

CONSOLIDATED HEARINGS BOARD

IN THE MATTER OF Sections 2 and 3 and 6 (3) of the Consolidated Hearings Act, 1981, S.O. 1981, c.20;

- and -

IN THE MATTER OF Section 12(2) of the Environmental Assessment Act, R.S.O. 1980, c.140;

- and -

IN THE MATTER OF Sections 30, 35 and 38 of the Environmental Protection Act, R.S.O. 1980, c.141, as amended;

- and -

IN THE MATTER OF Sections 24 and 61 (2) of the Ontario Water Resources Act, R.S.O. 1980, c.361, as amended;

- and -

IN THE MATTER OF Section 28 (3) of, and Regulation 164 under, the Conservation Authorities Act, R.S.O. 1980, c.85, as amended;

- and -

IN THE MATTER OF Section 40(12) of the Planning Act, S.O. 1983, c.1, as amended; in connection with site plan control of the sanitary landfill site;

- and -

IN THE MATTER OF Section 22(1) of the Planning Act, 1983 in connection with a referral to this Board by the Honourable Bernard Grandmaitre, Minister of Municipal Affairs, on a request by the Regional Municipality of Halton to amend the Official Plan for the Town of Milton to redesignate a parcel of land comprising Part Lots 3 and 4, Concession 2 N.S. in the Town of Milton from "Agriculture" and "Conservation and Hazard Lands" to permit the construction, operation and maintenance of a landfill site, Minister's File No. 24-OP-0208-A01;

- and -

IN THE MATTER OF Section 34(11) of the Planning Act, 1983 in connection with an appeal to this Board by the Regional Municipality of Halton for an order directing an amendment to By-law 61-85 of the Town of Milton to rezone the lands situated at Lot 3 and part of Lot 4, Concession 2 N.S., in the Town of Milton from "Agriculture" to permit a regional sanitary landfill site and ancillary uses;

- and -

IN THE MATTER OF Section 15(1) of the Planning Act, R.S.O. 1980 ch.379 in connection with a referral by the Honourable Claude F. Bennett, Minister of Housing on a request by Tremaine Britannia Citizen's Group for consideration of part of the Official Plan for the Halton Planning Area with respect to Sections 1 to 5 inclusive, 7, 9 and 10 of Part III D3 Solid Waste Management, Minister's File No. OPC-0026;

- and -

IN THE MATTER OF Section 64 of the Ontario Municipal Board Act, R.S.O. 1980, c.347 as amended in connection with an application by the Regional Municipality of Halton for an order approving:

a) the acquisition of land for the construction, operation and maintenance of a sanitary landfill site to contain 7.96 million cubic metres of waste in the Regional Municipality of Halton and to do so by one of two alternative methods as follows:

- (i) landfilling at the site referred to in Halton's Environmental Assessment as Site F in the City of Burlington;
- (ii) landfilling at the site commonly referred to in Halton's Environmental Assessment as Site D in the Town of Milton

at an estimated cost of \$12,775,000.00, and the borrowing of money by way of temporary advances not exceeding in the aggregate such estimated cost pending the sale of debentures, and

(b) the issuance of necessary debentures to a maximum of \$12,775,000.00 for a term not to exceed fifteen years;

- and -

IN THE MATTER OF Section 193(5) and Paragraph 84 of Section 210 of the Municipal Act, R.S.O. 1980, c.302, as amended;

- and -

IN THE MATTER OF Sections 6, 7 and 8 of the Expropriations Act, R.S.O. 1980, c.148;

- and -

IN THE MATTER OF an undertaking of the Regional Municipality of Halton to provide facilities for the purpose of receiving, dumping and disposing of waste as required by section 137 of the REGIONAL MUNICIPALITY OF HALTON ACT, R.S.O. 1980, c.436, as amended, by acquiring the land for, constructing, operating and maintaining a landfill to contain 7.96 million cubic metres of waste in the Regional Municipality of Halton.

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I N D E X

WITNESSES:

SOBANSKI, Alfred A, resumed;

BEECHINOR, James, resumed:

Cross-examination by Mr. McQuaid (cont'd) 7554

E X H I B I T S

<u>No.</u>	<u>Description</u>	<u>Page</u>
H-215	Borehole logs	7556
B-216	Addendum 1, Detailed Design Report, Leachate Collection System, Surface Drainage Improvements, Bayview Landfill Site, City of Burlington, July, 1986.	7559
B-217	Excerpts from the Hydro-geological Study for the Burlington Landfill Site	7572
B-217A	Map of Burlington landfill site, page 39 from Exhibit B-217	7574
B-218	Provisional Certificate of Approval for the Burlington Waste Disposal Site	7594
E-214D5	Enlargement of Figure 5 from Hewetson report.	7634
H-219	Base map of Drawing 6 in Site F study.	7706



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BEFORE:	H. H. Lancaster, Q.C.	-	Chairman
	Dr. D.J. Kingham	-	Member
	S. Tanner	-	Member



Nethercut & Co. Ltd.

Toronto, Ontario

Hearing conducted at The Oakville
Granary Commercial Centre, 105 Robinson
Street, Oakville, Ontario, on
Tuesday, September 29th, 1987.

VOLUME 35

APPEARANCES:

T.R. Lederer and
H.D. Hodgson

for the Regional
Municipality of Halton
(Proponent)

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for the Ministry of the
Environment

T. Vigod
J.F. Castrilli

for the West Burlington
Citizens Group

D. Estrin,
F.E. Leitch and
H. Dahme

for the Corporation of the
Town of Milton

S.R. Garrod and
A. Nurvo

for the Milton Area Citizens
Coalition and several
affected Milton area
landowners

R.B. Tuer, Q.C.
E.A. Cronk and
F. Perrier

for National Sewer Pipe
Limited

L.F. Longo

for Azova Investments
Limited

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and C.J. Tzekas

for the City of Burlington

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for the Ministry of Natural
Resources

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Nethercut & Co. Ltd.

Toronto, Ontario

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2	P. Hancock	Fosseri Investments
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5		Topic Investments
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12		Conservation Authority
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Per: P.D. McQueen



Oakville, Ontario.
September 29, 1987.

--- Upon commencing at 10:30 a.m.

DR. KINGHAM: Thank you. Good morning, please be seated. We have decided that we will forego the morning break this morning.

Mr. McQuaid.

ALFRED A. SOBANSKI, resumed:
JAMES BEECHINOR, resumed:

CROSS-EXAMINATION BY MR. McQUAID (cont'd):

MR. McQUAID: Thank you.

Q. When we adjourned last evening, Mr. Sobanski, we just filed E-214, which is Miss Hewetson's report. However, I am not really going to get into it in any detail, I am just going to stop for a moment and discuss with you and with Mr. Beechinor if you have information on it. Some of the history of the two sites that we see behind you. I have put the maps up on the board.

I will deal first of all with the Bayview site. I would like to get some appreciation from you of what the areas are of those sites and also we have some borehole logs, as I understand it, which will give some indication of whether they are on shale, till or some combination of the two.

Looking at the drawing, the righthand



1 drawing behind you, Mr. Sobanski, we see the Bayview
2 Park landfill. I don't know whether you can tell me
3 what area you are aware was filled. We heard some
4 reference, I think, about the data to 18 hectares
5 and I am informed that it is about 40 acres.

6 MR. SOBANSKI: A. I couldn't tell
7 you, Mr. McQuaid, it would have to come from other
8 reports, not from ours.

9 Q. I want you to assume then that
10 it is 40 acres for now. If you could just outline
11 that for the Board, the Bayview landfill on that
12 base map?

13 A. Yes. This is from the Morrison
14 Beatty report. They show the Bayview Park outline
15 as being, I don't know how to describe it.

16 Q. Then we have been supplied with
17 some borehole logs, Mr. Hodgson handed them out to
18 us last evening and Mr. Beechinor has them there.
19 Could you just identify these for us, either of
20 you gentlemen?

21 A. Yes, they are the three wells
22 we installed in the Bayview landfill to characterize
23 the chemistry of the leachate.

24 DR. KINGHAM: Are these part of an
25 existing exhibit, is this Halton information?



It would be H-215

then.

--- EXHIBIT No. H-215: Borehole logs.

MR. MCQUAID: I am sorry, we thought you had copies, but we'll get copies immediately for the other counsel.

Q. Looking at H-215, Mr. Sobanski, the first page, we look up under the borehole log title and we see Project Bayview Park and reference to the leachate wells and I guess we could identify it by what, reference to an HC6B, do you see that over on the righthand?

MR. BEECHINOR: A. It is on Figure 2 as LW-1.

Q. Then going down the soil description column, would you point or tell us what this log describes above the weathered shale we see at the bottom?

MR. SOBANSKI: A. It indicates there about a metre, a metre point two perhaps, hard layer reddish brown slurry, medium coarse sandy clay.

Q. That is 1.2 metres then at that particular point?

A. Approximately.



1 Q. And then going to --

2 MR. BEECHINOR: A. Then there is
3 the weathered shale after that.

4 Q. Then the weathered shale after
5 that. Does this indicate we have about 1.2 metres of
6 what we were characterizing as till over the shale?

7 MR.SOBANSKI: A. I am not sure from
8 that particular description. It could be.

9 Q. I said till, but it is described
10 as clay?

11 A. A reddish brown slurry. It might
12 be weathered shale as well, with pieces coming up, I
13 don't know, it is a little hard to tell. I think
14 the others are more descriptive.

15 Q. Look at page 2 then of Exhibit
16 H-215, and I see LW-2. What is the connection,
17 Mr.Beechinor, between LW-2 and the arrow to HC15?

18 MR. BEECHINOR: A. The HC15 was
19 the number we had when the well was put in. It was
20 subsequently changed to LW-1 on Drawing No. 2.
21 This location is shown as LW-2.

22 Q. I see down in the lower lefthand
23 side the reference to the red weathered shale and
24 the line indicating that. Above that we see a
25 description, hard layer and then red silty clay till?



1 MR. SOBANSKI: A. Yes, that is more
2 descriptive.

3 Q. What depth are we talking about
4 in the till above the shale at this point?

5 A. About one and a half metres.

6 We should go back to LW-1. While we
7 didn't define that layer, I have been misreading the
8 scale, I am sorry. It would be about 2.4 metres.
9 The scale is difficult to read, but it would appear
10 that each of the ticks in the depth column is one
11 metre. Every second one being numbered. So in
12 the first case of this unknown layer, which could be
13 something weathered like weathered shale, we have about
14 2.4 metres.

15 Now, on the next figure which is LW-2,
16 we come back to that one and we will have about three
17 metres.

18 Now, what is described on these logs
19 as red silty clay till and hard layer over the red
20 weathered shale.

21 Q. All right, on page 3?

22 A. It would appear that here we
23 have something in the order of about .6 of a metre
24 on the bottom of red silty clay till. So about .6
25 of a metre. There were other holes put in on the
site. We haven't seen the Conestoga-Rovers log, to



1 my knowledge.

2 Q. You have?

3 A. I have not seen the Conestoga-
4 Rovers' logs to my knowledge.

5 Q. You have not?

6 A. I have not, LW-4, 5 and 6.

7 Morrison Beatty put a hole into the refuse there,
8 Morrison Beatty No. 5, which reported refuse in
9 contact with the rock at the site that they selected.

10 DR. KINGHAM: Did you make a change
11 to the number you gave us for LW-2 when you noticed
12 a change in the scale? What thickness do you give
13 to that layer now?

14 MR. SOBANSKI: LW-2, Mr. Chairman, we
15 are dealing with about 3 metres.

16 DR. KINGHAM: So that includes the
17 hard layer of red silty clay?

18 MR. SOBANSKI: Yes, it does, which may
19 be shale. They didn't report, so that is perhaps
20 still a till.

21 MR. McQUAID: Q. I am going to show
22 you a document from Conestoga-Rovers dated July, 1978.
23 I would ask you to take that for a moment, 1986.

24 DR. KINGHAM: This would be B-216.

25 --- EXHIBIT No. B-216: Addendum No. 1



1 Detailed Design Report, Leachate
2 Collection System, Surface
3 Drainage Improvements, Bayview
4 Landfill Site, City of
5 Burlington, July, 1986.

6 MR. McQUAID: Q. Now, if you go into
7 the fourth page, if you would of B-216...

8 MR. SOBANSKI: A. Starting from where?

9 Q. Starting from the very cover page.
10 Let us number them as we go through. The cover page
11 is 1, transmittal letter is 2, there is a Figure 1
12 and then the fourth page is sheet 1 of 1 and it is
13 described as stratigraphy log (overburden).

14 MR. HODGSON: Is this an excerpt
15 from the document or is it the entire document?

16 MR. McQUAID: It is an excerpt.

17 Q. I refer you to what is page
18 4 in the exhibit, sheet 1 of 1, describing a log
19 at LW1-86 and I direct your attention to the depth
20 or elevation, 31 to 40.

21 MR. SOBANSKI: A. Yes.

22 Q. It is described there as clay
23 with silt sand red (no sample) and then there are
24 some other entries as to blows and weathered shale?

25 A. Yes, I am sorry, my colleague
was also talking to me here. What was your question,
please?



1 Q. I am directing your attention to
2 it. Does that seem to confirm, it would seem to
3 confirm that this particular point, LW1, this
4 driller encountered something like nine feet of clay
5 with silt sand red?

6 A. I don't understand the log, I'm
7 sorry.

8 Q. I want you to assume then that
9 that is the case and we will get more detail.

10 A. He says no sample, so I am not
11 sure how he says it is clay silt and sand when he
12 says he's got no sample.

13 Q. Right.

14 A. He took a split spoon at 40 feet
15 apparently to confirm perhaps weathered shale,
16 but I don't know how he got the clay silt and sand
17 when he says he has no sample.

18 Q. All right, well let us assume
19 that we can somehow solve this problem later on
20 as to what the indication of no sample suggests.
21 Let me refer you over to page 6 of the document.

22 A. Yes.

23 Q. We see reference to LW2-86.
24 Now maybe if I ask you, maybe we should locate those
25 in relationship to the three boreholes that you



1 describe in HC, I am sorry, on H-215. You will see
2 at Figure 1, which is page 3 of this exhibit H-216,
3 that there is a map showing the location of these.
4 I am just wondering if they could be examined in
5 the light of where your LW1, your LW2, and LW3 is?

6 A. I am sorry, we seem to be buried
7 in drawings up here. They are shown on this map.
8 This is Drawing 13 of the Site F report, the hydro-
9 geological report. LW1, 2 and 3 are located toward
10 the south end of the landfill. Morrison Beatty No.5
11 that I referred to is also located somewhat in that
12 area, I believe.

13 Q. Would you look at page 3 of
14 B-216 and tell us if the LW1, 2 and 3 are in the
15 same general area of the location of Figure 1 there?

16 A. They are in the same general
17 area. I would just note here they are in a straight
18 line and on ours they seem to be curved. I am not
19 sure where that is, but they are in the same general
20 area.

21 Q. Now we have been discussing
22 page 6 of B-216 and you will see at that page from
23 53 feet to 60 feet there is a note here that there
24 is clay silt sand, red, but again the note that
25 there is no sample?



1 A. That's right, yes.

2 Q. Continuing over to page 8, two
3 pages over, this is LW3 from 30 feet to 45 feet
4 clay with silt sand, red and again the comment no
5 sample?

6 A. Yes.

7 Q. And at page 10 there is a
8 reference to LW4 and if I refer you back to page 3,
9 that seems to be about mid-way in the Bayview Park,
10 sorry, mid-way up on the western side of it?

11 A. Yes, it is about mid-way on the
12 western side.

13 Q. At page 10 there is reference to
14 silty clay, red from 38 to 45 feet. At page 12
15 dealing with LW5, from depth 22 feet to 30 feet, a
16 description, silty clay, red-brown, no sample.

17 DR. KINGHAM: Are you now reading LW6?

18 MR. McQUAID: LW5 that one was, sir.
19 That is at page 12 in the document, the twelfth page,
20 really.

21 Q. Then two pages over, which would
22 be at page 14, at LW6 we see from 21 to 30 feet,
23 again the notation silty clay, red, no sample.

24 A. Yes.

25 Q. Now just to, at this point is



1 the problem that there is no sample in your mind,

2 Mr.Sobanski?

3 A. I think there is something, you
4 know, I am not.... it would appear in looking at the
5 logs that there is some indication of something on
6 the top of the rock that may be the till in those
7 areas.

8 Q. It may be till in those areas?

9 A. Yes.

10 Q. Let me ask you, going back to
11 your three boreholes, where there is reference to the
12 2.4 metres of sandy clay on the first one and the
13 red silty clay till and so on. What intervals were
14 you sampling at?

15 MR. BEECHINOR: A. It would be the
16 same, we did a split spoon sample when we encountered
17 the weathered shale. That is the only actual sample
18 we did with our logs.

19 Q. So the note of no sample could
20 also apply to your document, is that correct?

21 A. It could.

22 Q. Is there any reason, Mr. Sobanski,
23 to disregard the B-216 when the same technique
24 may have been followed on your H-215?

25 MR. SOBANSKI: A. Personally I would



1 like to have seen it sampled to be sure, but
2 certainly the techniques that were used seem to be
3 the same.

4 Q. All right. Now, that would
5 suggest, as you just indicated to me, that there is
6 some indication of till really across all of the
7 Bayview Park site or most of the Bayview Park site?

8 A. Except for the Morrison Beatty
9 log which I indicated they had shale on it.

10 Q. Where is that, can you direct
11 us specifically?

12 A. This would be OW15 in their
13 Phase 2 report.

14 Q. So we should look in your
15 appendices then for that? That will be in Volume 2,
16 I am not sure whether it is H-41 or H-40A. H-40A.

17 A. Yes, it is in there.

18 Q. At OW15, is it?

19 A. Yes.

20 Q. What is it that we should be
21 looking at there?

22 A. Pretty much the same sort of a
23 log. At 9.1 metres they have refuse, fill and
24 shale, seems to be a mix and then they come into
25 solid shale at 10.7 metres. They don't indicate in



1 this particular case the glacial till.

2 Q. Where is OW15 in relationship
3 to the figures, the boreholes we have just been
4 looking at?

5 A. OW15 would be located somewhat
6 north of our -- possibly between LW2 and 3, slightly
7 north from all appearances. I don't know whether it
8 was in the Conestoga-Rovers figure or not. It isn't
9 shown on the Conestoga-Rovers figure.

10 Q. Could you locate it for me
11 on the Conestoga-Rovers figure and then we will mark
12 our exhibits.

13 A. If I can.

14 Q. If you can.

15 A. I will see if I can scale it
16 from some point or other.

17 Q. Just while you are doing that
18 maybe Mr. Beechinor can tell us on Drawing 2,
19 there is LW one, two, three, four, five and six.
20 Can you tell us, the LW1, 2 and 3, are those your
21 HC, your Trow HC locations?

22 MR. BEECHINOR: A. LW1, 2 and 3?

23 Q. Yes.

24 A. They are.

25 Q. How about LW4, 5 and 6?



1 A. No.

2 Q. Whose locations are they?

3 A. That is right, Conestoga-Rovers.

4 Q. So where we see on Drawing 2
5 the LW4, 5 and 6, that is your attempt to locate
6 those, having regard for Figure 1 that we have in
7 B-216?

8 A. It was our attempt.

9 Q. Your attempt to locate them, but
10 with LW1, 2 and 3, those were your own?

11 A. That's right.

12 Q. Boreholes?

13 A. That's right.

14 Q. I just wanted it generally?

15 MR. SOBANSKI: A. I can't find it at all, it's
16 in the middle of the field.

17 Q. Look, we won't take the Board's
18 time at this point, Mr. Sobanski. Over the luncheon
19 break if you could locate those for me, and then
20 also let us see if we can't attempt to locate the
21 LW1, 2 and 3 that were bored by Conestoga-Rovers?

22 A. LW1, 2 and 3, those were done
23 by us.

24 MR. BEECHINOR: A. Those were done
25 by us.



1 Q. The ones that you have on Drawing
2 2 are yours?

3 A. That's right.

4 Q. That is your H-215?

5 A. Right.

6 Q. We have now learned, Drawing
7 H- 13, I am told. We are now told there are nine
8 boreholes on Bayview?

9 A. No.

10 Q. I thought that's what we would
11 get established?

12 A. At that time LW1, 2, 3, 4, 5
13 and 6 were put in at the same time. We shared
14 drillers, Conestoga-Rovers and ourselves. We
15 commissioned the drilling. We did LW1, LW2, LW3 and
16 then we turned over the driller to Conestoga-Rovers
17 to do LW4, LW5 and LW6.

