Planning Department Development Application Form

Complete Application

A complete development application consists of the following:

1. A properly completed and signed application form (signature must be original in planners file);
2. Supporting information adequate to illustrate your proposal as indicated in **Section H** of this application form (plans are required in paper copy and digital PDF format);
3. Written authorization from the registered owner of the subject lands where the applicant is not the owner as per Section N; and,
4. Cash, debit or cheque payable to Norfolk County in the amount set out in the user fees By-Law.

The above information is required to ensure that your application is given full consideration. An incomplete or improperly prepared application will not be accepted and may result in delays during the processing of the application. This application must be typed or printed in ink and completed in full.

Pre-Submission Consultation "Pre-consultation":

A pre-consultation meeting with staff is required for all applications; however, minor applications may be exempted depending on the nature of the proposal, with approval from the Director of Planning or delegate. The purpose of a pre-consultation meeting is to provide the applicant with an opportunity to present the proposed application, discuss potential issues, and for the County and Agency staff to identify the required information and materials to be submitted with the application in order for it to be considered complete. The applicant has the opportunity to make revisions to the application prior to submission, without the additional costs of recirculation fees. It may be necessary to seek the assistance of independent professional help (for example, a planning consultant or engineer) for complex applications. If a pre-consultation meeting has been held to discuss your development, please **include a copy of the Pre-consultation minutes with your application** as part of the submission package. It should be noted **that pre-consultation minutes are valid for one year after the meeting date**.

Development Application Process

Once an application has been deemed complete by a planner, it will be circulated to public agencies and County departments for review and comments. Notice of the application is also provided to adjacent land owners. The comments received assist the planner with the review and recommendation/approval of your application. The time involved in processing an application varies depending upon its complexity and its

acceptability to the other agencies and is subject to statutory *Planning Act* decision timeframes.

An additional fee will be required if a review by the Long Point Region Conservation Authority or by the Grand River Conservation Authority is deemed necessary by planning staff and/or by the Authority. A separate cheque payable to the Long Point Region Conservation Authority or the Grand River Conservation Authority is required in accordance with their fee schedule at the same time your application is submitted.

Additional studies required as part of the complete application shall be at the sole expense of the applicant. It should also be noted that in some instances peer reviews may be necessary to review particular studies and that the cost shall be at the expense of the applicant. The company to complete the peer review shall be selected by the County.

If the application is withdrawn prior to the circulation to commenting agencies, the entire original fee will be refunded. If withdrawn after the circulation to agencies, half the original fee will be refunded. If your drawings are required to be recirculated there will be an additional fee. Also, please note that if your engineering drawings require more than three reviews due to revisions by the owner or failure to revise your engineering drawings as requested, an additional fee will be charged. No refund is available after the public meeting and/or after approval of application.

Notification Sign Requirements

For the purpose of public notification and in order for staff to locate your lands for appropriate applications (zoning, subdivision, condominium or official plan) you will be given a sign to indicate the intent and purpose of your development application. It is your responsibility to:

1. Post one sign per frontage in a conspicuous location on the subject lands;
2. Ensure one sign is posted at the front of the subject lands at least three feet above ground level, not on a tree;
3. Notify the Planner when the sign is in place in order to avoid processing delays; and
4. Maintain the sign until the development application is finalized and thereafter removed.

Contact Us

For additional information or assistance in completing this application, please contact a planner at 519-426-5870 or 519-875-4485 extension 1842 or planning@norfolkcounty.ca. Please submit the completed application and fees to the attention of the Planning Department at 185 Robinson Street, Suite 200, Simcoe, ON N3Y 5L6.

For Office Use Only:

File Number		Public Notice Sign	
Related File Number		Application Fee	
Pre-consultation Meeting		Conservation Authority Fee	
Application Submitted		Well & Septic Info Provided	
Complete Application		Planner	

Check the type of planning application(s) you are submitting.

- ☐ Official Plan Amendment
- ☐ Zoning By-Law Amendment
- ☐ Temporary Use By-law
- ☐ Draft Plan of Subdivision/Vacant Land Condominium
- ☐ Condominium Exemption
- ☒ Site Plan Application
- ☐ Extension of a Temporary Use By-law
- ☐ Part Lot Control
- ☐ Cash-in-Lieu of Parking
- ☐ Renewable Energy Project or Radio Communication Tower

Please summarize the desired end result of this application (for example: a special zoning provision on the subject lands to include additional use(s), changing the zone and/or official plan designation of the subject lands, creating a certain number of lots, or similar)

The proposal is for the development and construction of a Long Term Care Home for 128 residents.

Property Assessment Roll Number: 33704019031

A. Applicant Information

Name of Owner 2079095 Ontario Ltd.

It is the responsibility of the owner or applicant to notify the planner of any changes in ownership within 30 days of such a change.

Address

Town and Postal Code

Phone Number

Cell Number

Email

Name of Applicant 1000210811 Ontario Inc.

Address [redacted]

Town and Postal Code [redacted]

Phone Number

Cell Number

Email

Name of Agent Paul McCorquodale c/o 1000210811 Ontario Inc.

Address 5015 Spectrum Way, Suite 600

Town and Postal Code Mississauga L4W 0E4

Phone Number

Cell Number 289 937 0372

Email paul.mccorquodale@reveraliving.com

Please specify to whom all communications should be sent. Unless otherwise directed, all correspondence and notices in respect of this application will be forwarded to both owner and agent noted above.

☐ Owner ■ Agent ■ Applicant

Names and addresses of any holder of any mortgagees, charges or other encumbrances on the subject lands:

B. Location, Legal Description and Property Information

1. Legal Description (include Geographic Township, Concession Number, Lot Number, Block Number and Urban Area or Hamlet):

PART LOT 15, CONCESSION 1 WOODHOUSE; SUBJECT TO AN EASEMENT IN GROSS AS IN NK102873 NK116367; SUBJECT TO AN EASEMENT IN GROSS AS IN NK115294; NORFOLK COUNTY

PIN No. 50256-1119 (LT)

Municipal Civic Address: N/A

Present Official Plan Designation(s): Urban Residential

Present Zoning: Urban Residential Type 5 (R5)

2. Is there a special provision or site specific zone on the subject lands?

☒ Yes ☐ No If yes, please specify corresponding number:

14.886

3. Present use of the subject lands:

Vacant

4. Please describe **all existing** buildings or structures on the subject lands and whether they are to be retained, demolished or removed. If retaining the buildings or structures, please describe the type of buildings or structures, and illustrate the setback, in metric units, from front, rear and side lot lines, ground floor area, gross floor area, lot coverage, number of storeys, width, length, and height on your attached sketch which must be included with your application:

NA

5. If an addition to an existing building is being proposed, please explain what it will be used for (for example: bedroom, kitchen, or bathroom). If new fixtures are proposed, please describe.

