



The Corporation of the
City of Burlington

**LANDFILL CAPACITY
& FEASIBILITY**

**NSP Property and
Adjacent Lands
City of Burlington**

September 1984
Ref. No. 1354

prepared by:
**ECOPLANS LTD.
CONESTOGA-ROVERS & ASSOCIATES LIMITED**

ADDITIONAL MATERIAL FOR CONSIDERATION BY

THE SOLID WASTE MANAGEMENT COMMITTEE AT

ITS MEETING TO BE HELD FRIDAY, SEPTEMBER 7, 1984.



Consulting Engineers

CONESTOGA-ROVERS & ASSOCIATES LIMITED

651 Colby Drive,
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510

August 31, 1984

Reference No. 1354

Mr. Michael H. Boggs,
Chief Administrative Officer
Corporation of the City of Burlington
P.O. Box 5013
426 Brant Street
Burlington, Ontario
L7R 3Z6

Dear Michael:

Re: Report Landfilling Capacity and Feasibility, NSP Property
and Adjacent Lands, City of Burlington

Enclosed are 10 copies of the report entitled "Landfilling Capacity and Feasibility, NSP Property and Adjacent Lands, City of Burlington".

This report was prepared at the request of the City of Burlington and updates aspects of landfilling on the NSP property and adjacent lands (Site F in the Walker Wright Framework).

The report contains two separate sections, Section 1 was prepared by Ecoplans Ltd. and reviews environmental concerns with landfilling on the above mentioned properties, especially the ESA, portion.

Section 2, prepared by Conestoga-Rovers & Associates Limited, deals with estimating practical landfilling capacities and outlining technical and/or operating concerns when landfilling on these holdings.

If you have any questions or comments on the above, please feel free to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES LIMITED


Anthony J. Crutcher, P. Eng.

AJC/mm
Encl.

SECTION 1.0

ENVIRONMENTAL CONCERNS OF LANDFILLING
NATIONAL SEWER PIPE PROPERTY AND ADJACENT LANDS

PREPARED BY: ECOPLANS LTD.

FOR: CITY OF BURLINGTON

September 1984

BURLINGTON: NATIONAL SEWER PIPE SITE

Background

The National Sewer Pipe property west of King Road has been proposed as a potential landfill site by the landowner. The National Sewer Pipe property and adjacent lands are also a candidate area (Site F) currently being evaluated by the Regional Municipality of Halton as part of its search for a new landfill site.

The National Sewer Pipe proposal for landfill on the site anticipates a capacity of 1,760,000 tons (3,520,000 cubic yards). Under this proposal, approximately 24 hectares of the 70 hectare National Sewer Pipe property would be landfilled. The attached figure (Figure 9) taken from the Proctor and Redfern Limited Report, National Sewer Pipe Limited - Environmental Appraisal (March, 1982) shows the extent of the landfill operation proposed by the proponent. The landfill operation is located in the north section of the property.

The Walker Wright Site F includes the National Sewer Pipe property (70 ha), Regional Municipality of Halton property (approximately 4.0 ha) and Azova Investments property (approximately 14 ha). The Regional property is already committed to landfill use (Phase B of proposed expansion) and should not be included in the calculation of the area available for landfilling purposes. If this area is removed, the Site F area is in the range of 84 ha.

