

**THE CORPORATION OF THE TOWN OF AMHERSTBURG**

**BY-LAW NO. 2005-81**

**A by-law to authorize the signing of a Development Agreement.**

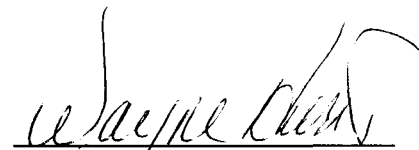
**WHEREAS** 1646247 Ontario Limited has proposed the development of property at 864 Alma Street for use as a marine repair/fibreglass shop;


**AND WHEREAS** the Council of the Town of Amherstburg and owners of the said property have agreed to the terms and conditions of a Development Agreement in the form annexed hereto;

**NOW THEREFORE THE COUNCIL OF THE CORPORATION OF THE TOWN OF AMHERSTBURG HEREBY ENACTS AS FOLLOWS:**

1. That the Mayor and Clerk be and they are hereby authorized to execute the original and copies of a Development Agreement in the form annexed hereto and affix the Corporate Seal thereto.
2. This By-law shall come into force and effect on the date of final passage hereof.

Read a first, second and third time and finally passed this 24<sup>th</sup> day of October, 2005.

  
\_\_\_\_\_  
Mayor

  
\_\_\_\_\_  
Clerk

Certified to be a true copy of By-law  
No. 2005-81 passed by the Amherstburg  
Municipal Council on October 24, 2005.

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FOR OFFICE USE ONLY

1544676

CERTIFICATE OF REGISTRATION  
CERTIFICAT D'ENREGISTREMENT  
ESSEX (HQ) WINDSOR

2005 DEC 22 09:47

LAND REGISTRATION

(1) Registry  Land Titles  (2) Page 1 of 15 pages

(3) Property Identifier(s) Block 01543 Property 0094 Additional: See Schedule

(4) Nature of Document  
**DEVELOPMENT AGREEMENT**

(5) Consideration  
Dollars \$

(6) Description  
**Pt. Lots 1, Concession 2 Anderdon,  
now designated as Parts 3, 8 and 13, on Plan 12R-18834  
Town of Amherstburg**

New Property Identifiers Additional: See Schedule

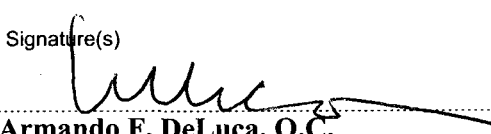
Executions Additional: See Schedule

(7) This Document Contains: (a) Redescription New Easement Plan/Sketch  (b) Schedule for: Description  Additional Parties  Other

(8) This Document provides as follows:  
**See Development Agreement attached**

Continued on Schedule

(9) This Document relates to instrument number(s)

| (10) Party(ies) (Set out Status or Interest)<br>Name(s)                 | Signature(s)                                                                                                    | Date of Signature |    |    |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------|----|----|
|                                                                         |                                                                                                                 | Y                 | M  | D  |
| THE CORPORATION OF THE TOWN OF AMHERSTBURG (Applicant) by its solicitor | <br>Armando F. DeLuca, Q.C. | 2005              | 12 | 22 |
|                                                                         |                                                                                                                 |                   |    |    |
|                                                                         |                                                                                                                 |                   |    |    |

(11) Address for Service **271 Sandwich St. S., Box 159, Amherstburg, Ontario N9V 2Z3**

| (12) Party(ies) (Set out Status or Interest)<br>Name(s) | Signature(s) | Date of Signature |   |   |
|---------------------------------------------------------|--------------|-------------------|---|---|
|                                                         |              | Y                 | M | D |
| 1646247 ONTARIO LIMITED (Owner)                         |              |                   |   |   |
|                                                         |              |                   |   |   |
|                                                         |              |                   |   |   |

(13) Address for Service **24 Laird Ave., Amherstburg, Ontario N9V 1X5**

(14) Municipal Address of Property  
**Vacant Land**

(15) Document Prepared by:  
**Armando F. DeLuca, Q.C.  
Mousseau, DeLuca,  
McPherson, Prince, LLP  
500-251 Goyeau St.  
Windsor, Ontario  
N9A 6V2**

| Fees and Tax     |           |
|------------------|-----------|
| Registration Fee | 60        |
|                  |           |
|                  |           |
|                  |           |
| <b>Total</b>     | <b>60</b> |

**DEVELOPMENT AGREEMENT**

Registered \_\_\_\_\_, 2005

THIS AGREEMENT made in quintuplicate this 11th day of October, 2005.

BETWEEN: 1646247 Ontario Limited

hereinafter called the "OWNER"  
OF THE FIRST PART

-and-

THE CORPORATION OF THE TOWN OF  
AMHERSTBURG

hereinafter called the "CORPORATION"  
OF THE SECOND PART

WHEREAS the lands affected by this Agreement are described in Schedule "A" attached hereto, and are hereinafter referred to as the "said lands";

AND WHEREAS the Owner warrants it is the registered owner of the said lands;

AND WHEREAS, in this Agreement the "Owner" includes an individual, an association, a partnership or corporation and, wherever the singular is used therein, it shall be construed as including the plural;

AND WHEREAS the Official Plan in effect in Amherstburg designated parts of the area covered by the Official Plan as a Site Plan Control area;

AND WHEREAS the Owner intends to develop or redevelop the said lands for a marine repair/fiberglass shop in accordance with the Site Plan attached hereto as Schedule "B", and hereinafter referred to as the "Site Plan";

AND WHEREAS the Corporation as a condition of development or redevelopment of the said lands requires the Owner to enter into a Development Agreement;

NOW THEREFORE THIS AGREEMENT WITNESSETH that in consideration of other goods and valuable consideration and the sum of FIVE (\$5.00) DOLLARS of lawful money of Canada, now paid by each of the parties hereto to each of the other parties hereto, (the receipt of which is hereby acknowledged), the Owner hereby covenants and agrees with the Corporation as follows:

1. The following Schedules, which are identified by the signatures of the parties to this Agreement, and which are attached hereto, are hereby made a part of this Agreement as fully and to all intents and purposes as though recited in full herein:

- SCHEDULE "A" – Legal description of the said lands
- SCHEDULE "B" – Site Plan/Servicing
- SCHEDULE "C" – Grading Plan
- SCHEDULE "D" – Landscape Plan
- SCHEDULE "E" – Elevations
- SCHEDULE "F" – Stormwater Management Calculations

2. Schedule "A" hereto describes the lands affected by this Agreement.
3. Schedule "B" hereto shows:
  - (a) The location of all buildings and structures to be erected;
  - (b) The location and provision of off-street vehicular loading and parking facilities and access driveways including driveways for emergency vehicles;
  - (c) Walkways and all other means of pedestrian access;
  - (d) The location and provision for the collection and storage of garbage and other waste materials.
  - (e) Site servicing
4. Schedule "C" hereto shows:
  - (a) Grading Plan.
5. Schedule "D" hereto shows:
  - (a) Landscape Plan.
6. Schedule "E" hereto shows:
  - (a) Elevations.
7. Schedule "F" hereto shows:
  - (a) Stormwater Management Calculations.
8. The Owner shall be responsible for consulting with and obtaining any necessary approvals from Essex Power Lines Corporation regarding any matters that relate to services provided by Essex Power Lines Corporation.
9. The Owner shall be responsible for consulting with and obtaining any necessary approval from the Ministry of the Environment or the Essex Region Conservation Authority.
10. The Owner shall be responsible for consulting with and obtaining any necessary approval from the authority having jurisdiction regarding the private septic system.
11. All of the exterior walls of the building shall be as per the elevation drawings as shown on Schedule "D" hereto.
12. All parking or loading areas and lanes and driveways shall be paved with asphalt or a concrete Portland cement or other material capable of permitting accessibility under all climatic conditions, as shown on Schedule "B" and together with crushed stone, slag, gravel, crushed brick, tile, cinders or like materials, having a combined depth of at least 15.2 cm. and with provisions for drainage facilities. The parties agree that the Owner shall asphalt the portion of the parking lot and driveway from the road allowance to the front of the structure immediately following the construction of the said structure. The Owner agrees to tar and chip the remainder of the parking lot immediately following the construction of the structure. The Owner shall

asphalt the entire parking lot within five years of the passing of this agreement

13. The Owner shall maintain a minimum of parking spaces, as designated on Schedule "B".
14. All walkways on the said lands, where so designated on Schedule "B", shall be constructed of either concrete or interlocking paving stone by the Owner to the satisfaction of the Corporation.
15. If any curbs, sidewalks, boulevards or highway surfaces of the Corporation are damaged during the development by the Owner, such damage shall be repaired or replaced by the Owner.
16. Snow removal from the parking or loading areas and lanes, driveways and walkways shall be the responsibility of the Owner.
17. The Owner shall install and maintain a system for the disposal of storm and surface water as indicated on Schedule "B", Schedule "C" and Schedule "F" so that no such water will flow along the surface from the said lands onto any adjoining lands. All storm and surface water disposal systems shall be to the satisfaction of the Corporation's Engineer.
18. Any garbage or refuse that is stored outside shall be stored in a non-combustible container and maintained so that the garbage or refuse does not blow or fall out of the container.
19. Any and all lighting shall be installed and maintained so as to not, in the opinion of the Corporation, interfere with the use or enjoyment of adjacent properties or with the safe flow of traffic on abutting or adjacent streets.
20. The Owner shall landscape and maintain in plants and ground cover acceptable to the Corporation those lands so indicated on Schedule "D". The Owner agrees that the site will be inspected on an annual basis and any deficiencies will require immediate correction in accordance with the approved site plan.
21. All driveways for emergency vehicles shall:
  - (1) Be connected with a public thoroughfare;
  - (2) Be designed and constructed to support expected loads imposed by firefighting equipment;
  - (3) Be surfaced with concrete, asphalt or other material capable of permitting accessibility under all climatic conditions;
  - (4) Have a clear width of 3 metres at all times;
  - (5) Be located not less than 3 metres and not more than 15.2 metres measured horizontally and at right angles from the face of the building;
  - (6) Have an overhead clearance not less than 4.5 metres;
  - (7) Have a change in gradient of not more than 1 in 12.5 over a minimum distance of 15.2 metres; and
  - (8) Have approved signs displayed to indicate the emergency route.
22. If the Ontario Building Code requires that an architect or professional engineer or both shall be responsible for the field review of any new building or extension provided for in this Agreement, the Owner shall not occupy or

use or permit to be occupied or used any said new building or extension until after an architect or professional engineer has given to the Corporation a letter addressed to the Corporation and signed by him certifying that all services on or in the said lands, required for this development or redevelopment, newly installed by the Owner in connection with this development or redevelopment and not contained within a building, have

been installed and completed in a manner satisfactory to the architect or professional engineer.

23. The Corporation through its servants, officers and agents including its building inspector, plumbing inspector, fire chief, public works head and municipal engineer may from time to time and at any time enter on the premises of the Owner to inspect:
  - (1) The progress of development;
  - (2) The state of maintenance as provided for in this Agreement.
24. In the event of any servant, officer or agent of the Corporation determining upon inspection the development is not proceeding in strict accord with the plans and specifications filed, such servant, officer or agent shall forthwith place a notice requiring all work to be stopped upon the premises and forward a copy by registered mail to the Owner at his last address as shown by the revised assessment rolls, and the Owner shall forthwith correct the deficiency or deviation.
25. In the event of any servant, officer or agent of the Corporation upon inspection being of the opinion that the state of maintenance is not satisfactory, such servant, officer or agent shall forthwith forward notice of such opinion to the Owner by registered mail at his last address as shown from the revised assessment rolls, and the Owner shall forthwith correct the deficiency or appeal to Council of the Corporation as hereinafter provided.
26. In the event that an Owner should disagree with the opinion of the servant, officer or agent of the Corporation as to the state of maintenance, such Owner shall appear before Council of the Corporation, which after hearing the Owner, shall express its opinion as to whether the maintenance is satisfactory by resolution, which shall constitute a final determination of the matter.
27. In the event that an Owner should fail to obey a stop work order issued under Section 24 hereof, the Owner recognizes the right of the Corporation to apply to the Courts for a restraining order.
28. In the event that an Owner should fail to correct a deviation or deficiency after notice pursuant to Section 25 or after notice of an opinion, which Council of the Corporation determines is correct under Section 26, the Council of the Corporation may by law direct or default of the matter or thing being done by the Owner, after two (2) weeks notice to it by registered mail at the last shown address of the Owner pursuant to the revised assessment rolls of passage of such by-law, that such matter or thing be done by the Corporation at the expense of the Owner, which expense may be recovered by action or like manner as municipal taxes.
29. In the event of an Owner wishing to change at any time any of the buildings, structures or facilities described in the plans annexed or referred to in Section

