Court File No. 661/89

SUPREME COURT OF ONTARIO
(Divisional Court)

B E T W E E N:

NSP INVESTMENTS LIMITED

Applicant

-and-

THE JOINT BOARD (ESTABLISHED UNDER SECTION 4 OF THE CONSOLIDATED HEARINGS ACT, 1981, S.O. 1981, c. 20, AS AMENDED), THE REGIONAL MUNICIPALITY OF HALTON, THE CORPORATION OF THE TOWN OF MILTON, THE CORPORATION OF THE CITY OF BURLINGTON, THE WEST BURLINGTON CITIZENS' GROUP, THE MILTON AREA CITIZENS' COALITION, THE HALTON FEDERATION OF AGRICULTURE, WATKIN AND DOREEN MARTIN, WALTER TOMOSKY, THOMAS AND MARY-JEAN MARTIN, MICHAEL AND CYNTHIA REED, AND THE HONOURABLE JAMES BRADLEY, IN HIS CAPACITY AS THE MINISTER OF THE ENVIRONMENT

Respondents

SUPPLEMENTARY APPLICATION RECORD

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Q. I am thinking back to Dr. Rowe's evidence. This model is based, is a simpler version, I take it of the model that Dr. Rowe used at Site F?

A. That is correct, yes.

Q. Am I correct that there is something in the order of a cone that would emanate out of the cracks so you would get a higher concentration at the peak and then spreading into the matrix, sort of a doubling of these lines that you have there?

A. That is also correct, yes. I presented a graph and I believe Dr. Rowe also presented a picture, I believe also taken from Freeze & Cherry showing that effect. I don't believe I have that overhead with me.

Q. If the concentration that is in the fracture, how do you go about assessing the overall increase at a certain depth, an overall increase in contaminant loading or an overall increase in the concentration of contaminants or is that important?

A. I don't think I understand your question.

Q. Let us back up a bit. Is it only important to understand what the relative concentration is in the fracture?

A. No, with respect to the impact on

the upper granular unit, the actual volumetric flow rate is also important. That is determined by the bulk hydraulic conductivity of that unit, be it fractured or unfractured and the hydraulic gradient across it.

Q. Am I correct, Mr. Feenstra, that the problem with Site D, if there is a problem, is that you simply can't have any impact at all on the upper granular unit?

A. That is correct. As, even as the contaminant migration simulations that were performed by myself and Trow, as described in Exhibit H-39, even with the bulk hydraulic conductivity of 8×10^{-8} centimetres per second, in the event of failure of the hydraulic trap because the upper granular unit is very thin and there is no potential for dilution of contaminants from uncontaminated water moving in laterally from off site and the fact that the potential receptors, the groundwater users are very close to the site boundary. Because of those factors, even a very small volumetric flow rate of leachate into the UGU will have a significant impact.

Q. For example, there could be, let us take cell 1 in Site D. There might be in all of cell 1 a half a dozen fractures. Let us take the worst example that extends all the way to the upper granular

unit. So, you might have in terms of overall increase in contaminant levels, you really wouldn't have very much, but the point is you are not allowed anything in the upper granular unit?

A. That is correct.

Q. If you had a situation where you could have some impact because you had more dilution in the UGU or you had more room to the site boundary, it wouldn't concern you as much?

A. That is very true, yes. One of my main concerns with respect to Site D with regard to the effect of fracturing is the actual time factor involved, Not so much the impact on the UGU. As I indicated, even a small volume of flow of leachate in the UGU is going to have a significant impact. If the unweathered upper till is unfractured, then the time for that impact to be felt is measured in years or a few tens of years. However, if the unweathered upper till is fractured, that impact could be felt much more rapidly. It could be in terms of less than a year. So it is not so much that the impact on the UGU will be different, but the time at which that impact is felt will be much more rapid.

Q. As I recall the stratigraphic layers at Site D, there is the upper till which was

taken to actually identify the potential failure of the leachate collection system and the migration of contaminants into the underlying geological units.

In comparison once one decides on alternatives 2 or 3, it is the installation of piped water to the residents or construction of a liner in the landfill, there isn't much that can go wrong with those alternatives. There isn't the same degree of, I am trying to think of the right word, you can't get it wrong once you are committed to option 2 or option 3, where option 1, detailed monitoring has to be done correctly to be effective and it has to be continue to be done correctly as the landfill is operated.

Q. So it strikes me that if that were down to between option 2 and option 3, which is really down to the difference between piped water and the liner?

A. You could distill it down that far.

Q. Do you have any preference between those two?

A. Hydrogeologically I don't think there is a preference. I think that would depend on factors such as cost and planning issues with respect to piped water.

MR. TIDBALL: Thank you, Mr. Feenstra.

Mr. Chairman, I am about to turn to Site F and this would be a convenient time for the morning break.

DR. KINGHAM: I don't understand your last answer, Mr. Feenstra. Maybe you can think about it over the break. You said hydrologically or hydrogeologically?

THE WITNESS: Hydrogeologically.

DR. KINGHAM: There wouldn't be a difference between alternative 2 and alternative 3. Do you mean from a public health perspective there wouldn't be a difference, but hydrogeologically there certainly would be a difference?

THE WITNESS: The hydrogeologic impact from a health perspective wouldn't be different. The impact on the residents along First Line would be the same with option 2 or option 3.

DR. KINGHAM: The hydrogeologic impact from an environmental perspective is the essential difference between alternative 2 and alternative 3?

THE WITNESS: That is correct; in option 3 there is still a potential for off-site migration that might affect surface water, that is true.

MR. LANCASTER: Fifteen minutes.

--- Short Recess

at Site F, yes, I would anticipate some degree of impact on the surface water system.

MR. TIDBALL: Thank you, Mr. Feenstra. Those are my questions, Mr. Chairman.

MR. LANCASTER: Mr. Estrin.

MR. ESTRIN: Mr. Leitch will be addressing this topic.

CROSS-EXAMINATION BY MR. LEITCH:

MR. LEITCH: Q. Mr. Feenstra, my questions will deal with the opinion which you have expressed as to whether or not one should reject the hypothesis which is contained in the decision tree. So, if you could have that before you.

A. Yes.

Q. As I have understood your evidence, both in-chief and in questions which Mr. Tidball put to you, you take it that as the better course not to reject the hypothesis that significant fracturing exists in the unweathered upper till at Site D?

A. That is correct.

Q. I would take from your witness statement and your evidence that you are of that opinion because of the work done by Mr. Ruland in the Sarnia area?

A. To a significant degree, actually

it was the factor, the main factor which caused me to develop this hypothesis and evaluate the hypothesis for Site D, that is correct.

Q. As I understand his work and what you have done with it, you have taken some of his findings in respect of these rather deeper fractures, which are found in the Lambton area, the till in that area and you have taken the hypothesis that because they are found at Lambton, they are likely to be found at Milton?

A. That is correct. Two of the major reasons why various investigators feel that fractures have developed in clay tills like this in Southern Ontario are weathering features, that would be drying features. During the post-glacial history in Ontario there was a period approximately five or six thousand years ago where temperatures were much warmer than they are today and I believe it to be somewhat drier. During that period, it is possible that deeper drying cracks may have developed in the surficial tills in the Ontario area.

Because of a reasonably wide-scale climatic effect such as that, we would have no reason to expect the tills in the Halton area have undergone a different history than the tills in the Lambton area.

The other possible explanation for the formation of these cracks in basically till materials is stress relief due to glacial rebound following the last glaciation in this area, approximately twelve thousand years ago. Likewise the amount of uplift that has occurred in the area of Halton is quite similar to what was suspected in the Lambton area.

So the two major mechanisms for the formation of these fractures would have been in effect in Halton as they were in effect in the Lambton area.

Q. Would they have been of a reasonably like degree?

A. Yes, a reasonably like degree.

Q. Am I correct that the till to be found in the Lambton area is a glacial till?

A. It is a glacial till of slightly higher clay content than the till you have at Site D, but similar mineralogically in terms of being comprised mainly of ilite and chlorite clays rather than swelling clays like smectites, which occur in some areas in Western Canada and the Western United States.

Q. The till at the Milton area is a glacial till?

A. That is correct, yes.

Q. Do I understand when you say

glacial till that those tills have been picked up by the glacier at some point in its life and dropped out of the glacier at another point in life?

A. That is correct; those materials were actually transported to their present location by the action of ice.

Q. So they are disturbed materials in relation to their glaciation?

A. I am not sure I know what you mean?

Q. How did they come into existence in the first instance?

A. They were deposited either in front of or beneath the ice as they moved through the area at Site D.

Q. I take it that they were picked up by the glacier at some point in time?

A. That's right.

Q. From what did they derive before they were picked up?

A. Any unconsolidated deposits or the erosion of the bedrock formations underneath the glacier, as the glaciers moved along.

Q. Is there anything in the nature of the disturbance itself that would lead to the fracturing that we are talking about?

A. That is not a possibility that I had heard of before as a mechanism for the formation of these types of fractures.

Q. My next question has to do with a question that Mr. Tidball asked you about the research that Mr. Ruland has done in respect of this fracturing. Is there other ongoing research at the present time?

A. At the present time I don't believe there is anyone specifically working on the aspect of deeper fracturing in the unweathered clay at the University of Waterloo. I believe there is some additional work going on in the West Lincoln area with respect to the proposed site for the OWMC, their waste treatment facility.

Q. What kind of clay do you find at West Lincoln?

A. That is actually not a till, it's a lacustrine clay, but it is a silty clay, a clay silt material, reasonably similar, the matrix is reasonably similar to the clay tills we are dealing with at Site D and in Lambton County. What it doesn't have is any larger stones or cobbles or larger grain-size material within it.

Q. So it has a larger degree of integrity from that point of view?

A. It would be more homogeneous.

Q. Are you familiar with the work that is going on at the OWMC site?

A. I actually had the opportunity to visit the site on Friday. The consultants for OWMC were digging some deep test pits to examine the presence of fractures in the upper portion of that silty clay material. I believe the public was invited to come out and look and there were various groups that would be represented in the upcoming hearing were also invited to come down and examine the test pits, as was the University of Waterloo. Along that line I also went along and examined the test pit on Friday.

Q. What did you see?

A. In both test pits dug to a depth of five and a half or six and a half metres, there was evidence of fractures along which there had been chemical weathering; in other words there were fracture surfaces that were identifiable as being different colours. In the deepest test pit at approximately six and a half metres, there was also evidence of roots of some age, probably geological age roots. What remains is simply the dry relics of the root material.

Q. Is it more or less likely that you would find fractures and roots as you have described in

that lacustrine clay as opposed to the Milton clay?

A. That is a difficult question to address. One might imagine that in a lacustrine clay, which are clay materials deposited in the bottom of a lake, one would find one would have vegetation growing on the bottom of the lake during most of its deposition in history. On the other hand, the clay till deposits were deposited as fairly thick units and although there may be some intervals during the deposition of those tills where the ground surface was exposed and some vegetation developed and some weathering occurred, the most significant degree of weathering had just occurred at the present ground surface. The fractures that are evident in lacustrine clays in West Lincoln seem to be fairly continuous vertically over distances of, in one particular case, two metres, more than two metres. It is difficult to tell how continuous the root systems are. The nature of the roots at the different levels down to a depth of six and a half metres all seemed very similar. I am still not quite sure how to interpret that. That will also be a topic of much future research.

Q. In reference to the opinion that you have reached as to the likelihood of there being the deeper fractures at Milton, does the work at West

Lincoln support or detract from your hypothesis?

A. There would be some additional supporting evidence that there is a reasonable possibility that fractures exist at depths of 4 to 8 metres on Site D.

MR. LEITCH: Thank you.

MR. LANCASTER: Ms. Cronk.

CROSS-EXAMINATION BY MS. CRONK:

Q. Mr. Feenstra, I don't propose to be very long, but I do have one or two questions arising from part of your discussion this morning with Mr. Tidball and as well a number of items referred to in the body of your reply report which was filed with the Board.

As I read the report and heard your evidence, Mr. Feenstra, with respect to Site D, it seemed to me and I would ask whether this is an accurate view of the essence of the opinion that you have given the Board with respect to Site D, is that what you are saying is that you now, based on all of the information available to you to date, have two concerns with respect to Site D.

The first relates to, as you have explained at some length, the possibility that the unweathered upper till at Site D is fractured and the

second, this is my characterization and please correct me if I am wrong, relates to the possibility in the future for widespread declines in the water levels in the upper granular unit at that site; is that a fair characterization of the two possible points made in your report?

A. I believe that's a fair characterization, yes.

Q. Dealing, if I might, with the second first and I will come back briefly to the issue of fracturing. On this whole issue of the potential in the future for declines in the water levels in the upper granular unit, you will recall that Mr. Tidball raised it with you briefly this morning, we have heard over the course of the many months of evidence at this hearing that the engineering premise of the hydraulic trap at Site D is very much related to the maintenance of the head differential between the level of leachate in the trap and the water levels in the geological units outside the trap. That is an essential ingredient or premise of the engineering feature of the trap itself, is that correct?

A. That is correct, yes.

Q. What is at issue there, as I understand it quite simply, is that the water level in

the units outside the trap must be kept higher at all times than the level of leachate in the trap in order for that trap to function properly?

A. That is correct, yes.

Q. I am sorry if I am repeating old ground, but we have been here for some considerable time and I want to be sure before I proceed much further that I have the bases correct.

That is so because the implication, as soon as the differential between the water levels outside and the leachate level changes is a probability of trap failure; is that correct?

A. As soon as the leachate level increases to the point where it is higher than the groundwater levels in the underlying geological units or the groundwater levels in the geological units decline to the same point, so that they are less than the head in the landfill, then you will, by definition, have failure of the hydraulic trap and potential for the movement of leachate out of the landfill.

Q. In essence then, the two basic concerns that you raised with respect to Site D are somewhat interrelated, if I can suggest that to you. Because, once you have trap failure, it at all, because of changes in that balance between the water levels and

the level of the leachate in the trap, the potential exists for the spread of contamination by virtue of the movement of leachate out of the trap?

A. That is correct, yes.

Q. If the geological units underneath the trap, that gives rise to the concerns you have outlined to the Board as to the speed with which contaminants will move?

A. That is correct, yes.

Q. Am I right then that anything that on a reasonable basis could be said to be likely to cause a change in the relationship of the water levels outside the trap and the level of the leachate in the trap is of concern. Any depletion or reduction in the water levels outside the trap has to be a concern?

A. It certainly does.

Q. Is it then from that rationale or from that basis that you have expressed your concerns to the Board about the possibilities in the future for the declines of the water levels in the upper granular unit?

A. That is correct, both short-term fluctuations and the possibility of long-term. In the event that the unweathered upper till is unfractured, then short-term or seasonal fluctuations in the

underlying groundwater levels beneath the site are of fairly little concern, because although for a short period of time there may be the possibility of some movement of leachate downward through the unweathered upper till, if that till is unfractured, then that movement is going to be very slow. It may only move a very small distance through the unweathered upper till.

Q. And conversely if it is fractured, what you are talking about is the type of increases in travel time you have already outlined for the Board?

A. That is right.

Q. I understand the essence of your evidence to be not that the concentrations of contaminants will change, but rather the speed at which they move and therefore the timeframe in which significant contamination could occur?

A. That is correct; simply the timeframe rather than the actual magnitude of the impact.

Q. Would you agree with me, Mr. Feenstra, that under the best of conditions from an engineering perspective, the maintenance of that head differential is really an object of maintaining a delicate balance between the water levels outside the trap and the leachate levels in the trap?

A. It is certainly something that has to be balanced, yes.

Q. It's a balancing exercise?

A. Yes.

Q. Given the implications for failure to do it in a proper way, it is really rather a delicate balance?

A. It is an important, a very important consideration because, as you mentioned, that difference is the basis for maintaining the hydraulic trap and preventing leachate movement out.

Q. As I understood what you said in your reply report to the Board, there are two particular scenarios that you regard as being of concern with respect to the issue of lowering the head in the upper granular unit; the first being the consequences of a drought and the second being the consequences of elimination of natural recharge to the upper granular unit consequent upon introduction of the landfill itself?

A. That is correct.

Q. I would like to briefly explore both of those with you. On the drought aspect of it, in your report you have suggested, as I understand it, were a severe drought to occur at any time over the

course of the operation of the hydraulic trap at Site D, it could result in sufficient reduction in the water levels in the upper granular unit that the trap could reverse for the time period of the drought; do I have that correct?

A. That is correct, yes.

Q. Are you suggesting, sir, what I am trying to get a feel for is what type of drought you are talking about. We have all lived through this summer and there has been a scarcity of water in some places in the province. What dimension of calamity in the water level supply is required to cause you to reach a level of concern as to the possibility of that?

A. In retrospect it would have been, I think, useful to have had groundwater monitoring, groundwater level monitoring data from this past summer because I would expect in the early part of the spring and summer months there should have and could have been significant declines in water levels in some of those areas.

Q. Is it then the case that a drought of even short duration might be sufficient to so affect the water levels in the upper granular unit at Site D that that balance of head differential could be thrown out?

A. Yes, I believe that is a possibility.

Q. Is it not also the case that, for example, if a drought over several weeks period of time or several months during the spring and summer were to occur, that there will also be a time period after the end of the drought that would be required for the natural levels to be restored in the granular units?

A. There would certainly be some time lag between the end of the dry conditions and the recovery of the water levels.

Q. I am sorry if I appear to be stating the obvious. What I am trying to have confirmed if I am correct is that we are not just talking about the length of the drought itself, we are talking about the time period over which a drought occurs,plus an add-on time period during which the otherwise natural levels of water have to be replenished?

