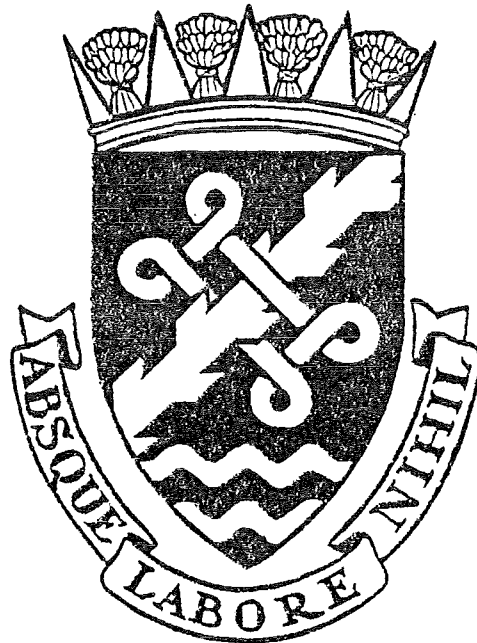


#7 - *Site assessment, landfill liners*

#8 - *Hydrological investigations (additional): Permeability, groundwater movements, predictability etc.*

THE REGIONAL MUNICIPALITY OF HALTON



Solid Waste Management Committee

Agenda

JANUARY 27, 1986

THE REGIONAL MUNICIPALITY OF HALTON

MEETING NO. 2-86

NAME OF COMMITTEE:

SOLID WASTE MANAGEMENT

DATE OF MEETING:

Monday, January 27, 1986
9:30 a.m.

PLACE OF MEETING:

Committee Room No. 1
Regional Administration Building
Oakville, Ontario

A G E N D A

ITEM NO.

PAGE NOS.

DISCLOSURES OF CONFLICT OF INTEREST

DELEGATIONS

DAY-TO-DAY

- | | | |
|----|---|---------|
| 1. | PW. Report No. 49/86 re:
Separation at Source Program -
News Article | 1 - 4 |
| 2. | PW. Report No. 66/86 re:
Status Report on 10-Year
Source Separation Master Plan | 5 - |
| 3. | C.A.O. Report No. 25/86 re:
Citizens' Solid Waste Advisory
Committee - Minutes and Meeting
Dates | 6 - 28 |
| 4. | C.A.O. Report No. 26/86 re:
Review of the Citizens' Solid
Waste Advisory Committee's
Interim Report by W.A. Mechler,
Senior Engineer for the District
of Greater Vancouver | 29 - 66 |

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SOLID WASTE MANAGEMENT COMMITTEE MEETING NO. 2-86
Monday, January 27, 1986

- 2 -

<u>ITEM NO.</u>		<u>PAGE NOS.</u>
5.	D.P.D. Report No. 20/86 re: Application for Local Planning Approvals to permit a Regional Sanitary Landfill Site in the Town of Milton at Site "D"	67 - 97
6.	PW. Report No. 65/86 re: Request for Additional Funds to Complete EPA Leachate Treatability and Toxicology Study	98 - 108
7.	PW. Report No. 63/86 re: Status of Landfill Liner Literature Search Halton Landfill EPA Study	109 - 117 .
8.	PW. Report No. 64/86 re: Request from Hydrology Consultants - Additional Hydrogeologic Investi- gation - Proposed Site "D" and "F" for New Halton Landfill	118 - 152
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OTHER BUSINESS

ADJOURNMENT

* * * * *

REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the
Solid Waste Management Committee

From The Director of Public Works

Date 1986 01 08

Report No. PW.49/86

Re Separation at Source Program - News Articles

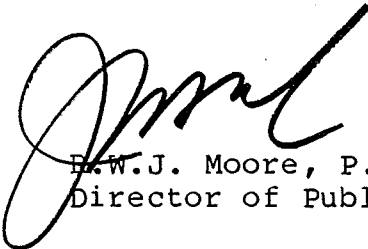
RECOMMENDATION

THAT Report PW.49/86 re Separation
at Source Program - News Articles,
be received for information.

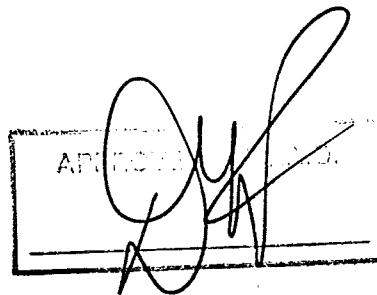
REPORT

Since September 1985, media interest in Halton's separation
at source program has increased. Attached are three recent
news articles for Committee's and Council's information.

Respectfully submitted,


B.W.J. Moore, P.Eng.
Director of Public Works

JRM:sw
Attach.



INFORMATION ONLY

Goods or garbage

Halton region's experiment in garbage recycling has made enough headway to prove it's worth continuing and expanding. Each year, the test program has kept hundreds of tons of paper, glass and metal out of the region's overloaded dump and put the materials back to work in new manufactured products.

Now Halton estimates some 3.5 per cent of household garbage is salvaged and the level could rise to 5 per cent in the next year. The business-backed Recycling Support Council believes 15 to 20 per cent of garbage could be saved and re-used, saving taxpayers millions in dump and incinerator costs and supplying local industries with a handy source of raw materials.

The trick is in persuading people to do their bit by putting out waste paper, glass and cans in separate containers for recycling and setting out the rest of the household trash in still another container. This means keeping four garbage receptacles going concurrently all week, then hauling at least four different units to the curb on garbage day.

Many towns have tried it without much success; most people found it too much trouble to co-operate.

But in Halton it's working. The region's program, run by a private company operating with provincial and municipal subsidies, has expanded steadily since it started in 1978.

One reason for Halton's success is the backing it has received from business. Companies in the support council, users of recoverable materials, provided containers for separated garbage and have actively encour-

aged householder participation, along with the company operating the program, Halton's Recycled Resources Ltd. The initiative coming from that company is another reason for the program's impressive results.

People involved in the Halton recycling project also believe there's an advantage in operating on a regional basis, instead of testing different salvage programs in a variety of neighborhoods. They've established the framework for a system that could expand to cover every house, store, apartment and office building in the region. Recycling, like garbage disposal itself, has been put on a regional footing.

Recycling isn't yet paying for itself; the Halton venture still needs subsidies. But because salvaged goods bring in money that offsets the cost of recycling, the system doesn't cost taxpayers as much as it would to bury or burn the stuff.

As communities run out of dump space and grasp for sensible alternatives to our traditional garbage disposal methods' appalling waste of money, land and materials, recycling is bound to gain public and political appeal.

The lessons being learned in Halton may be the key to efficient, economical garbage disposal for every big urban and suburban area in Canada. The Halton experiment is proving that people will co-operate with a system that makes sense and that tons of useful materials can be salvaged from household garbage.

Halton's investment is money well spent.



Money changed hands last Friday all because of garbage. Recycled garbage, that is. Guy Hardy (right) began a recycling program at Tridon and for his efforts received a \$700 cheque for charity. Sally Leppard, from Halton Region, hands over the prize to Steve Martin, president of Juvenile Diabetes Foundation. See story pg. C2.

Recycled trash rewarded

Guy Hardy will tell you recycling pays.

The Tridon Ltd. of Burlington employee presented a cheque last week for over \$700 to the Juvenile Diabetes Foundation. The amount came from the sale of Tridon's used office paper and tab cards.

Hardy, an employee of Tridon Ltd. for nine years, sought permission from Tridon Ltd.'s management two years ago to set up a recycling program in their Burlington plant.

Employees have been depositing their pop cans and office papers in special bins supplied by Tridon Ltd. and collected by Hardy.

Hardy flattens the cans, sorts the paper and arranges for collection by Halton's Recycled Resources Ltd., the Region's recycling contractor, for processing and resale.

Presenting the cheque with Tridon Ltd.'s vice president of operations, Steve Robbins, Hardy urged citizens and businesses to participate in Halton's recycling program.

"This donation would not have been possible without the efforts of Tridon's employees and the commitment this company has to recycling," said Hardy.

Regional Recycling Co-ordinator Sally Leppard attended the presentation and congratulated Hardy and Tridon Ltd. on their recycling efforts.

"We are delighted with Mr. Hardy's personal initiative and commitment to recycling in Halton. His efforts lead to the recognition that recycling works for Halton's businesses and benefits all our citizens — not only through reduced landfill refuse, but also by supporting the Region's charities."

Last week, the Region launched a major campaign to attract Burlington's industries into the recycling program. Industries and businesses are invited to contact Sally Leppard at 827-2151, ext. 211.

Oct. 30, 1985

Oakville is the best at recycling garbage

By LILIAN DIRISIO

In the recycling game Oakville residents are better than any other municipality in Ontario.

"Oakville is the highest in Ontario. In the waste stream reduction the Town of Oakville picks up 11.8% of household garbage. I believe one reason for this is that Oakville is an affluent community therefore we generate more garbage. We are impacting the waste stream because of the number of newspapers in Oakville . . . the Toronto papers, the New York Times, USA Today and the local paper," elaborates Murray Dinning, the town's operations assistant whose job includes the co-ordination of Oakville's recycling program.

Oakville's successful source separation and local collection project has become an example for the other municipalities in Halton. Sally Leppard, the newly appointed separation at source co-ordinator for the region of Halton, finds that the people in Oakville are committed to recycling waste.

"The Town of Oakville has been the most successful municipality in Ontario because the people are committed to this. The Region of Halton hopes to extend Oakville's concern to the other municipalities. The region has taken under its wing the recycling programs in all four municipalities," explains Leppard.

According to Leppard, in August, Halton became the first region in Ontario to co-ordinate a recycling program. The total cost of the program, for 1985, is \$165,674 and Leppard points out that the Ministry of the Environment (MOE) has funded \$78,174 of that, while the region is responsible for \$87,500.

"We have a three-year commitment from the Ministry of the En-

vironment but we do not know how much funding we will receive in 1986. We found that in 1984 the total diverted waste (that did not go into the landfill site) was 3.5%. We hope to get it up to 15%. The residential recyclable waste has increased substantially in 1985," says Leppard.

Leppard credits the substantial increase in the amount of recyclable waste collected in the curbside residential program to the region-wide awareness with waste issues.

"The municipalities are responsible for collecting the waste and the Region of Halton is responsible for disposing the waste. The region is committed to reducing the amount disposed of in the landfill site because of environmental reasons and the ethical reason of wasting recyclable materials," explains Leppard.

Leppard's figures show that 25% of the waste in the landfill site is recyclable. Dinning explains that municipal garbage trucks pick up recyclable materials, such as newspapers, glass bottles and tin cans, on the same day as the regular garbage truck makes its pickups. The collection of separated material is then taken to the Halton's Recycled Resources center in Burlington.

The region plans to continue its promotional campaign by going to neighborhood shopping malls and schools to get its program across to people. But, Leppard says that the region wants to increase the low participation of the commercial and industrial sector.

"Last year commercial and industry generated 99,198 tonnes of waste and only 1,323 tonnes were recycled. Halton hopes to boost that substantially in the next year," she says.

REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the
Solid Waste Management Committee

From The Director of Public Works

Date 1986 01 21

Report No. PW.66/86

Re Status Report on 10-Year Source Separation
Master Plan

RECOMMENDATION

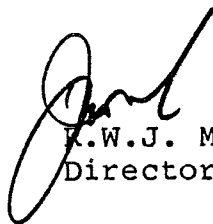
THAT Report PW.66/86 re Status
Report on 10-Year Source Separation
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information.

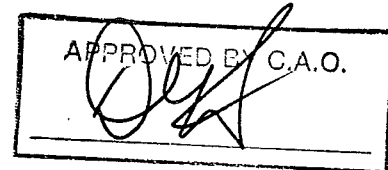
REPORT

The draft 10-year Master Work Plan - Separation at Source Program, was received by the Staff/Area Separation at Source Committee on 1986 01 14. Because of the substantive nature of the report and its impact on solid waste management in Halton until 1995, the Committee requires two weeks for review.

The final document will be distributed to the Solid Waste Management Committee, the Planning and Public Works Committee, at their next meeting in February.

Respectfully submitted,


R.W.J. Moore, P.Eng.
Director of Public Works



JRM:sw

THE REGIONAL MUNICIPALITY OF HALTON

Report to Chairman and Members of the Solid Waste Management
Committee

From D. Y. Perlin, Chief Administrative Officer

Date 1985 12 31

Report No C.A.O. 25/86

Re: Citizens' Solid Waste Advisory Committee - Minutes
and Meeting Dates

RECOMMENDATIONS:

1. THAT the minutes from the Citizens' Solid Waste Advisory Committee dated October 8, November 11 and December 9, 1985 as set out in Appendix A, B and C to CAO Report 25/86 be received for information.
2. THAT the regular 1986 meeting dates for the Citizens' Solid Waste Advisory Committee, be acknowledged as January 13, February 10, and March 17.

REPORT:

In October 1985, the Citizens' Solid Waste Advisory Committee (SWAC) released its Interim Report. The Report described the work the Committee had done to date and also identified work that was remaining. At its meeting of October 8, 1985, SWAC requested an extension to its mandate from November 1985, until March of 1986. The extension was granted.

The following new Sub-committees have since been formed to help SWAC complete its work:

1. Health Risks, Property Value and Social Criteria Sub-committee
2. Proposals Evaluation Sub-committee
3. Financial Assessment Sub-committee
4. Public Education Sub-committee
5. Ash Disposal Sub-committee

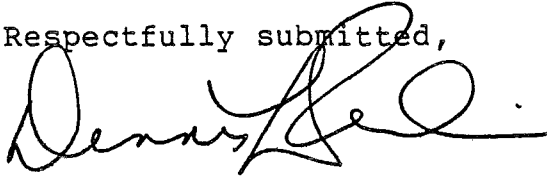
At SWAC's December 9, 1985 meeting, guest speaker W.A. Mechler Senior Engineer in charge of the Energy from Waste plant in the Greater Vancouver Regional District spoke to the committee. C.A.O. Report 278/85 authorized this meeting. C.A.O. Report 26/86, part of this agenda, is his report. The meeting dates for 1986 have been established.

All meetings are open to the public. They are held in Committee Room 1 at 7:30 p.m., of the Regional Administration Building.

On November 26, 1985, a Public Meeting was held at the Regional Administration Building to discuss the Interim Report. Approximately 25 people attended the meeting. The Report was circulated to interested members of the public, ratepayers groups and Area Municipalities for their comments. The deadline date for submissions was December 31, 1985. Council has since extended that date to January 31st, 1986. SWAC will be preparing a compilation and response to all the submissions received before SWAC completes its Final Report in March.

At SWAC's December 9, 1985 meeting, the Committee agreed that all E.F.W. proposals that had been submitted to Halton to date (ie. Petro-Sun, Enercan and Ed Hall's proposal), should be reviewed once evaluation criteria have been established by the Committee. SWAC's mandate requires that the committee review and comment on these proposals. This will be done at the February or March meeting.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read 'Dennis Perlin', written over the typed name.

D.Y. Perlin
Chief Administrative Officer

VH/MS:cc
attach.

Appendix "A"

Minutes of the Meeting of
The Citizens' Solid Waste Advisory Committee

DATE OF MEETING: Tuesday, October 8, 1985
TIME: 7:30 p.m.
PLACE: Regional Administration Building
1151 Bronte Road
OAKVILLE, Ontario
Committee Room #1

PRESENT:

T. Sutherland	B. McCormick
G. Brown	L. Hawes
J. Hueton	S. Chumley
I. Hughes	B. Laughlin
K. Reichert	J. Archdekin
S. Blakelock	

STAFF:

D. Perlin
J. MacKay
V. Henderson
M. Sidhwa

APOLOGIES:

C. Baynes
M. Black
D. Hook
M. Smith
B. Thackray
S. Frewen

M I N U T E S

1. Approval of Minutes (Schedule A, B)

The minutes of the meetings of September 16th and 23rd were approved as received.

Motion: G. Brown
Seconded by: L. Hawes

Update on Halton Hills

D. Perlin stated that in reading the minutes of the last SWAC meeting he felt that the Committee had misinterpreted the Region's response (CAO 264/85) to the Halton Hills proposal.

He explained that Waste Management is a Regional responsibility and that it would be wrong for Halton not to be concerned about the interests of Halton Hills. The formation of SWAC was not intended to stop the Region or others from looking at any opportunities for Energy from Waste projects that might arise.

It has been clearly stated in the past that Halton will not stop exploring other market alternatives because of SWAC. Also, SWAC's Interim Report does not deal with Transfer Station or haulage specifications which is what Halton Hills is concerned about. He suggested that SWAC reconsider the resolution passed at the last meeting on this subject.

T. Sutherland stated that he felt it was within this Committee's Mandate, and that the Halton Hills proposal should have come through SWAC. SWAC has stated that one large Energy from Waste Plant should be considered for the entire Region. The Halton Hills' proposal interferes with this recommendation.

S. Blakelock suggested that perhaps this Committee was stomping too strongly on Halton Hills for taking this initiative.

S. Chumley explained that M. Black, the main person to raise this issue at the last meeting, had stated that it was the local hauler (Leferink) who was pressing for this as he wanted the business.

D. Perlin commented that this information was incorrect. Leferink was not pressing or sponsoring this initiative. The issue was of concern to the Halton Hills Council because, as a small community, they found the cost of haulage to the existing landfill site very high and are very concerned about all future facilities being in the south. The Region does not provide any subsidies for this to the northern municipalities. Since the issue of responsibility for a transfer station is contested, Halton Hills was looking for a different and positive approach with which all of the rest of Halton was in agreement.

B. Laughlin suggested that as Halton Hills is only doing a Feasibility Study, it indicates that they are at a very preliminary stage. This type of study may be very useful to SWAC in establishing selection criteria.

I. Hughes reminded the Committee that at their last meeting SWAC stated that the work that Halton Hills was doing was premature and it should wait until this Committee has completed its work.

G. Brown stated that his interpretation is that the Region is going ahead in any case with what they want to do and SWAC's role is only to sell EFW to the public.

V. Henderson explained that her understanding of a Preliminary Feasibility Study is basically to put some ideas on paper and once this is done SWAC may be in a better position to comment just as they would comment on any other proposal.

L. Hawes commented that, in his opinion, SWAC should establish evaluation criteria before it reviews any proposals.

K. Reichert reminded the Committee that the Interim Report has not yet been adopted by SWAC and that perhaps SWAC was premature

in commenting on the Halton Hills proposal. SWAC may be in a better position to comment once the Final Report is completed. He also suggested that if the Committee shows initial hostility towards Halton Hills they may not be very receptive when SWAC presents its final report.

Motion:

THAT any further comment/action by SWAC regarding the Halton Hills intent to do an EFW Feasibility Study is premature until SWAC has had an opportunity to finalize its Interim Report.

Moved by: K. Reichert
Seconded by: G. Brown

3. SWAC's Work Program (Schedule C)

L. Hawes mentioned that he had asked Anne Mulvale for her opinion on extending SWAC's mandate. She suggested that it would be better to see a report that was well prepared rather than one that was put together hastily.

SWAC Member Mike Smith who was unable to attend this meeting had indicated to staff that he was supportive of Option 2 (dissolve the Committee in January).

G. Brown suggested that if a proper report is to be prepared the Committee must go with Option #3.

L. Hawes stated that all Members may not be able to remain on the Committee as late as March.

K. Reichert commented that the Committee seems to have narrowed down its decision to Option 2 or 3. The only difference between these two options was the degree of research to be undertaken. With Option 3, the Committee should undertake a considerable amount of research. With Option 2, whatever research remains to be done can be taken over by Regional Council. Option 3 may only delay the "unknown" that the Committee cannot resolve in any case.

Recommendation:

- 1) THAT Option 3 be adopted by SWAC for completing its mandate.
- 2) THAT staff be authorized to write to SWMC and request that SWAC's mandate be extended to March, 1986.

Moved by: G. Brown
Seconded by: J. Hueton

4. Formation of New Sub-Committees

The following new Sub-committees were formed with the following membership:

1. Health Risk Assessment, Property Value and Social Criteria Sub-Committee

Members: L. Hawes
G. Brown
I. Hughes
C. Baynes (absent)

2. Proposals Evaluation Sub-Committee

Members: J. Hueton
B. Laughlin
T. Sutherland
D. Hook (absent)
M. Black (absent)

3. Financial Assessment Sub-Committee

Members: K. Reichert
B. McCormick
J. Archdekin
S. Chumley

4. Public Education Sub-Committee

Members: S. Blakelock
B. Thackray (absent)
M. Smith (absent)

Staff will contact absent Members to see if they are able to remain on the Committee.

As K. Reichert has done most of the work on Leachate and Ash Disposal for SWAC, he is willing to work independently on any remaining work on this subject for the Final Report.

5. Interim Report

The Interim Report was reviewed for a final time. Committee Members wanting to make minor editorial/grammatical changes were requested to submit their reports with all the changes marked. These will then be incorporated into the final Report.

Motion: THAT the Interim Report as amended be adopted.

Moved by: J. Hueton
Seconded by: L. Hawes

6. Update on W.A. Mechler

The Committee agreed that Mechler should be invited to attend SWAC's next meeting (if possible) and SWMC be advised accordingly at an upset limit of \$3,000. K. Reichert suggested that Mechler be requested to bring the tender documents used in Vancouver to help SWAC determine selection criteria.

7. NITEP Results

Received for information.

8. Volumes of Waste in Halton

Schedules D and E, received for information.

9. Tour of Ford EFW Facility

Received for information.

10. Review of Interim Report by Area Municipalities

L. Hawes suggested that a deadline date for all comments be established.

D. Perlin stated that Area CAO's have indicated that their Councils require at least 60 days to respond to enquiries in a formal way.

The Committee agreed on a deadline date of December 31, 1985.

Other Business

A. Apartments with Incinerators

J. Hueton asked if staff had gotten any information regarding apartments in Halton that were still burning their own garbage.

V. Henderson responded that a letter has been drafted to be mailed out shortly to the Area Fire Departments.

B. Social Impact - Random Survey

S. Blakelock explained that earlier this year she had suggested that the Social Impact Sub-Committee conduct a random survey in local shopping malls. She asked Committee Members if they still felt this would be useful and if they would be able to contribute some time to actually do such a survey.

G. Brown commented that the credibility of such a survey may be questioned and what did the Committee hope to gain from such a survey.

V. Henderson stated that the E.F.W. Preliminary Feasibility Study had attempted to do such a survey but it was not given a lot of weight by the public.

L. Hawes commented that the E.F.W. Preliminary Feasibility Study Submissions Report may be a better source of public comment however it is almost impossible to categorize the document by subject area.

No decision was reached on this subject.

C. Article in Chemical Engineering News

L. Hawes informed the Committee of an article in Chemical Engineering News on a survey done in March on Hazardous Management Issues. Staff will make the article available to Members who would like a copy.

D. SWAC Public Meetings

The Committee agreed that due to the limited public response anticipated at this stage (without a specific site), one public meeting should be held at the Regional Headquarters in late November. It was also agreed that SWAC should Chair its own meeting. The meeting can be advertised in all local papers and Committee Members should also make an effort to notify their local organizations/ratepayers groups. Details of the public meeting can be finalized at the November 11th SWAC meeting.

12. The meeting was adjourned at 10:15 p.m.

MS:jmb

Minutes of the Meeting of
The Citizens' Solid Waste Advisory Committee

DATE OF MEETING: November 11, 1985
TIME: 7:30 p.m.
PLACE: Regional Administration Building
1151 Bronte Road
OAKVILLE, Ontario
Committee Room #1

PRESENT:

T. Sutherland	G. Brown
S. Chumley	M. Black
B. Thackray	B. Laughlin
K. Reichert	L. Hawes
I. Hughes	B. McCormick
J. Archdekin	D. Hook
S. Blakelock	

Guests

W. Mechler
M. Quinn

Staff

D. Perlin
V. Henderson
Henry Garcia
J. MacKay

APOLOGIES:

C. Baynes
S. Frewen
M. Smith
J. Hueton

1. Guest Speaker - Walter Mechler

Mr. Mechler indicated he had been with the Public Works Department since 1953 and that he had been involved in Energy from Waste for over ten years. In 1981 a sub-committee was formed to look into the development of the project with the Greater Vancouver District Area (GVDA). They were looking at a plant that would handle approximately 20% of the waste produced in the area or 210,000 tonnes per year. In addition to Energy from Waste, the area also have the use of two resource recovery projects. They are being handled by Genstar Limited and involve both a recycling program and a Refuse Derived Fuel (RDF)

See full

project. Genstar is making claims that they hope to be able to increase the volumes handled to 50% of the wastestream.

The proposed EFW plant is relatively close to the steam customer so the line between the two facilities is relatively short. However, soil conditions in the area are poor and this has caused some additional difficulties during construction.

The Vancouver area initiated Energy from Waste as a result of problems associated with establishing a new landfill site.

It is often easier for people to visualize costs using current dollars rather than inflated ones. This should be used in all public presentations. Landfill costs are increasing. As the trend is currently to provide liners, municipalities may face a significant change in costs when establishing their next landfill site.

In the Vancouver area, the cost of providing a transfer station and haulage represent \$25.00 per tonne. Eventually the area will have a blended Regional rate for disposal costs. When there are high revenue or long haulage costs, the Energy from Waste disposal method may be cheaper than landfilling.

Past experiences indicate that when a municipality accepts a private sector bid, it may be increasing its up front costs.

Mr. Mechler indicated he was in agreement with the Committee that only mass burning plants be considered. He indicated that semi-suspension burning (SSB) plants have higher operating costs. He also indicated that many of the problems experienced in the past with SSB have been due to problems in the front end of the plant. He recommended that Halton not be a guinea pig for this type of facility.

If Halton chooses to rely on private sector financing, this will limit the number of companies that are able to participate in the project. This may mean that Halton cannot be as selective.

With regards to stack height, Mr. Mechler indicated that if the Ford incinerator was burning residential waste, the current stack would be too low. He indicated that in Vancouver the stacks would be from 80 to 110 metres. The highest he is aware of is 120 metres. In his opinion nothing higher should be required for Halton.

The recently released results from the NITEP study in Prince Edward Island indicate that the quantity of heavy metals in the emissions are relatively high compared to mass burning plants. Fabric filters may provide good control over heavy metals. He also indicated that environmental limits almost always produce the development of a new technology. Sometimes this is

initiated to satisfy public concern rather than as a scientific requirement. In his experience, regulatory agencies try to outdo each other in terms of improvements and stricter control. This creates a cycle in which further improvements are required and the controls are tightened again.

Sid Chumley enquired as to whether or not incineration costs could be applied beyond a twenty year period. Mechler replied that they could but that it was difficult to predict costs with that long of a time frame. He also indicated that the type of waste in Germany was comparable to that found in North America. By this he meant that it had the same BTU value. However, he agreed it did not have the same content. He also indicated that recycling would have no impact on the project as long as a wide variety of materials were collected (including glass, plastics, paper and metal). It was noted that in Europe, people generate less waste on a per person basis.

With regards to the Interim Report, Mechler commented that the comparison of landfill and Energy from Waste was useful but that he felt it wouldn't take the Committee very far. He indicated there were many fallacies in rating things, (i.e. the people doing the rating have different biases and interests). He felt there was an opportunity for great distortions and that the Committee should ensure that what they have come up with makes common sense. Often ratings are done to prove preconceived points. He indicated it was easier to rate two landfill sites. He felt it was impossible to compare two different waste management systems. He indicated it would be better for the Committee to limit emissions to ensure there was no danger to the public and not do the comparison.

Mechler also indicated that the Committee should take a hard-nose look at costs. The general trend indicated by Table 6 of the report appears to contradict the information he has obtained from Vancouver. He indicated it did not reflect the economies of scale of landfill. V. Henderson indicated that the costs were for the waste management system not just the EFW plant. There may be some other factors such as transportation that is having a major impact on the results.

Mechler indicated that with a 600 t/d or 400 t/d plant, the Committee should forget about using modular technology. He indicated that he was suspicious whenever a modular plant was scaled up. In Prince Edward Island they were originally going to install a 36 t/d Consumat unit. Tricil improved on the technology.

D. Hook enquired as to whether it was preferable to build a plant larger or smaller than necessary. Mechler indicated that if the plant was undersized there was a tendency to push it to handle a greater volume than it was designed for. This limits

burnout. He indicated that the Vancouver facility would be loaded to its capacity. S. Chumley indicated that either the plant could be oversized or designed to add on another unit. He indicated that in the earlier years the Region could consider bringing waste in from other areas. Mechler indicated that a plant must be operated continuously (i.e. 7 days a week). Startup and shutdowns are tricky and expensive. The Region should ensure that any plant it builds is able to supply an appropriate volume of waste seven days a week.

B. Laughlin enquired as to the type of hearing process in B.C. Mechler indicated that there was a new Waste Management Act which allowed the Minister to approve projects if there was sufficient public participation. He indicated that a hearing was not necessarily required. When the Vancouver area could not get a site outside the Region, they proceeded with expropriation. After that the Province said that it was wasteful to have the adjacent landfill sites operated separately. The Committee was set up and staff time was donated for the sub-committee meetings. They had open houses and public consultation. The strongest opposition was from the people who lived near the proposed landfill. They were in support of Energy from waste. After this process, the Minister indicated that there would be no landfill site located in the community that had been selected by the Committee. As the Minister was from this area, it was considered to be a political decision. This meant that the Greater Vancouver area had to find a site within its own boundaries. There is no Environmental Assessment required in British Columbia.