3 hereof, it shall make application to Council of the Corporation for approval and shall not proceed with such change until approval is given by such Council, or in default by the Ontario Municipal Board, under the procedure set out in Section 41 of the Planning Act, R.S.O. 1990 herebefore referred to.

30. This Agreement and the provisions thereof do not give to the Owner or any person acquiring any interest in the said lands any rights against the Corporation with respect to the failure of the Owner to perform or fully perform any of its obligations under this Agreement or any negligence of the Owner in its performance of the said obligations.
31. In the event that no construction on the said lands has commenced within one (1) year from the date of registration of this Agreement, the Corporation may, at its option, on one month's notice to the Owner, declare this Agreement to be subject to re-negotiation, whereupon the Owner agrees that it will not undertake any construction on the said lands until this Agreement has been re-negotiated.
32. All facilities and matters required by this Agreement shall be provided and maintained by the Owner at its sole risk and expense to the satisfaction of the Corporation and in accordance with the standards determined by the Corporation and in default thereof and without limiting other remedies available to the Corporation, the provisions of Section 469 of The Municipal Act shall apply.
33. A financial guarantee (Performance Bond, Letter of Credit or other security acceptable to the Corporation) in the amount of \$10,000.00 for the cost of on-site improvements (other than buildings or structures) is required as part of the site plan agreement. A one (1) year maintenance security is also a requirement of this agreement with the option of reducing the security to 15% of the cost of the site improvements during the one (1) year maintenance period after the Town has inspected and initially approved same.
34. This Agreement shall be registered against the land to which it applies, at the expense of the Owner, and the Corporation shall be entitled, subject to the provisions of The Registry Act and The Land Titles Act, to enforce its provisions against the Owner named herein and any and all subsequent owners of the land.

**IN WITNESS WHEREOF** the Owner executed this Agreement.

OWNER: 1646247 Ontario Limited

  
Wendy Sprague-Bolger, President

THE CORPORATION OF THE  
TOWN OF AMHERSTBURG

  
Mayor Wayne Hurst

  
Clerk David Mailloux

Authorized and approved by Bylaw  
No. 2005-81 enacted the 11<sup>th</sup> day  
of October, 2005.

**SCHEDULE "A"**

The following is a description of the land to which this instrument applies:

Part of Lot 1, Concession 2,  
Geographic Township of Anderdon,  
now in the Town Amherstburg,  
in the County of Essex,  
now designated as  
Parts 3, 8 and 13, on Plan 12R-18834



N 87° 40' 50" W

226.17'

SCHEDULE "B" TO BY-LAW 2005-81

1646247 ONTARIO LIMITED

*Wendy Sprague-Bolger*  
WENDY SPRAGUE-BOLGER, PRESIDENT

TOWN OF AMHERSTBURG

*Wayne Neuss*  
MAYOR

*J. McMillan*  
CLERK

NOTES  
1. REFUSE STORAGE AREA TO BE FENCED IN  
2. DIMENSIONS OF STANDARD PARKING SPACES TO BE 9'-0" x 18'-0"  
3. DIMENSIONS OF HANDICAP PARKING SPACE TO BE 12'-0" x 20'-0"



768.71'

N 2° 36' 14" E

LIMITS OF CONSTRUCTION

REFUSE STORAGE 5' X 5'

PIPE TO SWALE

PROPOSED SWALE 7" WIDE



LANDSCAPE AREA 4' WIDE

PIPE TO SWALE

UNDERGROUND HYDRO SERVICE

1" POLYLINE WATER SERVICE

PROPOSED BIO-FILTER BED

N 87° 40' 50" W

226.15'

HYDRO POLE

GAS LINE

FIRE HYDRANT  
1" METER PIT  
1" COPPER

N 2° 36' 14" E

250.0'

EX. 10" WATER

24" BOSS 2000 - 35' LONG  
c/w GABION STONE ENDWALLS

ALMA STREET

FOX SIDE ROAD

|                                                                                                  |            |                                                                                         |                         |                          |                   |
|--------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------|-------------------------|--------------------------|-------------------|
| Designed by                                                                                      | Checked by | Approved by - date                                                                      | File name<br>MARINE.DWG | Date<br>09/12/05         | Scale<br>1" = 30' |
| LOT - 173850 SQ. FT.<br>BUILDING - 5000 SQ. FT.<br>16 PARKING SPACES<br>BUILDING HEIGHT - 20'-8" |            | PERCENTAGE OF AREA<br>BUILDING - 17.6%<br>ASPHALT/GRAVEL - 43.4%<br>GREEN SPACE - 39.0% |                         | OFFSHORE MARINE SITEPLAN |                   |
|                                                                                                  |            |                                                                                         |                         | Edition                  | Sheet             |

N 87° 40' 50" W

226.17'

SCHEDULE "C" TO BY-LAW 2005-81

1646247 ONTARIO LIMITED

*Wendy Sprague-Bolger*  
WENDY SPRAGUE-BOLGER, PRESIDENT

TOWN OF AMHERSTBURG

*W. H. ...*  
MAYOR

*...*  
CLERK

PROPOSED GRADE 99.20

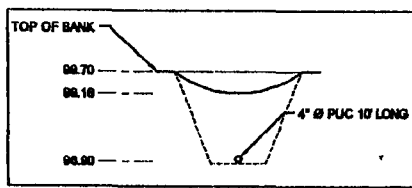
EXISTING GRADE +99.60



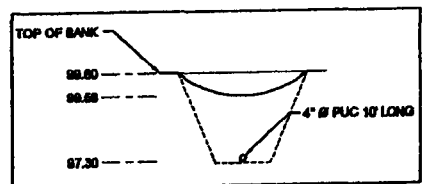
768.71'