A. That is not entirely correct because if you can look into the future and you say that a drought is going to start at such-and-such a date, it is going to take a period of time before the effects of that diminished recharge or those drought conditions are actually evidenced in the groundwater

system. In the same way that there is a time lag in the recovery of the groundwater system following drought conditions. I don't think you can add the two periods of time together.

Q. Am I correct in my understanding that the reason that the consequences of a drought in the Site D area are now of significance to you, flows really from the hypothesis of the possibility of fracturing in the unweathered upper till?

A. It doesn't necessarily follow from the hypothesis. The implication, the implications of the effect of drought conditions or seasonal fluctuations in water levels underlying Site D are really of no consequence if there are no fractures extending through the unweathered upper till. They are really only of consequence when the till is considerably fractured.

Q. That is simply because if you get trap failure, even if it is short-term trap failure, in that scenario you will get rapid movement of contaminants?

A. Yes.

Q. Is that then another reason why it becomes important in your opinion to determine whether or not that unweathered till unit at Site D is indeed

fractured?

A. That is certainly another reason to make that determination.

Q. You have identified in your report, as I read it, another potential cause for depletion of water levels in the upper granular unit apart from those you talked about this morning; that you described as being a reduction in the natural amount of recharge to Site D and I took that to mean that upon introduction of the landfill itself there will clearly be, there will be prevention of natural recharge going to the upper granular unit because it will fall on the landfill and won't reach the upper granular unit; is that correct?

A. That is correct.

Q. Can you tell me very briefly what the implications of that are as far as you are concerned? It seems to me, Mr. Feenstra, that has been a given as long as we have been talking about the trap.

A. What has been a given?

Q. As soon as you put in the hydraulic trap at Site D, the areal extent of the trap itself is going to capture natural recharge from the environment. Natural rainfall is going to be caught by the area of the trap?

evidence to date as to the actual areal extent of the granular units at Site D has not been confirmed?

A. That is correct.

Q. You also told me, I thought, that it was your opinion that the exact nature of the groundwater paths at Site D is not fully established, either based on information available to date?

A. Particularly in terms of a relationship between the overburden groundwater system and the bedrock groundwater system.

Q. My point is Mr. Feenstra, if you can ever get to the point of saying with absolute scientific certainty what the affect of a landfill would be, would you agree with me, I am really asking if it is your opinion that there is further investigation or more information which it would be desirable for the Board to have, given the concern about depletion of the water levels in the upper granular unit?

A. Certainly more information would be useful in starting to evaluate that effect, yes.

Q. In fact, to evaluate the effect of introducing a landfill in the context of determining what the impact is going to be on those groundwater levels, don't you have to have more information than is

available at the moment?

A. Would you repeat the question, please?

Q. I am saying to you that you can't, today, even begin to confidently assess what the impact of a landfill at Site D is going to be on groundwater levels in those granular units without further information; we don't know enough about the extent of the granular units or about the groundwater flow paths as you have mentioned?

A. You could make a preliminary attempt based on the information available at the present time. Primarily because we don't know the areal extent of the granular units, I think any estimates of the effect would be very....

Q. Would you want to see Site D approved as a hydrogeologist in the absence of other information in that respect?

A. That gets into a difficult question because, as I mentioned earlier, I am not sure we would ever be at the stage where we could confidently say there would be no effect due to the landfill. I am not sure we could ever understand the system well enough to say that with a reasonable degree of confidence.

Q. Would you agree with me, Mr.

Feenstra, that perhaps the desirable objective is to be in a position to say what the probable effects would be?

A. That would certainly be further down the road than we are at the present time.

Q. Do I take it from that that you would agree with me that we can't today say what the probable effects of that landfill, of a landfill at Site D would be on the groundwater levels in the vicinity of Site D without further investigation?

A. No one has at this stage done the appropriate analysis to give an indication of what the effect would be.

Q. In your opinion is that a desirable thing to occur?

A. Yes, I think that would be desirable.

Q. The second concern that you have raised and dealt with at some length in your report is this possibility of fracturing in the unweathered upper till unit at Site D. You spoke with Mr. Tidball this morning about the types of investigations that you felt should be undertaken or could be undertaken to explore whether or not such fracturing did exist. I would like to dwell just for a moment on what I understand to

have been the experience in the Sarnia area pursuant to the research of Mr. Ruland.

Am I correct that his team's investigations of the Sarnia clay plain extended to the creation of six test pits?

A. That is correct.

Q. They were put in at a variety of sites in the Sarnia area?

A. I believe a total of four different sites.

Q. It was based on putting in the test pits that visual observation, there was the opportunity for visual observation of the till units at each site to permit a determination as to whether or not fracturing existed?

A. That is correct.

Q. That of course we know has not been done to date at Site D?

A. That is also correct, yes.

Q. I understood you to tell Mr. Leitch a few moments ago that it was the same test pit mechanism that at the OWMC site in West Lincoln has led to information suggesting that the clay unit at that site is now fractured?

A. It is fractured to a depth of at

least five and a half to six and a half metres.

Q. It was pursuant to visual inspection conducted at the test pits?

A. That is correct, yes.

Q. Apart from putting in test pits, we have heard --

A. I might just comment on the OWMC site, there also had been some evidence of fracturing noted in vertical boreholes.

Q. Prior to the test pits?

A. Prior to the test pits.

Q. Apart from the Comcor borehole logs that you mentioned in your reply report to the Board, is there evidence at Site D of vertical fracturing in the borehole core samples that were taken from that site?

A. I don't believe there was any report of fracturing indicated on any of the Trow and Morrison Beatty boreholes, below the weathered zone of the till at approximately 4 metres.

Q. There were, as you pointed out in the Comcor borelogs?

A. Yes, there were.

Q. Apart from test pits, as I understand what took place pursuant to the

investigations of Mr. Ruland's team, there were a series of special piezometer nests put in in the Sarnia area, specifically for tritium testing at various locations; is that correct?

A. That's correct.

Q. Am I correct that there were some thirteen special piezometer nests in total used for that purpose?

A. I believe that number is correct.

Q. Am I correct that only one was installed and tested at Site D?

A. One piezometer nest was tested at Site D.

Q. You confirmed for Mr. Tidball this morning that as discussed at this hearing as to the merits or benefits to be derived from using angled boreholes to determine the existence of fracturing, that such boreholes were not put in at Site D?

A. That's right.

Q. And have not commonly in the province been used in the past?

A. I believe in 1985 when the investigations at Site D were performed, I don't believe there was a drill rig in the province capable of drilling angled boreholes.

Q. Is there now?

A. Yes, several firms have that capability.

Q. Is that another type of investigatory technique that could be employed to determine whether or not fractures exist in the unweathered upper till?

A. Yes.

Q. Finally, as I understood what you were saying in your report, the type of pumping tests you were referring to as being a possible investigatory technique at Site D was the type of test that Mr. Petrie described had been used by him in the Maryhill till situation?

A. That is correct, yes.

Q. We know that that type of test was not done at Site D?

A. That type of test was not performed at Site D.

Q. Are we then in this position, Mr. Feenstra, that there are various investigatory techniques that could be used to determine (a) if fracturing does exist in the unweathered upper till at Site D and secondly if so, how extensive it is but none of those investigatory techniques have to date been

employed at Site D?

A. That is correct, yes.

Q. Do I understand your opinion to the Board to be that those investigations at a minimum should be undertaken before landfilling is approved, if at all, at that site?

A. I am not sure that I said that. No, because I think if one looks at my decision tree, which was discussed earlier, that one could simply accept the hypothesis that significant fracturing does existing in the unweathered upper till at Site D and then work to modify the monitoring program and the design of the landfill itself to accommodate that possibility.

Q. Let me put the question to you this way, Mr. Feenstra. There is a basis on which Site D has been put before the Board for approval thus far. It does not extend, for example, to the pre-testing installation and design of a purge well system; that is not part of the proposal at the moment, right? I understand that to be your evidence and you have made recommendations in that regard, but do I have it that it is your opinion -- please correct me if I am wrong -- that as currently proposed before the Board, you would recommend that further investigations of the type

you discussed be done at Site D before it were approved, if at all, for landfilling?

A. Yes, I think that follows from my statement that on the basis of attachment 5 to my witness statement I feel that there is a reasonable possibility that fracturing does indeed exist in the unweathered upper till at Site D. I would not reject that hypothesis without further investigation or modification of the design and monitoring angles at Site D.

Q. The issue as to whether or not that till unit is fractured goes to the very integrity of Site D for a landfill site, would you agree, Mr. Feenstra, the very fundamental issue regarding the integrity of that site?

A. It's a very fundamental issue for the site and the monitoring program, as previously stated, yes.

Q. I understood at least by your inference,if not expressly, the suggestion made to you this morning by Mr. Tidball that perhaps these further investigations could be carried out as a required condition of any approval of Site D and coincident in point of time with other site preparation or investigation work.

Were that the approach, Mr. Feenstra, that some, were that the approached urged by some on the Board, would you agree with me that we can't tell in advance what the outcome of those further investigations might be?

A. We certainly can't tell in advance, but I think that depending on the nature of the preparatory work for operation of the site that if one could live with either conclusion or either finding, either of the investigative programs that in the case that the test program identifies that were was fracturing in the unweathered upper till, then depending on the nature of the site preparations, it may not be possible to implement option No. 3, that is the construction of a liner with purge wells. At that time you would certainly be able to implement option No. 2, which would be the installation of piped water to the surrounding residents after initial site preparations have begun.

Q. Perhaps I can suggest it to you this way, Mr.Feenstra. Is it correct that if this further, if these further investigations were undertaken that clearly you can't predict in advance how extensive the fracturing in the unweathered till unit might be if it is there at all? You can't tell

that in advance?

A. No, you can't tell that in advance, you have no information from the site itself.

Q. Nor can you tell the direction or the location in which that fracturing might exist?

A. That is also true, yes.

Q. Until that information is known, those who stand to be affected by the implications of contaminant migration at that site aren't really in a position to assess how their interests might be affected, wouldn't you agree?

A. For the site as designed at the present time, yes. That doesn't necessarily, that isn't the case, the scenario would be to do the investigation and then evaluate which one of these other alternatives might be appropriate.

Q. That assumes Mr. Feenstra, does it not, let us assume for the moment that the investigations, the further investigations undertaken showed that there was fracturing. That would trigger, what you are telling me is that that would trigger then a whole series of other events on your decision tree?

A. That is correct.

Q. I suppose what I am really suggesting to you is that approval today, both of a

further investigation program coupled with one or more of the proposals that you make on the decision tree to take place in the event that fracturing is discovered, assumes that those people or those persons whose interests stand to be affected by fracturing, would be content to accept, without further challenge or opportunity to challenge, that those proposals are adequate in the circumstances? It assumes that there would be no basis for those who would be affected by the fact of extensive fracturing, would be content with the proposals to respond to extensive fracturing that you suggested on the decision tree?

A. I think that assumption would be implicit in what you are indicating, yes.

Q. My point simply being this, Mr. Feenstra....

MR. HODGSON: I don't think he is finished.

THE WITNESS: I will let her finish the question.

MS CRONK: No finish.

THE WITNESS: I would like to hear the rest of the question.

MS CRONK: Q. What I am getting at is this and perhaps I am stating it awkwardly, but we

don't know in advance if fracturing exists, how extensive it is, where it may be and therefore, whose interests might stands to be affected if it's there?

A. Would you repeat that, please. I am really having difficulty with that.

Q. We don't know in advance of carrying out the kinds of investigations that you describe whether fracturing does exist, how extensive it might be or where it might be, we don't know that in advance?

A. You don't know that in advance, that's correct.

Q. Your response to me when I suggested that that meant that approval of Site D without the investigations being undertaken was inappropriate was to say yes, Ms. Cronk, we can live with either event, we can live with fracturing, the fact that fracturing was discovered or live with the determination that there was no fracturing because I have set out certain things that should be done on my decision tree if fracturing is discovered. That's what I thought you were saying to me. Have I got it right?

A. Yes.

Q. My point to you is this, let us assume we go in and these investigations are conducted

and fracturing is discovered, that in your evidence would trigger further actions to be taken; am I correct?

A. That is correct, yes.

Q. Then there are the three or one or more of the three set out in your decision tree under the testing scenario under fracturing, the three you have outlined in that column?

A. That is correct.

Q. The only point I am making to you is that if the Board were so inclined at the end of the day to approve Site D on that basis, that this investigative program should be undertaken and if fracturing was found, these further things should be done, that would deny, would it not, the persons affected and the persons who stand to be affected by the existence of those fractures from any further opportunity to challenge the results of the investigation program, to really test them at all or to challenge that what you recommend is adequate to respond to the fracturing risk in the circumstances. That couldn't take place?

A. I am not really familiar with all the avenues that the affected people might be able to pursue. It would certainly be my expectation, however,

that the implementation of any of these other alternatives as a condition of the investigations or as an outcome of the investigations would certainly be subject to the review and approval of the director of the Ministry of the Environment.

As I indicated, I don't know precisely what avenues individuals would have to challenge, review or comment on those decisions.

Q. Let us take a look then at the three scenarios you have put out in your decision tree. If I could ask you just to look at it, dealing with the rejection scenario of the hypothesis, you have already told Mr. Leitch and Mr. Tidball that that is not the course of action you would recommend to the Board?

A. That is not what I would recommend.

Q. I take it that that is so because to take that route with respect to this whole issue of the possibility of fracturing is essentially to gamble that they are not there at all?

A. That is correct.

Q. In that scenario, what you are really gambling with is public health and safety, isn't that so?

A. At this particular site, yes.

Q. Then of the two remaining ones, the

acceptance of the hypothesis or the testing of the hypothesis, you indicated to Mr. Tidball you had some difficulty as a scientist in recognizing in your own mind which was the preferable course?

A. That is also true.

Q. As a hydrogeologist and a hydrogeochemist, testing now before the Board based on everything that you know, what is your recommendation to the Board with respect to your hypothesis as to which they should do? Should they accept your hypothesis and plan accordingly or should they be testing it before making any further decision with respect to Site D?

A. I think, as I indicated, that is probably not a hydrogeological question, or a hydrogeological issue, because one could take into account the presence of fractures, whether we know they are there or not, with these alternatives that I have suggested. I am not suggesting that the three alternatives listed are the only alternatives, there may be other alternatives equally applicable. I think one has to consider the time element involved with respect to a landfill for the Region of Halton. That might be to accept the hypothesis and go along and design Site F accordingly, if a delay of a half or one

year is significant with respect to the approval of the site. If it was possible for the Board or the Board ruled that the site could be approved on the condition that the testing be conducted at the same time as the preliminary development of the site and based on the actual stage of site preparation and the findings of this investigation then some other alternative could be implemented at that time. I don't actually have a preference between the two. There are other non-hydrogeological issues involved.

Q. Those being both the time factor and the cost?

A. The time factor and the cost, that's right.

Q. Under the testing scenario, that's an area in particular as opposed to the acceptance scenario, that involves both time and increased costs, whereas the acceptance scenario involves just costs?

A. That is correct.

Q. Just dealing with the testing route then, as a response to your hypothesis, you explained to Mr. Tidball what technically was involved in each of the suggested responses that you identified in the event that fracturing was discovered. I am referring now to items 1, 2 and 3. I understood you to say that

there were really alternate solutions, not a composite solution to the problem of fracturing?

A. That is correct.

Q. Can we look at the first one for a moment. That is detailed monitoring with purge wells as a primary engineering feature. Would you agree with me, Mr. Feenstra, that there is nothing under that option that I called option No. 1 that is preventive in nature. That response or that solution is really remedial or reactive. It doesn't prevent the spread of contamination?

A. That is true, it is reactive to deal with the possible rate of movement of contaminants into the underlying geological units at a much faster rate than was previously expected or determined due to fracturing in the unweathered upper till.

Q. The point simply being then that nothing under that option or that solution, if I can put it that way, will prevent the contamination of existing water sources at Site D. It simply reacts in the event of contamination, isn't that so, to curtail it?

A. The objective of that detailed monitoring and the pre-installation of the purge well system would be to prevent offsite movement of

contaminants. It won't prevent contamination of the underlying units, but the intention would be to keep that contamination restricted to the site itself.

Q. And under option No. 2, that is to bring in a piped water supply as a response to the possibility of contamination of the existing water supply, would you agree with again that nothing under that option prevents contamination, it is a reactive measure, a remedial measure?

A. It is also a reactive measure because monitoring would still be required to ensure that offsite contamination would not occur and affect other receptors like more distant groundwater users. One would implement purge wells to prevent that offsite movement.

Q. I suppose the distinction I am getting at is really this, Mr. Feenstra, looking at this option, the piping in of water with purge wells, that option may have the effect of minimizing the impact of contamination but it won't prevent it. It does nothing to preserve the integrity of the existing water source at Site D?

A. That is true.

Q. That is essentially true with option No. 1 as well, isn't that so?

A. That is also true.

Q. It is only when we get to option No. 3, I suggest and that is the suggestion of a liner with purge wells, that there is any preventive aspect at all associated with the option, would you agree?

A. That is true. Option No. 3, the construction of a liner would actually act to prevent or reduce contamination of the groundwater underlying the site. Strictly speaking, I am not sure that the groundwater underlying the site is relevant with respect to the reasonable use policy of the Ministry of the Environment. In reality I think you can impact the groundwater on your own site, but the only concern is when it goes offsite.

Q. Let us deal just with the concept of option No. 3 for the moment. Even with that one, I suggest, and that is introducing a liner, would you agree with me that does not prevent indefinitely contamination of existing water supply if fracturing does exist?

A. If....

Q. It does not prevent for ever contamination of existing water supply?

A. It does not prevent for ever the contamination of the existing water supply, whether

there are fractures or whether there are no fractures.