National Sewer Pipe Ltd.
Study Area

Cover Types and Proposed Land Use

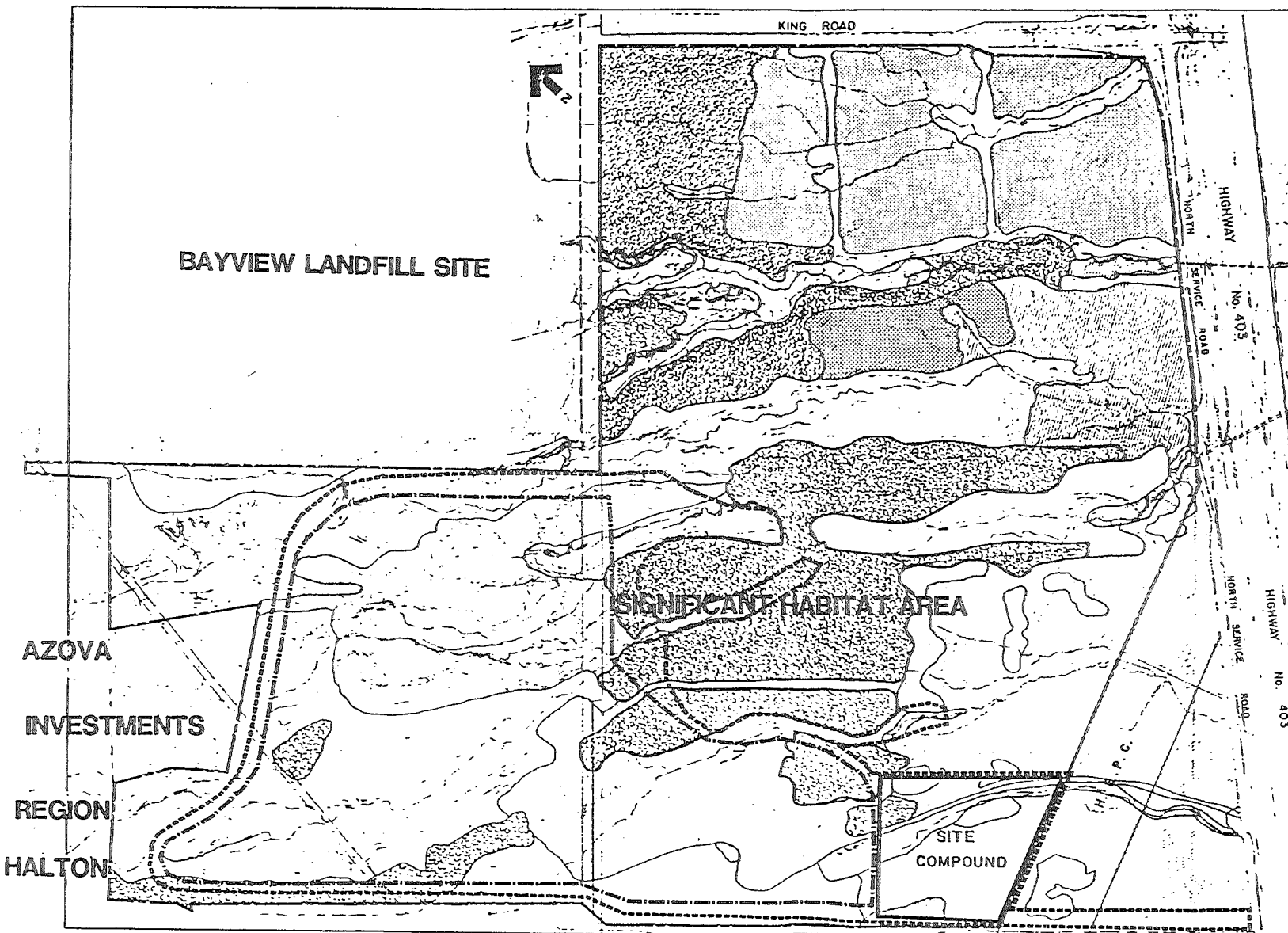
Burlington, Ontario

LEGEND

- Study Boundary
- COVER TYPE (see text):
-  Forest
 -  Scrub
 -  Dryland Herbaceous
 -  Wetland Herbaceous
 -  Anthropogenic
 -  Plantation
 -  Limit of Disturbance
 -  Limit of Landfill

 Proctor & Redfern Limited
Consulting Engineers, Planners and
Environmental Scientists
Toronto

SCALE: 0 50 100 METERS
E O 79475



BURLINGTON LANDFILL SITE

The Regional proposal for a landfill site has a capacity requirement of 4,350,000 tonnes (8.7 million cu. yds.). Under the single site option, this total amount would be placed in one landfill site (Table 7, after page 109, Selection of Candidate Sites). Under the dual site option, the Walker Wright report indicates that Site F would require a capacity of 3,611,000 tonnes (83% of total requirement) as it would receive waste from both Burlington and Oakville - the two closest municipalities (see Table 8, after page 110, Selection of Candidate Sites). As can be seen, both the single and dual site options would involve a major landfilling operation if Site F were selected.

Purpose

Ecoplans Ltd., in association with Conestoga-Rovers and Associates Limited has been asked to comment on two major items in respect to potential landfill operations on the N.S.P. site and adjacent lands. The concerns are the capacity of the site and the technical feasibility of operating a landfill on the site. The major decisions affecting these two parameters are based in the engineering disciplines and will be addressed by Conestoga-Rovers and Associates. Their comments are attached. There are natural environment considerations which may affect the land area available for landfilling. These considerations are discussed below.

1. Rare Plants and Significant Habitat

The Proctor and Redfern report identified 8 plant species found on the N.S.P. property which are considered to be rare in Ontario for one reason or another. An additional 6 species are considered to be regionally significant. The highest concentration of these plants were located in the upland hardwood areas in the south central section of the N.S.P. property.

The upland hardwood stands in which the majority of the noted species were found are also considered to be significant. The Oak-Hickory cover types found on the N.S.P. site are rare in Ontario, being restricted to exposed clay shale deposits found in the Burlington area. These dryland forest types are more typical of sites further south in the United States.

The combination of forest cover type and the presence of provincially rare and regionally significant plant species led to the identification of the central woodland area as a significant habitat area. Proctor and Redfern Ltd. (1982, p.35) indicated that this part of the N.S.P. property met 5 of the criteria used in the designation of Environmentally Significant Areas in the Region of Halton. One or more of the criteria must be met to qualify as an E.S.A. However, the woodland area (approximately 13 ha) may be too small to be considered as a regionally significant area.

In the Walker Wright Report (Selection of Candidate Sites) a number of Natural Environment objectives and evaluation factors were articulated. Study Objective B1 (to maintain significant ecosystems and ecosystem functions) and B2 (to protect sensitive and unique biophysical resources) would apply to the biotic resources located in the N.S.P. area. The potential removal of provincially rare plants would be rated by Walker Wright as a major impact and the loss of regionally significant species

would rate as a moderate impact. The loss of significant habitat, the upland hardwoods, would have been rated as a major impact under the Walker Wright evaluation approach.

If the south central woodland areas are excluded, a further block of land is removed from the candidate area. It also makes the landfilling of the south and southwest area less feasible. Conceptually, the recognition of the woodlands as a significant area and a decision to maintain them would restrict landfilling to the northern section of the candidate area: that area north of the unopened road allowance and containing 45 to 50 hectares.

2. Mineral Resources

Although not active at the present time, part of the N.S.P. property is licensed as a quarry for the extraction of shale. Objective B3 (to avoid areas with high potential for natural resources) indicates that the loss of the resource area would result in a high to low impact rating depending upon the extent to which the resources have already been depleted and/or the quality of the resource.

The N.S.P. proposal proposed that the extraction of shale would be synchronized with the landfilling operation. With the increased capacity requirements associated with the Regional landfill operations, it may not be possible to excavate and utilize the shale at a rate that will accomodate the landfill requirements. The significance of the mineral resource base will need further evaluation.

Conclusions

In terms of natural environment, the main issue appears to be the areas of significant habitat and rare and significant plant species. If these areas are recognized and subsequently protected, approximately 13 ha will be removed from the 84 ha available for landfilling. The protection of the significant habitat will make the landfilling of the south and south west sectors more difficult to undertake. If these additional areas are removed from consideration, the landfill site will be confined to the northern half of the candidate area: an area of approximately 45 hectares.

