

IN THE MATTER OF Sections 2, 3 and 6(3) of the
CONSOLIDATED HEARINGS ACT, 1981, S.O. 1981, C. 20;

- and -

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

**WITNESS STATEMENTS OF THE APPLICANT
THE REGIONAL MUNICIPALITY OF HALTON**

VOLUME I

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EVIDENCE OUTLINE

VOLUME I

- JFC ✓ Panel 1: Waste Quantities/Need JFC
- TV/JFC ✓ Panel 2: Biophysical/Agriculture TV JFC
- Panel 3: After-Use/Visual TV
- Panel 4: ✓ Heritage/Archaeology TV TV - call them separately. - Heritage first.
- Panel 5: Air Quality JFC
- Panel 6: Traffic JFC
- Panel 7: Noise TV
- Panel 8: Social TV TV / Mon.
- Panel 9: after use JFC
- end June

- C.N. Watson ✓ 1
- Linda Hellas ✓ 2
- Dr. Erven MacKintosh ✓ 3
- Denis Stevens ✓ 4
- Robert Wright ✓ 5
- Owen Scott ✓ 6
- Dr. Robert Pierce ✓ 7
- Dr. Eugene Koczur ✓ 8
- Paul McLeod 7
- John Coulter 16
- Dr. Myra Schiff 4

VOLUME II

- Panel 9: Hydrogeology ✓ TV
- Panel 10: Hydrology JFC
- Panel 11: Design & Operations TV
- Panel 12: Leachate Treatment/Toxicology JFC
- Panel 13: Economic Analysis JFC
- Panel 14: EFW/Resource Re-cycling TV
- Panel 15: Land Use Planning/Process TV

- Beckman
- A. Sobanski 12
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 - C.N. Watson 17
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 - Joseph Rinaldo 20
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19 witnesses.

4/15 done

WITNESS STATEMENT - WASTE QUANTITIES FORECASTS
OF
CAMERON N. WATSON, CMC, ONTARIO LAND ECONOMIST
OF
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in the matter of the Consolidated Hearing for Environmental Assessment
of the proposed Halton Region Landfill

ROLE AND RESPONSIBILITIES

I am an economist and a management consultant, specializing in economic analysis and forecasting for municipalities. Since 1982, I have been President of the economic consulting firm, C.N. Watson and Associates Ltd.

does this include long range forecasting?

My responsibilities in this project included the following items, for which separate witness statements have been prepared:

1. the long range forecasting of waste quantities; - waste quantities
2. the financial and economic impact analysis of alternative potential landfill site locations and a number of related policy areas, including off-site property owner compensation, multi-site operations, and potential shale extraction for Site F.

I began work on this project in September, 1982. From that date until June, 1985, my firm was a sub-contractor to Walker, Wright, Young Associates Ltd. From August 1985 to the present, I have been working under contract to the Region of Halton. The reports (or sections of reports) prepared by myself, together with my staff under my direct supervision, are listed in Table 1.

Table 1
Region of Halton Landfill
Environmental Assessment Work and Landfill Technical Studies
Prepared by C.N. Watson and Associates Ltd.

DATE OF PUBLICATION	SCHEDULE NO.	TITLE	C.N.W. SECTIONS	PAGE NO.
<u>May, 1983</u>	<u>4</u> <i>Waste</i>	<u>Phase 2, Stage 1 - Waste Needs and Systems Analysis - Consolidation</u>	<u>-Waste Quantities Forecast</u> <u>-Costing of Waste Disposal Options and Systems</u>	<u>3-20 & 25-47</u> <u>119-157</u>
<u>October, 1983</u>	8	<u>Final Report: Phase 2, Stage 2A, General Overview Analysis</u>	<u>-Economic Analysis</u> <u>-Waste Projections by Zone</u>	<u>94-105</u>
<u>April, 1984</u>	16	<u>Consolidation Report, Phase 2, Stage 2B, Selection of Candidate Sites</u>	<u>-Economic Analysis</u> <u>-Single vs. Multi-Site Analysis</u>	<u>108-117</u> <u>143-149</u>
<u>February, 1984</u>	15	<u>Appendices, Phase 2, Stage 2B Selection of Candidate Sites</u>	<u>-Appendices J & K - Haul Cost Analysis by Sub-Area for Multi and Single Site Options</u>	not paginated
<u>November, 1984</u>	<u>21</u> <i>Waste</i>	<u>Review and Supplement to Stage 2B, Selection of Candidate Sites, Final Report</u>	<u>-review of waste quantities forecast</u> <u>-review of single vs. multi-site analysis</u> <u>-economic analysis</u> <u>-Waste Quantities Forecast, October, 1983 Update</u>	<u>1-19</u> <u>20-24, 34-36 & 38-40</u> <u>45-49</u> <u>Appendix C, pages 1-23</u>
<u>June, 1985</u>	30	<u>Final Technical Report No.3, Economic Analysis, Phase 2, Stage 2C, Selection of Preferred Site</u>	<u>-complete report</u>	<u>1 to 11</u> <u>1-1 to 14-4</u> <u>A-1 to F-3</u>
<u>June, 1985</u>	40	<u>Final Report, Phase 2, Stage 2C, Selection of Preferred Site, Evaluation and Summary Report</u>	<u>-economic analysis</u> <u>-Input into evaluation process methodology</u>	<u>Chart 5</u> <u>14-15</u>
<u>February, 1986</u>	<u>L</u> <i>Waste</i>	<u>E.P.A. Review of Waste Quantity Projections</u>	<u>-entire report</u>	<u>7-106</u>
<u>November, 1986</u>	K	<u>Region of Halton, Landfill Technical Study, Economic Impact and Affordability Analysis</u>	<u>-entire report</u>	<u>1 to 11</u> <u>1-1 to 3-26</u> <u>B-1 to C-1</u>

APPROACH TO LONG RANGE FORECASTING

My approach to the preparation of long range forecasts is based on the following premises:

- Use of data ranges in order to recognize the volatility of events which potentially influence growth, development, solid waste creation and disposal and the variability which is possible over time;
- The development of scenarios for the future based on the use of a limited number of assumptions, incorporated into a forecasting model, in order that the interrelationship of factors can be logically considered;
- Consideration of the "sensitivity" of the output or results to possible changes in the variables used, in order that research may be focused on the most important and the full range of possibilities considered;
- Full review of historical data, in order that the forecasting model used can be "proved out", at least in terms of actual experience;
- Consideration of those fundamental changes which may be occurring, or about to occur, which would produce a different future than the past and argue against a simple extrapolation of past trends;
- Careful reconsideration of the model and assumptions where the unfolding future differs from the forecast.

SUMMARY OF INVOLVEMENT

Phase 2, Stage 1

The initial forecast of Halton's waste quantities was published in May, 1983 and is found on pages 3 to 47 in "Stage 1: Waste Needs and Systems Analysis - Consolidation" (Schedule 4). It was based on an analysis of waste trends; interviews with, and statistics on, major Regional waste haulers, including the Public Works Department of the four area municipalities, residential and non-residential waste quantities, and source separation.

Our approach employed a waste per capita factor (incorporating all landfilled Regional waste), multiplied by population expressed as a high to low range forecast. The waste per capita ratio was forecast based on an analysis of trends over the past seven years, linear regression analysis and consideration of nine socio-economic factors which are significant to waste generation and disposal. The results are shown in Table 19, page 46.

Our forecast formed the basis for the evaluation of alternative solid waste disposal systems by Walker, Wright, Young Associates Ltd. and the other team members in Stage 1, in which four alternative systems were defined and the share of the waste moving directly to the "primary option", source separation, direct to landfill, plant residue and contingency were established. The result was the determination of the total landfill requirement for each option.

The Stage 1 Waste Forecast was also used by Walker, Wright, Young Associates Ltd. and the other team consultants in the Stage 2A "General Overview Analysis", in which the entire Region was screened based on evaluation factors, to allow the identification of candidate areas.

4.

Waste Quantities October, 1983 Update

We prepared a forecast update in October, 1983 in light of a number of changes in the Halton solid waste system, the major one being the current decline in waste volume. This forecast update was published in November, 1984 in "Review and Supplement to Stage 2B - Selection of Candidate Sites - Final Report" (Appendix C).

current decline in waste volumes! do we agree

The reasons for the decline in waste volume were identified as principally relating to economic conditions, as well as increased haul cost and tipping fee, weather conditions and recycling. An analysis of the long term implications on Halton's waste volumes indicated that the lower waste volumes appeared to be a temporary situation brought about by these particular conditions.

decline in waste volume

A short term waste forecast was prepared for the interim period 1984 to 1988 to provide a basis for interim waste management policy before the establishment of the new landfill site, the sizing of which was based on the long term (20 year) forecast set out in the Stage 1 Report. The interim waste forecast results are shown in Table 8, page 23 of Appendix C.

Phase 2, Review and Supplement to Stage 2B

This waste forecast review was published in November, 1984, as part of "Review and Supplement to Stage 2B - Selection of Candidate Sites - Final Report" on pages 1 to 19. The primary reasons for revising the forecast were: ① to consolidate the interim and long term waste forecasts; ② to revise the 20 year forecast period from the 1982 to 2001 used in Stage 1 to June, 1988 to 2008 to allow for implementation; and ③ to determine the landfill requirement based on the Regional Council decision that the Environmental Assessment should seek a landfill site which would accommodate 100% of the waste for eight years (June 1988-1996) and 50% of the waste for 12 years (June 1996-2008), during which an EFW was assumed to handle the remainder of the waste. (This change in the waste volume to be handled by the EFW and the timing of the facility was a result of the findings of the "EFW Preliminary Feasibility Study"). *

*100% 1988-96
50% 1996-2008*

Our approach to this forecast varied from that included in the Stage 1 Report in one aspect. A single "most probable" forecast was developed, rather than a low to high range. With a lower waste quantity, the landfill site would be more than adequate and therefore, there was no need to consider that possibility. To accommodate the possibility of a higher waste volume than was forecast, a contingency allowance was incorporated into the landfill volume calculations.

how much contingency

why a single "most probable" forecast

The assumption for waste to be handled by the Region's source separation program was increased from the 5% of total waste assumed in the Stage 1 forecast to an ultimate goal of 8%, based on the success of the program to date.

how successful

The share of the total waste stream to be handled by EFW was effectively 32% in this forecast, assuming the plant opened in 1996. The assumption of 75% of waste quantities to be handled by the plant in the Stage 1 report (Chart 18) was "generic", not specifically tailored to the Halton situation and not related to implementation considerations.

?

The key tables outlining the twenty year "most probable" waste forecast, the quantity of waste to be handled by the EFW and the new landfill, and the landfill volume requirements are Tables 7, 8, 9 and 10 of Schedule 21.

We forecast the total landfill waste tonnage to be 4.9 million imperial tons. The landfill volume requirements, based on an in-place density of 1000 pounds per cubic yard (provided by Hydrology Consultants), for the long term was 11.3 million cubic yards (including contingencies).

This revised waste quantities forecast, prepared as part of the Stage 2B Review and Supplement document, was used by the consulting team members as the basis for their work in evaluating the six candidate sites for landfilling in Stage 2C in order to select the preferred site.

Landfill Technical Review of Waste Quantities

This review of the waste projection was prepared at the direction of Council and presented in the Report "E.P.A. Review of Waste Quantity Projections", dated February, 1986, pages 7 to 106. The following issues were addressed: ① timing for the landfill and EFW opening, ② recent waste disposal experience and source separation volumes, ③ the possibility of a revised Regional population forecast, and ④ the production of annual landfill volumes to be used in the landfill design process.

Our approach and methodology in this waste forecast review were similar to those employed in the Stage 2B Review, although a marginally higher waste per capita ratio (0.8 imperial tons) was used than the figure of 0.777 in the Stage 2B Review and the October, 1983 Update. This change was based on a review of Regional waste per capita figures, 1976 to 1985.

Our assumption for source separation in this review was increased from an ultimate share of 8% of the total waste figure used in the Stage 2B Review to 15% by 2008. The lower figure was judged to be overly conservative in light of the success to date of the Region's source separation program, recent Provincial initiatives, and proposed Provincial programs.

The key tables outlining the twenty year "most probable" waste forecast, the quantity of waste to be handled by the EFW and the new landfill, total landfilled waste including contingencies, and annual landfilled waste, are Tables 6, 7, 8, 9 and 10 of Schedule L.

We forecast the total landfilled waste tonnage to be 4.2 million imperial tons. A calculation of landfill volume (and any required contingency) was not undertaken in this report.

4.9? or 4.2?

1000 lb/cu yd.

findings on these?

used .8 not .77 waste per capita

SS from 8% to 15%

how successful is Halton's SS

now 4.2 million imperial tons is the forecast total

All of the key figures in the Landfill Technical Study waste projection were lower than those in the Stage 2B Review forecast for the following reasons:

- ① - The quantity of waste to be handled by source separation increased significantly. *① SS increased significantly*
- ② - The projected opening date of the landfill site changed from January 1, 1987 to September 1, 1988, reducing the length of operation by 18 months. *② date changed*
- ③ - The Planning Department completed a revised long term population forecast, with the high forecast refined downward by 11.5%. *③ pop declined * see clipping from D.P.*
- ④ - The high waste per capita figure was reduced from 0.855 tons per capita in the Stage 2B Review to 0.834 tons per capita. *④ .85 to .83 tons per capita*
- ⑤ - The plant residue assumption was reduced slightly from 26.9% of total waste to the plant to 25.48%. *but they say .80?*

This waste forecast was used by the consulting team members in undertaking their Landfill Technical Study work programs.

A comparison of the key findings in the Stage 1 waste forecast, the Stage 2B Review waste forecast and the revised forecast for the Landfill Technical Studies is set out below:

	Stage 1 Projection** (000 tons)	Stage 2B Review Projection (000 tons)	E.P.A. Revised Projection (000 tons)
Most Probable Long Term Waste Forecast*	5,400	4,965	4,683
Waste to EFW	4,300	1,576	1,477
Waste to Landfill (including plant residue)	1,600	4,112	3,582
Total Landfilled Waste 1988-2008 (including all contingencies except volume)	3,600	4,922	4,208

* excluding source separation waste volume.

** The Stage 1 forecast is based on a twenty year period from 1982 to 2001. In this instance, the most probable long term waste forecast is actually the high forecast since some items which were subsequently included in the contingency category formed part of the high waste per capita ratio in this stage.


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WITNESS STATEMENT

OF

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In the matter of the Consolidated Hearing for the Environmental Assessment of the Proposed Halton Region Landfill Component of the Solid Waste Management Study.

Role and Responsibilities:

I am a biophysical resource management specialist, with a background in biology (ecology) and environmental engineering. I am a partner and principal of Bird and Hale Limited.

Bird and Hale Limited has been involved in this Environmental Assessment project, from the submission of the initial proposal in July, 1982 to date. I have been responsible for Bird and Hale Limited's components of the study. We have been responsible directly for the biophysical components of the study, in the various phases, and have provided input into study design and evaluation methods.

Specific reports for which we have provided input or prepared completely are presented below. For those reports for which we were not entirely responsible, the applicable pages are given.

- ✓ 1. "Phase 2, Stage 2 Final Work Program", May 1983. (Environmental Factors, p. 3; Procedures, pp. 6-7; Site Evaluation Factors, p. 12; Methodology, p. 13)
- ✓ 2. "Final Evaluation Factors, Phase 2, Stage 2A", August 1983. (Biophysical Factors, pp. 16-18, 47-48)
- ✓ 3. "Final Report: Phase 2, Stage 2A, General Overview Analysis", October, 1983. (Biophysical Analysis, pp. 18-20, 59-64) Key
- ✓ 4. "Work Program: Phase 2, Stage 2B, Candidate Sites", October, 1983. (Biophysical Analysis, p. 9)

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- ✓ 5. "Final Evaluation Factors, Stage 2B", January, 1984. (Natural Environment, pp. 8-12)
- ✓ 6. "Stage 2B Consolidation Report", April, 1984. (Biophysical Analysis, pp. 39-65)
- ✓ 7. "Stage 2C Work Program", May, 1984. (Section 6, Biophysical Analysis, pp. 12-14)
- ✓ 8. "Biophysical Assessment", Final Technical Report No. 2, Phase 2, Stage 2C, Selection of Preferred Site, June, 1985. (entire report)
- ✓ 9. "Evaluation and Summary Report", Final Technical Report No. 5, Phase 2, Stage 2C, Selection of Preferred Site, June, 1985. (Chart 2, and Biophysical component, Chart 7)
- ✓ 10. "Biophysical Analysis Report, Site D", Halton Region Landfill Technical Study, Schedule D - D, August, 1986. (entire report)
- ✓ 11. "Biophysical Analysis Report, Site F", Halton Region Landfill Technical Study, Schedule D - F, August, 1986. (entire report)
- ✓ 12. "Comparative Analysis of Alternative Sites for Sanitary Landfilling in the Regional Municipality of Halton, Site 'D' and Site 'F'", January, 1987. (Appendix C, Biophysical Comparative Analysis)

Assessment of Biophysical Resources:

For all phases and levels of investigation, the biophysical resources have been considered from an ecological perspective, rather than from an engineering capability perspective.

NOT SO.

Biophysical factors were inventoried, evaluated, and assessed at increasingly more detailed levels as the phases proceeded. The factors included the physical terrain conditions that defined the conditions under which the biological communities developed, and factors which defined the biological communities. Factors which were investigated are landform type, soil conditions, topography, drainage, plant and animal communities and species, and combinations of these factors which produce significant and important biophysical resources. ① ②

The abundance, sensitivity, and significance of these biophysical resources were considered in light of the effects that landfilling would have on them. }

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1. Phase 2, Stage 2A, General Overview Analysis - Method and Results

The aim of the "General Overview Analysis" was to identify areas within the Regional Municipality of Halton that were not known to have conditions adverse to the siting of a landfill, using existing sources of information. //

The biophysical component was accomplished through discussions with regional and provincial government agencies, and analysis of existing documents, maps, and airphotos, and is documented on pages 59-64. [At this overview stage, reliance was placed on the "Environmentally Sensitive Area Study" (Regional Municipality of Halton, 1978) for definitions and guidelines related to environmentally sensitive areas (ESA).]

Areas that were defined and rated in this study included 38 Halton Region ESA's; wetlands, as mapped by the Halton Region Conservation Authority; 8 Credit Valley Conservation Authority ESA's or potential ESA's that are distinct from the Region's list; 4 areas defined as significant by the Cambridge District Ministry of Natural Resources that are distinct from the other lists; and, 13 areas that are classified as Conservation Authority Lands. → what about p & R

/ Delineation of these areas was used to help define the 55 sub-areas that were evaluated in the Phase 2, Stage 2B portion of the study. }

Additional involvement at this stage of the study included participation in public meetings and help in preparing responses to submissions from government agencies and individuals.

2. Phase 2, Stage 2B, Selection of Candidate Sites - Method and Results

As a consequence of the Stage 2A study, 55 areas were defined for more detailed evaluation. These areas were referred to as "candidate sub-areas". These sub-areas are areas that were not classified as biologically significant in Stage 2A. // As in Stage 2A, the sub-areas were to be considered in terms of defining areas that were not known to have conditions adverse to the siting of a landfill, using existing sources of information.