NA

6. Please describe **all proposed** buildings or structures/additions on the subject lands. Describe the type of buildings or structures/additions, and illustrate the setback, in metric units, from front, rear and side lot lines, ground floor area, gross floor area, lot coverage, number of storeys, width, length, and height on your attached sketch which must be included with your application:

Proposal is for the development and construction of a Long Term Care Home. See enclosed site plan.

7. Are any existing buildings on the subject lands designated under the *Ontario Heritage Act* as being architecturally and/or historically significant? Yes ☐ No ■

   If yes, identify and provide details of the building:

8. If known, the length of time the existing uses have continued on the subject lands:

9. Existing use of abutting properties:
   Residential

10. Are there any easements or restrictive covenants affecting the subject lands?

    ■ Yes ☐ No If yes, describe the easement or restrictive covenant and its effect: 1.NK102873 – Easement in favour of Union Gas Limited 2. NK116367 -Partial release of Easement No. NK102873 3. NK115294 -Sewer Easement in favour of the County

C. Purpose of Development Application

Note: Please complete all that apply.

1. Please explain what you propose to do on the subject lands/premises which makes this development application necessary:
   The development and construction of a Long Term Care Home.

2. Please explain why it is not possible to comply with the provision(s) of the Zoning By-law/and or Official Plan:
   NA

3. Does the requested amendment alter all or any part of the boundary of an area of settlement in the municipality or implement a new area of settlement in the municipality? ☐ Yes ☐ No If yes, describe its effect:
   NA

4. Does the requested amendment remove the subject land from an area of employment? ☐ Yes ☐ No If yes, describe its effect:
   NA

5. Does the requested amendment alter, replace, or delete a policy of the Official Plan?
☐ Yes ■ No If yes, identify the policy, and also include a proposed text of the policy amendment (if additional space is required, please attach a separate sheet):
N/A

6. Description of land intended to be severed in metric units:
Frontage: N/A
Depth: N/A
Width: N/A
Lot Area: N/A
Present Use: N/A
Proposed Use: N/A
Proposed final lot size (if boundary adjustment): N/A
If a boundary adjustment, identify the assessment roll number and property owner of the lands to which the parcel will be added: N/A

Description of land intended to be retained in metric units:
Frontage: N/A
Depth: N/A
Width: N/A
Lot Area: N/A
Present Use: N/A
Proposed Use: N/A
Buildings on retained land: N/A

7. Description of proposed right-of-way/easement:
Frontage: N/A
Depth: N/A
Width: N/A
Area: N/A
Proposed use: N/A

8. Name of person(s), if known, to whom lands or interest in lands to be transferred, leased or charged (if known):

9. **Site Information**	**Zoning**	**Proposed**
Please indicate unit of measurement, for example: m, m^2 or %		
Lot frontage	30m	131.2m
Lot depth		204m
Lot width		131m
Lot area		5.66 Acres
Lot coverage		13.6%
Front yard	3m	51.5m
Rear yard	9m	49.7m
Left Interior side yard	3m	6m
Right Interior side yard	3m	20.5m
Exterior side yard (corner lot)		
Landscaped open space		7,448m2
Entrance access width		6.7m
Exit access width		6.7m
Size of fencing or screening		
Type of fencing		

10. Building Size

Number of storeys	3	2
Building height		7.78
Total ground floor area		31,647sf
Total gross floor area		7056m2
Total useable floor area		

11. Off Street Parking and Loading Facilities

Number of off street parking spaces	32	55
Number of visitor parking spaces		
Number of accessible parking spaces		3
Number of off street loading facilities		

12. Residential (if applicable)

Number of buildings existing: 0

Number of buildings proposed: 1

Is this a conversion or addition to an existing building? ☐ Yes ■ No

If yes, describe: _____

Type	Number of Units	Floor Area per Unit in m2
Single Detached		
Semi-Detached		
Duplex		
Triplex		
Four-plex		
Street Townhouse		
Stacked Townhouse		
Apartment - Bachelor		
Apartment - One bedroom		
Apartment - Two bedroom		
Apartment - Three bedroom		

Other facilities provided (for example: play facilities, underground parking, games room, or swimming pool):

13. Commercial/Industrial Uses (if applicable)

Number of buildings existing: N/A

Number of buildings proposed: N/A

Is this a conversion or addition to an existing building? ☐ Yes ■ No

If yes, describe:

Indicate the gross floor area by the type of use (for example: office, retail, or storage):
N/A

Seating Capacity (for assembly halls or similar): N/A

Total number of fixed seats: N/A

Describe the type of business(es) proposed: N/A

Total number of staff proposed initially: N/A

Total number of staff proposed in five years: N/A

Maximum number of staff on the largest shift: N/A

Is open storage required: ☐ Yes ☐ No

Is a residential use proposed as part of, or accessory to commercial/industrial use?

☐ Yes ■ No If yes please describe:

14. Institutional (if applicable)

Describe the type of use proposed: Long Term Care Home

Seating capacity (if applicable):

Number of beds (if applicable): 128

Total number of staff proposed initially:

Total number of staff proposed in five years:

Maximum number of staff on the largest shift:

Indicate the gross floor area by the type of use (for example: office, retail, or storage):

15. Describe Recreational or Other Use(s) (if applicable)

D. Previous Use of the Property

1. Has there been an industrial or commercial use on the subject lands or adjacent lands? ☐ Yes ■ No ☐ Unknown
   If yes, specify the uses (for example: gas station or petroleum storage):

2. Is there reason to believe the subject lands may have been contaminated by former uses on the site or adjacent sites? ☐ Yes ■ No ☐ Unknown
3. Provide the information you used to determine the answers to the above questions:
   Phase 1 Environmental Completed

4. If you answered yes to any of the above questions in Section D, a previous use inventory showing all known former uses of the subject lands, or if appropriate, the adjacent lands, is needed. Is the previous use inventory attached? ☐ Yes ■ No

E. Provincial Policy

1. Is the requested amendment consistent with the provincial policy statements issued under subsection 3(1) of the *Planning Act, R.S.O. 1990, c. P. 13*? ■ Yes ☐ No

   If no, please explain:

2. It is owner's responsibility to be aware of and comply with all relevant federal or provincial legislation, municipal by-laws or other agency approvals, including the Endangered Species Act, 2007. Have the subject lands been screened to ensure that development or site alteration will not have any impact on the habitat for endangered or threatened species further to the provincial policy statement subsection 2.1.7? ☐ Yes ☐ No

   If no, please explain:

3. Have the subject lands been screened to ensure that development or site alteration will not have any impact on source water protection? ☐ Yes ☐ No

   If no, please explain:

   _____

   _____

   Note: If in an area of source water Wellhead Protection Area (WHPA) A, B or C please attach relevant information and approved mitigation measures from the Risk Manager Official.