18 Q. So that, is it your position
19 then that what we see on Drawing 2 and what we see
20 on Figure 1 of B-216, the LW1, LW2 and LW3 should
21 be in the same location?

22 A. They should be roughly in the
23 same location.

24 MR. HODGSON: They are the same holes.
25 Can we just clear this up now. I gather the borehole



1 log in 215 are borehole logs prepared by Trow, the
2 same first three holes as Conestoga-Rovers, is that
3 right, can we now compare them?

4 MR. SOBANSKI: A. Yes, we can.

5 DR. KINGHAM: Are you advising us that
6 we need not be concerned about the manifestly
7 different locations on Drawings 2 and 13 for LW1, 2
8 and 3 as compared to B-215?

9 MR. SOBANSKI: The locations are
10 not critical, Mr. Chairman. Ours are in a straight
11 line. I have not seen any of the three of them.
12 Maybe Mr. Beechinor can tell me whether they are in
13 a straight line or not.

14 MR. McQUAID: Q. For purposes of the
15 record, I think we would like to know what your
16 position is as to which three holes are more accurately
17 located? I am just just going to ask you if
18 you can go into that over the break or over the
19 evening?

20 MR. BEECHINOR: A. I think the actual
21 way of confirming it would be to go up there and
22 measure them out.

23 Q. Let us leave that for now.
24 We will try and answer that later. How can we --
25 can you explain to me at this point why is there



1 a difference in description between your H-215 and
2 the sheets that we see signed by Mr. Mayberry from
3 CRA?

4 A. If there is a difference, I don't
5 understand that, because we did the logging of L1,
6 L2 and L3 and provided Conestoga-Rovers with that
7 information. I don't understand why there's a difference
8 if there is a difference.

9 Q. I am just saying I notice there
10 is 2.4 metres on the first one, which is LW1. That
11 is 9 feet on the CRA. There is that small discrepancy,
12 2.4 metres, maybe it's closer than I think. It is
13 8 feet, I gather.

14 A. We logged the holes. There
15 shouldn't be a discrepancy.

16 Q. All right.

17 Now, we got back on this discussion,
18 we were talking about OW15, which is the Morrison
19 Beatty Ltd. node and you can locate that for me,
20 but I gather it is a little bit to the north of the
21 line on Figure 1 on B-216 and between LW2 and LW3
22 on that figure?

23 MR. SOBANSKI: A. Yes, it would be
24 approximately on the line that is B-B', about half
25 an inch north and three-quarters of an inch east of



1 C-C'.

2 Q. I am afraid that doesn't help
3 me any more, but we will get that over the break.

4 Looking at OW15 and the description
5 from Morrison Beatty, as you have noted it doesn't
6 indicate there is any clay at all there, it says
7 refuse/fill, comma shale?

8 A. Yes.

9 Q. That would seem to be at odds
10 with your own description at least, that LW1, LW2
11 and LW3?

12 A. It wouldn't surprise me. There
13 is some variation in the thickness as we recorded.

14 Q. Is that all the information you
15 would have then, that you are aware of with respect
16 to what might be in the Bayview site in terms of
17 clay underneath, above the shale?

18 MR. BEECHINOR: A. Yes, that seems
19 to be all the information we are aware of.

20 Q. Let us turn to the Burlington
21 landfill site and I refer you to the long map that
22 is on the easel behind you, Mr. Sobanski. That
23 map, if you could just confirm for us, down at the
24 lower righthand side on the legend there should be
25 reference to drawing -- I think it is an O-3 drawing.



1 That is the drawing that comes from this book here,
2 the Burlington landfill site, March, 1984, the Dillon
3 report which I understand was filed with the
4 application for continued use to the north of the
5 Burlington landfill site?

6 MR. SOBANSKI: A. Yes.

7 Q. I have handed to Mr. Beechinor
8 and I am tendering to the Board, some excerpts from
9 that large document, which bear on --

10 DR. KINGHAM: Which we would enter
11 as B-217.

12 --- EXHIBIT No. B-217: Excerpts from the
13 Hydrogeological Study
for the Burlington
Landfill Site.

14 MR. McQUAID: Q. I also provided
15 you, Mr. Beechinor, with a copy of the provisional
16 certificate on that and would you confirm that that
17 appears to indicate that the Burlington site, the
18 continuation was 72 acres within the total site area
19 of 169 acres?

20 MR. BEECHINOR: A. That is what it
21 says here, yes.

22 Q. That would seem to indicate,
23 we can search into this some more, but from what
24 we understand, that would indicate that the northerly
25 portion that was to be filled on the Burlington site



1 was an additional 72 acres. I don't know whether
2 you can tell us the 169 is coincident with the
3 entire area we see on that O-3 drawing or not?

4 MR. SOBANSKI: A. I really couldn't
5 cast any light on that, Mr. McQuaid.

6 Q. All right. Well, we will try
7 and find out what the total area is, but in any
8 event, the northerly expansion was contemplated to
9 be on 72 acres.

10 I refer you to the Exhibit B-217,
11 particularly at page 0-39?

12 A. Yes.

13 Q. And at 3.1, the physical
14 setting portion, you will see:

15 "The existing landfill site is
16 comprised of two sections. The
17 northern section, which is currently
18 being filled, was approved in 1980
19 for development. That section
20 is located in the glacial till
21 and is engineered with an underdrain
22 and toe drain system for the control
23 and collection of leachate. The
24 extent of the filling operation to
25 January, '84 is shown on Figure O-3."



1 That is the figure behind you. Now, can you identify
2 for us with reference to the legend, since you are
3 close to the drawing there, what is the extent of
4 the filling operation to January, 1984?

5 DR. KINGHAM: While he is looking
6 at that, Mr. McQuaid, while he is looking at that,
7 it is referred to on page 39. Shall we enter that
8 as B-217A then. So the map of the Burlington
9 landfill site which we referred to as O-3 will be
10 B-217A.

11 --- EXHIBIT No. B-217A: Map of the Burlington
12 landfill site, page 39
from Exhibit B-217.

13 MR. McQUAID: Q. Have you marked
14 B-217 on that?

15 MR. SOBANSKI: A. Yes, I have.

16 Q. Can you identify for us where
17 the January, '84 filling operation line appears to be?

18 A. It appears to be extended north
19 as far as what they call the maintenance building.

20 Q. Now, they are referring then
21 to a northern section currently being filled.
22 It is being located in the glacial till and then
23 in the next paragraph yousee:

24 "In the Southern section, refuse
25 has been placed directly on the



1 undisturbed ground of either bedrock
2 or shallow soil over bedrock. The
3 extent of the fill is shown on
4 Figure O-3."

5 We will stop at that point and can
6 you confirm for us on Figure B-217A that that red
7 line that runs diagonally across the site seems to be
8 the connection line between what is described as
9 the shale to the south and what is to the north,
10 described as some sort of a till or glacial till I
11 think it was?

12 A. Yes, it would appear that way.

13 Q. Would you just mark --

14 MR. HODGSON: I am sorry to interrupt,
15 but I have my own copy of that report which was put
16 into evidence in 1984 and I have got OW-3. My copy
17 doesn't have a diagonal line like that at all.
18 I don't know where that diagonal line came from.
19 I would like Mr. McQuaid to tell us.

20 MR. McQUAID: The diagonal line I
21 drew. It is the projection of what is the line on
22 the west, which indicates where the shale is and
23 where the line on the west, I am sorry, east of
24 the site indicates where the shale is. It's as
25 simple as that. I said it was the projection of the



1 shale to the till line.

2 MR. HODGSON: All right, thank you.

3 MR. McQUAID: If you have any better
4 evidence as to where the shale and the till line is
5 I would be glad to get it. At this point, if I
6 write on here till, and I am going to write on the
7 south part, shale.

8 DR. KINGHAM: Was the question to the
9 witness to confirm that?

10 MR. McQUAID: Q. You did confirm that,
11 that the red line projects those delineation points
12 on the west and the east across the site?

13 MR. SOBANSKI: A. On the surface,
14 Mr. Chairman, that line is a projection based on
15 a brick sort of texture that Gartner Lee has plotted
16 as the area of the shale. They then go on to show
17 other parts as being within the till. However, my
18 colleague points out that in Gartner Lee 25, which
19 is located well up into the north of the site, that
20 there we have refuse on top of the rock. Refuse
21 being about 16 metres deep. These are in our records.
22 It is borehole 25. That would put, somewhere in
23 this location, as rock being very near the surface.
24 So this is just a very broad generalization, just
25 as we have found on the site that there are areas of



1 glacial overlying the rock, in this area they show
2 all this as rock outcrop, yet I know there is some
3 glacial down at the south end of the site. There is
4 on ours just on the other side of the road, so I
5 expect there would be some here as well. This is a
6 very generalized map. You can't be that specific
7 with this map.

8 Q. Well, you tell me, if you can,
9 Mr. Sobanski, from your examination, where do you
10 understand that the northern section which is referred
11 to as being located in glacial till is?

12 A. I really haven't examined the
13 information in that kind of detail to try to determine
14 where it is in the Burlington site.

15 Q. Let us just take then at face
16 value what this document says for now and my drawing
17 of the line as the only indication right now we
18 have anything dividing the north and the south?

19 A. Again, I think that Gartner
20 Lee is better able to talk to their map, but we
21 know we have glacial in the southern part of this.
22 That isn't rock outcrop area. The tills come
23 up into the southern part of the site as they are
24 on the southern part of our Site F property.

25 Q. I am a little bit confused.



1 Are you saying that you think that this statement
2 that we see at O-39 in B-217A is an overstatement?
3 That in the southern section, refuse has been placed
4 directly on the undisturbed ground of either bedrock
5 or shale or shallow soil over bedrock and there is
6 more glacial till down there than we might think?
7 We have heard, I think, earlier, that there was some
8 suggestion, I think in the evidence, that the
9 southern section was put all on clay, all on shale,
10 sorry?

11 A. The southern section of

12 Q. ... of the Burlington landfill
13 site?

14 A. I don't think it would be
15 entirely on shale. It would probably be a mix of
16 shale and till in various areas. I have no way of
17 knowing exactly what is under this area of the
18 property. I know under our own section where we
19 have the valleys, we are into shale and where we're
20 into the slightly higher areas, we have till. Even
21 some of the very high areas are shale. It is
22 a deeply incised area that has a variety of both
23 terrain and geology. Gartner Lee would have to
24 comment on how they described this. If you say in
25 general it's on undisturbed ground of either bedrock



1 of shallow soil over bedrock, I guess that's not
2 too bad a statement, but that may also be made for
3 some of the northern area.

4 Q. Let me refer you to the next
5 page so we have the full context.

6 A. Yes.

7 Q. I will pick up at the bottom
8 of page 0-39, the last sentence:

9 "Based on the drilling results for
10 borehole 8 , waste depths to about
11 16 metres can be expected, but are
12 generally shallower. A toe drain
13 around the periphery controls
14 leachate springs."

15 Does the presence of that toe drain
16 suggest it is in some sort of till rather than on
17 shale?

18 A. It doesn't really suggest any-
19 thing to me.

20 Q. "The geology of the northern
21 section is similar to the Phase B and
22 D continued use areas, that is a
23 slowly permeable glacial till of at
24 least 1.5 metre thickness over a
25 shale bedrock. However, in the



1 southern section, the geology is
2 bedrock controlled with the till being
3 absent or shallow. The physical
4 properties of the shale bedrock are
5 similar to those described in Section
6 2.2.3. The slope of the surface of
7 the bedrock is shown on Figure O-5?

8 A. Yes.

9 Q. Now I am just trying to, Mr.
10 Sobanski, give the Board some assistance historically
11 on whether or not the Burlington landfill site was
12 all on shale, partly, half on shale or was on at
13 least 1.5 metres of glacial till. Is this something
14 you didn't pay any attention to in your analysis, as
15 I suspect from what we are hearing here is the case?

16 A. No, not at all. Gartner, Lee,
17 Gartner Lee says that it is, in the southern
18 section refuse is being placed directly on undisturbed
19 ground, either bedrock or shallow soil over bedrock.

20 Q. We don't know the extent of it?

21 A. No, not exactly.

22 Q. How, it seems on the northern
23 portion, whatever that area is, and to give the
24 Board some appreciation of it, I drew that line on
25 B-217A. The suggestion seems to be that the



1 northern section is on the glacial till of at least
2 1.5 metre thickness?

3 A. I don't know what Gartner Lee
4 is referring to there as the northern section. Do
5 they refer to the northern section as being everything
6 from here, from the diagonal you've drawn or are they
7 referring to the expansion area that they were
8 considering?

9 Q. Only the 72 acres then?

10 A. I don't know where the numbers
11 are or are they referring to the area which is the
12 main expansion, which has been dug into the till which
13 we also found on the Site F property as being
14 fairly thick. I am not sure if they are referring
15 to that till thickness from your line here or whether
16 they are referring to it up here. I can't derive
17 that from what I read here.

18 Q. Would this seem to suggest that
19 there is at least 72 acres of glacial till of at
20 least 1.5 metre thickness over the bedrock then at
21 some point on the site?

22 A. I don't know. The 72 acres
23 comes from the Certificate of Approval and the 1.5
24 metres comes from a Gartner Lee report. I don't know
25 how they relate.



1 Q. Can you tell us where the glacial
2 till is on Site F? Where does that line end, it's
3 the area to the east we are talking about. If there
4 is a delineation point?

5 A. We did attempt to delineate shale
6 from overburden on Site F. We are showing Site F,
7 it comes from Drawing No. 12, which is surficial
8 geology and we have made an attempt here to show
9 where the deposits are. I must admit it doesn't seem
10 to hold under the Bayview site. What we are showing
11 through the area is an area of relatively low
12 thickness of glacial till or other sediments roughly
13 through the centre of the site. Also in the deeply
14 incised ravines that dissect the property. It
15 varies from 1.2 metres to 8 metres in thickness on
16 our site and to the north of the area as well we
17 have a considerable, we have a variable thickness
18 of glacial till varying from about 5 metres to around
19 18.5 metres. We are just checking some of the
20 Gartner Lee logs. They have a thin area, a little
21 thinner than what we have, similar to what we have
22 in area 3 of that area of a thin covering of glacial
23 till to the south of their site as well.

24 Q. Can you give us, if you need
25 an opportunity to do it over the luncheon break, that



1 is fine.

2 Looking at the southern projection of
3 Halton till that you have described on Site F, do
4 you see that blob that comes down north of GL84
5 on 88, I am sorry, the southern tip of it? Would
6 you be able to just delineate where that is on
7 B-217A?

8 A. I think we can, yes.

9 Q. Would I be right that it is
10 somewhere in the general area of that red diagonal
11 line that I have drawn, cutting across in the
12 approximate location of that line?

13 Mr. Hodgson has handed me this,
14 Mr. Sobanski. It might help you to locate it. I
15 refer you to 8A, which is that EL8A that we see
16 on your Drawing 12?

17 A. That would be near
18 the height of land.

19 Q. The Halton till over a 5 metre
20 section is a little north of that.

21 A. This is not that easy. The
22 scales are so different.

23 Q. I refer you to the ownership
24 lines and you will see there is a jog just north
25 of 8A.



1 A. But I don't have them on here.

2 I have no reference for this map.

3 Q. All right, we will try and
4 locate that. It appears to be some point approximately
5 half-way down Site F, a little to the north of half-way
6 and Site F, the northerly extremity of it, I have
7 just marked, I have just marked an arrow with a line
8 just roughly opposite the northern part of the
9 Burlington landfill, which is roughly coincident
10 with the northerly limit of the Burlington landfill.

11 A. The southern limit of the till
12 as shown on this, would be somewhere about like the
13 blue line, approximately the same distance south
14 as the top of Site F. Again this is a quaternary
15 geology map. It is an overlay, mapped on a scale
16 of about 1:50,000, so one could expect some changes.

17 Q. You have drawn on there in blue
18 ink what would be the distance on Site F down the
19 Burlington landfill, approximately?

20 A. Approximately, yes.

21 Q. Let us continue over to page ...

22 MS. TANNER: Could Mr. Sobanski
23 please put some other colour over the ink line that
24 is the correct one?

25 MR. McQUAID: Q. To be accurate so



1 we don't get confused when we are looking at this in
2 argument or later on, what you have done is really
3 overlay that blob on Drawing 12 onto the Burlington?
4 Wouldn't it be more accurate if we drew it on the area
5 to the east? Just put an approximate location on F
6 of that area.

7 MR. SOBANSKI: A. I am sorry, you have
8 lost me.

9 Q. I thought on Drawing 12 the
10 blob I pointed to was a blob on Site F, which is an
11 area to the east and off the map.

12 MR. HODGSON: Now I'm confused.

13 MR. McQUAID: I'm sorry, you are
14 absolutely right.

15 MR. HODGSON: Can I please ask again
16 as we asked very early on with Mr. Estrin. It seems
17 to me quite improper. Unless counsel are going to
18 mark exhibits and witnesses are going to agree that
19 counsel have marked them correctly.

20 MR. McQUAID: I always thought that
21 was all right.

22 MR. HODGSON: You've already done it
23 and put it into evidence and we're not sure what
24 those lines are. Can we at least see Mr. Sobanski
25 mark it and identify it and describe it for the



1 evidence and we'll know it's his evidence and not
2 Mr. McQuaid's.

3 MR. McQUAID: I think that was the
4 point Ms. Tanner was getting at.

5 Q. Would you please mark it then
6 in some colour or dashed line what it is and describe
7 what you have done?

8 MR. SOBANSKI: A. This will be
9 approximate. I have also indicated on the drawing
10 the rough location of GL25 which indicated refuse
11 down to bedrock.

12 MR. McQUAID: Q. Now just picking up
13 back at Exhibit B-217, page 0-41, I refer you to the
14 first paragraph on the top of that page:

15 "Leachate is formed at the existing
16 site by the percolation of water
17 downward through the refuse. In
18 the northern portion of the site, the
19 leachate is collected by the under-
20 drain system and is removed. Only
21 a small portion (approximately 10 per
22 cent) of the leachate will exfiltrate
23 into the underlying glacial till soils.
24 Travel times are long in the till
25 and attenuation reactions will assist



1 in renovating the leachate as it moves
2 through the till."

3 Now, is that a comment, as you under-
4 stand it, Mr. Sobanski, on what the attenuating
5 qualities of the glacial till will do to the refuse
6 which is piled on top of it?

7 A. Yes.

8 Q. Do I understand that 90 per cent
9 will remain then in the glacial till and 10 per cent
10 will be going out at the line between the glacial
11 till and the shale and exfiltrating southwards?

12 A. I would think that they are
13 indicating 90 per cent will be collected and 10 per
14 cent will go through the till and into the shale.

15 Q. All right. And then continuing
16 it says:

17 "In the southern portion of the site
18 the leachate will exfiltrate into
19 the shale and move with the groundwater
20 flow system. Thus a contaminant
21 plume will develop primarily in a
22 southeast direction but also to a
23 lesser extent to the east and west.
24 There is a component of leachate
25 flow which travels through the



1 shallow saturated zone within the
2 refuse and is collected by the toe
3 drain system."

4 A. Yes.

5 Q. Now, at this point what I would
6 like to just ask you, do you confirm then that you
7 did not analyze what proportion of either the Bayview
8 site or the Burlington site was actually on shale as
9 opposed to being on glacial till?

10 A. No, we didn't.

11 Q. But when we are reading the
12 results of either plume studies or subsequent monitoring
13 reports, would it not be of some relevance as to
14 what portion is on shale and what portion is on
15 glacial till?

16 A. It may or may not. The thing
17 is the shale itself has a good attenuation capability.
18 All of the measurements we have done on the shale
19 suggest it is a good attenuator.

20 Q. I guess I am thinking in terms
21 of the concentrations and I think you indicated to
22 me earlier on that certainly the type of refuse that
23 was put on top of these various landfill sites might
24 have some bearing on the chemistry of the contaminant.

25 A. I agreed it could have an effect.



1 The southern portion of this site, by and large, is
2 located on the shale. These sites again I don't feel
3 are significantly different than ours. Parts of ours
4 will be on glacial till as well and parts will be on
5 shale.

6 Q. Can we give the Board some
7 appreciation of the numbers? I refer you to the
8 bottom of page 5 of your report, H-40. You make the
9 comment that approximately 80 per cent of Site F
10 lacks appreciable overburden cover?