Q. Just dealing with the scenario where we are assuming there are fractures because that is where you have the liner option set out, it will not have that effect.

A. Excuse me, could you repeat the question?

Q. We are dealing with the scenario that we are assuming the investigations have shown that there are fractures?

A. Right.

Q. I am suggesting to you that the option of putting in a liner at Site D does not have the effect of preventing contamination long-term?

A. In the event of failure of the hydraulic trap, no it does not.

Q. It carries with it a considerable price tag in financial terms, does it not?

A. It does. In the event of the failure of the hydraulic trap, the liner will simply act like the unweathered upper till. It is going to buy you time to be able to detect the failure with your monitoring program and implement, the time to implement an effective contingency to deal with that.

Q. You raised a few moments ago the

suggestion buying you time to deal with contamination programs, but as well the suggestion that so long as you didn't contaminate on site, that might somehow be acceptable as distinct from allowing contamination offsite. You made that comment in context of the reasonable use policy?

A. That's correct.

Q. Looking at option No. 2, the suggestion you bring in piped water with purge wells, that in itself as a proposed solution to this problem fracturing doesn't prevent contamination on site, would you agree, or offsite?

A. Simply bringing in piped water does not prevent offsite migration of contaminants, that's right.

Q. And it is only option No. 3 that carries with it that potential, albeit for a limited period of time, the liner?

A. For a limited period of time.

MS. CRONK: I expect to be another twenty minutes or half an hour. Would you be content to break now or do you wish me to carry on?

MR. LANCASTER: Yes, we will break now until 2:00 o'clock.

--- Luncheon Adjournment (12:45 p.m.)

--- Upon resuming at 2:00 p.m.

MR. LANCASTER: Please be seated.

MR. HODGSON: The court reporter spoke to me over the lunch break and I have to, with some embarrassment, retract my statement that Nethercut & Company had been "chintzy." It appears that my colleague, Mr. Lederer expedited a transcript in March and received his expedited transcript, at which point Nethercut as a matter of course sent out a copy to everybody else which means that poor Mr. Lederer had paid for the expedite and everyone else had the advantage of it. Tom raised such a fuss with Nethercut that they didn't do it this time. I am not in a position to criticize Nethercut, since it is clearly and obviously the Region's counsel that have caused this.

DR. KINGHAM: I have been in touch with the hearings registrar who assures me that a copy for the Board is on its way out here right now.

MS. CRONK: Q. Mr.Feenstra, we discussed this morning your opinions with respect to the possibility of depletion of the recharge in the area of recharge in the area of Site D caused by a number of potential events; do you recall that?

A. That's right, yes.

Q. One of the further investigations or matters you dealt with in your reply report concerns the more rigorous examination of recharge conditions at Site D, am I right?

A. More rigorous monitoring of water levels in the underlying geological units, yes.

Q. Can I take you to page 6 of your reply report, paragraph 15. I direct your attention to the third full sentence in paragraph 15, Mr. Feenstra, beginning:

> "The effect of the landfill itself on the groundwater levels beneath the site is difficult to quantify without a computer model and a good understanding of the areal extent of the units, the existing recharge and discharge areas and the groundwater flow patterns. A more detailed understanding of the groundwater flow system would be required before a rigorous evaluation of the effect of the landfill on groundwater levels beneath the landfill can be made."

Now, stopping there, would I be interpreting your comments in that paragraph correctly

if I took from it the suggestion that further examination of the groundwater flow system is required before what you have referred to as a rigorous evaluation of the effect of landfilling could be assessed in terms of the impact on groundwater levels beneath the landfill?

A. That is correct.

Q. Would you agree with me, Mr. Feenstra, if that type of examination of the groundwater flow system at Site D were undertaken, it is possible at least that it could disclose that the recharge conditions were such that there would be insufficient recharge to maintain the hydraulic trap once the landfill is introduced; that is a possible result?

A. That might be possible, yes.

Q. Insofar as that is a possibility, that is a result, I suggest, that could not be lived with insofar as the design of Site D is premised on the maintenance and continued maintenance of a hydraulic trap?

A. Unless the mechanism by which the groundwater levels in the underlying geological units could be recharged or surcharged artificially, that is correct.

Q. Then in the context of your having told me this morning that you could live, I don't mean you personally, but one could safely live with the results of further investigations, whatever the result, this would be an exception?

A. I don't quite understand.

Q. Perhaps you could put your decision tree back up.

A. Okay.

Q. Dealing with the testing scenario set out under your decision tree, Mr. Feenstra, the middle column as distinct from the rejection of your hypothesis or the acceptance of your hypothesis, I understood you this morning to be suggesting to me, let me back up, I was suggesting to you that approval on any terms of Site D without further investigation, given the concerns you have expressed, would be imprudent because further investigation would produce new information which would then be evaluated. I understood you to reply to me by suggesting that one could safely live with the results to be generated by those further investigations, whatever they were, because one could plan now how to deal with either result, that is prove the existence of fracturing or prove that fracturing did not exist. Am I correct, so

far?

A. Correct, so far.

Q. What I am suggesting to you, sir, is that if part of the further investigations to be undertaken included those suggested by you with respect to the groundwater flow system at Site D, and if those further investigations proved that there was insufficient recharge to maintain the hydraulic trap, that is not a result. At this stage one would have to find out first if that was the case before one could decide whether Site D was approvable subject to conditions or not?

A. In that event that would imply that basically the hydraulic trap could not be maintained for any significant, for a significant proportion of the life of the landfill.

Q. Exactly.

A. In that case one could consider the installation of the purge well system and operation of the purge well system at some point during the operation of the landfill as part of the primary engineering design.

Q. Wouldn't it mean, Mr. Feenstra that the very viability of the hydraulic trap were in issue if it required that design?

A. It would certainly mean that the hydraulic trap was not the key principle for the operation of the site, that is correct.

Q. Wouldn't that entail an entirely different design proposal?

A. It would certainly require a different design, either in terms of containment of offsite migration by the purge well system or the construction of a liner at the site.

Q. And the proposals of that design are not fully before the Board at this stage?

A. The proposals for that design, no.

Q. With respect, generally to the further investigations that we spoke about this morning, I had some difficulty with our exchange and I wanted briefly to come at it and make sure I understood what you were telling me.

What I wish to suggest to you, Mr. Feenstra, is that if the further investigations you have outlined are undertaken, clearly they will result in the generation of fresh data, fresh data not presently available?

A. That's correct.

Q. To the extent that fresh information and fresh data is generated, that could

well lead to conclusions different from those at Site D that have to date been put before the Board?

A. That is correct, yes.

Q. Those new conclusions, it follows, could apply to any number of things. They could apply to interpretation of the groundwater flow system at the site, they could apply to appropriate contingencies, they could apply to design issues to a whole myriad of things, do you agree?

A. That is correct.

Q. Now, in those circumstances none of those details are before the Board because one can't predict in advance what those new conclusions might be, not knowing what the new information might be, it follows one from the other, doesn't it?

A. That is true, yes.

Q. Can I come back then to your suggested solutions and your scenarios on the decision tree. Let us still deal still with the testing scenario. You have really followed through the testing scenario by saying one of two circumstances is going to result through further investigation. Either my hypothesis of fracturing of the unweathered till is going to be borne out or it is not, is that correct?

A. That's correct.

Q. If borne out, you proposed three options, any one of which could be introduced to respond to the fracturing problem?

A. That is correct.

Q. Those are the same three options that would apply were the Board simply to accept it, your hypothesis, without authorizing or requiring any further investigation?

A. That is correct.

Q. The second possibility if those further investigations are conducted is that the hypothesis of fracturing in the unweathered upper till unit would not be borne out and would not be demonstrated, correct?

A. That is correct.

Q. That leads you then, based on your decision tree or flow chart, to a second hypothesis, does it not, and that is the possibility of the landfill itself inducing fractures.

A. I guess you could regard that as a second hypothesis, that is true.

Q. We will just test that suggestion and move over to the rejection scenario. If the Board were to reject today your main hypothesis that fractures exist in the upper weathered till unit they

would still then, or they would -- a hydrogeologist and in particular you would recommend to the Board that there still be an evaluation as to whether the landfill itself would induce fractures; isn't that so, aren't there two issues to be considered?

A. I believe in reality that is probably the case. If one considered that, if one didn't consider that the hypothesis of significant fracturing existed in the unweathered upper till, had no merit and rejected that hypothesis, to some degree it is likely that such a decision would also be consistent with the decision that it is unlikely that the construction of the landfill will induce fracturing in the unweathered upper till. I think part of the rationale that one might suggest for rejecting the first hypothesis, that is that fracturing exists, is the feeling that lateral and various subsurface stresses will actually act to close fractures or that these fractures, although discontinuities and things may be observable in the unweathered upper till, don't transmit any water. I think if one subscribed to those types of opinions, it wouldn't surprise me if one would also subscribe to the opinion that it is unlikely that the landfill would either open any fractures that were there in the first place or induce them in the future.

But, on the other hand I think to be complete, as I have drawn this chart, a likely, it would probably be appropriate to take this second hypothesis to evaluate the possibility of landfill-induced fractures and put that below the rejected decision for the first hypothesis also.

Q. Shall we just draw a line in from that side of the decision coming down into the evaluation level? My approach, Mr. Feenstra, was perhaps a little more simplistic rather than the detailed perspective you have outlined. When I looked at the main hypothesis at the top of page, that really concerns whether or not fracturing exists today?

A. That is correct.

Q. Whereas if you look at what I am calling the evaluation box further down the chart, that concerns the possibility that fracture might be induced in the future, by virtue not of natural conditions but by the nature of the landfill itself?

A. That's correct.

Q. Clearly two types of fracture scenarios?

A. I think one of the main issues with respect to evaluation of landfill induced fractures is the degree to which any fractures would open during

construction of the landfill or created during excavation of the landfill would in turn be closed when the landfill is actually constructed and completed and many of the stresses that were in effect originally were reapplied.

Q. So even if the Board were persuaded to reject the hypothesis that fracturing currently exists in that unit, would it then be your recommendation that an evaluation should still be made as to whether subsequently-introduced fractures was a realistic possibility?

A. I think it would be reasonable to make that recommendation, yes.

Q. Is that the one you are making?

A. I would agree with this amendment to the tree here showing a connection between the rejection choice for hypothesis No. 1 to the box leading to the evaluation of possibility of landfill-induced fractures.

Q. If a result of that evaluation showed that it was likely, to use your words, that fractures could be induced by the introduction of a landfill, one then has to consider all of the three options that you previously outlined, is that fair?

A. That is correct.

Q. Similarly if it is unlikely, there the matter ends and routine monitoring could be carried out?

A. That's right.

Q. Could we go back to option No. 1 that we spoke about this morning. You explained to Mr. Tidball that that was comprised of first detailed monitoring which you described as being monthly?

A. It could be monthly, yes.

Q. And purge wells as a primary engineering feature and you explained that that was both pre-installed, designed and tested?

A. That is correct.

Q. Could I direct you as well back to your reply report to page 4, to the bottom of paragraph 9. It is in this paragraph, Mr. Feenstra, that you are discussing these various options and I direct your attention to the last two sentences appearing on page 4:

> "During the installation and testing of the purge well system, information can be gathered with regard to the continuity of the granular units westward towards the First Line and beneath the site. In addition, detailed

pumping tests of the type discussed by Mr. Estrin and Mr.Petrie could be conducted to assess the presence of fractures in the unweathered upper till. This information can be used effectively to design the final groundwater monitoring program."

I took that to mean, Mr. Feenstra, that with respect to the first option, you are suggesting that those pumping tests as well should be undertaken. Is that an accurate reading of what you recommended?

A. Not pumping tests, not the type of pumping tests described in the last sentence on page 4. I believe the pumping tests conducted in conjunction with the installation, the design and installation and testing of the monitoring well system might be somewhat different, mainly because it would be conducted to examine the lateral continuity of the granular units, not necessarily the presence of fracturing in the overlying unweathered upper till. Those tests might be of quite a different nature.

Q. Sorry, I understood the report at the bottom of page 4 to be suggesting that the pumping tests there described, would be conducted specifically to assess the presence of fractures?

the first hypothesis, yes.

Q. So that under the testing scenario and option No. 1, does it then involve both the conduct of a type of pumping test described at the bottom of page 4 plus the type of monitoring that you described to Mr. Tidball and the pre-designed testing and implementation of the purge wells? Are you suggesting all three should be done or just the two?

A. I think before you actually reach this point in the decision tree, that is you have tested, you are testing the hypothesis, you have conducted the investigations and you have reached a decision, you would have already conducted the pumping tests?

Q. I see. Thank you very much, it is my confusion.

Would you agree with me, Mr. Feenstra that from a public health and safety viewpoint, the most prudent course of action is to conceive and design a landfill facility taking into account the worst-case scenario that would apply at that facility if introduced in hydrogeological terms?

A. In general probably no. If one makes worst case assumptions on all one's input parameters, I think it is very likely that one would

come up with a final estimate at the conclusion that it is very unrealistic to the final conclusion.

Q. Let us make it specific then. In the instance of Site D, would you agree with me that the worst case scenario in hydrogeological terms is that the hydraulic trap will fail and that the unweathered upper till unit is fractured? That is the worst scenario for that site?

A. That certainly would be a worst-case scenario.

Q. Then with respect to Site D, would you agree with me that it would be prudent to both plan and design a landfill facility for that site which took into account that worst-case scenario?

A. I think one should try to design a landfill that would avoid that worst-case scenario, Ms. Cronk.

Q. Are you agreeing with me that it should be designed in such a way as to take that into account?

A. Yes.

Q. As I have heard your evidence, Mr. Feenstra, it is your opinion today, based on all that you know of the sites and all the information that has been adduced before the Board that Site F is suitable

for landfilling on the terms currently proposed to the Board; is that correct?

A. Were you asking whether that was my opinion?

Q. Yes?

A. With the exception of the construction of a perimeter drain, I believe that is correct.

Q. Taking into account the adjustments to the perimeter drain you discussed with Mr. Tidball this morning?

A. The adjustment of deepening the perimeter drain to capture the shallow groundwater flowing through the upper part of the shale.

Q. Could I ask you to go to page 17 of your final report then. It is in paragraph 50, is it not, that you express the opinion to the Board that Site F is suitable for landfilling?

A. That is correct.

Q. Am I correct that that was also your opinion last fall when you first testified before the Board?

A. Yes, it was.

Q. In restating that opinion to the Board, have you taken into account all of the

hydrogeological evidence that has been adduced before the Board since the time that you last testified?

A. I believe I have, yes.

Q. I direct your attention to paragraph 51, in which you express your opinions concern Site D and it is in particular the first sentence in which you indicate:

"It is my opinion that Site D can be made suitable for landfilling."

Stopping there, are we to take it from that that it is your opinion that Site D as currently proposed before the Board is not today suitable, but with the changes that you have outlined and discussed, it could be?

A. That is correct.

Q. That opinion, I take it, is based, as was the case with respect to Site F, on all the information available to you today?

A. That is also correct.

Q. Are we then in this situation that your opinion with respect to Site F and its suitability for landfilling remains unchanged from the opinion you held last fall but with respect to Site D, it has changed in the manner outlined in paragraph 51?

A. That is correct.

Q. Then in the second sentence of paragraph 51, you have indicated:

"For conditions when the hydraulic trap is functioning, there will be no leakage of leachate from the landfill."

Just stopping there, Mr. Feenstra, I was somewhat troubled by that when I read it. You, I take it, have heard the evidence given by others that there will in fact be some diffusion of leachate from the trap even if working properly at Site D?

A. That is correct.

Q. It is then, I suggest, not strictly accurate to suggest there will be no leakage of leachate. There will be some by virtue of the diffusion process?

A. Through the diffusion process and should not reach the granular unit underlying the site.

Q. The Board has heard evidence, as you are aware, from a series of witnesses, but in particular the Board has heard evidence since you last testified from a number of hydrogeologists. Mr. Petrie and Mr. Crutcher testified before the Board that in their opinion Site F was suitable for landfilling if a liner was part of the proposed design for the site. Mr. Sobanski disagreed with that and you have said in

your reply report, as well as in your evidence last fall, that you disagree with that. Dr. Charlesworth and Dr. Rowe disagree.

I would like your opinion, if you are in a position to give it, Mr. Feenstra, based on all of the information available to you and all of the data that you have looked at as to which of the two sites, Site D or Site F is, in your opinion, more likely to require a liner?

A. Okay. Well, I would have to say that Site D would be more likely to require a liner. A liner at Site F would certainly reduce the amount of seepage or exfiltration from the landfill into the underlying shale. It would be my estimate that the amount of exfiltration from the landfill at Site F would be something in the order of 10 to 20 millimetres per year. That is for an unlined Site F.

For a lined Site F, the estimate of leakage through the liner is approximately eight millimetres a year under normal operating conditions.

So the construction of a liner would only, would indeed reduce the amount of exfiltration, but only by a rate of approximately 20 to 60 per cent and in the event that exfiltration, or when exfiltration does actually leave the landfill and enter

fracturing in the unweathered upper till unit, but it were, after investigation, thought reasonably likely that the landfill itself would induce fractures, I take the liner scenario is one of the three responses you would suggest in those circumstances?

A. The liner option would be another response that could be considered.

Q. Mr. Feenstra, just two other matters very briefly. When you were last here last fall,you and I had a discussion concerning certain of the characteristics at Site F in comparison to Site D, the comparative merits of those two sites for landfilling. That led subsequently to discussions between you and my friend, Mr. McQuaid and Ms. Vigod and Mr. Hodgson. There is one aspect of the discussion that we had that I would like to take you back to and ask you whether, based on all of the information now available to you, your opinion has changed in any respect? Perhaps I could just read it to you and if you wish to see the transcript, by all means I will provide it to you. It is from Volume 44, Mr. Chairman, at page 10033, commencing at line 7 and the question to you, Mr. Feenstra was this.