SECTION 2.0

LANDFILL CAPACITY AND OPERATIONAL CONCERNS
NATIONAL SEWER PIPE PROPERTY AND ADJACENT LANDS

PREPARED BY: CONESTOGA-ROVERS &
ASSOCIATES LIMITED

September 1984

FOR: CITY OF BURLINGTON

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
2.0 LANDFILLING OPTIONS	4
2.1 LANDFILL AREAS	4
2.2 LANDFILL CAPABILITIES	6
3.0 OPERATIONAL CONCERNS	9
4.0 SUMMARY	14

LIST OF TABLES

TABLE 1 PROPOSED LANDFILL AREAS	5a
TABLE 2 LANDFILL OPTION PRACTICAL CAPACITIES	6a
TABLE 3 LANDFILL OPTION PRACTICAL CAPACITIES	9a

1.0 INTRODUCTION

Conestoga-Rovers & Associates Limited (CRA) in conjunction with Ecoplans Ltd. (EC) have been requested by the City of Burlington to prepare an update on the potential for, and the potential capacity for landfilling on the NSP site, and adjacent land holdings. This request was received in letter form on August 21, 1984. This letter and attached Solid Waste Management Committee report, and recommendations are enclosed in Appendix A.

As taken from the solid waste management committee report, the purpose of this report is to;

"obtain an accurate current figure on the potential capacity, both of the property owned by National Sewer Pipe, and of the property within the bounds defined by Walker Wright as Site F", and

"review this new information (i.e. Cherry studies at Bayview Park, and recent environmental assessment hearing, Burlington landfill) and to apply it to the question of technical feasibility".

On August 27, 1984, representatives from CRA and EC walked the NSP lands to obtain a first hand appreciation of the terrain, and the potential capacity and technical feasibility of landfilling on these properties. The following documents were also reviewed and referenced in order to prepare the text of this report:

- 1) Design Report, National Sewer Pipe Limited, Sanitary Landfill Proposal, Burlington, Ontario, by Proctor and Redfern Limited, April 1982.
- 2) Stage 1: Waste Needs and Systems Analysis Consolidation, Environmental Assessment of the Landfill Component of Halton's Solid Waste Management System, by Walker Wright Young Associates Limited, May 1983.
- 3) Final Report Phase 2, Stage 2A, General Overview Analysis, Environmental Assessment of the Landfill Component of Halton's Solid Waste Management System, by Walker Wright Young Associates Limited, October 1983.
- 4) Draft Report, Phase 2, Stage 2B, Selection of Candidate Sites, Environmental Assessment of the Landfill Component of Halton's Solid Waste Management, by Walker Wright Young Associates Limited, February 1984.
- 5) Progress Report Phase I Hydrogeologic Study, National Sewer Pipe Ltd. Proposed Landfill, Burlington, by Morrison Beatty Limited, July 1979.
- 6) Phase II Hydrogeologic Investigation, National Sewer Pipe Ltd. Landfill Site, Burlington, by Morrison Beatty Limited, June 1980.
- 7) Phase III Hydrogeologic Investigation, National Sewer Pipe Ltd. Landfill Site, Burlington, by Morrison Beatty Limited, November 1981.

- 8) Final Report, Solid Waste Management Strategy Study, by Acres Consulting Services Limited, September 1982.
- 9) Hydrological Suitability of the NSPL Landfill Site, Burlington, Ontario by John A. Cherry, Ph.D., P. Eng. Consulting Hydrogeologist and Donald L. Lush, Ph.D., Beak Consultants Limited, October 1980.
- 10) Bayview Park Landfill Site, Leachate Discharge Investigation Phase I, by Dillon Consulting Engineers & Planners, May 1982.
- 11) Burlington Landfill Site Application for Continued Use, Volume 2, by Dillon Consulting Engineers & Planners, March 1984.

The report reviews five different options for landfilling on the NSP property and adjacent lands, and determines approximate practical landfill capacities, for these options. Operational and technical concerns with landfill operation on this property are also outlined.

2.0 LANDFILLING OPTIONS

2.1 LANDFILL AREAS

The potential areas for landfilling on NSP land and the Azova property adjacent to the north, have been examined. Five landfilling boundary options have been reviewed for area and potential capacity. These are:

- 1) Option 1 (Figure 1) - the current (NSP) landfill proposal.

See Walker Wright study as per Myra Schiff, Oct. 17, '84 ()*

- 2) Option 2 (Figure 2) - landfilling on NSP lands excluding the northern Azova lands, and the environmentally sensitive area (ESA).