11 A. Yes.

12 Q. Does that mean 20 per cent
13 has some cover and 80 per cent has not?

14 A. No, it's just a general statement
15 as I'm sure some of the statements in the Gartner
16 Lee report are general statements about the nature
17 of a fairly complex site. Here in our case it is
18 a little difficult to say, but I would say in terms
19 of garbage being put on the site, if you can bear
20 with me for a moment, perhaps 60 per cent or so
21 will be put on shale and maybe 70 and the remainder
22 will be on till. In some cases, the valleys may have
23 some till backfill in fact in the underdrain system.
24 I am not sure what Mr. Hiraishi is planning on using
25 in that right now, so that may increase the proportion



1 of till. Somewhere in the estimate, eyeballing,
2 I would say about 60 per cent will be on, about 60
3 per cent on shale and 40 per cent on till; in that
4 order.

5 Q. 60 per cent you are saying on
6 shale and 40 per cent on till?

7 A. That's an estimate.

8 Q. That's an estimate, but I
9 think if we were to look at the actual design book,
10 is it not correct that a large amount of that till
11 is going to be excavated down to the shale?

12 A. That's what I say, it's
13 approximate. I'm not sure without doing a full....
14 it could be as high as 70.

15 Q. It could be as high as 70?

16 A. I said 60-70.

17 Q. You said 60/40?

18 A. They are still estimates.

19 Ten per cent on eyeballing isn't too bad.

20 Q. All right. I will ask you for
21 some more detail later, but let us just summarize
22 at this point. We have established this morning that
23 there is some till on the Bayview site, based on those
24 borehole logs that we examined, yours and the CRA
25 borehole logs on that approximately 40-acre Bayview



1 site. I am just saying based on these borehole
2 logs, there appears to be some till?

3 A. There is one that indicates
4 no till.

5 Q. Which would you put more weight
6 on? The six that you and CRA worked on or the one
7 that Morrison Beatty did in 19 -- whatever it was,
8 1980?

9 A. I would put weight on all of
10 them. I think it is only fair.

11 Q. I thought you agreed with me
12 there is some indication of till on the Bayview
13 Park site?

14 A. The thing is that if you use
15 the same map that we have used to draw the distribution,
16 if we were to use the same map for drawing the till
17 shale contact here, it says that most of Bayview
18 Park is underlain by shale. The quaternary map
19 says the whole site was underlain by shale except
20 the northern part.

21 Q. Would you not just prefer to
22 take your own borehole?

23 A. I'll use my own borehole logs,
24 but taking this map and given what Morrison Beatty
25 found, I wouldn't discount what Morrison Beatty said.



1 Q. One out of seven indicates
2 refuse and the six indicate some till. Could
3 you tell me as a hydrogeologist what that says to
4 you because I thought it would indicate there is
5 some indication of till. I didn't think it was that
6 difficult. One hole doesn't indicate it and six do.

7 A. It depends on what the valley
8 situation was in there before filling.

9 Some that may be on shale, somebody else put one
10 in and doesn't find till, at least he doesn't report
11 till. The same thing happens on the Burlington site.
12 Gartner Lee drills on what is supposed to be a till
13 area and they say the refuse is down to the top of
14 the rock. This is a 1:50,000 map. It hasn't got
15 that kind of detail.

16 Q. I didn't say it did. You've
17 got some specific indications here?

18 A. Yes, I have. There are six
19 that says there's till and there's one that says
20 there isn't. I says the one that says there isn't
21 would indicate there is no till at that location.
22 We were down to less than a metre in one of them.
23 It is quite possible given that, given the pleistocene
24 map, how the mappers felt given the big bit on other
25 side, there is a very thin veneer of till on all that



1 area.

2 Q. In Burlington there is indication
3 are you saying, based on that one hole of Gartner
4 Lee's, that you disregard the text that we have just
5 gone through?

6 A. I am not disregarding the text;
7 I am just saying it's not as homogeneous as we are
8 being led to believe. This is a till contact and
9 there's always till to the north of that. We know
10 the area has been incised by deep valleys and we can
11 see where it's been incised with deep valleys, it's
12 been cut through the overburden and into the shale.
13 It may have prevailed on this property as well.
14 I don't know what the predisposal topography was like
15 on that site, but given what we see there in terms
16 of topography and incisions and everything coming
17 up with holes that don't have till, it wouldn't
18 surprise me at all.

19 Q. Let us turn to another area,
20 Mr. Sobanski. I have been asked just to confirm
21 those areas by filing some sort of an exhibit. I
22 have given you a copy, Mr. Beechinor, of the
23 Provisional Certificate on the Burlington continued
24 site, this is dated September 20th, '84 and I
25 tender that as the next exhibit, Mr. Chairman.



1 DR. KINGHAM: This is an environment
2 exhibit tendered by Burlington. If you have no
3 strong views, I would mark it as B-218.

4 --- EXHIBIT No. B-218: Provisional Certificate
5 of Approval for the
6 Burlington Waste Disposal
7 Site.

8 MR. McQUAID: Q. I would like to
9 go to E-214, that is the report of Ms. Hewetson.
10 I guess it is the Bayview Park site really isn't it?
11 Or is it both Bayview and Burlington, do you know?

12 MR. SOBANSKI: A. It is Bayview Park.

13 Q. Now, I would like to go over
14 to page 2, Arabic 2, Chapter 1, which is the
15 introduction and I am just going to read the first
16 paragraph to you, Mr. Sobanski, and ask if you would
17 agree with it generally.

18 "As new landfills continue to be
19 developed and as leachate continues
20 to be produced from old landfills,
21 the need to acquire a better under-
22 standing of the transport of landfill-
23 derived contaminants in groundwater
24 persists. Investigations of the
25 influence of groundwater flow on
contaminant migration, while extensive,
have been mainly focused on sand and



1 gravel aquifers. A limited knowledge
2 of flow in fractures has hindered
3 research in rock despite the great
4 potential for rapid and extensive
5 contaminant transport in this type of
6 environment. Large groundwater
7 velocities and small fracture surface
8 areas can lead to relatively high
9 contaminant mobility and reduced
10 influences of chemical and physical
11 attenuation processes."

12 As a general principle, do you agree
13 with that opening part of the report?

14 MR. SOBANSKI: A. I am not so sure
15 that a limited knowledge of flow in fractures has
16 hindered research in rock. The federal government
17 has spent a great deal of money in researching fracture
18 flow in rock in research on their nuclear waste
19 sites. I am not sure it's all that limited any more.
20 A lot of work is being done in that area in terms
21 of perhaps landfills in Ontario. There may not be
22 that much information. I think there is more and
23 more information developed, being developed on
24 fractured flow. It is very complex, as we discussed
25 at the beginning of the cross-examination. Large,



1 groundwater velocities, this is supposed to be the
2 case because of the small fracture area. We have
3 low effective porosities which result in the Darcy
4 equation giving high velocity. However, my experience
5 so far has been that we haven't seen that while the
6 relative velocities may be high, the fluxes may also
7 be very low. You may be moving your drop of water
8 very quickly, but nevertheless it may just be a
9 drop of water, as spreading out into a fairly large
10 area and diluting. I think what is being said here
11 is very, very general.

12 Q. I appreciate that.

13 A. Reduced influences of chemical
14 and physical attenuation processes, that may or may not be
15 right. Because, into the shale type matrices, I
16 think people who are looking at these sites can be
17 looking at the amount of attenuation by on the
18 top of shale, we have to remember that what we are
19 talking about is essentially clay. There is some
20 carbonate added to the -- which causes solidified
21 clay. The matrix of the material itself is probably
22 not a bad material for attenuating leachate.

23 Q. Let me skip the next paragraph
24 down to the reference to Bayview Park. The last
25 paragraph:



1 "The Bayview Park landfill, reported on
2 in this paper, has features typical
3 of many waste disposal sites found in
4 the Niagara Region. It is located in
5 Burlington about 3.5 kilometres
6 (et cetera). Between 1961 and 1974,
7 waste from the surrounding community
8 was disposed in shale quarry
9 excavation at this site. The waste was
10 largely municipal in origin, but
11 because the landfill was one of only
12 two major waste disposal sites in the
13 region, it is reasonable to expect
14 that it also received some industrial
15 waste. When landfilling was completed,
16 the refuse was covered, graded to be
17 nearly flat, and then grassed."

18 Do you have any knowledge of whether
19 it is industrial waste or is that assumption
20 reasonable?

21 A. I don't know whether it is
22 right or not. We can see at the Burlington site now,
23 we think, because what we see in the organics in
24 the leachate, that there may have been some industrial
25 waste, some go in. It is possible that also occurred



1 here. Given that back in 1961 to '74, co-disposal
2 in the province was very common. That was essentially
3 it. You co-disposed everything altogether into one
4 big brew.

5 Q. Then the next paragraph on page
6 3 just indicates when the investigations at Bayview
7 began. It indicates they were for the purpose of
8 evaluating the use of conventional approaches for
9 determining the potential for large scale migration
10 of landfill-derived contaminants in fractured shale.
11 The report describes, the results are shown in two
12 parts. I am going to ask you questions on the two
13 parts, so we'll look at the first part. It says:

14 "The objective of Part 1 was to
15 conduct a hydrogeological
16 characterization of groundwater flow
17 through the shale, based primarily
18 on equivalent porous medium methods
19 and concepts. Hydraulic conditions
20 and the distribution of tritium,
21 derived from detailed vertical
22 groundwater monitoring provided by
23 conventional piezometers and multi-
24 level devices, are described."

25 It describes what tritium is. Just



1 going on so the Board has the background:

2 "The objective of Part 2 was to
3 establish the distributions of landfill-
4 derived contaminants in groundwater
5 in the shale and to use the distributions
6 for comparison with estimates of
7 potential contaminant transport based
8 on the hydrogeological characterization
9 of Part 1."

10 Then we see a general description of
11 the shale on the lower third on page 3. Just going
12 over to the top of page 4, and then I direct your
13 attention to the second paragraph on page 4:

14 "From an examination of rock core,
15 horizontal fracturing in the top 47
16 m of the Queenston Formation is
17 quite extensive."

18 Would you just confirm that, I guess
19 the next sentence as well:

20 "Fracture spacings range from 5 to
21 35 cm. The fractures appear to
22 have developed along horizontal
23 bedding planes but do not necessarily
24 appear to be coincident with changes in
25 colour."



1 Just stopping there with the comments
2 on the fractures and the degree of it, is that
3 generally what you found as well, Mr. Sobanski?

4 A. Not quite. We haven't seen this
5 core. I don't know just how much the core would
6 have deteriorated by now. It was collected some time
7 ago. We found that we had zones of competent rock
8 in the cores that would exceed, I believe, 35 cm. We
9 had to break sections to get them into the core
10 boxes in some cases. This describes a fracture
11 spacing I think that in general would be somewhat
12 closer than what we are indicating in our interpretation.
13 They are talking here of sections only about a foot
14 long perhaps. It may be, I mean from the point of
15 view of general description, it would come close to
16 ours, but it is difficult to say. We used a
17 different approach to logging the cores, I believe.
18 That is a very general statement she has made.

19 Q. Then there is a sentence here:
20 "The permeability attributable to the
21 fractures is orders of magnitude
22 greater than that attributable to the
23 matrix, so groundwater flow can be
24 expected to occur largely through
25 the fracture network between relatively



1 impermeable blocks of rock matrix."

2 A. That is reasonable for this
3 material.

4 Q. This would suggest, just
5 stopping at this point, the key then in looking at
6 Site F is to understand, I guess, these fractures
7 as they appear in the shale; is that correct? One
8 of the keys?

9 A. It is one of the pieces of
10 information that we have looked at, is the
11 continuity of the zones, yes.

12 Q. Because you get groundwater
13 flow in that fracture network and, as it says here,
14 run at orders of magnitude much greater than
15 obviously the impermeable blocks?

16 A. Yes.

17 Q. I want to just ask you as well,
18 do you have to be concerned or would I understand
19 that you have to be concerned also about vertical
20 fractures? In other words, the groundwater has to
21 get down into the horizontal planes?

22 A. Yes, that's right. We observed
23 vertical fractures and describe them in our report
24 and the interconnection between the various units.

25 Q. All right. Now, over at the



1 next page, page 5 there is this Chapter II, describes
2 in some detail the study methods that were followed.
3 The first paragraph refers to Morrison Beatty work
4 and comments on the number of sampling points they
5 had in the shale. Then, as I understand it, we
6 don't have to go through it, let me just summarize
7 it by saying Miss Hewetson then reports in some detail
8 on the methods that she followed or that the drillers
9 followed for her in connection with the boreholes
10 that the university was putting in; is that correct?

11 A. Yes, I think it is important
12 though to note at the bottom paragraph of page 6
13 and the top paragraph of page 7 where it says:

14 "During the period of piezometer
15 development and initial hydraulic
16 testing, the water levels in many of the
17 piezometers in each multilevel device
18 repeatedly equilibrated to the same
19 position. This suggested hydraulic
20 connection between the inside of
21 the PVC casing and the individual
22 sample intervals. The casing of each
23 multilevel device was then filled
24 with a thick bentonite slurry to seal
25 leaks and prevent the influence of



1 hydraulic 'short-circuiting.'"

2 As I said in my evidence, we had the
3 same problem looking at their No. 2 well to the
4 north of the site, which is the background well because
5 we found dyes in the actual piezometers. So they
6 were having problems with the seals in those wells.
7 It goes on to say:

8 "The differences in equilibrium water
9 levels between most sampling intervals
10 became distinct following bentonite
11 installation. At major leakage points
12 however, bentonite that moved into
13 sample sections caused clogging of
14 the sample port."

15 The bentonite moved from the inside
16 of the pipe to the interval in the annulus.
17 It got out through the sampling ports and started
18 filling the interval that had been packed off.
19 That intervals between the pipe and the rock was
20 actually being filled with bentonite.

21 "As a result, 7 piezometers, of a
22 total of 58 contained in all multi-
23 level devices, were no longer useful
24 for hydraulic testing."

25 We have no way of knowing how the



1 seven were arrived at or whether the seven that are
2 referred to also included the problems we found at
3 the No.2 installation to the north of the site where
4 we were picking up dye in several of the piezometers.
5 It wasn't fluorocene but a type of dye. They
6 had problems with their installations. You have
7 to remember that this was a fairly new method of
8 construction. As I saw part of Miss Hewetson's
9 thesis, while this is directed, while this is
10 directed to an assessment of contaminant migration,
11 I think it is also a very good assessment of the types
12 of problems she was having with the installations,
13 although it isn't handled here on how to prevent
14 this, it is a note of caution to people who use
15 these things that you have to be sort of careful
16 with the installations or you don't run into these
17 problems. There is an equipment testing process
18 going on that is very important to the scientific
19 community as well.

20 Q. Do I not read that Miss Hewetson
21 is saying that as a result of these problems, seven
22 of the total of fifty-eight were no longer useful?
23 There is still fifty-one of the fifty-eight that were
24 still used for hydraulic testing?

25 A. That was her conclusion.



1 Q. Do you have any reason from what
2 you have seen to disagree with her on that? A note
3 of caution has been sounded and you have sounded it
4 and she sounded it. This report says she is going
5 on to deal with fifty-one of the fifty-eight. I
6 guess we should know up front or are you saying she
7 obviously got off on the wrong track right here at
8 the beginning?

9 A. I am not sure. Mr. Feenstra
10 will comment on this, but I know there are some
11 differences between the Hewetson data base and our
12 data base that are causing me to wonder. We know
13 she had a problem with the construction and she is
14 very up front about it. I don't know how many in
15 the end it was. This is her determination of how
16 many she thought it was. Is that the whole case,
17 I don't know. Miss Hewetson, like all of us,
18 even the consultants, is restricted by time and
19 by budget as to how much work she can do on these
20 things.

21 Q. Just so the Board and I can
22 follow the study method, I see here in the second
23 full paragraph on page 7, there is reference to
24 "Sixteen conventional rising-head
25 response tests were performed to



1 determine bulk hydraulic conductivity
2 values for the shale."

3 This is the K value, correct?

4 A. Yes.

5 Q. Then, going down to the last
6 sentence in the next paragraph, which begins by
7 describing about pumping, it says:

8 "As part of the rising-head reponse
9 test procedure, water levels in sampling
10 intervals above and below the test
11 interval were recorded both before
12 and after the evacuation of groundwater."

13 A. Yes.

14 Q. So there were observations as
15 you've made them in other wells after pumping tests
16 had been conducted, correct?

17 A. Yes.

18 Q. Then in the last paragraph,
19 "To determine the distribution of
20 tritium in groundwater, between ten
21 and twenty groundwater samples were
22 collected annually between 1982 and
23 1984 from a total of seventeen
24 conventional piezometers and nine
25 multilevel piezometer tubes."



1 They then go on to indicate that these
2 were repeat samples and they also look at the Morrison
3 Beatty tritium data.

4 A. Yes.

5 Q. Then going over to the top of
6 page 8, we see further reference to samples of tritium
7 in the first paragraph and reference to the water
8 levels, the second paragraph, were recorded several
9 times a year through all phases of the research?

10 A. Yes.

11 Q. Now, going over to page 9, we see
12 a discussion, there are three sections in Chapter III,
13 Hydraulic Head 3.1, Hydraulic Conductivity, 3.2 at
14 page 11 and Tritium Distribution, 3.3 at page 14.
15 I want to go in the order of discussing the hydraulic
16 conductivity first and then the tritium and then we
17 will come back to the hydraulic head.

18 I want to ask you to turn over to
19 page 11 initially. Can you just confirm that the
20 method that is being followed was this Hvorslev
21 method we've heard reference to earlier and if I
22 take you over to page 12 in this first full paragraph
23 I guess on this page, we see the bulk conductivity
24 values are summarized there. Miss Hewetson notes they
25 range over six orders of magnitude, with a maximum of



1 1.8 x 10⁻⁶ and a minimum of 2.7 x 10⁻¹² and there
2 is reference then to Table 1?

3 A. Yes.

4 Q. If we turn to page 30 in this
5 exhibit we will see the conductivity values in the
6 second column on page 30, giving rise to that range
7 summarized at page 12?

8 A. Yes.

9 Q. Just so we have got the formula
10 correct, if we were to change these values to the
11 centimetres per second data in your report, we would
12 multiply by one hundred, we would actually knock -2
13 of each of those figures that we see?

14 A. That is correct.

15 Q. Since we have been discussing
16 K's and also at the same time porosity and linear
17 groundwater velocities on your Table 10, page 88,
18 I refer you to page 72, and on that table, No. 4,
19 we see the results, we see the K as the second
20 column, fracture porosity as the third column and
21 the average linear groundwater velocity in metres
22 per year in the fourth column?

23 A. Yes.

24 Q. Looking at the average linear
25 groundwater velocity, we see that the range is,



1 I guess the lowest is 0.4 metres per year at WAT 4-10,
2 to as much as 3,000 metres per year at WAT 5-1?

3 A. Yes. I think the Board should
4 note there the extremely low fracture porosities.
5 I did check those. They are in per cent, so when put
6 into the equation, there are two more zeros to be
7 put into those fracture porosity values before they
8 are used as a divisor into the equation. So what
9 we are talking about in these porosities is as low
10 as .000009, five zeros followed by a nine. This is
11 derived by a method that I have never used and I
12 can't really advise the Board too much on it. It is
13 described in the report. These would of course
14 result in incredible velocity under the right
15 conditions.

16 Q. We will talk some more about
17 that. I just wanted the Board to have an appreciation
18 of where we can find these when we need to discuss
19 them later.

20 Now, let me also quickly, having
21 given the K from the report, the range and the other
22 factors, let me ask you to turn to page 14 and here
23 the discussion of tritium distribution begins. I
24 refer you -- the conclusion I think we can pick up
25 at page 15. I will read the first sentence on page



1 15:

2 "Low and high tritium values are found
3 throughout the shale at varying depths.
4 At WAT 3 and WAT 7, tritiated water
5 is found at depths greater than 35 m,
6 while at the same depth at WAT 4
7 virtually no tritium is found.

8 Tritium values increase with depth at
9 some locations, a trend opposite to
10 expectations. Low values at shallow
11 depth indicate zones that are
12 hydraulically isolated from
13 infiltrating rainwater as well as
14 groundwater in other parts of the rock.
15 Beneath these zones higher values can
16 occur if there is connection to the
17 ground surface or to another zone
18 transmitting modern groundwater."

19 Now, this would certainly be the sort
20 of pattern, Mr. Sobanski, you would expect to find
21 in a fractured rock mass where there are numerous
22 fractures through which the rock is moving and in
23 various directions; is that correct?

24 A. Mr. Feenstra has been looking
25 into the tritium distribution at this site in more



1 detail and to my knowledge recently. I don't know what
2 conclusions he has, what he has come to. I will pass
3 to him in a way but we found of course some, also some
4 variations in tritium, where we had a sort of a normal
5 profile at one hole and very little tritium at
6 another hole. I don't disagree with the possibility
7 of finding tritium at depth here. Even the FLONETS
8 model that we developed for the site indicated tritium
9 could be in fact as deep as 35 metres.