"Q. Without taking you back to it, Mr. Feenstra, in light of the review and

analysis which you have done of both Sites F and D, and in light of your specific expertise, which of the two sites, F or D, do you regard as being preferable for landfilling?

A. On the basis of the evaluation of contaminant migration, it is my opinion that the attenuation capability exhibited by the geological materials at Site F would be superior to those at Site D and irrespective of engineering or the planned contingency measures. Obviously with the contingency measures that have been described and discussed with respect to Site D and Site F, offsite migration could be prevented if it was evidenced in the future.

Q. As was the case with Domtar..."

Parenthetically we discussed the work you had been involved in at the Domtar site:

"...I suggest in the case of Site F you need not be concerned about adverse impact from any possible contamination below Site F?

A. I would agree with that.

year, the groundwater pathway that we were considering and comparing to Site D was the deep groundwater flow pathway, not the shallow flow pathway. The shallow flow pathway at Site F has some capability for the attenuation of contaminants, but I wouldn't say that it is, how did I word it?

Q. "...the attenuation capability exhibited by the geological materials at Site F would be superior to those at Site D..."

A. I don't think I would call it superior because there certainly is the possibility for contaminant migration through the shallow part of the shale. It will be reduced somewhat by matrix diffusion and absorption and bio-degradation processes of organic material, for organic matter. Strictly speaking, I am not sure that the attenuation capability inherent in the material itself in the shallow shale pathway at Site F is particularly superior to Site D.

Q. Would you agree with me, Mr. Feenstra, based on what you know today that there being no need to be concerned about adverse impact from any possible contamination at Site F, that that is a very significant advantage of Site F over Site D, based on the information available to you today?

A. That is a very significant difference between Site F and Site D. Even in the event that the interpretation of Site F isn't exactly as I have suggested, there will be no groundwater supplies that are endangered, so no human health and safety directly affected by the contamination of the groundwater supplies.

Q. To use the language I once used with you before, that is an enormous advantage of Site F over Site D?

A. Yes, it is.

Q. Finally then one further aspect of the matter, Mr. Feenstra. You discussed with Mr. Tidball this morning certain aspects of the monitoring program at Site F. My recollection was that last fall when you testified you were asked to indicate with reference to the monitoring program that Mr. Sobanski had recommended for Site F where you would place monitoring wells at Site F and I apologize, I have looked for that exhibit, as have others, and its number now escapes me totally, but what I can provide to you, in short I haven't been able to find it....

A. I looked and I couldn't find it either.

Q. What I can give you is drawing No.

22, which is from Exhibit H-40. This is Mr. Tidball's copy and it deals with the monitoring system at Site F. There are a number of well locations marked in red. I confess I don't now recall whether those were your suggestions or whether they were those of Mr. Sobanski?

A. I believe it is Mr. Sobanski because I don't recognize the handwriting.

Q. The handwriting may be that of Mr. Tidball.

A. Okay. I don't believe I actually drew numbers on a map to show monitoring well locations. I might have been asked to comment on those identified by Mr. Sobanski.

Q. Either way, could I ask you now to look at that drawing No. 22 and with particular reference to, the legend indicates that the full black dots shown on that drawing are the location of on site monitoring wells I take it today as they exist today, or are those are proposed?

A. Those are as proposed.

Q. Taking those into account together with the ones circled in red, would you agree in light of the information now available to you, that those are suitable locations for monitoring wells in the vicinity of Site F?

A. Those are certainly suitable locations along the southern boundary of Site F. I would suggest that based on the subsequent evaluation of the zone of active flow in the shallow shale, as reflected by the tritium and chloride concentrations and the lack of an active flow zone in the shale in the vicinity of HC-8 on the southern portion of the site, one should also probably have groundwater monitors along the western margin of the site and on the eastern margin of the site, some of which are noted on this figure on the eastern margin, but I think you would probably want one or two more locations on that side to take into account the eventuality of a diversion of flow around the area around HC-8.

Q. Do I take it then that the monitoring wells on the western side of Site F that you have just described and the few more that you have suggested on the eastern side are additional to those shown on drawing 22?

A. That is correct, yes.

Q. I direct your attention to the triangle of land immediately to the south of the southern boundary at Site F?

A. You mean this section immediately south of the site?

Q. You are pointing to the triangle with the North Service Road and south of the black southern boundary line on drawing 22, there are a number of monitoring wells located in that triangle?

A. That is correct.

Q. Those lands are currently owned by NSP, are they not?

A. That's my understanding.

Q. Am I also correct that they do not as currently before the Board, form part of the area of the undertaking that the Region is proposing for Site F?

A. That is also my understanding.

Q. Would you agree with me that if the Region is to be required to conduct ongoing monitoring in that area, with respect to Site F, should it receive approval and be required to maintain monitoring, that it would be prudent for the Region to have assured access to those lands for those purposes?

A. Certainly monitoring would require assured and continuous access to those lands, that is correct.

Q. Similarly, look to the east, Mr. Feenstra, to the monitoring well locations now identified on drawing 22, those additional ones that

you have recommended. Some of those extend further to the east, do they not, than the area of the undertaking as currently proposed before the Board, although originally they were in the area of undertaking in the proposal before the Board?

A. That is also my understanding, yes.

Q. Once again, Mr. Feenstra, would you agree with me that if the Region is to be responsible in the future, assuming for the moment, were this Board to approve Site F and assuming that the Board required in the future the Region were to be required in the future to monitor on a continuing basis at those locations, would you agree with me it would be prudent for the Region to have assured right of access to those lands for those purposes?

A. Obviously to undertake continued monitoring of wells in those locations one would need continued access to those locations.

Q. With respect to the triangle to the south, that is immediately north of the North Service Road, as I understand the concern that you have identified there is that because there is no evidence of an active flow zone in the vicinity of HC-8, that there could actually be flow laterally to the west at that location?

A. That is correct, yes.

Q. If one were to move directly west form HC-8, that in fact goes on to NSP land, being that triangle, does it not?

A. Yes, it does.

Q. Similarly on the eastern side of the site, were there to be lateral flow in that direction, that as well would flow onto NSP lands immediately south of Bayview Park, isn't that so?

A. That is also correct, yes.

Q. In hydrogeological terms and given the recommendations you made to the Board as to proper monitoring of the site, Mr. Feenstra, would you agree with me that both of those locations should be monitored in the future if Site F is approved?

A. I agree they should be monitored, yes.

Q. On an ongoing basis?

A. On an ongoing basis.

MS. CRONK: Thank you very much. Mr. Chairman, those are my questions.

MR. LANCASTER: Mr. Garrod.

CROSS-EXAMINATION BY MR. GARROD:

Q. Mr. Feenstra, I expect I will be quite brief, I have more pages crossed out than I have

If I could turn then to the next issue we wish to address; that is what we have termed the task of weighing conflicting opinion evidence, the general principles. As I indicated earlier, Mr. Chairman and Dr. Kingham, and indeed it need not in any way come from me, but it is quite clear that there were very extensive challenges to credibility made in this case. I give you by way of example the cross-examination that occurred of Mr. Sobanski by the City of Burlington and the Burlington ratepayers. I give you the cross-examination of Mr. Feenstra by the same group. I give you the cross-examination of Mr. Petrie by the Town of Milton and by myself to a lesser extent. It is clear that there are on the issues before you conflicting expert opinions and legally that requires the weighing of those opinions in accordance with generally established principles and the assessment of which of those opinions in the circumstances you should prefer.

In our submission the question of conflicting evidence arises in two different ways in the context of the hydrogeological evidence and I will address myself to that in a moment. First with respect to Site F, it arises squarely on the issue of the need for a liner. You have opinions from experts who have

testified before you that a liner is not needed, and you have the evidence and the opinion from Mr. Petrie, and, no doubt, as Ms. Vigod would have it and Mr. Hodgson would not have it, from Mr. Bowen, that a liner would be required. That opinion by Mr. Petrie of CRA must be assessed in light of the fact you have received opinions from other informed qualified experts that a liner is not necessary. I would refer to Mr. Sobanski, I would refer to Mr. Beechinor, I refer to Dr. Charlesworth, Dr. Rowe and Mr. Feenstra. That is the first evidence that requires this kind of a weighing exercise.

The second issue is broader in nature in my submission, and that is whether the Site D undertaking as presented to you by the Region in its current form can and should be approved for the purposes of landfilling at that site. It has been suggested to you that this is a question of whether Site D can be designed so as to be safe for landfilling. In our respectful submission that is far too narrow a characterization of the issue, but rather the issue is whether on the hydrogeological and design evidence now before the Board the site is suitable for landfilling on the state of the evidence that you have and should be approved for landfilling or whether it is

premature to do so.

The evidence before you from the experts on this issue is again divergent. Mr. Hodgson would have it that the site can be approved subject to certain design and testing conditions and he points to the evidence of Mr. Feenstra in this regard and the three options put forward by Mr. Feenstra to address the problems raised by his hypotheses that fracturing and decline in water levels in the granular units and the possible inducement of fracturing upon the introduction of the landfill. Mr. Hodgson has suggested that no hydrogeologist who testified before you said that Site D could not be made suitable for landfilling without any adverse effect on public health and safety. He described the position of Drs. Charlesworth and Rowe as being "less optimistic." In our submission, the proper characterization of the evidence on Site D suggests and establishes that there are a group of experts who regard the approval of Site D as currently proposed before you as premature. In our submission, that is the express evidence of Drs. Charlesworth and Rowe and implicitly the evidence of Mr. Feenstra. It is the conflict in the evidence on this issue that gives rise to the second weighing exercise on the conflict of expert opinion evidence.

Mr. Chairman and Dr. Kingham, we are certainly aware and are quick to acknowledge that the general principles involved in the weighing of conflicting expert opinion evidence are matters with which this Board is familiar. This has been a very long hearing and it is our hope, sir, that by very briefly dealing with those general principles as they have developed in the case law, it may ultimately prove to be of some assistance to you when you come to reach your decision in this matter. We have prepared a case book for that purpose and I propose to refer to it only very briefly and indeed there are only three cases which I will ask you to go to directly and perhaps that could be distributed. I should say as well, Mr. Chairman, that the size of the case book should not be interpreted as reflective of the time which will be spent on the principles. I am mindful of the discussion which took place the other day and one half of this book is one case that is two hundred and forty odd pages, and rather than give you two pages and run the risk of a battle with Mr. Lederer, I have decided to give you the whole case. I appear to be one short.

The essential governing principles may be summarized in our submission as follows: first, in assessing credibility the law makes no distinction

between professional witnesses and other witnesses. The evidence of experts must be appreciated like that of others, and the trier of fact is bound to examine it and to weigh it as any other evidence given in the case, and I would refer you, for proof of that proposition, to the case appearing under the first tab in your case book, and we have taken the liberty of highlighting in yellow the relevant portions from each case that support the proposition that I am putting to you.

The second general principle, Mr. Chairman, in our submission, is that it is clear that the obligation of a tribunal in considering the evidence of experts is not restricted to assessing their credibility and qualifications, but rather it is the duty of the tribunal to do more than that. The obligation has been described in the following language, and I would suggest if you wish to go to tab 2, which is the case of Gallant et al v. F.W. Woolworth Company Limited et al, a decision of the Saskatchewan Court of Appeal in 1970, and I would refer you to page 252 and to the marked passage in which the Court is referring to the approach taken by the trial Judge in assessing the evidence of experts on a particular issue in that case. In my submission, all these cases are

different fact situations and they are not environmental assessment or Joint Board hearings, but the principles are the same, although the facts be different.

In that case the Court indicated:

"Expert witnesses, because of their special qualifications and experience, are allowed to give opinions and theories which may assist or guide the Court. The trial Judge, however, is not relieved of the responsibility of forming his own opinion based on all of the evidence."

The third general principle, Mr. Chairman and Dr. Kingham, is that I suggest the obligation to weigh conflicting evidence involves an evaluation of credibility. The concept of credibility, it has been suggested, "escapes exact definition." Sopinka and Lederman in their text on The Law of Evidence in Civil Cases, and you will recall there has been reference to this textbook several times at this hearing, have suggested at tab 3:

"Two witnesses may be worthy of credit, but in varying degrees, with the result that on points of contradiction, the

evidence of one will be preferred to the evidence of the other."

and still later:

"The demeanour of the witness, his manner of expression and other personality-related aspects of his testimony, although not necessarily determinative, are relevant."

That is at tab 3. There is as well another reference from the evidence text which may be of assistance to you and this is not in the textbook before you, but it is from Phipson On Evidence, the 11th edition, in which the author suggests the following:

"The credibility of a witness depends upon his knowledge of the facts, his intelligence, his disinterestedness, his integrity, his veracity. Proportioned to these is the degree of credit his testimony deserves from the Court or jury. Amongst the more obvious matters affecting the weight of a witness' evidence may be classed his means of knowledge, opportunities of observation, reasons for recollection or belief, experience, powers of memory and

perception and any special circumstances affecting his competency to speak to the particular case, all of which may be inquired into, either in direct examination to enhance or in cross-examination to impeach the value of his testimony."

The fifth general principle to which I would invite your consideration is this; that fundamental to the task of weighing conflicting opinion evidence is the principle that, absent extenuating circumstances, the testimony of disinterested witnesses should prevail over that of persons who are or may be interested in the result. That is a quote, Mr. Chairman, and I am referring to the case which appears at tab 4 of your book, a very old authority, and the principle has stood, in my submission, the weight of time and I would ask you to go as well to the bottom of page 210 of that case, in which it is said:

"Considering that when the evidence of an important fact is contradictory, as it is in the present case, the Court must weigh the motives of the witnesses, their relationship or friendship with the parties, their attitude and

demeanour in the box, the way in which they gave evidence, the probability of the facts sworn to, and come to a conclusion regarding the version which should be taken as the true one."

The Supreme Court of Canada also dealt with this issue in a number of cases and I suggest that the sixth relevant general principle is set out in the case of White v. The King at tab 5 of your textbook, or of your brief of authorities, and if I could refer you to the following passage:

"The issue of credibility is one of fact and cannot be determined by following a set of rules that it is suggested have the force of law..."

Mr. Justice Anglin, in speaking of credibility stated:

"By that I understand not merely the appreciation of the witnesses' desire to be truthful but also of their opportunities of knowledge and powers of observation, judgment and memory -- in a word, the trustworthiness of their testimony, which may have depended very largely on their demeanour in the

witness box and their manner in giving evidence."

That was a reference to an earlier case decided by the Supreme Court in 1919, the Raymond case, and then in White v. The King, the Supreme Court of Canada continued as follows, referring to the earlier case:

> "The foregoing is a general statement and does not purport to be exhaustive. Eminent Judges have from time to time indicated certain guides that have been of the greatest assistance but so far as I have been able to find there has never been an effort made to indicate all the possible factors that might enter into the determination. It is a matter in which so many human characteristics, both the strong and the weak, must be taken into consideration. The general integrity and intelligence of the witness, his power to observe, his capacity to remember and his accuracy in statement are important. It is also important to determine whether he is honestly endeavouring to tell the truth,

whether he is sincere and frank or whether he is biased, reticent and evasive. All these questions and others may be answered from the observation of the witness' general conduct and demeanour in determining the question of credibility."

That appears under tab 5. It is also important to recall, in my submission, the general principle that a witness, including an expert witness, may testify as to what he or she sincerely believes to be true, but he might be quite honestly mistaken. The Courts have consistently held that it is the duty of the trier of fact to assess the evidence of witnesses in accordance with the preponderance of probabilities in the case in an effort to determine on the evidence what contested facts have a very high degree of probability, and for that authority I refer you to the Faryna v. Chorny case at tab 6.

I would ask you very briefly -- there are three cases to which I wish to refer directly, and if I could ask you firstly to go to tab 7, if you will, Mr. Chairman. That is the case of Regina v. Baribeau, a decision of the Ontario County Court in March of 1983. The reason I am requesting you go to these

authorities directly is because they are more recent and represent, in my submission, a re-confirmation of the general principles I have outlined to you. This was a criminal case, a dangerous driving case again, and the factual circumstances of the case and the fact that it was a courtroom, in my submission, make no difference whatsoever to the articulation of the general legal principle. I would ask you to go to page 74 of that case if you would, and I would direct your attention to the passage highlighted in the fifth full paragraph which reads:

> "The next matter for consideration is the evidence of the four engineers. As trier of fact, I may believe all, none or part of what any witness has said and that includes the evidence of experts. Of course, the uncontradicted evidence of an expert witness is not to be lightly disregarded. Where the evidence of experts is contradictory, as it was in this case, that evidence must be appreciated and weighed in the same manner as that of any other witness. I must also take into consideration the factual basis for their opinions or lack

thereof, their qualifications, their fairness or objectivity and the possibility of an unconscious bias in favour of the party calling them."

It will be my submission later in the course of our argument, Mr. Chairman and Dr. Kingham, that the principles enunciated in this case have a direct bearing on the task before you of weighing conflicting opinion evidence.

Could I ask you to go as well to tab 10, and this is the case which consumes the bulk of the book, and again the factual circumstances in my submission are irrelevant, but the general principles are germane. It is a 1985 decision emanating from Saskatchewan and I would ask you to go to page 124. So often it is easier stated, the principles are easier stated than applied, and so often it is said that this is a matter of credibility, this is a matter of weight. It seems to me, or at least it is our hope that it will be of some assistance afforded to the Board by approaching that actual task in practical terms by this case and the one which follows it.