The Vancouver area will not have any additional public meetings. They found them ineffective and difficult to handle. Recently they invited a number of people from the opposition to the offices of the Greater Vancouver District. They were able to convince the five people who showed up of the merits of the project in informal discussions. Staff now issue newsletters and fact sheets about the project on a regular basis. When they have open houses, the press are invited, there is a moderator and the audience can listen to the presentations. The public is only allowed to ask questions in written form at the end of the meeting. The Vancouver area has not catered to the press particularly. Members of the community have been primarily concerned about traffic.

With regards to health effects, Mechler indicated that the Committee should rely on what is already known about dioxins and use this material as references in their final document. He indicated that we already know how to operate plants to minimize the emission of dioxins. These operating conditions can be monitored and checked on further if there are any difficulties. He indicated that although there is a moratorium on permits for new incinerators in Sweden, no one was intending to apply for a

permit anyway. He considered it good business for some people to continue to spread fear and concern. In fact, the person who initiated the moratorium has been hired to do further work in the area.

With regards to the co-disposal of ash with municipal solid waste in a regular landfill site, Mechler indicated that this would be acceptable provided separate cells were used. In Europe the bottom ash is used as aggregate. It may be a good idea to keep the flyash separate. It is not soluble in water but may be in oils that would be found in other waste products. He also indicated that ash residue could be used as a cover material.

Mechler felt it was a good idea to require experience for contractors. However, this was not necessarily appropriate for operators. He indicated that there were only two that had experience in Canada. They included Tricil (for semi-suspension burning plants) and Montenay for mass burning plants. He also indicated that he felt a number of the other suppliers could put together a very good team.

Mechler felt it would be helpful to have the operators review the bids. In Vancouver this was done and it was found to be beneficial. The operators can provide a check on the design before problems are created.

Vancouver has a ten year contract with its customer. Montenay has a twelve year operating contract plus an option for six additional years. The contract has a penalty in it if the average rated capacity times 85% is not met. They also get a bonus if additional steam is produced. This equates to approximately half of the steam revenue on the additional land.

Mechler indicated that it was important that the risks for the project be shared. The municipality may find it appropriate to take on the risk of natural disasters and strikes. The contractor should be prepared to take on the rest.

J. Archdekin enquired as to whether there was an advantage to one company controlling the entire waste stream. Mechler indicated this provided no better control.

M. Black indicated that during the Committee's U.S. tour, in many cases the alternatives were so bad that Energy from Waste looked good to the public. M. Black enquired as to whether or not this was the case in Vancouver. Mechler indicated that although there had been some problems with the original site, there were lots of sites technically available. He also indicated to the Committee that he had seven months of accumulated overtime and permission from his superiors to act as consultant to Halton. He also indicated that the Committee was

placing too much emphasis on the result of the NITEP Study. He did not feel it would provide operating criteria. As he had indicated earlier, we now know enough about how to operate a plant to control emissions.

In Vancouver they obtained permission to have two monitoring stations down wind from the EFW plant. They were also doing a survey of emission in the area both before and after the plant was operational. The Greater Vancouver District does air emissions approvals on behalf of the Province. This could be considered a conflict of interest, however, to date it has not become an issue.

T. Sutherland raised the issue of whether or not the Committee should proceed with the proposal call now. Mechler indicated that bidders were reluctant to respond to this type of proposal unless they were sure that the municipality was serious. A number of areas in the States have bad reputations for doing this. Vancouver overcame the problem by paying for the proposals to be done. This was intended as a show of good faith. It has worked fairly well.

G. Brown enquired of D. Perlin if it was possible for the Region to negotiate for the purchase of land before an Environmental Assessment. D. Perlin indicated that the Region could only take an option. If there was to be an immediate call for proposals he would suggest that the environmental consultant come in and update the study for the area of the QEW and Burloak Road. He felt all previous reports could be used as part of an EA. Another option was to do like Victoria Hospital and have the hearing first and then the proposal call afterwards.

Mechler indicated that it was not possible to hide the stack in the middle of the plant. This could be done for modular plants in some cases, however, for mass burning plants it was impossible. The stack had to be at the end of the process near the other pollution control equipment. He also indicated that he felt performance guarantees were a matter of housekeeping. The Committee could specify that no litter would be outside the building but should they not be involved in the internal operation of the plant. He felt the Committee should be much more concerned with emissions than dust.

Mechler indicated that ash filled trucks do not need to be covered. As the ash is wet, it will not create a dust problem.

He also felt it was unnecessary to restrict the plant to three days of storage capacity. It should not matter if it was stored for a week. He also suggested that it was unnecessary to have a daily cover material over top of the ash in the landfill site. The reason for this was that he felt that a non-permeable cover had some advantages. It would speed up the leachate process.

The municipality would have to decide if it wanted to get the leachate all at once or spread it out over a longer period of time. He felt the problem of odour in the landfill site could be reduced by leaving "windows".

With regards to a conservative risk assessment, he felt the Committee should rely on past study results. From this information the Committee should be able to get sufficient data to say that the Energy from Waste plant is safe. Similar conclusions were reached at the London hearing. The requirement for latest state-of-the-art technology may be inappropriate. More emphasis should be placed on proven technology within stated emission limits. Finally he suggested to the Committee that they should list the possible uses of a landfill site after it has been closed. This would help to offset perceived impacts on property values.

2. Approval of Minutes

G. Brown indicated that the minutes did not reflect Dennis Perlin's request for a change in the previous minutes. He indicated that he felt this request was out of order. S. Blakelock moved that the minutes be adopted as is. The motion was seconded by L. Hawes. G. Brown opposed the motion.

3. Extension of SWAC Mandate

The following dates were established for future meetings:

January 13
February 10
March 17

4. Recommendations from Tom Sutherland

As indicated in Item 1 it would not possible for the Region to proceed with the purchase of land without environmental assessment approval. G. Brown indicated that before this was done, site selection criteria were required. T. Sutherland indicated he felt the Committee had to generate specifics. He felt it would be useful for the Region if the Committee had done this work. M. Black indicated that he had thoughts on his own site and at this point was not prepared to support the one at QEW and Burloak Drive as suggested by T. Sutherland. G. Brown indicated at the present time there was no proposal before the Committee that had mass burning water wall technology. D. Perlin indicated that the Committee may wish to proceed with completing its criteria and then make sure that the site meets the criteria. W. Mechler enquired as to whether or not the Ford site should be considered further. G. Brown indicated that a tremendous sales job will be required of that community to

overcome the opposition. It was moved by G. Brown that the matter be tabled. This was seconded by D. Hook.

5. Public Meeting

S. Blakelock provided a handout of what was planned for the evening. She also indicated that the Chairman of each sub-committee should be asked to make a presentation. It was requested that S. Blakelock prepare an advertisement for the local papers. Slide presentation from the U.S. tour would be used along with overheads. Each speaker would be asked to briefly summarize the work that had been undertaken to date. It was agreed by all Committee members that this approach would be acceptable.

6. Attendance at Pollutech and Hydrogeology Consultants at Next Meeting

The Committee enquired as to the purpose in having these two firms attend the next meeting. It was indicated that as SWAC and the consultants were both addressing ash and its disposal in a landfill site, it was felt that there may be some benefit. These consultants are working on a landfill report which is expected out in March or April 1986. Committee recommended that the consultants contact K. Reichert first to see if the matter could be resolved. S. Chumley indicated that no one had taken ash samples of the material at the landfill site at this point. The motion was that Pollutech and Hydrogeology consultants meet with K. Reichert. This was moved by J. Archdekin and seconded by M. Black.

7. Chairpersons for the Sub-Committees

Motion - that this item be deferred to the next meeting. Moved by L. Hawes, seconded by D. Hook.

8. Incinerators in Apartment Buildings

G. Brown requested that the results of this enquiry be expedited and that staff be asked to report back at the next meeting. Motion - this item be deferred, moved by G. Brown.

9. Resignation of Mike Smith

Motion - that Mike Smith's resignation be received for information. It was moved and seconded.

10. New Members

Motion - that the Committee not replace Mike Smith or Steve Frewen with one of the original Committee applicants. It was moved and adopted.

11. Distribution of Interim Reports

V. Henderson indicated that the Reports have not been distributed to individual ratepayers groups. Instead copies of the newsletter have been circulated with a note that they could get the Report from Marook. L. Hawes expressed concern that the people involved did not get copies of the Report. M. Black suggested that the ad for the upcoming public meeting identify two possible sites. This would generate sufficient interest to encourage attendance at the meeting. G. Brown indicated he had distributed newsletters to residents of his area and made copies of the Interim Report available upon request. L. Hawes indicated that he did not feel he would be able to distribute copies to the executives of his ratepayers group, before SWAC's Public Meeting.

12. Submissions to Interim Report

This matter was deferred to the next meeting.

14. Energy from Waste Conference in Washington

G. Brown indicated that the Conference indicated to him that the concept of host benefits were very important. L. Hawes suggested that the Committee come up with a specific proposal. G. Brown requested that the handouts be made available to other members of the Committee that were not in attendance. T. Sutherland indicated that the fire grant was gone and that the Region should discuss with Ontario Hydro possible rate changes. D. Perlin indicated that the Region was already proceeding with regards to this matter. A report was expected to go to the Solid Waste Management Committee shortly.

15. NITEP Results

This matter was deferred.

16. Article from Brian McCormick

This item was deferred.

17. Work Required for December 9, 1985 Meeting

This item was deferred.

The meeting adjourned at approximately 11:15 p.m.

Minutes of the Meeting of
The Citizens' Solid Waste Advisory Committee

DATE OF MEETING: December 9, 1985
TIME: 7:30 p.m.
PLACE: Regional Administration Building
1151 Bronte Road
OAKVILLE, Ontario
Committee Room #1

PRESENT:

T. Sutherland	G. Brown
S. Chumley	M. Black
K. Reichert	B. Laughlin
J. Archdekin	L. Hawes
C. Baynes	S. Blakelock

Guests

M. Quinn

Staff

M. Sidhwa
H. Garcia
J. MacKay

APOLOGIES:

D. Hook
I. Hughes
J. Hueton
B. McCormick
B. Thackray

As there was not a quorum at the start of the meeting, the Committee agreed to discuss each item; once a quorum was obtained the Committee went back and passed a motion on each item.

1. Approval of Minutes

The following amendments were made to the minutes:

Item 1 - Page 3, second paragraph - "falicies" changed to "fallacies"
Page 5, first line - delete "that"
Page 5, first paragraph - sentence changed to read:
It is not soluable in water but may be in oils that would be found in other waste products.

Item 11 - Page 9, last sentence changed to read: L. Hawes indicated that he did not feel he would be able to distribute copies to the executives of his ratepayers group before SWAC's public meeting,

The minutes were approved as ammended.

Moved: S. Blakelock

Seconded: L. Hawes

Carried

2. Chairpersons for New Sub-Committees

The following chairpersons were appointed to the new Sub-committees:

- L. Hawes - Health Risk Assessment, Property Value and Social Criteria Sub-Committee
- J. Hueton - Proposals Evaluation Sub-committee
- B. McCormick - Financial Assessment Sub-committee
- S. Blakelock - Public Education Sub-committee

3. Incinerators in Apartment Buildings

L. Hawes suggested that there was no point in knowing which apartments have incinerators without knowing the number of occupants in each building. This could then be used to estimate the tons of garbage being improperly incinerated. This may be useful information to have at a public meeting.

S. Chumley stated that he investigated and found the two largest hospitals in the Region, in Burlington and Oakville, are burning their own garbage, they should have been included in the list received from area fire departments.

L. Hawes explained that SWAC had only requested this information for apartments. There are many other commercial installations, if the Committee had wanted to get a more detailed idea of the magnitude. Also, hospitals may have special dispensation due to the nature of their waste.

S. Blakelock asked the Committee if they thought EFW proposal today would meet the same opposition it had a year ago, or was there a better educated public today.

The group concensus was that the Region would encounter the same opposition they had a year ago.

C. Baynes stated that the OWMC had recently experienced strong opposition in the rural areas, and although it was for a toxic waste site, the issue is still stack emissions.

B. Laughlin stated that the Ford EFW plant does not seem to have decreased opposition to a Regional EFW plant.

L. Hawes stated that with the continuous odour problems experienced with Petro Canada in West Oakville, the area residents are strongly opposed to an EFW plant. In their opinion, it would be adding a new problem without resolving the previous one.

M. Sidhwa will obtain information on the number of occupants in apartment buildings with incinerators and give this information directly to the Committee looking at health risks.

4. Submissions to Interim Report

T. Sutherland stated that the Committee should be very proud of the work they had done so far. SWAC's representation and expertise at the public meeting was very impressive and the Committee had made good progress to date.

L. Hawes stated that he was still not clear on whether it was necessary to cover ash when transporting it. The ash may be wet when it leaves the plant, but on a hot dry day, the top surface of the ash could dry and be easily blown off an uncovered truck.

L. Hawes asked J. MacKay what the ash from the Ford plant looked like when it arrived at the landfill and if it had to be covered. J. MacKay responded that the ash is damp when it arrives at the Landfill site (at this time of year). It is covered with a tarp.

S. Blakelock stated that she thought the Ontario Highway Transport Board required all trucks carrying a load to be covered.

L. Hawes stated that the West Oakville Ratepayers may be sending in a submission to SWAC's Interim Report. S. Chumley stated that he had been requested to speak to some high school students on Waste Disposal and they had been very supportive of EFW over landfill. The Committee agreed that once all submissions are received, staff should prepare a Submissions document for SWAC's review at its January meeting.

Moved: B. Laughlin

Seconded: L. Hawes

Carried

5. Energy from Waste Conference in Washington - G. Brown

G. Brown talked about the report he had prepared on the Washington Conference he attended.

6. NITEP Results

The material on NITEP was received for information.

Moved: M. Black

Seconded: C. Baynes

Carried

7. Article from B. McCormick

The article "Incinerator tests aim to reduce Dioxin emissions" was received for information.

Moved: S. Blakelock

Seconded: S. Chumley

Carried

8. Proposal Evaluation

L. Hawes stated that this had been dealt with at a previous meeting. M. Black stated that the facilities sub-committee had reviewed the proposals in the past and prepared a report on this. M. Sidhwa explained that the Committee had previously decided that the proposals should be reviewed after evaluation criteria are established.

C. Baynes asked if Halton had ever formally asked for proposals. T. Sutherland responded that the Region had not, also Mechler had suggested that the Region be serious before they make a call for proposals, as they are expensive and time consuming. Specific criteria should be established before a call for proposals is made. C. Baynes stated his concern was that we may be closing the door prematurely on a good proposal.

L. Hawes reminded the Committee that the Regional Council could do whatever it wanted after SWAC, had completed its work. As volunteer consultants, SWAC is only to establish criteria and make recommendations.

B. Laughlin suggested that perhaps the criteria the Committee had established needed to be looked at again. For example mass burn technology is better financially, but modular may be better environmentally. C. Baynes agreed that there may be a need to look at some of the recommendations again. Modular technology has many advantages especially environmentally.

C. Baynes suggested that since some of the proposals are over a year old, these should be updated and revised before SWAC spends time reviewing them.

It was agreed that staff and the proposals sub-committee establish evaluation criteria before reviewing proposals for SWAC's February meeting.

Moved: M. Black
Seconded: C. Baynes

Carried

9. Mechler Report

L. Hawes commented that he found Mechler to be terribly 'long winded' although he had some valuable information to share.

S. Chumley questioned if Mechler's Report could justify the cost of having him come and talk to the group in person. The Report was received for information. Mechler's recommendations will be taken into consideration in preparing SWAC's final report.

Motion: L. Hawes
Seconded: S. Blakelock

Carried

10. Alternative Approach to Site Selection Process - G. Brown

This item was deferred.

11. SWAC's Interim Evaluation

a) Questionnaire - L. Hawes asked what the purpose of the questionnaire had been, and whether staff was trying to justify their time and involvement. M. Sidhwa stated that the questionnaire was intended to be a self evaluation of the committee's progress to date. Some SWAC members have expressed dissatisfaction, the results of the questionnaire may provide room for discussion.

b) Need to Define the Role of Staff, the Executive and the Committee - G. Brown - this item was deferred to the next meeting.

12. Circulation of Interim Report to Regional Departments - G. Brown

This item was deferred.

13. Other Business

L. Hawes commented that although Mechler generally agreed with SWAC's Financial evaluation, and with great respect for the work done by B. McCormick, the Financial part of SWAC's report is still far too complex. There is a need to work out some numbers independent of the Region's Preliminary Feasibility Study, Financial report.

B. Laughlin said that Mechler had also made a valid comment in saying that there are too many technical people on the Committee - the purpose of this Committee is not to do a detailed financial analysis. Can a simple calculation of tax increase per year to the individual be done?

K. Reichert commented that simple calculations could be made by using of a project example and making high rather than low estimates. Karl is willing to do this if some basic information such as size of plant and stack height are provided. From this an assessment of the financial impact on the average householder can be made.

C. Baynes stated that in his opinion, EFW will be considered totally unacceptable based on the financial information. From a citizen's perspective, their concern is "as long as it doesn't cost me too much, I don't care how my garbage is disposed of, Landfill or EFW." Any additional cost must be justified to the public, otherwise they will make the argument why change the way things are now?

S. Chumley stated that to go with EFW was to invest in the future.

J. Archdekin commented that financially EFW can also look very good after the first four to five years. Ideally what the Region needs is an interest-free loan to start. He used the example of purchasing an economy car - the initial investment is expensive, but the cost is recovered by the amount saved on gasoline.

B. Laughlin asked what the current cost of shipping to Occidental is. J. MacKay responded that the variable cost to Occidental is \$23 to \$24/tonne. This suggests (according to the Interim Report) that there would not be a major cost difference if the Region were to go to EFW for a plant in Halton the cost would go up to \$28 to \$30/tonne.

C. Baynes asked where the Region stood with Ontario Hydro (OH)? Is OH still reluctant without political direction? K. Reichert commented that OH may not be interested in the small amount of electricity the Region has available.

S. Chumley proposed that no more public meetings be held by SWAC, the small turnout at the last meeting is a good indicator that public meetings are a waste of time. Instead, SWAC needs to sell its ideas to Council; it is the politicians who are the strongest opposition. Once SWAC has sold the idea to Council, it is up to the administration to work out the details. It should not be the role of this Committee to go hunting for a site.

No decision was reached on this.

Adjournment

The meeting was adjourned at 10:30 p.m.

/cc

THE REGIONAL MUNICIPALITY OF HALTON

Report to Chairman and Members of the Solid Waste Management
Committee

From D. Y. Perlin, Chief Administrative Officer

Date 1986 01 02

Report No C.A.O. 26/86

Re: Review of the Citizens' Solid Waste Advisory
Committee's Interim Report by W.A. Mechler, Senior
Engineer for the District of Greater Vancouver

RECOMMENDATION:

THAT the Report prepared for the
Citizens' Solid Waste Advisory
Committee by W.A. Mechler, Senior
Engineer in charge of the Energy
from Waste Plant in the district of
Greater Vancouver, and attached as
Schedule A to C.A.O. Report 26/86,
be received for information

REPORT:

As part of the C.A.O. Report 278/85, Regional Council gave approval to retain Mr. W.A. Mechler, the Senior Engineer in charge of the Energy from Waste Plant in the District of Greater Vancouver at an upset limit of \$3,000. Mr. Mechler has been involved in EFW for over ten years in the Greater Vancouver area.

The Vancouver project, which is currently under construction, was initiated when problems were experienced in establishing a new landfill site. While meeting with SWAC, Mr. Mechler explained that in British Columbia under the new Waste Management Act, the Minister can approve a project without a hearing if there has been sufficient public participation prior to the submission of the project to the Minister for approval. Neither a Public Hearing or an Environmental Assessment is required for EFW in B.C. SWAC has made extensive use of the many Reports prepared by W.A. Mechler on the Vancouver project. If members of Council would like to review them, they are asked to advise the Project Officer, Marook Sidhwa (ext. 443).

Mr. Mechler spoke to the Citizens' Solid Waste Advisory Committee (SWAC) at their meeting of November 11, 1985. His main purpose in attending was to make a number of preliminary comments on SWAC's Interim Report. Although his entire report is attached as Schedule A, some of the highlights have been summarized below.

Generally, Mr. Mechler felt that SWAC had done an admirable job in preparing the Interim Report. However, he also felt there were some gaps in information. These gaps form the basis of his comments.

Health Risks

From the preliminary work SWAC has done so far, it was felt that the health risks associated with the emission of dioxins and furans from an Energy From Waste plant were likely to be very small. The Committee had intended to do a Health Risk Assessment to confirm this, as part of its Final Report. Mechler suggests that instead of SWAC trying to do its own Risk Assessment, it should review some of the many European and U.S. studies which repeatedly indicate that emissions from a properly designed and operated Energy from Waste plant pose a very low and acceptable risk to human health. The reason is that he feels the Committee has neither the time nor the expertise to determine if Energy From Waste is safe or safer than landfilling.

In suggesting that SWAC should not attempt to do an itemized health risk comparison of two waste disposal methods he makes the following comments. Both landfill and Energy From Waste discharge pollutants and create nuisances. Energy From Waste has upfront pollution control equipment costs but landfill has longterm perpetual care costs that are not as easily identified. In either disposal system nuisances and other problems can be minimized to an acceptable level. The cost will vary but each one must be assessed on its own merits.

Disposal of Ash

One of the Committee's main concerns was whether flyash should be codisposed with regular refuse or put in a separate cell of the landfill site. Special attention to disposal may be required as the flyash may contain quantities of dioxins and trace metals. Mr. Mechler recommends that flyash be disposed of in a separate cell of the landfill as flyash is not soluble in water, but may be in oils that are found in other waste products in the landfill. This separation would also minimize the mobility of the heavy metals. Mechler also suggested that transport vehicles carrying flyash be covered when weather conditions are such that they cause surface drying. A cover will prevent the ash from drying out and blowing from the truck.

Visual Impact

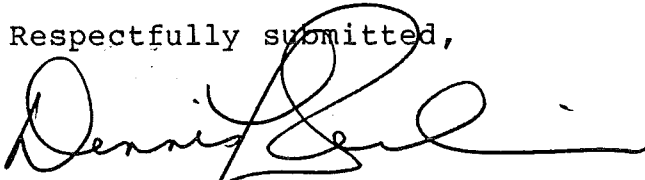
Mr. Mechler suggests that there is no need for the 180 metre (600 foot) stack that was suggested as part of the EFW Preliminary Feasibility Study. The highest existing stack

Mr. Mechler is aware of is a 120 metre (394 foot) stack in West Germany. He also suggests that attempts to hide the plant in a valley or with berms, is not necessary. The plant can be attractively designed and landscaped. Berming takes up a great deal of land and hides little of the building.

Detail

Finally, Mr. Mechler suggests that for a group whose mandate it is to examine issues from the citizen's perspective, SWAC has involved itself in too much engineering detail. He suggests SWAC should avoid being too specific technically at this stage. The Committee should be concentrating more on social impact and public education issues than the selection of technology.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read 'Dennis Perlin', with a long horizontal flourish extending to the right.

D.Y. Perlin
Chief Administrative Officer

MS/VH/cc

REVIEW OF THE INTERIM REPORT

Prepared By

The Citizens' Solid Waste Advisory Committee

by

W.A. Mechler, P.Eng.

November 22, 1985

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REVIEW OF THE INTERIM REPORT (OCTOBER 1985) PREPARED BY THE
CITIZENS' SOLID WASTE ADVISORY COMMITTEE OF HALTON

by W.A. Mechler, P.Eng.
November 22, 1985

1. INTRODUCTION

I presume that your resolve in 1983 to change refuse disposal to a large extent from landfilling (LF) to incineration with energy recovery (EFW) was prompted primarily by the difficulty of opening a new landfill site. Now you find that people also resist the locating of an incinerator near them and that potential energy customers are withdrawing because they do not want to be connected with a controversial issue. So the Region is reconsidering the matter (SWAC task to compare LF with EFW) and is also reviewing what size of EFW plant it may be able to afford.

Recognizing that citizen participation is all-important, the Region has established a Citizens' Solid Waste Advisory Committee (SWAC). SWAC's work to date is recorded in its Interim Report of October 1985, which I have been asked to review, using as background information also a summary report of 84.08.24 by your consultants SNC/Beak and your staff.

My experience comes from involvement in solid waste disposal planning in the Greater Vancouver Region (off and on since 1971), and in the operation of Greater Vancouver Regional District (GVRD) bulk transport and landfill disposal facilities. Since 1982, I was responsible for the planning, general design, tendering and advancement to the construction stage of an EFW plant of 456 tonnes per day (t/d) capacity. The size of this plant was recently expanded by addition of a third unit to $3 \times 228 = 684$ t/d rated capacity, which corresponds to an annual throughput of 210,000 tonnes (t/a). In the course of my work I have visited many EFW plants here and in Europe, attended international technical conferences, established personal contacts with staff of regulatory agencies and working relationships with consultants, and acquired a broad familiarity with the literature in English and German.

It appears that the main issue before you is whether the Region should continue to rely on landfilling or should move to EFW, and if so, to what extent and how soon. To arrive at decisions you need reliable information on:

- The relative environmental and social impacts of LF and EFW, and facts on these matters which can be presented to the public so as to allow informed citizen participation.

- Affordable costs for EFW which relate to size and technology, to grants from senior governments, to public vs. private ownership or equity participation by facility vendors, and to possible revenues from sale of energy.
- Selection of appropriate EFW technology and steps towards project implementation, with specific information to be given to the public and to be updated from time to time as the project progresses.

SWAC has done an admirable job in its Interim Report setting out facts, observations and considered opinions towards meeting these information needs. The report notes some gaps in the information available and some areas where further information and work is required, notably the assessment of health risks that may be associated with emissions from EFW plants and the development of performance requirements.

The following presents my comments and information that may fill some of the gaps, under broad subject matter headings rather than point by point notes. The more lengthy discussion is preceded by a summary that may suffice for those who are too busy or do not wish to read a lengthy technical presentation.

I am using herein a convention for distinguishing between the abbreviations of British Imperial and metric S.I. units that we have adopted. I am using t/d, t/a, m³/t, \$/t and the like when expressing metric S.I. units involving tonnes or Mg, and would write tpd, tpa and \$ per ton when referring to short tons. In the top line of Table 6, SWAC uses tpd for rated capacity in tonnes/day. This is incorrect and confusing.

In Appendix A, where the capacities of plants visited are listed, a note might be added that the metric capacities are 91% of the listed tpd. In the same appendix (p.24) heating values are given. I presume these are the higher heating values. Whatever they are meant to be should be defined.

2. SUMMARY

(a) Landfill Disposal (LF) vs. Energy from Waste (EFW)

When considering the issue in general terms it should be on the premise that, with either method, environmental and social impacts can be reduced to an acceptable level by providing appropriate pollution control measures and mitigating social impacts by site selection and specific measures at the site.

This comes largely down to costs. In the Halton situation, transport costs do not seem to be a big factor affecting only the costs associated with landfilling, and therefore landfilling will probably be cheaper. Therefore, a decision for EFW would likely result from opposition to landfill siting being greater or a desire for "doing the right thing" with a view to the future, so as to stretch the available capacity of land that may be dedicated to receiving wastes and, indefinitely, residues from incineration.

The qualitative comparison of relative impacts by SWAC is useful as a checklist when evaluating and comparing specific projects.

SWAC is right in questioning the need for an extremely high stack for a larger EFW plant. A stack height half the size mentioned (600 feet = 183 m) would be normal.

SWAC's idea of hiding the base of the stack in the building structure is not practicable. The stack must be at the end of the process, downstream of the air pollution control equipment.

Screening of an EFW plant by landscaping is a good idea but berming, which takes up land, may go a bit too far. EFW plants may be made to look quite attractive and need not be hidden entirely!

(b) Selection of Appropriate Technology and Experience Requirements for EFW

The emphasis on proven technology for the combustion system and the APC system, and on experience is quite right. It should not be compromised if public funds are

expended, and only with great caution for proposals based on private ownership.

On the whole, SWAC has correctly assessed the three major technologies -- Modular (MOD), Semi-suspension burning of Refuse-derived Fuel (RDF/SSB or, briefly, SSB) and Mass-burning on Grates (MBG). A new generation of SSB that avoids the problems of the past should have successful demonstration elsewhere before being considered for a project owned by the Region. There are several experienced vendors of MBG systems. MOD is an appropriate technology for plant capacities up to 225 t/d, but the committee rightly questions the maturity of some vendors.

SWAC is still uncertain about larger MOD plants. Over 225 t/d they should be considered only with much caution, and in my opinion they are quite inappropriate for plant capacities over 300 t/d. The energy recovery from each tonne of refuse is lower by about 10% for MOD, and this has considerable weight in a net present value (NPV) cost assessment.

Costs for larger MOD plants are usually underestimated relative to MBG, particularly if they are subjected to the same air pollution control (APC) requirements, as they should be. Experience on durability is rather limited. In contrast, some MBG plants have operated over decades. This and the difference in energy recovery, as well as operating costs, should be taken into account in overall cost comparison. Built-in provisions to facilitate a substantial future expansion of capacity (doubling) can be incorporated in MBG design, but for MOD only within the range of applicability.