10 Q. Is the point really here that
11 you have indicated that this is a complex, very complex
12 site to be analyzed? Is what we are seeing here
13 consistent with that complexity?

14 A. There are complexities at this
15 site. We feel that we have resolved most of them
16 and that is why we are here to discuss them, to
17 determine whether we have or not. Yes, there are
18 complexities in fracture flow. We have indicated
19 here the multi layer system of flow through the
20 various units. On the other hand, we have also
21 identified at Site D that we have seven or eight
22 units there. So, most geologic environments have
23 some complexity to them. Fracture flow is considered
24 to be a very complex environment. We are aided here
25 by delineation of the flow system that slopes towards



1 Lake Ontario, that drives water in that direction.

2 Q. Let me direct your attention to
3 one other paragraph on page 15. It is the third,
4 the second full paragraph, about half-way down the
5 page:

6 "The occurrence of tritium at depths
7 as great as 35 m in the shale indicates
8 that vertical movement of groundwater
9 is not inhibited by the primarily
10 horizontal orientation of fractures
11 found in the rock core. Evidence of
12 vertical fracture connection was not
13 apparent during the rising-head
14 response tests however, as groundwater
15 evacuation from test intervals did
16 not cause water level changes in sample
17 intervals above and below."

18 Do you agree with that?

19 A. We had the same result.

20 Q. Then let me take you over to
21 Chapter IV at page 17. I am going to come back to
22 hydraulic head distribution, but I wanted to discuss
23 these two, they are a little simpler and shorter
24 at the beginning.

25 A. I think to be fair, before we



1 went that far, she had problems with her tests. She
2 felt with hydraulic conductivity as well. I am
3 not convinced that these are really good tests with
4 these types of piezometers. We had problems with
5 the bigger piezometer here. She is dealing with half
6 inch tubes that are sampling at fairly large
7 intervals and she draws them down, a little bit of
8 water, takes them out and then measures the hydraulic
9 conductivity. She noted that there may be higher,
10 more permeable zones in the unit, but she was unable
11 to confirm it with any of the Hvorslev tests as we
12 had found it. She says on page 12:

13 "Although the sample intervals
14 registering extremely low water levels
15 are thought to represent zones of
16 relatively high permeability, this was
17 not confirmed by response test results.
18 Bulk hydraulic conductivity values for
19 these particular piezometers were on the
20 order of 10^{-10} m/s or less. Local
21 zones of high permeability positioned
22 near a sample interval, rather than
23 directly intersecting it, may influence
24 hydraulic head. However, hydraulic
25 conductivity values may not represent



1 this permeability because rising-head
2 response test results reflect conditions
3 only in the immediate vicinity of the
4 borehole."

5 She is something similar to what we
6 are saying. She has a well here that is even more
7 difficult to develop.

8 She saw that we had problems
9 measuring hydraulic conductivity as well. The
10 Hvorslev tests do not indicate the presence of the
11 highly permeable zone...

12 Q. Are you reading from something?

13 A. I am reading from page 12.

14 I note as well that Dr. Cherry was having some
15 meetings with the hydrogeologic community at Halton,
16 talking about these hydraulic conductivity tests
17 that were being run and the curves were rather odd
18 in many cases, they had strange shapes that occurred
19 that he wasn't sure what they meant.

20 Q. Do I understand correctly that
21 Miss Hewetson was actually writing a thesis report
22 for submission to Dr. Cherry?

23 A. This was being worked on, yes.
24 Their work was ongoing. Interpretation during
25 our investigation, the earlier stages of our



1 investigations. From time to time Dr. Cherry met
2 with various consultants to discuss the results
3 of the tests they were getting on site. One of the
4 things that we did discuss was the problem he was
5 having in interpreting the hydraulic conductivity
6 curve.

7 Q. What is it you are saying then
8 about the, I was going to take you to the conclusions
9 that Miss Hewetson makes about hydraulic conductivity.
10 Let us go to those right now and then I am going to
11 ask you to comment on those in the light of what
12 you have just noted here.

13 If you look at page 17. Just to
14 give the Board the background, I am going to talk
15 about hydraulic head in more detail shortly. It
16 says:

17 "The hydraulic head distribution in
18 the shale is very irregular."

19 Did you find that?

20 A. No, not as irregular as she did.
21 Keep in mind the differences between these two
22 studies, between all of the studies that have been
23 done We went in and we continuously cored every
24 hole. We were looking specifically for zones that
25 would appear to have some permeability in them. We



1 looked for muddy seams within the cores, high
2 frequency or fracturing, and these were the zones
3 that we instrumented. To my knowledge, no one else
4 has done this on these sites. We did it differently.
5 Because we could see from other reports and other
6 investigations that people had a problem interpreting
7 these sites, so we specifically instrumented core
8 permeability to the best that we could from our
9 core descriptions and then instrumented in the field
10 in that manner.

11 Now, the Hewetson work, these are set
12 up automatically at five foot spacings. There are
13 twelve piezometers or so and they all go in in a
14 bundle and they are all pre-set and pre-done. The
15 hole's aren't logged or cored. They don't know what
16 they are setting in, so we don't know about hydraulic
17 conductivity response, you are not sure what you are
18 measuring. You haven't got a clue what you are
19 measuring. You don't know what you are measuring.
20 You could be into solid units, you could be in a
21 slightly permeable unit; you don't know what you have.
22 We felt we had better control over it than that
23 and even then we had some problems with the Hvorslev
24 test, but she should have in theory even more problems
25 with the Hvorslev test, because a relatively large



99A

1 hole and a relatively small piezometer drawing from a side
2 port and a piece of pipe that may even have had some
3 leakage around it. So, you know, this was a new
4 technique she was investigating. We understand
5 these have since been refined even further and
6 these multilevel have been improved commercially.
7 Although Miss Hewetson's thesis isn't directed towards
8 that, she has made some valuable contributions on
9 instrumentation. We did things differently on this,
10 because other people, other investigators, they kept
11 coming up and saying, you can't resolve it. We
12 approached it a little differently and said let us
13 get everything we can, the best information we
14 possibly can. We'll core every hole, look at
15 everything, can we do a better job? If it hadn't
16 been for the pumping test, we probably would have
17 come out with the same type of an interpretation
18 that everyone else has made on this site, but we
19 knew that zone was there. We problem was we couldn't
20 prove it, even with our hydraulic conductivities
21 information. It took the pumping test to do it.
22 Q. So then the next sentence, two
23 sentences which address hydraulic head distribution,
24 you have that difference of view in terms of
25 between what the state of the art is now and what it



1 was then, I gather? I am reading from the second
2 sentence.

3 A. I'm sorry, it wasn't state of
4 the art. That wasn't really it. This is a state of
5 the art study too. We just did it differently.

6 Q. I see.

7 A. I am not criticising the way
8 this was done at all. We just did the study in a
9 different manner because we felt everyone coming
10 to the same conclusion, it couldn't be resolved. In
11 fact, perhaps it couldn't have been. In some ways
12 we got lucky.

13 Q. I am sorry, you are going to
14 have to give me that. What does it mean, everyone's
15 coming to the same conclusion, it couldn't be
16 resolved?

17 A. Everybody talked about a
18 weathered zone, all the water was moving in a
19 weathered zone and we started running FLONETS
20 with that type of a scenario and we couldn't get
21 FLONETS to work at all. Groundwater was
22 discharging all over the site. The traditional
23 approaches to it weren't quite the same. The
24 traditional answers to this site weren't what we
25 were finding. We had evidence of a high permeability



1 layer or layers and nobody, there is some reference
2 to it here, that she couldn't identify it. She ran
3 Hvorslev tests on it and couldn't find it. We went
4 in with the pumping test.

5 Q. Is it that she didn't find what
6 you are saying is a highly fractured unit, which is
7 key to your report; is that she you are saying?

8 A. She didn't get any indication
9 of it from her Hvorslev tests. She got some
10 indication that there were more permeable units from
11 her water level data, but she couldn't really define
12 it.

13 Q. All right then, let me just
14 read the next two sentences. Then if you have any
15 comment on it, make it.

16 "Equilibrium water levels can change
17 by as much as several meters over a
18 2 m change in depth. Marked low
19 values of hydraulic head may indicate
20 the presence of major zones of
21 groundwater transmission in the shale."
22 I should go on, I guess. The next
23 one:

24 "These zones do not correlate between
25 monitoring locations and therefore



1 appear to have a restricted lateral
2 extent."

3 A. That was the problem, because as
4 we interpreted it, we saw those downward gradients
5 over a large portion of the site and felt it did have
lateral extent.

6 Q. All right, so where she had
7 concluded at this point that they had a restricted
8 lateral extent further work, as we will discuss in
9 your report, indicates that you think it has, what
10 is the opposite, unrestricted?

11 A. Remember what she is comparing
12 here.

13 Q. First of all, will you answer
14 that, is that correct? Do you disagree with her
15 on her comment that there is a restricted lateral
16 extent between these zones?

17 A. Yes. We think that that unit
18 is continuous, as defined by the pumping test, when
19 she says these zones do not correlate between
20 monitoring locations. Remember what she has been
21 comparing right now. All she is comparing is hydraulic
22 conductivities. She didn't have a core to look
23 at, she didn't know what she was instrumented in.
24 All she did was drill the hole, put the instrumentation
in, allowed the package to expand.

25 Q. These first four sentences in



1 this paragraph on the conclusions deal with hydraulic
2 head, not hydraulic conductivity. Why are you
3 differentiating? The next sentence, we will go to
4 the sixth, seventh sentence to deal with hydraulic
5 conductivity.

6 A. You may be right. I'm sorry if
7 that is the case. They are all in the same paragraph
8 here. She didn't break hydraulic conductivity away
9 from head distribution.

10 Q. Just so the Board has some
11 appreciation of what the main difference is at this
12 point in hydraulic head, just concentrating on that,
13 the point is that you have concluded that the lateral
14 extent of the zones of groundwater transmission,
15 major groundwater transmission are more continuous
16 as opposed to restricted, as set out here by
17 Miss Hewetson?

18 A. Yes, we have demonstrated it.

19 Q. Then let me turn to the fifth
20 sentence in this paragraph on page 17:

21 "Bulk hydraulic conductivity values
22 for the shale range from 2.3×10^{-12}
23 to 1.8×10^{-6} m/s, reflecting the
24 variability in the fracture network
25 over sample intervals of regular length.



1 Hydraulic conductivity values do not
2 show any distinct trend with depth,
3 except for particularly high values
4 that are believed to be related to a
5 weathered zone in the top few metres of
6 the bedrock. Estimates of fracture
7 porosity range from 0.0007% to 0.1%."

8 I'll leave fracture porosity for a
9 moment and confine ourselves to the two sentences
10 on hydraulic conductivity. Her conclusion was that
11 the K or hydraulic conductivity values did not show
12 any distinct trend with depth. Can you tell us, do
13 you agree or disagree with that?

14 A. That would be, if we just looked
15 at that information, hydraulic conductivity, that
16 would be right. We talked yesterday about the
17 Morrison Beatty report that I hadn't agreed that
18 there was decreasing hydraulic conductivity with
19 increasing depth and I believe Miss Hewetson was
20 essentially saying the same thing.

21 Q. All right. However, I have
22 started in that second sentence, if I may back up
23 there:

24 "Bulk hydraulic conductivity values for
25 the shale range from (the numbers we see



1 there) reflecting the variability in
2 the fracture network over sample
3 intervals of regular length."

4 A. Her values on the low end of
5 the scale are much lower than anything that we measure,
6 but then as I said, we instrumented our site differently,
7 our holes rather. We were looking for zones that had
8 some permeability, so she has a value there, a low
9 value of 2.3×10^{-10} , which could indicate massive
10 shale perhaps.

11 Now, in the next case she says it is
12 roughly 2×10^{-4} centimetres per second, or 1.8×10^{-6}
13 metres per second sort of in the range of some of the
14 values we saw as well.

15 Q. Any other comment on the hydraulic
16 conductivity before I go to porosity?

17 A. No.

18 Q. "Estimates of fracture porosity
19 range from (the percents we see there)."

20 I gather from the comment you made
21 at page 72, you disagree with her fracture porosity?

22 A. Not necessarily disagree. I
23 can't really advise the Board on whether they are --
24 the method of obtaining that type of very low
25 porosity is meaningful.



1 Q. I think that's correct. You said
2 she used a technique?

3 A. I have not used the technique.

4 Q. Going on to the second paragraph
5 on page 17, dealing with tritium:

6 "The distribution of tritium in ground-
7 water did not exhibit any consistent
8 spatial trends."

9 Do you agree with that conclusion?

10 A. This is what her data indicates.
11 We have felt that we have a little better definition
12 of it than that. I don't know how many of those
13 piezometers she sampled, for example, whether they were
14 all sampled and we have a whole profile, whether they were
15 sporadically sampled. There isn't enough in here
16 to tell us exactly what was done. There is a general
17 description of what they did. I am not sure what
18 her results mean because they are somewhat sporadic.

19 Q. All right. I take it then you
20 wouldn't be able to really comment on the next
21 sentence?

22 A. The next sentence, levels of
23 three, again Miss Hewetson would have to speak
24 to that, but I noted in the report that she was
25 using 3 as a marker, but her very best results on



1 the enriched tritium were plus or minus 2 tritium
2 units, which would put this right at sort of the
3 limit of whether it's a good value or a bad value
4 or whether in fact we are dealing with, 3 is about
5 the right number for old and new groundwater.
6 Her best method was plus or minus two tritium units.
7 Her final, it was even worse than that on some of
8 the values. I am not arguing with her, with what
9 she is saying. She has made her interpretation. I
10 don't know whether she has taken that into account
11 or not. Plus or minus eight tritium units for the
12 samples analyzed in the year 1980 and 1981 and plus
13 or minus two tritium units, for the enriched tritium
14 analysis done during subsequent years. We were
15 running at .1 tritium units as our limit, because
16 a new lab had opened up giving better results.

17 Q. This portion on tritium, the
18 third sentence in this paragraph reads:

19 "This erratic distribution of values
20 indicates some degree of vertical
21 fracture connection in the shale
22 between which certain zones can still
23 remain hydraulically isolated."

24 Can you tell me, we've talked about
25 vertical fractures before. You confirmed that they



1 would have to be there because the water goes down?

2 A. I would agree that there could
3 be places that are isolated within the shale that
4 aren't connected to the general flow system.

5 Q. When you are putting a core in,
6 how do you handle vertical fractures, because the
7 borehole presumably is not put down through the middle
8 of a vertical fracture?

9 A. It is sometimes, from time to
10 time you hit one with the core. Maybe it will appear
11 on our logs. They do occur.

12 Q. How do you assess them across
13 the area of the site?

14 A. You can't really assess them
15 fully. It is very difficult. You don't know exactly
16 what the continuity is. As Miss Hewetson says,
17 faces of quarries have been mapped for that purpose
18 where one can see these vertical features. It has
19 been reported to her by others as well that they
20 have seen that occurring. We know there are some
21 vertical fractures.

22 Q. Just continuing over to the
23 last paragraph, the last sentence on page 17:

24 "The irregular and often large changes
25 in hydraulic head in conjunction with



1 the wide range of bulk hydraulic
2 conductivity values and erratic tritium
3 distribution indicate a very complex
4 flow system in the shale."

5 Would you agree with that conclusion?

6 A. It is a complex flow system in
7 the shale, yes.

8 Q. She says very complex?

9 A. When we come to the Board, we
10 come to the Board saying we think we have the answer
11 to it. We will call it complex I think as opposed
12 to very complex.

13 Q. Continuing:

14 "A distinct horizontal fracture network
15 exists for groundwater movement with
16 fractures spaced between 5 and 35 cm
17 apart."

18 I think you commented on that earlier.

19 A. We had horizontal fractures in
20 our core as well. They were very obvious.

21 Q. "Vertical fracture connections,
22 suggested by the distribution of
23 environmental isotopes, was not in
24 evidence during hydraulic testing."

25 Maybe I should go on to the next



1 sentence:

2 "However, downward movement of ground-
3 water may be partly facilitated by
4 soft-sediment deformation shear
5 fractures."

6 I am not sure what that first sentence
7 meant. I have a little trouble with it. It may be
8 obvious to somebody; it's escaping me.

9 "The vertical fracture connection suggested by
10 the distribution of environmental
11 isotopes was not in evidence during
12 hydraulic testing."

13 I see, I understand it now.

14 What she is saying there is the
15 environmental isotopes suggest that there is vertical
16 fracture connection but she did notice that when she
17 ran her Hvorslev tests.

18 Q. You have no reason to disagree?

19 A. No, I have no reason to disagree.

20 Q. Then the last sentence:

21 "These features were observed on
22 quarry faces near the study site and
23 have been associated with subhorizontal,
24 slice-kensided surfaces which were
25 identified in the rock core from



1 beneath the study site."

2 I guess we better ask you what you
3 mean by slickensided surfaces?

4 A. A sort of polished surface that
5 looks like a series of little fingers, except closely
6 spaced. It's where the rock has slid with respect
7 to another piece and leaves a polished surface
8 behind it. Quite often
9 we found them are cores as well. They were quite
10 often lined with a material. We never chased it down.
11 It might have been a bit of anhydride along the
12 line of some of these features. There was always
13 a sort of crusty material in them, as though they had
14 been filled in a bit.

15 Q. This is just an observation of
16 the features of these fractures as I understand it?

17 A. Yes.

18 Q. Did you observe the same in
19 your borehole logs?

20 A. Yes, we did. This was similar
21 to what we found. These are what we call the
22 transverse fractures that we described.

23 Q. All right, I will just quickly
24 go to the next page and then we can leave it until
25 after the break.

25 I would direct your attention to the



1 references and you can confirm for me that the two
2 Morrison Beatty references are N-186 and N-185, the
3 exhibits that we have in our hearing here, is that
4 correct?

5 A. Yes, those are the Phase 2 and
6 Phase 3 reports.

7 MR. McQUAID: Mr. Chairman, if this
8 would be a convenient time?

9 DR. KINGHAM: A very appropriate time.
10 We will reconvene at a quarter to 2:00.

11 --- Luncheon Adjournment (12:30 p.m.)

12 --- Upon resuming at 1:45 p.m.

13
14 DR. KINGHAM: Thank you, please be
15 seated. Mr. McQuaid.

16 MR. McQUAID: Thank you.

17 Q. Mr. Sobanski, just before we
18 go on to discuss the results of the Hewetson study
19 regarding the hydraulic head, there are a couple
20 of points I would like to go back and discuss with
21 you to be sure I understood them.

22 During the course of the discussion
23 with respect to, I think it was the installation of
24 wells, you commented on the fact that when you had
25 gone back into, I guess the same wells that you had



1 encountered dye, at least in one of the wells; is
2 that correct?

3 MR. SOBANSKI: A. My recollection was
4 there were several wells, about three, in the WAT 2
5 nest to the north of the site.

6 Q. We actually had some specific
7 discussion about the technique that had been
8 followed and as I understand it, that dye was
9 actually put in in order to determine whether the
10 problem which Miss Hewetson had addressed at page
11 6 over to the top of page 7, still existed. That
12 is whether or not the bentonite slurry sealed the
13 leaks that had been occurring around the well.
14 The dye was put in to determine whether or not the
15 corrective measures had worked or not; isn't that
16 the case?

17 A. I couldn't tell you. My
18 recollection was that our geologist knew the man
19 who had installed these and his indications were
20 that it had been introduced into the annulus
21 and observed for in the observation well. That
22 was one of our geologists who does our instrumentations,
23 speaking to the person who instrumented for Miss
24 Hewetson. I can't speak to that, I know we found
25 dye in the wells and I believe it was used to find



1 out if there was communication between zones, but
2 I am not exactly sure how they did it. It is third
3 or fourth hand now.

4 Q. Is it necessarily a problem if
5 you find dye in the well? In other words, would I
6 be correct that you would have to have that
7 information to know whether finding dye is good or
8 bad? For example, a well might not have been flushed
9 or something of that nature, since it was originally
10 installed?

11 A. I couldn't say.

12 Q. So you couldn't say whether or
13 not the presence of dye means that you would be
14 concerned with the results or not?

15 A. Well, the indications we had
16 was that it was introduced in a manner to find out
17 whether the probes were leaking or not. If it
18 comes up in our samples, I would expect that they
19 are leaking; that was the intent of it, my under-
20 standing.

21 Q. That is your understanding, fine.
22 However, when you come along now, some few years
23 after, I guess my point is really if it was put
24 in to find out that it was leaking, the fact that
25 there is still dye there may be just consistent



1 with the fact that nobody has flushed the dye out,
2 or run the well since it was put in?