At page 124, referring to the second full paragraph, there is again confirmation that "There is no distinction (at law) between evidence given by

experts and that given by ordinary or lay witnesses," and the Court indicates:

> "The evidence of experts must be appreciated and weighed in the same manner as that of any other witness. In determining the weight of expert evidence, the Court considers the usual rules of testing credibility. The weight, value and effect of expert evidence is entirely a question for the determination of the court trying a question of fact, in light of all the circumstances and in connection with all the other evidence. It is not conclusive, controlling or binding, even though uncontradicted or undisputed. All or part of an expert's opinion may generally be accepted or rejected as appeals to the judgment of the court. Of course, the uncontradicted evidence of an expert witness is not to be lightly disregarded. A conclusion of law has no probative force."

and he goes on to speak about what happens when an expert purports to give an opinion as to matters of law

when they are not legally trained to do so.

I would then refer you to the last paragraph at page 124:

> "Certain authorities have been helpful in assessing expert evidence which is in conflict. In Gallant v. F. W. Woolworth Co.,..."

and you will recall that is, I believe, the second tab of your book, yes, the second tab, it was said by the Saskatchewan Court of Appeal:

> "In the instant case, having found the experts equally credible and qualified, the trial judge should have considered all of the other evidence accepted by him and adopted that theory which was most consistent with that evidence and, therefore, more probable."

And then there is the particular passage I would commend for your consideration, beginning at the second full paragraph on page 125:

> "I have given careful consideration to the testimony of all expert witnesses. The evidence of a number of experts is a major issue in this case. I have looked at, inter alia, the following:

(1) The manner in which they presented their evidence and their attitude on the stand, watching for any indication that anyone was arrogant, argumentative, an advocate, overreaching, overly technical or forced to retreat or retract;

(2) Conflict between them;

(3) Conflict between expert evidence and lay evidence;

(4) The extent to which expert evidence was consistent with probability and reason;

(5) The extent to which expert evidence was contrary to physical facts or scientific principle;

(6) The lack of partisanship of a witness;

(7) The effectiveness of testing equipment and procedures;

(8) The manner in which they met cross-examination.

Of course, there was a variety of other considerations. Problems are more acute when, as here, there is a marked

conflict in testimony given by different experts."

In my submission, that is precisely the case before you. There is a marked conflict on two material issues on the evidence of experts you have heard, namely as to whether a liner is required at Site F and, secondly, whether Site D as currently proposed before you is safe and suitable for approved landfilling.

Finally, if I could refer you to tab 8, to the last authority to which I wish to refer, and again it is for the assistance of general principles and I would ask you to go to page 13, and this has to do, Mr. Chairman, with the test that should apply or which should be applied according to the Courts when there is conflicting opinion evidence.

There are two tests suggested in the case law and this case suggests the approach that should appropriately be taken in my submission in this case. Reading from paragraph 19 in the first column on the left at page 13:

"Experts, particularly when called en masse, will almost inevitably disagree as among themselves. This imposes a further caveat upon the trial judge when

attempting to assess that evidence, which will usually relate to a discipline of which he will have very little knowledge. I have found useful guidance in two authorities. The first of these is Re Warwicker, McLeod v. Toronto General Hospital...."

and then he proceeds to quote the test suggested in that case.

"When a case is complicated by the introduction of opinion evidence, particularly in cases of a medical nature, where doctors invariably disagree, it is, I think, the duty of the judge to arrive at his own opinion after carefully weighing and considering the evidence of the experts, and availing himself of all the assistance they are able to give him, and himself to determine the question of fact in the light of that evidence, and it is not enough for him to say, 'I doubt and cannot resolve the doubt, because an expert says "I doubt".'

The appropriate approach to be taken by

the trail judge is set out in Southern Canada Power Co. v. R.,... 'In my view the trial judge approached the evidence, and I think rightly, in this manner: Having carefully reviewed and considered the evidence of all the expert witnesses and finding marked differences of opinion among them, he turned to the great mass of lay evidence and then accepted the theory of these experts that was consistent with the evidence of those lay witnesses whose evidence he accepted because of their practical experience and credibility'."

That then is the first suggested approach and that is in the face of conflicting opinion evidence to relate the theory of the opinion evidence to lay evidence that is otherwise in your opinion and judgment considered to be credible. There is a difficulty in this case in that regard, because most of the evidence you have heard is apprised of opinion evidence and not lay witness evidence, but there is some and I suggest to the extent that that evidence is available to you, that correlation can be made.

However, the more compelling and

appropriate approach in my submission is the alternative approach set out at page 25 of this case, and I would ask you to go to page 25, paragraph 106. At page 25, paragraph 106, where the Court indicates, and they are referring again to a lack of unanimity among experts on the technical issue that was important in that case:

> "When faced with such professional dichotomy, what is the court to do? On the one hand, it may take the approach indicated in the Southern Canada Power case, supra, turn to lay evidence, and accept the expert theory which is the more consistent with the evidence of lay witnesses whose practical experience in the matters in issue renders them credible. This option is not available here, since the court has no such lay evidence which is credible and convincing on the critical issue, which is not, of course, to say that it might not be credible and convincing on other aspects."

Stopping there parenthetically, Mr. Chairman and Dr. Kingham, on the critical issue of

whether Site D is suitable for landfilling on the state of the evidence before you and on the critical issue of whether Site F requires a liner, in my submission the lay evidence does not assist you. Could I ask you to go to paragraph 107 for the alternate approach which in my submission should apply to this case:

> "Or, on the other hand, it may take the approach indicated to be the appropriate one, in the absence of such lay evidence, in Cie F. X. Drolet v. London & Lancashire Guarantee and Accident Co.,... McDougall, J.:
>
> 'In this case, as in others, the experts have differed... Where a Court is in doubt as between conflicting statements of so-called expert witnesses it is well to remember the words of Lord Sumner in The Australia v. The Nautilus, (1927) A.C. 145:
>
> "If, as may happen, a judge cannot decide in his own mind whether or not the advice he receives is sound, his position is simply that the point is not proven, and the loss falls on the party who bears the burden of proof in the

issue. It is just as if the necessary proof had failed"'."

It will be my submission to you that in the context of this case, the authority afforded in these cases, and in particular the last two, is most relevant in two respects. First with respect to the issue of a liner at Site F, the City of Burlington has come before you saying that a liner is required at Site F, and the Region's case from the very outset and continuing through this hearing has been that one is not required. The Region's witnesses have so said in the box and Milton's witnesses have so said. There is conflicting expert evidence on the point and, in our submission, the onus of proof on this issue rests with Burlington and they have failed to discharge it.

To make the point another way, in our submission and for the reasons we will outline, the Region has proved a liner is not required at Site F.

It is my submission to you that these general principles are relevant to the second issue, the approveability today of Site D in this context. There is again a conflict of evidence. CRA says that it is, and in my submission -- and as do the Region's witnesses -- and in my submission Dr. Rowe and Dr. Charlesworth say that it isn't, and Mr. Feenstra

individual experts had what the Courts refer to as "the ring of truth." That is an expression that finds its way in the case law as a manner of describing the credibility issue; what comes home to the trier of fact as being both probable and trustworthy, and that applies as well to expert witnesses. Involved in that concept is the issue of what has "a high degree of probability." Involved as well are the factors outlined by the Supreme Court of Canada as to whether a witness was sincere and frank and whether he or she was biased, reticent and evasive. The third factor, in my submission, that should be addressed is the demeanour of the witnesses in the witness box and for all of the reasons outlined in the general authorities and relevant to this issue, in my submission, is the degree to which the expert was forthcoming in matters both favourable and unfavourable to the position that he or she was advancing.

Fourthly is the objectivity of the expert. The authorities speak clearly of the preference to be given to the testimony of disinterested witnesses and the need to weigh the motives of witnesses and their relationship with the parties as well as their attitude and demeanour.

Fifthly is the nature of the methodology

employed by the expert in arriving at his or her opinion. Clearly, Mr. Chairman and Dr. Kingham, if there was some fundamental flaw in approach, if there was some relevant data base or type of data that was not considered or considered inadequately or overstated, that all goes to the reliability of the opinions expressed in reliance on the admissibility and that is relevant.

Sixthly, we commend to you a consideration of the evenness, if I can so describe it, of the evaluations performed by the various experts and that is whether a balanced analysis was undertaken with respect to both Sites F and D. If there were proven inconsistencies in approach and methodology, that is a factor to be taken into account in assessing the objectivity of the witness and the sufficiency of the approach they put before you.

I should say at this point as well, Mr. Chairman and Dr. Kingham, and I will return to this issue at the end of considering the hydrogeological case before you on Site F and Site D, that over many months there were extensive challenges of credibility made and at times it may have seemed, speaking only for my cross-examination if the point was not readily apparent. It is, in a case of this kind, important, in

my submission, to demonstrate for the assistance ultimately of the Board, the kinds of principles I have outlined to you and where there are issues to be taken specifically into account with respect to certain witnesses. That is not to suggest that any expert who came before you did not honestly express an opinion genuinely held. That is very different from suggesting that the opinion was an accurate one.

If I could turn to the Site F hydrogeology evidence and design and operations deal with the matters outlined in our index, starting first with the hydrogeological interpretation at Site F.

There has, of course, Mr. Chairman, been much evidence at this hearing regarding the hydrogeologic conditions at Site F, and concerning the most reliable way in which to characterize the hydrogeological environment at that site. You have heard from Mr. Hodgson in his final submissions to you with respect to that issue and as well from Mr. Estrin and Mr. Garrod. The relevance of this evidence, in our submission, is that it goes directly to the issue of risk assessment and therefore directly to the issue of suitability for approval of landfilling. Mr. Hodgson has already reviewed in detail the evidence of the various hydrogeologists concerning their

so in the form of a witness statement, not an affidavit. The type of motion Mr. McQuaid was bringing was supported by a witness statement, not affidavit material.

On the issue of who is asking you to do this, whether it is the Town of Milton or National Sewer Pipe, not all counsel in the room, perhaps this is the best way I can put it, were aware of these facts at the points in time that have been referred to by Mr. Leitch and by Mr. McQuaid and what Mr. McQuaid has characterized as opportunities to bring this evidence before you.

As the Board certainly knows, I represent the only private party before this Board and have done so since the commencement of this hearing. At the time I conducted my cross-examination of Mr. Feenstra on his reply evidence, I was unaware of the existence of this evidence and the facts and implications of it. It would be imprudent of me to suggest what might have been done had I known, suffice it to say, I didn't know and I now do.

From my client's perspective, Mr. Chairman, Dr. Kingham, there can be no doubt that this evidence is relevant to the Board's determinations. Indeed, I will be making submissions to you on the main

---- Upon resuming at 2:35 p.m.

MR. LANCASTER: Thank you, please be seated.

It has been suggested a number of times throughout this hearing that the purpose of the Environmental Assessment Act is to ensure that the Board hearing an application has all the information necessary to make its decision on behalf of all parties concerned.

Mr. Garrod re-emphasized that purpose this morning when he suggested that this forum should not be a dispute between parties. In this case, between municipalities ~~and~~ in Halton. In gathering this information we understand that the Regional Municipality of Halton has acted in the spirit of the Act and in particular with respect to hydrogeology, they allowed for observations and participation by the other parties to the hearing. This helped the Board to have a clear understanding of the evidence brought before us.

The Board now understands that additional hydrogeological studies were undertaken on April 6th and 7th of this year. With the exception of the Milton parties, other parties were not informed of the test and this result and were not invited to

participate in it. Within 30 hours the T-shaped hole, more than eight metres deep had been dug, examined and filled in again. In subsequent days, particularly on April 12th, 1988, counsel for the party on whose behalf the test pit had been dug was cross-examining a witness on the hypothetical existence of fractures in clay tills across southern Ontario. The witness stated that he had no evidence to support such a hypothesis, but that "If evidence were provided by yourself or the proponent, one would have to consider that fracturing with respect to assessing site suitability."

It was not suggested to the Board at that time or at any time since then that such evidence was available. When the expert witness for the proponent, Mr. Feenstra, proposed an hypothesis about fracturing in such tills, he also stated that he had no data to support such a hypothesis in the vicinity of Site D. Again, it was not suggested to the Board that such data might exist. When cross-examined about his hypothesis by counsel for the City of Burlington about the extent of the testing necessary to prove his hypothesis, Mr. Feenstra gave evidence that conclusive evidence could not be assured with even five test pits.

Additional tests of a different kind would be needed to clearly support or refute that

SCHEDULE "A" to Report CAO 262/86

Definition of the Undertaking - Unamended

The original Undertaking for which the Regional Municipality of Halton seeks approval is defined in Halton's Environmental Assessment for the Landfill Component of Halton's Solid Waste Management System, October, 1985 on page S1 as follows:

> "... to landfill in Halton 11.3 million cubic yards of solid waste, and to do so by one of two alternative methods:
>
> i) landfilling at the site commonly referred to as Site F in the City of Burlington, as set out in Map A, attached hereto, or
>
> ii) landfilling at the site commonly referred to as Site D in the Town of Milton, as set out in Map B, attached hereto."

Definition of the Undertaking - Amendment

As a result of the more detailed site specific investigations carried out by Halton during its Landfill Technical Study, refinements were made to waste projections and the site plan areas.

The definition of the Undertaking should therefore be amended to reflect these updated projections and requirements.

The revised definition of Halton's undertaking for which it seeks approval under the Environmental Assessment Act is:

> "The undertaking is to acquire land for, construct, operate and maintain a landfill 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, as shown on Maps A and B hereto; or
>
> ii) landfilling at the site referred to in Halton's Environmental Assessment as Site D, in the Town of Milton, as shown on Maps A and C hereto."

if we looked at Criterion No.6 -- and I have that marked as being found on page 59A of Exhibit H-10. This talks about a habitat for rare or endangered species that are endangered regionally, provincially or nationally.

First of all, would you agree with me that that language is somewhat unfortunate --

A. Yes.

Q. -- because it tends to confuse "endangered" with "rare"?

A. Yes.

Q. But notwithstanding that, I understand that you've interpreted it as meaning that if you have provincially rare or regionally rare plants, that it would meet that Criterion?

A. Yes.

Q. And you would agree with me therefore that Site D would also meet Criterio 6 --

A. Yes.

Q. -- in terms of being a regional E.S.A.?

A. Yes.

Q. And in fact many other areas of the Region, if studied in sufficient detail,

would likely also meet that Criterion?

A. Yes.

Q. And that alone would not be sufficient for all of these areas to become E.S.A's?

A. Not in my opinion.

Q. You referred, when you were being cross-examined by Mr.McQuaid, to a letter from the City of Burlington dated March, 1984, from Mr.Boggs, who I believe was the Chief Administrative Officer at that time. Do you remember that letter?

A. Yes, I do.

Q. It wasn't marked as an exhibit and I wondered where you were reading from, if you could identify it more precisely?

A. This was the culmination of a discussion -- at least that is my understanding -- between Mr.Walker and Burlington in terms of what level of information is appropriate and should be applied, and it says at the top:

Chairman and Members of the Solid Waste Management Committee.

Subject: City of Burlington's response to Region of Halton.

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Giffels Associates Limited
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Institute of Environmental
Research Inc.
Pollutech Limited
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Final Report

Phase 2, Stage 2A

General Overview Analysis

Environmental Assessment of the Landfill Component of Haltons Solid Waste Management System

October 1985

The identification of the quarries shown on Figure 7 should not be misconstrued as evidence that these are necessarily favourable sites for a sanitary landfill. Rather, it should be understood that these areas, on the basis of the overview analysis, stand out as offering potential. The site specific characteristics of the individual pits and quarries will be examined closely during the site specific stage of the study, which follows the overview stage.

It is true that much benefit might be derived through the use of these non-agricultural areas, but it must be recognized that such sites may require considerable engineering to mitigate less than desirable physical features. This factor does distinguish the quarries somewhat from areas identified through the overlay mapping technique, but the quarries offer ofher significant benefits, such as avoidance of agricultural lands and reclamation of damaged lands.

It may be worth noting that Metro Toronto, which buries close to half of all the garbage produced in Ontario currently uses only abandoned, engineered aggregate pits for sanitary landfill and has done so for many years without obvious bad effects. The same is true for many other municipalities. Thus, this option warrants full and careful consideration in Halton.

4.3.1 National Sewer Pipe

Located in the Town of Burlington, in the vicinity of King Road and the North Service Road of Highway 403, this property has been the subject of several intensive hydrogeologic investigations to assess its suitability for sanitary landfill. The area is underlain by red and green shale of the Queenston formation. It is cut by several stream beds that originate near the rim of the Niagara Escarpment. Groundwater may lie near surface in some of the lower quarried areas. There are no down gradient groundwater users because the area to the south is serviced with a surface water supply. The shale weathers to a clayey consistency that may be suitable for cover material.