Proven performance elsewhere in refuse incinerator applications should be a condition for selecting an APC system including acid gas scrubbing, but the period of experience may be shorter.

Operators with EFW experience may not as easily be attracted. There are only two private service companies with such experience in Canada. So, if a build-and-operate contract is being considered, you may have to

rely on the general contractor, with assistance from the system vendor, to attract experienced key operating personnel and to assure an operator training program.

The steam customer at the Vancouver EFW plant (3 units of 228 t/d capacity; annual throughput 210,000 tonnes; completion date spring 1988) was very concerned about reliability. Frequent stoppages for boiler cleaning as is common with MOD units would not have been acceptable to that customer.

The air emission limits set by most of the strictest codes can be met by quasi-dry scrubbing (milk of lime injection) or dry scrubbing (lime powder injection) with prior gas conditioning (lowering of temperature) in combination with either electrostatic precipitators (ESP) or fabric filters (FF) for particulate removal, including trace metals. Because of the urging of regulatory agencies, FF are increasingly preferred. First costs of ESP and FF are about the same, but the high cost of filter bag replacement (every two years or so) makes FF more expensive to operate. Extremely low emissions, as required in a few locations in Europe, can only be met by wet scrubbing, either alone or as a second stage. Wet scrubbing is preferred in some European jurisdictions also for the fact that it is generally easier to accomplish safe disposal of the resulting solid residues in landfills. Acid gas scrubbing adds substantially to capital and operating costs, wet scrubbing more so than dry or quasi-dry scrubbing.

(c) Health Risks from Dioxin Emissions

Reference to dioxins here is meant to include the related but less toxic furans. Dioxins seem to be ubiquitous, mainly due to small unintentional amounts which were in the past contained in herbicides. They have been found in the road dust of some cities, in fish and even mother's milk. Dioxins are generated in combustion, particularly in the presence of precursors. Emissions are much greater when combustion is incomplete and at relatively low temperatures.

Small amounts are found in the fly ash of refuse incinerators and emitted into the air with the residual

particulates in the treated gas or in vapour form. Tests have been conducted on incinerators in most countries where incineration is practised with varying results, but enough evidence that properly designed and operated plants emit much less than some others that are substandard. The importance of proper operation has been demonstrated particularly in Sweden by tests before and after efforts to improve combustion efficiency. Environmental Protection Agencies (EPA's) in several countries have concluded and announced that the small amounts that have been found in the emissions from properly operated plants do not pose a risk to health. The West German and Swiss EPA's have taken that stand; the Swedish Approval Board (permitting authority) having started later, is still conducting its own investigations and until their completion in 1986 will not act on applications for plant construction permits before it. Several risk assessment studies for specific large EFW projects in the U.S.A. have concluded that the risk to human health is extremely low. And, of course, the Ontario Environmental Hearing Board has considered the matter in relation to the London EFW project (at a time before more reassuring data were available from tests in other countries and at other Canadian plants).

Ontario has established ambient concentration limits for dioxins and furans and so have some other jurisdictions in North America. The West German and Swiss EPA's refrain from doing so on the grounds that there is no significant risk and therefore their protection principle is satisfied, and, furthermore, that monitoring of ambient air quality for these substances is not practicable. Nevertheless, their precaution principle has led them to prescribe operating practices that will minimize the emission of these substances. They specify limits or set minimum values for parameters indicative of complete combustion at adequate temperatures, and they demand that these be continuously monitored and recorded. The Vancouver project will comply with identical monitoring requirements. Agencies in some states of the U.S.A. have somewhat similar requirements, particularly with respect to minimum temperature. SWAC includes health risk assessment in its plans for future work and is discussing which risk evaluation model it should apply. Perhaps the committee should be content

with reviewing the conclusions of other more expert groups instead of attempting its own assessment.

(d) Safe Disposal of Residues from Incineration

Concern relates to fly ash and the dry products of scrubbing (neutral but readily soluble salts). Fly ash contains small amounts of dioxins and a large proportion of the trace metals (heavy metals). Dioxins are not water soluble but should be kept away from contact with oils and solvents that may be contained in raw wastes and the organics in leachate from putrescible waste landfills.

In the past, mixed residues (bottom and fly ash) were often used, instead of natural aggregates, as road base material and for similar purposes, especially in Europe. This practice is no longer permissible, but bottom ash alone may be so used.

When acid gas scrubbing is carried out, the bottom ash and fly ash (with scrubbing products) come off the process in separate streams. The Swiss have a preference for wet scrubbing, partly because the sludge from treatment of the scrubbing liquid is less leachable than residue from dry scrubbing. This applies also to some local jurisdiction in West Germany. Otherwise, the position of West German authorities (with a view to dioxins and trace metals in residue) is that:

- Mixed residues may be deposited in ordinary landfills, but are to be kept in separate cells away from raw wastes. This will to preserve a high pH (alkalinity) which has been shown in field tests to greatly reduce the mobility of heavy metals (as evidenced by their low concentrations in leachate).
- Bottom ash may continue to be used as construction (fill) material. The fly ash should then be placed in separate cells of regular landfills (for the reasons explained above), or taken to landfills for special wastes.
- Creation of airborne dust during handling, transport and dumping of fly ash and by wind-blowing after deposition must be avoided by thorough wetting and, if necessary, by additional covering of transport

vehicles. A final soil cover must be placed on all residue fills to prevent erosion and transport by wind and water.

Leachate from residue fills contains high salt concentrations but relatively low amounts of trace metals. At some residue fills where leachate is not collected and enters the ground water, attenuation of pollutant concentration with distance from the fill has been found to be rapid. This is not to suggest that leachate collection is unnecessary. Dioxins have not been detected in leachate samples tested in West Germany. The safe disposal of collected leachate (usually by sufficient dilution in watercourses or routing via sewage treatment plants for dilution must be assured. The relative quantity of leachate from raw waste fills is larger and often requires biological or physical-chemical treatment before discharge to receiving waters.

(e) Costs

SWAC has tabulated (Table 6) unit costs (in 1988 \$ for an 11 year period, 1988 to 1998) for landfilling (LF) and (blended unit costs) for various proportions of LF and incineration with energy recovery (EFW). The EFW costs contained in these blended disposal costs seem to be based on estimates by your consultants tabulated on Table 7 of the Final Summary Report.

The capital cost estimated by your consultants for a 363 t/d MOD plant (FD) are by far too low in relation to the estimated cost for a 400 t/d MBG plant (FD-C), and consequently the unit debt charges for the 363 t/d plant in the SWAC report are too low. Apart from underestimating the MOD cost, I consider this technology inappropriate for a plant of that size.

The capital cost for MBG plants estimated by your consultants are of the right magnitude, if on the low side in comparison with the Vancouver experience. The estimated operating costs are far too low, and this is reflected in the low unit costs tabulated by SWAC.

The relative magnitude of unit operating costs and, to a lesser extent, of the unit debt charges does not seem plausible considering the economy of scale normally

found with increasing EFW plant size, but I may not be aware of all the factors which have entered the estimates.

The unit debt charges in Table 6 appear to be based on the first year payment in the amortization period. In a comparison of unit costs based on constant \$ amounts (here 1988 \$), the debt charges should be levelized. This should also be done, if applicable, when comparing the unit cost for a publicly financed project with the tipping fee offered under full service proposals (i.e. proposals to finance, build and operate) if this fee is indexed to the inflation rate. An equivalent comparison of the net present value of annual system costs may instead be done.

The relative cost reduction to be expected when increasing the EFW plant capacity by building larger units (leading to lower unit cost) estimated by your consultant seems realistic. The Vancouver tendering experience showed a similar, if more pronounced, economy of scale when the capacity is doubled or trebled by adding units. The incremental unit cost for the second and third units is lower than the unit cost for any other disposal method, including landfilling with bulk transport.

The Vancouver tenders also showed that the ability to expand the basic capacity of an MBG plant (say one unit of at least 200 t/d) can be built into the initial plant design at a relatively modest additional cost for enlarged bunker, stack with spare flue(s), APC system with enlarged common equipment, and some other provisions. However, by staging construction, the considerable advantage of economy of scale will largely be lost.

The idea of building several smaller MOD plants to save transport costs would be attractive only in a situation where these are very high. In any case, siting problems are multiplied and economy of scale would be lost for both capital and operating costs. In other words, the aggregate cost will be higher than for a single larger plant, and this will in most cases outweigh the transport cost advantage.

The Greater Vancouver Regional District resolved to partially switch from LF to EFW without counting on grants from senior governments. It was fortunate to receive a grant under the Federal government's FIRE program. Such a grant may not be available in the future.

3. LF VS. EFW - RELATIVE ENVIRONMENTAL AND SOCIAL IMPACTS

The qualitative item by item comparisons are all true and useful as a check list when assessing and comparing specific projects. As aid for a general choice between disposal methods these considerations are of subordinate importance. This view is based on the contention that with either disposal method the discharges of pollutants and creation of nuisances (such as odours in the case of landfills) can be minimized to an acceptable level or even avoided, albeit at a cost. In the case of incineration, the cost of air pollution control is included up front as part of the capital cost and in the evaluation of operating costs. In the case of LF, costs for pollution and nuisance control measures and for "after care" are often not recognized from the outset and later arise as extras. It can be expected that increasingly stringent regulatory requirements for landfills will lead to proper recognition of environmental care costs of new landfill projects. For instance, it is reported that installation of liners will be a general requirement for landfills in the U.S.A. The State of Washington now mandates double liners at landfills for ordinary refuse (verbal communication with City of Seattle). SWAC is looking for more data on the comparative quantity and quality of leachate from raw wastes. Such data exist, and one could attempt to normalize them as mass discharges of pollutants per tonne of waste material in the deposit. A considerable scatter may be found (particularly for raw wastes) as a result of differing types of waste, age and depth of fill, exclusion of precipitation water by the cover, and of course, climate.

The general quality of leachate from raw wastes is known from many reports. In Vancouver, the leachate from most landfills is presently conducted via sanitary sewers to primary sewage treatment plants, which accomplishes dilution prior to discharge to the large Fraser River or the sea. Otherwise, on-site treatment would be required mainly to reduce ammonia (toxic to fish), as indeed it is at one private landfill. On-site leachate treatment is also planned for the large Vancouver City landfill when it becomes the disposal site for much of the refuse from the region under a new waste management plan.

European tests have shown that leachate from residue is high in salt content, but the concentrations of heavy metals are

quite low, even when the residue contains fly ash. Tests for dioxins and furans have been negative, even at a special landfill in West Germany where fly ash and scrubbing products from eight refuse incineration plants (RIP's), including the four Hamburg RIP's, are deposited (personal communication from Schleswig-Holstein, Min. of Env.). Separation is necessary because the other residue (bottom ash) is used as aggregate for road base construction etc. Specific information is also available from Bavarian elutriation tests with mixed fly ash and scrubbing products from dry scrubbing and tests with sludges from treatment of wet scrubbing liquid.

Other points to note in connection with statements in the SWAC report:

- The wisdom of a preference or even requirement for impervious (sealed) landfill cover to exclude precipitation water and thereby reduce leachate is debatable. There is a given amount of material to be leached out until the fill becomes stabilized. Under some circumstances it may be preferable to accelerate the leaching (and thus advance the time to stabilization). Imperfectly sealed raw waste dumps may develop severe odour problems (GVRD experience), unless the gas is collected and flared or utilized. Gas collection is not normally attractive for energy recovery, unless the fill depth is at least 40 feet (12 m).
- If leachate from raw wastes has to be treated, the method usually adopted for leachate from relatively young fills (biological treatment) will not suit the characteristics of leachate from aged fills, and so modification or replacement of the treatment plant is later required.
- The quality of leachate from residues of incompletely burned wastes approaches that of leachate from raw wastes (Swiss tests on leachate from residue coming from a RIP that was overloaded and had poor burnout). In this connection I wonder about the leachate from the residue of some modular plants which I have seen.

4. REGARDING THE VISUAL IMPACT OF INCINERATOR STACK AND PLANT

This is of course a matter of individual opinion and related to the use of the surrounding land. I would not generally consider it as severe, and some stacks look quite elegant (e.g. the triple steel stacks at some multi-unit European and Japanese plants). The idea of hiding the base of the stack in the building mass (SWAC Interim Report) is not practicable for larger plants where it must be at the process end (air pollution control system). The idea probably arose from visits to MOD RIP Parkdale, P.E.I. and the Ford incinerator. It is not practicable at MOD plants either if these are equipped with acid gas scrubber and particulate collection device, as they should be when burning mixed municipal waste, unless they are very small.

SWAC rightly questions the need for a very high stack such as indicated for the larger MBG plants in the consultants' Final Summary Report. Such high stacks are not even used for much larger facilities. I could see the need for a very high stack if Toronto were to proceed with its plans for an EFW plant in the downtown area.

The Burnaby RIP in the Vancouver area will have a 60 m stack. the new Marion Co. RIP (Salem are in OR, U.S.A.) has an 80 m stack and so has RIP Montreal. Stack heights between 80 and 110 m (260 to 360 ft) are not uncommon for rather large plants in urban areas. The greatest stack height of which I know is at RIP Schwandorf in West Germany (120 m = 394 ft). That plant is next to large Aluminum Works (which own and operate the RIP), and this may have determined the requirement (combined ambient air quality effect).

Thus the justification for an extremely high stack (600 ft = 183 m is mentioned) should be strongly questioned, even if the regulatory agency would like to see it. I presume that an effort to discharge above an inversion layer could have something to do with the inordinate stack height that is being mentioned. Inversions are also experienced at the west coast of this continent. Along with Los Angeles, the Vancouver area is particularly prone to this condition. Our dispersal studies assumed trapment of pollutants below an inversion layer, and the predicted ambient concentrations come out well below concentration limits, which are the same

or similar in B.C. and Ontario, except that B.C. has not established ambient concentration limits for dioxins. If ambient dioxin concentrations were the reason for proposing such tall stacks, the emission concentration that was assumed should be reviewed in the light of newer emission data from the testing of MBG plants and the Parkdale MOD plant, which are an order of magnitude smaller than the levels assumed in the London, Ontario hearings. Ambient air concentrations of pollutants will be roughly proportional to mass emissions, and reducing emissions to allow a lower stack can be considered as an economic trade-off or balance.

Seeing the short stacks typical at modular plants, as a resident living in the vicinity of one of these facilities, I would have a lot more concern than being close to a much larger plant with a higher stack.

Under 3.2 - Aesthetics (in Interim Report) - the minimizing of the visual impact of an EFW plant is discussed. A landscaping screen is desirable and can be accommodated on the recommended five acre site for a 600 t/d plant. Berming may go a bit too far, as it takes up land. As SWAC notes, an EFW plant can be made to look quite attractive, and therefore you don't have to hide it completely. It would well fit into a light industrial area but "having light industry buffer the surrounding area" seems a bit far fetched; so is the idea of the "virtually invisible" plant. After all, the main building block of an MBG is about 30 m high, and the tipping floor level is usually elevated above the plant site.

5. SELECTION OF APPROPRIATE TECHNOLOGY AND VENDOR/OPERATOR EXPERIENCE REQUIREMENTS

For convenience, the following abbreviations are used:

MBG - mass burning on grates. This is the technology developed in Europe and widely used all over the world, most notably also in Japan and more recently in North America.

SSB or RDF/SSB - semi-suspension burning of prepared (shredded and coarsely classified) refuse, developed in Canada (SWARU, Hamilton) and the U.S.A.

MOD - modular. A variety of systems comes under this classification for which the term "modular" has stuck. Not all are two-stage starved-air combustors. Some are excess air systems (e.g. Vicon and Basic). Even some MBG systems for smaller units with a high degree of shop prefabrication (e.g. Clarke-Kenith) are sometimes counted as MOD. Single units of two-stage combustors (e.g. Consumat) have so far reached 75 t/d capacity and there is little or no experience as yet with these large units burning municipal refuse.

In general, I concur with SWAC's conclusion that MBG involves the lowest technological risk, because of the long experience and a fairly large number of qualified vendors. The appropriateness of a technology must be related to cost and public ownership involvement. For the larger plant sizes, say over 300 t/d, only MBG and SSB can be considered. SWAC's negative view of SSB on the available evidence is correct. However, there is now a company with experience gained in fixing all those problems with the first generation of RDF/SSB plants, and they probably are capable of putting together a plant that works properly from the start, and of operating it. However, if I had to decide the spending of public funds on such a system, I would not want to take the risk that lies in being the first, but rather would insist on seeing such a plant in operation for some time elsewhere. In the case of private ownership, that could be a different matter. The financial position of the vendor should then be carefully investigated. And there are additional questions: Can the occurrence of a major explosion accident that might make the plant unavailable for some time be ruled out? Is a backup landfill then available?

Also, if a private investor owned facility runs into financial difficulties, the operator will either demand a higher tipping fee or, if the losses become too high, he may walk away from the commitment. There have been many experiences of that kind in the U.S.A. with unproven technologies (although the reasons for abandonment may in some cases have been more complex).

With respect to the demarkation between MBG and MOD, I would say the following:

Up to, say, 225 t/d plant capacity one of the forms of MOD is an appropriate technology, though a number of smaller MBG plants have been built or are being considered in the U.S.A. (Hampton VA, Lassen College and City of Commerce in CA), and, of course, smaller MBG plants are quite common in Europe and Japan. In the range between 225 and, say, 300 t/d, I would very carefully weigh and would be the more cautious the higher the capacity. Most likely when all factors, including durability, operating cost and energy revenue, are taken into account, the MBG technology will be preferable. In this area, the preferences and interests of consultants play a role. Their follow-up work involvement will be greater with MOD which can be designed by consultants with general experience, whereas with MBG the system vendors usually do a large part of the design. Your consultants have apparently costed the 363 t/d plant for Ford as MOD, which I would consider totally inappropriate technology for this size, apart from the stated capital cost being unrealistically low.

The lower efficiency of combustion in most MOD (high unburnt carbon in residue of pyrolytic two-stage combustors) and lower efficiency of add-on waste (heat boilers) results in a lower steaming ratio (tonne of steam per tonne of refuse fired) and consequently in lower revenue. The higher frequency of shutdowns for boiler cleaning may not suit some steam customers. (It would not have been acceptable to the user of steam from the GVRD incinerator, a paper plant making liner board etc. exclusively from recycled fibre, which operates continuously.) I know of no MOD RIP's equipped with superheaters for efficient electric power generation, but would not say that superheaters could not be used.

It is presumed that MOD plants, except perhaps very small ones, would have to meet the same air pollutant emission limits as MBG plants. Without air pollution control (APC) equipment, two-stage combustion MOD plants have emissions of particulates which are one order of magnitude smaller than raw gas concentrations at MBG or SSB plants (250 mg/m^3 std. dry at 12% CO_2 at the Parkdale plant vs. 5000 or more in the raw gas from MBG). The fractional size distribution is not reported, but may be predominantly fine, as the fairly high metals emissions would indicate. So, the effect on design of particulate control devices to reduce particulate emission concentrations below the permitted level (say 50 mg/m^3) may not be as favourable for two-stage MOD as the relative raw concentrations may indicate. A similar comment applies to trace metal emissions. Acid gas concentrations from MOD are the same as for MBG so that the same scrubbing effort is required.

The idea of building a number of smaller MOD plants instead of a large MBG plant has merit only if substantial transport costs can be saved, but the costs for the combined incineration capacity and operating costs will likely outweigh the transport cost advantage. The experience at the Ford MOD plant burning almost exclusively cardboard is not transferrable to refuse combustion with appropriate APC equipment.

The SWAC report is quite right in insisting on vendors having many years of experience and good references from previous project. Demonstrated experience should also be required of APC equipment vendors, but the required experience may be shorter since scrubbing technologies are relatively new. To demand similar experience from the operator may not be entirely realistic, since there are only two service companies in Canada with actual experience in running RIP's. One of them will operate the Vancouver RIP. Its contribution to selecting the APC system and specifying in detail preferred equipment so as to minimize operating problems was considerable.

Though the operating (sub-)contractor may not have prior experience, the chief operator and other senior positions should have, and, if possible at all, the designated people should have an opportunity to provide input to design. The major vendors of MBG receive feedback from experience at operating plants and can be expected to incorporate changes from lessons learned in new designs. They also can assist

with operator training. So, while getting an operating contractor with prior experience is advantageous, insistence on it may limit the competition.

6. AIR POLLUTION CONTROL TECHNOLOGIES

With respect to selection of APC technology, the notion has arisen that dry (or quasi-dry) scrubbing in combination with fabric filters (FF) is "Best Available Technology" (BAT). The California Air Resources Board (CARB), among other agencies, espouses this view. They are under the impression that earlier problems with wet scrubbing systems have persisted and that these systems are on the way out. This is not true. In fact, only systems with wet scrubbing can attain the extremely low emissions of acid gases required at some projects in Europe, and they also achieve very low particulate and heavy metals emissions. A deciding factor sometimes is the low leachability of sludges from treatment of the scrubbing liquid. At some European plants, wet scrubbing is employed as a second stage following dry or quasi-dry scrubbing, e.g. at RIP Goepingen (West Germany) for additional SO₂ removal. Costs for wet system are, however, relatively high. This is partly due to the fact that the flue gas is cooled to about 60°C and must be reheated for discharge through a normal stack, or otherwise the flues must be rubber lined to prevent corrosion. The Vancouver tendering experience has shown that electrostatic precipitators (ESP) can meet particulate emission limits as specified by some of the most stringent regulations and keep heavy metals concentrations under the limits of the new West German and Swiss regulations. First costs for ESP and FF are generally about the same, if not lower for FF. But the costs of bag renewal for the most reliable and durable filter materials is very high. Because of the lack of specific experience in RIP applications, the guaranteed life of even the best and most expensive materials is at this time only two years. Nevertheless, the Vancouver RIP will be equipped with FF for various reasons, among them the political wisdom of providing what is perceived as BAT.

Conditions and requirements related to specific situations are so different that not one set of technologies is appropriate for all. The opinion that there is one BAT is uninformed.

On the whole, the statements by the air emissions sub-committee are quite correct. I would add that the Vancouver experience shows air emission control meeting today's standards adds substantially to capital and operating costs, and this is not adequately reflected in your estimates.

7. AIR EMISSIONS, DIOXINS AND RELATED HEALTH RISKS

As in Canada, environmental protection authorities in several European countries have arranged for testing of RIP's for dioxins and the related but less toxic furans, and have assessed health risks from these substances. Environmental assessment of some RIP projects in the U.S.A. also have addressed the health risk issue.

West Germany: In November 1984 a working group of experts convened by the conference of Laender (equivalent to our provinces) ministers of environment issued a report. Its findings and recommendations were confirmed in a documentation and position statement by Bundesumweltamt (UBA, the federal environmental protection agency) titled "The State of Knowledge Concerning Dioxins - November 1984" which was published in April 1985 (copy of the relevant sections, in German, supplied to your staff). Both reports say that the amounts of dioxins and furans found in the fly ash and as particulate and vaporous emissions through the stack from properly operated RIP's is so low that no significant health risk is recognizable. Therefore, no need is seen to establish ambient air and dustfall concentration limits to satisfy the protection principle. In any case, continuous monitoring of these substances would not be possible. Nevertheless to satisfy the protection principle, which requires minimizing the emission of dioxins and furans, the authorities have established new criteria for operation of RIP's so that complete combustion and minimum temperature under all operating conditions (including startup and shutdown) will be assured. To this end, the magnitude of indicative parameters (CO, O₂ content, TOC and temperature) is specified, and the values of these parameters have to be monitored and recorded continuously. (See also referenced memo dated 85.01.22.)

The total dioxins and furans emitted at three Hamburg MBG plants and at another unidentified RIP in West Germany were recently reported as 148, 123, 45 and 7 ng/m³ @ 11% O₂ dry (average from repeated testing, with minor variation between tests). The higher values are about the same as the emissions found during NITEP testing of the Parkdale P.E.I. two-stage MOD combustors which are considered to be at a safe low level. (This is implied in a press release by Environment Canada). The implications of the presence of

low concentrations of dioxins and furans in incinerator fly ash for residue disposal will be noted later.

Switzerland: After the testing of RIP Zurich-Josefstrasse (total d & f 32 ng/m³) the Swiss federal environmental protection agency (EPA) arranged for testing of a number of other RIP's. At the time of my last contact with the Section Head responsible for RIP's (visit November 1984), the results were not published. He had of course seen them and stated that they repeated and confirmed the Zurich results in order of magnitude. Emissions as found in these tests are considered by the Swiss authorities to be safely below any danger level. The official told me that the population accepts these findings, and that this matter is no longer a contentious issue.

Sweden: It is reported that a moratorium has been imposed by the Swedish EPA on the permitting of new RIP's (construction of already approved project being allowed to proceed), while the matter is being investigated. An "operational study of solid waste treatment" has been jointly conducted by the Swedish Association of Public Cleansing and Solid Waste Management and the Swedish EPA. Over the period 1982 to 1985 it has led to improved plant and operating conditions, by which marked reductions in dioxin emissions have been achieved (sources: Rylander at ISWA Conf., Philadelphia, Sept. 84, 'Science News' of July 13, 1985, and Boras newspaper report).

The fifteen page memorandum (in Swedish) by Statens Naturvardsverk (SNV, the Swedish EPA), which supported the request to the environmental approvals board to suspend permitting of new refuse incinerators, seems a somewhat ambivalent document. Its conclusion contains the following sentences: "SNV does, however, emphasize that incineration is a suitable treatment method for refuse, and that the problem of dioxin emissions should be solvable. The alternative, landfilling, may from an environmental standpoint be an inferior method." One gets the impression that the call for a moratorium was a political move, partly to insure that in future projects good combustion conditions and complete monitoring of operation will be assured.

U.S.A.: I understand the position of the U.S. EPA is that emissions do not pose a health risk. Nevertheless; risk assessments were made for several new RIP projects,

including San Marcos CA (carried out by Henderson, Durham & Richardson, April 1984) and the Brooklyn Navy Yard Resource Recovery Facility (BNYRRF) of New York City (carried out by Fred C. Hart Associates). I attach copies summarizing results and conclusions from the former and excerpts from the executive summary of the latter (from 'Waste Age', Nov. '84) along with excerpts from the testimony by Commissioner Steisel (from 'Waste Age', April '85). The Chicago facility mentioned in both is a 1600 tpd plant; the RIP at Hampton VA is a 200 tpd plant, which has had rather negative reports in other respects also (except for boasting a zero tipping fee).

SWAC has tentatively concluded that health risks associated with emissions of dioxins and furans are likely to be very small, but recommends a conservative risk assessment be conducted to confirm this. Its Air Emissions Sub-committee believes that the matter of the toxicity of dioxins is "an area of considerable controversy in scientific circles", suggests the prudence of adopting the conservative zero threshold model rather than assuming a no effect level, and would then assess the associated risks on that basis. With due respect to committee members with credentials, I am wondering whether a citizens' committee is qualified to undertake such a task. It might look at conclusions that expert groups have reached (including the information which I have listed) and see if these satisfy the committee. If not, the committee should ask for a qualified consultant to review and evaluate the available evidence.

8. RULES FOR SAFE DISPOSAL OF RESIDUES

The SWAC report under 4.2 notes that the issue of disposing of fly ash in a regular landfill has not clearly been resolved. This issue is related to dioxins and the preponderant concentration of heavy metals in the fly ash. A note is tacked on to item 'Ash' on p. 28 saying that "Europe may require precipitator ash to be segregated and taken to hazardous (waste) landfill", and a similar question is raised under 'Ash' on p. 37. These notes probably refer to local requirements in West Germany, and the matter is also related to a preference for wet scrubbing by Swiss authorities. In the first place, it must be understood that in these countries residue is to a considerable extent used as aggregate for road base construction etc. In the past, the fly ash has often be included. This practice is now discouraged or even prohibited, but in most Laender jurisdictions there is no restriction on landfilling of mixed bottom and fly ash. Where separation is required, the fly ash sometimes goes to 'special waste dumps' (Sondermuelldeponien), which are not necessarily the same as hazardous waste landfills. The main purpose is to protect local water courses from inflow of leachates with heavy salt concentration. The Bavarian EPA, which has 15 RIP's in its jurisdiction (more than half of them equipped with dry, quasi-dry or wet scrubbing systems) and which has done extensive testing of leachate from residues, permits mixed or separate residue disposal in landfills, where the eventual receiving waters have adequate dilution capacity. The fly ash and scrubbing residues from four Hamburg RIP's and four RIP's in Land Schleswig-Holstein are taken to a secure landfill for special wastes managed by Land Sch-H. Leachate from this fill has been tested for dioxins with negative results, i.e. no presence detected (Personal communication from the state official who supervises this fill). They have even had to test for dioxins in the vapour that is rising when the wet, warm residues are dumped. As was predictable, none were found. Cost approximately \$50,000. Leachate from residue fills in Land Nordrhein-Westfalen also contained no dioxins. It is known from Barvarian, Swiss, Danish and other field tests that heavy metal concentrations in leachate from residue fills are quite low, if the high pH condition is preserved by keeping the residue in separate cells.

In April '84 a working group of Laender representatives on refuse disposal (LAGA) issued recommendations for disposal which broadly coincide with the Barvarian position:

- Fly ash including dry scrubbing products is to be deposited in dedicated (special) landfills or separate cells of general landfills (i.e. landfill where also raw wastes are deposited).
- Bottom ash and fly ash may be landfilled together.