The biophysical analysis was accomplished through review of existing documents, discussions with regional and provincial government agencies, airphoto interpretation, and reconnaissance field inspection. The objectives and factors that were investigated and assessed are outlined on pp. 11-15.

The findings of the Biophysical Analysis are presented in Section 6 (pp. 39-65). As a result of the investigation and analysis, the candidate sub-areas were placed in one of five categories, from (1) - lowest level of impact, to (5) - severe impact. //

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In concert with the results of similar studies by other team members, and study team discussions, six candidate sub-areas were identified for further detailed analysis at the Stage 2C level. These sub-areas, and their biophysical categorization, are as follows:

A Candidate Sub-Area C2c - Category 1 - does not exhibit natural environmental conditions that would exclude it from supporting a landfill; received a low ranking in terms of potential impact. Eight other sub-areas also were categorized as "1".

C, D Candidate Sub-Areas C2e, D4g - Category 2 - more detailed information, from field investigations, is required to determine details of natural environmental conditions; these sub-areas have minor drainage swales and/or woodlots that require more investigation. These areas received a moderate ranking in terms of potential impact. Sixteen other areas also were categorized as "2".

B, E, F Candidate Sub-Areas C2d, D4a, P&Q1 - Category 3 - more detailed information, from field investigations, is required to determine details of natural environmental conditions; these sub-areas support numerous scattered and/or large woodlots. These areas received a moderate ranking in terms of potential impact. Three other areas also were categorized as "3".

None of the sub-areas of Category 4 (high impact ranking) or Category 5 (severe impact ranking) was carried forth to the next stage of the investigation. There were twelve areas in Category 4 and ten areas in Category 5.

The six selected candidate sub-areas from Stage 2B which defined the Candidate Sites were redesignated as follows, for subsequent stages of the investigation:

<u>Stage 2C Designation</u>	<u>Stage 2B Designation</u>
A	C2c
B	C2d
C	C2e
D	D4g
E	D4a
F	P&Q1

Additional involvement in this stage of the study included participation in public meetings and help in preparing responses to submissions from government agencies and individuals.

3. Phase 2, Stage 2C, Selection of Preferred Site - Method and Results

The vegetation, wildlife habitat, and biological aquatic systems characteristics of six candidate sites were investigated and

12
10
6
28 - 28
55
27?
where
are
they

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evaluated to help define the landfill Site Plan Areas within the Candidate Sites that were identified by Stage 2B. The biophysical characteristics of the Site Plan Areas were then evaluated and compared to determine, from a biophysical perspective, the most suitable site(s) for landfilling.

The biophysical characteristics of the sites were determined through review of information acquired in earlier phases of the Environmental Assessment, airphoto interpretation, on-site investigations, and discussions with municipal, Ministry of Natural Resources, and Halton Region Conservation Authority personnel. Details of the method are presented on pp. 2-1 to 2-6. The implications of a landfill on each of the sites were categorized, analyzed and rated with regard to vegetation community types, plant species types, wildlife habitat capabilities, and biological aquatic systems characteristics, specifically with regard to measures of abundance, sensitivity and significance. The analysis and rating systems are included on pp. 2-7 to 2-10, and the results of the analysis and rating are summarized in the Biophysical Evaluation Chart (6 pages following p. 5-7).

Adverse biophysical environmental changes that may occur as a result of a landfill on a site were rated as O - no significant impacts; L - low impacts; M - moderate impacts; and H - high impacts. These ratings were assessed and discussed to establish a priority listing of the Site Plan Areas, in order of relative biophysical suitability to support a landfill operation.

For each site, each measure of each factor that was investigated (e.g., for the factor "Vegetation Community", three "Measures" of extent of impact were considered) was assigned a rating with regard to the level of impact that would be anticipated, taking into consideration any mitigation measures that could and would be implemented.

The conclusions of the biophysical analysis are included on pages 5-6 and 5-7. The Site Plan Areas are listed in order of relative suitability to support a landfill operation:

A > D > C > E, B > F

This list is a "preference" list from the biological perspective, with A being the most preferred and F the least preferred. However, the differences in suitability among B, C, D, E were not considered significant, and a final categorization of the sites was as follows:

- A - no real biophysical constraint to a landfill site exists;
- B, C, D, E - some constraints exist;
- F - significant constraints exist.

These conclusions were incorporated into the "Evaluation and Summary Report" (Report S; June, 1985) prepared by Walker Wright Young Associates Limited, specifically in Chart 2 and the Biophysical

component of Chart 7.

Additional involvement in this stage of the study included participation in public meetings and help in preparing responses to review responses from government agencies and individuals.

4. Technical Studies Phase - Method and Results

At the conclusion of Phase 2, Stage 2C, in the "Evaluation and Summary Report" (Report S; Walker Wright Young Associates Limited, June 1985) it was determined that Sites F and D were the preferred sites for landfilling, based on an evaluation of all environmental components. As a consequence, more detailed investigation and evaluation was undertaken for these two sites.

Two biophysical analysis reports were prepared, one for Site D and one for Site F.

The purpose of the study was to characterize and evaluate the sites in more detail to determine their suitability to support a landfill site, the adverse impacts that may occur, and mitigation measures that can be employed to reduce the impacts. This work is an extension of the work carried out during Stage 2C. The factor "Land Use Conflict: Vermin" was added to the study; in the previous stages of the study, this topic had been generally considered, in the "Agricultural Assessment" and the "Land Use and Planning Assessment" studies. Here, it is studied in terms of its biological potential to occur, and mitigation measures which can be introduced to eliminate or curb any problems.

The information sources were similar to those for the Stage 2C study, but the investigations were carried out to a greater level of detail. The sources included: previously undertaken studies specific to the two sites and environs, including the reports that were prepared for previous stages of this investigation; literature review, specific to the objectives of this study, such as floras, and landfill vermin control measures; on-site field work; visits to operating municipal landfill sites and discussions with the operators; and, discussions and interviews with government agency personnel and individuals knowledgeable about specific topics.

In general, the findings of this study verify and substantiate the findings of the Stage 2C report. The main difference relates to the significance designations of various plant species that have been found to occur on the sites. In the Stage 2C report, native plant species were classified as "rare" if they were classified as provincially rare in the "Atlas of the Rare Vascular Plants of Ontario", and its supplements (Argus and Keddy, 1984; Argus and White, 1977, 1982, 1983). Other species that had been classified, by knowledgeable persons or in existing reports, as being rare, uncommon or significant in Halton Region, were classified as "significant" in the Stage 2C report.

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In these studies, provincially rare native species were determined in the same manner; however, regionally significant native species have been classified as: rare - 1 to 5 locations within the Region; scarce - 6 to 10 locations with the Region; occasional - 11 to 15 locations with the Region; and, common - 16 or more locations within the Region. These designations are based primarily on the work of Crins (1981, 1983, 1985, 1986), supplemented by study team knowledge. Crins' work had only recently been completed (March, 1986) and his findings have resulted in changes in status designations for some species, from those given in the Stage 2C report.

After the conclusion of Stage 2C, and during the early period of these technical studies, the site plan areas for D and F were reduced in areal extent. This reduction provided the major mitigation measure available for the protection of biological resources: the extent of the potential impact on the biological resources is reduced since a smaller area would be cleared on either site. ? Q -

Site D:

Most of the site is utilized for agriculture. Approximately 4.8 ha of natural vegetation would be eliminated to accommodate a landfill operation. In addition, landfilling will result in the loss of all known representatives on the site of one regionally rare plant (black snakeroot), three regionally scarce species, and nine regionally occasional species, leaving representatives of one regionally rare species, three regionally scarce species, and twenty-four regionally occasional species.

The mammal, bird, reptile and amphibian species found on the site are common to the area and, due to their mobility, ranges, seasonal movements and activities, can adapt to a small area loss of habitat. The on-site habitats for these species are common throughout Halton and therefore their elimination would not be detrimental to the survival of the particular species, and would only have minimal effect on populations.

The natural vegetation communities on the site are common in Halton, and are not part of a larger forest stand or wildlife corridor and therefore loss of a portion of them would neither disrupt nor impact on a larger, more integrated forest ecosystem.

Site F:

Site F is a diverse environment supporting a variety of terrain, vegetation communities, and floral and faunal species. ↑

The vegetation is composed of twenty-one different habitat types which fall into the categories of forest, plantation, shrub thicket, meadow, wetland meadow, anthropogenic, and open water, none of which are uncommon or unusual in Halton. These habitat types are quite diverse and consequently support a large number of diverse plant species. Many of the forest habitat areas are typical of the Deciduous Forest Region and the Carolinian Floristic Zone. In

Q - p. 59.
summary!
"uncommon"

means
highly sig,
endangered.

bird and hale

particular, areas support associations of oak and hickory. Although hickory is a common component of the deciduous forest stands in southwestern Ontario, this association is reaching the northern limits of its range in Halton. Thus, this association is indicative of the diverse and floristically rich nature of the Site.

A total of 116 significant native plant species are recorded from the Site: 4 provincially rare; 8 provincially uncommon; 13 regionally rare; 28 regionally scarce; and, 63 regionally occasional. This number of significant plant species gives the Site biological importance in having a rich, significant, natural flora.

The final proposed areal extent of the landfill, under the preferred engineering site design, mitigates, to a certain extent, the loss of biological resources from the area that would be landfilled. A substantial portion of the natural vegetation communities will not be disturbed. However, the area that would be utilized for landfilling has a more diverse terrain, and supports a greater number of habitat combination types. In addition, there is a greater concentration of significant species in this area. Specific site locations are known for 27 of the 116 significant native species; of these, landfilling will result in the loss of all known representatives of at least 14 species. This includes 2 of the provincially rare species: sedge (*Carex gracilescens*) and American columbo (*Frasera caroliniensis*). In addition, although the specific location is not known for the provincially rare species nodding wedge grass (*Sphenopholis nitida*), field notes indicate that it is located within the proposed boundaries for landfilling. The specific site location of the fourth provincially rare species, hawthorn (*Crataegus corusca*) (which, in addition, is a tentative record), is not known.

None of the wildlife species that were determined or thought to be present on Site F is considered unusual or unexpected in this area of the province. Due to the mobility, ranges, seasonal movements and activities of the wildlife species, and the availability of similar habitats in the area that is not proposed for landfilling, and the nearby Sassafras Woods, the landfill would not be detrimental to the survival of a particular species, and would only have minimal effect on populations. In addition, because of the Highway 403 complex to the south of the Site which acts as a barrier, movement of animals would not be significantly adversely affected by the proposed landfill. Most animals would utilize Sassafras Woods to the west and immediately to the north of the Site.

Vermine Control

The creation of a landfill at either site will not cause vermin problems as long as the necessary operating procedures are in place. These include uniform compaction of the waste and cover material, applying sufficient depth of cover, minimizing the size of the working face, grading the site to prevent water ponding, keeping the grass on stabilized areas of the landfill and adjacent fields sufficiently long to discourage loafing by birds, and keeping the roadways, buildings, equipment and areas on and adjacent to the site

bird and hale

clean of garbage. In addition, periodic inspection of the site by a pest control contractor is recommended so that problems do not develop.

Birds, and specifically gulls, already occur in the vicinity of both sites. Increased congregations of birds may be expected in the vicinity of a landfill site but good housekeeping practices will help ensure that gull populations do not become a problem.

Proximity of the Site D to the Burlington Airpark was considered regarding the potential for bird-plane collisions as the population of gulls in the vicinity may increase. Procedures which can be implemented to prevent this problem from developing include implementing similar site management techniques at the airpark as for the landfill (for example, maintaining longer grass, and cleanup of any garbage), use of a pyrotechnic device when and where birds congregate, and application of worm repelling chemicals to the runway. Evidence from other airports situated near congregations of gulls (Maple Airport, Toronto Island Airport) indicates that it will be possible to operate the Burlington Airpark safely, with a minimum of modification to existing practices, with a landfill in the vicinity.

Conclusions of Technical Studies Phase - Impacts of Landfilling

The implications of a landfill on both of these sites was categorized and analyzed in accordance with the format used in the Stage 2C report, and are presented on pages 119-129 in the Site D report, and pages 152-162 in the Site F report. The conclusions substantially verify the findings of the Stage 2C report.

Considering the biological characteristics of the Sites, the following conclusions can be drawn:

Site D:

- Reduction of areal extent of the landfill site (from that proposed in Stage 2C) mitigates the extent of the adverse biological impacts.
- There are minor biological constraints to the development of a landfill site.
- Vermin problems should not occur if the recommended mitigation measures are followed.
- Land use conflicts should not develop with regard to the presence of the Burlington Airpark.

Site F:

- With the diversity of vegetation habitat types and the presence of rare plants, the site exhibits major biological constraints to the development of a landfill site.
- The reduction of areal extent of the landfill site (from that proposed in Stage 2C) helps to mitigate the impact by leaving representative units of vegetation resources.
- Vermin problems should not occur if the recommended mitigation measures are followed.

5. Comparative Analysis of Alternative Sites for Sanitary Landfilling in the Regional Municipality of Halton, Site 'D' and Site 'F' (Appendix C, Biophysical Comparative Analysis)

Considering the biological characteristics of the two Sites, it has been determined that Site D has minor and Site F has major biological constraints to the development of a landfill site. Therefore, from a biological perspective, Site D is the preferred site for the landfill.

Bird and Hale Limited

A handwritten signature in cursive script, reading "Linda Hellas". The signature is written in dark ink and is positioned above a horizontal line.

Linda Hellas.

GLOSSARY

accipiter hawk - long-tailed hawks with short, rounded wings; includes Cooper's hawk, sharp-shinned hawk, and goshawk.

adventive - native and alien plant species which are not indigenous to an area, but which are becoming naturalized in that area.

anthropogenic - caused, or the result of, man's activities; e.g., croplands are not natural plant communities, but are the result of human endeavour.

berm - terrace or ridge of earth, either naturally occurring or man-made.

calcareous substrate - underlying bedrock and/or soil material of calcium carbonate (limestone) and/or calcium/magnesium carbonate (dolomite) origin.

canopy - in a forest the trees, with their upper foliage in full sunlight, form the canopy or uppermost layer; canopy closure is a measure of the extent that the tree storey is covered by foliage; e.g., 70% canopy closure means that 70% of the sunlight is intercepted and absorbed or scattered.

Carolinian - generally used in reference to plant species which have a distinctive distribution restricted in Canada to southwestern Ontario and in the eastern United States extending southwards to Alabama and the Carolinas. This is a very specific term which properly refers to a limited number of plants having this distinctive distribution.

carrion - dead, rotting flesh.

channelized - watercourse artificially made to follow a straight, pre-planned path.

commensal species - living in groups or colonies.

coppiced - growth form of trees that results when periodic cutting of the trees occurs; usually small trees, frequently with multiple stems, commonly occurring in northern red oak and American basswood.

cover - vegetation habitats present varying degrees of "openness" in their tree, shrub, and herb strata. For this report, these are defined according to the following scale:

	<u>very open</u>	<u>open</u>	<u>semi-open</u>	<u>semi-closed</u>	<u>closed</u>	<u>very closed</u>
Tree:	<45%	45%-65%	65%-85%	85%-95%	95%-100%	>100%
Shrub/	<10%	10%-35%	35%-65%	65%-85%	85%-100%	>100%
Herb:						

bird and hale

dendritic - a drainage pattern which is characterized by irregular branching in all directions with tributaries joining the main channel at all angles.

dbh - diameter breast height; a standard measurement of the size (biomass) of trees; typically, dbh is measured at 1.5 m above the ground.

fencerow - vegetation such as trees and shrubs growing along a fence line.

feral - wild individuals of a domesticated species (e.g., cats or dogs).

forb - a herbaceous plant which has broad leaves, generally including non-grass-like plants, for example, wildflowers.

graminoid - a herbaceous plant which has narrow leaves, generally including grasses, sedges, and rushes, and other "grass-like" plants.

herb - a plant species that does not produce woody material (i.e., not trees or shrubs); above ground portion of plant dies back each year.

herbaceous - leaf-like in texture; pertaining to a herb.

herbarium - collection of classified, dried, mounted plant specimens; used as a "reference library".

lacustrine - pertaining to or formed by a lake, such as lacustrine sediments, which are those sediments laid down in the bottom of a lake.

loafing - idling, hanging about.

mesic - moderate moisture conditions which are neither wet nor dry.

old field community - when a plant community develops and succeeds (as in "succession") on land where a plant community previously had occurred, it is called "secondary succession" (e.g., land that originally was forest, then was cleared and utilized for agriculture, and now is left to return to a more "natural" state); in early stages, when herbaceous plants and shrubs dominate the plant community, it is termed an "old field community".

omnivorous - eating a variety of foods, including both plants and animals.

percolation - movement of water through porous rock or soil.

perennial - occurring throughout the year.

bird and hale

permeability - the capacity of the soil for transmitting water.

physiognomy - the classification (and study) of natural communities by form and structure.

point-quarter - a system of vegetation sampling which does not require permanent or established reference lines of points; generally, 10 to 30 random points are selected, and the nearest tree and sapling to each point within each of the 4 quadrats are measured to determine canopy composition, species importance and other community parameters; the under-canopy is sampled by complementary use of square metre quadrats but species presence only is measured.

predacious - free living organisms (wildlife species), which feed of other organisms.

pyrotechnic device - gun-like device, the shell of which explodes like a firecracker, with noise and light.

quadrat - defined plot in which all plant species are counted and identified; plot is usually 1 metre by 1 metre, but can be any size and shape, as long as area is known; information from quadrats is extrapolated to estimate total populations.

raptor - predatory bird such as an owl or hawk that hunts small prey.

remnant - small remaining sections of natural vegetation, typically in an area that supported extensive, natural vegetation.

regeneration - secondary, or replacement growth of vegetation in an area after it has been cleared, either through natural phenomena, (e.g., fire) or by man.

riparian - pertaining to the banks of a body of flowing water; for example, riparian vegetation would occur along a stream bank.

significant species - includes provincially rare, provincially uncommon, regionally significant species and species which are classified as threatened or endangered.

station - a location where a plant species has been identified; physically separated from other locations although the distance may not be great and this distance would vary among investigators and study purposes; the number of individual plants of a species at a station can be one or more.

substrate - the underlying layer of earth or rock.

bird and hale

succession - replacement of populations, of plant species usually, in a habitat through a regular progression to a stable state; for example, from a meadow of herbaceous plants, to the area gradually supporting shrubs, and then supporting trees.

swale - wide, grassy ditch-like feature, frequently dry.

taxonomy - classification of organisms (plants or animals) on the basis of their evolutionary relationships.

vascular - having vessels for conveying fluids; that is, those groups of plants that have connecting ducts, as compared with for example algae or lichen which have individual cells only.

voucher specimen - dried and mounted specimen of a plant species, usually stored in a herbarium, used for reference and comparative purposes.

wildlife corridor - path frequented by wildlife, usually having continuous or near-continuous natural vegetation and often near or containing water.

working face - specific area/surface where landfilling (disposal and burying) of waste is occurring.

xeric - dry moisture conditions.