Figure 1

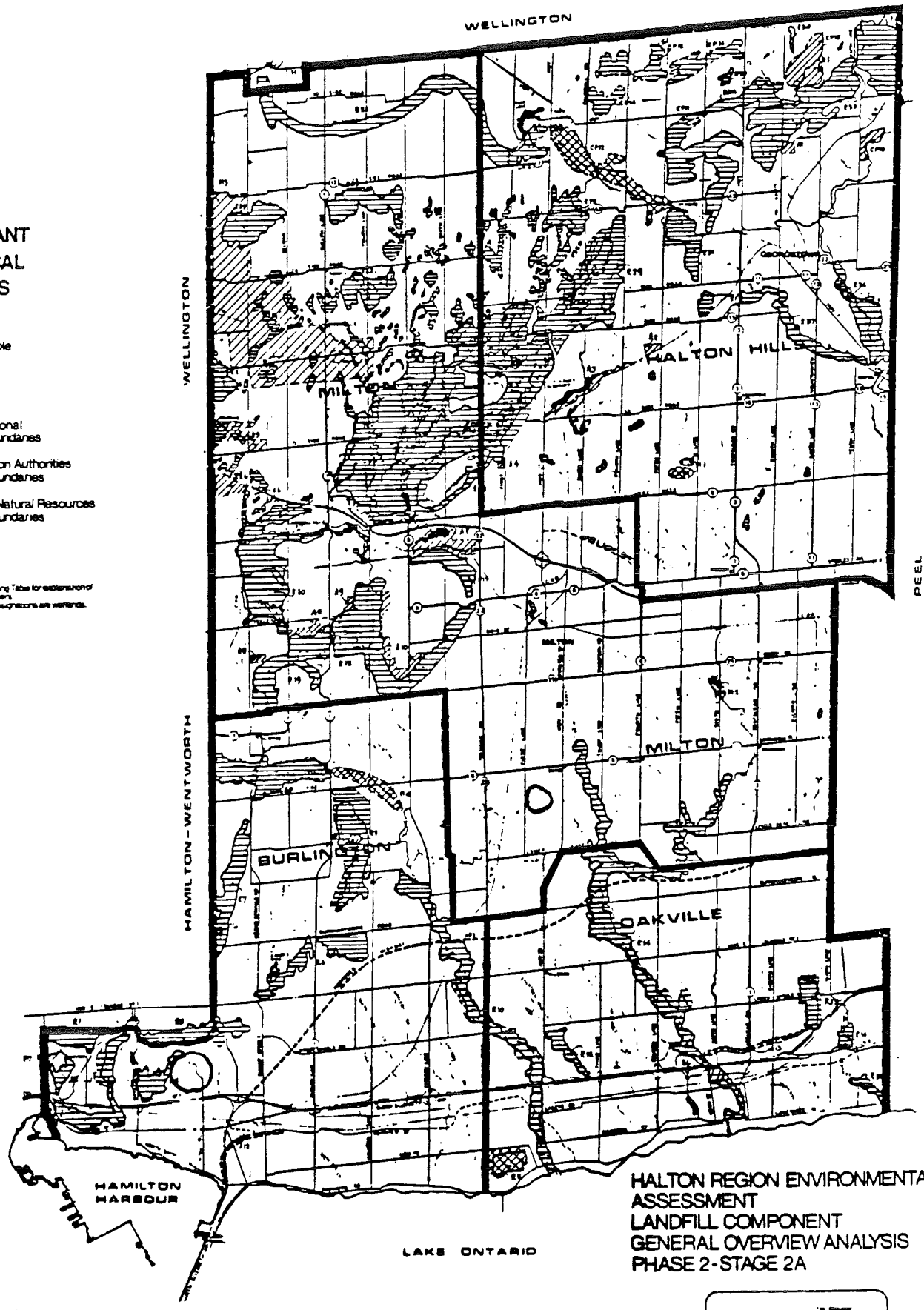
SIGNIFICANT BIOLOGICAL FEATURES

LEGEND

- Unacceptable
- High
- Moderate
- — Halton Regional Defined Boundaries
- --- Conservation Authorities Defined Boundaries
- -- Ministry of Natural Resources Defined Boundaries

NOTES

See accompanying Table for explanation of designated numbers
Areas without designations are wetlands.



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

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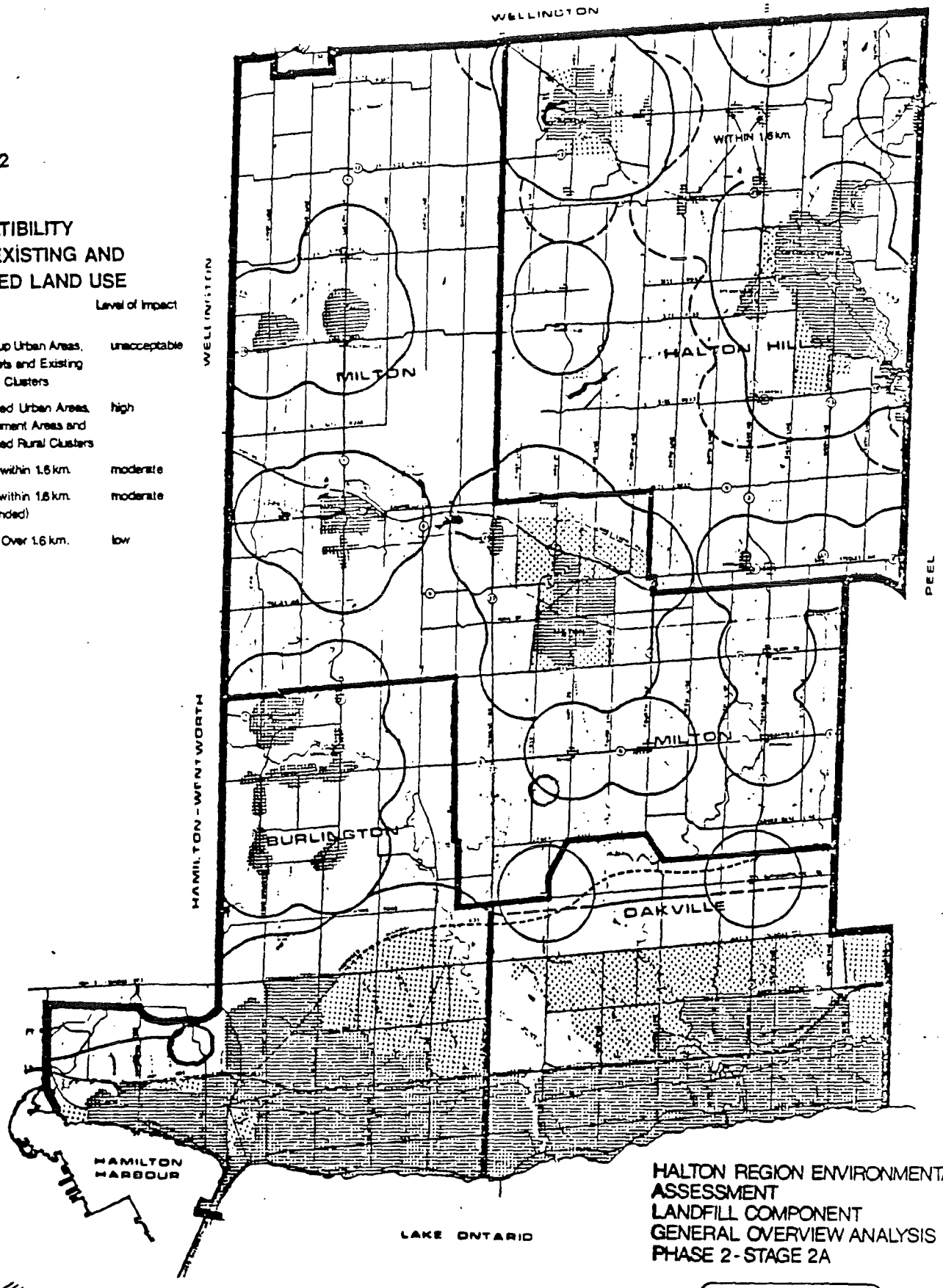
Halton

Figure 2

COMPATIBILITY WITH EXISTING AND PLANNED LAND USE

LEGEND	Level of Impact
Built-up Urban Areas, Hamlets and Existing Rural Clusters	unacceptable
Planned Urban Areas, Settlement Areas and Planned Rural Clusters	high
Area within 1.6 km.	moderate
Area within 1.6 km. (Extended)	moderate
Area Over 1.6 km.	low



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

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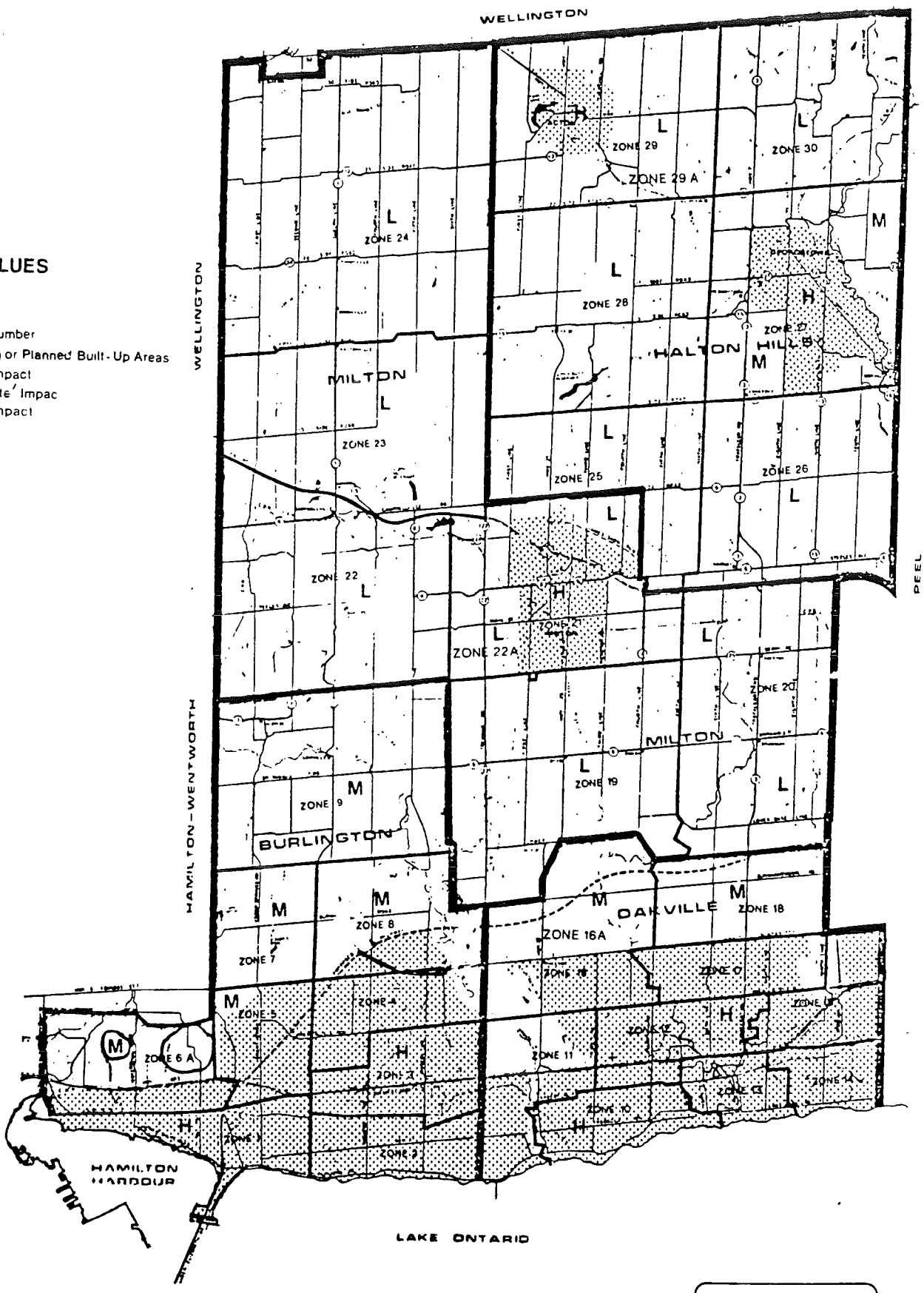
Figure 4

LAND VALUES

LEGEND

- 7 Zone Number
- Existing or Planned Built-Up Areas
- H 'High' Impact
- M 'Moderate' Impac
- L 'Low' Impact



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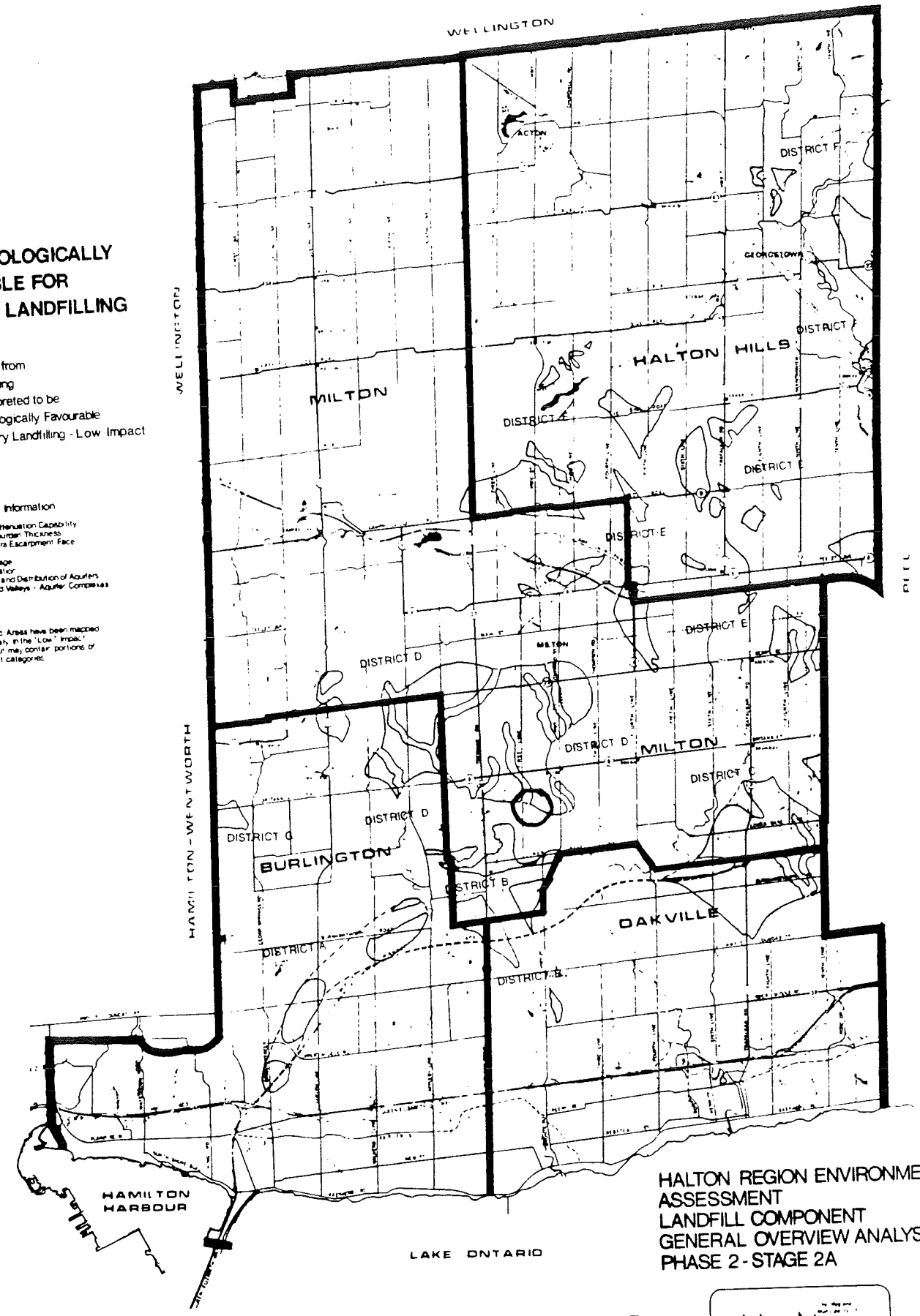
gure 6

AREAS YDROGEOLOGICALLY VOURABLE FOR SANITARY LANDFILLING



GEND

tential Impact from Sanitary Landfilling

Area Interpreted to be Hydrogeologically Favourable for Sanitary Landfilling - Low Impact

Sources of Information

Map of Soil Attenuation Capability
Map of Overburden Thickness
Map of Niagara Escarpment Face
Map of Slope
Map of Drainage
Map of Infiltration
Map of Type and Distribution of Aquifers
Map of Buried Valleys - Aquifer Complexes

Notes

Districts and Areas have been mapped predominately in the "Low" Impact Category but may contain portions of other impact categories

HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

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halton

Figure 7

CANDIDATE AREAS FOR SANITARY LANDFILL SITE(S)