N 2° 37' 05" E  
218.87'

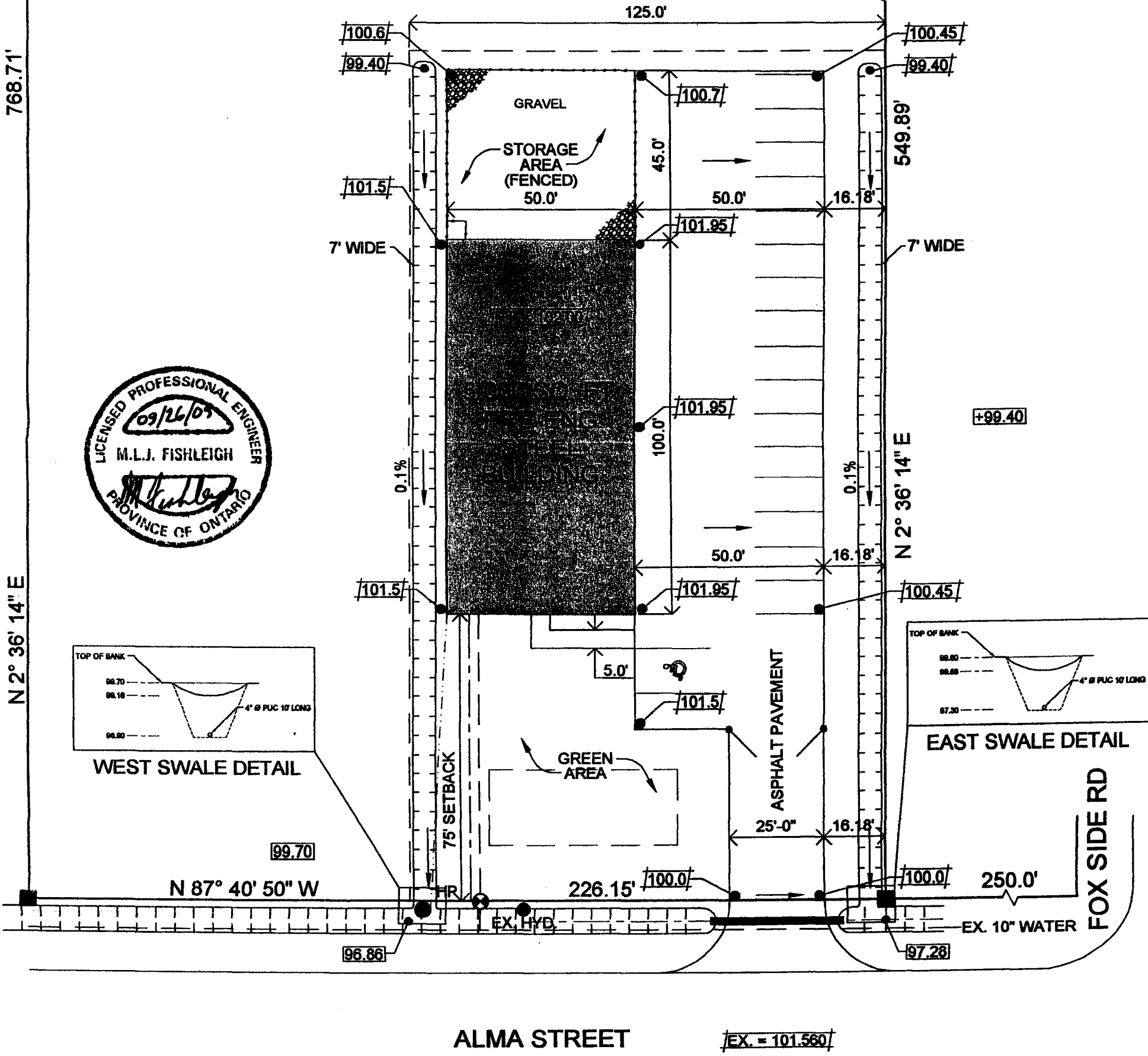
N 2° 36' 14" E



WEST SWALE DETAIL



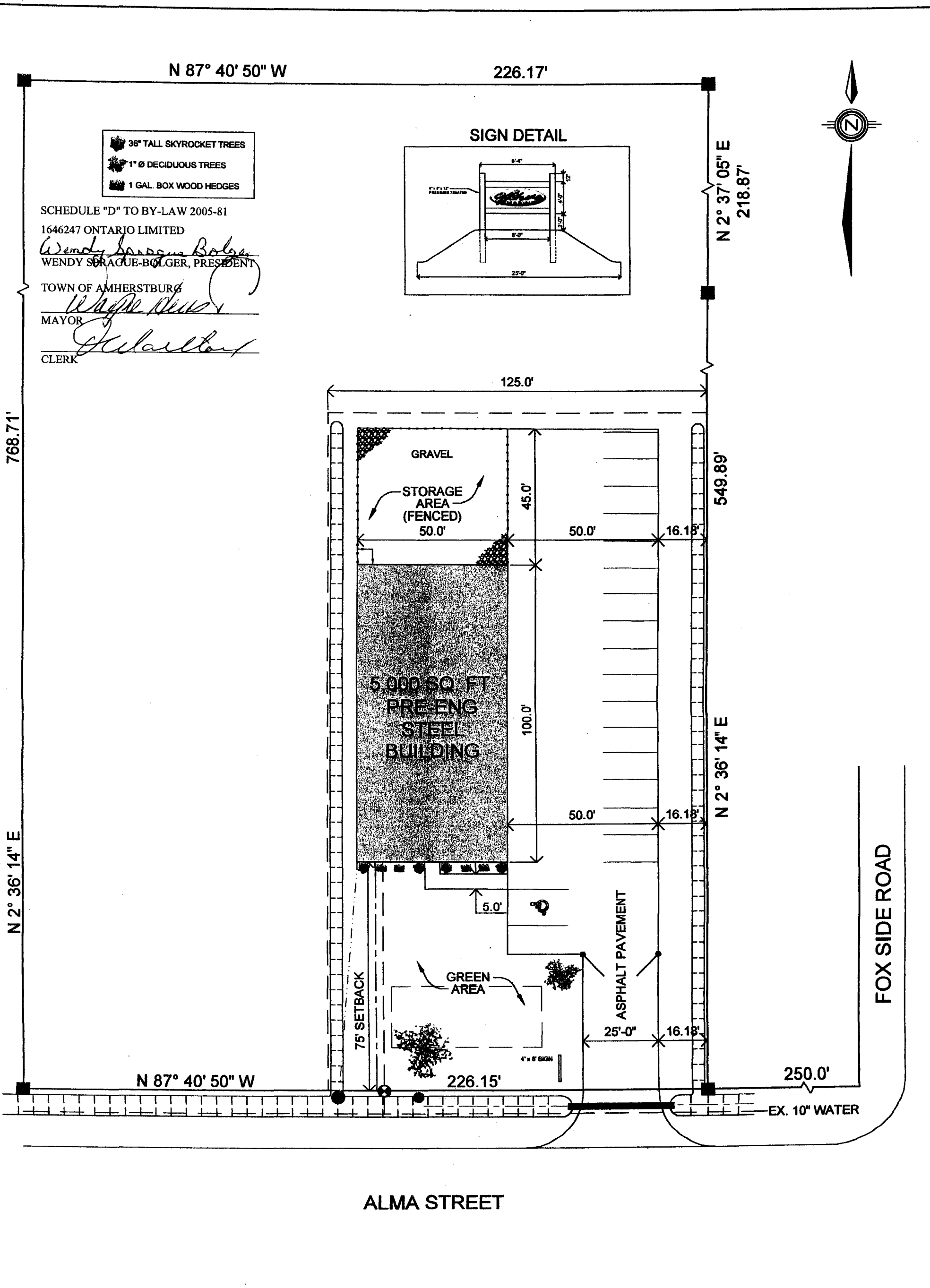
EAST SWALE DETAIL



ALMA STREET

EX. = 101.560

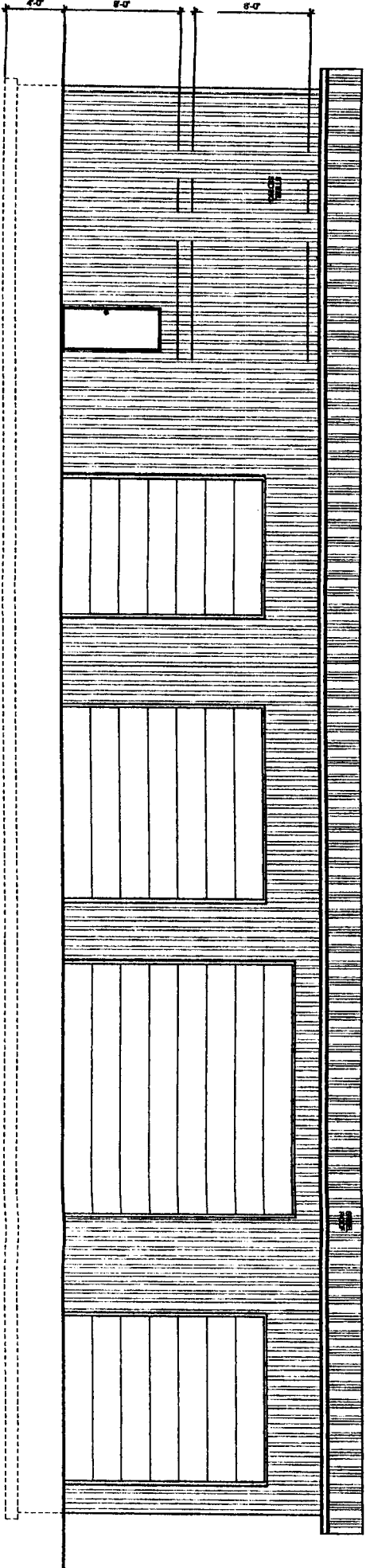
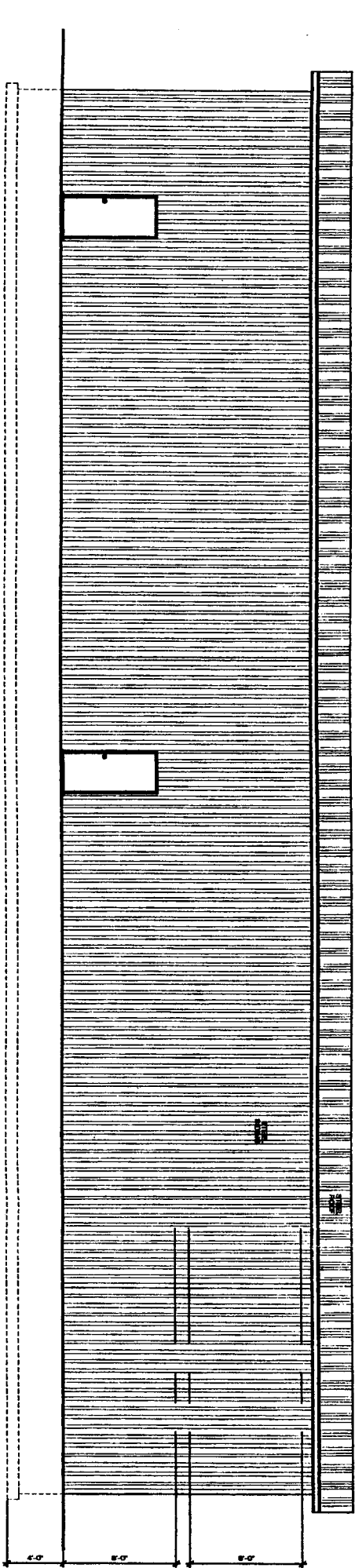
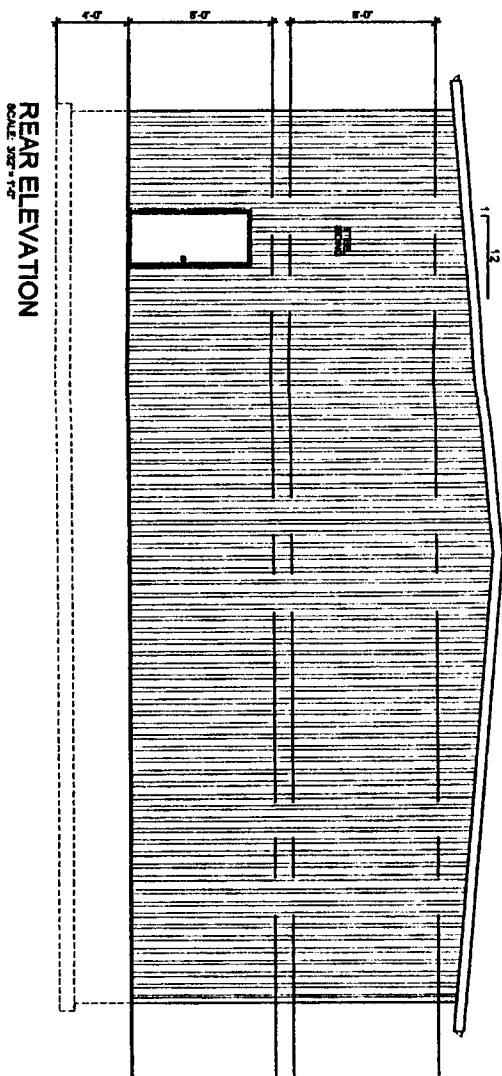
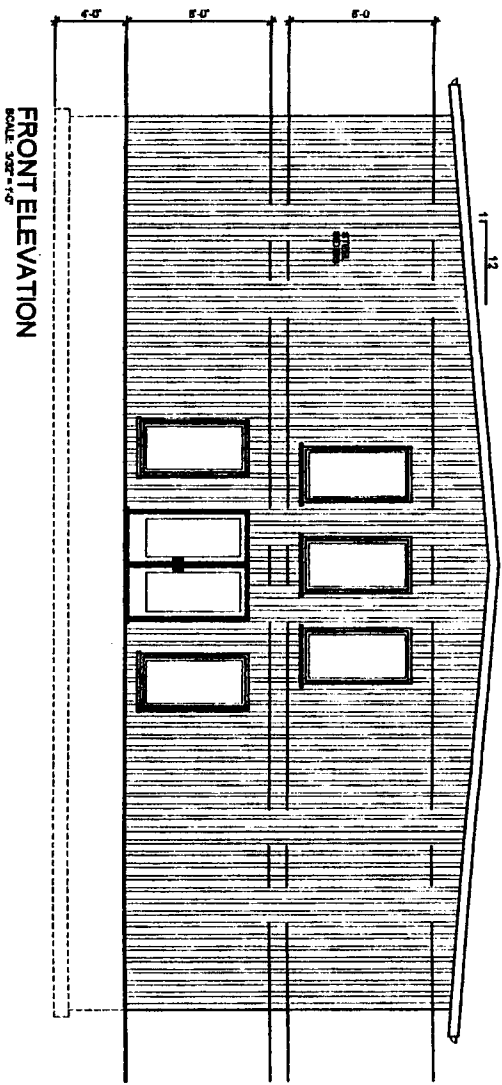
|                                                                                                  |            |                                                                                         |                         |                              |                   |