3 A. Yes, but you see that isn't how
4 they are set up though. I don't think they put,
5 I may be wrong, but I don't think they put the dye
6 down with the small tubes. When you run these packages
7 in, they put them into water and then you fill the
8 annulus with water and the packing starts to expand.
9 They expand because they are in contact with water.
10 I would think that it was some time after that that
11 the dye was introduced to find out whether it was
12 leaking or not. It isn't there as a result of not
13 flushing them. It is there as a fact that the
14 packing leaked or something leaked in the system.

15 Q. All right, well let us leave
16 that. One other area that you expressed some concern
17 or reservation about was the tritium data?

18 A. Yes, only that I didn't understand.
19 I found Miss Hewetson's table of tritium data in
20 it and I can see now what she has reported there.

21 Q. Are you referring to page 31?

22 A. Yes, I didn't review this
23 entire document last night.

24 Q. So if I look at page 31, I
25 actually see the tritium data and if I look back



1 at page 28, we actually see where the distribution
2 of the sample wells are found?

3 A. Yes, that is right. What appears
4 is that the two dates have been put together here,
5 November of '83 and May of '84, in terms of
6 sampling and then the actual values obtained are
7 plotted on Figure 8. In other words, if they had
8 zero -- it is reported here as zero plus or minus
9 2, but it is probably zero. We have OW13-3 as 3
10 plus or minus 2. So it may, if we use 3 as the
11 marker, it may or may not be a pre-1952 water.
12 Some of these values are very close. For instance
13 OW17-2 and 3 are essentially at the detection
14 limits, so it would be difficult to tell if it is
15 new or old water in that location.

16 Q. You are bringing to our
17 attention that there are some at that level but
18 there still are a significant number, are there not,
19 that are above that?

20 A. Oh yes, there is no question
21 of that. Again, we found similar results at one of
22 our nests as well, which would lead us to believe
23 that tritium has arrived at depth in some locations.

24 Q. Let us turn now, if we could,
25 to the hydraulic head data and one of the reasons that



1 I have discussed it in this order is that I think
2 this is the order we have been going through the
3 discussion, at least in the report on D, and I think
4 the report on F.

5 I wanted to, the text on hydraulic
6 head begins at pages 9 through 11. I wanted to start
7 with you, if I could, Mr. Sobanski, at page 25 we see
8 a Figure 5: hydraulic head distribution in the
9 shale. Just so everyone can follow where you might
10 be, we have a blow-up of that figure, which I would
11 just ask you to, Mr. Beechinor, if you would put
12 it up on the easel behind you. Mr. Chairman, maybe
13 I could ask that this be marked as an exhibit. I
14 am not sure whether....

15 DR. KINGHAM: In keeping with the
16 earlier marking of E-214, this is Figure 5. Can
17 we call this E-214D5?

18 --- EXHIBIT No. E-214D5: Enlargement of Figure
19 5 from Hewetson report.

20 MR. McQUAID: Q. Mr. Sobanski, that
21 is looking at a cross-section, concentrating on the
22 Bayview Park landfill. I am wondering if you could
23 just give us the approximate outline of where Site F
24 would be in relationship? Could you just draw a
25 line at the north end and the south end? We see
King Road at the lefthand side, the North Service



1 Road down at the right. Just outline for us, if
2 you would, Site F. The site a little to the
3 north of WAT - 2 is the first well we see on the
4 lefthand side?

5 A. Yes.

6 Q. Continuing then?

7 A. Down to the vicinity a bit south
8 of WAT 7.

9 Q. Now the upper part of this
10 figure is easy enough to understand. We see the
11 well locations, the WAT and the OW locations but
12 below that down in the lower third, beginning at
13 WAT 2 and then continuing over to OW18, we see a
14 series of graphs. Could you just explain those to
15 the Board?

16 A. There isn't really anything to
17 explain on the graph, but on the lefthand axis,
18 would be the elevation of various piezometers along
19 the Y axis. Along the X axis would be the hydraulic
20 head in metres above mean sea level.

21 Q. All right, take the WAT 2 if
22 you would, it is up at the upper part of the site.
23 On the drawing above, would you just draw a line
24 across at elevation, about elevation 155 and also
25 at 140. Would you just draw it through that point



1 where the WAT-2 well cuts down through those? I
2 mean up above.

3 A. I'm sorry, up above.

4 Q. Just draw a line so we can
5 discuss it. Then would you continue drawing a line
6 right through to the Bayview Park landfill?

7 A. Both of these lines?

8 Q. Please.

9 A. It will have to be approximate.

10 Q. That's all right. Now looking
11 at the lower lefthand graph this is, as I understand
12 it, Mr. Sobanski, indicating what the hydraulic heads
13 are at various depths in the actual well WAT-2,
14 concentrating on that one for a moment?

15 A. Yes, in the various piezometers
16 in WAT-2.

17 Q. In the various piezometers, right.
18 Could you confirm for me that there
19 are a significant number of piezometers in WAT-2
20 or any of the other WAT wells? There appear to be
21 maybe eight or nine, in excess of eight or nine,
22 whereas you might put four in in yours?

23 A. Yes, that is right.

24 Q. If we take the 155 elevation,
25 both up above on the elevation graph or down below



1 and we read across to that line that has the V going
2 in at 140 on WAT-2, we would get an indication that
3 the hydraulic head at 155 is, maybe you could just
4 give me what your estimate would be of what that
5 head is?

6 A. About 166.

7 Q. So at 155, the hydraulic head
8 is 166. Is that feet?

9 A. That would be in metres. I
10 believe it is.

11 Q. Then down at 140, the head goes,
12 drops to something between 150 and 160?

13 A. That would be about 154 perhaps.

14 Q. Okay, 154 metres.

15 Am I correct also that the hydraulic
16 head calculations down below also help us to under-
17 stand the direction of the groundwater flow?
18 The direction is always at right angles to the
19 hydraulic profile?

20 A. Are we talking now of --?

21 Q. I am really talking about the
22 ones underneath the lower part. In other words,
23 you can draw a right angle, as I understand it, to
24 each of those segments of the line and that would
25 give you some indication of the direction that the



1 groundwater is flowing?

2 A. I wouldn't do it that way.

3 Q. You wouldn't?

4 A. No, I don't believe so. It
5 is an indication of direction as to whether it's
6 going up or down, but I don't think I would do it
7 quite in that manner.

8 Q. Can you indicate to the Board,
9 we have talked about the V that goes in at WAT-2.
10 I direct you to the fact that there is one at WAT-4
11 and one at WAT-7?

12 A. At WAT-4 I see two possible
13 zones. In fact one at elevation about 115 metres
14 and another at approximately 100 metres. WAT-7
15 is very zig-zaggy. There is one at about 100
16 metres on this drawing.

17 Q. Do you want to just put an
18 arrow on those as you are going through there?

19 A. Yes. The major one?

20 Q. Yes.

21 A. One there at, as I said, about
22 115 and another one here at roughly 100. Another
23 one on WAT-7 at about 100. Another blip at about 92
24 and another at about 82.

25 Q. And then one over at WAT-2?



1 A. WAT-2 is essentially one blip
2 and we have to keep in mind that we are looking for
3 stabilized water levels. Miss Hewetson has instrumented,
4 it probably blocks the material in here that are
5 very, very tight and are going to take some time to
6 recover. So the question will be whether these are
7 stabilized levels or not.

8 Q. These low hydraulic head numbers,
9 am I correct they indicate that there is major zones
10 of transmission of groundwater, is that correct?

11 A. If they are stabilized they
12 could be, yes. These are in some cases the zones
13 that we mentioned to the Board where you see the
14 increasing hydraulic gradient with increasing depth.
15 The lower water levels within our highly fractured
16 unit for example, where we have the lower heads.

17 Q. I am going to come back to that
18 and comment on that, but first let me go to what
19 Miss Hewetson had included and just ask you whether
20 you agree with her or not? I will take you back to
21 page 9 and I refer to the first paragraph. Does
22 this help you to indicate whether these are
23 stabilized water levels or not?

24 A. I don't believe that WAT-7
25 was stabilized. I haven't checked all of them, but



1 we have all the readings for WAT-7. We know, for
2 example, that this lower unit does not exist. That
3 the water levels in the lower zone at WAT-7 are
4 much higher than indicated by Miss Hewetson a
5 couple of years later. She had constructed in various
6 types of material that might have been very tight
7 and if we go to the main report, we will see that
8 this head in the lower unit is much higher than
9 indicated by Miss Hewetson.

10 Q. Let me ask you just on that,
11 would you expect there would be no change at all
12 in the hydraulic heads over those two units
13 in fractured shale of this nature, or is there
14 likely to be some variation? Do the fractures develop
15 over a couple of years, or it could change over
16 a couple of years?

17 A. Yes, we could get some
18 variations in those data, but not 20 metres.

19 Q. I am sorry.

20 A. We could get fluctuations.
21 We would expect a metre or two of fluctuation over
22 time perhaps, but our elevation for her bottom
23 piezometer in terms of static water level is 109,
24 which puts it out, nearly off the graph. It would
25 mean that we have had a water level fluctuation of



1 nearly 20 metres and I won't buy that as a natural
2 water fluctuation.

3 Q. What is it that you are saying?
4 That she measured the wrong elevation or you got
5 a different number?

6 A. I am saying that her wells
7 weren't stabilized when she measured these.

8 Q. Can you draw the profile that
9 your WAT-7 would indicate on that?

10 A. It would take a moment to draw
11 it, but we can draw it, yes.

12 Q. Leave that for now and we'll
13 come back to it at the afternoon break.

14 A. Our value for this, and I haven't
15 checked them all.

16 Q. I had better ask you.

17 A. Appendix 5, the one in
18 Appendix 5, we have the static water level here,
19 is 109 at that elevation.

20 DR. KINGHAM: At which elevation.

21 MR. SOBANSKI: That would be at
22 the bottom of the hole.

23 Above elevation 82.

24 Our value is 109 from our report. Suddenly you
25 can see that that deflection in has changed a great deal.



1 Now the lowest elevation that we have would occur at
2 WAT No. 7. Sorry, I am wrong there. The lowest
3 elevation would be at WAT-10, this is WAT 7-10

4 Q. Can you give us an appendix
5 that that is in?

6 A. Yes, it is the water level data
7 that we measured in April of 1986, Appendix 5 and
8 it is the one, two, three, fourth page, about a
9 depth of 87 metres is the lowest water level
10 elevation that we measured at about 92.58. So, the
11 indication of the permeable zone in that well is
12 occurring roughly in the area of elevation 90 metres
13 as opposed to 80 metres, as indicated by Miss
14 Hewetson.

15 Now, I haven't gone through all of
16 these, but that was one that stood out as I reviewed
17 my report versus hers last night.

18 Q. Now we are going to come to that
19 because I want to connect your report and hers a
20 little later when we get into yours. At this point
21 let me just understand whether you have a different
22 vertical profile of WAT 7 from what she has?

23 A. Yes, I do.

24 Q. Can you just take the two
25 minutes to do that right now?



1 A. Sure. I am just calculating
2 the depth of the piezometers on her scale.

3 Q. I am sorry, have you got that
4 on there right now?

5 A. Yes I'll put it on there right
6 now and we can join it up. At elevation 111.5, we
7 had a static water elevation of 115.12.

8 Q. Say those numbers again so
9 we are with you?

10 A. Yes. At elevation 111.5, we
11 have a static water elevation of 115.12. This is
12 taking the depth of the well in the third column
13 on the table and subtracting it from the ground
14 elevation to get the depth of the piezometer approxi-
15 mately.

16 Q. Which ones, give me the ground
17 elevation?

18 A. The ground elevation is 117.75
19 in all cases.

20 Q. Okay.

21 A. Sorry, yes, 117.75.

22 Q. You took then?

23 A. You subtract the depth of the
24 piezometer, which is 6.23 metres from that to give
25 you the depth of the piezometer, the elevation of



1 the piezometer approximately.

2 Q. All right.

3 A. Then the static water level
4 elevation is reported on the righthand side.

5 Q. All right.

6 A. In the final column. The next
7 one, the piezometer elevation is 108.8. That is
8 for WAT 7-2, it is 108.8. Approximately 109 and
9 the water level in that is 114.94, so it is very
10 close to the previous value. It is only two-tenths
11 of a metre off. WAT 7-3, the elevation of the
12 piezometer is about 106. The static water level
13 elevation is 114.2, so again just a bit of a change
14 about seven-tenths of a metre. These are very
15 difficult to plot, because I am dealing with such
16 a narrow scale at the top. WAT 7-4 elevation is
17 103.2 and it has a static water elevation of 112.79.
18 WAT 7-6 has a piezometer elevation of 97.8 and a
19 water elevation of 110.46. In other words, almost
20 the same as it was above in the previous piezometer.
21 WAT 7-7 has a piezometer elevation of 95 and a
22 static water elevation of 112.55, so here we can
23 see that the water elevation has come up a little bit.
24 Bear with me, please.

25 Q. Mr. Sobanski, I am going to ask



1 you to suspend this for a while.

2 A. I have a problem, because I am
3 having difficulty with the scale.

4 Q. Let us not take the Board's time
5 at this point. We can get this at the break and come
6 back to that.

7 You are going to have a slightly
8 different pattern and I think what you are pointing
9 out is that your --

10 A. Ours is more uniform than hers.
11 We are losing some of the blips. For example at
12 the 100 elevation, she has it plotted about 104 metres
13 and ours is 110.5. That is quite a big change.
14 I didn't check all of these last night. We find,
15 Mr. Beechinor advises me he has checked it at other
16 times and we have a much smoother curve than Miss
17 Hewetson's, because the wells have had a longer
18 time to stabilize in some of these tight zones.

19 Q. I am going to ask you to do that.
20 At this point what you are saying is you have
21 presumed that when Miss Hewetson drew her profile
22 that the wells were not in equilibrium or stabilized?

23 A. They may not have been. It
24 would appear that way because in some cases we have
25 some very large changes in water elevation.



1 Q. Is it mainly WAT 7, is that the
2 main one?

3 A. That was the only one that I had
4 time to look at last night because I picked one with
5 three blips on it just to satisfy myself and found
6 that our information was indicating something else.

7 Q. Is it your evidence that the
8 levels that you have been giving us then from these
9 appendices are stabilized water levels?

10 A. Well, these were put in before
11 we touched the wells, so I would hope so. They have
12 been sitting there for many years. If they are not,
13 then, you know, part of our curve is matching Miss
14 Hewetson. The upper part is. It is within these
15 little troughs that we seem to have a difference.

16 Q. How about when you did your
17 own wells, did you stabilize them?

18 A. We believe we did. We have
19 presented for your inspection all of our hydrographs
20 so you can judge for yourself whether they are
21 stabilized or not. They are all in the report.

22 Q. Going back to page 9, let us
23 just pick up in the text here what Miss Hewetson
24 had reported on these hydraulic heads and these
25 profiles that we have been discussing. The second



1 paragraph says:

2 "Most of the vertical profiles are very
3 irregular, exhibiting some large
4 differences in hydraulic head over very
5 small changes in depth. Vertical
6 gradients range from 0.09 to 8.45
7 in the upward direction, while downward
8 gradients are commonly over 1.0, but
9 may reach as high as 8.70."

10 Just stopping at that point, the comment
11 is that the vertical profiles are irregular,
12 exhibiting some large differences in hydraulic head
13 over very small changes in depth. Do you agree with
14 that comment?

15 A. I think the fact is there are
16 vertical gradients at the site and I don't think
17 that given what I have just said, I would necessarily
18 agree with these values without checking them.
19 I doubt that our gradients were very often over 1.0,
20 in a saturated medium, one wouldn't expect them to
21 be greater than 1.0 unless there is a very tight
22 layer involved. Certainly I don't believe we
23 saw anything in the order of these values of 8.
24 We had a smoother curve than Miss Hewetson did.
25 However, I would have to check that. I didn't go



1 that far in my calculations.

2 Q. Let me ask you about the next
3 sentence which deals, comments specifically on
4 WAT 2 to WAT 4 and WAT 7, so let us focus on those
5 for a moment:

6 "At WAT 2, the gradual decrease in
7 hydraulic head found in the upper
8 portion of the rock is interrupted at
9 the 140 masl elevation by a drop of
10 over 12 m. Similar extreme changes in
11 hydraulic head can be seen in profiles
12 at WAT 4 and WAT 7."

13 Now first of all I'll ask you, her
14 profiles indicate that, do they not?

15 A. Her profiles, given her data,
16 indicate that, yes. We may take exception to it
17 with the new data, but we didn't monitor WAT 2 for
18 example, so we can't comment. We did, we really in
19 this group only did 7, it is the only one I can check
20 of this group.

21 Q. All right. Looking at those
22 profiles, and just at this point assuming they are
23 correct, am I correct that the water levels, the
24 gradients that are indicated there indicate that
25 water levels are going both up and down?



1 A. Yes. We assumed a zone of higher
2 conductivity. In WAT 4 for example, at 115, then there
3 would be some flow indicated into the zone from
4 below and some flow down from above, according to
5 those gradients.

6 Q. There is a comment here. I am
7 reading in the middle of this paragraph on page 9:

8 "At WAT 4, the water level centred on
9 the 100 masl elevation is 20 m below
10 water levels for adjacent sampling
11 intervals."

12 Now, am I correct, just go back to
13 " WAT 4 for a moment?

14 A. Yes.

15 Q. You point to, could you point to
16 that 100 masl elevation?

17 A. Yes.

18 Q. And Miss Hewetson shows that
19 there is a dramatic drop there. The number goes
20 back to, what does it go to, from what to what?

21 A. It goes from, in the order of
22 124 metres or so down to about 101 metres.

23 Q. All right. Yet, when we look
24 at WAT 3, and we look at -- can you point out WAT 3
25 which is just to the north of WAT 4?



1 A. Yes.

2 Q. And we look at WAT 5, which is
3 just to the south of WAT 4, we do not see that
4 dramatic decrease in levels, do we?

5 A. No, that's right.

6 Q. Now, that is the comment she is
7 making at this point. The WAT 4 level, the WAT 4
8 well in terms of drop in water level does not appear
9 to be connected in this case to the WAT 3 or the WAT 5
10 does it?

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11 A. Not if you assume they were
12 stabilized, but we haven't rechecked that.

13 Q. Let us leave that for a moment.

14 A. That is important.

15 Q. I realize that. You will have
16 a chance to comment. The data that she is reporting
17 right here and the observations that she is making
18 indicates that at WAT 4 there is a 20 metre drop in hydraulic
19 head between the adjacent sampling areas whether it
20 be WAT 3 or WAT 5?

21 A. Yes, that's right.

22 Q. Your position when we get into
23 the report is that there is a strata there or a
24 highly fractured zone and that that data would be
25 completely different and would show an interconnection at those



1 100 masl elevation through these zones; isn't that
2 correct?

3 A. Not necessarily. We mentioned
4 that there may be areas here where the rock is
5 relatively competent all the way through and wouldn't
6 display this sort of a feature. Our basis is based
7 on actual pumping tests of the cone of influence that
8 we threw out and affected other wells with. It has
9 nothing to do with hydraulic head. It is due to a
10 very detailed pumping test. I wouldn't have relied
11 just on that type of data to tell me the continuity
12 of the zone. This would just be an indication that
13 there is a zone there. It was the pumping test that
14 wrapped it up for us.

15 Q. If there was a continuity of
16 zone, would I not be correct that at WAT 3 and WAT 5,
17 you would see the same lead back to 100 metres that
18 you see on WAT 4?

19 A. That would be at WAT 3, it is
20 a drop of some 5 metres or three or four metres
21 as it has come from the upper piezometer to WAT 3.
22 That zone may be indicated as being in WAT 3 also.
23 There is an indentation there if you want to look
24 at the exact data that is here. We can't tell in
25 WAT 3 because we didn't go deep enough on what the



1 100 metres zone is here -- sorry it would be the 100
2 metre zone, it's got a small indentation in it.

3 Q. Very small.

4 A. Very small.

5 Q. By 20 metres?

6 A. No, not 20 metres.

7 Q. How about WAT 5, there is no
8 indentation there?

9 A. WAT 5 has an indentation at
10 about 115 metres and another one at about 105
11 metres.

12 Q. So your evidence is that you
13 wouldn't expect necessarily to see the same pattern
14 through your highly fractured zone in these hydraulic
15 profiles; is that what I understand?

16 A. We get, they may not be exactly
17 the same elevation all the time.

18 Q. Based on what you just said,
19 they can range from, in the case of WAT 5, what is
20 it, two or three metres to 20 metres?

