You have to drill the wells, purge them,
[22] sample them. What's typical turnaround for testing

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[1] organic compounds?
[2] A: I allocated for this particular purpose it
[3] would be a 24-hour turnaround.
[4] Q: Well, that's if you pay extra money; right?
[5] A: That's correct.
[6] Q: What's the standard turnaround? What's
[7] turnaround when you don't have to pay extra money?
[8] A: Ten days for most laboratories.
[9] (A brief recess was taken.)
[10] BY MR. HARRIS:
[11] Q: We were discussing Mr. Morrison's sequence of
[12] events to accomplish a work plan. I think we had
[13] started off in the fact we put in five new monitor
[14] wells. They need to be sampled. I think you agreed
[15] with me ultimately that turnaround for getting
[16] analytical results from those samples without paying
[17] extra is typically ten days.
[18] Once you get the results back whether it's ten
[19] days or something less, you then have to make
[20] decisions about the location of the pumping well and
[21] the observation wells to see if you're going to
[22] modify the location at all; correct?

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[1] A: Correct.
[2] Q: How many days do you think that will take to
[3] utilize the results and decide whether to keep the
[4] location where you had it or move it?
[5] A: First of all, the work plan assumption
[6] attached to my affidavit assumes 24-hour turnaround
[7] in the lab, and that's actually included or that
[8] contingency is included in the budget. The budget
[9] has a contingency factor of roughly $50,000. So the
[10] first item is that I would expect to have the data
[11] within 24 hours of the sampling. Based upon that,
[12] then I would expect one or two days.
[13] Q: Let's say with my question.
[14] MR. ROSENTHAL: Let him finish his answer.
[15] MR. HARRIS: He wasn't answering my question.
[16] I understand what your position is. It's not your
[17] opinion.
[18] BY MR. HARRIS:
[19] Q: I'm asking you to assume a different set of
[20] facts, all right. We're already beyond that. I was
[21] just confirming where we were before. At some point
[22] regardless of how long it takes whether it's 24 hours

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[1] or ten days to get the results back, let's set that
[2] aside. You're going to have to review those results
[3] and determine whether you want to stay with the
[4] location for the pump well and the observation wells
[5] or remove them; am I right about that?
[6] A: I understand your hypothetical.
[7] Q: Well, forget the hypothetical. After you get
[8] the results back, how long will it take you to
[9] determine whether you want to maintain the pump well
[10] and the observation wells at the location you would
[11] have initially selected?
[12] A: On the order of one to three days.
[13] Q: Then those wells have to be drilled. They
[14] take whatever time it takes to accomplish; correct?
[15] A: Yes.
[16] Q: Then I think we agreed that they'd have to sit
[17] for some period of time from one to seven days before
[18] you'd begin the pump test?
[19] A: Correct.
[20] Q: Can you explain to me why you decided not to
[21] use any of the existing monitor wells instead of
[22] drilling new observation wells and running the pump

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[1] test?
[2] A: Yes.
[3] Q: What were your reasons?
[4] A: Twofold. One is proximity to the existing
[5] monitoring wells and two is the inconsistency of the
[6] screened intervals with the expected screen interval
[7] of the extraction well.
[8] Q: I thought the expected screen interval for the
[9] extraction was the entire thickness, didn't you
[10] already tell me that?
[11] A: It would be the entire thickness of the
[12] contaminated zone.
[13] Q: And how is that inconsistent with the
[14] screening in the monitor wells?
[15] A: The monitoring wells are screened at various
[16] zones within the aquifer.
[17] Q: What was the second reason?
[18] A: The distance.
[19] Q: And what is it about the distance? Why are
[20] they too far away?
[21] A: I looked at the distance of the observation
[22] wells during the 1984 HLA test and if one goes

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[1] through that observation you notice that wells were
[2] for example, within 45 feet of PW1 were used for
[3] measuring the water level response to the extraction
[4] well. In the proposed area of the extraction
[5] observation wells on Buckeye, the nearest well, would
[6] be approximately 250 feet up gradient. Those would
[7] be wells 60 and 61.
[8] Q: Why is that again too far? The fact that the
[9] wells on site were within 45 feet doesn't suggest to
[10] me at any rate logically they couldn't have been
[11] father away and still provided the same information?
[12] A: A proper design of a pump test requires wells
[13] close enough to the extraction wells so that the
[14] measurements early on during the extraction can be
[15] measured.
[16] Q: And what imperical data do you have to suggest
[17] that in this part of the country a well 265 feet away
[18] couldn't accomplish that?
[19] A: It would be standard engineering practice to
[20] have wells much closer to the extraction well. For
[21] example, if you look at the textbooks dealing with
[22] pumping tests, they all suggest a well very close to