|--------------------------------------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------|-------------------------|------------------------------|-------------------|
| Designed by                                                                                      | Checked by | Approved by - date                                                                      | File name<br>MARINE.DWG | Date<br>09/24/05             | Scale<br>1" = 30' |
| LOT - 173850 SQ. FT.<br>BUILDING - 5000 SQ. FT.<br>16 PARKING SPACES<br>BUILDING HEIGHT - 20'-8" |            | PERCENTAGE OF AREA<br>BUILDING - 17.6%<br>ASPHALT/GRAVEL - 43.4%<br>GREEN SPACE - 39.0% |                         | OFFSHORE MARINE GRADING PLAN |                   |
|                                                                                                  |            |                                                                                         |                         | Edition                      | Sheet             |



SCHEDULE "D" TO BY-LAW 2005-81  
 1646247 ONTARIO LIMITED  
*Wendy Sprague Bolger*  
 WENDY SPRAGUE-BOLGER, PRESIDENT  
 TOWN OF AMHERSTBURG  
*Walter Hill*  
 MAYOR  
*J. Hartley*  
 CLERK



|             |            |                    |           |      |       |
|-------------|------------|--------------------|-----------|------|-------|
| Designed by | Checked by | Approved by - date | File name | Date | Scale |
|-------------|------------|--------------------|-----------|------|-------|