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WITNESS STATEMENT OF DR. ERVEN E. MACKINTOSH ECOLOGICAL SERVICES FOR PLANNING LTD., GUELPH

ROLE AND RESPONSIBILITIES

Dr. Mackintosh is an agrologist with Ecological Services for Planning Ltd. He is a principal and President of the Firm.

His responsibilities for this project were to prepare an agricultural impact assessment of the proposed landfill component of the Halton Region Waste Management Plan. His Firm acted as a subconsultant to Walker, Wright, Young Associates Ltd. in preparation of the agricultural component of the environmental assessment in Phase 2, Stage 2B and 2C. Ecological Services contracted directly with the Regional Municipality of Halton in preparation of the agricultural component of the Environmental Protection Act phase of the study.

APPROACH TO AGRICULTURAL IMPACT ASSESSMENT

The Food Land Guidelines are a policy statement of the Province of Ontario which outline a strategy for Ontario farmland. The guidelines identify prime agricultural lands which should be taken into consideration in planning rural areas. These include two major groups of land:

1. Lands with a capability for production of specialty crops; and
2. Class 1 to 4 soils as defined in the Canada Land Inventory of Soil Capability for Agriculture.

In addition to identifying the land resource base, the guidelines also address the issue of establishing priorities for agricultural lands and the development of land use designations and supporting policies for Official Plans.



The policy statement provides guidelines. Identification of the specific agricultural issues and the approach taken in the agricultural impact assessment is determined on a project basis. For this study, the approach and criteria used evolved over time as a result of meetings with the Foodland Preservation Branch, Ontario Ministry of Agriculture and Food and the Halton Agricultural Advisory Committee (HAAC).

AGRICULTURAL IMPACT ANALYSIS - PHASE 2, STAGE 2B

This part of the evidence is found in Section 7, Consolidation Report - Selection of Candidate Sites, p66-75.

The candidate sub-areas were evaluated using three factors: ^① land quality; ^② contiguous blocks of agricultural lands; ^③ and special farm enterprises. They are described on pages 66-68. Data were collected on each candidate sub-area by visiting the site in the field and by using published reports and other background information. *when do*

Each of the three factors were subdivided into a series of sub-factors and these were given a relative weighting of high, medium and low impact. Results of these comparisons are presented on pages 68-73.

Conclusions for the agricultural impact assessment are found on pages 73-75. From an agricultural perspective, the assessment identified 10 candidate sub-areas and 7 pit and quarry areas as being suitable



as candidate sites for the next phase of the study.

AGRICULTURAL ASSESSMENT - PHASE 2, STAGE 2C

This part of the evidence is found in Final Technical Report No. 4 - Agricultural Assessment. It presents the approach used in selecting the preferred site from among the six acceptable candidate sites identified in Stage 2B.

NB where come from?
Two major factors were used in Stage 2C to differentiate between the acceptable candidate sites and these are discussed on pages 2-1 to 2-3. The most important factor used at this stage was the "Impact on Long Term Agricultural Viability". Once the sites had been evaluated using this factor, they were subdivided further, using a combination of the land quality, contiguous blocks of agricultural and special farm enterprises. Each of the latter three factors were treated as having equal weight and the site plans were rated accordingly. Information for each of the site plan areas was refined by onsite visits.

The results of the comparisons and the overall ranking of the six site plan areas are presented on pages 3-1 to 3-5. Based on this analysis, the site plan area having the least impact on agriculture was identified as Site F.

A preliminary set of guidelines for the rehabilitation of landfill site(s) to an agricultural after-use are also discussed on pages 4-1 and 4-2.



Specific concerns raised by the H.A.A.C. on bird problems and livestock watering are addressed on pages 5-1 to 5-2.

AGRICULTURAL IMPACT AND REHABILITATION STUDY

The evidence presented in this report deals with the feasibility of restoring the two preferred landfill sites selected in Stage 2C to an agricultural after-use and the respective guidelines required to achieve site rehabilitation. This information is found in the Appendices to the After-Use Report, for Site D and Site E. ?

The feasibility of restoring the two preferred landfill sites, D and E, to an agricultural after-use, was assessed by a comparative analysis using the following factors: ① onsite and surrounding agricultural characteristics; ② rehabilitation problems; ③ ongoing post-rehabilitation problems; and ④ relative cost of rehabilitation (pages 5-16). The background information was collected from onsite surveys and available published information.

It was concluded (pages 16-17) that the rehabilitation of Site F was not feasible, whereas it is possible to rehabilitate Site D to an agricultural after-use. MB

A detailed rehabilitation plan is presented for Site D on pages 18-26. It includes specific guidelines on soil stripping and stockpiling, reapplication of soil material, soil restoration, post-rehabilitation land management and a post-rehabilitation monitoring program.



CONCLUSION

The evidence concludes that Site D is a feasible site for rehabilitation to agriculture according to the program outlined in Final Technical Report No. 4 - Agricultural Assessment.

Dr. E. E. Mackintosh, P.Ag.

EEM/gf

WITNESS STATEMENT

of

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In the matter of the Consolidated Hearing for the
Environmental Assessment of the proposed Halton
Region Landfill Component of Solid Waste Management.

1. Roles and Responsibilities

I am an ecologist and environmental consultant and a senior principal of The Landplan Collaborative Limited with responsibilities for environmental planning and assessment. My resume, outlining my qualifications is enclosed.

My technical responsibilities on this Environmental Assessment project consisted of over-all project management and coordination of the Heritage Features Assessment Visual Impact Assessment and After-use planning undertaken by our firm as consultants to the Regional Municipality of Halton. I was directly responsible for the identification, analysis and development of appropriate options for landfill after-use of Sites D and F. I worked closely with staff from Ecological Services for Planning in their analysis of agricultural rehabilitation as an option for after-use.

As project manager for Landfill After-use I produced two reports:

1. After-use Report - Site D, Halton Region Landfill Technical Study (Schedule E-D) September, 1986.
2. After-use Report - Site F, Halton Region Landfill Technical Study (Schedule E-F) September, 1986.

Each report contained an appendix titled: Agricultural Impact and Rehabilitation Report, July 1986 produced by Ecological Services for Planning Ltd.

is
MacIntosh

My firm's involvement with the Environmental Assessment began on August 15, 1985 for the Landfill Technical Study Phase concerned with after-use.

Landfill After-use Planning

After-use refers to the rehabilitation program and land use plans and activities for the property comprising a closed sanitary landfill.

The Environmental Protection Act of Ontario regulates the after-use of sanitary landfills and requires the approval of the Minister of the Environment for all uses of lands on completed landfills within 25 years of cessation of landfilling operations.

The approach used to determine and prepare suitable after-use plans was to consider a broad range of concept options that met the following criteria for development feasibility; compatibility with surrounding land-uses and local land use plans; regulatory requirements for human health and environmental safety; and reasonable expectations of long term viability and public support. It was our assumption that after-use should be a long term land use with landfilling as an interim use for a given site.

This approach used a combination of systematic analysis and professional judgement. The descriptions of after-use options discussed in Phase 2, Stage 2C, were relied upon as a foundation for the Technical Study Phase after-use concept analysis, (see, Walker Wright Young and Associates, Land Use and Planning Assessment, 1985).

The technical aspects of agricultural rehabilitation were provided by Ecological Services for Planning Ltd..

2. Technical Study Phase Methods and Results

The methods used to identify, select and describe suitable after-use concepts for Sites D and F are described in Section 3.0 of each of the After-use Reports:

- After-use Report - Site D September 1986, pages 11-12;
- After-use Report - Site F September 1986, pages 11-14.

I reviewed published material on landfill after-use planning and reclamation, the Phase 2 Stage 2C Reports, and held discussions with the staff of the Town of Milton, the City of Burlington, the Region of Halton and practitioners in the field of landfill after-use. The following sequence of tasks was used to arrive at a recommended after-use for each site:

- review of the literature on landfill after-use.
- examples of closed sites were reviewed or visited.
- a "long-list" of potential after-use options was developed.
- development of screening criteria to evaluate after-use options and review of the "long-list".
- evaluation of the options for each site remaining after screening for each site.
- a recommended option was proposed.
- potential site constraints affecting after-use were assessed with other members of the consulting team

During this period an Agricultural Rehabilitation Report (1986) was produced by Ecological Services for Planning (in consultation with Landplan) that addressed the feasibility and potential for rehabilitation of Site D and Site F to a viable farming enterprise. The report is included as an appendix of After-use Report - Site D (September 1986) and After-use Report - Site F (September 1986).

The criteria used for After-use evaluation are found in Section 4. of each report:

- After-use Report - Site D September 1986, pages 13-25;
- After-use Report - Site F September 1986, pages 15-33.

For screening, (that is the systematic evaluation and progressive removal of after-use options based on established criteria), the criteria that were developed are found in sub-section 4.4.2 of each report. They included minimum landfill size, characteristics of the local landscape, land-use and potential demand, site and area topography and soil cover, the presence/absence of mature natural vegetation, land use policies, public safety and concern, and the degree of uncertainty of implementation regarding the feasibility of the potential after-use.

I developed the criteria in consultation with other consultants and with reference to the Phase 2, Stage 2C reports.

The results of the screening of the "long list" of potential after-uses for each site are found in Section 5, Table 2 of each Report. The results of the concept evaluation which followed screening are found in Section 5.6 of each report:

- After-use Report - Site D September 1986, pages 36-37
- After-use Report - Site F September 1986, pages 42-43

The clearly flawed or unsuitable after-uses were screened from the "long list". The concepts remaining were evaluated by considering to what degree each prospective after-use concept fulfilled the opportunities offered by each site and met the general objectives:

- compatibility with surroundings,
- minimizing environmental disruption
- maintaining planning and design flexibility, and
- the potential of an appropriate public benefit that was responsive to perceived public and municipal interests.

I assessed the options specific to each site and site setting and compared potential after-uses with respect to the objectives of the undertaking and Environmental Assessment. The evaluation process involved considerable professional judgement and extensive consultation with consultants concerned with after-use.

2.1 Site D

The results of the concept evaluation for Site D are found on page 36 of the After-use Report - Site D, September 1986. Seven concepts were considered at this stage, including: picnic areas, sports fields (with archery), golf course, botanical garden/arboretum/museum, agriculture and greenhouses. Many of the after-uses were not mutually exclusive - elements of one after-use could be used as components of another.

Agricultural rehabilitation was the recommended after-use for Site D. The agricultural rehabilitation plan is described in the Appendix of the After-use Report - Site D, September 1986. It consists of a plan to rehabilitate the soil of the landfill area through a sequence of cover crops and cash crops, forage crop rotation to produce sustained yields of grain corn, hay forage and small grains. No animal production would be involved. The major strengths of this after-use are discussed on page 24 of the After-use Report - Site D, September 1986. Specifically, the after-use adheres to current planning policies and designations, reflects Provincial policy on Foodland Guidelines and is generally compatible with surrounding land use. The estimated net cost of implementing this option was from \$138,300 to \$190,800 (Ecological Services for Planning Ltd., p. 19). My views on the appropriateness of agriculture in the form of a cash crop farming enterprise are the same as those expressed by the agricultural consultant - Ecological Services for Planning, in their report, Agricultural Rehabilitation, July 1986 (see Section 1). These results are consistent with the analysis of the Phase 2, Stage 2C study.

2.2 Site F

The results of concept evaluation for Site F are found on Page 42 of the After-use Report - Site F, September 1986. Five after-use concepts remaining after screening were evaluated: natural area rehabilitation, buffer area rehabilitation, hiking and ski trail development, outdoor education and viewing, and picnic/open space passive recreation. All of these after-use concepts had common characteristics involving provision for revegetation and their open space character.

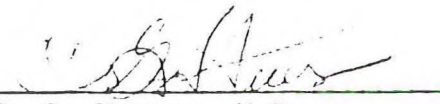
* The natural area concept was the recommended after-use for Site F. This concept is described in the After-use Report - Site F, September 1986 on pages 44 to 49 and includes a discussion on establishing vegetation on sanitary landfills. This after-use consists of re-establishing natural forest vegetation that will ultimately reflect the native forests found on lands on, and near Site F that represent local natural communities. It is anticipated that a soil reclamation and revegetation plan will be produced before landfilling begins once the site is approved for landfilling. The estimated cost of implementing this after-use is approximately \$1,598,000. *10 times the cost* *where come from?*

The major strengths of this concept are: its compatibility with the surrounding landscape - particularly the forested sections of the Niagara Escarpment and the planned rehabilitation of the existing Regional Landfill west of the Site; its goal of helping to protect plant communities in the area, and the flexibility in long term site planning implicit in this concept. *

3. Technical Study Phase C-1 Conclusions

I conclude that the most appropriate after-use for the proposed Regional landfill at Site D is rehabilitation to Agriculture, specifically a forage/grain cash crop enterprise. This conclusion is consistent with the Phase 2, Stage 2C study results and the Agricultural Impact and Rehabilitation Report produced by Ecological Services for Planning dated July 1986; and landfill design requirements.

I conclude that the most appropriate after-use for the proposed Regional landfill at Site F is rehabilitation to natural area, specifically a long term program of reforestation to native forest cover. My conclusion is consistent with the after use analysis discussed during the Phase 2, Stage 2C study and the landfill conceptual design requirements.


D. G. Stevens, M.Sc.

WITNESS STATEMENT

of

ROBERT M. WRIGHT, O.A.L.A., C.S.L.A.

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In the matter of the Consolidated Hearing for the
Environmental Assessment of the Proposed Halton
Region Landfill Component of Solid Waste Management.

Role and Responsibilities

I am a Landscape Architect, registered in the Province of Ontario with specialist skills in visual landscape assessments. I am a consultant to The Landplan Collaborative Ltd. My resume is attached for further information.

I was responsible for preparing the visual assessments for Phase 2, Stage 2C and Landfill Technical Study phases and the Visual Addendum Report for the Halton Region Landfill Component of Solid Waste Management Environmental Assessment. Landplan was engaged as a subconsultant to Walker Wright Young and Associates for the Phase 2, Stage 2C study component, and as a consultant to the Regional Municipality of Halton for the Technical Study component and Addendum of the Environmental Assessment.

As project manager of the Visual Assessment and Analysis, I produced four reports:

- ✓ 1. Visual Assessment, Final Technical Report No. 10, Phase 2C Selection of Preferred Site (June 1985). H-22
- ✓ 2. Visual Analysis - Site D, Halton Region Landfill Technical Study, Schedule G-D (August 1986). H-23
- ✓ 3. Visual Analysis - Site F, Halton Region Landfill Technical Study, Schedule G-F (August 1986). H-24
- ✓ 4. Visual Analysis, Comparative Analysis Sites D and F, Halton Region Landfill Technical Study (January 26, 1987). H-14

Landplan's involvement with the Environmental Assessment dated from June 1984 for the Phase 2, Stage 2C work and from August 15, 1985 for the Landfill Technical Study phase of the project.

Assessment of Visual Impacts

Visual impact assessment and analysis techniques must be related to the proposed alterations to the landscape, to the existing landscape character, to the population affected by the visual change and to the potential for mitigation of the visual change.

Visual assessment undertaken for Stage 2C involves determining the relative impact of each alternative site, based on comparable factors and examining practical mitigative measures which can be incorporated.

In conducting a visual assessment, I analyze the following critical components which constitute the visual experience of the population and viewers within a given area.

1. the existing physical characteristics, natural and man-made, of the site.
2. the extent and type of physical change proposed for the site.
3. the areas from which the site can be seen (the viewshed) throughout the seasons.
4. the areas from which the site is most clearly visible and the population (residential, commercial, institutional, industrial, travellers, etc.) who will be affected by a visual change.
5. the nature of the proposed visual change (impact) that can be expected within the viewshed.
6. a comparison of visual impacts from one site to another.
7. practical mitigative measures and their results on reducing and/or alleviating visual impacts.

Phase 2, Stage 2C Methods and Results

The methods used are described in Sections 3.0 and 4.0, pages 3-1 to 4-2, of the Visual Assessment (June 1985).

A literature review was undertaken of previous reports on the 6 sites and general physical development parameters were given from which to evaluate the sites, ie., a 15m increase in elevation from existing topography.

what
mean?

Maps and aerial photographs were studied to determine general site characteristics. A method was developed to compare the visual impact of landfill development on the 6 sites. Field work was then carried out on all sites to determine the degree of visibility, designated viewing areas, number of residences from which the sites can be seen, views from roadways by length and designation and views from other land uses. Information was mapped and analyzed to confirm field observations. Information from other sub-consultants and Walker Wright Young Associates was utilized.

first time?

what relied on from others?

An evaluation was based on the 6 factors discussed. Each of the 6 site plan areas was evaluated relative to each other using high and medium-to-low categories. The evaluation ranked the site plan areas from the lowest overall visual impacts to the highest.

The results of the visual assessment for the 6 sites (candidate sites and site plan areas) are found in Sections 6.0, 7.0 and 8.0 on pages 5-1 to 8-4 of the report. The visual impacts determined were, in order from least to most, A, B, C, F, E, and D.

Options for mitigation of visual impacts are described in Section 9.0 on pages 9-1 to 9-4.

The conclusions of the Visual Assessment (June 1985), are summarized in Figure 4, page 10-4, and Figure 5. These figures indicate a ranking of the sites, in order of preference and from a visual impact perspective: Site A was most preferred, followed by Sites B and C, then F and E, with D being least preferred. This information was communicated to Walker Wright Young and Associates to be used in the site specific analysis of the 6 candidate sites.

Technical Study Methods and Results

Based on the findings of Walker Wright Young and Associates and under the direction of the Regional Municipality of Halton we were directed to further evaluate Sites D and F. The method for the visual analysis is described in the two reports Visual Analysis - Site D, (August 1986), pages 9-16 and Visual Analysis - Site F, pages 10-16.

The same methods for visual analysis were used as those described in the Phase 2, Stage 2C reports. To avoid confusion with terminology in other reports the "Land Use" category was re-named "Other Visual Concerns" and "Designation of Roadways" was shortened to "Roadways"; the analysis of these two factors remained the same.

The method involved a review of background literature and maps and aerial photographs, construction of cross-sections through the landfill and the surrounding landscape, and field reconnaissance in both summer and winter (1985 and 1986). Helium balloons were deployed at set elevations to determine future visibility of the landfill. The field work involved

measurement of viewsheds, identification of residences, viewing areas, roadways and other areas of visual concern potentially affected by the proposed landfill.

Recommendations for possible mitigation of the two sites were provided in Section 5.0, page 29 for Site D and page 27 for Site F. These recommendations included suggested placement of vegetative screens, preservation of existing hedgerows and woodlots, progressive rehabilitation of the landfill, location of service areas, and landform shaping.