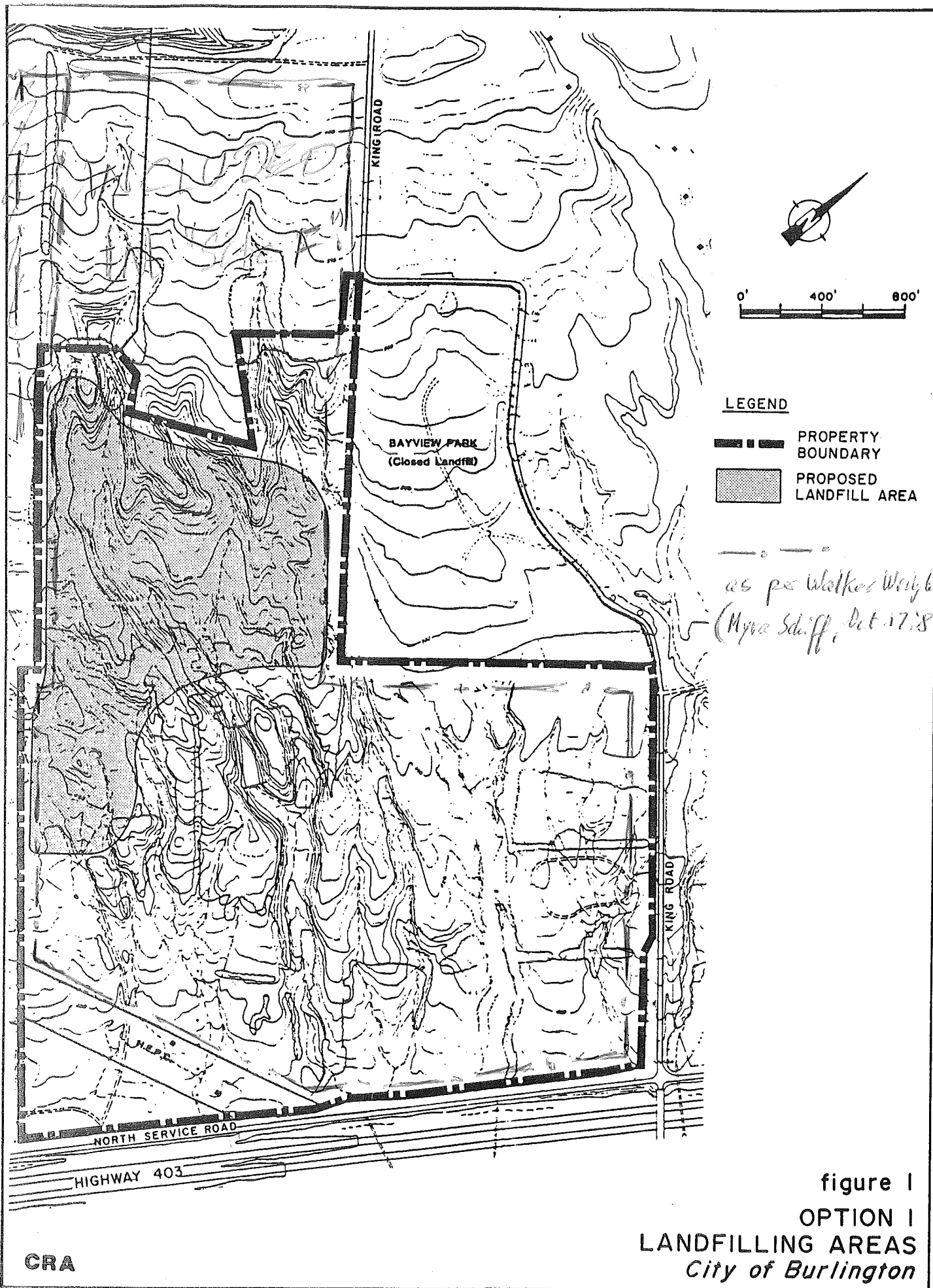
- 3) Option 3 (Figure 3) - landfilling on NSP lands, including the ESA, excluding the Azova property.

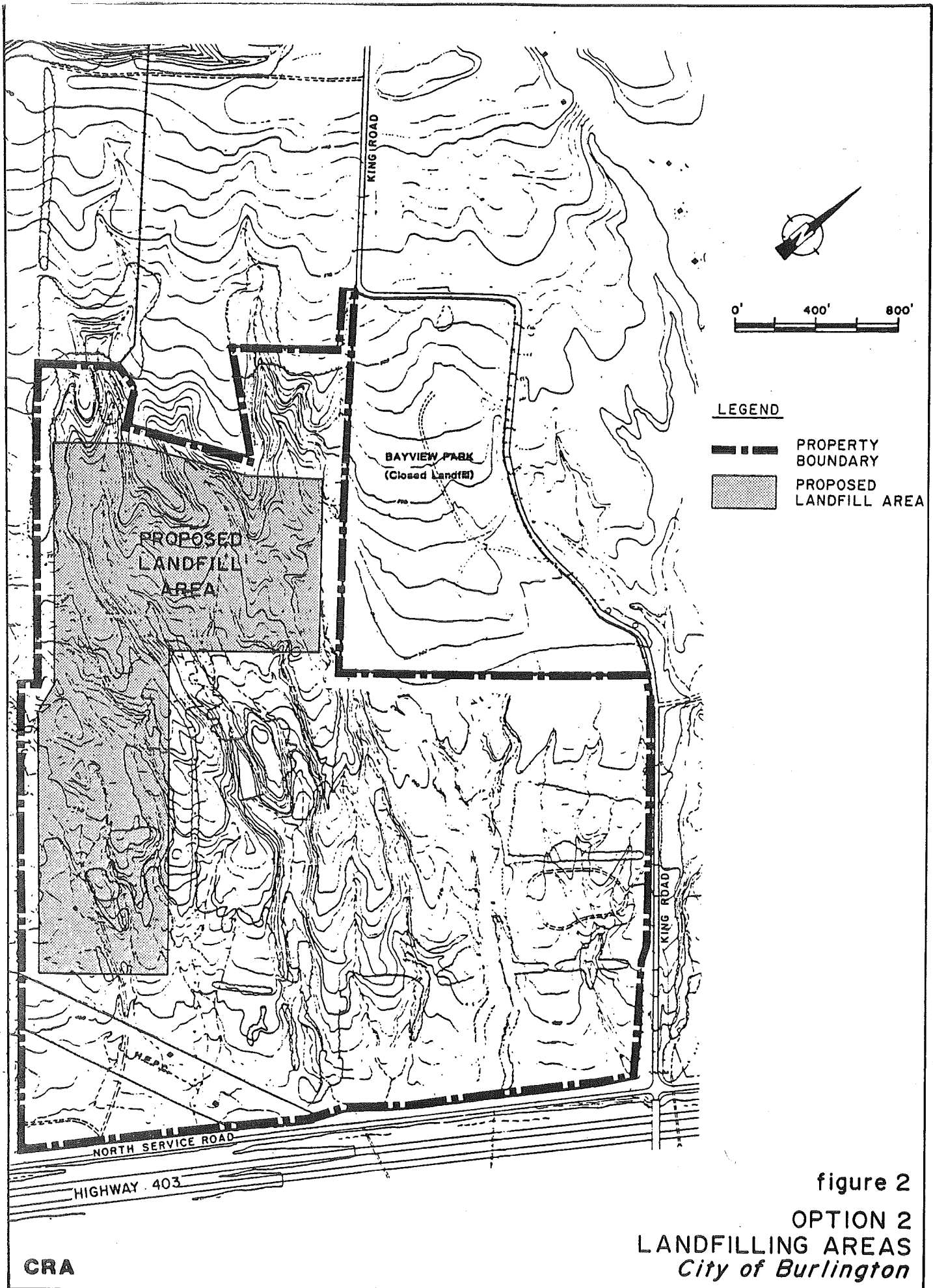
- 4) Option 4 (Figure 4) - landfilling on NSP lands, including Azova property, excluding the ESA.