SCHEDULE "E" TO BY-LAW 2005-81

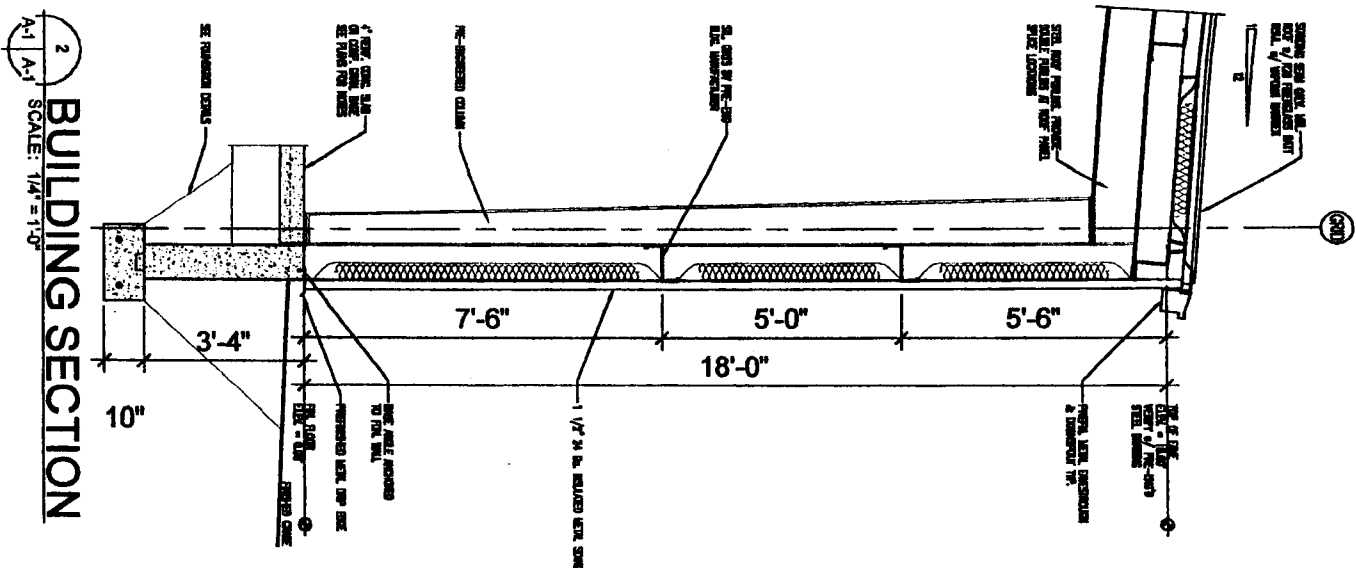
1646247 ONTARIO LIMITED

*Wendy Sprague Bolger*  
WENDY SPRAGUE BOLGER, PRESIDENT

TOWN OF AMHERSTBURG

*W. P. McNeill*  
MAYOR

*P. D. Dillmore*  
CLERK



|            |          |        |
|------------|----------|--------|
| File name  | Date     | Scale  |
| MARINE.DWG | 09/14/05 | VARIES |

ELEVATIONS & WALL SECTION

|         |       |
|---------|-------|
| Edition | Sheet |
|         | A-4   |

**Stormwater Management Calculations  
165699000**

| <b>Existing Conditions</b> |              |                  |                    |
|----------------------------|--------------|------------------|--------------------|
| Location                   | Area<br>(ha) | C before         | Area x<br>C before |
| farmland                   | 0.272        | 0.2              | 0.0544             |
| <b>Total</b>               | <b>0.272</b> |                  | <b>0.0544</b>      |
|                            |              | <b>Average C</b> | <b>0.20</b>        |

Time of Concentration =  $(0.057 \cdot L) / (S^{0.2}) \cdot (A^{0.1})$

L = 70 m  
S = 0.05 %  
A = 0.272 Ha.

Time of Concentration = 8.27 minutes

| <b>Proposed Conditions</b> |              |                  |                   |
|----------------------------|--------------|------------------|-------------------|
| Location                   | Area<br>(ha) | C after          | Area x<br>C after |
| Building                   | 0.046        | 0.9              | 0.0414            |
| Pavement                   | 0.092        | 0.9              | 0.0828            |
| Gravel                     | 0.021        | 0.8              | 0.0168            |
| Grass                      | 0.113        | 0.2              | 0.0226            |
| <b>Total</b>               | <b>0.272</b> |                  | <b>0.1636</b>     |
|                            |              | <b>Average C</b> | <b>0.60</b>       |

Time of Concentration = 6.54 minutes (Pipe and ditch travel time)

**AES Storm**

2 Year  $i = 25.3 T^{-0.712}$   
5 Year  $i = 32.5 T^{-0.712}$   
100 Year  $i = 52.2 T^{-0.711}$

**5 Year Storm (Pre-developed)**

$Q = 2.78 C_i A$

$Q = 2.78 \cdot 2 \cdot (32.5 (8.27/60)^{-0.712}) \cdot 0.272$   
= 20.1 L/s

Use Q = 20.1 L/s

SCHEDULE "F" TO BY-LAW 2005-81

1646247 ONTARIO LIMITED

*Wendy Sprague Bolger*  
WENDY SPRAGUE-BOLGER, PRESIDENT

TOWN OF AMHERSTBURG

*W. J. Bell*  
MAYOR

*W. J. Bell*  
CLERK

**5 Year Storm (Developed)**

$$Q = 2.78 CiA$$

$$Q = 2.78 \cdot .6 \cdot (32.5(6.54/60)^{-.712}) \cdot .272$$

$$= 71.6 \text{ L/s}$$

**Storage Volume Required**

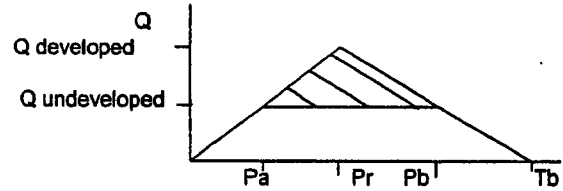
$$Pr = Tc/2 + 0.6 \cdot Tc$$

$$= 6.54/2 + 0.6 \cdot 6.54$$

$$= 7.20 \text{ min}$$

$$Tb = 2.67 Pr$$

$$= 19.2 \text{ min}$$



**Developed Runoff Volume**

$$= 0.5 \cdot (Tb \cdot 60 \text{ sec}) \cdot (Q \text{ dev}) / 1000 \text{ L/s}$$

$$= 41.3 \text{ cubic m}$$

$$Pa = 2.0 \text{ min}$$

$$Pb = 15.8 \text{ min}$$

**Allowable Outflow Volume**

$$= (0.5 \cdot Pa \cdot 60 \text{ sec} \cdot Q_{undeveloped} + (Pb - Pa) \cdot 60 \text{ sec} \cdot Q_{undeveloped} + 0.5 \cdot (Tb - Pb) \cdot 60 \text{ sec} \cdot Q_{undeveloped}) / 1000$$