The results of the analysis are summarized in Section 6.0 (Conclusions) of both reports pages 30 to 33 for Site D and pages 32 to 35 for Site F. Two tables in this section were produced to show, a Summary of Impacts on Visual Factors, (Table 1), a Summary of Net Visual Impacts (Table 2). Because of the more detailed nature of the study, there is some variation with the results presented in the Phase 2, Stage 2C report. These minor variations, such as the presence of new houses etc., were not significant enough to alter the outcome of the analyses.

Conclusions of the Technical Study Phase

At Site D the analysis confirmed the Stage 2, Phase 2C findings, namely, that the visual impacts of locating a landfill are considered to be high. This was due to the large area of visibility, the large number of residences in close proximity to the site, and impacts on secondary roads surrounding the site.

3 reasons why impact on D high.

At Site F the analysis confirmed the Stage 2, Phase 2C findings. The overall visual impacts on the site are considered to be medium to low, primarily because of the relatively few residences in close proximity to the site, and the short lengths of roadways affected. One area of land, Bayview Park and it's associated users, ie. park patrons enjoying the view, the equestrian area, the radio controlled model airplane field and the Burlington Rod and Rifle Club, will receive high visual impacts because of the close proximity of the site to the landfill.

But says Flow med to impacts but says those as Bayview equestrian life club will receive high visual impact.

Update to the Technical Studies

As the Design and Operations report was refined, several changes to the landfill design assumptions used in the Technical Study Reports visual analysis were made. These included a change in the 15m height limit from existing elevations and a change in the site areas proposed to be landfilled (areas smaller than the site plan area boundaries).

As a result, the changes proposed were re-evaluated through field reconnaissance (in fall and winter conditions) and through the construction of cross-sections through the landfill and surrounding landscape.

Comparative Analysis, Sites D and F

A comparative analysis was completed in January of 1987, (Visual Analysis, Comparative Analysis Sites D and F). This analysis compared the two sites, D and F, to show the difference in visual impacts between the two sites after the new elevation and size considerations had been evaluated. The report compared impacts on the visual characteristics, viewing areas, residences, other visual concerns and roadways.

In Table 5, page 11 of this report a summary of the comparative analysis of net visual impacts after assumed mitigation is shown.

The analysis concludes that the overall visual impact of the sites is greater at Site D than at Site F.

The results of our comparative evaluation were communicated to Dr. Myra Schiff.

Robert Malcolm Wright

WITNESS STATEMENT

of

OWEN R. SCOTT, O.A.L.A., F.C.S.L.A.

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TORONTO, ONT.
SASKATOON, SASK.

In the matter of the Consolidated Hearing for the
Environmental Assessment of the Proposed Halton
Region Landfill Component of Solid Waste Management

Role and Responsibilities

I am a Landscape Architect, registered in the Province of Ontario with specialist skills in landscape heritage assessment and design. I am a senior principal and chief administrative officer of The Landplan Collaborative Ltd.

I was responsible for preparing heritage features assessments for Phase 2, Stage 2C, and Landfill Technical Study phases of the Halton Region Landfill Component of Solid Waste Management Environmental Assessment. My firm was engaged as a subconsultant to Walker Wright Young and Associates for the Phase 2, Stage 2C study component, and as a consultant to the Regional Municipality of Halton for the Technical Study component of the Environmental Assessment.

As project manager of the Heritage Features Assessment I produced two reports; one for each of the project phases in which I was involved:

1. Heritage Features Assessment, Final Technical Report No. 11, Phase 2 Stage 2C Selection of Preferred Site (June 1985).
2. Heritage Features Assessment Sites D and F, Halton Region Landfill Technical Study, Schedule F. (August 1986).

My firm's involvement with the Environmental Assessment dated from June 1984 for the Phase 2, Stage 2C work and from August 15, 1986 for the Landfill Technical Study phase of the project.

Assessment of Heritage Features

Heritage features are defined by the Ontario Ministry of Citizenship and Culture Guidelines on the Man-Made Heritage Component of Environmental Assessments, MCR, September 1980 (Guidelines) and include properties of historical, architectural, archaeological, aesthetic, and scenic

do we
have
these?

interest. My assessment, for this project, was limited to man-made heritage features of historical, architectural, aesthetic, and scenic interest. Archaeological features were assessed by others.

I consider the following as heritage features to be assessed: landscape elements such as plantings, fences, street furnishings, engineering works; buildings and outbuildings.

Impact assessment for heritage features is guided by the aforementioned Ministry document. Impacts are those which may physically alter or destroy a heritage feature or portion of a collection of heritage features. ~~Impacts of a visual or behavioural nature are not considered by me as direct impacts on heritage features and are not part of my assessment.~~

Does he ignore visual impacts on a historical site?

Assessment of a heritage feature or collection of features involves a combination of factual, objective analysis and subjective judgement based on knowledge and experience. Objective analysis results from factual information found such as dates of construction, association with well-known events or people, and association with activities. Subjective judgements come into play in determining a feature's status as a landmark, its contribution to the harmony of its surroundings, alterations over time, its aesthetic and scenic appeal.

Phase 2 Stage 2C Methods and Results

The methods used are described on pages 2-1 and 2-2 of the Heritage Features Assessment (June 1985).

Stage 2B and 2C reports were reviewed. A literature search was undertaken for material relevant to a review of the heritage resources of the Region of Halton with concentration on the potential for the heritage resources on or contiguous with the six candidate landfill sites. Contact was made with the Ontario Ministry of Citizenship and Culture and the Local Architectural Conservation Advisory Committees of the Municipalities of Milton, Oakville and Burlington for guidance and/or inventory information. Inventory and photographic documentation of early heritage features for each site was undertaken during site visits. Each feature was assessed and rated.

The results of the inventory are found on pages 2-4, 2-5 and in Table 3.1 of the Heritage Features Assessment (June 1985).

The site area with the greatest number of heritage features subject to impact was Site C with 5, followed by Sites A and B with 4 each, Site D with 3 and Sites E and F with 1 feature and no features respectively. ~~Heritage features were inventoried if they were located within site plan area boundaries.~~ The features were also segregated into high and low significance categories. Site C had 5 significant features, Site D has 3, Site B has 2, Sites A and E has 1 and Site F has no significant heritage features.

what if immediately adjacent? like Leptone's house?

Significance was assessed using criteria proposed by the Ministry of Citizenship and Culture. (Guidelines). The 17 criteria used are found on page 3-1 of the Heritage Features Assessment (June 1985).

Options for mitigation of impact on heritage features were described on pages 6-1, 6-2 and 6-3 of the Heritage Features Assessment (June 1985) and included feature relocation and or modification of landfill design and siting. High, medium and low classes reflecting potential for mitigation were assigned. For Stage 2C, I based my evaluation on the premise that all features within the site boundaries would be removed or destroyed by landfilling.

Phase 2, Stage 2C - Conclusions

The conclusions of the Heritage Features Assessment (June 1985), are found on page 7-1 and involved a ranking of site locations in order of preference: Sites F, A, E, B, D, and C; with Site F the most preferred from the perspective of reducing heritage impact and Site C was the least preferred. Potential for mitigation was incorporated into this evaluation. This information was communicated to Walker Wright Young and Associates to be used in the site specific analysis of the six candidate sites.

Technical Study Methods and Results

The methods for the Heritage features assessment are described on pages 5, 6 and 7 of the Heritage Features Assessment Sites D and F (August 1986).

The same methods for visual impact assessment of Sites D and F were used as those described for Phase 2, Stage 2C. Literature was reviewed; each site was visited and their features documented, and interviews with relevant agencies were again undertaken with specific reference to Sites D and F. Air photos were consulted to date features and note changes in the cultural landscape over time.

The inventory and results of the heritage assessment of the Stage 2C Study were confirmed.

Site D:

On Site D three heritage features: a farm residence, outbuildings and landscape plantings were confirmed. The inventory data and photographs are found in Appendix C of the Heritage Features Assessment Sites D and F (1986) report.

The options for mitigation considered for Site D included recommendations to the Region and its design consultants that the design of the proposed landfill be amended to retain as many of the heritage features associated with the heritage farmstead as possible. Accordingly, the amount of land required for landfilling near the identified farm residence (known as the "Ford Farm") was reduced. Construction of a proposed perimeter berm would require demolishing the outbuildings and loss of the landscape plantings. The farm house would be retained. Consultation with the Ministry of Citizenship and Culture supported this course of action. Salvage of the heritage materials of the outbuildings proposed for demolition was suggested in consultation with heritage groups. Other mitigation measures included potential use of the farm residence during landfilling, and after site closure, which would preserve its heritage qualities. Also considered was detailed documentation of all features before landfilling begins (Heritage Features Assessment Sites D and F) (1986) pp 18, 19, 20).

Preservation of the farm residence proposed during this Phase of the Environmental Assessment differs from the Phase 2, Stage 2C study assumptions. In the latter, the level of detail necessitated the assumption that all features within Site boundaries would be lost. In the Technical Study Phase detailed site design and mitigation analysis resulted in retention of the most critical heritage feature - the farm residence.

Site F:

On Site F no heritage features were found.

but what about adjacent to the site?

Conclusions of the Technical Study

The conclusions of the Technical Study component of the Environmental Assessment are found in the Heritage Features Assessment Sites D and F (1986) on page 17.

The three heritage features on Site D are considered locally significant. As individual features and as a farmstead group they are rated "high" significance.

only locally significant in it all stone's provincially significant

The outbuildings and most of the landscape plantings would be removed during landfilling. The farm residence and remnants of the landscape plantings would be retained.

The impact of the landfill on the heritage features of Site D would be the loss of most of the two features.

There would be no heritage impact on Site F as there are no heritage features on that site.

The results of the Technical Study confirmed the heritage analysis in Phase 2, Stage 2C with the refinement that one of the three heritage features on Site D was retained through design mitigation thus reducing potential heritage impact.

The Landplan Collaborative Ltd.

A handwritten signature in dark ink, appearing to read "Owen R. Scott", written over a horizontal line.

Owen R. Scott, FCSLA



WITNESS STATEMENT
OF
ROBERT J. PEARCE, Ph.D.
CONTRACT ARCHAEOLOGIST
MUSEUM OF INDIAN ARCHAEOLOGY

IN THE MATTER
OF
THE CONSOLIDATED HEARING
OF
THE PROPOSED HALTON REGIONAL LANDFILL

1. Role and Responsibility

I am a professional archaeologist employed with the Museum of Indian Archaeology, an affiliate of The University of Western Ontario. The Museum undertakes on a consultative basis contracts with all levels of government, business, industry, and the private sector, to provide archaeological data as may be required prior to approval of an undertaking.

The Museum has been involved in the Halton Environmental Assessment between September 1982 and July 1985 as a sub-consultant to Walker, Wright, Young Associates.

More recently, the Museum has provided specific information on the comparative evaluation of Sites D and F to both Walker, Wright, Young Associates and Halton Region.

The overall goal of the Museum for this project has been to provide data on prehistoric archaeological sites, and specifically to identify if significant prehistoric archaeological sites would be impacted on the site or sites selected as the preferred location for Halton's landfill.

I have been responsible for the administration of all of the Museum's work in the Halton Environmental Assessment, supervised all of the fieldwork and data collection, and prepared all of the documentation and reports submitted for this project.

As Project Director, I have submitted the following documentation and reports for this project:

1. Background Study on the Archaeological Resources of the Region of Halton. October 1982. Submitted to Walker, Wright, Young Associates, Toronto.
2. A set of 1:50 000 scale topographic maps showing the locations of, and a table describing, 76 registered archaeological sites on and in the vicinity of six potential landfill areas. October 1983. Submitted to Walker, Wright, Young Associates, Toronto.



3. Stage 2C Archaeological Assessment. June 1985. Submitted to Walker, Wright, Young Associates and distributed by Halton Region as Stage 2C Final Technical Report No. 8.
4. Additional data on Site D, and a summary of existing data for Sites D and F, for a Comparative Evaluation of Sites D and F. December 1986-January 1987. Submitted to Walker, Wright, Young Associates and Halton Region.

The Museum has been simultaneously involved in the Ontario Waste Management Corporation's (OWMC) Facilities Development Process, including fieldwork on OWMC Candidate Sites PI-1N and LF-4N, which overlapped Halton Sites D and E respectively. Since 1982 I have also served as Project Director on the OWMC project. The Museum has received verbal permission from OWMC to utilize pertinent data from their Candidate Site PI-1N in connection with the presentation of archaeological data for Halton Site D.

2. Statement on the Nature of Archaeological Resources

Archaeological resources form part of the cultural environment and are defined as any location or artifact made and used by man for any purpose. Fieldwork carried out in conjunction with archaeological resource studies is regulated by the Ontario Heritage Act, which is administered by the Ministry of Citizenship and Culture. To carry out fieldwork to study archaeological resources, an archaeologist must obtain a licence from the Ministry of Citizenship and Culture.

Archaeological resources include native archaeological sites and non-standing historic Euro-Canadian sites. Southern Ontario was first occupied by native peoples around 9000 B.C., and native peoples have lived continuously in southern Ontario since that time. They were met by European explorers, missionaries, and settlers in the early to mid 1500s. This initiated the historic period, which saw the continued occupation of southern Ontario by various groups of native peoples (including both indigenous groups and groups of native peoples who moved to southern Ontario from northern Ontario, New York State, and elsewhere) as well as the first sustained settlement by Europeans and later by peoples of European ancestry that were born and raised in the area now defined as southern Ontario. Archaeological resources may therefore include any site or artifact attributed to native peoples from 9000 B.C. to the present. Native archaeological sites may range from a single artifact location to a small camp site to a large village. Non-standing historic archaeological sites may include any artifact or settlement attributed to Europeans or the first generations of peoples of European ancestry born and raised in southern Ontario. The most frequent types of historic sites documented are structures built in the 1700s and 1800s, such as residences, stores, post offices, railway stations, saw mills, grist mills, and factories. Archaeologists are normally only concerned with non-standing historic sites (i.e. ruins or evidence for a non-standing structure), which are treated as archaeological sites, while historical consultants are concerned with standing historic structures.

The Ministry of Citizenship and Culture maintains a register of archaeological sites that have been documented through archival research or



fieldwork. Since the passing of the Ontario Heritage Act in 1975, archaeologists must obtain a licence to conduct fieldwork, must file a report on that fieldwork with the Ministry, and must file "Archaeological Site Record Forms" for every site they investigate.

Projects requiring archaeological data, such as the Halton Environmental Assessment, normally include a Background Study Phase, where known archaeological sites in the area of a proposed undertaking are documented, using data on file at the Ministry of Citizenship and Culture. This is then followed by archaeological fieldwork to search for previously undocumented sites, and/or to re-visit previously documented sites, on the land to be impacted by the proposed undertaking.

Archaeological fieldwork can be accomplished in two ways. The first involves walking over all areas where the ground surface is exposed, to look for evidence of prehistoric or non-standing historic sites. Areas with the ground surface exposed include ploughed or cultivated fields and gardens, and fields planted in crops such as corn, young beans, and young wheat, where a portion of the ground remains visible between rows of crop. The second type of fieldwork takes place in areas where the ground surface is not exposed, such as fields covered in hay or pasture, and woodlots. In this case it is necessary to excavate "test pits" to look at portions of the ground. Test pits are normally dug with a hand-shovel, measure 30 cm in diameter, and are excavated to subsoil, which is normally 15 to 25 cm deep. The soil removed from a "test pit" is examined for artifacts and then backfilled. It is customary to dig test pits at 10 metre intervals across the entire area that requires examination (see Stage 2C Technical Report No. 8:2-1).

The Museum's Stage 2C work program included only an examination of those areas on the six Candidate Sites that had the ground surface exposed. The Museum made the recommendation that an additional examination, including the excavation of test pits where necessary, be made of the Candidate Site selected at the end of Stage 2C as the preferred location of the landfill facility.

3. Stage 1 Background Study

In July 1982, the Museum completed a Phase 1 archaeological background study. This study culminated in the submission of a written report to Walker, Wright, Young Associates in October 1982 entitled "Background Study on the Archaeological Resources of the Region of Halton" (Museum of Indian Archaeology 1982a). The data base used for this study consisted of all registered archaeological sites within the current (1982) boundaries of the Regional Municipality of Halton as known from the "Archaeological Sites Data Base" on file at the Archaeology Unit, Heritage Branch, Ministry of Citizenship and Culture. This report was accompanied by a map at a scale of 1:50000 showing a total of 415 archaeological sites within Halton Region.

4. Stage 2A General Overview Analysis

In September-October 1983, the Museum submitted to Walker, Wright, Young Associates a set of maps showing the precise locations of all registered archaeological sites (from the Stage 1 Background Study) on and in the vicinity



how come they included a radius around the site but heritage report did not?

(roughly 4 km radius) of six candidate areas that had been selected by the consultants as potential locations for Halton's landfill site. This work involved a set of topographic maps, and was not accompanied by a written report. This submission did, however, include a letter to Walker, Wright, Young Associates discussing the maps, pointing out that a total of 76 archaeological sites were mapped, and a list of those 76 sites providing information on location, site type, cultural affiliation, and significance.

5. Stage 2C Comparative Evaluation of Six Candidate Sites

I carried out some additional background (archival) research specifically to collect existing data on known archaeological sites in the vicinity of Halton Sites E and F. These data were obtained from the researcher who documented these sites, Dr. Peter Storck of the Royal Ontario Museum. (These sites had not been registered and therefore information on them did not exist in the Archaeological Sites Data Base of the Ministry of Citizenship and Culture). These data were used the Stage 2C Comparative Evaluation.

In June-July 1984, the Museum initiated fieldwork on Halton Region's six potential landfill sites, which involved a visual survey of all areas on each potential landfill site with the ground surface exposed (i.e. cultivated fields and gardens, or fields planted in corn or beans where a portion of the ground surface remained visible between rows of crops); it did not include areas where the ground surface was not exposed, such as pasture, fields of hay, or woodlots. As a result, no areas of Site F were examined, while survey coverage of Sites A, B, C, D, and E ranged from 10% to 73% of the land within the original boundaries (i.e. those defined in March-June 1984) of the potential landfill sites.

why not?

no where you looked your friend!

Archaeological sites were discovered on each of the five potential landfill sites that were examined. We also evaluated each of the six potential landfill sites in terms of archaeological potential (i.e. the potential for discovering archaeological sites in areas not examined as part of Stage 2C). These two factors were combined, and the six potential landfill sites were ranked, in terms of archaeological data, as follows (most preferred to least preferred): F, A, B, C, E, D (see "Archaeological Assessment", Stage 2C Final Technical Report No. 8).

6. Comparative Evaluation of Sites D and F

In December 1986 and January 1987, I provided additional documentation on the comparative evaluation of Sites D and F. This consisted primarily of a summary of data collected during Stage 2C, but also included a summary of new data collected on a portion of Halton Site D. The latter derived from the Museum's fieldwork on OWMC Site PI-1N, on behalf of OWMC, after the Museum's fieldwork on Halton Site D on behalf of Halton Region had been completed. These data are summarized below.