Based on the fact that dioxins are not soluble in water but are affected by oils, solvents and solvent aids, but also with a view to reducing the mobility of heavy metals, the expert group reporting to the Conference of the Laender Ministers of Environment additionally recommended that...

- Wind transport of residue dust and transport by rainwater runoff is to be avoided by immediate covering or by wetting of the flyash.
- Contact with oils, solvent, and leachates containing organics in deposits of raw wastes is to be avoided by placing fly ash in separate cells if they are taken to general landfills.
- Wind transport from and erosion of completed residue landfills is to be prevented by a final soil cover over the surface.

The usual practice prior to the introduction of acid gas scrubbing was to convey the fly ash captured by ESP or FF into the bottom ash quench tank and thus mixing the two residue streams. This is not practicable when dry scrubbing products (neutral salts and some unreacted lime) are captured with the fly ash. In plants equipped for dry scrubbing (and similarly but in a different way with wet scrubbing systems) the bottom ash (usually including the heavy boiler fly ash) and the residue from scrubbing reactors and particulate collectors (briefly and simply referred to as fly ash) leave the process in separate streams and are usually transported separately to a landfill, or, in the case of bottom ash, to uses as construction fill material. Quenching leaves the bottom ash with about 20% moisture.

To prevent dust blowing during transport (even with a cover) the mixture of fly ash and scrubbing products should be wetted by mixing the dry particulate residue thoroughly with water in a 'conditioner'. At the GVRD RIP, this will be a double-paddle mixer with water sprays. Therefore, covering of transport vehicles (recommended by SWAC) will not always be necessary. I would specify that, if weather conditions are such that surfact drying could result in dust blowing, the transport vehicles shall be covered.

9. COSTS

A number of questions arise with respect to Table 6 - Comparative Cost Analysis over an 11 year period starting 1988, and in 1988 dollars. The tabulated costs are not checkable without more information and therefore my comments may miss factors which substantiate relationships that do not appear plausible on the surface.

I presume the analysis is based on the cost tabulated on Table 7 of your Consultants' Final Summary Report of 1984-08-24. Without seeing the full report these are subject to possibly incorrect interpretation. Do the capital costs include construction financing over as much as 30 months in the case of the 600 t/d plant? If they are meant to include interim financing, they are too low, going by the Vancouver cost experience. Otherwise they are of the right magnitude for the MBG plants, but probably on the low side. The estimated annual operating costs are woefully low, even if they were without acid gas scrubbing, which adds a substantial amount. Steam sale prices are favourable in comparison with expected Vancouver revenues based on the price of natural gas in B.C. Non-binding price quotations to the GVRD of capital costs for a 225 t/d plant indicated very little difference between the three combustion technologies. These quotations showed relative high operating costs in the more realistic proposals from MOD vendors who had operating experience, and also in the one SSB proposal.

In Table 6 of the SWAC report, the costs are melded units costs for different proportions of LF and EFW. The operating costs do not seem to follow the typical and plausible trend, unless factors come into play of which I am unaware. Take for example the relative costs associated with the 400 and 600 t/d EFW plants:

Assuming that the unit costs for LF increase to \$19/t and \$22/t respectively when the landfill operation decreases in size, the respective unit operating costs for the 400 t/d plant would have to be \$21/t and for the 600 t/d plant \$27/t. If the unit landfill cost stayed the same, the respective unit costs for EFW would be \$25/t and \$29/t. In fact, the unit cost of operating a larger RIP should be lower, since a large portion of the cost is for labour, and not many additional staff members are needed to run the

larger plant. The unit debt charges seem to be the first year charges. In a constant dollar analysis, they should be reduced by the anticipated rate of inflation and levelized (to a financially 'weighted' average for the study period).

The debt charges for the 363 t/d (MOD) plant and the 400 t/d (MBG) plant differ unrealistically. I have previously mentioned that I would consider the MOD technology unsuitable for a 363 t/d plant, and that I believe the capital cost for a 363 t/d plant in the Final Summary Report to be much too low in comparison with the cost of the 400 t/d MBG facility. The relative steam revenues for the two types (which can be deduced from the tabulated blended system unit cost as \$32/t and \$31/t respectively) do not reflect the lower steaming ratio for MOD recognized in Table 7 of the Final Summary Report (about 8% lower).

Some notes on economy of scale factors, i.e. the change of capital and operating costs with plants size, may be of assistance in deliberations on the size of your EFW project.

Economy of scale is experienced in three different ways, the first two being closely related.

- (1) Increase size by building bigger units, e.g. 2 @ 200 t/d = 400 t/d vs. 2 @ 300 t/d = 600 t/d.
- (2) Achieving a given plant capacity with fewer units, e.g. 600 t/d in 3 units vs. 2 units.
- (3) Increasing the plant size by adding units.

Respecting the economy inherent in building bigger units, the cost increase estimated by your consultants for plant code FD-400 C and FD-600 C are 1.39 for capital and 1.30 for operation which seem realistic. The GVRD asked respondents to its 'Request for Proposals' (see Part 5 of TRC report under Lower Mainland Refuse Project) to indicate cost savings by providing 225 t/d plant capacity (the size considered at that early stage) in one unit instead of two. Some MBG vendors indicated a 10% capital cost saving. Taking advantage of this type of economy of scale has practical limits. It would be unrealistic, for instance, for Halton to consider one single unit of 600 t/d capacity as was suggested in conversation by one of your SWAC Members

(although some vendors can building much larger units than that).

The Vancouver tendering experience with firm bids from three selected vendors of MBG systems has shown a considerable economy of scale of the third type (increased plant capacity by adding units). Under the initial tender, the bidders were asked to price the 'basic' size of 1 unit @ 228 t/d and a larger plant of 2 units @ 228 t/d. They were also required to quote the cost for one unit with provisions to facilitate later addition of a second unit, and this approach may be worth considering by you if initially you can afford only one unit. On the basis of the incremental cost for the 2nd unit, the contract was awarded for two units because the incremented unit cost was lower than the cost of disposal by landfilling (including transfer and bulkhauling) or any other method. In response to a subsequent Request for Proposals for diversion of additional tonnage from landfills (brought about by the collapse of the Lower Mainland Refuse Project which had sought a joint solution to the disposal problem for the GVRD and two adjacent regional districts), the contractor for the 2 unit plant, GKN Birwelco, offered to build a 3rd unit. The bids for the APC system (including dry scrubbers and FF) were for 2 and for 3 process trains with the common auxiliary equipment to suit. I have estimated the respective capital cost for APC equipment for the single stream plant. The additional costs for operation of the APC system are not yet established and I have estimated these from partly known factors such as lime consumption, increased electrical power consumption, filter bag replacement costs, etc., and the expected additional labour. Bidding strategy may have somewhat affected the incremental cost increases for additional units. With these provisos, I find the cost increase factors relating to the lowest tender for the Vancouver project to be as follows:

Relative Costs GVRD EFW PLANT	1 @ 228 t/d 70000 t/a	2 @ 228 t/d 140000 t/a	3 @ 228 t/d 210000 t/a
Capital cost not including interim finance	1.00	1.43	1.90
Annual Operating Cost	1.00	1.56 1.00	2.13 1.37
Unit Operating Cost	1.00	0.78 1.00	0.71 0.91

Notes:

Somewhat longer construction and commissioning periods for the larger plant sizes will increase the related interim finance charges and consequently the overall capital cost factors to, say, 1.5 for doubling and 2.0 for trebling the basic plant size.

The operating costs include maintenance and replacements during the operating contract period for 12 years, which may be extended at the GVRD's option by up to 3 x 2 years to 18 years.

Similar economies of scale can be expected to apply to MOD plants in the range of unit and plant sizes for which they are suitable. In my opinion, it would not be appropriate, however, to assume that you could start with a MOD plant of, say 200 t/d, and later double its capacity. If a present restriction on indebtedness limits the size of plant you can afford, it is possible with MBG to build into the layout, at a relatively modest increase in capital cost, the ability to later double the plant capacity by adding a unit. The advantage of economy of scale, however, is then largely lost. I will close this discussion of costs with some notes on comparing unit costs derived under differing financing methods typically applying to publicly owned and investor-owned facilities.

Debt retirement for the Vancouver RIP will be in equal dollar amounts. So, the relative burden of amortization will decrease with inflation, while operating costs will be

indexed to inflation factors, and revenues are also expected to increase with inflation (more or less). It is expected that in time the RIP will become a 'profit centre' in the system. In contrast, full service contractors for EFW plants usually offer a tipping fee that increases with price indices roughly paralleling inflation. They are thus able to levelize the debt charges. Is there a reason why publicly financed projects could not similarly level the debt charges if this were desired? In any case, when cost for publicly owned and investor-owned facilities are compared, this should be done on the basis of net present values (NPV) or levelized unit costs (which are the NPV divided by the discounted annual series of product, in the case of a RIP the discounted annual throughout tonnages, as discussed in more detail in the TRC Report produced under the Lower Mainland Refuse project).

As a final comment on costs, I would note that the GVRD never counted on received grants from senior governments as a condition of proceeding with its RIP project. The GVRD was fortunate to receive a grant under the Federal government's FIRE program (based on the 2-unit facility). We understand that no further funds are available under the FIRE program, but you will want to verify this for yourselves. There is no provincial assistance available in B.C., not even a tax rebate.

10. MISCELLANEOUS COMMENTS

- (a) Re: Terms of Reference (1.2) and Section 4.7, Site Selection Criteria: The terms of reference give the committee a mandate to establish site selection criteria. I feel that for a group which is to examine the issues from a citizen's perspective, the committee is involving itself in too much technical detail, in too much engineering, to say it bluntly. The committee should develop instead guidelines that do not put the engineers in a straightjacket. For instance, the 1 km distance from residential areas should be a desirable goal but not a firm criterion, because a certain site, though not meeting this condition, may possess offsetting advantages. The reason for this rule really applies only to noise and traffic and perhaps visual impact, which may be mitigated in specific situations. Contrary to what citizens may think, it is not relevant to air pollution effects, which are apt to be lower near the plant (though well within limits anywhere).
- (b) On p. 13, Type of Technology: The reference of the maximum size of 300 t/d for MOD is to modular or two-chamber units in the preceding sentence. The number is intended to refer to plant size, and therefore 'per plant' should be added after 300 t/d. Avoid using short tons when most of the other sizes are expressed in t/d.
- (c) Re: p. 14, Metal Recovery: I agree, it is not economical. However, at the Vancouver plant there will be coarse metal separation to make the bottom ash more suitable for road construction on a landfill for raw wastes and later, hopefully, as general fill for flood-proofing of low land in the vicinity of the plant. It is intended to fill a controlled test area and monitor the leachate.
- (d) Re: p. 15, Self Sufficiency of EFW with electric power generation: A supply from the grid is required for cold starts and malfunction of the in-house generating equipment. This use of outside electricity will incur a demand charge, which in B.C. would reduce the possible revenue by roughly 25%.
- (e) Re: p. 15, Performance Guarantees: There and in other places (4.1 and 4.4) an expectation is expressed that

- NITEP will provide information on specific operating procedures etc. I think it will not do that, or only to a limited extent. However, it is well known how plants should be operated properly and how this should be monitored. The committee ("needs to determine ...", Sec. 4.4) concerns itself too much with engineering.
- (f) Re: p. 16, Odour Control: It is standard practice (and should be specified, to make sure) that the combustion air is drawn from the bunker space, and this takes care of this requirement. I have noted at one plant that the intakes were arranged so that paper and plastic film were sucked onto the intake screen which looked messy.
 - (g) Re: p. 16, Storage: While normally the stored volume should be turned over in three days, somewhat more bunker space is desirable.
 - (h) Re: p. 18, Monitoring: Refer to Vancouver program written up in memos and 'The Facts on the Burnaby RIP' distributed to residents in South Burnaby. Promising a monitoring station or two in the affected area for continuous monitoring of ambient air quality may help to allay citizen concerns.
 - (i) Re: p. 18, Costs: I am not convinced that absence of a liner requirement for LF would greatly affect the relative economics. Liners are expensive, but do not cost that much.
 - (j) Re: p. 19, Revenues: I understand there is an oil refinery in your area. Have you investigated it as a potential steam customer? Loss of a steam customer is a risk. If it is rated high, provisions can be made for a later switch to electric power generation (in the first place, leaving sufficient space within the building or at least on the site).
 - (k) Re: p. 37, App. C - Ash: Fly ash as 10% of total residue is really in terms of weight, not volume. With scrubbing, the scrubbing products increase the quantity of fly ash. The scrubbing products contain some unreacted lime. I have never heard of separately admixing lime to residue. As discussed at length, disposing fly ash together with bottom ash, both separate from raw wastes, is the correct way. Bottom

ash can be used as daily cover over raw refuse and for roads on the fill.

- (1) Re: 4.9, Relationship between SWAC and Staff ("SWAC has instructed staff"): Our organization would not have let a citizens' committee operate without (a very cooperate) input from expert staff and keeping control of the committee. Letting such a committee arrange and organize public meetings without keeping control would be out of the question. I recommend the reading of a very informative article by Carolyn Konheim in the November 1985 issue of 'Waste Age' (pp. 76 & 80). I would subscribe to almost everything she writes.

REGIONAL MUNICIPALITY OF HALTON

Report To Chairman and Members of the Solid Waste Management
Committee

From R. Mohammed, Director of Planning and Development

Date 86 01 02

Report No DPD 20/86

Re: Application for Local Planning Approvals
to permit a Regional Sanitary Landfill Site
in the Town of Milton at Site 'D'.

RECOMMENDATION

That DPD 20/86 regarding the application for local planning approvals to permit a Regional Sanitary Landfill Site in the Town of Milton at Site 'D' be received for information.

REPORT

As authorized in CAO 203/85, Walker Wright Young Associates Ltd. have prepared the necessary Milton zoning by-law and Official Plan amendment applications to permit a Regional Sanitary Landfill site in the Town of Milton at Site 'D'. These amendments were reviewed by the Approvals Management Committee and then sent to the Town of Milton in December, 1985.

Milton staff has indicated that they are now actively processing the applications and Town Council will be considering them and holding a public meeting in the next few months. In the meantime, as required by Milton, Halton will be posting two amendment notification signs adjacent to the site during the last week of January, 1986.

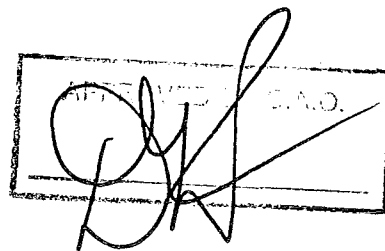
A copy of the application is attached as Schedule A for the information of Council.

Respectfully submitted,



R. Mohammed
Director of Planning and Development

KA/gl.sc



RECEIVED
DEC 20 1965
PLANNING & DEVELOPMENT
REG. MUN. OF HALTON

15 Delisle Avenue
Toronto, Ontario
M4V 1S8
416/968-3511

Peter R. Walcker
B.A. M.Sc. MCIP
James M. Wright
B.A. MRAC
Richard D. Young
B.Sc. M.A. MRAC RIBA
Robert A. Drapacovic
BES MES MCIP
Wendy Hott
BES MCIP

iii) The legal description of the subject lands is as follows:

Lot 3 and Part of Lot 4, Concession II N/S, Town of Milton.

A plan of survey is to be prepared, and will be submitted to you in due course.

iv) Argument and reasons for the amendment

An exhaustive process has been undertaken under the Environmental Assessment Act to select a waste management system and a sanitary landfill site for the Regional Municipality of Halton. The subject site has been selected as having the necessary combination of potential benefits and low negative impacts for sanitary landfilling, and on this basis is being put forward for approval under the Environmental Assessment Act, the Environmental Protection Act, the Municipal Act and the Planning Act. Approval under the Planning Act is required because the sanitary landfill facility is not permitted within the zoning and designation which applies to the site, and the same may be true of the proposed after-use when this is finally established. Detailed information concerning the site selection process, the characteristics of the site and its locality, and the potential benefits and impacts may be found in the supporting documentation to the Environmental Assessment.

v) Detailed landscaping plans are required only as part of a "formal application", as described in the Town's list of requirements for Zoning By-law and Official Plan amendments, and not at the current 'initial application' stage. These plans will be sent to the Town when they become available.

vi) Floor plans of buildings and details of proposed installations will be provided when this information becomes available.

vii) Detailed Description of Amendments

We enclose draft amendments to both the Zoning By-laws (existing and adopted) and the Official Plan for your review. These amendments would remove the Zoning and Official Plan provisions which permit landfilling in the "old Site F" area, to the west of the intersection of Tremaine Road and Britannia Road, having provided for sanitary landfilling, a buffer area, ancillary uses and after-use on the new area shown on the site plan.

viii) Street addresses of properties within the subject site are indicated on the attached table, "Details of On-Site Landowners".

Mayor & Council
Corporation of the
Town of Milton

December 17, 1985
Page 3

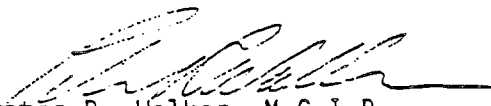
The proposed site for Sanitary Landfill use lies in the block located to the north of Lower Baseline and to the west of Highway #25, and the "old Site F" area, on which the current designation and zoning to permit Sanitary Landfill use would be deleted by the proposed amendments, is located in the northeast quadrant of the intersection between Tremaine Road and Britannia Road.

I trust that the above information, together with that shown on the application form, is sufficient to enable the Town to commence processing the required planning amendments. We enclose a cheque for \$650, comprising \$200 for an amendment to the Zoning By-law in a rural area, and \$450 for an amendment to the Official Plan.

If you have any questions or require any further information, please do not hesitate to contact myself or my assistant Mr. Steven Rowe.

With thanks for your consideration,

Yours truly,



Peter R. Walker, M.C.I.P.
Partner

PRW/le

Enc.

cc: R. Mohammed, Regional Municipality of Halton —

The Mayor & Members of Council,
The Corporation of The Town of Milton,
P.O. Box 1005,
MILTON, Ontario.
L9T 4B6

APPLICATION TO AMEND ZONING BY-LAW
(To be completed in triplicate)

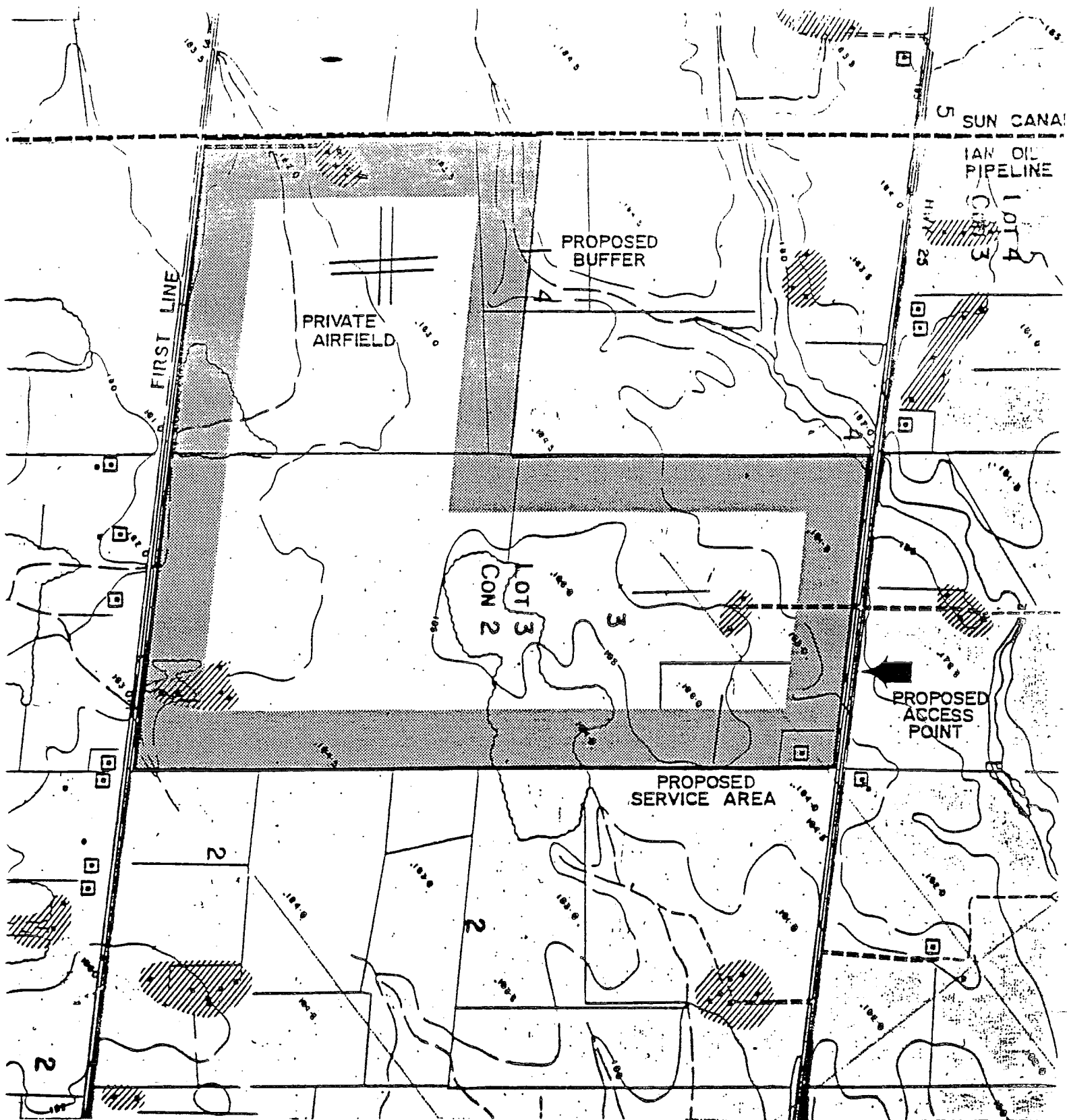
Date December 17, 1985

1. Name of Applicant Agent WALKER, WRIGHT, YOUNG ASSOCIATES LIMITED
(please print)
2. Address of Applicant Agent 15 DELISLE AVENUE, TORONTO, ONTARIO, M4V 1S8
3. Telephone number - home _____ business 416-966-3511
4. State whether applicant is registered owner, agent or future purchaser
(See affidavit and Note 1). ---AGENT---
5. Name and address of present owner SITE IS IN MULTIPLE OWNERSHIP: SEE
ATTACHED LIST AND SKETCH PLAN
6. Name and address of person or company intending to develop or use the
property after the by-law is amended (See Note 1).
THE REGIONAL MUNICIPALITY OF HALTON, P.O. BOX 7000
1151 BRONTE ROAD, OAKVILLE, ONTARIO L6J 6E1
7. Legal description of property to be changed in by-law. Provide sketch
of property showing all measurements and area - must be attached.
(See Note 2).
LOT 3 & PART OF LOT 4, CONCESSION 2N/S, TOWN OF MILTON
8. If owner owns adjoining lands, describe. SOME OWNERS OWN ADJOINING LANDS,
AS SHOWN ON LIST AND SKETCH PLAN REFERRED TO UNDER '5' ABOVE.
9. Describe existing use of property. PREDOMINANT USE IS AGRICULTURE.
PRIVATE AIRFIELD AND 4 RESIDENCES (SOME WITH ASSOCIATED FARM BUILDINGS).
10. Describe intended use of property for which zoning amendment is requested.
(See Note 3.)
A REGIONAL SANITARY LANDFILL SITE AND ANCILLARY USES ON AN INTERIM BASIS,
FOLLOWED BY AN APPROPRIATE LONG-TERM AFTER USE.
11. Reasons to support requested amendment (See Note 4.)
SEE ATTACHED LETTER

Peter R. Walker, MCIP

(Signed)

Peter R. Walker
(AGENT)



CONCEPT PLAN: PROPOSED SANITARY LANDFILL SITE, TOWN OF MILTON

EXISTING BUILDING AND USES

- RESIDENCE
- RESIDENCE RELATED TO FARM BUILDINGS



-73-

Walker Wright Young Associates Limited / Planning Consultants

15 Delisle Avenue Toronto, Ontario M4V 1S8 416 / 669-2544



PROPOSED AMENDMENT TO
THE OFFICIAL PLAN
OF THE TOWN OF MILTON PLANNING AREA
TO PERMIT SANITARY LANDFILLING ON SITE 'D'

INTRODUCTION

Part A - The Preamble does not constitute part of the Amendment.

Part B - The Amendment, together with Schedule 'A', constitutes Amendment No. _____ to the Official Plan for the Town of Milton.

Part C - The Appendices does not constitute part of this Amendment, and consists of Appendix I (Conceptual Site plan) and Appendix II (List of documents prepared in support of the Halton Environmental Assessment for Landfill).

PART A - THE PREAMBLE

PURPOSE

The purpose of the amendment is:

1. To permit a Sanitary Landfill Site, to be controlled by the Regional Municipality of Halton, in Lot 3 and Part of Lot 4, Concession 2 N/S, Town of Milton, and to indicate its location on 'Figure D' of the Official Plan for the Town of Milton.
2. Related to the approval of permission for a Sanitary Landfill as noted in 'Purpose 1' above, to delete provisions in the text and a notation on 'Figure D' of the Official Plan for the Town of Milton which permits a Sanitary Landfill Site in Part Lots 6 and 7, Concession 7 NS.
3. To designate the proposed Sanitary Landfill Site as a Site Plan Control Area under Section 40 of the Planning Act, S.O. 1983.

LOCATION

This Amendment consists of five parts, which shall be referred to as Item (1), Item (2), Item (3), Item (4), and Item (5). Items (1), (2) and (3) deal with text changes, and Items (4) and (5) deal with a map change as indicated on the attached Schedule "A".

- Item (1) A subsection which permits a Sanitary Landfill Site north of Lower Base Line, between First Line and Highway #25, is inserted to form a new Subsection 4.1.4, in Part 2 (Policies) of the Official Plan for the Town of Milton; and
- Item (2) Upon approval of the location referred to in Item (1) above, Part 2 (Policies), Subsection 4.1.4, is deleted in order to remove a special provision which permits a Sanitary Landfill Site near the intersection of Tremaine Road and Britannia Road.
- Item (3) Part 3 (Interpretation), Subsection 'N', is amended to designate the area on which sanitary landfilling is permitted by Item (1) above as a Site Plan Control Area.
- Item (4) A symbol designating a Sanitary Landfill Site is added to 'Figure D', 'Land Use', north of Lower Base Line between First Line and Highway #25, as indicated on Schedule 'A' attached; and
- Item (5) Upon the approval of the designation referred to in Item (4) above, the symbol which designates a site near Tremaine Road and Britannia Road as a Sanitary Landfill Site on 'Figure D', 'Land Use' is deleted, as indicated on Schedule "A", attached.

BASIS

The necessary approvals under the Planning Act to permit a Sanitary Landfilling operation, to be operated by the Regional Municipality of Halton in Part Lots 6 and 7, Concession 7 NS in the Town of Milton (northwest of the intersection between Tremaine and Britannia Roads) were confirmed by an Order-In-Council dated January 30, 1980. As a result of this decision, the Town of Milton made the necessary amendments to the applicable Official Plan and Zoning By-law to permit the Sanitary Landfilling use. The Official Plan amendment to permit Sanitary Landfilling was carried forward into the new Official Plan for the Town of Milton, as an exception to the 'Agriculture' designation (Section 4.1.4 and Figure D).

The Regional Municipality has been unable to commence landfilling on the above site because the required approvals under the Environmental Protection Act are not in place. On February 9, 1981, the then Minister of the Environment made an order to the effect that the sanitary landfill proposal would be regarded as an 'undertaking' under the Environmental Assessment Act. Under this Act, the need for a sanitary landfill component in Halton's solid waste management system, and the location(s) of sanitary landfill(s), if needed, would be established through the evaluation of 'alternatives to' and 'alternative means of carrying out' the disposal of solid wastes generated within the Region.

The 'Environmental Assessment of the Landfill Component of Halton's Solid Waste Management System' was initiated in 1982. In June 1983, Regional Council approved the recommendations of 'Phase 2, Stage 1, Waste Needs and Systems Analysis', thus making a commitment to a resource recovery-based waste management system, with a sanitary landfill component.

There followed a three-stage process by which the Region was screened in an increasingly more detailed manner, as the scope of the search for a Sanitary Landfill Site was narrowed down. The criteria on which this screening was based include hydrogeological, biological, agricultural, land use, transportation, social, economic and cultural factors. It became clear at an early stage in the process that, in order to conform to the Environmental Assessment

Act, the site selection process must commence with consideration of the Region as a whole, rather than with alternative sites generated by earlier site selection activities.

Agencies and interested members of the public were circulated with reports and invited to public meetings when selection criteria were being chosen and ranked, and when each stage of the study was completed. Their comments were sought, and were compiled into 'Submissions Reports' and considered in revisions to the draft reports.

The search for a Sanitary Landfill Site was influenced by a parallel study to evaluate the feasibility and siting of the main resource recovery component of Halton's solid waste management system, namely an Energy from Waste facility(ies). The capacity and timing of an Energy from Waste facility(ies) would have a direct influence on the volume of waste which would be disposed of at the Sanitary Landfill Site. On September 5, 1984, Regional Council approved landfill volume management which was reliant upon an Energy from Waste Plant(s) being introduced during the latter part of a 20-year planning period (1988-2008). The capacity of the proposed Sanitary Landfill Site was established on the basis of this approved landfill volume.