$$= 20.0 \text{ cubic m}$$

**Storage Volume Required**

$$= \text{Developed Runoff Volume} - \text{Allowable Outflow Volume}$$

$$= 21.3 \text{ cubic m}$$

**5 Year Storm (Predeveloped)**

$$Q = 2.78 CiA$$

$$Q = 2.78 \cdot .2 \cdot (32.5(8.27/60)^{-.712}) \cdot .272$$

$$= 20.1 \text{ L/s}$$

$$\text{Use } Q = 20.1 \text{ L/s}$$

**100 Year Storm (Developed)**

$$Q = 2.78 CiA$$

$$Q = 2.78 \cdot .6 \cdot (52.2(6.54/60)^{-.711}) \cdot .272$$

$$= 114.8 \text{ L/s}$$

**Storage Volume Required**

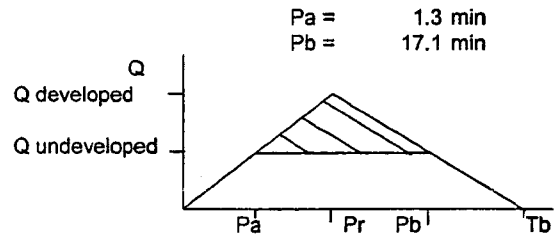
$$Pr = Tc/2 + 0.6 \cdot Tc$$

$$= 6.54/2 + 0.6 \cdot 6.54$$

$$= 7.20 \text{ min}$$

$$Tb = 2.67 Pr$$

$$= 19.2 \text{ min}$$



$$Pa = 1.3 \text{ min}$$

$$Pb = 17.1 \text{ min}$$

Developed Runoff Volume  
 $= 0.5 \cdot (T_b \cdot 60 \text{sec}) \cdot (Q_{\text{dev}}) / 1000 \text{L/s}$   
 $= 66.2 \text{ cubic m}$

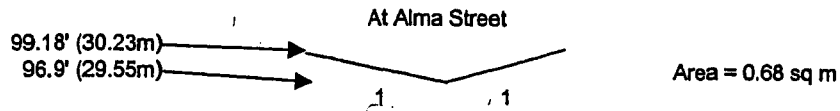
Allowable Outflow Volume  
 $= (0.5 \cdot P_a \cdot 60 \text{sec} \cdot Q_{\text{undev}} + (P_b - P_a) \cdot 60 \text{sec} \cdot Q_{\text{undev}} + 0.5 \cdot (T_b - P_b) \cdot 60 \text{sec} \cdot Q_{\text{undev}}) / 1000$   
 $= 21.2 \text{ cubic m}$

Storage Volume Required  
 $= \text{Developed Runoff Volume} - \text{Allowable Outflow Volume}$   
 $= 45.0 \text{ cubic m}$

Required Storage:

45.0 cubic m

Proposed swale



\* Storage Provided in each swale:

$\text{length} \times (\text{area at Alma Street} + \text{area at upper end}) / 2$

length = 70 m  
 area at Alma = 0.68 sq m  
 area at upper end = 0 sq m  
 storage provided in each swale = 23.80 cu m  
 storage provided in two swales = 47.60 cu m

Hydraulic capacity of orifices in the swale at Alma Street

Orifice equation:

$Q = C_d A_o (2gh_o)^{1/2}$

| Pipe diameter (mm) | invert elev. | spillway elev. | Q, cms    | Ao, m <sup>2</sup> | ho   |
|--------------------|--------------|----------------|-----------|--------------------|------|
| 100                | 29.55        | 30.23          | 0.0100145 | 0.007857           | 0.23 |

flow conveyed from one swale = 10.01 L/s  
 flow conveyed from two swales = 20.03 L/s  
 allowable flow (5Year pre-developed) = 20.1 L/s



# STORM SEWER DESIGN SHEET (METRIC)

## DESIGN CRITERIA

YEAR STORM CURVE                    5 year  
 ENTRY TIME                            5 min  
 VELOCITY RANGE                    0.75 m/s to 3 m/s  
 MINIMUM PIPE SIZE                300 mm

Project :

Client :

| STREET OR EASEMENT | LOCATION             |                    | SEWER LENGTH (m) | CUMULATIVE                    |       | A x C           |             |             | RAINFALL INTENSITY |             |                   | MAXIMUM FLOW EXPECTED (L/sec.) | SEWER DESIGN |                 |               |               |                     | PROFILE             |                    |            | AVERAGE COVER (m) |                      |            |
|--------------------|----------------------|--------------------|------------------|-------------------------------|-------|-----------------|-------------|-------------|--------------------|-------------|-------------------|--------------------------------|--------------|-----------------|---------------|---------------|---------------------|---------------------|--------------------|------------|-------------------|----------------------|------------|
|                    | FROM STREET AND M.H. | TO STREET AND M.H. |                  | DESIGN AREA SERVED (HECTARES) |       | RUNOFF FACTOR C | INCR. A x C | TOTAL A x C | FLOW TIME          |             |                   |                                | KIND OF PIPE | SEWER SLOPE (%) | DIAMETER (mm) | MANNING'S "n" | CAPACITY FULL (L/s) | VELOCITY FULL (m/s) | UPSTREAM ELEVATION |            |                   | DOWNSTREAM ELEVATION |            |
|                    |                      |                    |                  | INCREMENT                     | TOTAL |                 |             |             | SECT. (min)        | ACCUM (min) | INTENSITY (mm/hr) |                                |              |                 |               |               |                     |                     | INVERT (m)         | GROUND (m) |                   | INVERT (m)           | GROUND (m) |
|                    | A                    | B                  | 70               | 0.272                         | 0.272 | 0.6             | 0.163       | 0.163       | 1.5424             | 6.54        | 157.44            | 71.4                           | CSP          | 0.650%          | 375           | 0.022         | 83.5                | 0.76                |                    |            |                   |                      |            |
|                    |                      |                    |                  |                               |       |                 |             |             |                    |             |                   |                                | CSP          | 0.850%          | 300           | 0.022         | 52.7                | 0.75                |                    |            |                   |                      |            |
|                    |                      |                    |                  |                               |       |                 |             |             |                    |             |                   |                                | CSP          | 0.850%          | 300           | 0.022         | 52.7                | 0.75                |                    |            |                   |                      |            |
|                    |                      |                    |                  |                               |       |                 |             |             |                    |             |                   |                                |              |                 |               | Total =       | 105.4               |                     |                    |            |                   |                      |            |