1. During the summer of 1984, the Museum of Indian Archaeology carried out archaeological fieldwork on Halton Landfill Site D as part of the Stage 2C Comparative Evaluation. This involved survey of all available cultivated fields. A total of 126 hectares were surveyed, representing 73% of the site area. A total of ten previously unrecorded prehistoric archaeological sites were discovered, but none of these was considered to be significant. Two



previously recorded prehistoric archaeological sites on Site D were also investigated. One of these, AiGx-46, is considered to be significant (camp site dating between 2500 B.C. and 300 B.C.), and the Museum's Stage 2C Technical Report recommended avoidance or salvage excavation of it prior to construction, if Site D were selected.

2. Subsequent to research on Site D for Halton Region, the Museum carried out additional fieldwork as part of OWMC's investigation of Candidate Site PI-1N, which overlapped with Halton Site D. This fieldwork included survey of additional cultivated fields on Site D that had not been available for survey when the Museum was working on Halton Stage 2C. A total of 52 additional hectares on Site D were surveyed as part of OWMC research. Combined with earlier work, a total of 178 hectares on Site D were surveyed, representing 92% of the area of Halton Site D. One additional significant prehistoric archaeological site, AiGw-190, was discovered. It is interpreted as a Late Archaic (circa 2500 B.C.) camp site.
3. Combining research carried out for both Halton Region and OWMC, 92% of Halton Site D was archaeologically surveyed resulting in the documentation of two significant prehistoric archaeological sites - AiGx-46 and AiGw-190. Avoidance or salvage excavation of these two sites is recommended if Site D is selected as the preferred location for Halton's landfill.

+ 0%
% F.

7. Conclusions

The discovery of an additional significant archaeological site (AiGw-190) on Halton Site D after completion of Stage 2C investigations, does not alter or affect the ranking of potential landfill sites or the comparative evaluation of Halton Site D versus Halton Site F from the Museum's Stage 2C report. The discovery of site AiGw-190 on Site D reinforces the Museum's conclusion that Site F is preferred over Site D (see Stage 2C Technical Report No. 8:5-2 to 5-5).

Robert J. Pearce, Ph.D.
Contract Archaeologist



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WITNESS STATEMENT
OF
EUGENE KOCZKUR Ph.D. P.Eng.

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In the matter of the Consolidated Hearing for the Environmental Assessment of the Proposed Halton Region Landfill Component of Solid Waste Management.

Role and Responsibilities

I am an Engineer, registered in the Province of Ontario with special skills in the study of air pollution. I am Chairman of SENE Consultants Limited and am responsible for all aspects of air environmental work. My resume is attached.

I was responsible for preparing the air quality comparison of the six candidate landfill sites for Phase 2, Stage 2C, and the air quality analysis and monitoring of preferred sites in the Landfill Technical Study phase of the Halton Region Landfill Component of the Solid Waste Management Environmental Assessment. My firm was engaged as a subconsultant to Bird and Hale for the Phase 2, Stage 2C study component and as a consultant to the Regional Municipality of Halton for the Technical Study component of the Environmental Assessment.

As project manager of the Air Quality Assessment work, I was responsible for the preparation of four reports, one for Phase 2 and three for the Landfill Technical Study phase.

1. Air Quality Assessment, Draft Technical Report No. 6 Phase 2 Stage 2C Section of Preferred Site (January 1985).
2. Air Quality Analysis - Site D, Halton Region Landfill Technical Study, Schedule I-D (August 1986).
3. Air Quality Analysis - Site F, Halton Region Landfill Technical Study, Schedule I-F (August 1986).
4. Air Quality Analysis; Comparison - Site D and Site F, Halton Region Landfill Technical Study (January 1987)

.../2

My firm's involvement with the Environmental Assessment dated from October 19, 1984 for the Phase 2, Stage 2C work and from August 9, 1985 for the Landfill Technical Study phase of the project Phase 2 Stage 2C Methods and Results.

Assessment of Air Quality

Assessment of future air quality (i.e. dust and odour) is estimated by using established modelling techniques to predict downwind concentrations of calculated or measured emissions from a landfill under prevailing meteorological conditions.

Concentrations are calculated at landfill boundaries and at further distances downwind where receptors (i.e. people) are located.

The regulations, air quality criteria and general provisions of the Environmental Protection Act are used in the assessment of specific emissions and emission sources in aggregate when estimating downwind impact on receptors. Mitigation measures are recommended to reduce the impact of emissions to the acceptable levels specified under the standards, criteria and guidelines of the Environmental Protection Act.

Phase 2 Stage 2C Methods and Results

Using published data, emission estimates were prepared for equipment and surfaces that could generate dust during landfill operations.

The dispersion procedures of the Ministry of Environment were applied to predict downwind concentrations of dust. The results are found on page 4-1, 4-2 and in Figure 4.2.

A cumulative dust dose estimate was prepared for each site and the sites were ranked then as described on page 5-2 and shown in Figure 5.1.

The results indicate that the difference between the sites is not large at the distance at which dust concentration drops to background levels (750 m). The most suitable sites were selected based on the lowest cumulative dust dose. They are sites A, E and F. The least suitable is site B, and sites C and D are ranked in between. The ranking reflects minor differences as shown on Figure 5-1. Mitigation effectiveness as described on page 2-3 and Table 2.1 can reduce dust considerably. Good operation can provide further reductions.

Odour emissions were estimated using surface odour measurements made over a malodorous surface. The dispersion procedures of the Ministry of the Environment were applied to predict downwind concentration of odour. The results are found on page 4-2 and in Figure 4.3. Potential odours are estimated to be confined within the boundaries of the landfill, consequently there is no difference in the ranking of sites from an odour standpoint.

Phase 2 Stage 2C - Comparison

The Comparisons of the Air Quality Assessment (January 1985) are described on page 5-2. On an individual basis the sites are ranked as follows:

.../3

Site F-1; Site E-2; Site A-3
Site C-4; Site D-5; Site B-6.

Mitigation measures were incorporated in the assessment. From an air quality standpoint all sites could be made acceptable for landfill operations.

Technical Study Phase Methods and Results Site D and Site F

The methods used for the Halton Region Landfill Technical Study, Air Quality Analysis are described in Section 4.4 (page 4-11 to 4-18) of the air Quality Analysis Site D (August 1986) and Section 4.4 (pages 4-11 to 4-16) of the Air Quality Analysis Site F (August 1986) .

The methods used for both D and F sites were similar but information and data specific to each site were used in the individual evaluations.

Emissions of Total Suspended Particulate matter were made using the empirical equations shown in Table 4.13 of each report. The operations, to which the equations were applied, were based on information taken from the Design and Operations Reports for sites D and F (Hydrology Consultants, 1986) and on the assumption that current general practices would be employed for construction activities.

Emission estimates were made for various stages of the operation of construction and landfilling, using those conditions having the highest potential for creating elevated levels of suspended particulate matter downwind of the site.

The emissions were used in dispersion modelling employing the Industrial Source complex Model for Long and Short Time periods. (U.S. EPA, 1987). The meteorological data required for annual averages estimates were taken from the Lester B. Pearson International Airport meteorological station readings for the Site D estimates and were abstracted from the Hamilton Royal Botanical Garden meteorological station readings for Site F.

The results of these calculations are described on pages 4-16, 4-17 and 4-18 of the Site D report and page 4-15 and 4-16 for the Site F report. They indicate that air quality at neighbouring residences will be within the Ministry of the Environment's regulations and criteria except for periods during the construction of the berm at Site D. For short periods the concentrations, in Bayview Park near Site F and on the first line near Site D, may exceed the Ministry Standard of $100 \mu\text{g}/\text{m}^3$ but those occasions arise only under limited wind speed and directions and D stability conditions.

Emissions of odour have been assessed (pages 4-15, 4-16 and 4-18 for Site D and Pages 4-13 to 4-16 for site F) for exposed raw refuse. The use of soil cover limits the area of exposed refuse and the amount of odours releases so that odours are unlikely to be detected off the property.

Mitigating measures for limiting the emissions of particulate matter have been proposed for both sites. They include the use of paved roads wherever possible, surface treatment of roads, minimizing the amount of soil moved and the use of ground cover.

.../4

Soil cover is considered to be adequate mitigation for limiting odour emissions.

Conclusion of the Air Quality Analysis

The conclusions of the Air quality Analysis are found on pages 5-1 of both reports, with summaries of the predicted impacts listed in Tables 5.1 and 5.2.

Both Sites D and F can be developed into an acceptable landfill operation from an air quality point of view.

Infrequent elevated levels of dust and odour from Site F may impact on the Bayview Park, but limiting activities in the area of the landfill closest to the Park will reduce any impact to acceptable levels.

Mitigative measures could be applied to either site to reduce emissions of total suspended matter even further.

Comparative Analyses - Site D and Site F

Methods and Results

The methodology for the comparative analysis of sites D and F is described in the Walker Wright Young Associates Limited Report - Comparative Analysis of Alternative Sites for Sanitary Landfilling in the Regional Municipality of Halton Site "D" and Site "F" on page 2 of Appendix I.

Existing air quality was characterized through measurements and compiled information from nearby monitoring stations of the Ministry of the Environment. Predicted downwind concentrations from emissions resulting from landfill operations were compared to criteria in Section 3 of the air quality analysis prepared for each site.

Measurements indicate that total suspended particulate (dust) levels are similar at the two sites and dustfall levels are also quite similar. Both fall within the ranges found at rural locations. No odour complaints have been received at the Ministry of Environment and no odours were detected during site visits to both sites.

Predicted impacts at site D may occur during the construction of the berm. Dust levels, comparable to those near a large construction project may be elevated. During operation dust levels are estimated to be below regulated limits.

At site F, construction emissions are low because only a small berm has been proposed. Dust levels are elevated for a brief time when operations are carried on near Bayview Park. Elsewhere they are at acceptable levels. At both sites long term dust levels are low. Off-site odours are not likely to occur.

Conclusions of the Comparison

Predicted air quality impacts are less than those presented in the Stage 2C
.../5

report because better layout and operation procedures information indicates that emissions will be lower. Either site is acceptable from an air quality perspective. Comparison of the sites is described on page 6 and Table 5-3.

Site F would be preferred since a larger berm is not necessary, wind generated dust and litter potential is less, nearby residences are further away than at Site D, and nearby human activity occurs primarily on weekends. While Site F is preferred, Site D would be acceptable from an air quality standpoint since both dust and odour do not exceed standards and criteria.



E. Koczur

WITNESS STATEMENT

of

Paul MacLeod, P.Eng.

Giffels Associates Limited
Consulting Engineers and Architects
30 International Boulevard
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M9W 5P3

In the matter of the Consolidated Hearing for the Environmental Assessment of the Proposed Halton Region Landfill Component of Solid Waste Management.

ROLE AND RESPONSIBILITIES

I am a professional engineer licensed to practice in this province by the Association of Professional Engineers of Ontario. With Giffels, I am a project manager specializing in the transportation and municipal fields. My resume is attached to this statement.

On this project, I was responsible for the assessment of the off-site transportation effects of locating a landfill site. I have been involved from the start of the study, in September 1982, through all phases of the Environmental Assessment project. During this time Giffels was engaged as

a sub-consultant to Walker, Wright, Young Associates Limited. More recently, during the Landfill Technical Study (February 1985 - August 1986), Giffels worked as a consultant directly for Halton Region.

I have written or contributed to numerous study reports throughout this project. My contributions can be found in the following reports:

- o Stage 1: Waste Needs and Systems Analysis - Consolidation (May 1983)
 - author of Section 1.4.4 (Pages 28-30)
 - Appendix E information developed by Giffels
- o Phase 2, Stage 2A: General Overview Analysis - Final Report (October 1983)
 - author of Section A.8 (Pages 21-22)
 - author of Section 8 (Pages 90-93, Tables 7-27)
- o Phase 2, Stage 2B: Selection of Candidate Sites - Consolidation Report and Appendices (April 1984)
 - author of Section 12 (Pages 118-142)
 - Appendix A information developed by Giffels

- supplied travel time data in Appendices J and K
- Appendices L and M prepared by Giffels

- o Phase 2, Stage 2C: Selection of Preferred Site -
Transportation Assessment (June 1985)

- author of report

- o Landfill Technical Study: Site D -
Transportation Analysis (August 1986)

- author of report

- o Landfill Technical Study: Site F -
Transportation Analysis (August 1986)

- author of report

- o Comparative Analysis of Alternative Sites for Sanitary Landfilling in
the Regional Municipality of Halton, Site D and Site F (January 1987)

- Appendix B prepared by Giffels

I also contributed responses to transportation related questions and comments submitted by reviewers of the various reports throughout the project. I also provided transportation input to the development of work programs and to the evaluation of alternatives.

APPROACH TO TRANSPORTATION IMPACT ASSESSMENT

The general approach I took in assessing potential transportation impacts was to identify the most likely routes of travel to be used by haulage vehicles from various locations within Halton Region to alternative disposal locations. These routes were then analyzed to determine their suitability to carry haulage vehicles (notably trucks). This usually involved a field review of all routes and the assessment of numerous factors including adjacent land uses, number of entrances and their types, road standards and conditions and safety aspects.

As the study progressed, more detailed information was developed to describe in detail vehicle arrival characteristics (e.g., times of arrivals, types of vehicles) at the site (Stage 2C and Technical Studies). During the Technical Studies, interviews were conducted with major haulers in Halton to determine haulage practices and trends, confirm haulage routes and to record comments and concerns.

For the transportation assessment, generally two factors were used to evaluate impacts. These were traffic safety, traffic service and operations. Traffic safety considers transportation aspects that would affect the safe operation of both haulage traffic and other road users along identified routes to the site. Traffic service and operations considers transportation aspects that would affect the level of traffic service provided to haulers along these routes. This involved the consideration of items such as travel time and distance, road standards and quality and number of intersections. Generally, evaluations stressed the traffic safety factor.

STUDY METHODS, RESULTS AND CONCLUSIONS

Phase 1: Preparation of Work Program (September to November 1982)

I provided information with respect to transportation criteria to be used in future evaluations during this phase of the study. In addition, I contributed to the preparation of the Phase 2, Stage 1 (Waste Needs and Systems Analysis) Work Program related to transportation.

Phase 2, Stage 1: Waste Needs & Systems Analysis (January to May 1983)**Methods and Results**

I provided input to the siting of components associated with various waste disposal alternatives. Waste centroids developed in earlier studies (Dillon, Proctor and Redfern) were used to approximate the source of waste, or start of haulage, from each area municipality. The likely haulage vehicle route was developed between each centroid and various destination facilities that formed part of alternative waste management systems. The time required to travel each route was then determined.

Appendix E of the Stage 1 - Waste Needs and System Analysis: Consolidation Report (May 1983) summarizes this work with Table 1 presenting the results of the travel time assessment.

In addition to this assessment, I developed a procedure that used thirty waste zones to represent waste sources and distribution throughout Halton Region. This methodology is described in Section 1.4.4 (Pages 28-30) of the above mentioned report.

Phase 2, Stage 2A: General Overview Analysis (April to October 1985)**Methods and Results**

Traffic service and safety aspects related to establishing alternative landfilling areas were assessed. The assessment considered the haulage route changes that are likely to occur throughout Halton's road network resulting from alternative landfill sites. The suitability of an area for landfilling, with respect to transportation, was evaluated by considering the classification and condition of roads used by haulage vehicles and their proximity to alternative landfilling areas.

A waste generation centroid for each of the four area municipalities (for years 1986 and 2001) was determined. Halton was divided into thirty zones or geographic areas, each of which was assessed for its suitability to contain a landfill. A representative haulage route was identified from the centroid of each area municipality to each of the thirty zones. Potential impacts were assessed for each zone by determining how suitable the identified haulage routes were for landfill related traffic.

Impacts were categorized as unacceptable, high, moderate or low. Travel times and distances were calculated along each haulage route. Each route was travelled and reviewed in the field.

In general, zones that were well serviced by provincial highways and other high standard roads were considered to have less potential for negative transportation impacts. A complete outline of the analysis is contained in Section 8 (Pages 90-93, Tables 7-27) of the Phase 2, Stage 2A: General Overview Analysis - Final Report (October 1983). Table 27 contains the results of the impact assessment and indicates the potential transportation impact for each of the thirty zones within Halton Region.

Conclusions

The conclusions of the transportation impact assessment are summarized in Table 27. No zones were considered unacceptable for a landfill site because of transportation. Eleven zones were eliminated from further consideration due to land use considerations identified by other study team members. Eight zones within Halton were considered to have low negative transportation impact potential, eight to have moderate impact potential and the remainder (three) have high impact potential. This information formed part of the overall evaluation and selection of the most suitable areas within Halton to locate a landfill site.

Phase 2, Stage 2B: Selection of Candidate Sites(September 1983 to November 1984)**Methods and Results**

I used the same municipal centroids generated in Stage 2A and determined a likely haulage route between each centroid and each candidate sub-area. These routes were reviewed in the field. Trip distances and travel times were calculated for each route (refer to Appendix 1 of Phase 2, Stage 2B: Selection of Candidate Sites - Consolidation Report, April 1984). A detailed visual inventory of road conditions along each haulage route was completed. The following route characteristics were recorded:

- general road condition (grades, width, adjacent roadside conditions, route continuity, road curvature)
- number of private entrances
- number of railway level crossings
- posted truck and load restrictions
- posted speed limits
- traffic control signage and signals

Road upgrading requirements were determined.

Each candidate sub-area was assessed for potential negative traffic service and safety impacts by evaluating the identified haulage route from each of the four area municipalities. A rating (good, fair, poor, unacceptable) was determined for each route to each candidate sub-area. A Region-wide level of potential impact was determined by combining the individual area municipality ratings and then the candidate sub-areas were ranked in order of this potential impact. This ranking was used in the evaluation and selection of the most suitable sites for landfilling (referred to as candidate sites).

This transportation analysis work is outlined in Section F, Pages 118-142 of the Phase 2, Stage 2B: Selection of Candidate Sites - Consolidation Report (April 1984). Table 20 contains the rating of each sub-area by municipality and Table 21 indicates the overall sub-area ranking.

Conclusions

The conclusions of the transportation evaluation are summarized on Page 142 of the Stage 2B, Consolidation Report (April 1984).

Phase 2, Stage 2C: Selection of Preferred Site (May 1984 to June 1985)**Methods and Results**

For this assessment of six candidate sites (Sites A, B, C, D, E and F), I divided the Region into ten waste zones whose centres were used to represent point sources of waste, (i.e., the locations where haulage trips were assumed to start). Travel routes were identified from these points to each of the six Site Plan Areas. Site entrances were selected at locations that would minimize traffic impacts. Road improvement requirements were assessed for each site. Haulage traffic volumes and arrival characteristics were assessed for existing conditions and these were used as a basis to predict future arrival characteristics (e.g., time of arrivals, type of vehicle). Determination of the number of future arrivals was based on future waste projections; this information was supplied by other study team members. Two basic transportation evaluation factors were considered:

- traffic safety
- traffic service and operations

Field work was completed to assess road conditions in the vicinity of each site. Each site was then analyzed to predict the main transportation effects associated with hauling refuse. General mitigation measures were

assessed to reduce anticipated negative impacts. Meetings were held with school board officials and the Ministry of Transportation and Communications to collect data and discuss concerns. The six sites were ranked (most preferred to least preferred) with respect to Traffic Safety and Traffic Service/Operations.