On July 23, 1985, Regional Council resolved to submit an Environmental Assessment document to the Ministry of the Environment which proposed an 'undertaking' comprising two alternative sites for sanitary landfill, one of which was the subject site (See Appendix I). These sites had been found to have the lowest potential environmental impacts from landfilling after mitigation among the alternatives considered, and the greatest potential benefits.

It may be seen from the above that the selection of the subject site for sanitary landfill is the result of a comprehensive process of screening, analysis and comparative studies. All of the considerations which would normally have been investigated under the provisions of the Planning Act with respect to a proposal of this magnitude have been fully researched and reported upon during the course of the Environmental Assessment. For detail concerning the

screening process and the characteristics of the subject site, reference should be made to the documents which have been prepared in support of the Environmental Assessment and which are listed in Appendix II.

As a result of the Environmental Assessment, the site which already has Planning Act approvals in place for Sanitary Landfilling is not required for this purpose if the results of the Environmental Assessment are confirmed by the approving authorities. By removing the special provisions in the Official Plan which permit this use, this Amendment will reduce the range of permitted uses and applicable policies to that which applies within the conventional 'Agriculture' designation, in order to reflect the current and anticipated future use of the site. This change will take place only if the site which would be approved for Sanitary Landfilling by this amendment is actually approved.

The site which has been selected for Sanitary Landfilling purposes through the Environmental Protection Act and the Environmental Assessment Act is currently designated 'Agriculture' and 'Conservation and Hazard Lands' in the Official Plan for the Town of Milton. These designations do not permit the proposed sanitary landfilling use, and therefore an amendment to the Official Plan is required to allow sanitary landfilling as a permitted use, and to allow an appropriate after-use upon completion of landfilling without further amendment to the Plan.

The Official Plan for the Town of Milton designates only the urban area of Milton for site plan control purposes, and the Town wishes to designate the proposed Sanitary Landfill Site as a site plan control area. The site is therefore so designated by this Amendment, in order that the Town may take advantage of the provisions of Section 40 of the Planning Act, S.O. 1983, in considering the proposal.

Official Plan Designation: "Agriculture"

Sanitary landfilling is not a permitted use within the "Agriculture" designation, and the Official Plan states: (Section 4.1.2)

"Uses and activities deemed incompatible with farming shall be discouraged from locating in the Agricultural area."

Section 4.2.2 of the Official Plan for the Town of Milton provides a series of criteria against which 'non-farm development in the Agricultural area' would be evaluated.

The following is an account of the extent to which the proposal would conform with these policies:

a) "[The use shall be] deemed compatible with existing and potential farm operations"

- The use of the subject site for sanitary landfill is viewed as an "interim use" in Policy D3.8 of the Halton Regional Plan. The range of uses identified as potential after-uses for the subject site includes passive and active recreation uses, and agriculture. Passive outdoor recreation in the 'Agriculture' designation is permitted under certain circumstances by Section 4.1.3 of the Official Plan for the Town of Milton, as is a wide range of agricultural uses. Active recreation uses are not permitted in the 'Agriculture' designation. This Official Plan Amendment would include active recreation uses as permitted uses on the subject site.

b) "every reasonable effort has been made to preserve Prime Agricultural Soils."

- The Environmental Assessment identified areas with deep glacial till, such as the subject site, as being suitable for sanitary landfilling because of their potential to reduce the risk of contamination of the environment. Areas of deep glacial till

often coincide with good agricultural soils, and it was found in Halton that it would not be possible to locate a Sanitary Landfill Site in such areas without using Prime Agricultural Soils.

- The Environmental Assessment examined the potential use of pits and quarries for landfilling as an alternative to the use of good agricultural land. One of these, in the City of Burlington, formed one of two final alternative sites in the Environmental Assessment.
 - Topsoil on the subject site will be preserved and utilized in site rehabilitation.
- c) "detailed studies prove that the lands are better suited to non-farm uses"
- The first two points under (b) above also apply with respect to this criterion.
 - The Environmental Assessment reviewed each alternative site against a broad range of factors, and the subject site was relatively highly placed in such categories as Hydrology and Hydrogeology, Traffic Safety, Traffic Service and Operations, Biophysical impacts, Population impacts, Land Use Compatibility and Costs. The site has a high level of performance against all of these factors, despite the potential for displacement of agricultural land.
- d) "[The use shall be] in conformity with the policies of this and the Region of Halton Official Plan"
- In Policy D3.9, the Official Plan for the Halton Planning Area recognizes that:

"The nature of the operation of landfills, including the need to protect ground and surface water, may require locations for landfills which according to other policies of this Plan may be best suited to other purposes."

In addition, the Halton Region Official Plan is being amended to reflect the current intentions of Regional Council with respect to its solid waste management system; and to permit the development of the subject site as a Sanitary Landfill.

The proposed Sanitary Landfill Site would conform to the Official Plan of the Town of Milton with the approval of this Amendment.

"Conservation and Hazard Lands"

The Town of Milton Official Plan states: (Section 10.6.4)

"An amendment to this plan will not be required for changes to Hazard Land boundaries which are deemed to be suitable after consultation with the appropriate Conservation Authority."

The Halton Region Conservation Authority has commented on the subject site with respect to its potential use for sanitary landfill, and has noted the fact that a stream which crosses the site and which forms the basis for a 'Hazard Land' designation would be diverted around the site with the implementation of the proposal. The Conservation Authority has raised no objection to this stream diversion, and therefore no difficulties are anticipated with respect to the 'Hazard Land' designation.

Land Ownership

The severances which would be required to assemble the subject site under one ownership may result in a number of small, remnant parcels. This would conflict with the policies contained in Part 2, Section 4.3 of the Official Plan, particularly as they apply to the fragmentation of farmland. The Regional Municipality, if feasible, will attempt to reduce this fragmentation effect through negotiations with landowners in the process of purchasing the required land, in an attempt to consolidate remaining parcels.

After-Use

Studies have been undertaken to determine a final use or uses which may be put in place once landfilling operations are completed on all or part of the subject site. Landfilled areas are subject to a number of constraints which would prevent the erection of buildings or structures on the filled area. The studies indicate that rehabilitation of the site for agriculture, a golf course or a combined active and passive recreation area are potentially feasible, subject to further investigation. Such uses would enable the site ultimately to be put to productive use, and would have less impact on the surrounding area than the Sanitary Landfill facility. This Amendment therefore permits uses in the range described above to be introduced as after-uses, without further amendment to the Plan.

PART B - THE AMENDMENT

Introductory Statement

All of this part of the document, entitled Part B - The Amendment, consisting of the following text and schedule, constitutes Amendment No. _____ to the Official Plan for the Town of Milton.

Details of the Amendment

The Official Plan for the Town of Milton is amended as follows:

Item (1)

A new Subsection 4.1.4 is inserted in Part 2 (Policy), as follows:

"4.1.4 Notwithstanding any other policies of this Plan, a Sanitary Landfill Site and ancillary uses to be controlled by the Regional Municipality of Halton is permitted between First Line and Highway #25 north of Lower Base Line, located in Lot 3 and Part of Lot 4, Concession 2 N/S. For purposes other than the use of the site for Sanitary Landfilling, the 'Agricultural' designation shall continue to apply, with the exception that no amendment to this Plan shall be required to permit active outdoor recreation facilities, such as sports fields or golf courses, together with ancillary uses, as part of a rehabilitation program on the Sanitary Landfill Site, subject only to Section 40 of the Planning Act, S.O. 1983 and to the applicable regulations of the Ministry of the Environment with regard to use of rehabilitated sanitary landfills. The Sanitary Landfill use shall be permitted only until such time as eight point six four million cubic metres (eleven point three million cubic yards) have been disposed of on the said lands."

Item (2)

With the approval of the designation referred to in Item (1) above, Part 2 (Policy), Subsection 4.1.4 is deleted in its entirety.

Item (3)

Part 3 (Interpretation), Subsection N, is amended by deleting the first sentence of this subsection and replacing it with the following:

"The areas specifically designated on Figure E, together with those lands on which a Sanitary Landfill Site, ancillary uses and after-uses are permitted by Part 2, Subsection 4.1.4, of this Plan, shall be subject to Site Plan Control under the provisions of Section 40 of the Planning Act S.O. 1983."

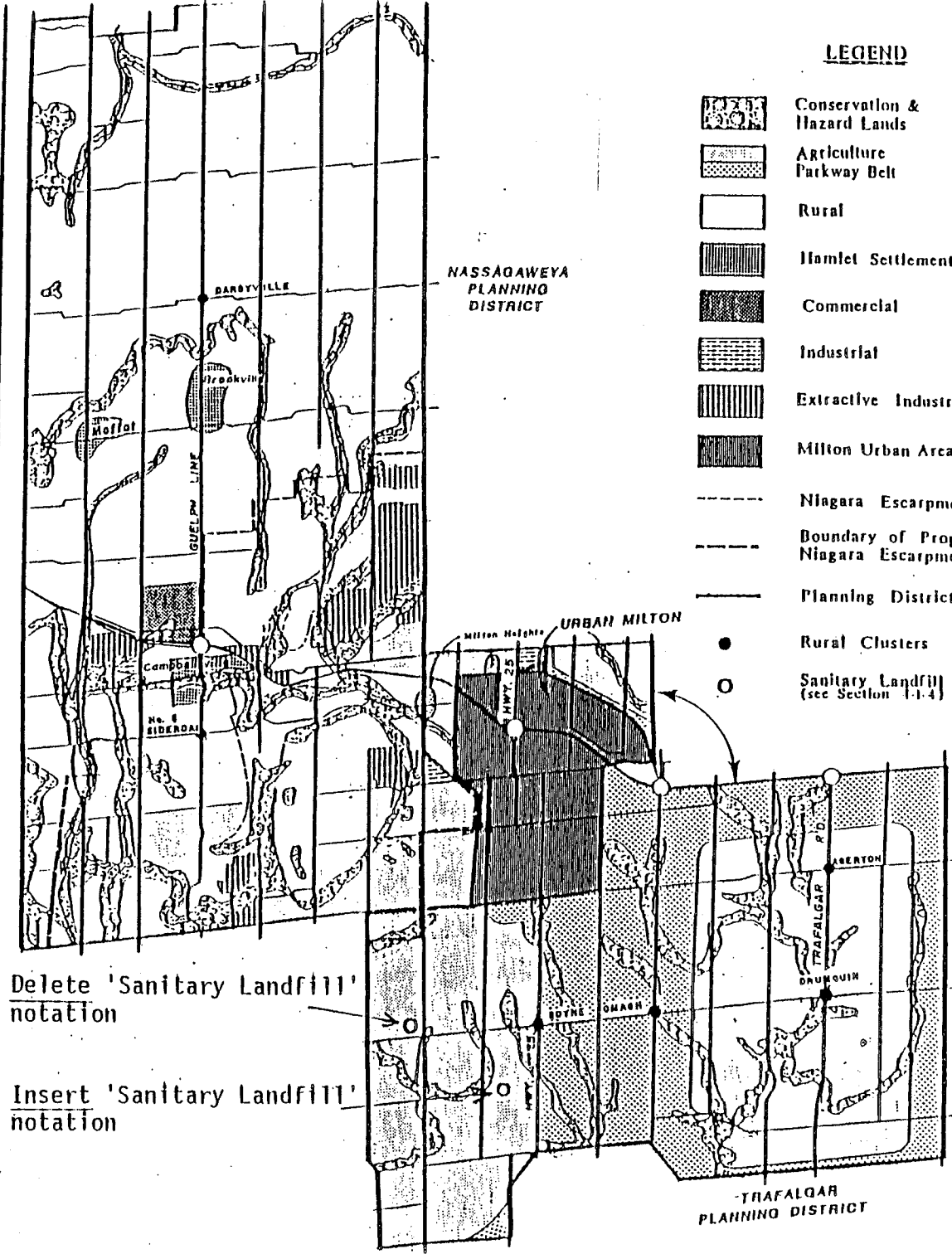
Item (4)

Figure 'D', 'Land Use', is amended by placing a symbol designating a Sanitary Landfill Site north of Lower Base Line between First Line and Highway #25, as indicated on Schedule 'A' attached.

Item (5)

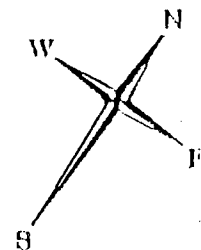
Upon approval of the designation referred to in Item (4) above, Figure 'D', 'Land Use', is amended by deleting the symbol which designates a Sanitary Landfill Site from the location near the intersection of Tremaine Road and Britannia Road, as indicated on Schedule 'A' attached.

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LEGEND

- Conservation & Hazard Lands
- Agriculture Parkway Belt
- Rural
- Hamlet Settlement
- Commercial
- Industrial
- Extractive Industrial
- Milton Urban Area
- Niagara Escarpment
- Boundary of Proposed Niagara Escarpment Plan
- Planning District Boundaries
- Rural Clusters
- Sanitary Landfill (see Section 1-1.4)



SCHEDULE A

TO PROPOSED AMENDMENT
NO. TO THE OFFICIAL
PLAN OF THE TOWN
OF MILTON PLANNING
AREA

LAND USE

OFFICIAL PLAN TOWN OF MILTON

THIS FIGURE FORMS PART OF
THE OFFICIAL PLAN AND SHOULD BE
READ TOGETHER WITH THE TEXT.

FIGURE

D

PART C - THE APPENDICES

The following appendices do not constitute part of Amendment No. ____, but are included as information supporting the Amendment.

Appendix I Conceptual Site Plan

Appendix II List of documents prepared in support of the Halton
Environmental Assessment for Landfill.

APPENDIX I:
CONCEPTUAL SITE PLAN

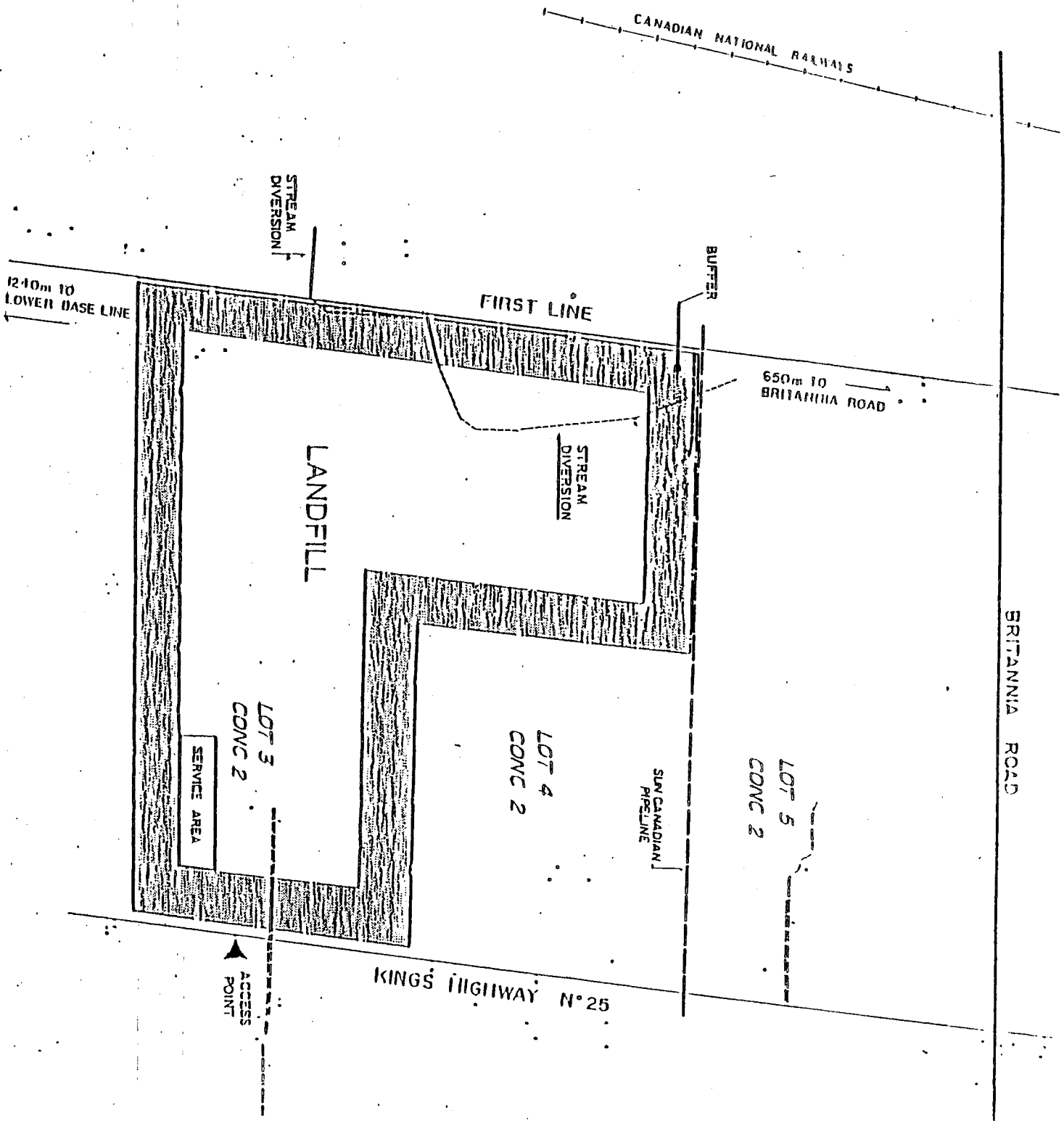


FIGURE 4

SCALE



SITE D

PHASE 2 STAGE 2 C

SELECTION OF PREFERRED SITE

ENVIRONMENTAL ASSESSMENT OF THE
LANDFILL COMPONENT OF HALTOM'S
SOLID WASTE MANAGEMENT SYSTEM

Walker Wright Young Associates Limited

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APPENDIX II
LIST OF DOCUMENTS PREPARED IN SUPPORT OF THE
HALTON ENVIRONMENTAL ASSESSMENT
FOR LANDFILL

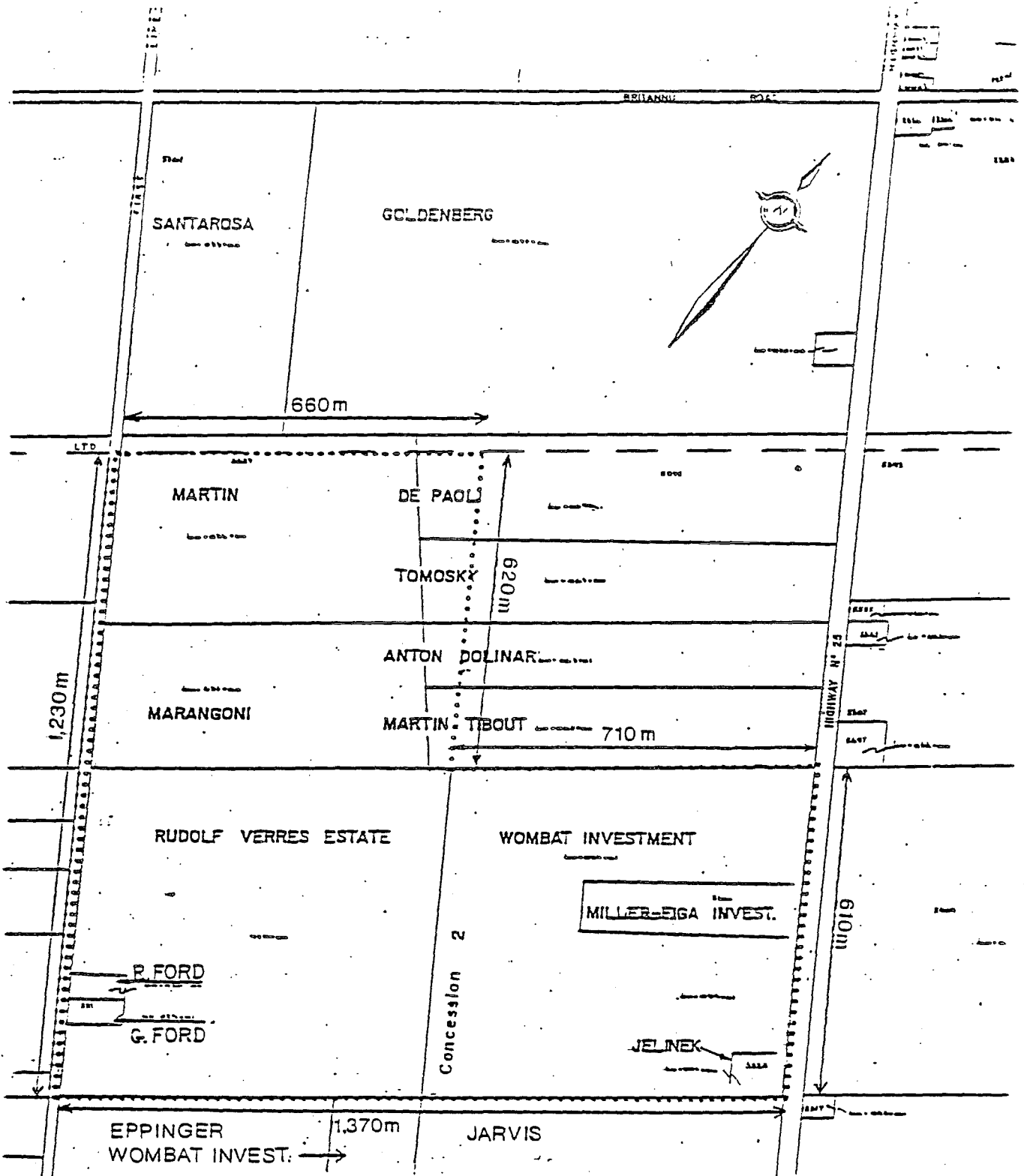
1.	Final Work Program	May 1983
2.	Addendum to Stage 1 Report: Submissions	May 1983
3.	Addendum to Stage 1 Report	May 1983
4.	Stage 1 Waste Needs and Systems Analysis: Consolidation	May 1983
5.	Summary: Environmental Assessment Process	June 1983
6.	Final Evaluation Factors, Phase 2, Stage 2A	August 1983
7.	Summary: Stage 2A General Overview Analysis	September 1983
8.	Final Report: Phase 2, Stage 2A, General Overview	October 1983
9.	Submissions: Phase 2, Stage 2A, General Overview Analysis	October 1983
10.	Work Program: Phase 2, Stage 2B, Candidate Sites	October 1983
11.	Submissions: Evaluation Factors, Stage 2B	January 1984
12.	Final Evaluation Factors, Stage 2B	January 1984
13.	Summary: Stage 2B, Selection of Candidate Sites	February 1984
14.	Summary of Environmental Assessment Process	February 1984
15.	Phase 2, Stage 2B Appendices	February 1984
16.	Stage 2B Consolidation Report	April 1984
17.	Submissions: Stage 2B Report (Work Program)	April 1984

II - 2

18.	Submissions: Stage 2C Final Site(s) Evaluation	April 1984
19.	Stage 2C Work Program	May 1984
20.	Stage 2B/2C Supplementary Work Program	August 1984
21.	Final Stage 2B Review and Supplement	November 1984
22.	Submissions Report: Stage 2B Review & Supplement	November 1984
23.	Stage 2C Submissions Report	June 1985
24.	Compilation of Submissions Book 1 of 2 (Municipalities, Provincial Ministries, Agencies)	April 1985
25.	Compilation of Submissions Book 2 of 2 (Citizen's Groups, Individuals)	April 1985
26.	Compilation of Submissions, Addendum 1 of 2 (Various Responses)	April 1985
27.	Compilation of Submissions Addendum 2 of 2	April 1985
28.	Transportation Assessment	June 1985
29.	Biophysical Assessment	June 1985
30.	Economic Assessment	June 1985
31.	Agricultural Assessment	June 1985
32.	Social Impact Assessment	June 1985
33.	Air Quality Assessment	June 1985
34.	Hydrogeologic- Hydrologic Assessment Report and Appendices Report	June 1985
35.	Archaeological Assessment	June 1985
36.	Noise Assessment	June 1985
37.	Visual Assessment	June 1985
38.	Heritage Features Assessment	June 1985
39.	Land Use and Planning Assessment	June 1985
40.	Stage 2C Final Evaluation and Summary Report	June 1985

41.	Public Participation Program	September 1985
42.	Final Energy From Waste Marketing Phase Report	February 1984
43.	Preliminary Feasibility Study, Final EFW Summary Report	August 1984
44.	Final EFW Environmental Report	August 1984
45.	Final EFW Financial Report	August 1984
46.	Final EFW Technical Report	August 1984
47.	CAO Report 203/85	June 1985

PROPOSED SANITARY LANDFILL SITE, MILTON: LANDOWNERS AND SITE DIMENSIONS



..... SUBJECT SITE

Site Area: 140 ha. approx.

All dimensions are approximate

PROPOSED REZONING AND OFFICIAL PLAN AMENDMENT FOR LANDFILL,
TOWN OF MILTON: DETAILS OF ON-SITE LANDOWNERS

R5.256
1985-12-02

Name	Location	Mailing Address	Parcel Size (hectares)	Estimated Lot Area on Site (hectares)
Doreen & Watkin Martin	5929 First Line Conc. 2 N/S, Lot 4	5629 First Line, R.R. #1 Milton, Ontario L9T 2X5	20.3	20.3
Assunta & Pasqualino Marangoni	5609 First Line Conc. 2 N/S, Lot 4	79 Troutbrooke Drive Downsview, Ontario M3M 1S6	16.9	16.9
Rudolf Verres Estate	5579 First Line Conc. 2 N/S, Lot 3	6300 First Line, R.R. #2 Milton, Ontario L9T 2X5	39.5	39.5
Dario De Paoli*	Hwy #25 Conc. 2 N/S, Lot 4	3762 Bayswater Crescent, Mississauga, Ontario L4T 2G5	13.6	2.7
Amelia & Walter Tomosky*	5576 Hwy. #25 Conc. 2 N/S, Lot 4	5576 Highway #25, R.R. #1 Milton, Ontario L9T 2X5	11.5	1.9
Anton Dolnar Trustee*	Hwy #25 Conc. 2 N/S, Lot 4	c/o Maria Senicar, 259A Delta Street Toronto, Ontario M8W 4E8	8.8	1.1
Martin Tibout Trustee*	Hwy #25 Conc. 2 N/S, Lot 4	c/o Maria Senicar, 259A Delta Street Toronto, Ontario M8W 4E8	11.4	1.1
Wombat Investments* Ltd.	Hwy #25 Conc. 2 N/S, Lot 2, 3	c/o JB Transport, 7450 Bren Rd. Suite 212, Mississauga, Ont. L4T 1H4	46.6	35.8
Miller-Figa Investments Ltd.	5406 Hwy #25 Conc. 2 N/S, Lot 3	c/o JB Transport, 7450 Bren Rd. Suite 212, Mississauga, Ont. L4T 1H4	4.1	4.1
Frank Jelinek	5328 Hwy #25 Conc. 2 N/S, Lot 3	5328 Hwy #25, R.R. #1, Milton, Ontario L9T 2X5	0.8	0.8
Roy & Margaret Ford	5367 First Line Conc. 2 N/S, Lot 3	1078 Jobs Lane, R.R. #2, Burlington, Ontario L7R 3X5	0.5	0.5
Clare Ford	5357 First Line Conc. 2 N/S, Lot 3	5357 First Line, R.R. #1, Milton, Ontario L9T 2X5	0.5	0.5
				125.2 ha

See attached sketch plan for location of land holdings.

Owners marked thus: * own adjoining lands.

SOURCE: Assessment data. Area of 'remnant parcels' revised based on measurements of rectified aerial photography (1979).

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THE CORPORATION OF THE TOWN OF MILTON

BY-LAW NO.

A By-law to amend By-law Number 61-85 with respect to certain lands in the Town of Milton

FINALLY PASSED the _____ day of _____, 198__.

WHEREAS Section 32(3)(j) of By-law 61-85 presently permits a Sanitary Landfill in the area designated 'A1-10' on Schedule 'A' to that By-law;

AND WHEREAS the area indicated in red and designated 'A1-13' on Schedule 'A' attached is currently zoned "Agricultural (A1)" and "Open Space Conservation (OSC)", and is now required as a Sanitary Landfill, this use to be eventually replaced by an appropriate after use;

AND WHEREAS the above-mentioned site is no longer required as a Sanitary Landfill, and it is considered that the future use of the site should be governed by the provisions of the "Agricultural (A1)" zoning;

AND WHEREAS the proposed change is in accordance with the Official Plan for the Town of Milton, as amended;

NOW THEREFORE the Council of the Corporation of the Town of Milton hereby enacts as follows:

- 1.1 That the text of Section 32(3)(j) of By-law 61-85 of the Town of Milton is hereby deleted in its entirety, and a new Section 32(3)(j) of By-law 61-85 is inserted to read as follows:

"(j) SANITARY LANDFILL DISTRICT
HIGHWAY #25 AND FIRST LINE,
NORTH OF LOWER BASE LINE

(i) Notwithstanding any provisions of this By-law to the contrary, in the Sanitary Landfill District lying between Highway #25 and First Line to the north of Lower Base Line, which is designated 'A1-13' on Schedule "A" attached hereto, no building or structure shall be erected, altered, extended or enlarged, nor shall any land, building or structure or part thereof be used for other than one or more of the following uses:

(a) Sanitary Landfill and accessory uses, to be controlled by the Regional Municipality of Halton;

(b) Ancillary buildings, structures, equipment and facilities which are incidental to the principal use of Sanitary Landfill;

(c) Agricultural Uses as permitted by Section 32(1) of this By-law;

(d) A public park."