4. Are any of the following uses or features on the subject lands or within 500 metres of the subject lands, unless otherwise specified? Please check boxes, if applicable.

   Livestock facility or stockyard (submit MDS Calculation with application)

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Wooded area

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Municipal Landfill

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Sewage treatment plant or waste stabilization plant

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Provincially significant wetland (class 1, 2 or 3) or other environmental feature

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Floodplain

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Rehabilitated mine site

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Non-operating mine site within one kilometre

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Active mine site within one kilometre

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Industrial or commercial use (specify the use(s))

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Active railway line

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Seasonal wetness of lands

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Erosion

   ☐ On the subject lands or ☐ within 500 meters – distance _____

   Abandoned gas wells

   ☐ On the subject lands or ☐ within 500 meters – distance _____

F. Servicing and Access

1. Indicate what services are available or proposed:

Water Supply

- ■ Municipal piped water
- ☐ Individual wells
- ☐ Communal wells
- ☐ Other (describe below)

_____

Sewage Treatment

- ■ Municipal sewers
- ☐ Septic tank and tile bed in good working order
- ☐ Communal system
- ☐ Other (describe below)

_____

Storm Drainage

- ■ Storm sewers
- ☐ Other (describe below)
- ☐ Open ditches

_____

2. Existing or proposed access to subject lands:

- ■ Municipal road
- ☐ Unopened road
- ☐ Provincial highway
- ☐ Other (describe below)

Name of road/street: _____

G. Other Information

1. Does the application involve a local business? ■ Yes ☐ No
   If yes, how many people are employed on the subject lands?

   _____

2. Is there any other information that you think may be useful in the review of this application? If so, explain below or attach on a separate page.

   _____

   _____

   _____

   _____

H. Supporting Material to be submitted by Applicant

In order for your application to be considered complete, **folded** hard copies (number of paper copies as directed by the planner) and an **electronic version (PDF) of the properly named site plan drawings, additional plans, studies and reports** will be required, including but not limited to the following details:

1. Concept/Layout Plan
2. All measurements in metric
3. Key map
4. Scale, legend and north arrow
5. Legal description and municipal address
6. Development name
7. Drawing title, number, original date and revision dates
8. Owner's name, address and telephone number
9. Engineer's name, address and telephone number
10. Professional engineer's stamp
11. Existing and proposed easements and right of ways
12. Zoning compliance table – required versus proposed
13. Parking space totals – required and proposed
14. All entrances to parking areas marked with directional arrows
15. Loading spaces, facilities and routes (for commercial developments)
16. All dimensions of the subject lands
17. Dimensions and setbacks of all buildings and structures
18. Location and setbacks of septic system and well from all existing and proposed lot lines, and all existing and proposed structures
19. Gross, ground and useable floor area
20. Lot coverage
21. Floor area ratio
22. Building entrances, building type, height, grades and extent of overhangs
23. Names, dimensions and location of adjacent streets including daylighting triangles
24. Driveways, curbs, drop curbs, pavement markings, widths, radii and traffic directional signs
25. All exterior stairways and ramps with dimensions and setbacks
26. Retaining walls including materials proposed
27. Fire access and routes
28. Location, dimensions and number of parking spaces (including visitor and accessible) and drive aisles
29. Location of mechanical room, and other building services (e.g. A/C, HRV)
30. Refuse disposal and storage areas including any related screening (if indoors, need notation on site plan)
31. Winter snow storage location

32. Landscape areas with dimensions
33. Natural features, watercourses and trees
34. Fire hydrants and utilities location
35. Fencing, screening and buffering – size, type and location
36. All hard surface materials
37. Light standards and wall mounted lights (plus a note on the site plan that all outdoor lighting is to be dark sky compliant)
38. Business signs (make sure they are not in sight lines)
39. Sidewalks and walkways with dimensions
40. Pedestrian access routes into site and around site
41. Bicycle parking
42. Architectural elevations of all building sides
43. All other requirements as per the pre-consultation meeting

In addition, the following additional plans, studies and reports, including but not limited to, **may** also be required as part of the complete application submission:

☐ Zoning Deficiency Form

☐ On-Site Sewage Disposal System Evaluation Form (to verify location and condition)

☐ Architectural Plan

☐ Buildings Elevation Plan

☐ Cut and Fill Plan

☐ Erosion and Sediment Control Plan

☐ Grading and Drainage Control Plan (around perimeter and within site) (existing and proposed)

☐ Landscape Plan

☐ Photometric (Lighting) Plan

☐ Plan and Profile Drawings

☐ Site Servicing Plan

☐ Storm water Management Plan

☐ Street Sign and Traffic Plan

☐ Street Tree Planting Plan

☐ Tree Preservation Plan

☐ Archaeological Assessment

☐ Environmental Impact Study

☐ Functional Servicing Report

☐ Geotechnical Study / Hydrogeological Review

☐ Minimum Distance Separation Schedule

☐ Noise or Vibration Study

☐ Record of Site Condition

☐ Storm water Management Report

☐ Traffic Impact Study – please contact the Planner to verify the scope required

Site Plan applications will require the following supporting materials:

1. Two (2) complete sets of the site plan drawings folded to 8½ x 11 and an electronic version in PDF format
2. Letter requesting that the Holding be removed (if applicable)
3. A cost estimate prepared by the applicant's engineer
4. An estimate for Parkland dedication by a certified land appraiser
5. Property Identification Number (PIN) printout

Standard condominium exemptions will require the following supporting materials:

☐ Plan of standard condominium (2 paper copies and 1 electronic copy)

☐ Draft condominium declaration

☐ Property Identification Number (PIN) printout

Your development approval might also be dependent on Ministry of Environment and Climate Change, Ministry of Transportation or other relevant federal or provincial legislation, municipal by-laws or other agency approvals.

All final plans must include the owner's signature as well as the engineer's signature and seal.

I. Development Agreements

A development agreement may be required prior to approval for site plan, subdivision and condominium applications. Should this be necessary for your development, you will be contacted by the agreement administrator with further details of the requirements including but not limited to insurance coverage, professional liability for your engineer, additional fees and securities.

J. Transfers, Easements and Postponement of Interest

The owner acknowledges and agrees that if required it is their solicitor's responsibility on behalf of the owner for the registration of all transfer(s) of land to the County, and/or transfer(s) of easement in favour of the County and/or utilities. Also, the owner further acknowledges and agrees that it is their solicitor's responsibility on behalf of the owner for the registration of postponements of any charges in favour of the County.

K. Permission to Enter Subject Lands

Permission is hereby granted to Norfolk County officers, employees or agents, to enter the premises subject to this application for the purposes of making inspections associated with this application, during normal and reasonable working hours.