21 A. According to this information,
22 yes.

23 Q. Just continuing in the next
24 paragraph or the next sentence:

25 "At WAT 7, there are two vertical



1 zones with water levels that deviate
2 almost 3 metres from the general
3 downward trend indicated by other
4 water levels in the multilevel device.
5 Absolute shifts in hydraulic head are
6 smaller for the remaining multilevel
7 devices and conventional west nest,
8 but still produce variable profiles."
9 You have some serious questions about
10 WAT 7, is that what I understand?
11 A. WAT 7, we have other information
12 for it.
13 Q. Going over to the top of page 10:
14 "In most cases, extreme high and low
15 hydraulic-head values occur over only
16 1-2 m vertical zones and do not
17 correlate well between monitoring
18 devices."
19 Now, first of all does her data
20 indicate that?
21 A. First of all, at WAT 3 and WAT 4
22 there is a zone, there is an indentation at about
23 100 metres in both of those wells. It occurs at
24 WAT 7 also, at about 100 metres, although we are
25 going to be widening that out eventually. But at



1 about 100 metres in WAT 7, in WAT 4 and in WAT 3
2 we have an indentation. Now if we go further down-
3 stream from that and look at OW13, 16 and 17, now,
4 mind you, these are across, they are going into the
5 picture. We have an indication of some sort of a
6 zone coming in, in the order of between 100 and 95,
7 indicating some continuity across this cross-section,
8 17, 13, 16, which is running into the figure at about
9 the same depth. We have a decline in water level
10 starting at about the 100 metre level. That indicates
11 there may be a zone there with some continuity to it.
12 Other zones, OW12, it doesn't have enough data in it.
13 OW11, we can see that there is a fall off from the
14 110 level down to the 100 level, indicating perhaps
15 a decrease in hydraulic head. So, you know, it depends
16 how you want to interpret this. You just, you could
17 see zones here occur around that 100 metre level.
18 There could be some continuity to them.

19 Q. Well, I thought, maybe I had
20 misunderstood your highly fractured zone. I thought
21 that you were of the opinion that your highly
22 fractured zone continued across the entire Site F;
23 is that correct?

24 A. I don't know exactly where
25 the highly fractured unit is, as we get further back



1 into the site. We have, we feel that it could end
2 in an area of our OW4, but we don't have an exact
3 fix on it, we don't have holes that are deep enough.

4 Q. You don't know whether it is
5 across the northern part of the site or not, is that
6 what you're telling me?

7 A. If we had used the 100 metre
8 zone as a sort of marker here, which is about the
9 elevation of that unit, WAT 4 might fall into that
10 unit, WAT 3 might fall into that unit, while having
11 these indentations at 100 metres. There is some
12 indication OW11 will fall off towards 100 metres.
13 We would have to check on WAT 7, WAT 7 comes
14 into the pumping test so we'd know what happened
15 in WAT 7. We know which ones drew down in WAT 7.
16 That occurred at the 100 metre mark. That will tie
17 together.

18 Q. How about your comment, I draw
19 your attention to the last sentence of the first
20 paragraph on page 10. This is commenting in this
21 section and it says there is extreme high and low
22 hydraulic head value.

23 "Distinct differences exist between
24 profiles at WAT 3, WAT 4 and WAT 5,
25 each separated by a distance of about



1 50 m."

2 "As a result of these variations, hydraulic
3 head values are sometimes highest at
4 WAT 5, suggesting local groundwater
5 flow opposite to the regional topo-
6 graphic slope."

7 You don't agree with that?

8 A. I really don't know, I really
9 couldn't say. I'd have to look at that well in more
10 detail using stabilized values. I saw that, I've
11 marked it. There would be no way I could comment
12 on it.

13 Q. Then dropping down on page 10
14 to the last paragraph where Miss Hewetson said:

15 "The zones of extremely low hydraulic
16 head in vertical profiles at WAT 2,
17 4 and 7 are believed to be major zones
18 of groundwater transmission in the
19 shale. These zones may be related to
20 fractures that have developed in the
21 Queenston Formation"

22 and then it goes on to describe what they would be,

23 ".... large, soft-sediment
24 deformation shears due to stress
25 release."



1 A. I don't believe we have any
2 quarrel with that. We do have zones of higher
3 hydraulic conductivity within the shale.

4 Q. As I understand it, you believe
5 that the zones are across all these profiles that
6 we've seen generally, isn't that the case? They
7 are not limited.

8 A. We have drawn our model as
9 indicating that it pinches out somewhere in the
10 vicinity of the Bayview Park landfill.

11 We have no data on which to draw any
12 extension towards the north, mainly because of the
13 extreme depth that we are drilling to. We are
14 talking about having to drill 200 metres or more to
15 get through this zone and look at that profile.
16 There comes a point where I think you have to be
17 practical and say how far are we going to go with
18 this, particularly when our area of real interest
19 on this site is the southern end, from which the
20 leachate might move if there were a problem. So
21 we have concentrated our efforts down towards the
22 south where we are looking whether or not we can
23 intercept any leachate that may be in the shale.

24 Q. You mean you are not interested
25 in whether the leachate goes contrary to the regional



1 topographic slope that is referred to here on page 10?

2 A. I don't know what you found in
3 WAT 5 and we haven't analyzed it, but if the water
4 levels haven't stabilized, I am not sure what results
5 you would have. You could have a tight section too
6 that's holding water up.

7 Q. You say you have no data?
8 We had a discussion this morning as to something as
9 simple as whether there may be till on the Bayview
10 Park site and you brought in the Morrison Beatty
11 well as some significant indicator that would allow
12 you to say it wasn't till or something of that nature
13 across most of the site. Are you saying that this
14 is not data that you should have analyzed or can
15 analyze?

16 A. No.5.

17 Q. The whole report?

18 A. The whole report. We looked
19 at the report, but overall, knowing how this site
20 was instrumented and how we instrumented, we relied
21 more on our own data base. We instrumented it
22 differently then. Then in this particular study we
23 felt it had some shortcomings and certainly we
24 relied more heavily on our data base.

25 As far as this morning's conversation



1 on the till, the logs are what the logs are and what
2 was logged was some smear of material coming up off
3 the augers. We have had garbage sitting on that
4 material for nearly thirty years.

5 Q. I am not going back to the
6 Bayview Site now. This is strictly with hydraulic
7 heads.

8 A. You mentioned that.

9 Q. I mentioned it because you
10 want to look at every piece of data. I'm asking,
11 don't you want to look at every piece of data this
12 afternoon also?

13 A. Sure I'll look at every piece
14 of data.

15 Q. Look at page 43 with me.

16 A. Yes.

17 Q. In the second paragraph, just
18 to give you a context, this is back at page 42,
19 Section 10.4, it's talking about the distribution
20 of three chlorinated organic compounds in groundwater.
21 You will see the second sentence there it is
22 referred to as TCA, CB and PDCB and they were
23 established using WAT 2 and WAT 2 you will see over
24 on the display behind you there?

25 A. Yes.



1 Q. Going over to page, the top of
2 page 43, Miss Hewetson's report says:

3 "CB was not found at either of the
4 above locations. TCA and PDCB were not
5 found in groundwater at OW 5 but were
6 present at significant levels in the
7 piezometers at WAT 2. Any influence
8 on TCA levels by packers used to
9 isolate sample intervals at this location
10 and known to contain this compound, is
11 not expected to be great and will be
12 discussed later."

13 I draw your attention to the next
14 paragraph:

15 "A more likely explanation for the
16 anomalous results at WAT 2 involves
17 hydraulic conditions within the rock.
18 Hydraulic head profiles are typically
19 very irregular with depth in the
20 shale so a zone may exist beneath
21 the refuse in which hydraulic head is
22 higher than that at the two sample
23 piezometers at WAT 2. If a fracture
24 connection exists between the locations,
25 it is conceivable that contaminants



1 could move with groundwater to WAT 2
2 in response to the head differential."

3 I asked you to draw the two lines on
4 Figure 5 which you have behind you there. 155 and
5 140 intercept the Bayview Park landfill site?

6 A. Yes, they do.

7 Q. Let me finish, Mr. Beechinor
8 and then you can tell Mr. Sobanski what you want.
9 You will see that the 155 and the 140 intercept
10 the Bayview landfill site?

11 A. Yes, they do.

12 Q. Therefore, if those profiles are
13 correct the leachate and these organic components
14 that Miss Hewetson is referring to, in fact can
15 move northward to the WAT 2 well that we see on
16 E-214D5, am I correct, isn't that what she was
17 saying?

18 A. No, I would say not. The
19 hydraulic potential in the piezometer that she is
20 measuring the organics in has a head of something
21 in the order of 165 metres, while the water level
22 within the Bayview site is quite a bit lower than
23 that.

24 Now if we want to go higher and higher
25 up gradient, then perhaps the point could be made



1 right at King Road. Again though the hydraulic
2 potential in that piezometer is probably just about
3 the same as the hydraulic potential in the Bayview
4 landfill. She didn't find it, she wasn't looking at
5 that zone, she looked at one of the high piezometers
6 and one of the low piezometers. The hydraulic
7 potential in the second or third piezometer down
8 would be about 165 metres or more at least. That
9 occurs way back in here at the most. It certainly
10 isn't within this zone. Most of the landfill has
11 hydraulic potential below 155 metres.

12 Q. All right. So you are saying
13 her observation then is not correct?

14 A. Not necessarily correct, that
15 is right. Not unless water goes uphill.

16 Q. Unless the fractures and
17 the hydraulic heads are such that the water can,
18 the water in fact is pushed against what I guess
19 has been referred to as this regional flow?

20 A. It won't go against the
21 prevailing gradient though.

22 Q. All right. Let us go back
23 then to page 9, 10, 11. I read to you the last
24 part, sorry, the sentence beginning at the bottom of
25 page 10 and continuing over to page 11 and then



1 there is some general observation made with respect
2 to the fractures and examination at other quarries,
3 as you will see down in the second paragraph on page
4 11. This section ends with the sentence:

5 "The limited extent and changing
6 orientation of these soft-sediment
7 deformation shear fractures appear
8 consistent with the restricted lateral
9 extent of zones of marked low hydraulic
10 head in the shale."

11 A. I'm sorry I haven't found the
12 place.

13 Q. The last sentence before
14 Hydraulic Conductivity.

15 A. You were reading the last
16 sentence?

17 Q. Just read that, please.

18 A. I have no particular comment
19 on this. I don't think it is a conclusion she
20 has drawn from what she has seen along quarry faces
21 and some other quarry 50 kilometres north of this
22 site from a personal communication. I really don't
23 know how to respond to that.

24 Q. Let me go over to page 17 and
25 the first three sentences on that page. We touched



1 on these this morning, but having examined the
2 hydraulic head profiles, I just want to go back and
3 summarize the differences between you and Miss Hewetson
4 as I understand them. The first sentence on page 17
5 says:

6 "The hydraulic head distribution in
7 the shale is very irregular."

8 Your evidence this afternoon, I think
9 your comment earlier this morning was specific, that
10 you didn't find it as irregular as she did?

11 A. We believe that we can explain
12 the irregularities in the hydraulic conductivity.
13 I agree it is irregular. She said it is irregular
14 with depth, and I agree and I think we have an
15 explanation for why it is irregular.

16 Q. "Equilibrium water levels can
17 change by as much as several meters
18 over a 2 m change in depth."

19 A. Yes, this is according to her
20 data.

21 Q. But you don't agree with it?

22 A. We will plot up the No. 7 which
23 we have and then we'll see.

24 Q. "Marked low values of hydraulic
25 head may indicate the presence of



1 major zones of groundwater
2 transmission in the shale. These zones
3 do not correlate between monitoring
4 locations and therefore appear to have
5 a restricted lateral extent."

6 Do you disagree with the restricted
7 lateral extent? You did this morning.

8 A. Restricted in some cases. We
9 did discuss, however, it would appear that if we do
10 project the lows through, we can find zones there at
11 about 100 metres in several wells and also at some
12 elevation between 100 metres and 90 metres can be
13 derived from the profiles.

14 MR. McQUAID: Mr. Chairman, I see
15 it is 2:50 and I have finished this section of the
16 report. This would be a convenient time for an
17 afternoon break.

18 DR. KINGHAM: So, we will resume in
19 fifteen minutes.

20 --- Short Recess

21
22 DR. KINGHAM: Thank you. Please
23 be seated.

24 MR. McQUAID: Q. Mr. Sobanski, at
25 the break, Mr. Chairman can you give me some



1 indication, will we adjourn tonight at 4:30?

2 DR. KINGHAM: Yes.

3 MR. McQUAID: Q. You plotted on
4 Exhibit E-214D5 in red on the vertical profile
5 WAT 7, another line, is that correct?

6 MR. SOBANSKI: A. Yes, I have.

7 Q. That is your interpretation or
8 your measurements of what WAT 7 should actually look
9 like and correspondingly the disagreement you have
10 with Miss Hewetson about what it looks like?

11 A. Yes, in general we have plotted
12 the points that we have measured and two points near
13 the bottom, 9 and 10 have been marked with a circled
14 question mark. Miss Hewetson is advising me that
15 the way to read her piezometers are that they are
16 set at equal intervals and any place where she has
17 left a gap was a piezometer that she highly
18 suspected of being inoperable. So, we have gaps
19 within that system at these two question marks of
20 piezometers. We did not know that.

21 Q. You didn't know that before
22 the break?

23 A. That's right.

24 Q. When I look at WAT 7 on the
25 upper portion and I go down the little squares that



1 show where the multilevel device is, we see that
2 when you go down to 9 and 10, the ninth and tenth
3 square down is missing and there is an 11 and a 12?

4 A. Yes, that's right.

5 Q. So the 9 and 10 were plugged,
6 as I understand it; is that correct?

7 A. She suspects that they may be
8 plugged. We don't know that and we monitored them
9 in any event so they are in our data base.

10 Q. So the first time that you
11 plotted them is over this break and the first time
12 that you had the discussion about whether those,
13 what those gaps mean in terms of plugs or not is
14 over the break, is that correct?

15 A. Yes, that's right.

16 Q. So why do you put a question
17 mark there? How can you even draw the line
18 vertically to 100 metres or 90 metres at that point?

19 A. Well, it was already drawn and ---

20 Q. Already drawn, but it was plugged?

21 A. I left the line to indicate
22 where our data had plotted it because we measured
23 it and I have just put a question mark because Miss
24 Hewetson has questioned it really.

25 DR. KINGHAM: I would like to know



1 which line is there and which line is not. Are you
2 showing a dramatic drop as the result of your data,
3 Mr. Sobanski, that goes into the 90 foot, 90 metre,
4 that is from your data?

5 MR. SOBANSKI: That is from our data,
6 Mr. Chairman.

7 DR. KINGHAM: As opposed to her
8 presentation, your data shows that line coming back
9 out at a depth of 85 metres?

10 MR. SOBANSKI: Yes, that's right. It
11 is Miss Hewetson who questions those two data points.
12 We report them here as measured.

13 MR. McQUAID: Q. If in fact those
14 question marks at piezometer 9 and 10 were plugged,
15 they would be measurements that you couldn't use?

16 A. That's right.

17 Q. And your line would be, really
18 the connection, would you connect them in green,
19 form me here at this point?

20 A. Yes.

21 Q. You have just continued down
22 there and you wouldn't have, you would have a
23 drop in hydraulic head and a lower point?

24 A. Yes, there would be a small
25 drop in the hydraulic head at about 85 metres.



1 Q. But before the break, as I
2 understand when you were talking about it earlier
3 and you were plotting those numbers off the appendices,
4 you seemed to feel that the dramatic drop there,
5 that has got the question marks on was coincident
6 with your highly fractured zone?

7 A. It probably still is. I mean
8 we are only talking two metres difference here. We
9 haven't changed it very much.

10 Q. Now, would I be correct that
11 this is the first time you have examined Miss
12 Hewetson's data in vertical profile?

13 A. No. We have looked at it before.

14 Q. Where are the figures, they are
15 not in your report?

16 A. We didn't put them in the report.

17 Q. Do you have them?

18 A. I am sorry.

19 Q. Do you have them plotted somewhere?

20 A. Which?

21 Q. These vertical profiles?

22 A. We've had a copy of the report
23 for some time.

24 Q. I realize that, but where are
25 your versions? They are not in your report, are they?



1 A. Yes, they are in our report.

2 Q. Vertical profiles of the same
3 nature?

4 A. Of this nature here, no, no
5 we haven't plotted those.

6 Q. My question to you, have you
7 ever plotted them before this afternoon and you said
8 yes, and I said where are they? They are not in your
9 report.

10 MR.HODGSON: The question was, have
11 you considered this report before?

12 MR. McQUAID: No, that was not the
13 question.

14 MR.HODGSON: Ask the question.

15 MR. McQUAID: I want the question that
16 I asked earlier, answered. Have you plotted these
17 before and you said yes and I said were they in
18 your report and you said yes. I said where were
19 they and you said, no they are not in my report.

20 A. No they are not in my report.

21 Q. Now you have plotted them?

22 A. When I said they were in the
23 report, I was referring to the hydrographs, not
24 this type of profile. I'm sorry if I misunderstood
25 your question. Hydrographs are for water level



1 measurements and they are in the report.

2 Q. What is it you are referring to
3 so I'll know?

4 A. I am referring to water level
5 data for various observation wells.

6 Q. What appendix is it so I'll
7 know what it is?

8 MR. BEECHINOR: It's in Appendix 8.

9 Q. Appendix 8, Groundwater
10 Hydrograph. You plotted it in a completely different
11 manner. A hydrograph is a different set up, not in
12 this manner.

13 MR. SOBANSKI: A. That's right.

14 Q. And at WAT 7, do you have a
15 WAT 7 in your appendix?

16 MR. BEECHINOR: A. Yes, we do.

17 Towards the end, this is the last three hydrographs
18 in Appendix 7, the last four hydrographs.

19 Q. Did you use all of the data
20 which would be missing from Miss Hewetson's because
21 they may be plugged piezometers?

22 A. We used all of
23 the information from all of the monitors at the
24 drilling site. We were not aware until a few moments
25 ago that two of the piezometers at that drilling



1 site were plugged.

2 Q. And that there are any others
3 that may be missing and may also be plugged. Do you
4 know whether there are others or not?

5 A. I presume there are others.

6 MR. SOBANSKI: A. We can see some gaps
7 for example at the top of WAT 3 and near the bottom
8 of WAT 4, there are two gaps there as well.

9 Q. Now let me go back to the discussion
10 that I referred you to at page 43 and you will recall,
11 Mr. Sobanski, I asked you about the result at WAT 2
12 and whether it was, whether you agreed with the
13 statement that Miss Hewetson makes in the third
14 sentence in that second paragraph?

15 A. Yes.

16 Q. And you do not, as I understand
17 it?

18 A. That's right.

19 Q. And then going over to page 44,
20 I direct your attention to one paragraph which I
21 think Ms. Cronk may have put to you, being the
22 second paragraph on page 44 and I will read it:

23 "TCA is a component of the Dowell seal
24 packer material, which is used in the
25 construction of multilevel devices.



1 Although these devices have rubber
2 sheaths to isolate packers from
3 groundwater, TCA may be diffusing
4 through this membrane. In addition, some
5 of these sheaths may have leaked
6 because of faulty seals where they
7 attach to the PVC casing or acquired
8 holes due to irregularities on the
9 borehole walls during installation. As
10 a result, it is also conceivable that
11 some TCA may be derived from direct
12 groundwater contact with the packer
13 material."

14 I think Ms. Cronk may have stopped at
15 that point and I want to read the next paragraph too:

16 "TCA concentrations in the monitoring
17 network are consistent between multi-
18 level devices and nearby conventional
19 piezometers so it is concluded that the
20 influence of the packer material on
21 the observed distribution is negligible.
22 The occurrence of PDCB, not a
23 component of the packer material, at
24 WAT 2 suggests that the TCA at this
25 location is probably landfill-derived.



1 In addition, groundwater collected from
2 WAT devices does not contain fragments
3 of packer material or have a
4 characteristic green colour imparted
5 by it as evidence of this type of
6 contamination. The concentrations at
7 WAT 7-11, WAT 2-3 and WAT 2-7 therefore,
8 are believed to represent conditions in
9 groundwater uninfluenced by packer
10 material."

11 Now, this is in the section that is
12 talking about looking for the three chlorinated
13 organic compounds in the groundwater, that is TCA,
14 CB and PDCB, which were established at WAT 2?

15 A. Yes.

16 Q. Can you tell me what is your
17 position on why PDCB is found at WAT 2, if it
18 couldn't have got there, as you told us before the
19 break, from the Bayview landfill?