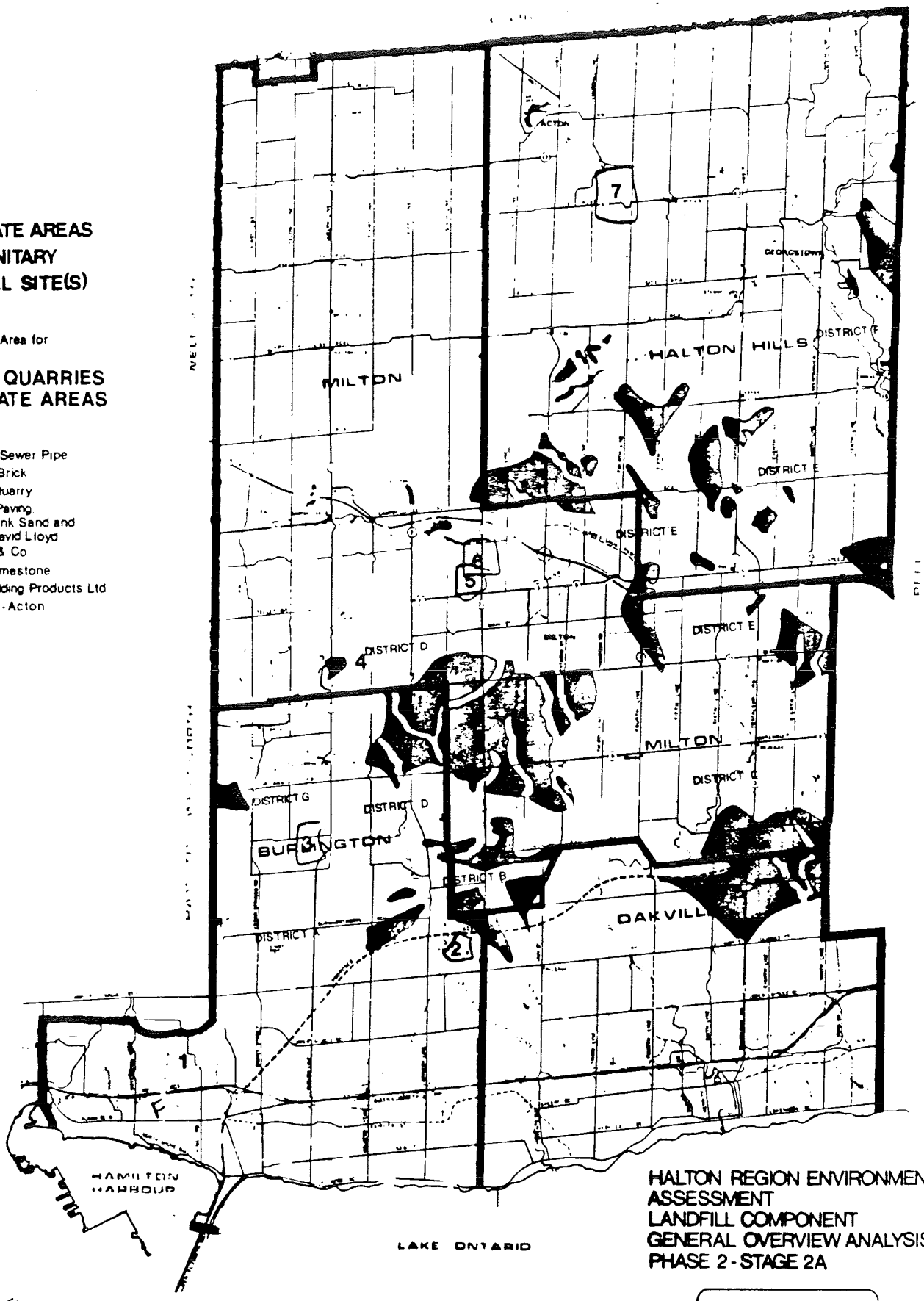
LEGEND

- Potential Area for Landfill

PITS OR QUARRIES CANDIDATE AREAS

LEGEND

1. National Sewer Pipe
2. Canada Brick
3. Nelson Quarry
4. Warren Paving, Springbank Sand and Gravel, David Lloyd George & Co
5. Milton Limestone
6. RBD Building Products Ltd
7. Indusmin - Acton



HALTON REGION ENVIRONMENTAL ASSESSMENT
LANDFILL COMPONENT
GENERAL OVERVIEW ANALYSIS
PHASE 2 - STAGE 2A

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TABLE 41 - CANDIDATE AREA: DISTRICT D

Description: District D is found in the central part of the Region in the areas surrounding Britannia Road and Tremaine Road. The ter rain is rolling to hummocky composed predominantly of clayey to silty till. Groundwater supplies are obtained from the Queenston shale. There are three potential areas in this District. They range in size from about 40 to 2500 hectares.

SUMMARY OF POTENTIAL IMPACTS

Factors	Level of Impact		
	High	Moderate	Low
PHYSICAL FACTORS			
Attenuation Capability			Till and clay plains
Overburden thickness			Predominantly greater than 15m
Agricultural Capability	Agricultural Capability Classes 1, 2, 3, 4		
Slope		Slopes of 0-20%	
Distance from Major Watercourse		Areas over 100m from major watercourse	
Infiltration			Infiltration rate less than 15cm per year
BIOPHYSICAL FACTORS			
Significant Biophysical Areas	Northwestern fringe lies adjacent to Crawford Lake - Rattlesnake Point Escarpment Woods E.S.A.	Area on southern fringe lies adjacent to "Spawning Nursery Area" identified by Ministry of Natural Resources	
LAND USE FACTORS			
Compatibility with Existing and Planned Use		Northeastern areas of District lie within 1.6km of Milton Urban Area and/or Royne Rural Cluster (P8) Southern part of District lies within 1.6km of Hamlet of Lowville Area in extreme western part of District lies within 1.6km of Guelph Line/Derry Road Rural Cluster (E13)	Remaining areas lying more than 1.6km from the designated areas
TRANSPORTATION FACTORS			
Traffic Service and Safety	Zone 22: considerable off highway travel for Burlington and Oakville; Guelph Line is only N-S Regional Road; not considered suitable for major haulage route	Zone 9: location of zone results in increasing haulage lengths not on highways	Zone 19: maximum use of highways for haulage Zone 21: some urban conflict potential in Milton
SOCIAL FACTORS			
Population Density			Less than 100 persons/square kilometre
Community Services & Institutions	Western and Central portions of District are located north of airfield Hospital is located in North Central part of District	Northeastern part of District is adjacent to a community/ recreation centre and to two elementary schools (one under construction North & east parts of District lie within Parkway Belt West A Cemetery and Church are located adjacent to the western portion of District	
ECONOMIC FACTORS			
Land Costs (1982 $)		$10,000-$50,000/ha (approx. $4,000-$20,000/ac) in area lying within Burlington	Below $10,000/ha (approx. $4,000/ac) within area in Milton
Haul Costs (1982 $)			$6.01-$7.56/tonne haul cost range (2001) in Burlington $4.72-$5.76/tonne haul cost range (2001) in Zone 19 in Milton $6.03-$7.37/tonne haul cost range (2001) in Zone 21 in Milton
		$7.04-$8.55/tonne haul cost range in Zone 22 in Milton	
CULTURAL FACTORS			
Historical			No known designated heritage sites
Archaeological Resources	32 known sites, others in near vicinity		

TABLE 45 - PITS OR QUARRIES CANDIDATE AREAS: NATIONAL SEWER PIPE

SUMMARY OF POTENTIAL IMPACTS

Factors	Level of Impact		
	High	Moderate	Low
BIOPHYSICAL FACTORS Significant Biophysical Areas			No impact
LAND USE FACTORS Compatibility with Existing and Planned Use		Site lies within 1.6 km of Burlington Planned and Existing Urban Areas	
TRANSPORTATION FACTORS Traffic Service and Safety			Zone 6: Some urban conflict potential in Burlington (Plains Road/Brant Street)
SOCIAL FACTORS Population Density Community Services & Institutions		100-199 persons/square kilometre Within Parkway Belt West	
ECONOMIC FACTORS Land Costs (1982 $) Haul Costs (1982 $)		$10,000-$50,000/ha (app. $4,000-$20,000/acre)	$5.48-$6.89/tonne haul cost range in Burlington (2001)
CULTURAL FACTORS Historical Archeaological Resources			No known designated heritage features No known sites

ADMINISTRATIVE LAW

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this, as will be shown, there are serious legal objections.[1] There is force in the dissenting view of Russell L.J. that a planning authority, as 'the guardian of the planning system', is 'not a free agent to waive statutory requirements', and that the law should not be made to conform to 'a thoroughly bad administrative practice'.[2]

No power to dispense

Where something more than mere procedure or formality is in question, a public authority cannot exercise a dispensing power by waiving compliance with the law. For this would amount to an unauthorised power of legislation. There is therefore no power for a local authority to waive compliance with its building byelaws;[3] nor is any such power possessed by the minister with whose consent the byelaws are made.[4] Still less is there any power to grant dispensations from the ordinary law, e.g. as to obstruction of the highway.[5]

Abandonment

A public authority which fails to proceed with a compulsory purchase order may be held to have abandoned it and so to have lost the power to enforce it.[6]

RES JUDICATA

Principles and distinctions

One special variety of estoppel is res judicata. This results from the rule which prevents the parties to a judicial determination from litigating the same question over again, even though the determination is demonstrably wrong. Except in proceedings by way of appeal, the parties bound by the judgment are estopped from questioning it. As between one another, they may neither pursue the same cause of action again, not may they again litigate any issue which was an essential element in the decision. These two aspects are sometimes distinguished as 'cause of action estoppel' and 'issue estoppel'. It is the latter which presents most difficulty, since an issue 'directly

[1] Below, p. 330.

[2] In the *Wells* case (above) at 1015.

[3] *Yabbicom* v. *King* [1899] 1 Q.B. 444; *Bean (William) & Sons* v. *Flaxton Rural District Council* [1929] 1 K.B. 450; below, p. 709.

[4] *Bean (William) & Sons* v. *Flaxton Rural District Council* (above).

[5] *Redbridge London Borough Council* v. *Jacques* [1970] 1 W.L.R. 1604; *Cambridgeshire County Council* v. *Rust* [1972] 2 Q.B. 426.

[6] *Tiverton and North Devon Railway Co.* v. *Loosemore* (1884) 9 App. Cas. 480; *Grice* v. *Dudley Corporation* [1958] Ch. 329; *Simpsons Motor Sales Ltd.* v. *Hendon Corporation* [1964] A.C. 1088.

upon the point' has to be distinguished from one which 'came collaterally in question' or was 'incidentally cognisable'.[1] In any case, 'there must be a lis or issue and there must be a decision'.[2]

Like other forms of estoppel already discussed, res judicata plays a restricted role in administrative law, since it must yield to two fundamental principles of public law: that jurisdiction cannot be exceeded; and that statutory powers and duties cannot be fettered.[3] Within those limits, however, it can extend to a wide variety of statutory tribunals and authorities which have power to give binding decisions. It is by no means confined to courts of law in the strict sense.

Res judicata is sometimes confused with the principle of finality of statutory decisions and acts, and thus with the general theory of judicial control. If a public authority has statutory power to determine some question, for example the compensation payable to an employee for loss of office,[4] its decision once made is normally final and irrevocable. This is not because the authority and the employee are estopped from disputing it, but because, as explained elsewhere,[5] the authority has power to decide only once and thereafter is without jurisdiction in the case. Conversely, where a statutory authority determines some matter within its jurisdiction, its determination is binding not because of any estoppel but because it is a valid exercise of statutory power. The numerous cases which hold that a decision within jurisdiction is unchallengeable[6] have therefore no necessary connection with res judicata. Res judicata does nothing to make the initial decision binding: it is only because the decision is for some other reason binding that it may operate as res judicata in later proceedings raising the same issue between the same parties.

How easily these questions may appear to overlap may be seen in a case where a school teacher, who had enlisted for war service, claimed additional pay from the local authority which had undertaken to make up his service pay to the level of his teacher's pay. The dispute was referred to the National Arbitration Tribunal, which ruled against him, and he then brought proceedings in the High Court. The questions were whether there was a 'trade dispute'

[1] These phrases were used in *The Duchess of Kingston's Case* (1776) 20 St. Tr. 355, 538n., in which the rules were laid down. See Spencer Bower and Turner, *Res Judicata.*

[2] *Vernon* v. *Inland Revenue Commissioners* [1956] 1 W.L.R. 1169 at 1178, holding that the Attorney-General was not estopped from disputing the purposes of a charity by having been party to an order of the court which did not put that question in issue.

[3] Above, p. 220.

[4] As in *Livingstone* v. *Westminister Corporation* [1904] 2 K.B. 109.

[5] Above, p. 214.

[6] See above, p. 42.

within the Tribunal's statutory jurisdiction, and whether it had jurisdiction over private (as opposed to national) service agreements. These being answered in the affirmative, the Tribunal's award was held conclusive[1]—from which it followed, the judge said, that it was res judicata.[2] But in fact the case seems to belong to the common class where a specific matter is allotted by statute to a specific tribunal so that the tribunal's award, within its jurisdiction, is conclusive.[3] Where the question in issue is one of jurisdiction, no estoppel can prevent the court from determining it.[4] Once it is determined in favour of the tribunal, no estoppel is needed to bind the parties conclusively. If in the case of the teacher there had been an 'issue estoppel'—if, for example, the tribunal had determined that he belonged to a particular category, and he disputed this in later proceedings against the local authority—a true res judicata might have been pleaded.

Administrative cases

Res judicata in an administrative context is illustrated by a decision of the House of Lords about the making up of Sludge Lane, Wakefield. Adjoining landowners disputed their liability to contribute to the costs incurred by the Corporation on the ground that Sludge Lane was a public rather than a private road, and so chargeable to the ratepayers generally rather than to the frontagers. A local Act empowered two justices to determine the objection, and they determined it in favour of the frontagers. Three years later the Corporation undertook further works and again attempted to charge the frontagers, who were mostly the same persons as before. The justices refused to reconsider the matter, holding it to be res judicata; and after being reversed in the King's Bench Division and upheld in the Court of Appeal, their decision was upheld in the House of Lords.[5] The House of Lords was prepared to treat the original decision as a judgment in rem,[6] binding on everyone. Lord Davey said that, alternatively, it would bind all who were given notice and an opportunity to object. Such an

[1] *Re Birkenhead Corporation* [1952] Ch. 359.

[2] At 379.

[3] As for example *I.R.C.* v. *Pearlberg* [1953] 1 W.L.R. 331; *Healey* v. *Minister of Health* [1955] 1 Q.B. 221; *R.* v. *Paddington &c Rent Tribunal ex parte Perry* [1956] 1 Q.B. 229; *Davies* v. *Price* [1958] 1 W.L.R. 434.

[4] See above, p. 222.

[5] *Wakefield Corporation* v. *Cooke* [1904] A.C. 31. See similarly *Armstrong* v. *Whitfield* (1973) 71 L.G.R. 282 (determination as to public right of way conclusive in later proceedings).

[6] For this see also *Attorney-General* v. *Honeywill* (1972) 71 L.G.R. 81; *Armstrong* v. *Whitfield* (above).

estoppel would, on ordinary principles, bind their successors in title also.[1]

The House of Lords distinguished *R. v. Hutchings*,[2] a superficially similar case where the justices had held that the disputed road was a public highway and had dismissed the local board's application for the enforcement of its levy on the frontager. Five years later the same board made another levy on the same frontager which a magistrate upheld. The Court of Appeal held that this was correct and that there was no res judicata. The reason was that the Public Health Act 1875, unlike the local Act in Wakefield, gave the justices no power to determine finally whether the street was public or private. Their only power was to decide whether the levy was properly assessed or not. If its validity was disputed on the ground that it was ultra vires, the magistrate had indeed to determine that issue before proceeding further; but it was only a matter 'incidentally cognisable' which created no estoppel. That is to say, it lay outside the limited area within which justices could give an unchallengeable decision.[3] Otherwise, said Lord Selborne L.C., there might be two laws operating simultaneously in opposite directions as against different persons in exactly the same circumstances.[4]

The reasoning of the last-mentioned case has played an important part in a series of later decisions about assessments for rates and taxes. In these it has been repeatedly held that matters decided for the purposes of one year's assessment or of one rating list do not amount to res judicata for the purposes of later assessments or lists. A medical society successfully established before the Lands Tribunal in 1951 that it was entitled to exemption from rates under the Scientific Societies Act 1843. In 1956 a new valuation list had to be made and the valuation officer again attempted to assess the society, and on his appeal to the Lands Tribunal the society pleaded res judicata. Although it was admitted that there had been no relevant change of circumstances, the House of Lords disallowed this plea and ruled that the question must again be decided on its merits.[5] It was held that questions determined for the purpose of a different list, since the local valuation court had jurisdiction to determine them for the purpose of one list only at any one time. The same point has been settled, after some difference of opinion, in a line

[1] See *Halsbury's Laws of England*, 4th ed., vol. 16, p. 1041.

[2] (1881) 6 Q.B.D. 300.

[3] See at 305.

[4] But this possibility is always inherent in the law of res judicata, e.g. where parties are bound by a judgment which is later overruled in proceedings between other parties. Lord Selborne perhaps meant that it was particularly inappropriate in public law.

[5] *Society of Medical Officers of Health* v. *Hope* [1960] A.C. 551.

of income tax cases. Thus where a trust in Ceylon had been held to be a charity, and so exempt from income tax, by the statutory board of review, this was held to be conclusive only in the relevant year of assessment, and to be open to challenge by the Commissioner of Income Tax in any subsequent year.[1] The Privy Council emphasised that the important consideration was the limited nature of the question that was within the tribunal's jurisdiction: each year's assessment was a different operation and there was not 'eadem quaestio' of the kind required for res judicata.

The search for a principle

The above-mentioned decisions on rates and taxes have carried the doctrine of *R. v. Hutchings,*[2] which they profess to follow, far beyond its apparent boundaries. That case merely illustrates the familiar principle that where jurisdictional questions are raised before a tribunal of limited jurisdiction, the tribunal must necessarily determine them for its own purposes but its determination may be reviewed in the High Court.[3] It follows that the tribunal's determination cannot be conclusive, whether as res judicata or otherwise. But it is plain that the question whether a taxpayer or ratepayer is entitled to exemption, if raised before a revenue tribunal, is not 'collateral' or 'incidental' in any such sense: it falls squarely within the range of questions which it is the tribunal's business to decide conclusively. The tax and rate cases observe no such distinction, and the Privy Council admit that they may form 'a somewhat anomalous branch' of res judicata.[4] It should likewise be admitted that no help is to be derived from trying to distinguish judicial from administrative functions[5] (that favourite fallacy[6]): all that res judicata requires is some power to adjudicate. Nor does there appear to be merit in the argument that there is no *lis* because the taxing or rating officer is a neutral party rather than an opponent.[7] Law based on such sophistries must lack a firm foundation.

Yet a firm foundation exists, and can be traced through a series of judicial opinions. The principle is simply that an assessing officer

[1] *Caffoor* v. *Commissioner of Income Tax* [1961] A.C. 584, following *Broken Hill Proprietary Company Ltd.* v. *Broken Hill Municipal Council* [1926] A.C. 94 and *Inland Revenue Commissioners* v. *Sneath* [1932] 2 K.B. 362; not following *Hoystead* v. *Commissioner of Taxation* [1926] A.C. 155.

[2] Above.