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[1] the extraction well, then wells at subsequent
[2] distances from that first well.
[3] Q: What imperical data do you – again, if you
[4] listen to the question we could get that done a
[5] little more quickly. What imperical data do you have
[6] that a well 265 feet away from a pumping well in this
[7] geology won't show an appropriate response?
[8] A: There is always the likelihood that wells at
[9] these kind of distances –
[10] Q: Mr. Morrison, it was a real simple question.
[11] Do you have any imperical data to suggest a well 265
[12] feet away will not show a response, yes or no. If
[13] you've got it, tell me about it. If you don't, tell
[14] me that.
[15] MR. ROSENTHAL: You should let him answer the
[16] question.
[17] MR. HARRIS: I'd love for him to answer the
[18] question.
[19] THE WITNESS: It's a difficult question to
[20] answer because you're asking me to assume something
[21] that's out of the normal engineering practice for
[22] conducting a pump test.

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[1] BY MR. HARRIS:
[2] Q: I'm not asking you to assume anything. I'm
[3] just asking if you have any imperical information
[4] that shows, given the geology at this site, that a
[5] well 265 feet way from a proposed extraction well is
[6] too far away to show a response in a way that you
[7] could measure. Do you have any experience at any
[8] other site in which you attempted to measure a well
[9] 265 feet away and were unsuccessful in doing so?
[10] A: Unsuccessful in terms of measuring a response
[11] or being unable to collect a measurement.
[12] Q: Either one. What I'm getting at, have you
[13] ever run a test where you've attempted to use a well
[14] that far away and been unsuccessful?
[15] A: Without wells based closer to the extraction
[16] well?
[17] Q: Sure.
[18] A: No.
[19] Q: Okay. But I take it you have run tests where
[20] you've used a well that far away, 265 feet, with
[21] wells in between and you've gotten a response at the
[22] well 265 feet away?

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[1] A: I don't have any experience specifically at
[2] 65, but I've performed pump tests where they're
[3] certainly hundreds of feet away in conjunction with
[4] wells that are closer.
[5] Q: And is the closest monitor well to the
[6] location that you've selected would actually be –
[7] would not be 265. Is it something less than 265
[8] feet, or have you looked at that?
[9] A: Depending on where the final installation is
[10] it would be something in the range of more on the
[11] order of 300 feet.
[12] Q: In your affidavit you make reference to a fact
[13] if you don't put in a containment system, the plume
[14] will continue to move. Have you reached any
[15] conclusions about how far it will expand if nothing
[16] is done to contain it? Would it expand above
[17] drinking water limits? Again my question is have you
[18] done any calculation? I'm not asking for you to
[19] answer the question unless you've looked at it.
[20] A: No.
[21] Q: Okay. And my point is simply if you haven't
[22] looked at it, then you haven't yet reached a

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[1] conclusion about how far it could continue to cause
[2] exceedences to the drinking water limits beyond where
[3] it currently is if it's not contained?
[4] MR. ROSENTHAL: Objection. Not clear what
[5] drinking water limits you're talking about.
[6] MR. HARRIS: For TCE primary.
[7] MR. ROSENTHAL: Federal, state, local?
[8] MR. HARRIS: Federal.
[9] THE WITNESS: Excuse me, is there a question
[10] pending?
[11] BY MR. HARRIS:
[12] Q: I thought there was but you haven't reached
[13] any conclusions. Since you haven't looked at it you
[14] haven't reached any conclusions about how far the
[15] contaminants might continue to expand above federal
[16] drinking water limits for TCE?
[17] A: I haven't looked at that issue and the reason
[18] is that I don't have the hydraulic parameters in this
[19] area in order to allow me to look at that issue.
[20] Q: As to how far it would expand?
[21] A: Correct.
[22] Q: Okay. So you haven't reached any conclusions

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[1] about how far it might expand?
[2] A: Correct.
[3] Q: All right. And where did you assume that the
[4] water developed during the pump test was going to be
[5] disposed of?
[6] A: It's my understanding that it would be
[7] discharged into a sewer and/or storm drain located on
[8] Buckeye Street.
[9] Q: And if it went into the storm drain, where
[10] would it go?
[11] A: I misspoke. I believe Mr. Gaume said that the
[12] water would be pumped into the sewer system not the
[13] storm drain system.
[14] Q: And you've only looked at where that treated
[15] water would be disposed of during the pump test, you
[16] haven't looked at any other scenarios so far in your
[17] work for the government?
[18] A: No.
[19] Q: Has anybody spoken to you about the
[20] possibility of a preliminary injunction
[21] hearing in this case?
[22] MR. ROSENTHAL: Objection, to the extent that