L. Freedom of Information

For the purposes of the *Municipal Freedom of Information and Protection of Privacy Act*, I authorize and consent to the use by or the disclosure to any person or public body any information that is collected under the authority of the *Planning Act, R.S.O. 1990, c. P. 13* for the purposes of processing this application.

May 13, 2022

Owner/Applicant Signature | Date

M. Owner's Authorization

If the applicant/agent is not the registered owner of the lands that is the subject of this application, the owner(s) must complete the authorization set out below.

I/We 2079095 Ontario Ltd. am/are the registered owner(s) of the lands that is the subject of this application.

I/We authorize ~~Revera Inc.~~ 1000210811 Ontario Inc. to make this application on my/our behalf and to provide any of my/our personal information necessary for the processing of this application. Moreover, this shall be your good and sufficient authorization for so doing.

April 27, 2022

Owner | Date

Owner | Date

N. Declaration

I, Frank Cerrone of The City of Toronto

solemnly declare that:

all of the above statements and the statements contained in all of the exhibits transmitted herewith are true and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of *The Canada Evidence Act*.

Declared before me at:

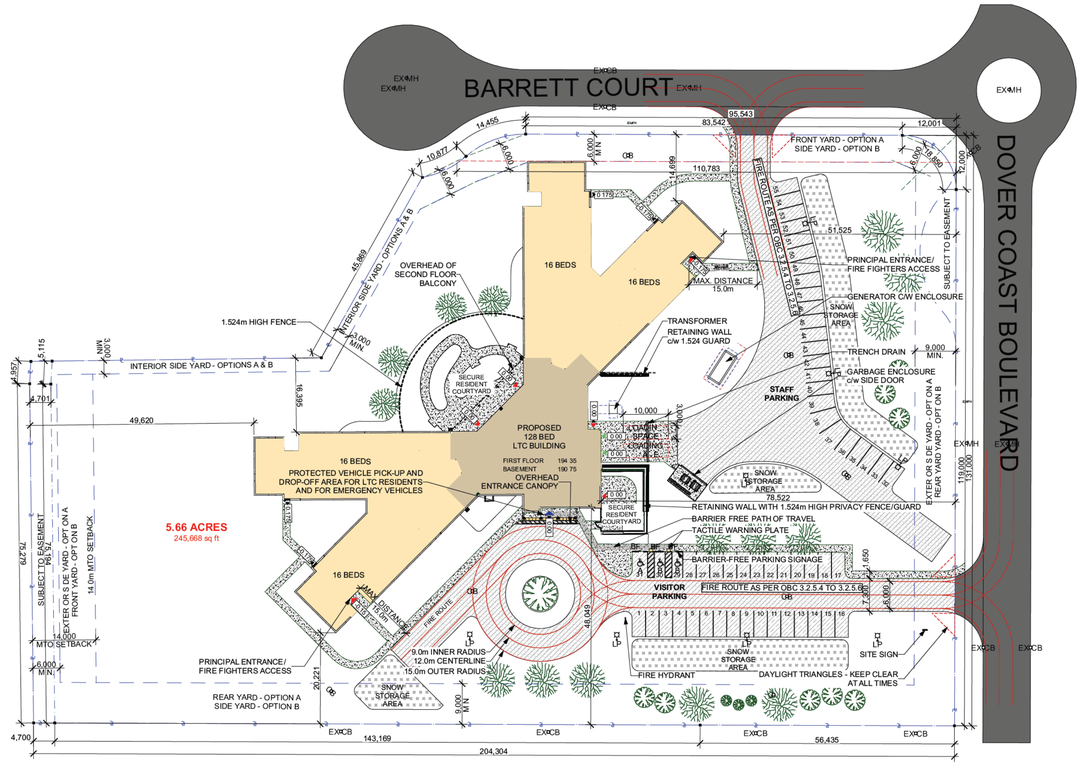
Owner/Applicant Signature

In Mississauga

This 13th day of May

A.D., 2022

A Commissioner, etc.
Taylor Lash



6 OVERALL SITE PLAN

A100 1:625

SITE PLAN NOTES

1. CONTRACTOR TO MAKE GOOD ALL EXISTING AREAS (INSIDE OR OUTSIDE THE PROPERTY LINE) DISTURBED OR DAMAGED DURING PERIOD OF CONSTRUCTION, WHETHER SHOWN ON DRAWINGS OR NOT.
2. SITE PLANS ARE TO BE READ IN CONJUNCTION WITH DETAILS AND INFORMATION SHOWN ELSEWHERE ON DRAWINGS. IN THE EVENT OF DISCREPANCIES THE MORE STRINGENT REQUIREMENT SHALL GOVERN.
3. ALL EXCAVATION SHALL BE UNDERTAKEN IN SUCH A MANNER AS TO PREVENT MOVEMENT WHICH WOULD CAUSE DAMAGE TO ADJACENT PROPERTIES, EXISTING STRUCTURES, UTILITIES, ROADS & SIDEWALS, ETC. AT ALL STAGES OF CONSTRUCTION. EXCAVATIONS THAT EXCEED 1.2 M (4 FT.) IN DEPTH SHALL BE SHORED OR CUT BACK AT THE TOP SO THAT THE ANGLE OF THE CUT DOES NOT EXCEED 1:1 SLOPE. IF SHORING IS TO BE PROVIDED, SUBMIT DRAWINGS WITH DESIGN PARAMETERS CLEARLY STATED AND PREPARED BY P. ENG. (REGISTERED IN ONTARIO) WITH SEAL AND SIGNATURE, FOE APPROVAL UNDER SEPARATE PERMIT APPLICATION.
4. DISTANCES SHOWN ON THIS PLAN ARE IN METERS AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.
5. DO NOT DISTURB OR REMOVE ANY EXISTING VEGETATION (TREES, SHRUBS, GROUND COVER, ETC.) WITHOUT ARCHITECT'S WRITTEN APPROVAL.