In general, I considered each Site Plan Area to be accessible via highways and other high standard roads. The exception was Site E which would require the use of local roads for access. Transportation impacts and the evaluation are summarized on Pages 6-1 to 6-11 in the Phase 2, Stage 2C: Selection of Preferred Site - Transportation Assessment Report (June 1985).

Conclusions

Essentially, all sites were considered to be acceptable from a transportation standpoint and the differences with respect to Traffic Safety and Traffic Service/Operations were not significant.

A ranking with respect to both of these factors (most preferred to least preferred) was developed as follows:

Rank	Site
1	D/F
3	A/B/C
6	E

This information was in the overall evaluation of the six candidate sites.

TECHNICAL STUDY PHASE

Site D and F - Methodology

The methodology used in the technical study for Site D and Site F was identical. A detailed outline can be found in the Landfill Technical Study: Transportation Analysis Report (August 1986) for both Sites D and F prepared by Giffels (Pages 8-14). Interviews were conducted with major haulers presently operating within Halton to predict hauler behaviour, travel patterns and general practices and characteristics. The results of the survey are summarized in Appendix B of the above noted reports.

A detailed assessment of vehicle arrival characteristics and trends at the existing Regional landfill site in Burlington was undertaken. This information was used to predict the future traffic arrival characteristics at the new site. In this assessment I used statistics from 1983, 1984 and 1985. The detailed results of the assessment are summarized in Appendix A of the Transportation Technical Study Reports (August 1986).

As in the previous Stage 2C work, a prediction of the number of future vehicle arrivals was based on future waste projections. The arrival and weight characteristics for the three year period (1983 - 1985) were used to develop a relationship between the total weight delivered during the day in a busy month (May) and the total number of vehicle arrivals. It was assumed that this historical vehicle/weight relationship and the general distribution of vehicle types (large trucks, pick-up trucks and vans, cars with trailers, cars) would be similar in the future.

The historical relationship between total number of arrivals and total delivery weight for any day is influenced by many factors, including the existence of transfer and container stations. The transfer station in Georgetown has been in operation continuously throughout the time period analyzed (1983 - 1985) to establish the vehicle/weight relationship, the total daily arrivals and the arrival characteristics for future years at the new landfill site. Not all of the four container stations have been in continuous operation throughout the analysis period.

It was recognized that the future landfill site will be operating within an overall Halton Region waste handling and disposal system. The components of this future system will be selected from numerous alternatives. Some of these components are presently in use (e.g., transfer and container stations) while others, such as an Energy From Waste (EFW) facility will be new. For the purpose of the transportation technical studies, the total waste handling and disposal system in place in Halton during the period 1983 to 1985 was assumed to be representative of any future, overall system. In addition it was assumed that the planned EFW facility would be in operation in 1996.

A traffic counting program was carried out by Halton staff at key intersections. This information was used to assess such traffic aspects as vehicle travel patterns, intersection loadings and pedestrian movements. A summary of the traffic counts can be found in Appendix A of each Transportation Technical Study Report (August 1986).

Haulage routes were identified from each of the ten Halton waste zones to each site in a manner similar to the work in the previous study phase. The routes identified were identical to those developed in the Stage 2C study. A detailed inventory of existing conditions was completed along sections of the main haulage routes to each site. This information was used as the basis for predicting the compatibility of existing roads with haulage vehicles. Interviews were held with local school boards and the Ministry

of Transportation and Communications to collect information and discuss comments and concerns.

Negative transportation impacts (i.e., those resulting from a new landfill site) relate directly to the redistribution throughout Halton of landfill oriented vehicles and the implications of this redistribution. The suitability of utilizing specific road sections that were identified as having potential for containing a significant haulage vehicle component (notably large trucks) was used as the main evaluation criterion. The Site D assessment concentrated on the analysis of Highway 25 and the Site F assessment concentrated on the analysis of Brant Street and the North Service Road. These roads will be the major feeder routes to the sites. A number of indicators were developed for use in evaluating the roadways and to assess their appropriateness to carry haulage vehicles. These were:

- number of haulage vehicles
- background level of traffic
- classification of road
- condition of road
- adjacent land use and number of entrances
- competition with other road users (school buses, pedestrians)

Site D - Results and Conclusions

I chose a day during a period of high numbers of deliveries (May, typically the busiest month) in 1996 to represent the critical condition for the assessment of potential impacts. This year (1996) is the last year before the planned operation of an Energy From Waste facility in Halton.

Presently, about half of all weekday arrivals are large trucks while on Saturdays, less than ten percent of arrivals are trucks. Approximately eighty percent of Saturday arrivals at the existing site are either pick-up trucks, vans or cars. The average number of weekday arrivals is about 260 vehicles (all types) and this is expected to increase to approximately 410 during a busy weekday in 1996. The average number of Saturday arrivals is about 360 vehicles and this is expected to increase to a high of 660 vehicles in 1996. Large truck traffic in 1996, during a weekday, will average about 22 per hour and on Saturday about 6 per hour in a busy month.

The operation of Site D will result in the generation of additional trucks for the haulage of leachate. During 1996, approximately 10 trucks per day (based on 22 m³ capacity trucks) or 1 truck per hour would be required for this purpose.

A detailed discussion of vehicle arrival and weight characteristics can be found in the Site D Transportation Technical Study Report (August 1986), Section 5.1 (Pages 15-29). Detailed statistics are in Appendix A.

Giffels interviewed public works officials of each area municipality and six of the major private haulers operating within Halton. One of the main results of the interviews was that the routes from each waste zone to the existing landfill site are to some extent variable and may change depending on such influences as customer fluctuations, pick-up area variation during the week, driver preference and weather. For example, I identified the main route of travel to the existing site from some areas in Oakville and Milton as the Q.E.W. to Plains Road to Brant Street, north to the North Service Road then west to the site. From the interviews, it was evident that some of these trips will utilize Dundas Street and travel south on Brant Street to the North Service Road.

A detailed summary of the characteristics of major haulers can be found in the Transportation Technical Study Report (August 1986), Section 5.2. A record of each interview is contained in Appendix B.

The main access route to Site D will be Highway 25. Between the Q.E.W. and Britannia Road there are approximately 130 entrances, most to rural residences and farms. There are eight intersections of which three have traffic signals. There are three public and three separate school bus routes on this section of Highway 25 which contain buses that stop to collect and drop off students. Other school buses also utilize Highway 25 during the day. Other potential truck traffic conflicts may exist at areas such as the hamlet of Palermo and with the mix of high speed through

traffic and with agricultural traffic. In addition, approximately twenty percent of arrivals will access Site D from the north travelling through built-up areas in Milton. Refer to Section 5.4 (Pages 51-67) of the Transportaton Technical Study Report (August 1986) for a detailed discussion of haulage traffic impacts.

The impact of haulage vehicles on road safety along Highway 25 is considered low due to a combination of good existing road standards and a relatively low landfill component in the overall traffic stream (additional large haulage trucks will be less than four percent of total traffic). Widening of Highway 25 at the Site D entrance should eliminate conflicts between turning vehicles and through traffic.

Refer to Section 6.0 (Pages 68-72) of the Transportation Technical Study Report (August 1986) for an outline of the conclusions and recommendatons of this study.

Site F - Results and Conclusions

The results and conclusions of the haulage vehicle arrival and weight characteristics analysis as outlined above with Site D are the same as for Site F. For details, refer to Section 5.1 (Pages 15-29) of the Site F Transportation Technical Study (August 1986). The results of the major hauler interviews are also the same (refer to Pages 30-39) and to Appendix B.

The main route for haulage vehicles accessing Site F will be the Q.E.W., with an exit at the new Brant Street interchange (which will be opened in a few years) north on Brant Street to the North Service Road, then west to the site. Some vehicles will use Brant Street between Dundas Street and the North Service Road and potential impacts exist here due to the urban nature of adjacent land uses.

Between Plains Road and Dundas Street on Brant Street, there are approximately 60 access points including 15 intersections of which six have traffic signals. The other accesses are mainly to medium density residential or commercial and office uses.

There are three existing school crossings which have crossing guards. There are no school bus routes for buses picking up or dropping off students on Brant Street but school buses do travel along the road. Refer to Section 5.4 (Pages 49-63) of the Site F Transportaton Technical Study Report (August 1986) for a detailed discussion of haulage traffic impacts.

The overall impact of haulage vehicles using Brant Street north of the North Service Road is considered to be relatively low. The majority of haulage vehicles will access Site F by using Brant Street, only between the Q.E.W. and the North Service Road, a section of road with no adjacent development or entrances.

There will be less than a one percent increase in overall traffic on Brant Street to the north as a result of these large trucks. Therefore, the overall traffic safety impacts associated with Site F are considered to be low. Refer to Section 6.0 (Pages 64 - 67) of the Transportation Technical Study Report - Site F (August 1986) for the conclusions and recommendations of this study.

Comparative Assessment of Sites D and F

I carried out a comparative assessment during the Technical Study Phase to compare Site D and Site F with respect to transportation. The results of this work are summarized in Appendix B of the report Comparative Analysis of Alternative Sites for Sanitary Landfilling in the Regional Municipality of Halton, Site D and Site F (January 1987).

The principal traffic safety consideration associated with each site is the appropriateness of the main routes used by large haulage vehicles to access the site. For Site D, the main route is Highway 25; for Site F, Brant Street and the North Service Road are the main routes for access. There are no major traffic safety concerns on these three roads.

For haulage to Site D, Highway 25 is a high standard road with good stopping sight distances and roadway characteristics. The relatively minor haulage component (less than four percent large trucks in the total traffic

stream) should result in a small reduction in the level of traffic service afforded drivers of Highway 25. General traffic safety should not be affected and increases in vehicular conflicts will be low. Recommended road widening at the Site D entrance should eliminate conflicts between turning vehicles and through traffic. Pedestrian safety in the Milton urban area should not be affected because of the relatively low number of additional haulage vehicles. Traffic impacts related to the Boyne Athletic Facility are considered low. Its entrance is off Britannia Road which has not been identified as a haulage route and truck traffic to Site D will be relatively low during Saturdays, the highest use period of the athletic facility.

The majority of haulage vehicles travelling to Site F will utilize the Q.E.W., Brant Street between the Q.E.W. and the North Service Road, and the North Service Road. These road sections are considered appropriate for haulage vehicles, all being high standard roads with good stopping sight distances and roadway characteristics. With the high levels of background traffic, particularly on Brant Street, and the component of large haulage trucks being less than one percent of the total, the additional landfill bound traffic will result in a small reduction in the level of traffic service. General traffic safety should not be affected and increases in vehicular conflicts will be low. Pedestrian safety on Brant Street between the Q.E.W. and Highway 5 should not be affected because of the relatively low number of haulage trucks and the existence of numerous road crossing

locations (at signalized intersections and school crossings). Traffic impacts on travellers to Bayview Park are considered low. The highest use period for the park is on weekends, when truck traffic to the site is relatively low.

In an attempt to illustrate any differences in potential traffic impacts between Sites D and F, road characteristics along the main feeder routes to each site were compared. These included the following characteristics:

- existing entrances
- adjacent land use
- school crossings
- background traffic
- existing road conditions and standards
- traffic accident history
- pedestrian activity

For Site D, Highway 25 (from the Q.E.W. to Steeles Avenue) contains a total of 245 entrances and 25 intersections (of which nine are signalized). With Site F, the critical road sections along Brant Street and the North Service Road contain a total of 43 entrances and 18 intersections (of which eight are signalized). No significant increases in the number of entrances are anticipated along the North Service Road as a result of planned developments to the north.

Some trucks will have to travel through built-up areas with either site. With Site F, on Brant Street north of the North Service Road, this will occur over a greater distance compared with the Milton trips with Site D. However, on Highway 25 south of Site D, scattered developments exist (e.g., Hamlet of Palermo) through which the majority of haulage vehicles will pass.

Brant Street contains three school crossings but there are no school buses picking-up or discharging students. On Highway 25, there are presently three bus routes for the collecting and dropping off students and five crossings (pedestrian and school) to the north. The peak landfill arrival period does not occur during the periods when most students are travelling to or returning from school. The routing of buses for collecting and dropping off students is variable from year to year, and will change in the future as families move in and out of the area.

Brant Street and the North Service Road have a higher level of background traffic than Highway 25 and will experience a smaller percentage increase in traffic upon the introduction of additional haulage vehicles, creating less of a change from existing conditions than would occur on Highway 25 with Site D.

The number of traffic collisions is significantly higher with the roads associated with Site F than those with Site D. However, the volume of traffic on these roads is considerably greater.

Pedestrian activity is evident on haulage sections associated with both sites; on Brant Street north of the North Service Road with Site F and on Highway 25 in Milton with Site D.

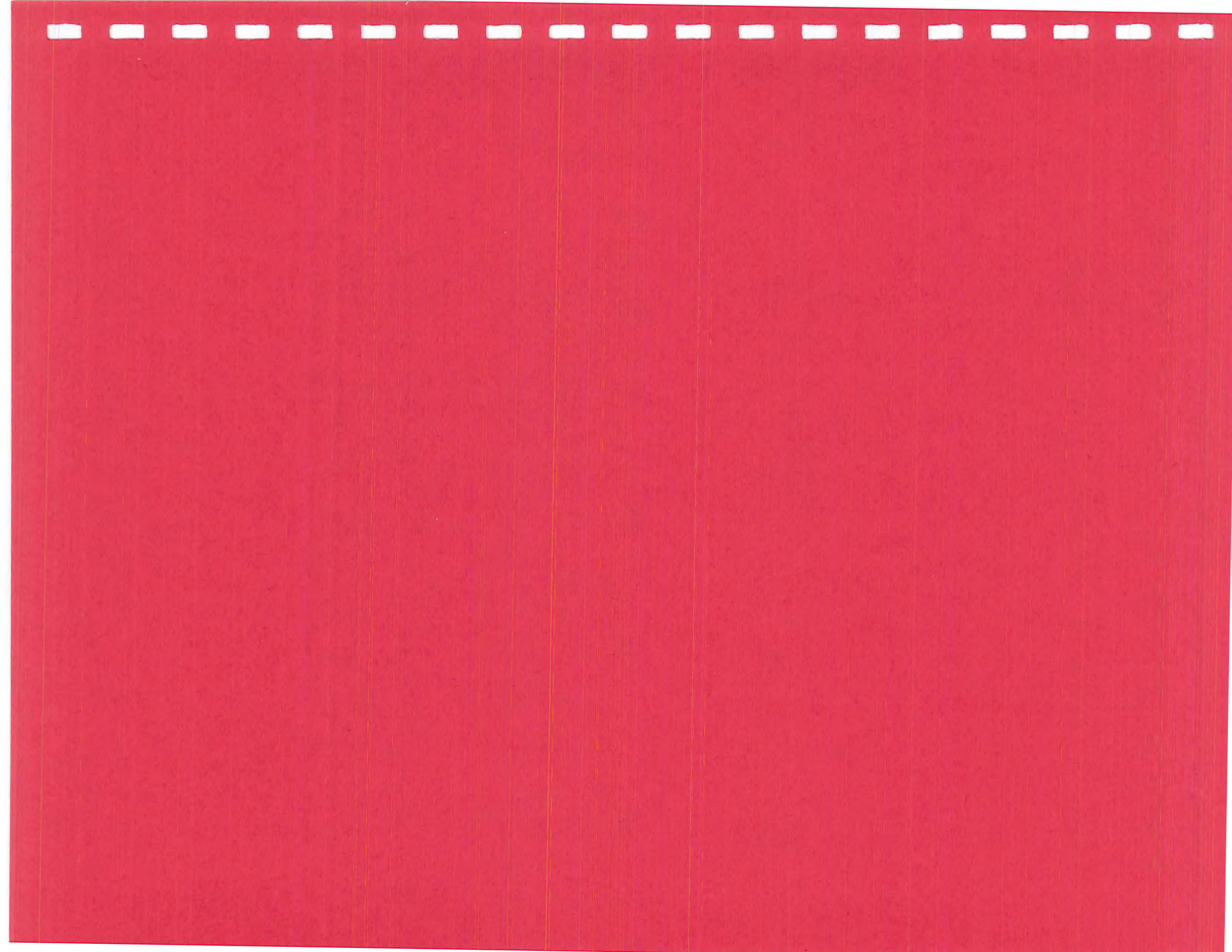
Due to the nature of adjacent land use, the potential for conflict with slower moving agricultural vehicles is greater for Site D.

In light of the fact that no major significant negative transportation and traffic safety impacts have been identified with either site, and that on balance there is no clear, overall advantage with either site over the other, there is no site preference with respect to transportation. Site D and Site F are considered of equal merit.

Witness statement prepared by:


Paul MacLeod, P.Eng.