2. That in the Sanitary Landfill District which is described in Section 32(2)(j), a Sanitary Landfill Use shall be permitted only until such time as eight point six four million cubic metres (eleven point three million cubic yards) have been disposed of on the said lands.

3. That the boundary and reference to that area designated "A1-10" on Schedule 'A' of By-law 61-85 be deleted so that the lands are henceforth zoned "Agriculture A1".

A1-10

AREA
DESIGNATED
'A1 - 13'

-95-

THE CORPORATION OF THE TOWN OF MILTON

BY-LAW NO.

A By-law to amend By-law Number 1965-136 (Town of Oakville) with respect to certain lands in the Town of Milton

FINALLY PASSED the _____ day of _____, 198__.

WHEREAS the area indicated in red and designated '_____' on Schedule 'A' attached is currently zoned "Agriculture", and is now required as a Sanitary Landfill, this use to be eventually replaced by an appropriate after use;

AND WHEREAS the proposed change is in accordance with the Official Plan for the Town of Milton,

NOW THEREFORE the Council of the Corporation of the Town of Milton hereby enacts as follows:

1. THAT a new Section _____ be inserted into By-law 1965-136, to read as follows:

"SANITARY LANDFILL DISTRICT
HIGHWAY #25 AND FIRST LINE,
NORTH OF LOWER BASE LINE

- (i) Notwithstanding any provisions of this By-law to the contrary, in the Sanitary Landfill District lying between Highway #25 and First Line to the north of Lower Base Line, which is designated '_____' on Schedule "A" attached hereto, no building or structure shall be erected, altered, extended or enlarged, nor shall any land, building or structure or part thereof be used for other than one or more of the following uses:

- (a) Sanitary Landfill and accessory uses, to be conducted by or on behalf of the Regional Municipality of Halton;
 - (b) Auxiliary buildings, structures, equipment and facilities which are incidental to the principal use of Sanitary Landfill;
 - (c) Agricultural Uses as permitted by Section 56(1) of this By-law;
 - (d) Public Open Space, including passive open space, a golf course and areas for the pursuit of sporting activities."
2. THAT in the Sanitary Landfill District which is described in Section _
_ a Sanitary Landfill use shall be permitted only until such time as
eight point six four million cubic metres (eleven point three million
cubic yards) have been disposed of on the said lands.

REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the
Solid Waste Management Committee

From The Director of Public Works

Date 1986 01 22

Report No. PW.65/86

Re Request for Additional Funds to Complete EPA
Leachate Treatability and Toxicology Study

RECOMMENDATION

THAT the firm of Pollutech Limited be authorized to carry out the additional work as set out in Report PW.65/86 at an upset limit of \$29,823 in order to complete the leachate treatability and toxicology studies for Halton's new landfill component, with the additional funding coming from the EPA project contingency.

REPORT

Attached to this report is a copy of the request from Pollutech Limited dated January 20, 1986 for additional funds in order to complete their leachate treatability and toxicology studies for Halton's new landfill component.

Pollutech have identified two main reasons for their need for additional funding. Firstly there is the delay in obtaining leachate samples from the former Bayview Landfill Site in Burlington. On November 27, 1985 Council approved report PW.322/85 for the installation of additional wells to collect leachate from the Bayview site. These wells are now installed.

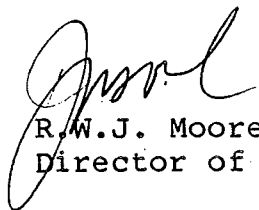
Pollutech in their work to date have identified 32 organic and 7 inorganic compounds that will require analytic and toxicology review. In preparing their original proposal Pollutech reviewed Halton's previous landfill leachate monitoring reports. These reports were based on MOE laboratory results and reporting requirements and had identified 6 organic compounds. Pollutech's original proposal was based on detailed analyses of 12 organic compounds. In addition to dealing with these 20 additional compounds, additional analytic procedures will also be required.

APPROVALS
BUS. DEV.
HEALTH
LAW
PERSONNEL
PLANNING
P.W.
SOC. SERV.
TREAS. ☒

The request for the additional \$29,823 can be accommodated within the EPA project contingency fund.

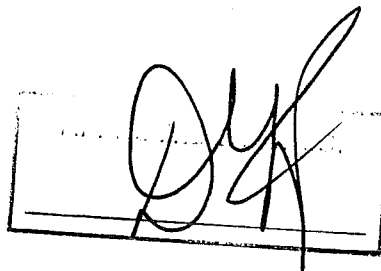
Mr. J. Norman will be in attendance at the January 27, 1986 Solid Waste Management Committee meeting in order to answer any questions Committee may have regarding this request for additional funding.

Respectfully submitted,



R.W.J. Moore, P.Eng.
Director of Public Works

JRM:sw
Attach.



January 20, 1986

The Regional Municipality of Halton
2316 South Service Road
OAKVILLE, Ontario
L6J 6E1

Attention: Mr. J. R. MacKay, P.Eng.

Dear Mr. MacKay:

RE: Leachate Treatability and Toxicology Study (File #3952)

We now have sufficient information to determine the implications to our scope of work of the modifications as directed by staff during our discussions over the past three months. The purpose of this brief is to provide you with documentation on the extent to which our workload has been increased.

Original Proposal

With respect to our original terms of reference for this project, our instructions received from staff included the following conditions:

- There was to be a rigid schedule in that all work was to be completed by the end of January 1986 and that we would be able to commence our work in August 1985.
- That there would be no delays in obtaining samples of existing leachates because access sampling holes were available on all four landfill sites.
- That all of the trace organic compounds of concern in Burlington leachates had already been identified by the MOE and were shown on Page 64 of the Gartner Lee report of April 1985. This data showed only six (6) volatile organic compounds detected, based on April and August 1984 samples.

Cont'd...

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Mr. J.R. MacKay, P.Eng.,m
The Regional Municipality of Halton
January 20, 1986
Page 2

Schedule Modifications

Our realization of major problems with scheduling occurred when we were finally given a go-ahead of this project in early October. We found that Bayview leachate samples could not be obtained because the wells on the site were not suitable for sampling. They were a different kind of well, installed for hydrologic purposes, and located adjacent to the site, not in an area where leachate samples could be obtained.

This entire problem was discussed with staff who informed us that arrangements would be made to drill appropriate sampling wells on the site. However they advised that our completion could not be extended until June in the likely event that leachate samples would not be available until January. Therefore, we were directed by staff to modify our work program in order to proceed with all the studies immediately on the impact of a simulated leachate mix on three (3) Halton Municipal treatment plants using samples of only the three (3) leachates available at that time (early October). By proceeding in this manner it was recognized at that time, that our workload would be significantly increased. This approach would involve repeating a portion of the work with respect to determining the impact of the proposed leachate mix on any of the three (3) treatment plants in Halton when the Bayview leachate became available. Council subsequently (on November 27, 1985) authorized the drilling of the necessary holes by Hydrology Consultants Limited. Our understanding is that these holes will be completed quite soon and that we can expect to have Bayview leachate within the next week or two.

Increased Analytical Requirement

The second major modification to our original scope of work occurred with respect to the amount of analytical work that would be required for trace organic measurements on the leachates. Analyses of the existing three leachates by gas chromatograph/mass spectrograph, showed that there were a large number of priority pollutants, potential carcinogens, mutagens, and other toxics present which were not identified by the Ministry of the Environment analyses (as presented in the Gartner Lee report) which was specified as the basis for our original proposal.

Cont'd...

Mr. J.R. MacKay, P.Eng.
The Regional Municipality of Halton
January 20, 1986
Page 3

The net result as now determined is that there are 39 trace organic compounds which because of their known carcinogenicity, mutagenicity or other forms of toxicity will require evaluation in order to complete this study. Of these, 32 are trace organic compounds and 7 are trace metals. The original list of the analyses on leachates in Halton by the Ministry of the Environment, which was the basis of our terms of reference for our proposal, contained only six (6) trace organic compounds. Further, the Ministry's analysis included only one analytical procedure for organic compounds. It has now been determined that three (3) procedures will be required in order to measure the compounds of concern.

With respect to the toxicity evaluations, these additional compounds will require toxicity profiles and hence, increased man hour involvement in this task.

Fish toxicity bioassay tests (LC50's) will also have to be repeated on the leachate mix containing Bayview.

Perspective on Analysis for Trace Organics in Water

The detailed explanation below is offered to provide some insight into the mechanics of organic analysis, and in particular, the requirement for additional procedures.

- Organic compounds can be detected on a gas chromatograph equipped with an appropriate detector.
- However, a gas chromatograph cannot process a sample if any water is present.
- Therefore, in order to detect trace organics in water, we must either:
 - Purge them out of the water (these are the "volatile" compounds) or
 - Extract them from the water using organic solvents.

Cont'd...

Mr. J.R. MacKay, P.Eng.,
The Regional Municipality of Halton
January 20, 1986
Page 4

- Further there are two types of solvent conditions which extract different compounds from the water. One is an acidic condition in order to remove such compounds as phenolics and the other is a basic condition which removes heavier compounds such as pesticides or PCB's.
- Thus, there are three categories of organic compounds in the water all requiring separate preconditioning and separate analytical procedures on the gas chromatograph. There is a separate output from the instrumentation for each of these three categories.

Analytical Summary

In our original terms of reference for our proposal we were given the analytical information which the Ministry of the Environment had obtained on Burlington leachate samples. These included only the purgeable category and did not indicate any requirement for either acid extracts or base extracts. The list contained only six purgeable compounds.

- Our initial evaluation showed a far greater number of purgeable compounds but also some acid extractables and several base extractables.
- Hence, the number of analytical procedures for the trace organic analysis is now triple that which we were made aware of prior to submitting our original work program in the summer of 1985.
- In total, there are now 348 organic analyses required compared to 108 included in the original proposal.

Cont'd...

Mr. J.R. MacKay, P.Eng.,
The Regional Municipality of Halton
January 20, 1986
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Cost Implications of the Additional Work

Both the additional analytical burden and the additional work required to repeat part of the study to include the Bayview leachate were discussed in detail with staff as soon as the problems came to light. The extent of additional effort required in order to accommodate these new conditions could not be accurately determined in October when this situation became evident. Accordingly, we continued under staff's directions to proceed on this basis and are now in a position to advise you of the expanded cost implications to our program.

The table which follows describes the details of the various work items. The first column shows the extent of work required for the original proposal. The second column shows the revised work requirement.

PROPOSED

ACTUAL

1. OPERATION AND CONTROL OF
TREATMENT PLANT SIMULATORS

A) UNIT START UP AND PREPARATION

Two week start up needed to acclimate and equalize the units to get them running at a steady stage prior to starting the test 15 hrs/wk (October/85) for a total of 30 hours.

Two week start up needed to acclimate and equalize the units to get them running at a steady state prior to starting the test 15 hrs/wk (October/85) plus start up needed to re-establish units after end of first run and Christmas break. This will be a three week period if we are able to begin January 27, 1986. At 15 hrs/wk this is an additional 45 hours for a total of 75 hours.

B) COLLECTION OF LEACHATE TO ADD
TO FEED FOR TEST UNITS

Collection of leachate from four test sites; Bayview, Burlington, Oakville and Georgetown. In October 1985, 23 hours are needed for this collection.

Collection of leachate from three test sites; Burlington, Oakville and Georgetown, in October 1985, plus collection of leachate from four test sites: Bayview, Burlington, Oakville, and Georgetown in January 1986 to allow the running of the Bayview tests. This would take an additional 18 hours for a total of 41 hours.

C) ROUTINE MAINTENANCE AND SAMPLING
OF UNITS

Running six units for six test weeks. This includes 4 hrs every week day for maintenance and daily tests, 3 hrs each day of the weekend for maintenance and cleaning units, 4 hrs/day for each day that samples are taken which is 3 days/week, for sample collection and preparation for analysis. Samples to be taken three days per week, requiring 38 hrs/week, this would total 228 hours.

Running six units for six test weeks. This includes 4 hrs every week day for maintenance and daily tests, 3 hrs each day of the weekend for maintenance and cleaning units, 4 hrs/day for each day that samples are taken which is 3 days/week, for sample collection and preparation for analysis. Samples to be taken three days per week, plus running 4 units for two test weeks with Bayview leachate. Including 1 hr for daily maintenance each week day, 3 hrs each day of the weekend for maintenance and cleaning of units, 7 hrs each day that samples are collected, for collection and preparation for analysis and tests, of which there will be two per week at 25 hrs/wk for 2 weeks, this is an additional 50 hrs for a total of 278 hours.

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PROPOSED

ACTUAL

D. COLLECTION OF SEWAGE TO MAINTAIN
A FRESH SUPPLY TO THE TEST UNITS

Sewage collection from the three plants to be modelled (Oakville South West, Oakville South East, and the Skyway water pollution control plants) at 8 hrs/wk for 6 weeks, this represent 48 hours.

sewage collection from the three plants to be modelled. (Oakville South West, Oakville South East, and the Skyway water pollution control plants) at 8 hrs/wk for 6 weeks, this represents 48 hours for the original program. The 2 additional weeks for repeating the study with Bayview leachate, requires an additional 16 hours.

E. ROUTINE SUPPORT ANALYSIS FOR
EACH UNIT

Routine laboratory analysis would take place 3 days/week with 12 samples being taken each sampling day (6 influent, 6 effluent) for the six week test period. This amounts to 216 samples and based on 10 hrs of laboratory time required per sampling day this equals 180 hrs.

Routine lab analysis would take place 3 days/wk with 12 samples being taken each sampling day (6 influent, 6 effluent) for a six week test period, plus 2 weeks of routine sampling two days each week. This would give 8 samples (4 influent, 4 effluent) each sampling day. This will give an additional 32 samples for a total of 248 and an increase of 28 hours of laboratory time, based on seven hours required per sampling day.

2. DETAILED ORGANIC ANALYSES

18 samples to be analyzed each week for 6 weeks being the purgeable analysis of the influent (6), effluent (6), and sludge (6) for a total of 108 samples.

12 (6 influent, 6 effluent) samples to be analysed each week as purgeables, acid and base extractables, for a total of 36/wk, bi-weekly composite analysis of sludge for each unit, for purgeables, acid and base extractables for a total of 18 bi-weekly for 6 weeks. Plus weekly analysis of 4 influent and effluent samples for purgeables acid and base extractables representing 24 analyses each week and one bi-weekly analysis of 4 composite sludge samples for the same three groups. This represents an additional 180 analyses for the original tests and a further 60 to include Bayview. This brings the total number of analyses to 348 instead of the original 108.

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Cost Summary

	<u>Item</u>	<u>Additional Time Req'd.</u>	<u>Additional Cost</u>
1.	Process simulations		
	a) start up	45 @ \$44	\$ 1,980
	b) leachate	18 @ \$44	792
	c) process operation	50 @ \$44	2,200
	d) sewage	16 @ \$44	704
	e) analytical support	28 @ \$43	<u>1,204</u>
	Sub Total		\$ 6,880
2.	Organic analysis		
	a) extractions	197 @ \$45	\$ 8,865
	b) G.C. Operator	17.2 @ \$45	774
	c) gas chromatograph	162.7 @ \$35	5,695
	d) data system	150.4 @ \$10	1,504
	e) purge and trap	10.5 @ \$10	<u>105</u>
	Sub Total		\$16,943
3.	Toxicology		
	a) benzene, ethyl	1 day @ \$500/day	\$ 500
	b) camphor	0.5 day @ \$500/day	250
	c) 2-butanone	2 days @ \$500/day	1,000
	d) dioxins and furans	3 days @ \$500/day	1,500
	e) ethane, 1,1,2-trichloro	0.5 day @ \$500/day	250
	f) indole, 3-methyl	0.5 day @ \$500/day	250
	g) methylene chloride	1 day @ \$500/day	500
	h) octanoic acid	0.25 day @ \$500/day	125
	i) sulfide, dimethyl-	0.25 day @ \$500/day	<u>125</u>
	Sub Total		\$ 4,500
4.	Fish bioassays	3 LC ₅₀ @\$500 ea.	\$ 1,500
	TOTAL		<u>\$29,823</u>

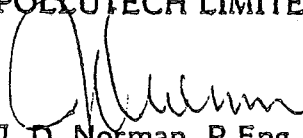
RECEIVED

Mr. J.R. MacKay, P.Eng.,
The Regional Municipality of Halton
January 20, 1986
Page 9

You will note that the additional charges which we have itemized are only for the time of the field sampling people, the laboratory persons tending the units for the additional study to include Bayview, and for the analytical work of our chemists and laboratory technicians in measurement and analyses. Please note that we have not included any additional costs for either Mr. Laughton or myself, nor for project management, administration, office involvement, or engineering support staff. There has been considerable extra work added for several of us as a result of these items which were totally beyond our control and unknown to us at the time that we made our original proposal and discussed our work program with Regional staff and the Advisory Committee.

Since we have proceeded under staff direction to undertake this modified work program without having a formal amendment to our Agreement, we would now appreciate if you would make the necessary formal authorization to our purchase order in order to provide us the funds which are required for carrying out this expanded scope of activity.

Yours very truly
POLLUTECH LIMITED



J. D. Norman, P.Eng., Ph.D.
President

JDN:sc
D.86/1

REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the
Solid Waste Management Committee

From The Director of Public Works

Date 1986 01 23

Report No. PW.63/86

Re Status of Landfill Liner Literature Search
Halton Landfill EPA Study

RECOMMENDATION

THAT Report PW.63/86 re Status of
Landfill Liner Literature Search -
Halton Landfill EPA Study, be
received for information.

REPORT

As reported in Report PW.198/85 - Detailed Studies and Reports Budget and Hydrogeology and Design Work Program for Environmental Protection Act Approval of Halton's New Landfill Component, the issue of the need for a liner is important in the consideration of Halton's new landfill site, both from a cost point of view, as it is predicted it could increase the site development cost from a minimum of \$10 million to \$25 million, as well as from an environmental point of view, i.e. can landfill leachate be adequately collected and treated at a water pollution control plant, or would a natural treatment process through soil attenuation be better, with a lower potential of toxicity impact on the natural and human environment.

As part of their EPA work program, Hydrology Consultants will be addressing the issue of whether a liner is needed or not for Halton's new landfill site and if so, then what type, to what degree, and at what cost. In that regard, Halton's Public Works' staff is currently undertaking a review of the most up to date information available with respect to liners. The following summarises some of the information found to date on the issue of liners at municipal landfill sites.

1. United States Environmental Protection Agency

Staff requested from the U.S. Environmental Protection Agency (USEPA) on 1985 09 23 their official agency position on liners for municipal landfill sites and an update on the liner issue in the United States. A

letter dated 1985 11 14 from the USEPA (copy of the letter attached as Schedule A) indicates that the USEPA is currently revising their regulations concerning municipal landfill sites and the requirement for natural or synthetic liners, and as part of their review they are surveying the individual States to determine the nature of each State's regulations. The USEPA indicated that because their regulations are being revised, and the permitting of municipal landfill sites is a State responsibility, they felt that it would not be appropriate for them to comment at this time on liner requirements, should a municipal landfill site be proposed in the United States under identical geological and hydrogeological conditions as Site D or Site F.

2. New York State Department of Environmental Conservation

Through discussions with staff of the New York State Department of Environmental Conservation (NYSDEC), in Buffalo, N.Y., Halton staff were advised that the State Government is currently revising their Part 360 guidelines to provide more stringent guidelines regarding landfill design and construction. The existing regulations require a liner at all municipal landfill sites and the liner requirements have been divided into three categories: (i) minimum design, (ii) recommended non-sensitive area design, and (iii) fail-safe design for sensitive areas.

(i) Minimum Design Requirement

The minimum requirement is a 5 ft. (1.5 m) thickness of soil at a hydraulic conductivity of 10^{-5} cm/sec. or less. This type of liner is only applicable in non-sensitive hydrogeologic settings, rural and remote locations, areas of low alternative land uses, areas of suitable soils (low permeability homogeneous silts and clays with alkaline pH, high sorption capacity and high cation exchange), and areas where there is sufficient vertical separation between the refuse and bedrock and groundwater.

(ii) Recommended Non-Sensitive Area Design Requirement

The recommended non-sensitive area design involves a minimum of 2 ft. (0.61 m) of soil at a hydraulic conductivity of 1×10^{-7} cm/sec. or less. This decrease in hydraulic conductivity would greatly reduce the rate at which any liquid would pass through the soil. The soils should be CL or CH (Unified Soil Classification System). The grain size should be at least 50% passing the #200 sieve

and at least 25% clay content. The liquid limits should be 30 or greater, and the plasticity index should be 15 or greater. The liner should be compacted in a maximum of one foot (0.30 m) lifts at optimum moisture content. Compaction should be to 95% of standard proctor density, or 90% of modified proctor density. The liner soil should be free of all organic matter, large stones (>150 mm) and construction debris. The liner should be sloped a minimum of 2-5% for drainage to the leachate collection system.

A synthetic liner may also be used in non-sensitive areas. For mixed municipal wastes a 40 mil thick HDPE or 36 mil industrial grade hypalon (chlorosulfonated polyethylene) is recommended.

(iii) Fail-Safe Design for Sensitive Area Requirement

The fail-safe landfill design for use in sensitive areas incorporates design redundancy in that two liners and two collection systems are involved. This system would consist of a minimum 2 ft. (0.61 m) thick remolded clay subliner meeting a permeability of 1×10^{-7} cm/sec. or less with the specifications and compaction as discussed in (ii) above. Above this subliner should be a one foot (0.30 m) minimum thickness interliner drainage blanket consisting of material in the SP or SW soil classification of the Unified Soil Classification system. Grain size should be a maximum 5% passing the #100 sieve by weight. The interliner blanket should provide at least four orders of magnitude difference between the permeability of the interliner drainage blanket and the permeability of the liner material. Leachate detection should be provided in this interliner drainage blanket. Above this should be placed a synthetic liner such as HDPE. Another drainage blanket, with a slope of 5% toward a second leachate collection system, should be placed on top of the synthetic liner.

The NYSDEC also requires a comprehensive quality control program for placement of all liner materials such as the testing of grain size, moisture control, liquid limit, plasticity index and permeability.

The NYSDEC acknowledges that some leachate will leak through a liner. However, this process will take time and to some degree the leachate will be treated through natural soil attenuation. In any case, the State requires that a study be carried out to evaluate the impact of this quantity of leachate on the groundwater quality.

3. Ontario Ministry of the Environment

MOE staff have indicated that they review each proposed landfill design and its potential impact on the environment on a case-by-case basis and they do not have any standard requirements for liners. Should it be determined that a proposed landfill will have an adverse impact on the environment, the Ministry may require a liner as a condition of approval. MOE staff indicate that they expect that the Ministry will continue with this approach in the future and will not be establishing pre-set standard requirements for liners.

4. Dr. K. Brown - Texas A & M University

Dr. Kirk Brown, a partner with the firm of K.W. Brown & Associates Inc. - an environmental consulting firm specializing in soil-related aspects of waste disposal, and a Professor in the Department of Soil and Crop Sciences at Texas A & M University, has authored several articles on landfill design, including the use of liners.

The following points summarize an article entitled "The Case for Aboveground Landfills" written by Dr. W. Brown and D. Anderson which appeared in the November 1985 issue of the Pollution Engineering magazine.

- (i) Liners, leachate collection systems and caps on below ground landfills may cease to function properly some time within the first few decades after closure of the landfill. A failed liner or leachate collection system may not be detected or may be impossible to repair without taking drastic measures such as excavation of the waste. These problems can be avoided by constructing landfills above ground and on a sloped, doubled lined base.
- (ii) While flexible membrane liners may have initial low permeabilities, their 10-30 year useful life-time covers only a fraction of the period during which a landfill may generate contaminated leachate. Compatibility tests should be used to select the best membrane material for containing waste leachates.
- (iii) A properly installed and tested membrane liner could probably last at least 10 years if the need to rely on its seams could be eliminated. This would be possible if flexible membrane liners were constructed on a sloped, saw-toothed based. Because leachate would be continuously removed by gravity, the liquid level should never reach the

overlapped membrane edges. By the time the membrane deteriorated, the concentration of salts, acids bases, and organics should have decreased substantially.

- (iv) Clay minerals with their proven long-term durability may be a better liner material for minimizing the long-term leakage of weak leachates. Therefore, with an overlying membrane, a clay liner is protected from the strong initial leachate that might otherwise increase liner permeability.
- (v) Since above ground facilities are further from groundwater, siting requirements may in some cases be less severe than those for below ground facilities. Also, gases generated above the normal ground surface are less likely to cause subsurface migration to adjacent areas.

5. Geotechnical Aspects of An Engineered Municipal Solid Waste Disposal Site (Master's Thesis) - P. Toth

This paper discusses various complex and interrelated hydrogeologic and chemical processes which must be considered in the selection of a municipal solid waste disposal site, and includes an excellent discussion on the role of landfill liners, and in particular, various physical and chemical mechanisms by which liners mitigate contaminant migration. The primary mechanisms are dilution, time delay, and retardation.

A low permeability liner with a native soil mixture reduces the concentration of contaminants at the monitor site principally through dilution in the groundwater flow. The liner restricts the rate of leachate flow into the groundwater system to a level which is diluted by mixing with a high groundwater flow. Rate prediction of maximum leachate flow and minimum groundwater flow would be required so that contaminant levels are not exceeded at the monitor points with this system.

The second type of liner system in the case of very slow groundwater flow with contaminant movement comprising of advection and diffusion transport mechanisms, both occurring at slow rates, employs the concept of time delay. It should be noted that concentrations that eventually arrive at the monitor points may be quite high, thus the acceptability of this type of system may be questionable. This liner system which comprises a higher permeability liner, relies principally on physical and chemical retardation mechanisms to attenuate the contaminant concentration

to acceptable levels at monitor points. The problems with this approach stem from the lack of knowledge of the attenuation mechanisms, the selective nature of attenuations with regard to contaminants, possible reversible nature of these mechanisms and the finite capacity of the soil system for attenuation.

Another approach to liner design is known as total containment and is most applicable to hazardous wastes or very sensitive environments. In this approach, multiple liners and leachate interception drainage layers are used. The first liner and interception drainage layer will reduce the hydrostatic head on the bottom layer so that seepage through it is greatly reduced. It was noted, however, that diffusion gradients may still result in significant migration through liners subject to small hydraulic gradients. Natural attenuation of the soil is assumed to control the small amount of contaminants that do get through this liner system.

6. New Product Information

In order to obtain a better understanding of the latest synthetic liners available on the market for municipal landfill sites, staff requested technical information and specifications from a number of liner companies. A review of this information indicates that there are two major types of liner materials available for this purpose, high density polyethylene (HDPE) and polyvinyl chloride (PVC) flexible membrane liners.

The advantages of HDPE liners are its excellent chemical resistance, high puncture resistance, excellent weatherability and contains no plasticizers which may migrate out of the liner material becoming a source of potential contaminant. The choice of thickness depends on the quality of the sub-grade earth rock and the protection afforded the liner during the placing of wastes, and for municipal landfill site applications, the typical thicknesses are 40 and 60 mil.

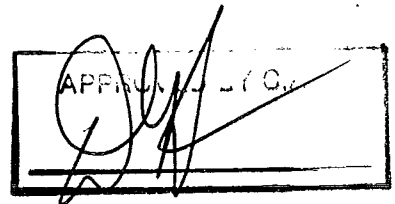
The other major type of flexible membrane liners is made from domestic virgin material of single-ply construction, having polyvinyl chloride as its principle polymer, and the typical thickness for this type of application is 30 mil. The advantages of PVC liners is its excellent durability, weatherability, and flexibility and chemical resistance. This type of liner also has the advantage of being factory fabricated into panels up to 1,860 square metres in size, which reduces the amount of field seaming required.

This report has summarized some of the information collected to date by staff such as the requirements of the United States Environmental Protection Agency, the New York State Department of Environmental Conservation, and the Ontario Ministry of the Environment. An article by Dr. K. Brown, and a technical report from P. Toth have been summarized as well as state of the art technical information relating to the use of flexible membrane liners at municipal landfill sites. This and other information is circulated to Hydrology Consultants as it becomes available as part of the ongoing literature search on the use of natural and synthetic liners at municipal landfill sites.

Respectfully submitted,



R.W.J. Moore, P.Eng.
Director of Public Works



JRM:sw
Attach.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

RECEIVED

20 NOV 1985

HALTON REGION
PUBLIC WORKS

NOV 14

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Mr. David G. Smith
Public Works Department
Regional Municipality of Halton
P.O. Box 7000
2316 South Service Road West
Oakville, Ontario L6J 6E1

Dear Mr. Smith:

This is in reply to your letter of September 23, 1985, in which you requested the U.S. Environmental Protection Agency's (EPA) position on liners for municipal landfill sites and an update on the liner issue in the United States. You also requested EPA's opinion on the advisability of requiring the installation of liners at two specific sites.