MUNICIPAL REVIEW		SITE DATA
PROJECT NO	1822	BARRETT COURT PORT DOVER ONTARIO CANADA
DESCRIPTION		2 STOREY, 128 BED LONG TERM CARE FACILITY
OFFICIAL PLAN		URBAN RESIDENTIAL
BY LAW		1 Z 2014 & SPECIAL PROVISION 14.886 IN 19 Z 2020
ZONING		URBAN RESIDENTIAL TYPE 5 ZONE (R5) & SP 14.886
PERMITTED USES		LONG TERM CARE IN SPECIAL PROVISION 14.886
REGULATION	**REQUIREMENT**	**ACTUAL**
LOT AREA	540.0 m^2	22,823.0 m^2 (5.66 ACRES)
LOT FRONTAGE	MIN. 30.0 m	110.783 m: OPTION A (BARRETT COURT) 80.236 m: OPTION B (HWY #6)
LOT COVERAGE	N/A	13.6% (3,106 m^2)
HARDSCAPE AREA	N/A	4,336 m^2
FRONT YARD	MIN. 6.0 m	6.0 m: BARRETT COURT OPTION A 49.522 m: HWY #6 OPTION B
REAR YARD	MIN. 9.0 m	20.211 m: SOUTH SIDE OPTION A 51.525 m: DOVER COAST OPTION B
SIDE YARD (EXTERIOR) OPTION A	MIN. 6.0 m	49.522 m: HWY #6 51.525 m: BARRETT COURT
SIDE YARD (EXTERIOR) OPTION B	MIN. 6.0 m	NONE
SIDE YARD (INTERIOR)	MIN. 3.0 m	16.396 m: NORTH SIDE OPTION A 16.396 m NORTH & 20.211 m SOUTH OPTION B
HEIGHT	MAX. 11.0 m [1 Z 2014]	7.78 m (REFER TO ELEVATION DRAWINGS) 2 STOREYS

MUNICIPAL REVIEW		PARKING DATA
REGULATION	**REQUIREMENT**	**ACTUAL**
PARKING	ZONING REQUIRES 1 PER 4 BEDS = 32 SPACES	REFER TO PARKING TABLE ON THIS DRAWING
DRIVING LANE WIDTH	MIN. 7.3 m	7.3 m
PARKING AISLE WIDTH	MIN. 7.3 m	7.3 m
PARKING SPACE	3.0 m x 5.8 m MINIMUM	3.0 m x 5.8 m
ACCESSIBLE PARKING		
TYPE A	3.4 m x 5.8 m MINIMUM	3.4 m x 5.8 m
TYPE B	2.4 m x 5.8 m MINIMUM	2.4 m x 5.8 m
LANDSCAPED OPEN SPACE		32.5% (7,448 m^2)
BUILDING AREA		3,111 m^2
GROSS FLOOR AREA		7,050 m^2

Building GFA	
Story	Area
BASEMENT	844.6
FIRST FLOOR	3,111.4
SECOND FLOOR	3,094.4
	7,050.4 m²

7 MUNICIPAL REVIEW

- A100

SITE PLAN LEGEND

- PROPOSED BUILDING
- PROPOSED BUILDING BASEMENT
- LIGHT DUTY ASPHALT
- HEAVY DUTY ASPHALT
- PROPERTY LINE
- CHAIN LINK FENCE
- MAIN ENTRANCE / PRINCIPLE ENTRANCE
- SERVICE ENTRANCE
- SECONDARY BUILDING ENTRANCE
- SECONDARY PRINCIPLE ENTRANCE
- BUILDING EXIT
- 0.00 EXTERIOR GRADE ELEV. IN RELATION TO ADJACENT INTERIOR FINISH FLOOR ELEV. (m)
- BARRIER FREE PARKING STALL
- CONCRETE SIDEWALK OR PAD
- 1 IN 12 SLOPE DOWN TO DROP CURB
- SNOW STORAGE LOCATION
- XFH EXISTING FIRE HYDRANT
- XCB EXISTING CATCH BASIN
- XMH EXISTING MANHOLE
- PROPOSED SOFFIT MOUNTED LIGHT FIXTURE
- W PROPOSED WALL MOUNT LIGHT FIXTURE
- B PROPOSED BOLLARD LIGHT FIXTURE
- LP PROPOSED LIGHT POLE
- BF BARRIER FREE PARKING STALL SIGN
- FR FIRE ROUTE, NO PARKING SIGN
- HP HYDRO POLE
- HBP HYDRO BRACING POLE
- PAINTED LINES AT PEDESTRIAN CROSSWALK
- GRAVEL DRIVEWAY
- 0 BORE HOLE LOCATION AND NUMBER
- FIRE ROUTE CENTERLINE AND WIDTH
- RWL RAIN WATER LEADER
- FLUSH CURB

The Contractor shall be fully liable for all costs and any damages incurred as a result of the raising of dust or the erosion, spillage or tracking of soil or other debris from the Lands onto adjacent lands and municipal highways, and will indemnify the County against any claim made as a result of such problems.

The Contractor shall regularly inspect the property for discarded waste material or items that may accumulate on lands. The Contractor shall collect and dispose of said waste forthwith in an appropriate manner to the satisfaction of the Director of Development Engineering, all to prevent unsightly conditions.

All applicable signs will be subject to the provisions of Norfolk County Sign by law 2009 66, as amended, and a separate sign application will be required through the Building Division.

PARKING CALCULATION

PARKING REQUIREMENTS FROM ZONING BY-LAW 1-Z-2014

PARKING REQUIRED FOR NORFOLK COUNTY LONG TERM CARE FACILITY

1. ZONING REQUIRES 1 SPACE PER 4 BEDS
   128 BEDS RESULTING IN 32 SPACES (128 / 4 = 32)

2. BARRIER FREE PARKING FOR 32 TOTAL SPACES = 2 SPACES REQUIRED.
   1 TYPE A REQUIRED
   1 TYPE B REQUIRED

3. PARKING PROVIDED
   52 STANDARD SPACES.
   3 BARRIER FREE SPACES (1 TYPE A/2 TYPE B)

TOTAL 55 SPACES

revera®

KEY SITE PLAN

Prints issued to

Particulars	No.	Date	By
OWNER & CONSULTANTS	1	19/11/19	DDML
OWNER FOR REVIEW	2	22/01/06	DDML
OWNER & CONSULTANTS	3	22/01/10	DDML
OWNER FOR DRAFT SPA	4	22/02/18	DDML
OWNER FOR SPA	5	22/02/25	DDML
OWNER FOR SPA RESUBMISSION	6	22/12/20	DDML
OWNER FOR CM RFP	7	23/01/24	DDML

Particulars	No.	Date	By

Revisions to drawing — All previous issues of this drawing are superseded.