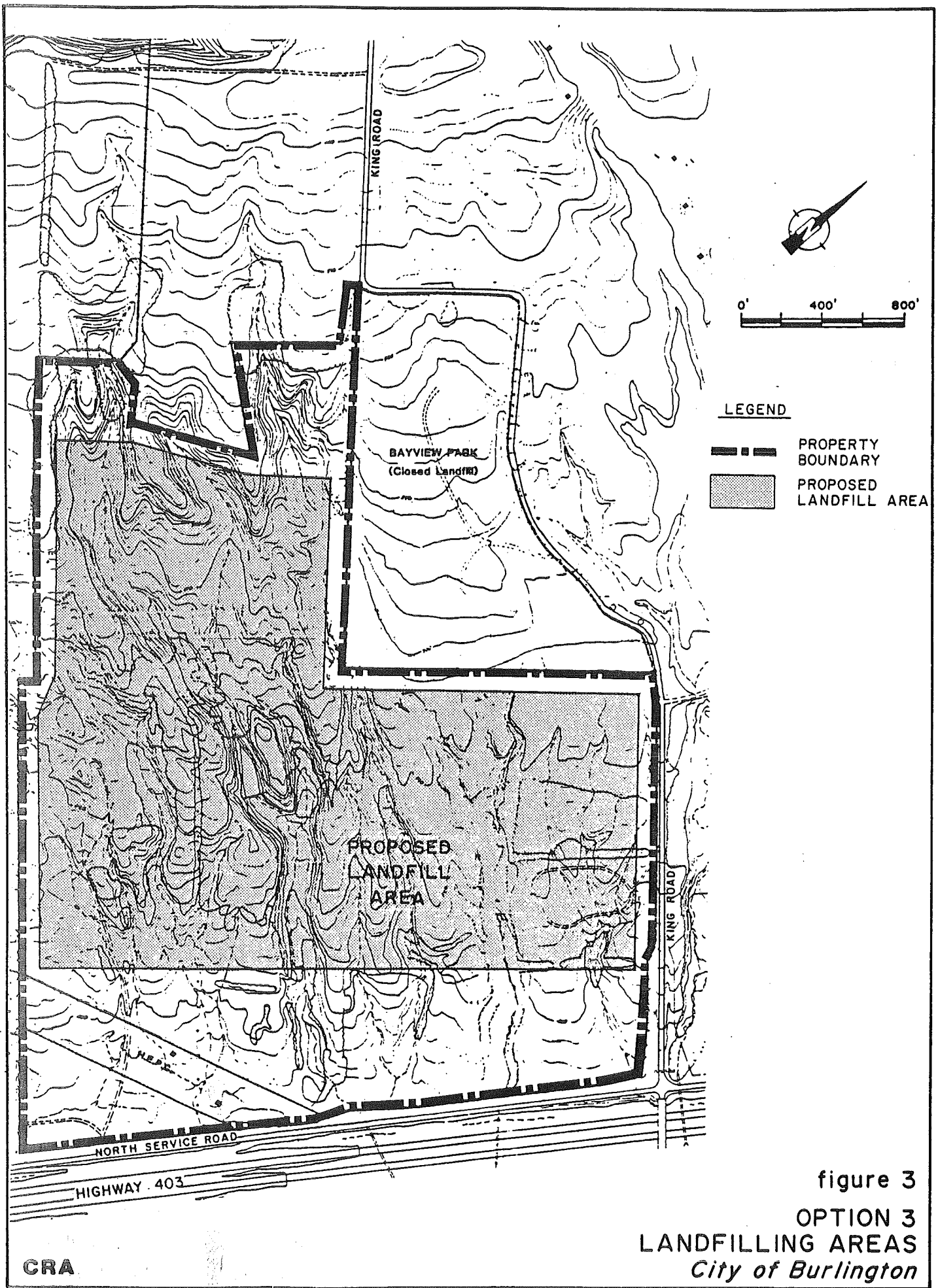
- 5) Option 5 (Figure 5) - landfilling on the total area as shown on Map 11, Walker Wright Young Associates Limited Report, Draft Report, Phase 2, Stage 2B, Selection of Candidate Sites, February 1984. This would include the NSP lands, the Azova property, and the ESA.

() Closest to Walker Wright engineering as per Myra Schiff, Oct. 17, '84*

No options considered landfilling on or past the HEPC right of way in the southern corner of the site.