You recently received copies of several technical guidance documents on landfill design from Michael Flynn of my staff in a letter dated September 24, 1985. As Mr. Flynn indicated in that letter, we are in the process of revising our current regulations that apply to municipal landfills. For your information, I have enclosed a copy of these regulations, which are entitled, "Criteria for Classification of Solid Waste Disposal Facilities and Practices." These current standards are performance rather than design standards and do not contain any specific requirements for liners. These standards are implemented by the States, some of which have more stringent design standards including liner requirements for municipal landfills. As a part of our effort to develop background information prior to revising our standards, we are currently surveying the States to determine the nature of the individual State regulations. We expect to have a summary report available in the next three months. We will forward a copy of this report to you as soon thereafter as possible.

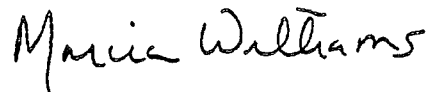
As we move ahead in the regulation revision process, we will face many decisions regarding the nature of possible liner requirements. The use of clay, asphalt, or synthetic membrane liners and how to incorporate tradeoffs for superior hydrogeologic settings or climatological conditions will be some of the most difficult decisions we will face. In our hazardous waste program, we are farther along in the evaluation of these issues. We currently require double liners for new hazardous waste

landfills. The upper liner must be a synthetic membrane liner. These liner requirements were mandated by the Hazardous and Solid Waste Amendments (HSWA) of 1984. I am enclosing copies of our three minimum technology guidance documents, which explain how owners and operators of hazardous waste land disposal facilities can comply with these new liner requirements.

Because EPA's regulations for municipal landfill sites are in the process of being revised and because the permitting of these sites is done by individual States, we do not believe it is appropriate at this time to suggest liner requirements for the municipal landfill sites you have described. However, I am enclosing an additional guidance manual that may help you in making your final site selection. This manual is the Permit Writers' Guidance Manual for the Location of Hazardous Waste Land Treatment, Storage, and Disposal Facilities--Phase I: Criteria for Location Acceptability and Existing Applicable Regulations. A second guidance manual entitled, Permit Writers' Guidance Manual for the Location of Hazardous Waste Land Treatment, Storage, and Disposal Facilities--Phase II: Criteria for Evaluating a Vulnerable Hydrogeology, will be forwarded to you when it is released later this month. While these documents pertain to hazardous waste facilities, many of the concepts and issues addressed also apply to non-hazardous waste facilities.

Thank you for your interest in solid waste management. If we can be of further assistance to you, please feel free to contact Michael Flynn, who is the staff person responsible for this area, directly at (202) 382-4489.

Sincerely,



Marcia Williams
Director
Office of Solid Waste

Enclosures

cc: Michael Flynn

REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the
Solid Waste Management Committee

From The Director of Public Works

Date 1986 01 24

Report No. PW.64/86

Re Request from Hydrology Consultants - Additional
Hydrogeologic Investigation - Proposed Sites D
and F for New Halton Landfill

RECOMMENDATION

THAT the firm of Hydrology Consultants be authorized to carry out the additional hydrogeological work as set out in report PW.64/86 at an upset limit of \$90,500, with the additional funding coming from the EPA project contingency.

REPORT

As reported in report PW.34/86 - Request from Hydrology Consultants - Additional Hydrogeological Investigation - Proposed Sites D and F for New Halton Landfill, staff advised that they had received a request from Hydrology Consultants to carry out additional drilling and other hydrogeological testing on Sites D and F. Staff noted in the report that they have discussed the additional hydrogeological work program with Morrison Beatty, hydrogeologists representing the Town of Milton, Conestoga-Rovers and Associates, hydrogeologists representing the City of Burlington, and the Ministry of the Environment. However, it was identified that before recommending any additional hydrogeological work to Council, further input from Conestoga-Rovers and the Ministry of the Environment is required, and the recommendation was made in report PW.34/86 that the request for additional work be put on hold pending receipt of a further staff report analyzing and investigating such request.

Staff has now received comments from Conestoga-Rovers which have now been reviewed by Hydrology Consultants. The Ministry of the Environment advise that their comments will not be ready, at the earliest, by the end of January. In order not to unduly delay the EPA schedule and approval process, staff wish to proceed with the additional hydrogeological work program, despite the lack of comments from

the Ministry of the Environment. However, staff will try to accommodate and incorporate into the program their comments or concerns when they become available.

Conestoga-Rovers' comments on the additional hydrogeological work recommended at Site F are detailed in their letter dated 1985 12 12 which is attached to this report and identified as Schedule A. Hydrology Consultants' review of Conestoga-Rovers' comments are noted in their letter dated 1986 01 16 which is attached to this report and identified as Schedule B.

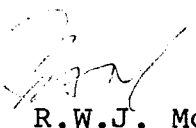
A copy of the original request by Hydrology Consultants dated 1985 12 04 is attached and identified as Schedule C. As a result of Hydrology Consultants' review of Conestoga-Rovers' comments and further discussions with staff, Hydrology Consultants have prepared a letter dated 1986 01 23 revising the additional hydrogeological work and costs. A copy of this letter is attached and identified as Schedule D.

As reported in report PW.34/86, the purpose of the additional work is to further investigate the presence of either upward or downward groundwater gradients downgradient from Site F, and at Site D, install additional boreholes to define the potential interconnection of shallow sand zones encountered in the recently completed drilling program. It is essential to note that the recommended additional work is required whether or not a liner of some description becomes part of the final requirements. The additional requested work will not be "throw away" but indeed part of the information needed to proceed to the hearing and proceed with the level of site design required at this time.

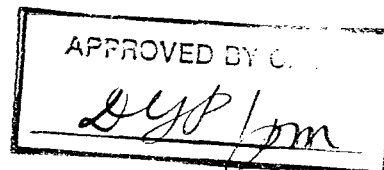
The revised cost of the additional EPA work is \$90,500. Staff recommends that this work be financed from the EPA contingency fund.

Representatives from Hydrology Consultants will be present at the Committee meeting to address any concerns of Committee regarding the additional hydrogeological work recommended at Sites D and F.

Respectfully submitted,


R.W.J. Moore, P.Eng.
Director of Public Works

JRM:sw
Attach.



CRA

Consulting Engineers

CONESTOGA-ROVERS & ASSOCIATES LIMITED
651 Colby Drive,
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510

December 12, 1985

Reference No. 1354-10

Chairman and Members
Burlington Environmental Management Committee
Corporation of the City of Burlington
P.O. Box 5013
426 Brant Street
Burlington, Ontario
L7R 3Z6

Dear Chairman and Members:

Re: Comments on Recommended Extension of Hydrogeological
Work Program
Landfill Site Selection - EPA Studies

The Region of Halton through its hydrogeological consultants Hydrology Consultants (HCL) has requested that the City of Burlington comment on a recommended extension of the Hydrogeologic Investigation of Site D and Escarpment Site F. To this end HCL invited CRA to attend a meeting on November 26, 1985 to discuss a draft version of a document recommending this extension.

This letter documents CRA's response to that portion of the above work plan prepared by Hydrology Consultants (HCL) that addresses Escarpment Site F. A draft version of this plan was discussed at the meeting between HCL, CRA and Halton Region on November 26, 1985. The minutes of this meeting, prepared by CRA are attached to this letter as Appendix A. A subsequently revised work plan was received by CRA on December 5, 1985, a copy of this revised work plan is presented in Appendix B.

It has been and continues to be CRA's opinion based on a hydrogeological perspective, that if landfilling at Escarpment Site F is to occur, it would be necessary to provide significant engineering works (e.g. liner, grout wall, etc.) to control leachate migration through the fractures found within the shale. In fact the documented evidence to date would indicate the fracturing within the shale is significant and unpredictable in every aspect. The recent hydrogeological work conducted by HCL has further demonstrated this premise by identifying within two on-site boreholes, significant fracturing within the shale at depth.

December 12, 1985

Reference No. 1354-10

- 2 -

The investigations undertaken by HCL are based upon the philosophy of conducting a comprehensive hydrogeological investigation before consideration is given to any of the potential engineering landfill design options available. The original work program proposed by HCL at Escarpment Site F was considered by CRA to be a comprehensive hydrogeologic investigation. However HCL believes that additional hydrogeologic information is required prior to evaluating the level of engineering works required at this site.

CRA takes issue with this approach. Any investigations at this point in the program should be tailored to refining the choice of design options such that a detailed landfill design and cost estimate could be prepared.

Sufficient hydrogeological data presently exist to complete a preliminary design of a liner and leachate collection system. For such a design option, no additional hydrogeological investigation is considered necessary.

The above summarizes CRA's response to the proposed expansion of the hydrogeologic investigation for Escarpment Site F. However the following addresses specific points raised within the program, as presented in Appendix B. This response is based in part upon a review of partial data provided by HCL on the recent investigations:

1. Page 3, 2.1.2 Site F - Groundwater Movement

Any conclusions at this time on the groundwater hydraulics from the recently installed wells would be premature due to the present groundwater levels not reflecting a static condition.

2. Page 4, Second paragraph

HCL has stated that if an engineered leachate interception system is required at Site F then similar systems would be required at the adjacent Bayview and Burlington landfills. HCL argues that this lends support to the use of Site F because lateral extensions of the leachate interception system would also control leachate migration from these existing landfills. CRA disagrees with this approach given that Site F is to stand on its own merits. The City of Burlington is presently designing and will install a leachate collection system for the Bayview Park landfill in 1986.

December 12, 1995

Reference No. 1354-10

- 3 -

The design will address both the shallow and deep groundwater flow as best as practical. It must be recognized that both the Bayview and Burlington landfills are in existence, and further landfilling in the area will only compound this situation.

3. Page 7, Drilling Sites 14 and 15

HCL recommended these boreholes in order to refine the understanding of the hydraulic gradients and the groundwater flow system south of Highway 403. CRA agrees that additional borehole(s) would provide a better understanding of the hydraulic gradients of this area. However given that Site F should be evaluated on its own merits, the proposed borehole at Drilling Site 15 is superfluous, and that at Drilling Site 14 should suffice.

4. Page 8, Drilling Site 16

This well is proposed in order to conduct a pumping test to estimate the potential continuity of fractures in the shale bedrock. The location of the hole is such that it will define conditions at the site boundary to aid in the design of the leachate collection system. Such a test will yield useful data only if the hydrogeologic system can be suitably stressed and the response monitored in a number of observation wells. Should this borehole penetrate unfractured rock, then it is most likely that little useful data will be generated. It must be recognized that the fracturing within the shale bedrock is not uniform and therefore several wells along the site boundary would be required to provide the necessary design data if a liner is not employed.

5. Page 8, Drilling Site 17

A pumping test of a well completed in a highly fractured rock will most likely yield much more useful data. Interpretation of this data will yield hydraulic parameters that may be representative of a larger volume of the fractured rock mass, as well as indicating the extent and permeability of the highly fractured zone. A pumping test conducted at Site 17 will probably result in more significant data upon which to base a landfill design.

December 12, 1985

Reference No. 1354-10

- 4 -

6. Page 8, Drilling Sites 5 and 8

CRA argues that tritium is a useful tool in defining the position of modern waters in a groundwater flow system. For the conditions that exist at Sites 5 and 8, that of massive unfractured shales, one would expect the tritium distribution with depth to confirm the existing interpretations based on the hydraulic gradient and hydraulic conductivity data. However as previously stated, CRA does not feel that further definition of conditions in the massive portions of the bedrock is critical. The important issue is the nature and distribution of fractures in the bedrock. In this regard it may be useful to determine the tritium content of groundwater contained in the highly fractured zones. This may indicate how readily these fracture systems are recharged by precipitation.

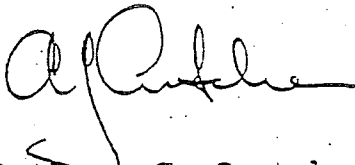
7. Page 9, Work not recommended at this time

This section of the work plan was prepared in response to comments presented by MOE in October 29, 1985 correspondence. CRA are not in receipt of this document and therefore make no comment.

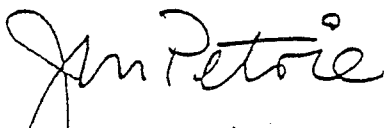
Should you have any questions concerning the above, please do not hesitate to contact us.

Yours very truly,

CONESTOGA-ROVERS & ASSOCIATES LIMITED



Anthony J. Crutcher, P. Eng.



John M. Petrie, M.Sc.

AJC:JMP:ja
Attach.



HYDROLOGY CONSULTANTS

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Project: T 6600-HY

January 16, 1986

The Regional Municipality of Halton
2316 South Service Road West
P.O. Box 7000
Oakville, Ontario
L6J 6E1

Attention: Mr. J.R. MacKay, P.Eng.
Manager of Waste Disposal

Dear Sirs:

Responses to Comments Prepared By
Conestoga Rovers & Associates Limited (CRA)
on the Recommended Extension of the
Hydrogeological Work Program

Comments prepared by Conestoga Rovers & Associates Limited (CRA) in connection with the proposed extension of the Hydrogeological Work Program for Site F are contained in a December 12, 1985 correspondence to the City of Burlington. Our responses to CRA's comments are presented herein.

It is CRA's position that significant engineering works are necessary to control leachate migration at Site F because of the fractured nature of the shale. Our approach is to achieve the criteria set by the Ministry of the Environment. The Ministry states that the hydrogeologic setting at Site F is acceptable if it can be reasonably demonstrated that leachate infiltrating into the shale will go to depth and will not come to surface between the site and Lake Ontario. To ensure this criteria for environmental security is met, an appropriate level engineering design will be carried out.

We appreciate and agree with CRA's comment that our original work program is comprehensive. Nonetheless, as a consequence of the fieldwork we identified new work activities which would improve the comprehensiveness of the original program.

CRA takes issue with our philosophy that a comprehensive hydrogeological investigation is required in order to assess leachate control options. We take issue with CRA on this matter. In our opinion, a thorough understanding of the hydrogeologic setting is required in order to assess the full range of leachate control options available. In this way, we can select the most suitable leachate control option for the hydrogeologic conditions. It has been and remains our approach not to prejudge the level and type of engineering works required. CRA on the other hand presuppose the need of installing a liner as the desired engineering works for this site and therefore believe further hydrogeologic fieldwork is unnecessary.

The following responds to specific comments prepared by CRA.

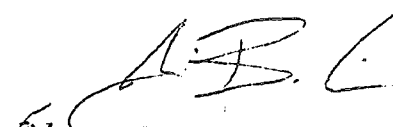
1. We concur with CRA that continued monitoring of groundwater levels is required before we can finalize our conclusions with respect to vertical groundwater movement, this has always been our intention. Nonetheless, based on current groundwater level trends, we foresee the need of additional information on the groundwater flow regime in the vicinity of Highway 403. As of this writing, vertical groundwater gradients south of Drilling Site 9, remain lateral to weakly upward.
2. CRA disagrees with our approach that if an engineered leachate interception system is required at Site F, then similar systems would be required at the adjacent Bayview and Burlington Landfills and that this would tend to support the use of Site F. It should be clarified that this approach is a recent consideration. In the Environmental Assessment selection process Site F was identified as candidate landfill site on its own merits. From the hydrogeologic perspective, we did not consider the leachate management implications of the existing waste disposal in proximity to Site F. However, in our current capacity we would be remiss in our responsibilities as hydrogeologic consultants for the Regional Municipality of Halton if we did not consider leachate management in the context of the existing landfills. This is even more valid in light of the fact that CRA's study of the Bayview Landfill is limited geographically. Therefore, they will not be in a position to consider the need of a comprehensive leachate control plan for the entire Burlington Landfill -Site F - Bayview Landfill area.

3. CRA feels that the proposed well installations at Drilling Site 15 is superfluous. For the reasons discussed in the previous response, we feel a drilling site south of the Burlington Landfill is warranted.
4. Contrary to CRA's opinion, we feel that the proposed pumping test at Drilling Site 16 will yield useful data for the design of engineering works regardless of the degree of bedrock fracturing encountered.
5. We have included the pumping test at Drilling Site 17 recommended by CRA in the proposed Extended Work Program.
6. In connection with CRA's concern about the representativeness of sites chosen for tritium analysis, it should be recognized that wells installed by Hydrology Consultants are positioned within fractured zones in the shale. We accomplished this by advancing boreholes with air-coring techniques so that the location of major fractures could be readily identified from the examination of cores. This allowed us to position the wells in the fracture zones. For the reason, tritium analysis at Drillings Sites 5 and 8 are, in our opinion, representative of site conditions.

We trust this responds to CRA's comments adequately. Should you require further clarification, please contact Mr. Jim Beechinor or the undersigned.

Yours very truly

HYDROLOGY CONSULTANTS


for R.E. Crysler, P.Eng.
Manager,
Environmental Services

/lh/36



SCHEDULE C TO REPORT PW.64/86

HYDROLOGY CONSULTANTS

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December 4, 1985

The Regional Municipality of Halton
2316 South Service Road West
P. O. Box 7000
Oakville, Ontario
L6J 6E1

Attention: Mr. J.R. Mackay, P.Eng.
Manager of Waste Disposal

Dear Sirs:

Activity 1B
Liaison with Concerned Parties and
Recommended Extension of
Hydrogeological Work Program
Landfill Site Selection - EPA Studies

1.0 INTRODUCTION

As specified by Activity 1B, "Liaison with Concerned Parties", contained in the General Work Program we:

- i) Circulated the detailed description of the field work program, "Activity 1A, "Drilling and Well Installation for the Detailed Hydrogeologic Assessment, August, 1985";
- ii) Received and considered the ideas and general views of the staff of the area municipalities and their consultants; and
- iii) Met with the Ministry of the Environment and Halton staff and their advisors to obtain their comments with respect to the Hydrogeology of the sites under consideration.

The overall aim of Activity 1B was to develop a fieldwork program, generally agreed to by the Ministry of the Environment, by the Halton staff and their advisors, by member Municipalities and by Hydrology Consultants. The program was circulated for review in August, 1985.

It was our schedule to complete this process during the first week of September, before the fieldwork program commenced. However, this process took much longer. For example, the Ministry of the Environment's review and comments of the "Detailed Hydrogeologic Fieldwork Program" is contained in a letter dated October 29, 1985, and therefore we received their input after the fieldwork was complete.

An outcome of the field program undertaken in Activity 1A and the liaison with concerned parties undertaken in Activity 1B is the identification of new fieldwork requirements. There are two reasons for the requests for additional fieldwork, namely; (1) the detailed field program undertaken in Activity 1A has identified hydrogeologic features that require further investigation in order to support the site designs; and (2) the representations made by the Town of Milton, the City of Burlington and the Ministry of the Environment for additional information in some areas (Activity 1B). After a review of these requests, we feel that the additional work discussed herein is warranted. Subject to Staff's and Council's review and approval of this Extended Work Program, the components of this program would be incorporated into the final field program document (Activity 1C).

With respect to the Environment Ministry's review and comments on the hydrogeologic program dated October 29, 1985, most of their suggestions are included in the original work program and will be clearly detailed in the final field program and the final report itself. Additional work suggested by the Ministry (October 29, 1985 letter) and not contained in the original program form part of the Extended Work Program presented herein.

On November 15, 1985, we met with the Ministry of the Environment to discuss our preliminary findings and to discuss comments contained in the Ministry's October 29 correspondence. During that meeting we developed a general consensus with respect to their comments and the course of action required at this time. This will be documented in a separate correspondence.

2.0 SALIENT RESULTS OF FIELD PROGRAM

2.1 General

There are important hydrogeologic features of Sites D and F which require further study to establish their significance and characteristics in order to support the site design. The potential existence of these features was previously taken into consideration and still reflects the site ranking developed in the EA Studies.

2.1.1 Site D - Sand Zones

The overburden at Site D consists of a clayey silt till overlying a sandy silt till. Sand and silt zones were found in boreholes advanced at Drilling Sites 2, 4 and 5. This new information, together with our previous work and work carried out by other investigators indicate the possible presence of a continuous sand layer(s) interbedded in the lower sandy silt till beneath a portion of the site. On average, the sand layer is estimated to be about 10 m below ground surface. In order to establish the sand layers, significance as a pathway for leachate egress, a thorough understanding of its characteristics is required.

2.1.2 Site F - Groundwater Movement

For the EA Study, the Ministry of the Environment indicated that Site F would be hydrogeologically acceptable if the consultant can reasonably demonstrate that the leachate infiltrating into the shale will go to depth and will not come to surface between the site and Lake Ontario.

Our preliminary data indicate the likelihood of demonstrating this condition. Measurements of groundwater levels in wells recently installed show:

- (1) A downward groundwater gradient (recharge gradient) on Site F; and
- (2) A transition to a weak upward groundwater gradient (discharge gradient) or lateral gradient in the area south of Highway 403 and generally an

upward to lateral groundwater gradient between Site F and Hamilton Harbour.

Even though groundwater gradients south of Site F appear upward leachate discharge between the site and Lake Ontario from the shale is not anticipated. This is because (a) upward gradients are weak or nearly lateral; (b) the permeability of till overlying the shale is low; and (c) the leachate collection system would be designed to intercept the groundwater flow originating from Site F with the potential for discharge between the site and Hamilton Harbour.

Should it be established by the hydrogeology that an engineered leachate interception system (e.g., liner, purge wells, toe drains, grout curtain) needs to be installed to control the underground egress of leachate southward of Highway 403 from Site F, then it only stands to reason that similar control is necessary to intercept leachate now moving southward underground from the Burlington and Bayview Sanitary Landfills. If this proves to be the situation, this would tend to support the use of Site F because lateral extensions of the leachate interception system designed for Site F would also solve the same problem south of the existing two sanitary landfills.

3.0 EXTENDED WORK PROGRAM - SITE D

The rationale for the selection of proposed new drilling sites is discussed in this section. Table 1, found at the end of the text, documents the fieldwork that would be carried out in connection with the drilling sites. The locations of the drilling sites are shown on Figure 1.

Drilling Site 13 (part of the original work program)

A pumping well would be constructed in the sand unit found 15 to 18 m below ground surface in the vicinity of Drilling Site 4. Existing wells would be utilized to observe the effect of pumpage. The pumping test would estimate the areal extent of this water-bearing zone and its potential to serve as a pathway for the egress of leachate. This installation and test was budgeted for in the original Activity 1A Program (June, 1985).

Drilling Sites 14 - 16 (work requested by the Town of Milton)

The Town of Milton and its consultant Morrison Beatty Limited have asked for a greater density of drilling than currently exists. This additional drilling is to define the potential interconnection of shallow sand zones encountered in some of the boreholes previously drilled. In our opinion, sufficient borehole data exists for our assessment, however, we concede that additional information is always useful and with the Region's concurrence we have no objection to increasing the drilling density at this time since it does not yet impact on our overall time constraints. To assess the potential connection of sand zones, we would continuously sample the overburden to the bedrock contact at these new drilling sites. Piezometers would be installed in the boreholes. Permeability testing and groundwater level monitoring would be conducted on these wells. Access to the Martin property is necessary for some of the drilling sites. In lieu of this access it would be possible to drill around the Martin property in most cases, however, the use of this property is desirable.

An outcome of this drilling program is the possible need of a second pumping well and test should a major water-bearing strata be encountered. At this time, the second pumping test is budgeted as a contingency item. Its need will be assessed during the drilling program. It should be recognized that the presence of a continuous sand layer would not render the site unsuitable for waste disposal. Nonetheless, its presence does suggest that a higher level of engineering may be required to control leachate migration in the sand zone. A continuous sand zone is a feature which requires study to establish its significance and characteristics in order to support the site design.

Drilling Site 17 (new work recommended by Hydrology Consultants)

Prior to 1952, the natural Tritium content of precipitation was estimated to be between 5 and 20 Tritium Units (TU). Beginning in 1952, the above ground testing of thermonuclear bombs resulted in an increase in the Tritium activity in the atmosphere. Post-1952 precipitation contains a greater Tritium concentration (in 100's of TU) and so this isotope can be used to delineate pre-1952 waters from post-1952 waters.

At recent environmental hearings, the measurement of the radioisotope tritium in the groundwater has been used effectively to resolve issues related to the movement of recent groundwater in the subsurface environment. For example, this analysis is helpful in establishing whether the subsurface environment acts as a porous or a fractured medium. This is ultimately useful in determining the depth of penetration of recent waters into the soil profile and therefore, assists in assessing the potential rate and mode of leachate migration. The analysis of tritium is a valid up-to-date investigative technique that should be employed in this study.

Special well construction techniques are necessary for tritium sampling to prevent the intercommunication of waters between the zones being tested. This installation would involve the construction of a series of eight wells at various depths each constructed in individual boreholes. Above the well screen, bentonite would be used to fill the entire borehole annulus.

Assessment of Other Data

In addition to the drilling, and testing program described above it will be necessary to review, which is already budgeted for in the original work program:

- the results of seismic testing conducted by Morrison Beatty Limited;
- the continuous samples collected from three boreholes installed by Morrison Beatty Limited; and
- the results of the drilling program conducted by Comcorp Ltd.
(Note: it is our understanding that this information may not be made available to us.)

3.1 Budget - Site D

The fees and disbursements for the extended program for Site D are shown below:

	<u>Fees</u>	<u>Disbursements</u>
<u>SITE D</u>		
<u>Drilling Site 13</u>		
Pumping Well and Test #1 (24 hour test)	- already budgetted -	
<u>Drilling Sites 14-16</u>		
Three continuously sampled boreholes and well installations, including permeability testing, chemical analyses and monitoring	\$ 4,500.	\$ 13,000.
Pumping Well and Test #2 (contingency)	1,500.	7,000.
<u>Drilling Site 17</u>		
Well Installations for Tritium analysis	3,000.	10,000.
TOTAL SITE D	\$ 9,000.	\$ 30,000.

4.0 EXTENDED WORK PROGRAM - SITE F

The rationale for this work is discussed in this section. Table 2, found at the end of the text, documents the fieldwork that would be carried out in connection with the drilling sites. The locations of new drilling sites are shown on Figure 2.

Drilling Sites 14 and 15 (work recommended by Hydrology Consultants)

Groundwater levels recently measured on Site F program generally show a downward groundwater gradient (recharge gradient). In the vicinity of Hwy. 403 (Drilling Site 9) preliminary data indicates a transition to an upward groundwater gradient (discharge gradient). It should be recognized that even though groundwater levels have not yet stabilized in wells installed at Drilling Site 9, further understanding of groundwater hydraulics in the vicinity of Drilling Sites 14 and 15 will ultimately be required. This transition from a recharging to a discharging environment is important for the leachate collection considerations and requires further investigations. Thus, a more thorough understanding of groundwater hydraulics of the area south of Hwy. 403 and north of the railway is warranted. For this reason further drilling and well installation at two sites shown on Figure 1 is recommended. Permeability testing, chemical analyses and groundwater level monitoring would also be carried out on these wells.

At Drilling Site 14, it will be necessary to confirm groundwater gradients observed at Drilling Site 9. Data developed at Drilling Site 14 is necessary for the design of an appropriate leachate interception system.

At Drilling Site 15, it will be necessary to confirm the continuity of similar groundwater flow regime to the west of Site F. This would establish whether the leachate interception system designed for Site F would also be effective in the collection of leachate that may be escaping southward from the Burlington Sanitary Landfill.

Drilling Site 16 (new work recommended by Hydrology Consultants)

To estimate potential horizontal continuity of fractured water bearing zones in the shale, we propose the installation of a new well in order to conduct a pumping test. The Ministry of the Environment agree that a pumping test to define the extent and characteristics of permeable zones would be helpful. This test at the location shown on Figure 2 would assist our decision making with respect to the selection of most efficient leachate collection system for Site F.

Drilling Site 17 (new work suggested by Conestoga Rovers & Associates Limited)

A major fracture and water-bearing zone was identified as a consequence of the Packer Test conducted at Drilling Site 3. To further establish its characteristics of this zone, the installation of a well to conduct a pumping test would be required.

Drilling Sites 5 and 8 (new work recommended by Morrison Beatty and Hydrology Consultants)

Tritium analyses previously carried out by the University of Waterloo yielded anomalous results. Therefore, we propose to analyze for tritium in wells already installed at these drilling sites in order to further investigate the tritium distribution with depth.

Assessment of Additional Data

In addition to the activities associated with the drilling sites, we would review and assimilate into our work, studies being currently conducted on the Bayview and Burlington Sanitary Landfills by Gartner Lee and Conestoga Rovers. This work has already been budgeted for in the original work program.

4.1 Budget - Site F

<u>SITE F</u>	<u>Fees</u>	<u>Disbursements</u>
<u>Drilling Sites 14 and 15</u>		
Two well nests, including permeability testing, chemical analysis and monitoring.	\$ 4,000.	\$ 18,000.
<u>Drilling Sites 16 and 17</u>		
Two pumping wells and tests (24 hr)	3,000.	14,000.
<u>Drilling Site 5 and 8</u>		
Tritium analysis	<u>1,000.</u>	<u>2,000.</u>
TOTAL SITE F	<u>\$ 8,000.</u>	<u>\$ 34,000.</u>

5.0 WORK NOT RECOMMENDED AT THIS TIME

A few of the suggestions or comments (3 out of 24) outlined by the Ministry of the Environment are, in our opinion unnecessary at this time, these are discussed below. Our responses refer to comments prepared by MOE in their correspondence of October 29, 1985.