MMMC ARCHITECTS

Brantford Studio
127 Brant Ave., Brantford,
ON N3T 3H5
519.756.6331 1.877.789.6662
www.mmmc.on.ca

ONTARIO ASSOCIATION OF ARCHITECTS
CAROLYN DORADO MILES LANDER
LICENCE
5005

PLAN NORTH

Project title

REVERA LIVING

REVERA DOVER CLIFFS

BARRETT COURT

PORT DOVER **ONTARIO**

Project number	Date issued	Scale
1822	3/1/2023	1:500, 1:20, 1:10
	Drawn by: JRJ / KH / VP	Date: 3/1/2023

Sheet title: **SITE PLAN**

Drawing no.: **A100**

ENLARGED SITE PLAN

1 / A101

1:250

5.66 ACRES
245,668 sq ft

PROPOSED
128 BED
LTC BUILDING

FIRST FLOOR 194.35
BASEMENT 190.75

HARDSCAPE AREA
1,930 sq ft

HARDSCAPE AREA
700 sq ft

HARDSCAPE AREA
127 sq ft

HARDSCAPE AREA
190 sq ft

HARDSCAPE AREA
20,036 sq ft

HARDSCAPE AREA
19,532 sq ft

HARDSCAPE AREA
2,199 sq ft

FRONT YARD OPTION A
SIDE YARD OPTION B

REAR YARD OPTION A
SIDE YARD OPTION B

INTERIOR SIDE YARD OPTIONS A & B

INTERIOR SIDE YARD OPTIONS A & B

EXTERIOR SIDE YARD - OPTION A
REAR YARD - OPTION B

SUBJECT TO EASEMENT

FIRE ROUTE AS PER OBC 3.2.5.4 TO 3.2.5.6

RETAINING WALL

DOWNSPOUT TO DRAIN TO TOP OF RETAINING WALL

1.53m HIGH DECORATIVE METAL FENCE c/w 1.22m GATE

TRANSFORMER

TRENCH DRAIN

LOADING SPACES 3m x 10m

GENERATOR C/W ENCLOSURE

WASTE ENCLOSURE

OVERHEAD ENTRANCE CANOPY

BARRIER FREE PATH OF TRAVEL AS PER OBC 3.8.3.2

TACTILE WARNING PLATE

FLUSH CURB

SNOW STORAGE AREA

R 26,000
R 15,000
R 7,700
R 12,000
R 10,350
R 1,500
R 9,200
R 9,000
R 8,000
R 5,800
R 7,500
R 20,000
R 12,000

EXCB
EXMH
LP
FH
BF

KEY SITE PLAN

Prints issued to

Particulars	No.	Date	By
OWNER FOR CM RFP	1	23/01/24	DDML

Particulars	No.	Date	By

Revisions to drawing

All previous issues of this drawing are superseded.

MMMC ARCHITECTS

Brantford Studio
127 Brant Ave., Brantford,
ON N3T 3H5
519.756.6331 1.877.789.6662
www.mmmc.on.ca

ONTARIO ASSOCIATION OF ARCHITECTS
CHRISTOPHER TILES LANDER
LICENCE 5005

PLAN NORTH

Project title

REVERA LIVING

REVERA DOVER CLIFFS

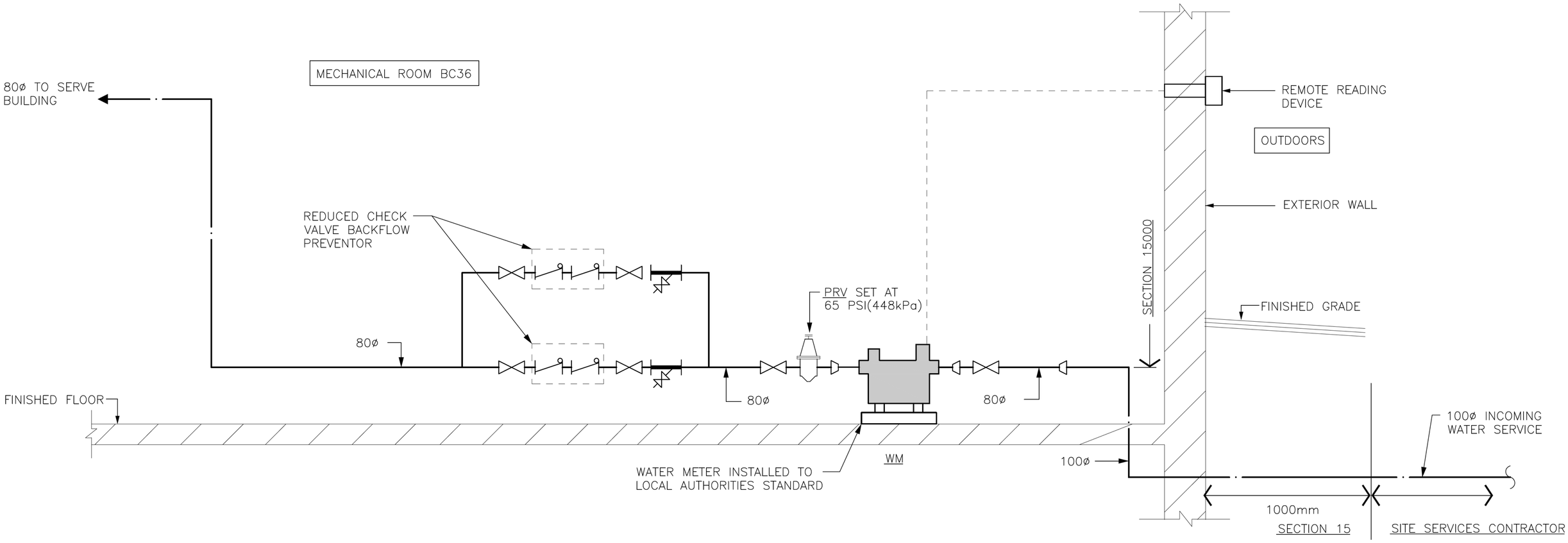
BARRETT COURT

PORT DOVER **ONTARIO**

Project number	Date issued	Scale
1822	3/1/2023	1:250
	Drawn by: JRJ / KH / VP	Date: 3/1/2023