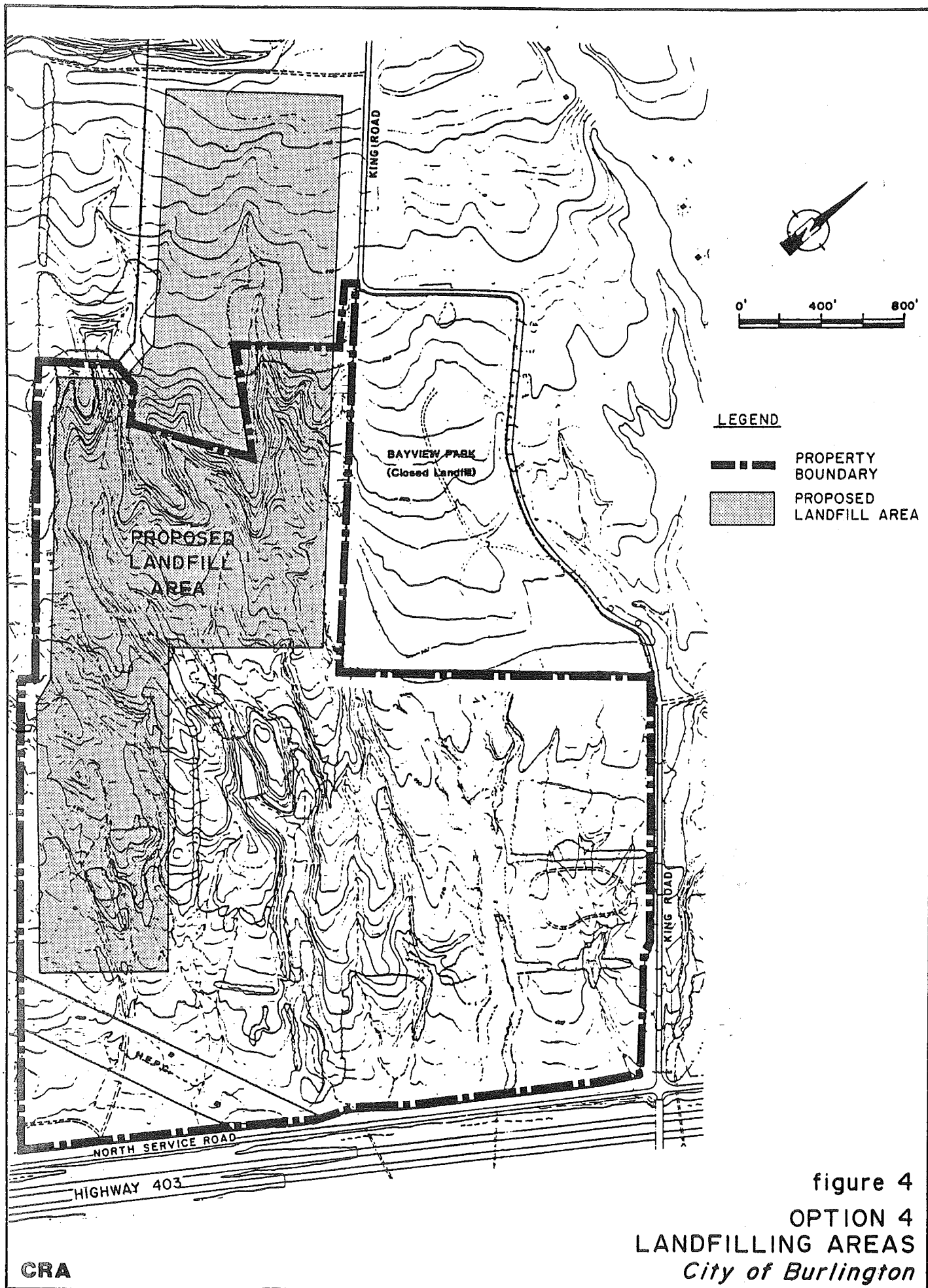
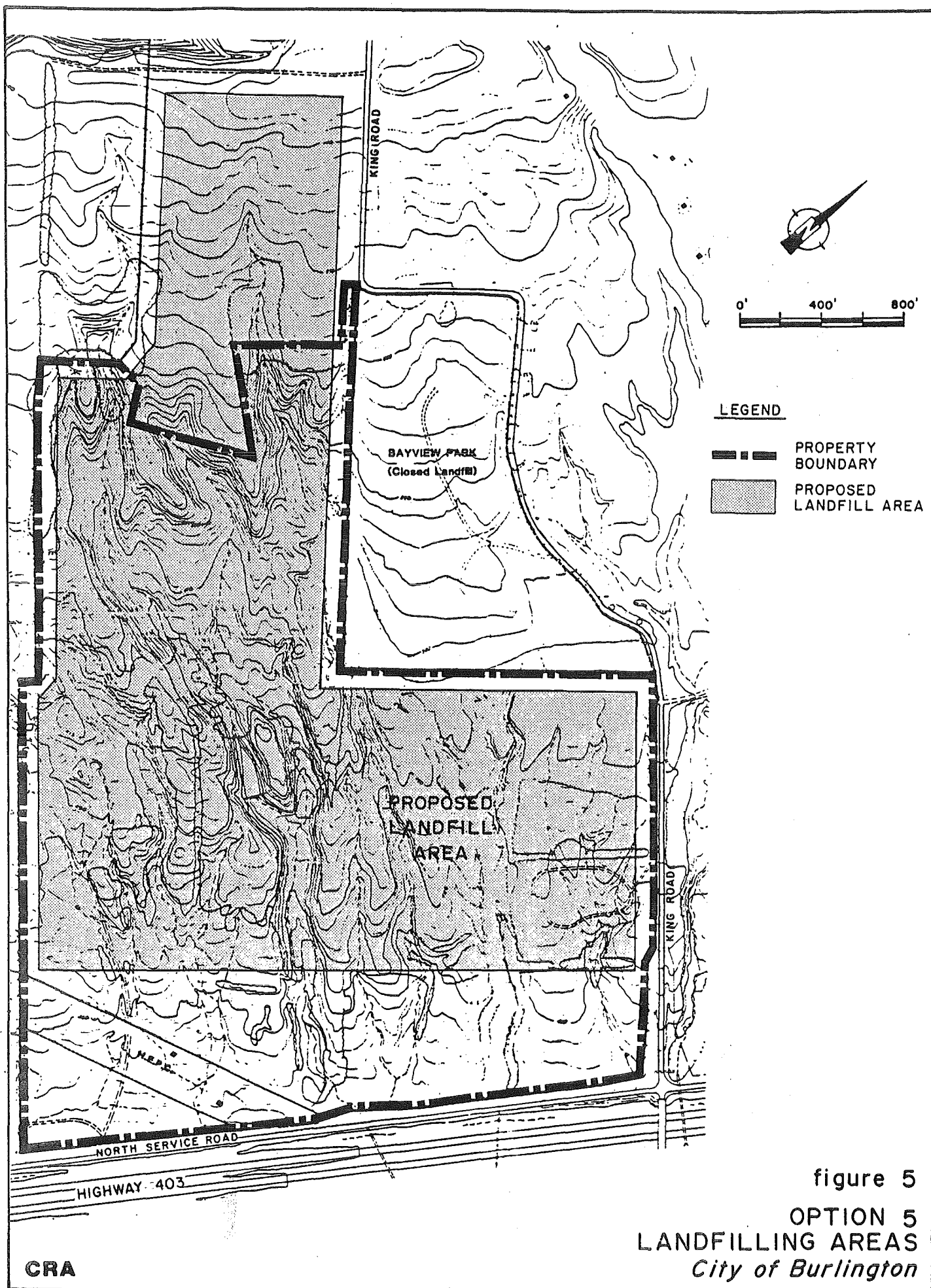


figure 4
OPTION 4
LANDFILLING AREAS
City of Burlington



CRA

Table 1 lists the potential landfilled areas for each option.