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[1] the answer will entail any discussions he's had with
[2] the attorneys regarding the strategy for the
[3] preliminary injunction.
[4] MR. HARRIS: At this point all I want to know
[5] has anybody told you there might be a hearing at
[6] which you'd have to testify? I don't think that
[7] reveals any privileged information.
[8] MR. ROSENTHAL: Yeah, you can answer that
[9] question.
[10] THE WITNESS: Yes.
[11] BY MR. HARRIS:
[12] Q: Have you been asked to do any additional work
[13] in connection with that hearing or potential hearing?
[14] MR. ROSENTHAL: You can answer.
[15] THE WITNESS: Possible tasks have been
[16] discussed.
[17] BY MR. HARRIS:
[18] Q: What are those?
[19] MR. ROSENTHAL: Where is this going? This
[20] will get - I can't see how this can avoid getting
[21] into attorney work product information.
[22] MR. HARRIS: I think I'm entitled to know what

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[1] he is taking a look at in preparing for the hearing
[2] so I can be properly prepared to know what he may
[3] testify about.
[4] MR. ROSENTHAL: Well, I mean that - I mean
[5] the purpose of the deposition was to explore issues
[6] raised in his affidavit. Obviously those are the
[7] issues that he'll be testifying about in the hearing,
[8] and any other tasks I think we'd be asking him to
[9] perform in conjunction with that would be privileged
[10] information.
[11] MR. HARRIS: Are you going to instruct him not
[12] to answer? That's fine.
[13] MR. ROSENTHAL: Yeah, I will.
[14] BY MR. HARRIS:
[15] Q: Would you follow the instruction of
[16] Mr. Rosenthal?
[17] A: Yes.
[18] Q: Is what a well yields always consistent with
[19] the pump rate that you've set in the pump? Is my
[20] question at all clear?
[21] A: No.
[22] Q: If you have a pump that is supposed to pump

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[1] 600 gallons per minute, does that necessarily mean
[2] the well will yield 600 gallon per minute?
[3] A: No.
[4] Q: Is one of the purposes of a step drawdown test
[5] to identify what the well actually yields?
[6] A: Yes.
[7] Q: And isn't that same information generally
[8] known to drillers and water well consultants in the
[9] vicinity of the area where you're drilling?
[10] A: I don't know.
[11] Q: Maybe are you saying you don't - are you
[12] discounting the possibility entirely or would you
[13] agree with me that someone who has been involved in
[14] drilling water wells say in Albuquerque for 25 years
[15] should have a pretty good idea what a particular
[16] sized well is going to yield for a given pump rate?
[17] A: That's a reasonable assumption.
[18] Q: And if that information - if somebody had
[19] that information, it wouldn't be necessary to run a
[20] step drawdown test?
[21] A: I would still recommend a step drawdown test
[22] be performed in that situation to confirm the

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[1] information provided by the driller.
[2] Q: And if it confirms it, it's money wasted?
[3] MR. ROSENTHAL: Objection.
[4] BY MR. HARRIS:
[5] Q: You can answer the question.
[6] A: Could you repeat the question?
[7] Q: If the step drawdown test simply confirms what
[8] the driller said would you agree with me you wasted
[9] some money?
[10] A: No.
[11] Q: In your affidavit in paragraph three last
[12] sentence you say a TCE was detected at the depth of
[13] 265 feet below the ground surface. Which well were
[14] you talking about that?
[15] A: MW55.
[16] Q: And what's the distance from ground surface to
[17] the water table there, if you know? You know what,
[18] in the interest of time, I think I can look that up,
[19] Mr. Morrison. Let me ask you another question.
[20] You indicate in your affidavit that
[21] restoration can take time. Have you been asked or
[22] have you looked at how long restoration might take at

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[1] this site?
[2] A: No.
[3] Q: You've also not looked at whether restoration
[4] is possible at that site, not looked at that issue
[5] yet?
[6] A: I have not been asked to look at that issue.
[7] Q: And have not looked at it?
[8] A: No.
[9] Q: No, you haven't or no you have?
[10] A: The former.
[11] Q: All right. Have you looked at whether
[12] restoration is possible at this site?
[13] A: No.
[14] Q: Thank you.
[15] In paragraph 8 of your affidavit you talked
[16] about 60 days consisting of 30 days for monitor well
[17] installation and 30 days for the pump test. You make
[18] no reference there to the extraction well, the
[19] observation well installation. Is there a reason you
[20] left those out? That is subparagraph 8.
[21] A: I included the one extraction well, the three
[22] observation wells, and the five monitoring wells on

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[1] the - within the 30 days estimate.
[2] Q: You just lump those all together as monitor
[3] wells?
[4] A: Correct.
[5] Q: Do you know what the distance is from the
[6] leading edge of the plume to the New Mexico
[7] utilities well that you reference in your affidavit?
[8] A: What was the question? The leading edge or
[9] from the Sparton property?
[10] Q: The leading edge.
[11] A: Leading edge. I don't recall that distance.
[12] Q: You also say that the leading edge is
[13] expanding at a rate greater than 100 feet per year.
[14] Have you been able to do any analysis that allows you
[15] to be more specific as to what that rate is or is
[16] that your best estimate as of today?
[17] A: The latter.
[18] Q: I am going to mark this as one series of
[19] exhibits, 210.
[20] THE REPORTER: Number 11.
[21] (Morrison Deposition Exhibit Number 11 was
[22] marked for identification.)