Comment 4, Part A

The Ministry has suggested that maps be prepared showing elevations and locations of wells and septic tanks of residents in the vicinity of the proposed sanitary landfills. We know from the house to house survey we conducted, that wells and septic systems are near each dwelling. This, in our view, is an adequate

definition of their location. However, we will conduct an elevation survey of water supply wells immediately adjacent to Site D if information derived from the wells are critical to our understanding of the local hydrogeology.

Comments 6 and 7, Part A

The public's preference for servicing by municipal water supplies, is more properly the domain of the planning or public relations consultants. This work cannot be conveniently done now as the walk and talk survey was completed some time ago.

Comment 8 (2nd Paragraph) and Comment 9, Part B

The Ministry refers to the possible need for demonstrating the continuity of the geology and background water quality between the north and south areas of Site F. This could require the construction of at least one and perhaps several well installations up to 100 m deep. This results from the considerable elevation differences between the north and south ends of the site. As well, it would be necessary to conduct an extensive chemical testing program to ensure that background quality is well defined. Gartner Lee & Associates Limited are currently installing deep wells for the examination of background water quality and groundwater hydraulics in the area north of the existing Burlington Sanitary Landfill Site. This study will be completed in about two months and arrangements have been made to incorporate their findings into our investigation. This should address the Ministry's comment. Should additional well installations be required, they could be established after site approval. It should be recognized that there is a possibility that the natural quality of the groundwater south of Highway 403 will differ the natural groundwater quality north of the site. In summary our preliminary data does not indicate the need of drilling deeper at this time.

6.0 PROJECT SCHEDULE

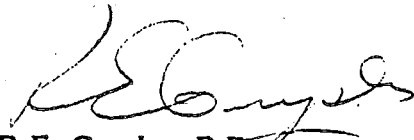
A two month extension of the project schedule is required so that data collected during the proposed extended field program can be properly assimilated into the study. This includes the time needed to install wells, conduct tests and

compile and interpret data. Even though groundwater levels in wells may not be completely stabilized within this time frame, two months should be sufficient time to establish whether groundwater level trends from new wells are comparable to trends established from earlier work. This should be adequate for our analysis.

Should you require any further clarification, please contact the undersigned or Jim Beechinor.

Yours very truly,

HYDROLOGY CONSULTANTS



R.E. Crysler, P.Eng.
Manager, Environmental Services

REC/lh/35

TABLE 1

SITE D

Borehole					Well Installation			
Drilling Site	Drilling Method	Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site	Sampling	(A) Soil-Borehole Tests	Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
1	Augering	30-160	2	Continuous	S & H (3) W (2)	i) Standpipe (32 mm)	4.5 m	a, b, c
						ii) Piezometer (32 mm)	9.0 m	a, b, c
						iii) Piezometer (32 mm)	13.7 m	a, b, c
						iv) Piezometer (32 mm)	29.5 m	a, b, c, h
2	Augering	27.3-160	1	Continuous	S & H (3) CE (1)	i) Standpipe (32 mm)	6.4 m	a, c
						ii) Piezometer (32 mm)	13.1 m	a, c
						iii) Piezometer (32 mm)	27 m	a, c
3	Augering	16.1-160	1	Continuous	S & H (3) CE (1) W (2)	i) Standpipe (32 mm)	5.0 m	a, c
						ii) Piezometer (32 mm)	12.1 m	a, c
						iii) Piezometer (32 mm)	16.1	a, c

(A) S & H - Sieve & Hydrometer
 CE - Cation Exchange
 Geotec - Atterberg Limits, Point Load & Slake Durability Tests
 P - Packer Test
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 1/continued

SITE D

Drill Site	Drilling Method	Borehole		Sampling	(A) Soil-Borehole Tests	Well Installation		
		Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site			Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
4	Augering	27.9-160	1	Continuous	S & H (3)	i) Standpipe (32 mm)	6.7 m	a, c
						ii) Piezometer (32 mm)	18.9 m	a, c
						iii) Piezometer (32 mm)	27.4 m	a, c
5	Augering	24-160	2	Continuous	S & H (3) CE (1) W (2)	i) Standpipe (32 mm)	6.0 m	a, b, c
						ii) Piezometer (32 mm)	12.5 m	a, b, c
						iii) Piezometer (32 mm)	23.5 m	a, b, c
6	Augering	17.4-160	2	Continuous	S & H (3) CE (1)	i) Standpipe (32 mm)	5.2 m	a, b, c
						ii) Piezometer (32 mm)	9.1 m	a, b, c
						iii) Piezometer (32 mm)	17.4 m	a, b, c

(A) S & H - Sieve & Hydrometer
 CE - Cation Exchange
 Geotec - Atterberg Limits, Point Load & Slake Durability Tests
 P - Packer Test (location to be determined)
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test (location to be determined)
 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 1/continued

SITE D

Drilling Site	Drilling Method	Borehole		Sampling	(A) Soil-Borehole Tests	Well Installation		
		Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site			Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
7	Augering	6-100	1	Continuous	--	Standpipe (32 mm)	Shallow Overburden	e
8	Augering	6-100	1	Continuous	--	Standpipe (32 mm)	Shallow Overburden	e
9	Augering	6-100	1	Continuous	--	Standpipe (32 mm)	Shallow Overburden	e
10	Augering	6-100	1	Continuous	--	Standpipe (32 mm)	Shallow Overburden	e
11	Augering	6-100	1	Continuous	--	Standpipe (32 mm)	Shallow Overburden	e
12	Augering	6-100	1	Continuous	--	Standpipe (32 mm)	Shallow Overburden	e
13	Rotary	16-100	3	Cuttings	--	i) Pumping Well (100 mm)	16 m	a, f
14	Augering	25-100	1	Continuous	S & H (1)	Piezometer (32 mm)	Sand Lense	a, c

(A) S & H - Sieve & Hydrometer
 CE - Cation Exchange
 Geotec - Atterberg Limits, Point Load & Slake Durability Tests
 P - Packer Test
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 1/continued

SITE D

Borehole						Well Installation		
Drilling Site	Drilling Method	Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site	Sampling	(A) Soil-Borehole Tests	Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
15	Augering	25-100	1	Continuous	S & H (1)	Piezometer (32 mm)	Sand Lense	a, c
16	Augering	25-100	1	Continuous	S & H (1)	Piezometer (32 mm)	Sand Lense	a, c
17	Augering	16-100	8	Continuous	S & H (1)	i) Piezometer (32 mm)	1.5 m	a, h
						ii) Piezometer (32 mm)	3 m	a, h
						iii) Piezometer (32 mm)	4.6 m	a, h
						iv) Piezometer (32 mm)	6.1 m	a, h
						v) Piezometer (32 mm)	7.6 m	a, h
						vi) Piezometer (32 mm)	9.1 m	a, h
						vii) Piezometer (32 mm)	13.7 m	a, h
						viii) Piezometer (32 mm)	16.8 m	a, h

(A) S & H - Sieve & Hydrometer
 CE - Cation Exchange
 Geotec - Atterberg Limits, Point Load & Slake Durability Tests
 P - Packer Test
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

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CANDIDATE SITE 'D'

ACTIVITY 1A : WORK PROGRAM

EXISTING BOREHOLES & OBSERVATION WELLS

- ① GARTNER LEE ASSOCIATES LTD
- ② MORRISON BEATTY LTD
- ③ HYDROLOGY CONSULTANTS

PROPOSED LOCATIONS OF BOREHOLES OBSERVATION WELLS AND MONITORING STATIONS

- ④ DRILLING SITE
- ⑤ MONITORING WELLS ALONG
PIPELINE CORRIDOR
- ⑥ SURFACE WATER MONITORING
STATION
- ⑦ PROPOSED NEW DRILLING SITE

LEGEND

LIMITS OF LANDFILL

SCALE: 0 50 100 250 500 (M)

FINAL SITE SELECTION FOR THE
LANDFILL COMPONENT OF HALTON'S
SOLID WASTE MANAGEMENT SYSTEM
PHASE 4

HYDROLOGY CONSULTANTS

CONSULTING ENGINEERS AND GEOLOGISTS

Job No. T6600-HY Date AS SHOWII

Drawn by A.L.B. Date A.G. 1985

Approved by J.B. Date

Revised OCT 1985 FIGURE 1

SITE F

Borehole					Well Installation			
Drilling Site	Drilling Method	Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site	Sampling	(A) Soil-Borehole Tests	Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
1	Augering & Air Coring	3-100	2	Continuous	S & H (1) CE (1)	i) Standpipe (32 mm)	5.5 m	a, b, c, g
						ii) Piezometer (32 mm)	18.9 m	a, b, c
						iii) Piezometer (32 mm)	30.5 m	a, b, c
2	Augering	10-100	1	Continuous	S & H (1) CE (1)	i) Standpipe (32 mm)	9.7 m	a, c, g
3	Air Coring	31-100	1	Continuous	W (2)	i) Standpipe (13 mm)	3.7 m	a, c
					Geotec	ii) Piezometer (13 mm)	7.6 m	a, c
					P	iii) Piezometer (13 mm)	11.6 m	a, c
					P	iv) Piezometer (13 mm)	15.2 m	a, c
						v) Piezometer (13 mm)	30.5 m	a, c

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 P - Packer Test
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

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TABLE 2/continued

SITE F

Borehole					Well Installation			
Drilling Site	Drilling Method	Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site	Sampling	(A) Soil-Borehole Tests	Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
4	Air Coring	31-160	2	Continuous		i) Standpipe (32 mm)	6.1 m	a, b, c
					P	ii) Piezometer (32 mm)	11.3 m	a, b, c
					P	iii) Piezometer (32 mm)	17.4 m	a, b, c
						iii) Piezometer (32 mm)	30.4 m	a, b, c
5	Augering & Air Coring	31-100	2	Continuous	W (2)	i) Standpipe (32 mm)	5.8 m	a, b, c, h
					Geotec	ii) Piezometer (32 mm)	9.3 m	a, b, c, h
						iii) Piezometer (32 mm)	18.6 m	a, b, c, h
						iv) Piezometer (32 mm)	30.8 m	a, b, c, h

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 CE - Cation Exchange
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 P - Packer Test
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 2/continued*

SITE F

Drilling Site	Drilling Method	Borehole		Sampling	(A) Soil-Borehole Tests	Well Installation		
		Approximate Borehole Depth (m)	Number of Boreholes at each Drilling Site			Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
6	Augering & Air Coring	31-100	1	Continuous		i) Standpipe (13 mm)	3.0 m	a, c
					P	ii) Piezometer (13 mm)	8.2 m	a, c
					P	iii) Piezometer (13 mm)	17.7 m	a, c
					P	iv) Piezometer (13 mm)	21.3 m	a, c
					P	v) Piezometer (13 mm)	30.5 m	a, c
7	Augering & Water Coring	30-100	2	Continuous	W (2)	i) Standpipe (32 mm)	7.6 m	a, c
					Geotec	ii) Piezometer (32 mm)	19.8 m (re-drilled)	a, c,
						iii) Piezometer (32 mm)	27.7 m	a, c
8	Augering & Air Coring	31-100	1	Continuous	W (2)	i) Standpipe (32 mm)	6.4 m	a, b, c
					Geotec	ii) Piezometer (32 mm)	10.7 m	a, b, c

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 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 2/continued

SITE F

Borehole						Well Installation		
Drilling Site	Drilling Method	Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site	Sampling	(A) Soil-Borehole Tests	Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
						iii) Piezometer (32 mm)	17.1 m	a, b, c
						iv) Piezometer (32 mm)	30.9 m	a, b, c
9	Augering & Air Rotary	31-160	2	Continuous		i) Standpipe (32 mm)	4.9 m	a, b, c
						ii) Piezometer (32 mm)	9.1 m	a, b, c, d
						iii) Piezometer (32 mm)	16.5 m	a, b, c
						iv) Piezometer (32 mm)	30.5 m	a, b, c
10	Augering & Water Coring	15-100	2	Continuous		i) Standpipe (32 mm)	5.5 m	a, b, c
						ii) Piezometer (32 mm)	9.9 m	a, b, c
						iii) Piezometer (32 mm)	14.6 m	a, b, c

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- (B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
 d - Priority Pollutants
 e - Groundwater Interference Measurements
 f - Pumping Test
 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 2/continued

SITE F

Drilling Site	Drilling Method	Borehole		Sampling	(A) Soil-Borehole Tests	Well Installation		
		Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site			Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
11	Augering & Water Coring	21.5-100	1	Continuous		i) Standpipe (32 mm)	6.1 m	a, b, c
						ii) Piezometer (32 mm)	21.5 m	a, b, c
12	Augering & Water Coring	30-100	2	Continuous	S & H (1)	i) Standpipe (32 mm)	4.6 m	a, b, c
						ii) Piezometer (32 mm)	7.0 m	a, b, c
						iii) Piezometer (32 mm)	24.5 m	a, b, c
13	Augering & Water Coring	30-100	1	Continuous	S & H (1)	i) Standpipe (32 mm)	5.8 m	a, b, c
						ii) Piezometer (32 mm)	9.1 m	a, b, c
						iii) Piezometer (32 mm)	29.9 m	a, b, c

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 Geotec - Atterberg Limits, Point Load & Slake Durability Tests
 P - Packer Test
 W - Weight Percent Organic Carbon

(B) a - Groundwater Level Measurements
 b - Background Chemistry
 c - Hvorslev - Rising Head Test
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 e - Groundwater Interference Measurements
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 g - Augment existing observation wells
 h - Tritium Analysis

TABLE 2/continued

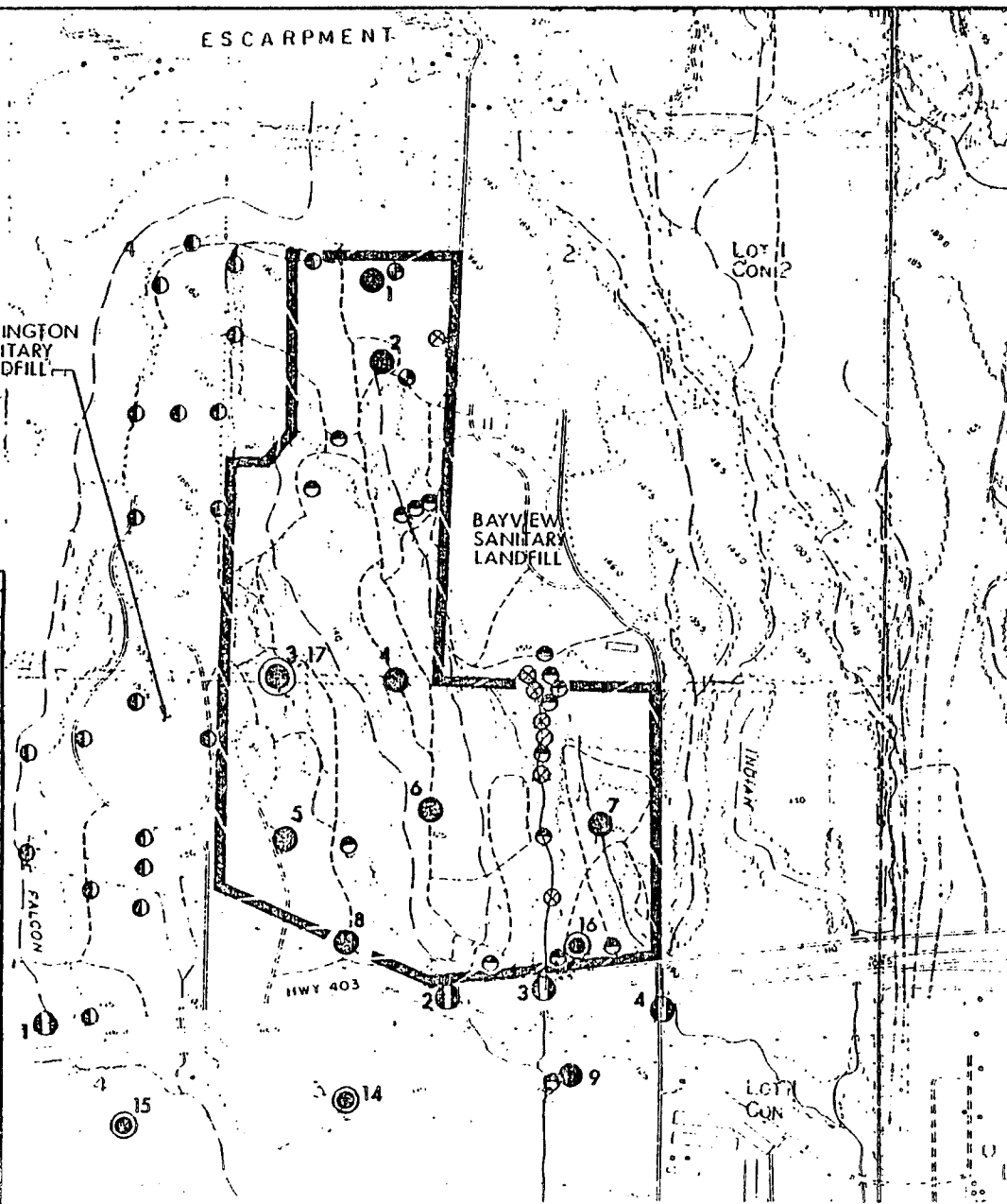
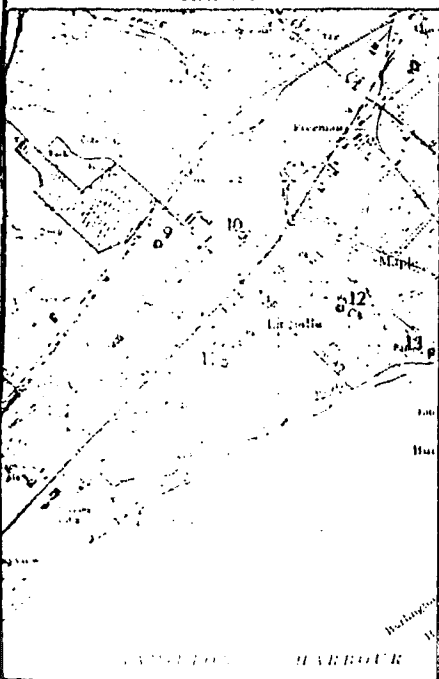
SITE F

Borehole					Well Installation			
Drilling Site	Drilling Method	Approximate Borehole Depth (m) Diameter (mm)	Number of Boreholes at each Drilling Site	Sampling	(A) Soil-Borehole Tests	Monitor Type	Approximate Location of Screen Tip (Metres Below Ground Surface)	(B) Purpose of Monitor
14	Air Coring	30-100	2	Continuous		i) Standpipe (32 mm)	6 m	a
					P	ii) Piezometer (32 mm)	10 m	a, c
					P	iii) Piezometer (32 mm)	20 m	a, c
					P	iv) Piezometer (32 mm)	30 m	a, c
15	Air Coring	30-100	2	Continuous		i) Standpipe (32 mm)	6 m	a, b, c
						ii) Piezometer (32 mm)	10 m	a, b, c
						iii) Piezometer (32 mm)	20 m	a, b, c
						iv) Piezometer (32 mm)	30 m	a, b, c
16	Rotary	30-100	1	Cuttings		(i) Pumping Well (100 mm)	30 m	a, f
17	Rotary	15-100	1	Cuttings		(i) Pumping Well (100 mm)	15 m	a, f

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(B) a - Groundwater Level Measurements
 b - Background Chemistry
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 d - Priority Pollutants
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 f - Pumping Test
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DRILLING SITES BETWEEN
SITE F AND HAMILTON
HARBOUR



CANDIDATE SITE 'F'.

ACTIVITY 1A: WORK PROGRAM

EXISTING BOREHOLES & OBSERVATION WELL NESTS

- ① GARTNER LEE ASSOCIATES LTD.
- ⊖ MORRISON BEATTY LTD.
- ⊗ UNIVERSITY OF WATERLOO
- ⊕ HYDROLOGY CONSULTANTS

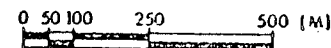
PROPOSED LOCATIONS OF BOREHOLES,
OBSERVATION WELLS AND
MONITORING STATIONS

-  DRILLING SITE
 PROPOSED NEW DRILLING SITE
 SURFACE WATER MONITORING STATION

LEGEND

LIMITS OF SITE

SCALE



FINAL SITE SELECTION FOR THE LANDFILL COMPONENT OF HALTON'S SOLID WASTE MANAGEMENT SYSTEM PHASE 4

HYDROLOGY CONSULTANTS

CONSULTING ENGINEERS AND GEOLOGISTS

Auto. Ind. T6600-HY	Ext. no. AS SHOWN
Drawn by R.B.	Date: AUGUST, 1985
Appr. by J.B.	FIGURE 2
Reviewed OCT. 1985	



HYDROLOGY CONSULTANTS

CONSULTING ENGINEERS AND GEOLOGISTS

Head Office: 1595 Clark Boulevard
Brampton, Ontario, Canada
L6T 4V1
Telephone: (416) 793-9800
1-800-387-2437
Telex: 06-97802

Project: T 6600-HY

January 23, 1986

The Regional Municipality of Halton
2316 South Service Road West
P.O. Box 7000
Oakville, Ontario
L6J 6E1

Attention: Mr. J.R. MacKay, P.Eng.
Manager of Waste Disposal

Dear Sir:

RECOMMENDED REVISIONS TO THE PROPOSED EXTENSION
OF HYDROGEOLOGICAL WORK PROGRAM

This will revise our submission, "Activity 1B Liaison With Concerned Parties and Recommended Extension of Hydrogeological Work Program", dated December 4, 1985. These revisions take into account comments provided by Conestoga Rovers & Associates Limited (CRA), and subsequent discussions with Halton's Approvals Management Committee (AMC) on December 17, 1985 and again on January 21, 1986.

SITE D

1. Reduce disbursements for drilling site 17 by \$2,000.00. This is because a portion of the well installation for the Tritium analysis is already in place as a result of the pumping test well installed at this location.

SITE F

1. Drilling Site 19

This drilling site would be located south of drilling site 11, near Lake Ontario. Groundwater level data collected from this well installation would refine our interpretation of the groundwater flow regime between Site F and Lake Ontario. A second cross section of the Regional groundwater flow system can be prepared as a result of this installation.

2. Drilling Site 18

A water-bearing zone was identified by work carried out by the University of Waterloo at well location "WAT 5". To further establish the characteristics of this zone, the installation of a well to conduct a pumping test would be required.

A summary of the revised budget for the extended work program is as follows. For both sites, the total budget is \$90,500.00.

<u>SITE D</u>	<u>Fees</u>	<u>Disbursements</u>
<u>Drilling Site 13</u>		
Pumping Well and Test #1 (24 hour test)	-already budgetted-	
<u>Drilling Sites 14-16</u>		
Three continuously sampled boreholes and well installations, including permeability testing, chemical analyses and monitoring	\$4,500.	\$13,000.
Pumping Well and Test #2 (contingency)	1,500.	7,000.
<u>Drilling Site 17</u>		
Well Installations for Tritium analysis	<u>3,000.</u>	<u>8,000.</u>
TOTAL SITE D	<u>\$9,000.</u>	<u>\$28,000.</u>
<u>SITE F</u>		
<u>Drilling Sites 14, 15, and 19</u>		
Three well nests, including permeability testing, chemical analysis and monitoring	5,000	21,500.
<u>Drilling Sites 16, 17 and 18</u>		
Three pumping wells and tests (24 hr.)	4,000.	20,000.
<u>Drilling Site 5 and 8</u>		
Tritium analysis	<u>1,000.</u>	<u>2,000.</u>
TOTAL SITE F	<u>\$10,000.</u>	<u>\$43,500.</u>

Project: T 6600-HY

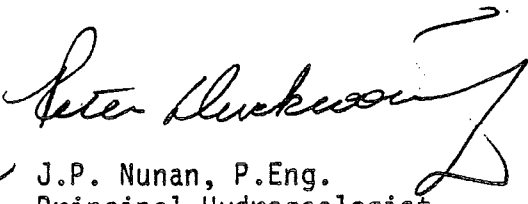
3

Finally, in our discussions with Gartner Lee Associates, it was identified that in addition to our study needs the proposed well installations at Drilling Site 15, south of the Burlington Landfill could also provide useful data in conjunction with their plume delineation study of the Burlington Landfill. However, this would require the installation of stainless steel wells at this location which is considerably more expensive than the well construction materials we are using. In the event that this well installation could serve the purposes of the two studies involved, we recommend a contingency fund of \$2,000.00 be established for the installation of stainless steel wells at this location.

Should you require any further information, please contact the undersigned or Jim Beechinor.

Yours very truly,

HYDROLOGY CONSULTANTS

for 
J.P. Nunan, P.Eng.
Principal Hydrogeologist

JPN/ac

THE REGIONAL MUNICIPALITY OF HALTON

Report to The Chairman and Members of the Solid Waste
Management Committee

From J. L. Rinaldo, Director of Finance

Date 1986 01 24

Report No FIN 41/86

Re Variance Report on Environmental Protection Act -
Approvals Approach

RECOMMENDATION:

1. THAT FIN 41/86, Variance Report on the Environmental Protection Act Approvals Approach, be received for information.

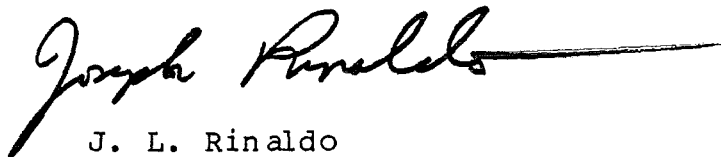
REPORT:

Further to CAO Report 203/85 "Halton's New Landfill Component - Approvals Approach" I have attached to FIN 41/86 Schedule A outlining original and revised budgets, (see PW 267/85, PW 316/85, PW 322/85, FIN 218/85) expenses incurred to date, outstanding commitments and uncommitted balances. The schedule includes all invoices paid as of December 31, 1985 as well as all invoices known but unpaid.

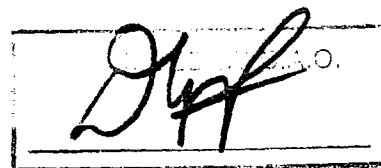
As the process is still in its early stages, there are no variances appearing on the Schedule. A review of the invoices from the consultants indicate that their work plans are proceeding according to the revised budgets.

A similar report will be forwarded to Council each quarter for Council's information.

Respectfully submitted,



J. L. Rinaldo
Director of Finance and
Regional Treasurer



TB/pd

**VARIANCE REPORT
EPA - APPROVALS PROCESS
as of December 30, 1985**

**SCHEDULE 'A'
FIN 41/86**

<u>CONSULTANT</u>	<u>ASSESSMENT</u>	<u>ORIGINAL BUDGET</u>	<u>AMENDMENTS</u>	<u>REVISED BUDGETS</u>	<u>ACTUAL EXPENSES</u>	<u>OUTSTANDING COMMITMENTS</u>	<u>UNCOMMITTED BALANCE</u>
Trow/Hydrology	Hydrogeology	\$ 551,890	18,120 (1)	660,510	219,488	350,522	90,500
Pollutech	Leachate/Toxicology	98,225	25,000 (2)	153,048	68,103	55,122	29,823
Senes	Air Quality	85,490	-	85,490	15,159	70,331	-
Landplan	After Use/Visual/Heritage	87,473	-	87,473	50,464	37,009	-
Ecological	Agricultural	45,081	-	45,081	34,589	10,492	-
Bird and Hale	Bio Physical	34,042	(1,032)	33,010	7,783	25,227	-
Giffels	Transportation	37,750	(4,750)	33,000	17,675	15,325	-
Barman, Coulter	Noise	13,005	-	13,005	1,983	11,022	-
Review Leachate		15,000	-	15,000	-	-	15,000
MCMaster	Human Toxicology	30,000	(30,000)	-	-	-	-
R.F. Theakson	Wind Studies	40,000	(28,005)	11,995	300	11,695	-
Trow/Hydrology	Approvals	9,100	-	9,100	-	9,100	-
Walker, Wright	Comparatives	51,000	-	51,000	-	-	51,000
Walker, Wright	Planning	79,310	-	79,310	1,356	77,954	-
Osler, Hoskin	Legal Counsel	64,000	-	64,000	15,583	48,417	-
C.N. Watson	Financial	24,143	-	24,143	4,938	19,205	-
Property Appraisal	Appraisal	19,000	-	19,000	-	-	19,000
Golder Assoc.	Review Hydrology	1,500	-	1,500	1,500	-	-
Public Meetings		60,000	-	60,000	-	-	60,000
Internal	Public Works	175,800	(6,500)**	169,300	42,755	-	126,545
Internal	Planning	59,000	-	59,000	15,580	-	43,420
Contingency		158,000	(20,667)	178,667	-	-	178,667
TOTALS		\$1,738,809	(6,500)	1,852,632	497,256	741,421	613,955

* A commitment of \$20,000 to Pollutech recoverable from the City of Burlington is not included.

** \$6,500 in word processing is allocated to AES project.

(1) Contained in this agenda is report PW 64/86 which seeks approval of \$90,500 to be financed from EPA Contingency.

(2) Contained in this agenda is report PW 65/86 which seeks approval of \$29,823 to be financed from EPA Contingency.

NOTE: The balance of the Contingency with the inclusion of these reports is \$58,344.

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