Sheet title: **ENLARGED SITE PLAN**

Drawing no.: **A101**



WATER METER SCHEMATIC

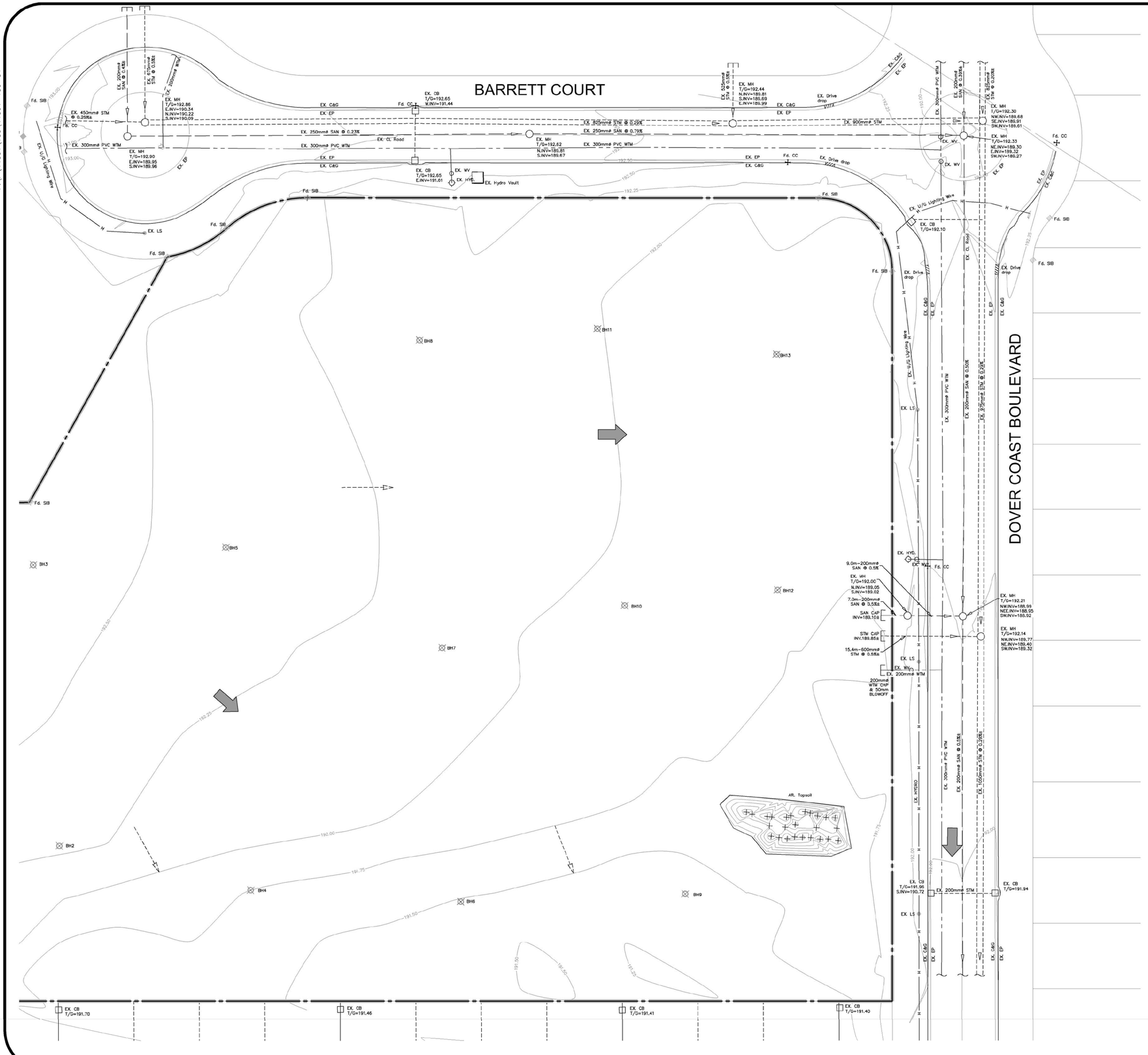
N.T.S.

44661-100-C1.1

EXISTING CONDITIONS PLAN

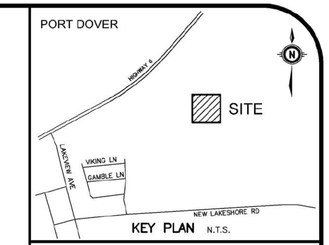
MTE FILE No:

P:\P\44661\100\44661-100-C1



LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CONTOURS
- Ex. 300mmø SAN / Ex. MH — EXISTING SANITARY SEWER
- Ex. 200mmø WTM / Ex. HYD. SET — EXISTING WATERMAIN
- Ex. 375mmø STM / Ex. MH — EXISTING STORM SEWER
- Ex. Drop Curb — EXISTING CURB
- OVERLAND FLOW ROUTE (MAJOR STORM)
- EXISTING DIRECTION OF DRAINAGE
- BH7 — EXISTING BOREHOLE (SEE GEOTECHNICAL REPORT BY MTE)



GEODETIC BM ELEV. = 182.23m

BENCHMARK STATION 0011976U002.

LOCATED AT HIGHWAY NO. 6 LIFT BRIDGE OVER LYNN RIVER, 0.8km EAST OF POST OFFICE, TABLET IN SOUTH FACE OF CONCRETE CURB AT SOUTH SIDE OF BRIDGE, 43cm FROM EAST END, 30cm BELOW TOP, NEAR ROAD LEVEL.

SITE BENCHMARK ELEV. = m

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	REISSUED FOR SPA	GPB	2023-02-28
3.	ISSUED FOR CM RFP	GPB	2023-01-24
2.	REISSUED FOR SPA	GPB	2022-12-21
1.	ISSUED TO OWNER FOR SPA	GPB	2022-02-28

MTE
Engineers, Scientists, Surveyors
(905) 639-2552 www.mte85.com

LICENSED PROFESSIONAL ENGINEER
G.P. BERENYI
100058712
2023-02-28
Digital Original
PROVINCE OF ONTARIO
44661-100

CLIENT

REVERA INC.

290 Queen Street South Kitchener

PROJECT

PORT DOVER LTC FACILITY
CIVIL WORKS

1234 Ontario 6 Port Dover

DRAWING

EXISTING CONDTIONS PLAN

Project Manager: G.BERENYI	Project No.: 44661-100
Design By: MXM/RNC	Checked By: GPB
Drawn By: WML	Checked By: GPB
Surveyed By: MTE	Drawing No.: C1.1
Date: Aug.30/18	
Scale: 1:300	Sheet 1 of 4

February 28, 2023 — 9:36 a.m. — Plotted By: RCologero

44661-100-C2.1
SITE GRADING & ESC PLAN
P:\P\44661\100\44661-100-C2
MTE FILE No:

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING CURB (Ex. Drop Curb)
- EXISTING DIRECTION OF DRAINAGE
- EXISTING CONTOURS (326.00)

LEGEND OF PROPOSED FEATURES

- SITE BOUNDARY
- PROPOSED SPOT ELEVATIONS (326.00), T/G=326.00, FFE=326.00
  EX =MAINTAIN EXISTING
  T/G =TOP OF CASTING/GRATE
  INV =INVCRT CLEVATION
  FFE =FINISHED FLOOR ELEVATION
- DIRECTION OF DRAINAGE/SWALE (1.0% → 1.0%)
- DRAINAGE SPLIT (RIDGE)
- PROPOSED BUILDING
- OVERHEAD DOOR
- MAN DOOR
- CONCRETE CURB (DROP CURB)
- FENCE
- OVERLAND FLOW ROUTE (MAJOR STORM)
- SEDIMENT CONTROL FENCE (SEE DETAIL ON C2.3)
- SILT SACK (SEE DETAIL ON C2.3)
- CONSTRUCTION ACCESS (SEE DETAIL ON C2.3)
- HEAVY DUTY ASPHALT. REFER TO SITE PLAN
- DS PROPOSED DOWNSPOUT
- RIP RAP (SIZE & TYPE AS NOTED)
- TACTILE
- LP LIGHT STANDARD (SEE ARCHITECTURAL DRAWINGS)