Landfilling areas as shown on Figure 1 through 5, have maintained a minimum 30-meter buffer zones on all property boundaries. Frontage of any options on the North service road and 403 maintain a minimum buffer of 600 feet to provide for setback and screening from these major routes. These buffer zones would seem appropriate based on the current setback of the existing Burlington Landfill Site from the North Service Road and the evidence and presentations made at the recent Environmental Hearing for the Burlington Landfill expansion.

Option 1, the current NSP landfill proposal, and Option 2 are in similar areas of the NSP lands. Option 2 has larger buffer zones, is more distant from the ESA boundaries to provide added protection of the ESA.

Options 3 and
As shown on Table 1, only ~~Option~~ 5 has actually greater than 40 hectares that could be used for landfilling as used as a requisite for candidate site selection in the 'Walker' report. This area would however encompass the ESA area. *(per City SSMC Sept. 7, '84)*

Approval to landfill on the ESA area might be difficult to obtain based on evidence given at the recent Burlington Landfill Expansion Environmental Hearing.

TABLE 1
PROPOSED LANDFILL AREAS

<u>Landfilling Option</u>	<u>Potential Landfilling Area</u>
Option 1 (Current proposal)	20.6 ha (51 acres)
Option 2 (NSP)	24.3 ha (60 acres)
Option 3 (NSP & ESA)	54.2 ha (134 acres)
Option 4 (NSP & AZOVA)	38.9 ha (96 acres)
Option 5 (All Lands)	68.8 ha (170 acres)

2.2 LANDFILL CAPABILITIES

Estimates of the practical landfill capacities of the presented landfill options have been calculated. These estimates are presented in Table 2 along with cover soil surplus and deficit figures for each individual landfill option.

As shown by the Table 2, Option 5 and Option 3 would have enough practical landfill capacity to meet a criteria of 4,419,600 tonnes (4,350,000 tons) of refuse for the single site option or 3,149,600 tonnes (3,100,000 tons) for the dual site option. These options both include using the ESA area as discussed previously. No other options, as presented on Table 2, could practically meet the capacity criteria.

In order to calculate these capacities and soil deficit and surpluses, certain assumptions were used. These are listed below:

- i) Combined refuse and working cover soil density of 545 kg/cy.
- ii) A refuse to daily and intermediate cover soil ratio of 4:1.
- iii) Final contour heights comparable to existing Burlington Landfill and proposed expansion at 198 meters AMSL. Maximum slopes of 25 percent for final contours were utilized extensively to provide a practical maximum capacity of refuse for each option.
- iv) A maximum of 2 meters of clay till - with weathered shale was left above the more competent shale bedrock. Base contours range from 177 meters AMSL in the northern Azova property to 117 meters AMSL at the southern end of the proposed landfill boundary on the NSP property.

TABLE 2
LANDFILL OPTION PRACTICAL CAPACITIES

(As per City SMMC Sept. 7, '84)

<u>Landfilling Option</u>	<u>Refuse Capacity Tonnes</u>	<u>*Working Soil Surplus (Deficit)</u>
Option 1 (Current Proposal)	1.7×10^6	Not Given
Option 2 (NSP)	1.3×10^6	290,532 m ³ (380,000 c.y.)
Option 3 (NSP & ESA)	5.2×10^6	451,090 m ³ (590,000 c.y.)
Option 4 (NSP & AZOVA)	2.2×10^6	282,887 m ³ (370,000 c.y.)
Option 5 (All Lands)	6.1×10^6	443,444 m ³ (580,000 c.y.)

* Working Soil - Daily and Intermediate Cover not including Final Cover and Soil Liner

For purposes of capacity calculation the base contours were kept relatively flat with maximum cuts of 30 feet in depth. Some ravine portions would require filling to achieve this relatively flat base contour.

- v) Top of shale and depth of overburden was interpreted from on-site boreholes as described by Morrison Beatty reports. Phase I through III, Hydrogeologic Investigation, National Sewer Pipe Ltd., Burlington, Ontario. Borehole data from the existing Burlington Site and the closed Bayview Site were also taken into account.
- vi) A final cover of 1.0 meters of material would be used at landfill completion.

Option 1, the current NSP landfill proposal differs in volume of refuse (greater amount), from Option 2. This is because of different base contours in Option 2, and the extensive use of 33 percent slopes for final cover for Option 1, versus 25 percent slopes maximum for Option 2. Thirty-three percent slopes can be difficult to work and cause erosional problems. These reasons are why maximum slopes of 25 percent were used in the design of Options 2 through 4.

The working soil deficits as listed on Table 2, are large. No indication of soil surplus or deficit was given in the P&R report of the current NSP landfill proposal. Part of the soil deficits as shown are due to the filling of ravine portions with material to provide flat base contours. In actual detailed design, the base contours would be optimized to attempt to alleviate this filling and provide more working soil. The options would still be in a deficit situation however, although not as

large as shown on Table 2. The deficit figures as shown on Table 2 do not account for final cover soil. It is anticipated in all options that this would be imported. If the Azova property is not used for landfill, this property could provide cover soil material.

It should be noted that the capacities as noted on Table 2, are practical capacities. These figures could be adjusted by numerous landfill design factors such as landfill height or slope changes, and base contour changes. These figures provide an "order of magnitude" approximation of the amount of refuse that could be reasonably expected to be disposed of for the various options. The option volumes as presented on Table 2 were not contained by available working soil. For purposes of the calculation it was assumed that an alternate soil source is available.