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[1] BY MR. HARRIS:
[2] Q: Let me hand you what I've marked as Exhibit
[3] 211 and take a quick look through and tell me if that
[4] appears to you to be notes of conversations related
[5] to the work plan and affidavit in earlier drafts of
[6] your affidavit and work plan.
[7] A: The correspondence title characterization of
[8] vapor contamination Sparton site seems to deal with
[9] vapor extraction which was not a part of the work
[10] plan or affidavit.
[11] Q: Okay.
[12] MR. ROSENTHAL: Could I inject?
[13] MR. HARRIS: Sure.
[14] MR. ROSENTHAL: First of all, it's almost 6:15
[15] and if he's going to go through each exhibit it's
[16] probably going to take another half hour.
[17] MR. HARRIS: All I'm trying to do is have
[18] somebody authenticate it. If you guys want to agree
[19] that what you've given me represents what I just
[20] said, I don't need him to go through.
[21] MR. ROSENTHAL: I gave you like I - as I
[22] characterized it earlier, I gave you basically

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[1] everything that was left over in his file that we -
[2] that was possibly work product with the exception of
[3] attorney opinion work product, and that includes not
[4] only drafts of various affidavits and work plans but
[5] also there is a - one document is the notice of a
[6] telephone conversation that was done by Mr. Newan not
[7] by Dr. Morrison.
[8] There are other things and they're
[9] miscellaneous items as - I'm just afraid if he goes
[10] through all of them it will take you forever. I've
[11] given you everything in his file.
[12] **MR. HARRIS:** Maybe what we can do is simply
[13] agree that 211 represents material taken from his
[14] file and the administrative binder that relates to
[15] discussions about drafts of the work plan, the
[16] affidavit, or the sole vapor extraction test.
[17] **MR. ROSENTHAL:** It would include that. Sure,
[18] I can stipulate to that.
[19] **MR. HARRIS:** Then I'm done.
[20] **MR. ROSENTHAL:** Your ten seconds are over.
[21] What should he do?
[22] (Discussion off the record.)

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[1] **MR. DONNELLAN:** We would like a copy with a
[2] Minuscript thing, as many pages to the page as you
[3] can do.
[4] **MR. ROSENTHAL:** We could like a copy too.
[5] **MR. DONNELLAN:** And ASCII disc.
[6] (Reading and signature not waived.)
[7] (Time noted: 6:15 p.m.)
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[1] WASHINGTON, D.C., to wit:
[2] I, Katie B. Stewart, before whom the foregoing
[3] deposition was taken, do hereby certify that the
[4] within-named witness personally appeared before me at
[5] the time and place herein set out, and after having
[6] been duly sworn by me, according to law, was examined
[7] by counsel.
[8] I further certify that the examination was
[9] recorded stenographically by me and this transcript
[10] is a true record of the proceedings.
[11] I further certify that I am not of counsel to
[12] any party, nor an employee of counsel, nor related to
[13] any party, nor in any way interested in the outcome
[14] of this action.
[15] As witness my hand and notarial seal this
[16] day of _____, 1997.
[17]
[18]
[19] **KATIE B. STEWART**
[20] Notary Public
[21] MY COMMISSION EXPIRES: January 31, 2001
[22]

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[1] CERTIFICATE OF DEPONENT
[2] I hereby certify that I have read and examined
[3] the foregoing transcript, and the same is a rue and
[4] accurate record of the testimony given by me.
[5] Any additions or corrections that I feel are
[6] necessary, I will attach on a separate sheet of paper
[7] to the original transcript.
[8]
[9]
[10]
[11] ROBERT D. MORRISON, Ph.D.
[12] I hereby certify that the individual
[13] representing himself/herself to be the above-named
[14] individual, appeared before me this _____ day
[15] of _____, 1997, and executed the above
[16] certificate in my presence.
[17]
[18]
[19] NOTARY PUBLIC IN AND FOR
[20]
[21] MY COMMISSION EXPIRES:
[22]

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[1] **WITNESS:** ROBERT D. MORRISON, Ph.D.
[2] **DATE:** May 2, 1997
[3] CASE: City of Albuquerque vs. Sparton Technology
[4] Please note any errors and the corrections thereof on
[5] this errata sheet. Rules require a reason for any
[6] change or correction. May be general, such as "To
[7] correct stenographic error," or "To clarify the
[8] record," or "To conform with the facts."
[9] **PAGE LINE CORRECTION REASON FOR CHANGE**
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Lawyer's Notes