PM:sgr/S:51(62)



HALTON LANDFILL STUDY
TRANSPORTATION ASSESSMENT

TRANSFER STATION AND CONTAINER FACILITIES

REVIEW OF VEHICLE CHARACTERISTICS

Giffels Associates Limited

March 1987

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- 3. Tonnes Removed Per Month (Georgetown Transfer Station)
- 4. Total Vehicles Per Month (Halton Container Stations)
- 5. Average Number of Vehicles Per Day (Halton Container Stations)

EXHIBIT 1 - Transfer Station and Container Facilities

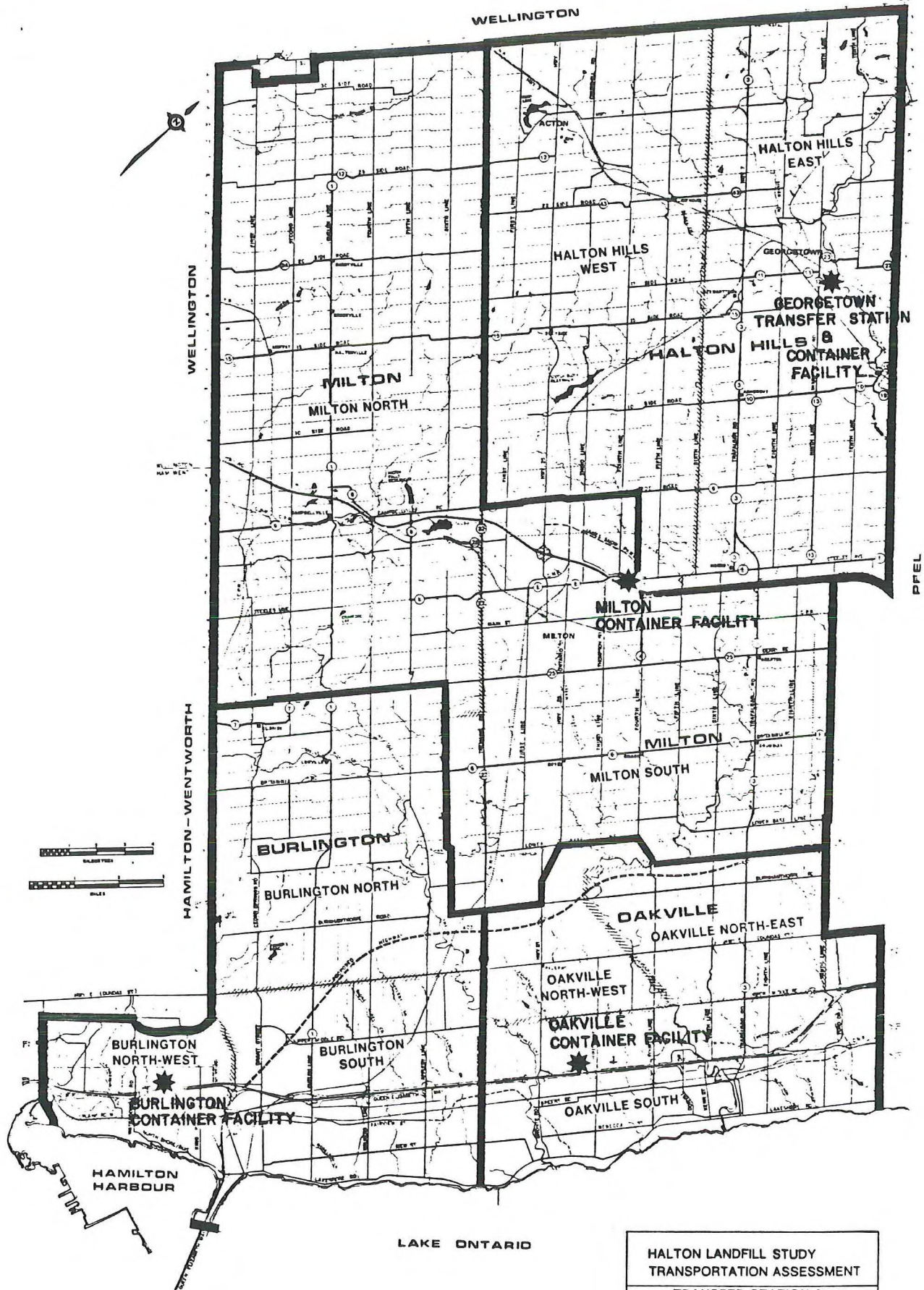
A. BACKGROUND

The transportation component of Halton's recently completed landfill studies relied on statistics from the existing Regional landfill site in Burlington to predict future arrival characteristics. These statistics covered the period from 1983 to 1985. During this period, the transfer station in Georgetown had been in continuous operation as had container facilities in Burlington and Georgetown. During 1984, additional container facilities were established by Halton in Oakville and Milton.

An inherent assumption in using the existing arrival characteristics to represent future year characteristics is that either similar Region wide system components (such as container facilities) will be operating in the future or that other system components will be in place that produce similar vehicular movement patterns or characteristics.

A recommendation from the transportation assessment was that Halton should consider establishing permanent container facilities in the Region as part of the future waste handling and disposal system. This was in recognition of their role in reducing vehicular traffic at the landfill site and discouraging localized litter and roadside dumping as well as other benefits. Continued operation of the Georgetown transfer station does not offer any significant advantages to traffic safety.

The purpose of this review is to present an overview of vehicle characteristics at the transfer station and container facilities in order to provide background on these recommendations and on the assumption in the earlier transportation work related to use of existing statistics to predict future arrival characteristics.



**HALTON LANDFILL STUDY
TRANSPORTATION ASSESSMENT**

**TRANSFER STATION &
CONTAINER FACILITIES**

Griffith Associates Limited
Consulting Engineers and Architects

Exhibit No. 1

B. DESCRIPTION OF THE EXISTING SYSTEM

Presently, Halton Region sponsors four temporary container facilities, one in each area municipality. The Burlington facility has been in operation since January 1983 at the existing landfill site. The container facility in Halton Hills was established in November 1979 at the closed Georgetown landfill site and this was augmented with a privately run open air transfer station (Leferink Disposals Limited) in 1983 at the same site. In 1984, container facilities were set up by Halton in Oakville (on the North Service Road between Highway 25 and Third Line) and in Milton (on Steeles Avenue west of the James Snow Parkway).

For locations, refer to Exhibit 1.

All container facilities in Halton are temporary. They accept small loads (up to 150 kg.) of residential wastes from private citizens. In addition, glass, old newsprint and scrap metal are accepted for recycling.

HALTON LANDFILL STUDY
TRANSPORTATION ASSESSMENT

TABLE 1
TRAFFIC CHARACTERISTICS-GEORGETOWN TRANSFER STATION
TOTAL VEHICLES PER MONTH

YEAR	MONTH	VEHICLES DELIVERING WASTE TO TRANSFER STATION					VEHICLES REMOVING WASTE FROM STATION	
		A	B	C	D	E	TOTAL	(TOTAL NUMBER)
1984	MARCH		208	144	47	1966	2365	109
	APRIL		207	190	106	2269	2772	135
	MAY	45	232	216	107	2294	2894	150
	JUNE	45	221	193	133	2367	2959	128
	JULY	56	208	170	133	2652	3219	122
	AUG.	60	268	182	137	3056	3703	115
	SEPT.	60	237	142	111	2935	3485	107
	OCT.	56	261	190	120	2767	3394	120
	NOV.	38	251	168	115	2354	2926	108
1984	DEC.	33	228	152	86	2268	2772	97
1985	JAN.	33	256	157	74	2371	2891	111
	FEB.	27	223	114	72	2092	2528	108
	MARCH	45	279	134	98	2700	3256	130
	APRIL	72	258	196	175	2329	3530	134
	MAY	86	313	222	164	2686	3471	164
	JUNE	86	293	168	155	3326	4028	164
	JULY	33	393	182	133	3488	4274	163
	AUG.	79	355	168	103	3751	4456	153
	SEPT.	71	332	151	87	3260	3901	147
	OCT.	80	378	178	113	3117	3866	177
	NOV.	63	361	162	80	3019	3685	168
1985	DEC.	60	348	155	41	2947	3551	159
1986	JAN.	69	358	160	48	2955	3590	167
	FEB.	47	318	135	43	2465	3008	147
	MARCH	65	356	138	23	3441	4023	171
	APRIL	97	407	204	143	4024	4875	234
	MAY					4203		217
	JUNE	93	378	171	112	4217	4971	183
	JULY	129	366	166	394	4459	5514	198
	AUG.	124	353	152	91	4404	5124	198
	SEPT.	107	297	162	120	3949	4635	161
	OCT.	110	291	203	168	4209	4981	195
	NOV.	96	284	155	126	3939	4600	163
1986	DEC.	89	291	151	91	4065	4687	141

NOTES

- A. TRUCKS FROM THE MILTON CONTAINER STATION (LEFERINK VEHICLES)
- B. OTHER LEFERINK TRUCKS
- C. HALTON HILLS COLLECTION VEHICLES
- D. OTHER PAYING VEHICLES
- E. NON-PAYING VEHICLES (< 150 KG)

HALTON LANDFILL STUDY TRANSPORTATION ASSESSMENT

TABLE 2
TRAFFIC CHARACTERISTICS-GEORGETOWN TRANSFER STATION
AVERAGE NUMBER OF VEHICLES PER DAY

YEAR	MONTH	VEHICLES DELIVERING WASTE TO TRANSFER STATION					VEHICLES REMOVING WASTE FROM STATION	
		A	B	C	D	E	TOTAL	(TOTAL NUMBER)
1984	MARCH		8	5	2	73	88	4
	APRIL		8	8	4	91	111	5
	MAY	2	9	8	4	85	108	6
	JUNE	2	9	7	5	91	114	5
	JULY	2	8	7	5	102	124	5
	AUG.	2	10	7	5	113	137	4
	SEPT.	2	9	6	4	117	138	4
	OCT.	2	10	7	4	102	125	4
	NOV.	1	10	6	4	91	112	4
1984	DEC.	2	9	6	3	91	111	4
1985	JAN.	1	10	6	3	91	111	4
	FEB.	1	9	5	3	87	105	5
	MARCH	2	11	5	4	104	126	5
	APRIL	3	10	8	7	109	137	5
	MAY	3	12	8	6	99	128	6
	JUNE	3	12	7	6	133	161	7
	JULY	3	14	7	5	129	158	6
	AUG.	3	13	6	4	139	165	6
	SEPT.	3	13	6	3	130	155	6
	OCT.	3	14	7	4	115	143	7
	NOV.	2	14	6	3	116	141	7
1985	DEC.	2	14	6	2	118	142	6
1986	JAN.	3	14	6	2	114	139	6
	FEB.	2	13	6	2	103	126	6
	MARCH	3	14	5	1	132	155	7
	APRIL	4	16	8	6	155	189	9
	MAY					161		8
	JUNE	4	15	7	4	169	199	7
	JULY	5	14	6	15	165	205	7
	AUG.	5	14	6	4	169	198	8
	SEPT.	4	11	6	5	152	178	6
	OCT.	4	11	8	6	156	185	7
	NOV.	4	11	6	5	158	184	7
1986	DEC.	3	11	6	4	156	180	5

NOTES

- A. TRUCKS FROM THE MILTON CONTAINER STATION (LEFERINK VEHICLES)
- B. OTHER LEFERINK TRUCKS
- C. HALTON HILLS COLLECTION VEHICLES
- D. OTHER PAYING VEHICLES
- E. NON-PAYING VEHICLES (< 150 KG)

HALTON LANDFILL STUDY
TRANSPORTATION ASSESSMENT

TABLE 3
WEIGHT CHARACTERISTICS-GEORGETOWN TRANSFER STATION
TONNES REMOVED PER MONTH

YEAR MONTH		TOTAL WEIGHT (TONNE) REMOVED FROM STATION DESTINATION			
		A	B	C	TOTAL
1984	MARCH	1243	0	142	1390
	APRIL	1660	0	157	1817
	MAY	2043	0	129	2172
	JUNE	1351	0	140	1991
	JULY	1761	0	145	1906
	AUG.	1855	0	179	2034
	SEPT.	1651	0	211	1862
	OCT.	1869	0	326	2195
	NOV.	1699	0	249	1948
1984	DEC.	1359	0	205	1564
1985	JAN.	1475	0	226	1701
	FEB.	1345	0	178	1523
	MARCH	1480	273	185	1938
	APRIL	1913	0	175	2093
	MAY	2293	0	231	2524
	JUNE	1976	0	297	2273
	JULY	2258	0	205	2463
	AUG.	2090	0	331	2421
	SEPT.	1866	0	363	2229
	OCT.	837	1229	469	2535
	NOV.	632	1330	438	2400
1985	DEC.	386	1242	361	1989
1986	JAN.	658	1102	356	2116
	FEB.	723	791	310	1824
	MARCH	1060	792	333	2185
	APRIL	1415	880	526	2821
	MAY	1032	1252	405	2689
	JUNE	1089	1057	454	2600
	JULY	1922	406	368	2696
	AUG.	978	1115	352	2445
	SEPT.	796	1061	506	2363
	OCT.	498	1489	530	2517
	NOV.	401	1194	435	2030
1986	DEC.	337	1030	339	1756

NOTES

- A. TO THE EXISTING REGIONAL LANDFILL SITE IN BURLINGTON
- B. EXPORT TO NEW YORK
- C. OTHER EXPORT

HALTON LANDFILL STUDY
TRANSPORTATION ASSESSMENT

TABLE 5
TRAFFIC CHARACTERISTICS-HALTON REGION CONTAINER FACILITIES
AVERAGE NUMBER OF VEHICLES PER DAY

		VEHICLES DELIVERING WASTE TO CONTAINER STATION PER DAY				
YEAR	MONTH	BURLINGTON	GEORGETOWN	MILTON	OAKVILLE	TOTAL
1985	JAN.	45	91	38	9	183
	FEB.	49	87	37	14	187
	MARCH	91	104	54	30	279
	APRIL	120	109	71	60	360
	MAY	117	99	89	64	369
	JUNE	110	133	100	82	425
	JULY	95	129	92	83	399
	AUG.	102	139	104	82	427
	SEPT.	78	130	80	72	360
	OCT.	59	115	91	69	334
	NOV.	50	116	78	51	295
1985	DEC.	44	118	74	39	275
1986	JAN.	34	114	73	37	258
	FEB.	23	103	72	29	227
	MARCH	65	132	89	50	336
	APRIL	79	155	106	83	423
	MAY	90	156	139	90	475
	JUNE	97	169	131	102	499
	JULY	95	165	148	115	523
	AUG.	112	169	174	104	559
	SEPT.	113	152	149	90	504
	OCT.	81	156	141	83	461
	NOV.	74	158	132	62	426
1986	DEC.	52	156	121	44	373

C. TRAFFIC CHARACTERISTICS

Tables 1 through 5 summarize vehicle arrival and departure characteristics at the existing transfer station and the four container stations. The following information should be noted:

1. The use of container station facilities has been increasing substantially over the period of record (30-40% increase in vehicles) with the highest use being in Georgetown and Milton.
2. An assessment of the busiest month in the two years of record indicated that approximately 14,500 (August 1986) small vehicles delivered waste to all four container stations. This represents approximately 560 vehicles per day, a substantial volume.
3. Without a transfer station operating in Georgetown, a maximum of 35 trucks that now deliver waste locally (during a busy weekday) would have to travel to Burlington or alternative sites.

D. CONCLUSIONS1. Georgetown Transfer Station

In previous work (Landfill Technical Study, Transportation Analysis - Sites D & F - August 1986), it was predicted that during a busy weekday in 1996, approximately 193 large trucks would be delivering waste to the new landfill site (Table E). This represents an anticipated increase in present truck deliveries of approximately 27%. If large truck traffic at the Georgetown Transfer Station were to experience a similar growth rate, a maximum of approximately 44 trucks would utilize the site daily in 1996. If this facility were not in place, these trucks would deposit their waste at the new landfill site and at alternative locations.

In the previous work completed during the Technical Studies, it was determined that the Halton Hills large truck component of the total large truck weekday deliveries in 1996 would be approximately 23. Without this transfer station, an additional maximum of approximately 21 trucks could travel to the new landfill site during a busy weekday. This would result in an increase of approximately 2-3 trucks during the busiest hour of the day (mid-morning period).

The analysis of impacts and the conclusions reached in the previous studies related to traffic safety would not be affected by this

relatively small increase in large truck traffic. Low impact levels would still be anticipated.

2. Container Facilities

The number of small vehicles (pickup trucks, vans, cars with trailers and cars) presently using Halton's four container facilities is substantial. Approximately 560 such vehicles deposited waste at these facilities per day during August of 1986. It is likely that usage will continue to increase. Eliminating container stations and requiring travel directly to the landfill site would considerably increase the numbers of small landfill bound vehicles. Of the 560 vehicles, approximately 112 were using the Burlington container facility. Therefore, without the other three container facilities, an additional maximum of 448 vehicles could be utilizing the facility.

Due to the effectiveness of the existing container facilities in reducing vehicular traffic travelling to the landfill site, their use should be continued as recommended in the Technical Study Transportation Analysis Reports (August 1986) for Sites D & F. The conclusions reached in these previous studies assumed facilities of this type in place in the future. If they are not part of Halton's future waste handling and disposal system, local traffic service and safety aspects associated with landfilling would be affected.

E. RECOMMENDATIONS

It is recommended that Halton continue its policy of providing container facilities in each area municipality. Continued operation of the Georgetown transfer station does not offer any significant advantage from the standpoint of traffic safety. Its role in Halton's future waste handling and disposal system should be reassessed.

PM:sgr/S:31(62)

Witness Statement
of
John E. Coulter, B.A.Sc., P.Eng.

Barman Coulter Swallow Assoc.,
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In the matter of the Consolidated Hearing for the
Environmental Assessment of the Proposed Halton Region
Landfill Component of Solid Waste Management

Role and Responsibilities

I am a Professional Engineer, registered in the Province of Ontario, practising in the field of acoustics, vibration and noise control for the past 15 years. I am a partner in the partnership of Barman Coulter Swallow Associates and have been in private consulting practise for the past 9 years.

I was responsible for preparing the the noise impact assessments for Phase 2, Stage 2C, and the Landfill Technical Study phases of the Halton Region Landfill Component of Solid Waste Management Environmental Assessment. Barman Coulter Swallow Assoc. was engaged as a subconsultant to Walker Wright Young and Associates for the Phase 2, Stage 2C study component, and as a consultant to the Regional Municipality of Halton for the Technical Study component of the Environmental Assessment.

Four reports have been prepared by Barman Coulter Swallow Associates with myself acting as project manager:

1. Phase 2 Stage 2C Noise Assessment (June 1985)
2. Halton Region Landfill Technical Study Noise Analysis
Site D Schedule J-D September 11, 1986
3. Halton Region Landfill Technical Study Noise Analysis
Site F Schedule J-F

4. Comparative Analysis of Alternative Sites for Sanitary Landfilling in the Regional Municipality of Halton Site "D" and Site "F" Appendix H Noise Impact Analysis Comparison Site F vs. Site D, January 21, 1987

The involvement of Barman Coulter Swallow dates from June 1984 for the Phase 2, Stage 2C work and from August 15, 1985 for the Landfill Technical Study portion of the project.

Methods for the Assessment of Noise Impact

The noise impact assessment was carried out as two separate assessments in each case: (1) one for the area immediately surrounding the proposed landfill sites, and (2) one for routes used for access to the sites by landfill traffic. For the immediate area of the site, I used the criterion of the Ministry of the Environment (55 dB Leq worst case sound level at the residential receptors) for the assessment of landfill noise as a primary measure of impact, and the comparison of the landfill noise to the background noise as is the usual manner for most environmental noise assessment work as a secondary measure. [The number and location of the various noise sources on the landfill site is based on the information supplied by the site design consultant.]

what was this info?

For the traffic noise impact I considered the increment in roadway sound levels caused by the traffic using the landfill site. [The traffic noise projections are based on information supplied by the project traffic consultant.]

disclaimers

The noise of a landfill operation fluctuates greatly as the active filling location moves over the relatively large area of the site and also varies in elevation from well below to well above grade. The Ministry of the Environment assessment criterion is applied on the basis of worst case noise occurrences which correspond to times when the equipment is operating close to neighbours at elevations that expose the listener as directly as can occur. While this method of assessment is useful in the setting of criteria, it does limit the noise review to only a relatively short period of the landfill site's long term noise output. To assist in the overall understanding of the nature of the landfill sound, I have added acoustical descriptions of the landfill operations as they progress over the long term to our Technical Study Phase report material. In some cases, it is the long term exposure to the sound, rather than the short term worst case situations, which demonstrates distinct differences among landfill sites under consideration. This information is intended to augment the basic acoustical criteria rather than act as an alternative assessment method.

noise fluctuates greatly

Phase 2 Stage 2C Methods and Results

The methods used in the assessment are outlined in sections 2, 3, and 4 of the Noise Assessment Report (June 1985). These pages outline the ¹acoustical modeling technique and the ²standardized mitigation measures that were used in the evaluation of the landfill site itself. The Traffic noise along the haulage routes is analysed on page 5-1. The models are applied to each of the 6 sites under consideration in Section 6 of the report with a count of the number of residences impacted by the landfill operation noted site by site.