3.0 OPERATIONAL CONCERNS

There are a number of operational concerns when considering landfilling on the NSP and adjacent properties. These are described below as follows:

i) LINER

The current landfill proposal on the NSP property as presented by P&R landfill directly on shale and does not provide for a base liner. Given the landfilling techniques used at the present Burlington Landfill Site, and the evidence given at the environmental hearing for the Burlington Landfill expansion, it might be difficult to have the NSP proposal approved on this basis.

If a liner were required, the clay silt till to weathered shale excavated could be difficult to rework and compact to a sufficiently low permeability to act as a liner. In this case, a low permeability soil would need to be imported and placed at a minimum 1.5 meter depth or an artificial liner could be placed. Both of these undertakings would be a very costly proposition.

Table 3 lists the required amount of imported soil that would be required for a base liner for all options, based on a 1.5 meter minimum thickness as given above.

TABLE 3
LANDFILL OPTION PRACTICAL CAPACITIES

<u>Landfilling Option</u>	<u>Cover Soil</u>	<u>Liner Soil c.y.</u>
Option 1 (Current Proposal)	188,724 m ³ (246,840 c.y.)	308,249 m ³ (403,172 c.y.)
Option 2 (NSP)	298,178 m ³ (390,000 c.y.)	370,047 m ³ (484,000 c.y.)
Option 3 (NSP & ESA)	607,059 m ³ (794,000 c.y.)	828,017 m ³ (1,083,000 c.y.)
Option 4 (NSP & AZOVA)	441,915 m ³ (578,000)	592,533 m ³ (775,000 c.y.)
Option 5 (All Lands)	750,797 m ³ (982,000)	1,047,446 m ³ (1,370,000 c.y.)

From a technical point of view, the impact of leachate contamination of the groundwater contained within the shale might be acceptable, due to the poor existing water quality in this formation. Given the shale materials makeup and the secondary permeability of the material, liner installation would be a difficult undertaking.

Given the poor groundwater quality, it would be difficult to prove that the groundwater quality is adversely affected, which may favour liner exclusion.

ii) BASE CONTOUR PREPARATION

Due to the rugged terrain on the existing NSP lands, the preparation and excavating for base contours would be difficult. In many areas heavy equipment would have difficult access and tight working conditions. This would therefore become a slow and costly proposition, as large amounts of materials must be moved.

iii) STREAM REROUTING

A number of intermittent stream paths are deeply incised on the NSP property. These would all require rerouting at the northern boundary of the landfill to prevent them from entering into landfilling areas.

iv) LEACHATE COLLECTION SYSTEM

The current landfill design proposed by P&R uses no base liner and incorporates a periphery leachate collection system. The periphery leachate collection is to reduce leachate mounding in the site, and to prevent leachate springs. The majority of leachate would exfiltrate from the landfill into the base shales. A large portion of the present Burlington Landfill and the proposed expansion of the Burlington Site use a complete underdrain leachate collection system. This system collects leachate for treatment, and minimizes the amount of leachate exfiltrating from the base.

Given the systems already in place at the Burlington site it may be difficult to obtain approval for the NSP proposal based on a periphery system only.

v) SOIL DEFICITS AND COVER MATERIAL

As shown on Table 2, and discussed in Section 2.2, all options would have working soil deficits. This does not include the cover soil requirement, or any soil requirement for a base liner, if required.

This soil deficit has the effect of further reducing refuse volumes as there is not enough soil for daily work, unless imported soil is used for working material.

A suitable soil source would need to be located for any significant landfilling operation to proceed at this site.

It is anticipated that a suitable cover material would need to be imported for final cover. This is mainly due to the soil deficits that would be anticipated. Table 3 lists the anticipated quantity of cover soil that would be required for each option. These quantities are based on a 1.0 meter depth of cover material.

The importing of material is a costly exercise in landfill operations.

The Azora property, if not landfilled, would supply enough glacial till material for cover soil use. However, this would leave a large open borrow pit, which would create ponding and water problems, and would likely need to be rehabilitated.

vi) ECONOMICS

The large amount of earth moving and the importing of cover soil and working soil would make significant landfilling operations on the NSP and adjacent land holdings expensive to operate.

The most practical (economic) method of landfilling in these areas would be to directly fill depressions and ravines with minimal earth moving and install a leachate cut-off system on the southern boundary of the site. This would however further reduce landfill capacities

from those listed on Table 2, and make the site less viable from a capacity standpoint. It would also be difficult to obtain approval for the site on this basis for reasons as previously discussed.

4.0 SUMMARY

This report (Section 2.0) has presented a review of the potential practical landfilling capacity of various landfill area options located on the NSP property and adjacent lands. Also included are operational and technical concerns dealing with landfilling on this property. The following summarizes the main points presented within this report, Section 2.0.

- 1) In reference to practical landfill capacity, only the ^{use} rise of the whole or substantial portions of the ESA on the NSP property would allow for a total practical landfill capacity for a single site option, or dual site option as referenced in the Walker Wright report. Approval of landfilling on all or part of the ESA area would be difficult to obtain.
- 2) A number of operational and technical concerns on landfilling in the NSP property have been described. These include;
 - landfilling soil deficits for any practical significant landfill operation on these lands, and the importing of soil material, which is a costly undertaking
 - the rugged terrain of the area hinders and makes the moving of large earth quantities prohibitive, and landfilling difficult. This earth moving would also be costly
 - the rerouting of numerous intermittent creeks and streams in the landfilling areas

- the difficulty perceived in obtaining approval for landfilling as proposed in the NSP proposal, given the landfilling practices at the current Burlington Landfill, and the evidence presented at the Burlington Landfill Expansion Environmental Hearing.

All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES LIMITED

A handwritten signature in cursive script, reading "Walter Graziani".

Anthony J. Crutcher, P. Eng.

Walter Graziani, P. Eng.

APPENDIX A

LETTER OF AUTHORIZATION

AND

SOLID WASTE MANAGEMENT COMMITTEE REPORT

CITY OF BURLINGTON