[3] Below, p. 240.

[4] *Caffoor* v. *Income Tax Commissioner* [1961] A.C. 584 at 599.

[5] *Caffoor* (as above); and see [1965] P.L. 237 at 241 (G. Ganz).

[6] See below, pp. 439, 534.

[7] The House of Lords lent countenance to this in *Society of Medical Officers of Health* v. *Hope* [1960] A.C. 551. Cf. *Inland Revenue Commissioners* v. *Sneath* [1932] 2 K.B. 362.

today at the Burlington site, the water is collected in the perimeter collection system that exists at the site, it then feeds down through the pipes into the existing sewer pipe along the North Service Road.

A. I expect so, but I'm not positive of what their connection is like.

Q. I suggest it goes along the existing sanitary sewer line for ultimate treatment at the Skyway treatment plant at the QEW and the Burlington Skyway?

A. I believe so.

Q. And in effect the same thing is proposed by you and your firm for Site F and that is you would hook up to the existing sanitary sewers and run the leachate off in the same way?

A. Yes.

Q. There are no sanitary sewers in place at Site D and they depend on septic systems, do they not?

A. That is right.

Q. Could you move to the proposition I said I was going to put to you and that was to assume that the highly fractured zone does not exist, and in fact I am going to ask you to make the assumption contrary to what you have told us as a result of your own

investigations and contrary to your professional judgment on the matter, but assume for me that the highly fractured zone does not exist in the manner you have described and are you clear on the assumption?

A. Yes.

Q. First we are still talking I suggest about a maximum of five per cent leachate or water to be concerned about escaping through the underdrain system. That is the maximum. It's the same scenario; 95 per cent will be collected by the underdrain system?

A. No, I don't believe so. The number would be lower. I'm sorry, the capture efficiency of the collector system would be higher and it is that underdrain system which is carrying the water away and when I say the underdrain I will come back to that, but the highly-fractured unit is creating the downward gradients and we are saying let's ignore the downward gradients. If we ignore the downward gradients and ignore the lower unit, then not much leachate moves to depth. We have modelled that situation and essentially you can't squeeze very much liquid into the ground and most of it would surface on or near the site and the capture efficiency of the systems would be higher.

Q. Let's deal then with the numbers so

I understand what you are saying. What number are we looking at in terms of capture and if it's less than five per cent, what is it?

A. It might well be close to zero.

Q. Let's assume it isn't zero but, say, one or two per cent.

A. Fine. Then perhaps you would be dealing with a gallon per minute. It's quite small.

Q. Mr. Garrod would like us to assume five.

A. Five gallons a minute?

Q. Five per cent, so let's take the worst case at five per cent. I am going to suggest to you and are you clear on the assumptions, we are still assuming first the highly-fractured zone does not exist, and I am asking you to make the assumption that it is five per cent leachate that will escape from the bottom of the landfill. Are you clear on the assumptions?

A. Yes.

Q. I will suggest to you that there will be only one of two possible results if that highly-fractured zone doesn't exist and I think you alluded to them in passing a moment ago but I would like to be clear about them. I suggest the first possible consequence of the two assumptions I have put to you is that that escaping

leachate, that five per cent or whatever quantity it is, will go to depth at Site F and will ultimately with the passage of time follow the groundwater paths and come up in Lake Ontario. Am I right in that? That's the first possibility. It will go to depth?

A. Right now the model indicates for example an upward gradient in some areas as a result of this, so the two scenarios you can have other than that scenario is -- one is that it is lateral in that zone and the other would be that it's still downward in that zone. Right now the model indicates a discharge area and if that isn't correct, if the model -- not necessarily that the model is wrong but not accurate enough -- then you have two other possibilities and one is that it is horizontal and the other is that there is still some vertical component . In the case you have put to me it would still have some vertical component and it would be going much deeper and therefore wouldn't discharge until Lake Ontario.

Q. Let's deal with that and we can come back to the lateral scenario. That in effect is a yes to my question, as I understand it, and I don't put it in terms of priority, but that is one of two possibilities, that it will follow the downward and we will have vertical gradients but it will ultimately go to much deeper

depth and ultimately it will come up in Lake Ontario?

A. That is right, yes. Yes, that is a possibility. I shouldn't say it's a possibility, but as a scenario it's a scenario other than the one we have put forward, the case we put forward.

Q. Under the assumptions I have put to you that is one of two results, isn't it?

A. Yes, it is.

Q. Under that scenario, I suggest to you, that it will take a very great number of years for it to reach Lake Ontario. Isn't that so?

A. Based on what we are seeing at Bayview and Burlington, yes, I would agree with that.

Q. We are talking dozens of years?

A. At least.

Q. At least?

A. Yes.

Q. How long do you think in fact it would take, would it be hundreds of years?

A. Well, we have got 700 metres and maybe it has moved that far in nearly 40 years, so probably well over 100 years anyway.

Q. Throughout that entire period of time it will be attenuated by the soils through which it is moving. Isn't that so?

A. I expect it would be even though that wasn't assumed in the model but, yes, indeed, I believe the shale will attenuate this leachate.

Q. Perhaps you can see where I am going. I am really suggesting that under that scenario, by the time it reaches the lake there will be no contaminants that are distinguishable from background water quality given the length of time it will have to take before it gets there and the attenuation mechanisms that will be at work en route, and isn't that in fact the result of that scenario?

A. I would expect that to be the case and it certainly would appear to be borne out by the results of monitoring at the two existing sites.

Q. Just on that scenario and the length of time that in fact it might take, you said it would certainly be over 100 years, I would like to show you what I promise will be my last extract from Dr. Cherry's book on "Groundwater." I don't profess to speak for any others, but this is my last.

MR. ESTRIN: Why not photocopy the whole book?

MS CRONK: You can photocopy the whole book. I would prefer to do it by extracts.

Q. This is an extract from page 158

statement for landfills that you should use best available technology?

A. Not that I know of and I'll go one step farther. I'm not even sure what best available technology means because there are a number of definitions for it, but taken quite literally it means the best available technology. Some people worry about whether it's best available practical technology or best available -- it gets confusing after a while.

Q. I understand that that term has been used in what is called the MISA program which is designed as it indicates to address water pollution, particularly concerns with toxic discharges?

A. If you say so.

Q. Are you not familiar with that?

A. I don't deal at all with MISA.

Q. Have you never looked at the document itself?

A. I should be ashamed to admit it, but to be honest, no.

Q. No?

A. No. I have lots of things to do without reading things that are not directly related to my job. I'm ashamed to say so and I suppose I should have read MISA or been acquainted with it and I know

generally what it's about but that's about all.

Q. Can I ask you to confirm what it's generally about at least for the benefit of the Board? I'm handing you the brochure of the Ministry of the Environment which deals with the MISA program generally. That's all we really need at this point.

MR. HODGSON: Can we establish this witness has some familiarity with this because he has already said he hasn't and this is the second time at this hearing Mr. McQuaid has tried to introduce this document into evidence and the last time he wasn't successful because the witness didn't know about it and now he's going to try and slip it in through this witness.

THE WITNESS: I can tell you everything I know about MISA. It deals with discharge to surface water and that's all I know and it's handled by the Water Resources Branch.

MR. McQUAID: Q. And it uses best available technology?

A. I don't know. I don't know what it uses. I suspect it's not that simple because things never are.

MR. TIDBALL: I suspect Ms Vigod and I should go in the box because she and I know more about

MISA than Dr. Hughes. In fact it's the best technology economically achievable, and I have no objection to it going in because it's an information package of the Ministry and at the end of the day it will have nothing to do with the assessment of either of these landfills, but if Mr. McQuaid would like to put it in I don't object.

MR. McQUAID: I would like to put it in.

MR. HODGSON: I object to putting it in. I don't think we have a witness who can speak to it. This witness indicated he doesn't deal with surface water matters and it's handled by another branch and he knows nothing about it and he has too much to do to bother getting acquainted with it. I mean no disrespect to the witness, but I think Mr. McQuaid now -- and we know why Mr. McQuaid wants it in as we have had a witness who has tried to flog the idea of best available technology at Site F and therefore he wants it. He had a chance to call a witness to speak to that issue and he hasn't taken that chance and I don't think he should now have an opportunity to slip into evidence something that this witness can't address, can't confirm, can't tell us anything about other than he can probably tell us it comes from the Ministry.

MR. McQUAID: That would be sufficient.

I would like to put it in just to confirm it comes from the Ministry.

MR. LANCASTER: Perhaps we won't mark it but will accept it.

MR. McQUAID: I'm surprised that the Region would not want to have the best evidence if they could get it in.

MR. HODGSON: We want the best evidence.

MR. ESTRIN: The witness has said it has nothing to do with groundwater.

MR. McQUAID: He hasn't said anything about it at all yet.

MR. ESTRIN: If it was applicable to groundwater he would know of it.

MR. TIDBALL: Could we clarify something off the bat? This document is not MISA but something put out and it's a PR document put out on the release -- it is, and in fact I think it actually came out when the first draft regulation was released for public comment and the document, if you want the document on what MISA is all about you need the MISA white paper and the MISA white paper was put out as a discussion document by the Ministry.

MR. LANCASTER: We can accept that with no problem.

MR. TIDBALL: This summarizes what MISA is and I don't think anyone should have any problem with it.

MR. LANCASTER: We can't hear you giving evidence on it and we can accept it but not as an exhibit.

MR. McQUAID: I would like to put the full document in for you so you have the underlying document.

MR. HODGSON: If you receive the full document in evidence, then surely it means that other parties in fairness have an opportunity to test what's in that document by questioning the witness about the document and what it means. We don't have that situation and we don't have a witness who can speak to that policy paper and as far as I know we are not going to have a witness who can speak to it. Perhaps someone wants to correct that, but in the absence of that you will have another piece of paper on which I submit you can't place any weight until somebody proves it in the witness box and someone is prepared to speak to it and defend it as this man is prepared to speak to and defend the reasonable use policy and the guidelines for engineered landfill facilities policy.

MR. McQUAID: Mr. Chairman, I have a

witness here from the Ministry of the Environment and produced by the Ministry of the Environment and I think it's only appropriate we can put a document from the Ministry because it talks about a policy program statement of the Government of Ontario controlling municipal, industrial discharges into surface waters and I can assure you it gives us the term "best available technology".

MR. LANCASTER: Is that the white paper?

MR. McQUAID: The white paper and there is reference to it in the summary.

MR. LANCASTER: I think we can accept it as government policy.

MR. McQUAID: I was going to work from the summary document because that was sufficient for my purposes.

MR. HODGSON: I accept, Mr. Chairman, you can accept it as government policy and I won't contest the issue it's government policy if someone is prepared to tell me it is, and I'll even take Mr. Tidball's evidence on this, notwithstanding he is no longer with the government. However the issue is whether or not it's government policy as it relates to landfilling in Ontario which is the subject matter of this hearing. In that regard I think we have already

had evidence from this witness that it's not and therefore I don't know how it can have any relevance whatsoever. If we want to sort of add it to the stack we will sit on at the end of the hearing, perhaps we can take it on that basis.

MR. ESTRIN: I have to agree with Mr. Hodgson. There is absolutely no doubt about the proper way to do things and Mr. Tidball is doing it the right way by calling the gentleman who helped write and is responsible for a particular policy. If Mr. McQuaid wants to give this Board some evidence about the relevance of MISA to anything before the Board, he has a responsibility and he knows it as a competent and experience counsel to call someone from the Ministry and have him tell this Board that MISA has some application to the issues of this hearing. I suggest that that is what he ought to do instead of taking this back-handed approach of putting in something that has nothing to do with this hearing. As you say, it's government policy but it doesn't relate to this hearing and we can accept it perhaps on that basis, but let's all be clear that if we are going to consider it it has no whit -- there is no substance of it and there is no evidence at all that it has anything to do with the issues before you.

MR. LANCASTER: You can leave that with the Board then.

MR. ESTRIN: Well, Mr. Chairman, it is a matter for the Board, but it is patently unacceptable for anyone let alone Mr. McQuaid and least of all Mr. McQuaid to come out at the end of the hearing and say MISA has some relevance to any argument he wants to make. The obvious argument he wants to make at the end of the hearing is that his witness came forward and said the best practical technology and the Board ought not to be considering contaminant loading whatsoever into the environment. If that is an argument he wishes to draw some support for from MISA, then it behooves him and it behooves this Board to compel him, knowing obviously that that is the argument he intends to make and it has already been made here, to say to Mr. McQuaid "Call someone from the Ministry" and let's hear whether or not the Ministry says it applies to groundwater and landfills.

MR. TIDBALL: I can speak to that. I can't object to the policy going in as a statement of government policy because it is a statement of government policy, the white paper itself. If I had thought for a moment, Mr. Chairman, that MISA had any relevance at all to the issues before this Board I

would have called someone from the Ministry and it would be my submission at the end of the day that the policy has nothing whatsoever to do with groundwater especially as it relates to landfilling. I think probably the question could be put to Dr. Hughes. I don't know if he knows enough about it to know if it applies.

MR. McQUAID: I just want to discuss the reference to best available technology as it's in this document and it's referred to, B-A-T, best available technology, and it's something being applied by the Ministry and my friends say it's irrelevant and I say it's something the Ministry is using certainly with respect to toxic chemicals and discharges and it certainly will be my argument whether it is a policy or not that the Board should as a matter of discharging its responsibility under the Act, should consider best available technology and the best evidence.

MR. LANCASTER: If you can get evidence on that point that would be fine.

MR. TIDBALL: I don't dispute Mr. McQuaid's right to say to this Board that he thinks the proper standard for you to apply to this matter is best available technology. I think that that kind of debate would be very helpful in this context, but we

came to this hearing not so much to say you have to apply Ministry policy because, Mr. Chairman, you know full well that is not the way it works any more. Policies are put forward and you have a right to cross-examine on the policies and Boards can exercise their judgment with respect to those policies but I don't for a minute say anything about Mr. McQuaid's right to put to you that the proper standard is best available technology and we can argue that at the end of the day and I don't know what it helps to go through it with Dr. Hughes.

MR. McQUAID: Let me file the document and then I can ask Dr. Hughes about it. This is the white paper on MISA.

Q. Dr. Hughes, are you telling me you've never examined it or heard of the document?

A. I have heard of it and as a matter of fact I have attended meetings I guess two years ago and I was at a meeting that discussed MISA, but I'm not familiar enough with MISA to address it here. I just don't know what they are doing. They haven't asked me for any input with respect to groundwater and I shouldn't say and from my own knowledge I don't know that it doesn't deal with groundwater, but I just know they have not asked me.

---Upon commencing at 9:30 a.m.

MR. LANCASTER: Good morning and thank you. Please be seated.

MR. TIDBALL: I don't see Ms. Vigod and she's up next.

MR. LANCASTER: She is rather important at this moment.

MR. TZEKAS: Mr. Chairman, while we are waiting for Ms. Vigod, I understand yesterday Mr. McQuaid put before the Board a document on the MISA program, and it was not, as I understand it, marked as an exhibit?

MR. LANCASTER: It wasn't.

MR. TZEKAS: Perhaps it should be.

MR. LANCASTER: It wasn't established by the witness and counsel for the environment said it had nothing to do ...

DR. KINGHAM: But there are two, this one and the policy.

MR. LANCASTER: The white paper was accepted but we didn't mark it.

MR. TZEKAS: I was referring to the government policy.

MR. LANCASTER: And there was an objection to it and it wasn't established by the

witness and that is why it wasn't marked. It is of interest, but it is not an exhibit.

MR. HODGSON: Mr. Chairman, could we discuss this. That's not my recollection of what happened. I am sensitive to losing these things and I am almost sure that I objected but I am sure in the end you decided you would accept the policy paper.

MR. LANCASTER: I said it could be tabled. I didn't say it would be marked as an exhibit. I wanted it tabled because it was a government document and it may be of some interest.

MR. HODGSON: I waive any objection to it being made as an exhibit and you have the matter and it can be marked and referred to in argument.

MR. LANCASTER: I had the comment also that it is not relevant to this matter, but if you have no objections to it being marked, and no one else has...

MR. TZEKAS: It might be easier if reference is made to it in argument if it had a number.

MR. LANCASTER: I left mine upstairs but it will be Exhibit E-930, the white paper.

MR. TIDBALL: The proper title would be the MISA white paper.

---EXHIBIT NO. E-930: MISA White Paper

Trow

SCHEDULE B-F

TEXT - VOLUME 1 OF 3
HYDROGEOLOGIC REPORT FOR
SITE F - BURLINGTON
HALTON REGION LANDFILL
TECHNICAL REPORT

Prepared for
THE REGIONAL MUNICIPALITY OF HALTON

HYDROLOGY CONSULTANTS
DIVISION OF TROW LTD

September, 1986

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i) EXECUTIVE SUMMARY

In Stage 2C of the Environmental Assessment studies undertaken to locate a suitable landfill site in Halton, preliminary studies were undertaken on six potential landfill sites. As a result of considering all appropriate environmental factors, two sites, Site D in Milton and Site F in Burlington, were selected for detailed environmental evaluations. This report documents the results of detailed hydrogeologic - hydrologic studies at Site F in Burlington.

Extensive hydrogeologic and hydrochemical studies on Site F show that with the proper engineering works, the lands proposed for landfill are hydrogeologically suitable for waste disposal.

The bedrock of Site F consists of Upper Ordovician red shales of the Queenston Formation. Four zones were identified within the shale bedrock. An uppermost Weathered or Fractured Shale is underlain by a Weakly Fractured Massive Shale Unit (calcite cemented). A Highly Fractured Shale Unit is found at the lower contact of the Weakly Fractured Shale Unit. This unit is in turn underlain by a Moderately Fractured Shale Unit which has undergone less calcite cementation.