20 A. Stan Feenstra will be responding
21 to that.

22 Q. That's fine, I'll get his view
23 when we come to it. What is your view?

24 A. I will pass to Mr. Feenstra
25 on that.



1 Q. You cannot explain it?

2 A. Mr. Feenstra is our organic
3 chemist.

4 Q. You wrote the main report. When
5 was Mr. Feenstra involved in this process?

6 A. He was part of the study team
7 almost throughout the whole process.

8 Q. You have no explanation that
9 you can give me, Mr. Sobanski?

10 A. Not offhand, no.

11 Q. May I take it then in your,
12 may I take it then that in this area of the report
13 of Miss Hewetson, beginning with what is referred to
14 I think as Part 2, beginning at page 33, that you
15 did not examine the report at all in this respect?

16 A. No, I did examine the report.
17 We have had Mr. Feenstra take a very close look at
18 it and he will be presenting evidence on it.

19 Q. Insofar as hydraulic connections
20 are concerned to Bayview and wells such as this WAT 2,
21 am I correct then that Mr. Feenstra is responsible
22 for that hydrogeological aspect and you are not?

23 A. In terms of hydraulic connection,
24 I guess I am the one that is the responsible person
25 for it.



1 Q. I would have thought.

2 May I take it this is one, this portion
3 of the report is one bit of data which you have not
4 had occasion then to consider before the discussion
5 we have had this afternoon?

6 A. No, we have looked at it, we
7 have discussed it with Ms. Cronk as well. It is
8 important to remember that even if the results are
9 real, it would not be inconsistent with the model
10 that we have presented to the Board that the
11 contaminants might have arrived at the property
12 boundary and what we pointed out was they were
13 at very low concentrations in any event.

14 Q. All right, while we're at
15 page 33 in the report, this is the second part of
16 the study. If I read the second paragraph on page 33,
17 it says:

18 ".... the chemistry of groundwater in
19 the shale was investigated to determine
20 the extent of landfill-derived
21 contaminant migration. The objective
22 was to evaluate the consistency
23 between the observed trends in
24 groundwater contamination and the
25 physical hydrogeologic conditions



1 described in Part 1."

2 It then goes on to indicate the mapping that was done
3 and refers to the travel distances compared to estimates
4 of contaminant generated by the Darcy relation.

5 Is this Mr. Feenstra's area also?

6 A. I have no problem with that.

7 As I said, the model we have used would predict
8 that if there were contaminants, organic contaminants
9 emanating from the site, they would probably have
10 arrived at the area they are seen in any event.

11 It wasn't inconsistent with our modelling results.

12 Approximately 30 years through the confining layer
13 to the underlying zone and relatively rapidly to
14 the property boundary which would put it in the right
15 range.

16 Q. Let me refer you over to page 46.

17 I refer you to the paragraph in the middle of page 46:

18 "The distributions of TCA, CB and PDCB
19 downgradient of the landfill provide
20 an indication that extensive groundwater
21 pathways exist from the landfill through
22 the shale."

23 Do you agree with that?

24 A. I agree that groundwater pathways
25 exist from the landfill through the shale, yes.



1 That is our conclusion as well.

2 Q. Are you quibbling over the word
3 "extensive"?

4 A. Yes, I am.

5 Q. I just want to know because when
6 we come to your report, the Board has to decide.

7 A. Yes.

8 Q. The second sentence:

9 "In addition, the maximum vertical
10 and lateral occurrence of these compounds
11 establishes minimum limits on a zone
12 in which groundwater has probably been
13 affected by the landfill operation that
14 began 23 years ago."

15 Any comment to make on that? Do you
16 agree or disagree with it?

17 A. We keep hearing different years
18 as to when this landfill was initiated. I have heard,
19 in Miss Hewetson's report, she says 1961. I have
20 heard numbers in the fifties as well, so I don't
21 know whether it is exactly twenty-three years.

22 Q. So the question mark in your
23 mind is the twenty-three years?

24 A. The twenty-three years, yes.

25 Q. "The distribution of the



1 chlorinated organic compounds provides
2 conclusive evidence that groundwater
3 contamination related to the landfill
4 exists as deep as 35 m and as far as
5 875 m downgradient ."

6 Do you agree or disagree with that?

7 A. Mr. Feenstra I think should
8 comment as to the reliability of the chemistry before
9 that conclusion is reached.

10 Q. Is the same conclusion true in
11 the next sentence:

12 "It is possible that groundwater
13 monitoring at greater depth and at
14 greater distance would show that the
15 zone of contamination extends much
16 deeper and much farther toward Lake
17 Ontario than these minimum limits."

18 A. I don't see any evidence from
19 that where we put our No. 14 nest, HCl4 and your
20 observation well 18. We instrumented that as deep
21 as 100 feet down an additional 30 metres which in
22 the section is getting quite deep into the shale
23 section when you compare it to the height of the
24 landfill. We didn't detect any of the light
25 organics in that particular well. So, I am not sure



1 that I would jump at that statement. I don't think
2 there is any evidence to support it.

3 Q. All right, let us leave that
4 Exhibit E-214 and turn back to your report, Mr.
5 Sobanski, H-40. Yesterday we had just started and
6 we had got --

7 MR. SOBANSKI: A. If I might just
8 have a minute to locate my report.

9 Yes.

10 Q. We had been going through some
11 of the reports listed at your pages 3 and 4 in
12 reverse chronological order, or actually chronological
13 order, reverse order from that you have listed.
14 We had been discussing Miss Hewetson's report, which
15 is No. 2 and then I direct your attention back at
16 page 3 to your own report, the 1985 Phase 2, 2C
17 report?

18 A. Yes.

19 Q. We see a summary of that
20 report over at pages 5 to 7?

21 A. Yes, that is right.

22 Q. Is that correct?

23 A. Yes.

24 Q. I would like to direct your
25 attention to the hydrogeology and to the last



1 paragraph on page 6?

2 A. Yes.

3 Q. You have there a comment,

4 "Hydraulic conductivity values for
5 the unweathered shale had a geometric
6 mean of 9.3×10^{-6} cm/s. From
7 previous investigators the linear
8 groundwater velocity through the
9 fractured shale was estimated to
10 vary from 6 metres per year to 130
11 metres per year. Vertical velocities
12 were estimated to be in the 0.004 to
13 88 metres per year range."

14 Looking at the second sentence and
15 having fresh in our minds this E-214, there is
16 certainly reference to previous investigators,
17 but if I look at the range of linear groundwater
18 velocity on page 72 of E-214, would I be correct
19 that this report at least did not take into account
20 the results of Miss Hewetson's study? If I look
21 at the linear groundwater velocities on page 72 of
22 E-214 and I see that the range is from 0.4 metres
23 at WAT 4-10 to 3000 metres per year?

24 MR. BEECHINOR: A. I see in a
25 number of the groundwater locations, an average



1 groundwater velocity has been estimated, ranging,
2 except for the 3000 metres per year, is in the range
3 between about less than one metre per year to 149
4 metres per year. I suspect we did not use the
5 3000 metres per year at that time.

6 Q. Can you be more specific about
7 it? Did you even analyze or look at Miss Hewetson's
8 report, bearing in mind the date that your report
9 was prepared and when you may have received Miss
10 Hewetson's report?

11 A. Our report, our 2C report
12 was published in June, 1985. Miss Hewetson's thesis
13 came out sometime during 1985. I suspect that we
14 did not have this information when Miss Hewetson's
15 report came out.

16 Q. So your explanation of knocking
17 off the 3000 metres and the other numbers and so on
18 is not really accurate. You in fact suspect you
19 did not even have the Hewetson report when you wrote
20 this?

21 A. At the 2C level investigation.

22 Q. The 2C level correct?

23 A. It appears.

24 Q. In fact, am I correct that
25 your report you say was published in June of 1985.



1 That is when Regional Council received it and adopted
2 it. That is H-38 I think in our exhibits here, is
3 that correct, it was adopted in June of 1985?

4 A. June, '85, I don't recall.

5 Q. I want you to assume that was
6 the case.

7 MR. HODGSON: It was July actually,
8 July 23rd, 1985.

9 MR. MCQUAID: Thank you.

10 Q. Do I understand that in fact
11 you published a draft of this report, the 2C report
12 in January of 1985? Was it not your practice to
13 publish these draft reports, circulate draft
14 reports?

15 MR. BEECHINOR: A. I would have
16 to check the date we circulated the draft report.

17 Q. Would you like to look, pull
18 the draft report out during the evening and we will
19 fix that up and get those dates in the morning?
20 You will be able to confirm them for us, that this
21 paragraph was or wasn't in the draft.

22 A. I would have to go back to
23 the office this evening to find out.

24 Q. We will find a draft one for
25 you.



100A

1

Let us continue then, going over to

2

the top of page 7 into the summary report 2C, I

3

refer you, Mr. Sobanski to the observation that:

4

"Previous reports indicated that

5

there is a dramatic deterioration

6

of groundwater quality with increasing

7

depth in the shale."

8

That was the Morrison Beatty

9

observation, correct?

10

MR. SOBANSKI: A. Yes.

11

Q. That is not one that you agree

12

with at this point?

13

A. I am sorry.

14

Q. I am sorry, I am confusing

15

groundwater quality and the K, cancel that one.

16

Then going on, the conclusion, sir,

17

at this point and we will pin down whether, the

18

date, but at this point we have Mr. Beechinor --

19

A. I could suggest that Mr.

20

Beechinor could look in the 2C report and see whether

21

we reference the Hewetson report in there.

22

Q. All right, let us do that.

23

Are you going to do that right now?

24

A. Yes, he will just take a second

25

and that will clean it up.



1 The references in that report, that
2 is the final technical report, No. 7. The
3 references on previous work are given in Section 1.3,
4 page 3 and at that stage they do not list the
5 Hewetson thesis. There is one paper referred to
6 Cherry, Hewetson, 1983, A Hydrogeological Investigation
7 of the Bayview Park Landfill. That predated the
8 Hewetson thesis. The Hewetson thesis is not identified
9 at this point. Apparently it was not available to
10 us when report 2C was prepared.

11 Q. Right. Just quickly going
12 through pages 8 and 9, Section 2, am I correct, the
13 key, 2.1 General Approach, the key concern
14 that the Ministry of the Environment had indicated
15 to you was that leachate infiltrating into the
16 shale should not surface between Site F and
17 Hamilton Harbour. That is noted at the last sentence
18 in that section, 2.1?

19 A. Yes.

20 Q. Then you have a section talking,
21 discussing liaison with concerned parties. That
22 section is similar to the one we reviewed in Site D
23 and over at page 10 you have set out the comments
24 that were received and made observations on your
25 responses or actions to those?



1 A. Yes.

2 Q. Now, there is a comment I would
3 ask you to direct your attention to specifically,
4 the second one from the bottom:

5 "...assimilating work carried out at
6 Burlington and the Bayview landfill...."
7 and there's a comment that the Ministry of the
8 Environment had made observations at that point.
9 It says:

10 "Work of other investigators had
11 been assimilated into this study."

12 MR. BEECHINOR: A. Yes.

13 Q. That of course, from what we
14 just determined, would exclude any observations
15 that arise from the Hewetson report. What was it
16 that they were asking you to assimilate at that
17 point in time?

18 A. It is my understanding that
19 the Ministry of the Environment requires that we
20 review reports from other investigators with respect
21 to hydrogeologic studies that have been done in
22 the vicinity of the site, that we did do that.

23 Q. Let me put it to you, maybe
24 I should, to be more accurate, the summary that
25 we talked about before the 2C and the study methods



1 that we are now in, speak of, they spoke of the
2 earlier date. This is speaking as of what is Phase 3,
3 the final phase here in this report.

4 A. The technical level, that is
5 right.

6 Q. Is there anything significant
7 that you can explain to us? What is it that they
8 were referring to in assimilating work carried out
9 at Burlington and Bayview?

10 A. The Ministry recognised there
11 are two adjacent landfills, adjacent to Site F,
12 and they asked us to review those reports
13 and consider them in our study design and consider
14 them in our analyses.

15 Q. Then going over to page 11
16 through, I guess, 18, 19, you describe the field
17 work program, which I think has been explained,
18 Phase 1 and Phase 2. At page 19 there is discussion
19 about the soil samples that, the results of which
20 are found in the appendices.

21 At pages 22, 23 and 24, reference
22 to the groundwater samples that were sampled, Again
23 the results are found in the appendices, correct?

24 A. That's right.

25 Q. Then there is reference on page



1 24 to a walk-and-talk survey in Section 2.5. A
2 similar process to that carried out at D and then
3 I direct your attention specifically to page 25,
4 Section 2.6, where you are coming to address the
5 hydrogeologic and geologic relationships. We see,
6 similar in some respects to Site D, a report which
7 we have gone through that the first step or
8 activity that was carried out was two regional
9 and five local stratigraphic cross-sections of the
10 site were prepared?

11 A. Yes.

12 Q. Could you just put those two
13 regional and five local stratigraphic, an example
14 of that local stratigraphic cross-section up for
15 the Board.

16 If you can't find your cards, let
17 us use one of the ones that is in the back with
18 the drawings. Here is A-A, a local one -- you have
19 got them?

20 A. This is one of the regional
21 cross-sections, Section B-B, Drawing No.7, starting
22 north of the site or at the north end of the site,
23 HCl through to HCl6, which is found near Hamilton
24 Harbour. Site F is denoted to occur in this general
25 area.



1 Q. What does it depict, just the
2 glacial till and then it shows the shale underneath
3 that glacial till?

4 A. That's right, it is showing the
5 location of overburden, the Halton Till found at
6 the north end of the site and at the south end of
7 the site, and the lacustrine and till units found
8 between the site and Hamilton Harbour and the brick-
9 like material is the Queenston shale, similar to
10 what we saw at Site D.

11 Q. Outline for me again where Site F
12 is?

13 A. Site F is generally shown between
14 drilling site HCl and just north of Highway 403.

15 Q. All right. Then would you put
16 up a local stratigraphic cross-section for us?

17 A. This is one of the local
18 stratigraphic cross-sections. Section A-a,
19 Drawing No. 8. It is just showing the stratigraphy
20 found on the site itself.

21 Again from HCl at the north end of
22 the site to, it extends to HC9, which is found just
23 south of Highway 403, just off the site.

24 Again, it is showing the similar
25 geologic characteristics shown on the regional map



1 with the Halton Till at the north end of the site
2 above the Queenston bedrock. In the central portion
3 of the site the overburden has been eroded away,
4 exposing the Queenston shale. Towards the south end
5 of the site we find overburden above the shale and
6 it thickens as we leave the site.

7 Q. At this point, while the boreholes
8 are shown going through the shale, there is no
9 indication on this local stratigraphic cross-
10 section or any of the others that there is any
11 difference or difference of strata in any of the
12 brick-like shale formation, is there?

13 A. That's right.

14 Q. If we then turn back to the
15 report at page 4.0 -- I'm sorry, page 30, Section
16 4.0, Mr. Sobanski, the discussion begins of the
17 geology and we see reference to the bedrock and
18 to the overburden and some reference beginning
19 over at page 31, some description of the bedrock
20 at Section 4.2.1?

21 MR. SOBANSKI: A. Yes.

22 Q. And colour is commented on in
23 that paragraph on page 31, just under 4.2.1 and
24 over the top at page 32 reference to the content
25 of the shale, iron, gypsum and so on are referred to?



1 A. Yes.

2 Q. In the middle of the page:

3 "A review of the core logs taken over
4 the site indicates that the shales
5 possess a complex fracture system
6 near surface and at depth"?

7 A. Yes.

8 Q. Reference then to this Table 1
9 which is a clay size mineral identification technique
10 and then we continue on the geology discussion of
11 the overburden at page 33. Really it is when we
12 get to 4.3 on page 34 that we get into a detailed
13 discussion about the Queenston formation; is that
14 correct?

15 A. Yes.

16 Q. And the second sentence we see
17 under 4.3 again refers to:

18 "The complexity of the geologic
19 system lies not with the surficial
20 features, but with the fracture
21 characteristics at depth."

22 A. Yes.

23 Q. Then if I understand it, as a
24 result of, the next sentence is:

25 "A detailed study of the core logs."



1 So as a result of the detailed study
2 of the core logs, resulted in a delineation of
3 discrete zones of fractured and weakly fractured
4 shale, see Figure 2. Figure 2 is the figure
5 immediately opposite Figure -- at page 35?

6 MR. BEECHINOR:A. That's right.

7 Q. It goes on to indicate:

8 "By implying lateral connection of
9 these features as shown by pumping
10 tests and references made to the
11 section, a general fracture network
12 was interpreted."

13 I want to ask you about, we will get
14 to those pumping tests when we get to that section.
15 Then there is some discussion about Russell and
16 Harman 1984 in borehole studies in Milton and it
17 goes on to discuss what was observed there.

18 If we go over to page 36, we see the
19 results of their plots from the Milton boreholes;
20 is that correct?

21 MR. BEECHINOR: A. That's right.

22 Q. Can you tell me, when we look
23 at this pattern and the use of this study, if I
24 look, for example at the calcite, which is the
25 middle, per cent calcite, the percentages seem to go



1 from zero, close to zero, somewhere between zero and
2 4 per cent out to 16 per cent, 20 per cent. This
3 certainly doesn't show any pattern in that one,
4 nor do we see a very significant pattern in any of
5 the other information. How did you use this?

6 A. I think it is just to demonstrate
7 a relationship that this researcher was noting in
8 the Queenston shale in that in the upper portions of
9 the shale he was noting a high frequency of the
10 slickenside fractures and that could be generally
11 correlated with low calcite. Once the frequency and
12 the density of the fractures diminished at depth
13 into a more weakly fractured shale unit the
14 sedimentation of the calcite increased.

15 Q. Was this study, how far away
16 was the site at Milton from the formation we are
17 talking about here?

18 A. I think I just recall seeing
19 it in Janet's thesis as being 50 kilometres.

20 Q. Would that distance be of any,
21 would that make, not make some significant difference
22 in terms of what you might find down at Site F?

23 A. It could. But when we are
24 dealing in the geological science, as we try to
25 utilize work by other researchers in the same



1 geological formation in other areas, because it helps
2 us to understand how that environment was deposited
3 or that geologic formation was deposited.

4 Q. Did you make any of these
5 similar tests here at Site F?

6 A. We did in the sense if you go
7 to -- we made a correlation with respect to calcite
8 cementation and found areas, zones within the
9 shale that had less calcite in it, tended to have
10 a greater fracture frequency than zones in the rock
11 that had a high calcite content, seemed to have
12 a weak or low fracture frequency.

13 Q. This is at Table 2 is it on
14 page 37, based on the two samples there we see from
15 HC4-85?

16 A. No, oh Table 2? That's right,
17 Table 2 on page 37. It is noted on Table 2 on
18 page 37, the sample description at HC-4 we had a
19 weathered shale unit with a 9.9 per cent calcite.
20 At the same location about six or seven metres
21 below ground surface we had a massive or low fracture
22 frequency shale unit with a calcite percentage of
23 22.1. So generally speaking we could see, granted
24 the information, the data is limited. We could see
25 a relationship between calcite and the degree of



1 fracturing. Similarly to what the research had
2 found in Milton.

3 Q. Were these the only two samples
4 that were run?

5 A. That's right.

6 Q. And then continuing over on,
7 below that table on page 37, there is reference
8 back to the core logs. Am I correct that the
9 remainder of the discussion, at least in that
10 paragraph, going over to the top of page 38, this
11 is just general, this is not really assisting you
12 is it, in terms of giving you the data base upon
13 which Figure 2 was drawn?

14 A. It is general in the sense
15 that we were, when we first encountered this zone
16 of highly fractured or the highly fractured shale
17 unit that was delineated by the pumping test.
18 We looked into the literature to see if there were
19 any features that have been noted elsewhere along
20 the lakeshore in the Queenston shale. We did find
21 what were called pressure relief features that
22 could be an explanation of the presence of the
23 highly fractured shale unit. That is a general
24 discussion explaining that.

25 Q. Page 38 there is similar



1 general reference, reference to general material as
2 well, is that correct?

3 A. Yes.

4 Q. Then on page 39 we see a
5 summary paragraph that says:

6 "To summarize the available information
7 obtained for the Queenston formation
8 from the literature,"

9 and you have all the literature that was of any
10 assistance to you summarized here, is that correct?
11 We have just been skimming through it at this point?

12 A. I believe so.

13 Q. Personal discussions, what
14 personal discussions were you referring to?

15 A. The personal discussion noted
16 here was with one of my staff and Dr. White of
17 the Ontario Geological Survey to confirm that the
18 stress relief features do occur in the environment
19 that we seemed to have identified.