For all 6 potential landfill sites, the traffic noise impact was relatively light and is not a significant factor in ranking the sites.

There is a distinction among the sites as far as operational noise is concerned. At two of the sites, B & C the mitigation requirements were quite severe. These locations were considerably poorer than the others even with mitigation.

At Site F in Burlington, there is the adjacent Bayview Park with some institutional uses on which some noise impact was forecast. Since this condition did not exist at the other sites, direct comparison was not possible. The potential need for mitigation of noise impact on this facility was dealt with in detail in the Technical Study Phase. In the findings of Phase 2 Stage 2C the potential impact on the park was rated as less significant than the impact of the same noise on a residence.

same.
noise
impacted on
park rated
less than
on a
residence

Phase 2, Stage 2C - Conclusions

The sites were ranked on the basis of the number of homes that would receive significant noise impact in and are shown in Section 7 of the Noise Assessment (June 1985). The order of ranking reflects the number of residents in the immediate vicinity of each site and their setback from the property line of the proposed landfill sites. The ranking order from least impact to greatest is given in the report as F, A, E, D, C, and B.

Technical Study Phase Methods and Results

The methods used and models of the Technical Study Phase (August 1986) are an extension in detail of those used in Stage 2C of Phase 2. The possible mitigation methods considered were extended to incorporate site specific

measures which became available to us from other members of the design group. The methods are described in the Two Reports entitled Halton Regional Landfill Technical Study Noise Analysis Site D (or F) September 11, 1986 in Sections 3.

In the case of Site D, the reduced landfill area used for the Technical Study Phase resulted in several residences east of the site having virtually no noise impact. In addition, as a result of the depth of excavation, enough soil was available to construct a large berm along the western property line to shield the residences along First Line. This mitigation brought all of the residences around the site within the Ministry of the Environment's noise criterion for landfill sites except for the 2 month period in which the berm was erected close to the residences along the First Line West and a similar period while the berm was disassembled for use as final cover after the landfill is completed. We have recommended the berm as the mitigation method of choice for this application.

The landfill traffic noise for Site D did not add sufficient noise to the background traffic noise to warrant mitigation.

For Site F, I found that the setbacks between the landfill and the nearest residences were sufficient that at the closest approach of the filling area to these homes to the north of the Site, the landfill noise would equal the Ministry of The Environment criterion for landfill noise. The institutional part of the Bayview Park to the east which includes facilities for horse shows was evaluated in detail. I was not concerned that the sound levels would interfere with the individual riders or the animals, but rather about the possibility that spectators would, after an hour or two, find the effort in raising their voices above the landfill noise to be objectionable. An analysis of the number and duration of times when such interference might occur indicated that there were only about eight days over the life of the proposed landfill site when the situation might be significant. At that rate I considered the noise impact of the landfilling on the horse ring to be minimal.

*how did
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this.*

The increment in traffic noise due to the landfill traffic is negligible at Site F due to the already high sound levels generated by traffic on the adjacent Highway # 403.

In comparing the noise impact of the two sites I noted that the sound level along the western property line of Site D will rise to the Ministry of the Environment criterion regularly over the lifetime of the site, affecting the homes remaining there. At Site F on the other hand, the sound levels at the nearest homes will start out at or just below

*how
happen?*

the 55 dB Leq MOE criterion for the first 2 years of operation, and then decrease below the background traffic noise by approximately the 4th year and cease to have any impact thereafter.

} how?

Conclusions of The Technical Studies

It was my conclusion that both Sites F and D could be operated within the noise criterion of the Ministry of the Environment; Site F with little mitigation of any kind, and Site D by the use of a berm of excavated material available from normal operations of the site.

Comparative Evaluation Between Site F and Site D

In comparing the two potential sites in Appendix H of the Comparative Analysis of Alternative Sites for Sanitary Landfilling in the Regional Municipality of Halton Site "D" and Site "F" of January 1987, I have concluded that the Technical Study findings support the conclusion of the Phase 2 Stge 2C report, that Site F is the preferable location for landfill from a noise impact point of view.



J.E. Coulter, B.A.Sc., P.Eng.

WITNESS STATEMENT OF
MYRA SCHIFF, PH.D.

MYRA SCHIFF CONSULTANTS LIMITED
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In the matter of a Consolidated Hearing
for the Environmental Assessment of the proposed
Halton Regional Landfill

1. Role and Responsibilities

I have a Ph.D. in psychology and have worked in the field of behavioural implications of environmental decision-making for the past seventeen years. I am the President of Myra Schiff Consultants Limited.

I was responsible for completing the social impact assessment for Phase 2, Stage 2B and for designing and completing the social impact assessment in Phase 2, Stage 2C of the Halton Region Landfill Component of Solid Waste Management Environmental Assessment. My firm was engaged as a subconsultant to Walker Wright Young Associates Limited for these two components of Phase 2 work.

In Phase 2, Stage 2B I provided information to Walker Wright Young Associates Limited which was included in:

Consolidation Report, Phase 2, Stage 2B, Selection of Candidate Sites, pp. 95 - 103.

During Phase 2, Stage 2C I produced two reports

1. Social Impact Assessment, Final Technical Report No. 5, Phase 2, Stage 2C, Selection of Preferred Site
2. Interim Report on Public Concerns and Issues, Phase 2, Stage 2C, Selection of Preferred Site

During this phase I also participated in discussions which led to the production of

Review and Supplement to Stage 2B, Selection of Candidate Sites. Final Report (See Section 2.2.3, through iii,c for a summary of my contribution).

As well, I wrote a letter reviewing the implications of the Technical Studies and updated information on population impacts for a comparative analysis study conducted by Walker, Wright, Young Associates Limited.

My involvement with the Environmental Assessment dated from November 1983 for the Phase 2 work.

2. Approach to Social Impact Assessment

Social Impact assessment may be defined as the systematic assessment of those impacts of an undertaking which may have social consequences.

Several principles have guided the approach to social impact assessment used in this study:

- **Results should be quantifiable.** Wherever possible the measures used should be in numerical form.
- **The measures should be relative and comparative.** The use of quantitative data allows for measures at different sites to be ordered so that sites can be compared with each other.
- **A multi-factor approach should be used.** Several different measures should be used to assess social impact. In this study, for example, measures of population impact included a factor for dislocation for people living on site, a factor for disruption for residents in the surrounding area, and a factor for the emotional impact for residents on site and in the study

area. As well, many factors were made up of a series of sub-factors. The factor for dislocation, for example, included the number of people on site, the number of households on site, the number of households with more than 4 people, the number of children 16 and under, as well as other sub-factors.

- **The measures should consider impacts at various levels.** In this study, measures included impacts on individuals and households, as outlined above, as well as measures of impact on the community, in the form of an assessment of the impact of a landfill on community-serving facilities.
- **The measures should be responsive to residents' concerns.** Some factors used in this assessment (most notably social equity and emotional impact) were developed in response to issues raised by residents as part of the public participation program.

3. Phase 2, Stage 2B, Selection of Candidate Sites Methods and Results

The assessment of social impacts in Stage 2B involved identifying and mapping community-serving agencies, reviewing population densities using maps provided to me by Walker, Wright, Young Associates Limited, and visiting each of the candidate sub-areas to note any special features which should be considered in assessing the social impact of a possible landfill. Candidate sub-areas were ranked as low, medium, high, and severe impact areas based on these factors.

The results were discussed at meetings of the consulting team held to select candidate areas and the results incorporated into the final report of this component:

Consolidation Report, Phase 2, Stage 2B, Selection of
Candidate Sites, pp. 95 - 103

Of the 55 candidate sub-areas, 21 were rated low, 19 were rated moderate, 10 were rated high, and 5 were rated severe.

During this stage, I also participated in determining the study area boundaries for the six candidate sub-areas which were carried forth into Stage 2C as candidate sites.

4. Phase 2, Stage 2B, Selection of Candidate Sites
Conclusions

Any of the sub-areas rated low or moderate on social impact in this stage was acceptable for further consideration as a candidate site.

5. Phase 2, Stage 2C, Selection of Preferred Site
Methods and Results

During this stage I participated in discussions which led to developing the boundaries for the site plan areas, and was responsible for assessing three of seven evaluation factors which comprise the social impact.

The methods used to assess these three factors are described on pages 2-1 to 2-6, and on page 4-1 of Social Impact Assessment, Final Technical Report No. 5, Phase 2, Stage 2C, Selection of Preferred Site.

Face to face interviews were held with individuals responsible for each of the community-serving facilities which might be affected by landfilling to obtain their concerns about the impact of a landfill on their facility; I reviewed and revised this following the identification of mitigation measures at each site.

As well, questionnaires were sent to all households located on a candidate site or in the study area, using the Region's assessment list to identify appropriate households. A follow-up telephone survey was conducted with individuals who had not completed the original questionnaire.

Seven major evaluation factors were considered in Phase 2, Stage 2C under the Social Environment. These are:

- Population Impacts with five sub-factors:
 - . Dislocation of households and residents on site
 - . Disruption of households and residents in the study area near the landfill
 - . Emotional Impacts
 - . Disruption of an established community
 - . Disruption of unique and special population groups
- Social Equity
- Community Facilities
- Airborne Contaminants
- Noise
- Visual Impact
- Land Use Compatibility

I was responsible for assessing the first three factors, which are addressed in this statement. Other consultants were responsible for determining the impacts of airborne contaminants, noise, visual impact and land use compatibility.

Their reports are:

1. Final Technical Report No. 6, Phase 2, Stage 2C, Selection of Preferred Site, Air Quality Assessment, prepared by Senes Consultants Limited
2. Final Technical Report No. 9, Phase 2, Stage 2C, Selection of Preferred Site, Noise Assessment, prepared by Barman, Coulter, Swallow Associates

3. Final Technical Report No. 10. Phase 2. Stage 2C. Selection of Preferred Site. Visual Assessment. prepared by The Landplan Collaborative Ltd.
4. Final Technical Report No. 12. Phase 2. Stage 2C. Selection of Preferred Site. Land Use and Planning Assessment prepared by Walker Wright Young Associates Limited

A summary of the ratings on Population Impacts may be found on page 2-29 of Final Technical Report No. 5. Phase 2. Stage 2C. Selection of Preferred Site. Social Impact Assessment.

Sites A, B and C

Site A had 11 people in 3 households living on site; 2 of these were 66 or over and 2 were children 16 or younger. There were 246 people living in 75 households in the study area for this site.

At Site B, 32 people in 11 households were living on site, including 4 who were 66 or older and 1 child who was 16 or younger. There were 205 people in 59 households living in the study area.

At Site C, there were 31 people in 8 households living on site, including 1 person over 65 and 10 children aged 16 or younger. The study area contained 272 people in 83 households.

With respect to social equity, these three sites are all located near a former landfill, and are located in a rural area which does not benefit from garbage collection.

With mitigation in place, there were no identified impacts of a landfill on community serving facilities at any of these three sites.

Site D

There were 10 people living in 3 households on site; 2 of these were people over age 65. There were 222 people in 69 households in the study area, 36 of which were children under 16.

Site D would be visible from the Milton District Hospital; although the view can be screened, it would be some time before the screening were effective if average sized plant material were used. This factor warranted concern, since the prospect of looking over a landfill site from a hospital room would not be conducive to patient morale, and might therefore have an indirect effect on speed of recovery.

With respect to Social Equity, Site D is located in a rural area of Milton and residents in the area adjacent to the site do not benefit from municipal garbage collection. The town as a whole generates 7% of the Region's waste stream.

Site E

There were 7 people, living in 3 households on this site; 2 of these were over 65 years of age, and one of them was 16 or younger. There were 95 people in 31 households in the study area, 23 of whom were children under 16.

The social equity issues relevant to this site are the same as those mentioned for Site D.

Site E would be visible from the Milton District Hospital, a factor which was felt to warrant concern.

Site F

At Site F there are no households on site and 39 people living in 14 households in the study area around the site.

With respect to community serving facilities at Site F, it was recommended on the basis of information from the noise consultant, that the horse ring at Bayview Park be moved to another location to mitigate the noise impact. However, there still remained the potential impact of occasional noise, dust, odour and litter on the park which was to be developed as the after-use for the existing landfill.

With respect to Social Equity, lands on either side of Site F have served or are now serving as a landfill. Bayview Park, to the east of Site F, operated as a municipal landfill for Burlington between 1960 and 1972. The land west of Site F has operated as a municipal landfill since 1972. It became a regional landfill in 1974, accepting waste from Burlington and from Milton in 1980. In December 1982, it became the Region's only landfill site.

6. Stage 2, Phase 2C, Selection of Preferred Site **Conclusions**

The conclusions are to be found on page 5-1 of Final Technical Report No. 5, Phase 2, Stage 2C, Selection of Preferred Site, Social Impact Assessment.

Sites A, B and C

These three sites were the least preferred from the point of view of Population Impact and each of them was rated High overall on this factor.

These three sites were all rated low with respect to Impact on community-serving facilities.

Site D

Site D was rated moderate - high with respect to Population Impacts, and was ranked as the third most preferred site on this factor. It was rated low-^{moderate}~~moderate~~ on Impact on community serving facilities, and was tied for second in ranking, with three sites tied for first rank.

Site E

The site was rated low-moderate on Population Impact, and was the second most preferred site with respect to this factor. It was rated moderate-high on the factor for Impact on community serving facilities.

Site F

Site F was rated low - moderate with respect to Population Impact, and was ranked as the most preferred site on this factor. It was rated low-moderate on Impact on community serving facilities, tied with Site D for its ranking.

It was not possible to rate or rank the sites on Social Equity, since all sites were unique on this factor, and each had a claim on it.

This information was communicated to Walker, Wright, Young Associates Limited to be used in the selection of the preferred site/sites.

7. Technical Study Phase

I did not prepare any reports during this phase. However, I did have discussions with, and reviewed reports prepared by, other consultants during this stage to determine any changes to the social impact which may have occurred as a result of their work.

Halton Region Landfill Technical Studies:

1. Design and Operations Report, for Site D and Site F, prepared by Trow Hydrology Consultants;
2. Air Quality Analysis for Site D and Site F, prepared by Senes Consultants Limited;
3. Noise Analysis for Site D and Site F, prepared by Barman, Coulter, Swallow Associates;
4. Visual Analysis for Site D and Site F, prepared by The Landplan Collaborative Limited.

As well, I have updated data with respect to residents living on site to reflect changes in these households and have prepared a letter about the changes to assist in the preparation of a comparative analysis by Walker Wright Young Associates Limited.

Site D

At Site D fourteen people, living in four households, would have to move if a landfill were located at this site. There are three children 16 and under living on the site. There are 222 people living in 69 households in the approximately half mile study area surrounding the site.

With respect to the impact on community serving facilities in the vicinity of Site D, further refinement of the visual analysis as part of the Technical Study Phase has determined that it is doubtful if a landfill at Site D would be visible from the hospital. This is a change from the results at the end of Phase 2, Stage 2C, Selection of Preferred Site.

Site F

At Site F, there are no changes with respect to Population Impacts.

Mitigating measures with respect to noise at Site F mean that the original recommendation to relocate the horse ring is no longer

necessary. However, the presence of a landfill at Site F will have some minor effects on the after-use of the existing adjacent regional landfill, which is intended to serve as a park with public open space and links to the Bruce Trail; on a few days each year there will be an impact from dust and litter. As well, there is a concern regarding the visual impact of a landfill on Bayview Park and the horse ring in the park.

8. Technical Study Phase, Conclusions

Site D continues to be rated moderate-high with respect to Population Impacts, and is now rated low-moderate with respect to Impact on community serving facilities.

Site F continues to be rated low-moderate on Population Impacts, and is now rated moderate-high with respect to Impact on community-serving facilities.

Either Site D or Site F would be acceptable for Halton's landfill with respect to population impact and impact on community facilities. Site F is preferred over Site D with respect to Population Impacts, while Site D is preferred over Site F with respect to impact on community-serving facilities. Since the effects on population are more significant and of greater duration than the impact on users of community facilities, it is my opinion that Site F is preferred over Site D as the location of a landfill for Halton Region from the perspective of these two impacts.

**Halton Landfill Consolidated Hearings
Definitions of Terms
Social Impact Report**

Candidate Sites

The six potential landfill sites identified in stage 2B, Selection of Candidate Sites.

**Community Facilities/
Community Serving
Facilities**

Those non-profit facilities (buildings, spaces or institutions) which provide services in the fields of recreation, health, religion, education or research.

**Completion Rate/
Response Rate**

The percent of mailed questionnaires returned; the percent of telephone interviews successfully completed. The over-all completion rate is the combined percentage of completed interviews and returned questionnaires.

Dislocation

Measures used to assess the impact on those individuals and households on site who would be forced to move if the site were chosen as the preferred site.

Disruption

Measures used to assess the impact of possible changes in lifestyle on residents and households living in the study area if the site were chosen as the preferred site.

**Disruption of An
Established Community**

Measures used to assess the possible impacts of a landfill on community stability.

Emotional Impact

Measures used to assess the stresses for residents on-site and in the study area as a result of the landfill selection process and the possibility of living near a landfill.

Household

Refers to a person or group of persons (other than foreign residents) who occupy a private dwelling and do not have a usual place of residence elsewhere in Canada. The number of households equals the number of occupied private dwellings.

**Income From Activities
In The Study Area**

An Index was generated to allow the sites to be rank ordered on the extent to which residents in the study area relied on activities undertaken on their property for a portion of their income.

**Income From Activities
On Site**

An Index was generated to allow the sites to be rank ordered on the extent to which residents on site relied on activities undertaken on site for a portion of their income.

Median

When a list of numbers is placed in numerical order, the median is that value for which there is an equal quantity of numbers greater than and less than it. It divides the distribution of responses in half.

Mitigation Measures

Those measures which can reduce the impact of a landfill.

On-Site

Refers to the site plan area.

Population Impact

The collection of social impacts which will affect people because they live on-site or in the study area.

Site Plan Area

The actual area of landfilling selected within each area of the six candidate sites.

**Special Population
Groups**

Groups with special needs who may be particularly affected by a landfill. These include residents of institutions, people with disabilities, and artists, writers, artisans and craftspeople.

Social Equity

The concept of how fair it is to locate a landfill on a particular site.

Social Impact

Those impacts of an undertaking which may have social consequences.

Social Network

The collection of people who provide friendship and assistance or emotional support to a given individual.

Stigma

A component of emotional impact related to the perceived negative image of a community which contains a landfill.

Study Area

The 0.8 km (0.5 mile) boundary around the original candidate sites.

HALTON LANDFILL CONSOLIDATED HEARINGS

ERRATA - SOCIAL IMPACT REPORT

- p 2 - 1 Paragraph 4, last line should read "on site or
in the study area."
- p 2 - 16 Last paragraph should read "study area
boundary at site F..."
- p 2 - 24 Median length of residence: 0 - 7 = Low
8 - 15 = Moderate
16 - 22 = High