20 Q. Is this discussion summarized
21 over at what I guess is the third paragraph, the
22 second full paragraph on page 38?

23 A. Yes, the second full paragraph.

24 Q. Most important it says the
25 field data, meaning the data which we will be



1 discussing about core logs and the pumping well test.
2 Is that the main, are those the two main pieces of
3 field data that you relied upon?

4 A. At this stage when we are just
5 characterizing the geologic units, I would say yes.

6 Q. Let me, I know that the thinking
7 process may be different from the writing process.
8 At this point on page 39 in your report, you are
9 saying there was four zones within the shale being
10 identified?

11 A. As shown on Figure 2 on page 35.

12 Q. Right. Were these four zones
13 decided upon or the conclusion that they were there,
14 was that arrived at at an early point in the process?

15 A. No, I guess it wasn't. It wasn't
16 until we had conducted the pumping test of PW1 that
17 we saw as a result of that pumping test a horizontal
18 lateral extent of influence with respect to it.
19 So, we felt there was a horizontal correlation
20 of units on the site. So therefore at that point
21 we went back to the core logs and began systematically
22 going through and defining the discontinuities.
23 When I say the discontinuities, those zones of
24 fractures, ground up core and clay mud seams and
25 slugs and that kind of thing. Delineated as can



1 be seen on Figure 2 on page 35. Zones where the
2 distribution or the frequency of discontinuity
3 is greater than others. For instance, on Figure 2,
4 page 35 at HC4, the hatched in lines on that borehole
5 show various discontinuities. They could be
6 weathering clay mud seams, slickensides, fractures,
7 ground up core.

8 Then below that we found the unit
9 we described as a weakly fractured shale unit which
10 is calcite cemented. Here we saw a unit that had a
11 lower frequency of discontinuities than the one
12 above, the unit we described above. Moderately
13 weathered and fractured shale.

14 Although in the weakly massive
15 fractures shale we saw another unit with a fairly
16 significant concentration or frequency of discon-
17 tinuities. So, from that information we made
18 an interpretation and drew the lines that you see
19 on Figure 2. What we are primarily doing here and
20 it is interpretive, what we saw here were two units,
21 the moderately fractured and weathered shale and
22 the highly fractured shale that had a greater
23 percentage or distribution of discontinuities than
24 this weakly fractured massive shale unit. There
25 was a relative difference between the weakly fractured



1 massive shale unit in terms of discontinuities as
2 compared to the moderately fractured weathered shale
3 and the highly fractured weathered shale.

4 Q. Yes, all right.

5 A. Hence our interpretation.

6 Q. That was at a point before you
7 had run any modelling, was it?

8 A. At that point, I am trying to
9 recall the study process.

10 Q. Mr. Beechinor, were you
11 responsible for it initially, did you come up with
12 Figure 2 initially?

13 A. I was responsible for it.

14 Q. Before Mr. Sobanski was
15 involved?

16 MR. SOBANSKI: A. The initial
17 interpretations, I knew what was going on.

18 Q. Let us just get the process
19 so we can understand because I am not sure who had
20 responsibility for what. I would like to know
21 who first identified the four strata.

22 MR. BEECHINOR: A. There were a lot
23 of things going on concurrently and that is the
24 difficulty for us to recall. We were coming at, we
25 were on a schedule to get this report done as



1 quickly as possible. We were making an interpretation
2 of what we saw out there. At the same time I think
3 we had initiated some computer modelling and we
4 were finding it very unsuccessful. That was before
5 we had come up with an interpretation. We were just
6 about to leave the idea of preparing the computer
7 model and simulation of the system, because it didn't
8 seem to fit the field data and it wasn't until we
9 came up with an interpretation such as shown on
10 Figure 2. I mean an interpretation where we find
11 units of higher fracture frequency and lower
12 fracture frequency that once that interpretation was
13 made and once that was input into the computer
14 simulation, for the first time the computer
15 simulation started computing the hydraulic heads
16 we were actually measuring in the field with a
17 reasonable degree of closeness.

18 Q. That's your recollection, Mr.
19 Beechinor. Mr. Sobanski, did you want to add something
20 to that?

21 MR. SOBANSKI: A. That is pretty
22 well it, Mr. McQuaid. We have had essentially
23 traditional thoughts on the site to the point of
24 the pumping test.

25 Q. When was that, just so I have a



1 date in my mind, when was the pumping test so we
2 can get some idea of when this figure and the idea
3 of the four strata first came into your minds?

4 MR. BEECHINOR: A. I have got one
5 of the pumping test data sheets here and the date on
6 it is March 12th, 1986.

7 Q. Were all three done about the
8 same time, Mr. Beechinor?

9 A. In about a two week period of
10 one another, yes.

11 Q. All right. When would the first
12 version of Figure 2 have been prepared or has it
13 remained fairly constant throughout?

14 A. That would have come in subsequent
15 to that.

16 Q. Right. Has that remained pretty
17 much as we see it on page 35 and since some time in
18 early 1986?

19 A. Pretty much the same. I have noted
20 over the summer, for instance, that I could change
21 the dashed lines to a small degree, looking at it in
22 a slightly different way. The essence of the
23 interpretation seems to be, maintains itself in my
24 opinion.

25 Q. Would I be correct in assuming



1 that this, it is only Figure 2, it is the H4, H6, H8
2 and H14 that form the basis for this figure. There
3 are not other figures or you would have put them
4 in the report?

5 A. At this stage, that is correct.

6 Q. What do you mean at this stage?

7 A. Well, if you are going to
8 progressively go through this report and get into
9 the hydrostratigraphic units, then there will be
10 an explanation of how we came up with the hydro-
11 stratigraphic units which is based on this example.

12 Q. We are going to get to that,
13 but this report is dated August 28th, 1986, at least
14 the transmittal letter is August 28th, 1986?

15 A. Yes.

16 Q. At the time you reported, first
17 of all let us concentrate on that. At the time you
18 reported the only four boreholes that you had
19 prepared a distribution chart of fractures
20 was Figure 2, is that correct?

21 A. I want to be accurate on this
22 and I am just uncertain at this moment. I think we
23 probably looked at other core logs at that time.

24 Q. I appreciate that; would you
25 have looked at all of them.



1 A. And had some rough sketches of
2 the configuration, but I don't believe we formalized
3 them in any manner.

4 Q. That's really what I wanted
5 to know. You didn't prepare a series of figures,
6 2A, B, C, D, showing other boreholes and showing
7 these four moderately fractured, weakly fractures,
8 highly fractures and the dotted lines on them?

9 A. Not on a formal basis, no.

10 Q. All right. That leads then to,
11 do you have some rough sketches that I can see over-
12 night of other boreholes?

13 A. I do have a rough sketch that
14 I did prepare, yes.

15 Q. Is it of these very same
16 boreholes?

17 A. It is a combination of all the
18 boreholes that we used to come up with our hydro-
19 stratigraphic interpretation that we used in the
20 model.

21 Q. How many boreholes were there
22 other than these four?

23 A. Well, we looked at HC4, HC3-85,
24 HC6, HC5, HC8, HC9, HC14.

25 Q. All right. Now, going in order to



1 get them in their arithmetic order, HC3-8 did you
2 say?

3 A. That's right.

4 Q. That is not on Figure 2?

5 A. No, it's not.

6 Q. HC4 is on Figure 2, HC5 is
7 not on Figure 2?

8 A. No, it's not.

9 Q. HC6 then is on Figure 2 and
10 then you have HC8 which we have on Figure 2. HC9
11 was not on Figure 2 and then HC14 is. All right?

12 A. The reason the other ones are
13 not on it, it is not on this particular line of
14 section. The information we have here, we have put
15 all the information on the same line, the same
16 section line.

17 Q. So these four on Figure 2 give
18 us a section, is that what you are saying?

19 A. That's right.

20 Q. The others, 6, I am sorry,
21 3, 5 and 9 would not have followed on the same section,
22 is that what I understand?

23 A. That's right.

24 Q. Do you have, I don't know what
25 you call this graph or this line of the borehole



1 with the cross-hatching on it. Do you have a similar?

2 A. I just recall there is, ask a
3 question first.

4 Q. Do you have something I could look
5 at to see your slickensides, mud seams, fractured
6 joints and no fracture pattern?

7 A. One other location for a
8 section is in the interrogatories. You could refer
9 to that. I think it is in the CELA interrogatory,
10 if we could turn to that.

11 Q. Let us deal with the one we've
12 got right now. We'll go to that one in a moment.

13 My question to you is, do we have
14 a drawing or three drawings of these other three
15 boreholes showing the same data as we see on Figure
16 2, page 35?

17 A. I had one drawing showing the
18 distribution of the discontinuities for all the
19 information. For all the boreholes, I have just
20 indicated to you that is here.

21 Q. That's the drawing you have
22 right there?

23 A. Yes.

24 Q. So the rough sketch that you
25 have referred to, is that that drawing?



1 A. That's right.

2 Q. All right then, while I think of
3 it I would like to mark this if I could, Mr. Chairman.
4 We will ask Mr. Beechinor to describe it. The
5 base map is Drawing 6 in the Site F study. On it
6 there is a legend with hydrostratigraphic units.

7 DR. KINGHAM: Would you want that
8 entered as a Halton exhibit then, Mr. Hodgson.

9 MR. HODGSON: Sure.

10 DR. KINGHAM: It will be entered then
11 as H-215.

12 Another possibility would be to enter
13 it as one of the subs from the existing exhibit.

14 MR. McQUAID: I think it's separate
15 and on its own sir.

16 DR. KINGHAM: We'll leave it as H-215.

17 My colleague reminds me we've taken
18 that number up. I've lost track of the numbers.
19 219.

20 --- EXHIBIT No. H-219: Base map of Drawing
6 in Site F study.

21 MR. BEECHINOR: I brought this
22 figure in for Ms. Vigod today.

23 MS. VIGOD: I asked Mr. Beechinor to
24 prepare a cross-section and he was going to give
25



1 me that this morning.

2 DR. KINGHAM: How can it be made
3 available?

4 MR. HODGSON: It's available now.

5 MS. VIGOD: I think it should be
6 clear it was done last evening for us.

7 DR. KINGHAM: We will retain it as
8 H-219, MCV.

9 MR. McQUAID: Q. H-219 is the
10 Drawing 6, is it, the cross-section A-A, the
11 regional cross-section in your report?

12 MR. BEECHINOR: A. That's right.

13 Q. We see over in the area of Site F
14 from HC4, could you just point that out for the
15 Board? HC4, south to, what is the lowest HC
16 number?

17 A. It goes to HC16 in Hamilton
18 Harbour, HC13, I am sorry.

19 Q. But the ones you said you looked
20 at and did some sketching on. I think the highest
21 number you went up to was HC14?

22 A. That's right.

23 Q. Just if you could, could you
24 outline and I will give you this marker here....

25 MR. HODGSON: Mr. Chairman, before we



1 continue, could we have some evidence as to what it
2 is we have marked as Exhibit H-219. When was it done?
3 Perhaps it would be of some assistance.

4 MR. BEECHINOR: This is a rough
5 drawing that I had in our files for some time. I
6 redrew it last night to make it a little more
7 understandable. The title of it is Hydrostratigraphic
8 Units. The various hydrostratigraphic units are
9 denoted on Drawing 6. They are the overburden and
10 there were two sub units of that hydrostratigraphic
11 unit. The till unit found north of the site, 1b,

12 the discharge zone till around, south of HC9. .
13 In the bedrock we defined four hydrostratigraphic
14 units. No. 2, a fractured shale unit, which was
15 highly weathered at surface. That is denoted too.

16 3, the weakly fractured massive
17 shale unit. This is the one shown on Figure 2 in
18 the text. It has a low frequency of fractures.

19 No. 4, the highly fractured shale
20 unit as denoted here. Partly defined by the
21 borehole information, the discontinuities as I've
22 shown on Figure 2 and the pumping test.

23 And what we called No. 5, a moderately
24 fractured bulk shale unit which underlies Site F
25 and is considered the hydrostratigraphic nature of



1 the unit found under the overburden between Site F
2 and Hamilton Harbour.

3 Now, these hydrostratigraphic units
4 have been defined by No. 1 what you see in front of
5 you, Figure 2, the various discontinuities that we
6 saw and No. 2, the pumping tests, we ran three pumping
7 tests on the site and No. 3, the packer tests that
8 were conducted on the site.

9 MR. McQUAID: Q. Is it your evidence
10 that H-219, first of all that H-219 is a copy is it
11 of some other drawing? You have cleaned it up for
12 us?

13 A. I cleaned it up. There are notes
14 and revisions and the interpretation is an
15 evolutionary process.

16 Q. I appreciate that.

17 A. The information we have in the
18 file reflects that. What I am showing here is what
19 our final interpretation was when we distributed
20 and produced the report. This is also the framework
21 of the interpretation that we provided our modeller
22 in order to simulate the groundwater flow system.

23 Q. I appreciate getting that, but
24 what I am trying to determine from you, Mr. Beechinor,
25 is, you can let us have a look at the original



1 document if you have it here?

2 A. I don't have it here.

3 Q. You can get that for us tomorrow,
4 can you?

5 A. No, I can't; I'm not going back
6 to the office tonight.

7 Q. That's when I told you I would
8 give you a copy of the draft report. I am not so
9 sure we are going to be able to do that now.

10 I think we should see the original
11 drawing. From what I understand you are telling me,
12 that drawing came into existence before Figure 2
13 came into existence, is that true?

14 A. No.

15 MR.HODGSON: Before he answers the
16 question, can I have a clarification. Which drawing
17 came into existence before the other? Let's identify
18 them and get the right sequence.

19 MR. BEECHINOR: Let us point out
20 one thing, Drawing 2 in this, Drawing 2 is just
21 one piece of the information that went into this
22 hydrostratigraphic interpretation. That is just
23 one bit of the information. I would believe
24 that Drawing 2 came before this drawing because we
25 had to first establish the relationship that was



1 established as a result of the analysis shown in
2 Figure 2. We established the relationship that there
3 is a distinct zone of fracture frequency as compared
4 to distinct zones of low fracture frequency. That
5 relationship is defined first. That gave us the
6 basis for interpreting the horizontal system of
7 varying fracture frequencies and complexities.

8 Then we utilized all of the information
9 including the pumping test, the packer test information.
10 We considered the hydraulic gradients and that sort
11 of thing to help us define the hydrostratigraphic
12 units.

13 Q. All right, we'll get into those
14 later in the report. Let us just concentrate. We
15 know that you just prepared H-219 last night for
16 Ms. Vigod; is that correct?

17 A. From notes that we had at
18 the time we made our interpretation.

19 Q. Is there another drawing that
20 is similar to H-219 or is it just notes?

21 A. There is another drawing that
22 is very rough with a lot of notes on it. It would
23 be difficult to decipher, but it is there.

24 Q. Don't you worry about that.
25 I would like you to produce that.



1 A. All right.

2 Q. So we can see that.

3 Now the question Mr. Hodgson and I
4 are trying to get at is, did that drawing with your
5 notes on it come into existence before Figure 2 or
6 after Figure 2?

7 A. That would have come into
8 existence after Figure 2.

9 Q. Now we got off on the discussion
10 about this drawing which you are going to produce
11 for me and H-219. When I asked you if you had
12 prepared other figures with the information on it
13 that we see on Figure 2, that is the information as
14 we go down the borehole from the surface down to
15 the bottom of the borehole with all the information
16 you have on it in Figure 2. Now can you just
17 confine yourself to that. This drawing doesn't have
18 any of that stuff on it, does it?

19 A. Oh yes it does.

20 Q. It has all the detail on it?

21 A. It summarized the discontinuities.

22 MR.HODGSON: Just a minute, before
23 he starts shouting at the witness, I would like to
24 hear the witness' answer to the previous three
25 questions. One question at a time and let's get the



1 answers.

2 MR. BEECHINOR: Discontinuities are
3 shown on Figure 2, are also symbolized on this drawing
4 in the form of a pencil, a dark pencil mark.

5 MR. McQUAID: Q. Okay. Now, let's
6 take Figure 2 and look at HC4 carefully for me.
7 Figure 2, Figure 2 starts at 137.40 for HC4, as I
8 understand it, if we go to the log we can check it.
9 Just trust me at this point, it is 137.4 and we will
10 assume that is correct. Then if you go down to the
11 first cross-hatched, 45 degree hatched line where it
12 ends, it is a little above 131.3, I think if we
13 look on the log, okay?

14 Then if we go down there is a white
15 section. Now, does that white section show no fractures?

16 MR. BEECHINOR: A. That is what it
17 does show.

18 Q. Just so we understand it. On
19 the legend, if we were to draw a square?

20 A. Let us say it is not no fractures,
21 it is just when you compare it to that dashed line
22 at the top there is a significant reduction in the
23 number of fractures.

24 Q. We could keep going down the
25 hole, but the point is, whether or not for these



1 other boreholes which you gave us, which are HC3-8, 5
2 and 9, have you gone down those other three boreholes
3 and drawn something as specific as you have for HC4
4 on Figure 2?

5 A. I don't think we have quite as
6 specifically but we do have notes that follow the
7 same analytical technique that is shown here in regard
8 to the other logs as well.

9 Some of this information is also shown
10 in the information I provided CELA. Can we turn to
11 that?

12 Q. We'll get to that in a minute.
13 I just want to know if there is another drawing like
14 Figure 2 that has these other three boreholes on it?

15 A. It is in the CELA document.

16 Q. Now you say you made reference to
17 notes. Are the notes you are talking about on the
18 other drawing back at the office or are they in the
19 CELA document?

20 A. They are in the CELA document
21 where they are denoted fracture frequency on a cross-
22 section that we have provided CELA.

23 Q. Are they also on the drawing
24 that is back at your office?

25 A. They are shown on this drawing



1 here.

2 Q. You didn't answer my question.

3 A. I would think so, yes.

4 They are very rough notes. It is our raw data so
5 to speak.

6 Q. We will get to that then when
7 we get that drawing with the notes on it, but let
8 us go to the CELA document then.

9 DR. KINGHAM: Will we be long on the
10 CELA document?

11 MR. McQUAID: I don't know. Let us
12 just see if we can get a page and we'll see if it's
13 going to be long or not.

14 MR. BEECHINOR: It's in the
15 interrogatory responses to the Canadian Environmental
16 Law Association submission.

17 MR. McQUAID: It is H-85.

18 MR. BEECHINOR: It's Addendum I,
19 what I am referring to.

20 DR. KINGHAM: You mean Addendum I,
21 is that what it is?

22 MR. BEECHINOR: Yes.

23 MR. McQUAID: Q. Addendum I,
24 geologic cross- sections.

25 MR. BEECHINOR: A. That's right.



1 Q. We see then three pages.

2 A. Can I explain this?

3 Q. Not yet, let us get what it is
4 first. We see three pages and there in front of
5 Figure 2 (modified) there is a fourth page in here?

6 A. There are three in here, there's
7 one section thrown through Section HC15, west-east
8 section through HC15, HC9. There is another
9 section, a north-south section HC3 through HC15.
10 There is another east-west section, west-east
11 section through HC3 and HC4 and there is another
12 section of Figure 2 where we just superimposed a
13 different borehole into the Figure 2 that is in the
14 text to see how that fit in to the interpretation.
15 HC9, originally it was HC14 and we replaced it with
16 HC9 to see how the distribution of discontinuities
17 fits into the section at another borehole location.

18 Q. Is there a date on these when
19 they came into existence? Or can you give us a
20 time when they did come into existence?

21 A. They would have been produced
22 during the evolutionary process that led to the
23 report. This would have come from the rough notes
24 that led us to our evolutionary or final
25 interpretation. They were formalized for this document



1 for CELA at the time the CELA interrogatory was
2 published. So we drafted them up at that point, but
3 the interpretation was already in existence in
4 advance of that.

5 Q. So the actual physical three
6 pages we see were drawn after the letter of March
7 6th, 1987 from CELA to Mr. Lederer?

8 A. They were formally drawn at that
9 time, yes.

10 MR. McQUAID: Mr. Chairman, we are
11 not going to finish here at this point tonight.

12 DR. KINGHAM: You may have to start
13 fresh tomorrow morning, very fresh. Is it clear
14 what is going to happen overnight in terms of
15 documents?

16 MR. McQUAID: I think this document
17 should be here first thing in the morning, sir.
18 I don't like to ask Mr. Beechinor to do it, but I
19 think somehow we've got to get it overnight. Whether
20 someone can bring it for him, get on the phone,
21 we're going to be at that point in the morning.

22 DR. KINGHAM: There was another
23 document you were looking for.

24 MR. McQUAID: The draft 2C report.
25 We have a copy here.