BARRETT COURT

DOVER COAST BOULEVARD

MATCH INTO EX. CURB AND GUTTER
EX. CURB TO BE SAW CUT, REMOVED AND REPLACED WITH DROP CURB PER OPSD 600.040

MATCH INTO EX. GRADES ALONG PROPERTY LINE

PROPOSED BUILDING
FFE=194.35
BFE=190.75

ASPHALT

SNOW STORAGE

LANDSCAPE

PROP. SIDEWALK

TAPER CURB

CBMH7 T/G=192.00
CB7.1 T/G=193.45
MH4 T/G=192.36
CBMH3 T/G=191.70
CBMH2 T/G=191.70
MH1A T/G=191.58
CBMH1 T/G=191.55
CB1 T/G=193.55
MH7 T/G=193.98
MH3A T/G=193.69
CBMH6 T/G=193.41
MH2A T/G=193.24
CBMH5 T/G=193.05
MH8 T/G=193.07
CB6.1 T/G=191.70
CB5.1 T/G=191.70
CB8.1 T/G=192.15

TERMINATE RETAINING WALL AT ELEVATION 191.10
PROPOSED 11.8m RETAINING WALL c/w GUARD RAIL. MAX HEIGHT=3.15
T/W=194.15 B/W=191.00
TERMINATE RETAINING WALL AT ELEVATION 194.25.
PROPOSED 34m RETAINING WALL. MAX HEIGHT=3.47
T/W=194.40 B/W=190.93
T/W=194.40 B/W=193.80

TRANSFORMER ON CONCRETE PAD. PAD ELEVATION TO BE MIN. 191.05
DRYER INTAKE. REFER TO SITE PLAN
CANOPY
CONC.
PROP. CONCRETE
PROP. ASPHALT
PROP. GARBAGE ENCLOSURE
PROP. HYD.
TRENCH DRAIN T/G=190.70
TAPER CURB
DAYLIGHT TRIANGLE. REFER TO SITE PLAN
2.0m DROP CURB AS PER OPSD 600.110
CONCRETE BARRIER CURB PER OPSD 600.110
GENERATOR ON CONCRETE PAD. PAD ELEVATION TO BE MIN. 192.25
PROPOSED SEDIMENT CONTROL FENCE (TYP.) (REFER TO DETAIL ON C2.3)
PROPOSED SILT SACK (TYP.) (REFER TO DETAIL ON C2.3)
7.0m x 14.0m CONSTRUCTION ACCESS (SEE DETAIL ON C2.1)
PROP. 1800mmø BACKFLOW CHAMBER. REFER TO C2.2 FOR MORE DETAILS.
EX. CURB TO BE SAW CUT, REMOVED AND REPLACED WITH DROP CURB PER OPSD 600.040
MATCH INTO EX. CURB & GUTTER
MATCH INTO EX. GRADES
MATCH INTO EX.GRADES ALONG PROPERTY LINE
0.3m WIDE BERM
65m CUT-OFF SWALE
SIGN

2.0m x 2.0m RIP RAP PER OPSD 810.010 TYPE 'B'
PROPOSED DOWNSPOUT (TYP.)
17m SWALE @ 4.5%
16m SWALE @ 2.0%
30m SWALE @ 1.0% C/W SUBDRAIN
40m SWALE @ 1.0% C/W SUBDRAIN
45m SWALE @ 1.1% C/W SUBDRAIN
48m SWALE @ 1.0% C/W SUBDRAIN
50m SWALE @ 1.0% C/W SUBDRAIN
53m SWALE @ 2.5%

PORT DOVER
HIGHWAY 6
SITE
LAKESHORE RD
VIKING LN
GAMBLE LN
NEW LAKESHORE RD
KEY PLAN N.T.S.

GEODETIC BM ELEV. = 182.23m
BENCHMARK STATION C011976U002.
LOCATED AT HIGHWAY NO. 6 LIFT BRIDGE OVER LYNN RIVER, 0.8km EAST OF POST OFFICE, TABLET IN SOUTH FACE OF CONCRETE CURB AT SOUTH SIDE OF BRIDGE, 43cm FROM EAST END, 30cm BELOW TOP, NEAR ROAD LEVEL.

SITE BENCHMARK ELEV. = m

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	REISSUED FOR SPA	GPB	2023-02-28
3.	ISSUED FOR CM RFP	GPB	2023-01-24
2.	REISSUED FOR SPA	GPB	2022-12-21
1.	ISSUED TO OWNER FOR SPA	GPB	2022-02-25

MTE
Engineers, Scientists, Surveyors
(905) 639-2552 www.mte85.com

LICENCED PROFESSIONAL ENGINEER G.P. BERENYI 100058712 2023-02-28 Digital Original PROVINCE OF ONTARIO
44661-100

NOT FOR CONSTRUCTION

CLIENT
REVERA INC.
290 Queen Street South Kitchener

PROJECT
PORT DOVER LTC FACILITY
CIVIL WORKS
1234 Ontario 6 Port Dover

DRAWING
SITE GRADING & ESC PLAN

Project Manager G.BERENYI	Project No. 44661-100
Design By RNC/ALP	Checked By GPB
Drawn By SDU	Checked By GPB
Surveyed By MTE	Drawing No. C2.1
Date Jan.28/22	
Scale 1:300	Sheet 2 of 4

February 28, 2023 - 9:40 a.m. - Plotted By: RCalogero

44661-100-C2.2
SITE SERVICING PLAN
P:\P\44661\100\44661-100-C2
MTE FILE No:

BARRETT COURT

SEWER CROSSING CHART

NOTE:
1) Maintain minimum 0.5m vertical clearance between all watermains and sewers. Where watermain is deflected, ensure 2.0m cover is achieved or watermain is insulated.
2) Maintain vertical clearance at all other crossings.
3) Existing and proposed watermain depths are approximate only. Notify Design Engineer of any discrepancies.
4) Contractor to verify all existing inverts prior to product ordering. Notify Design Engineer of any discrepancies.

CROSSING #	SEWER TYPE	SEWER SIZE (mmø)	CROSSING ELEVATION	NOTES
X1	STM	375	INV=189.93	
	SAN	200	OBV=189.38	
X2	STM	525	INV=190.08	MAINTAIN MIN 0.5m DEFLECTING UNDER STORM
	WTM	150	OBV=189.58±	
X3	WTM	150	OBV=188.80±	MAINTAIN MIN 0.5m DEFLECTING UNDER SAN
	SAN	200	INV=189.30	
X4	WTM	150	OBV=189.85±	MAINTAIN MIN 0.5m DEFLECTING UNDER STM
	STM	450	INV=190.38	

LEGEND OF EXISTING FEATURES

- SITE BOUNDARY
- EXISTING SANITARY SEWER (Ex. 300mmø SAN, Ex. MH)
- EXISTING WATERMAIN (Ex. 200mmø WTM, Ex. HYD. SET)
- EXISTING STORM SEWER (Ex. 375mmø STM, Ex. MH)
- EXISTING CURB (Ex. Drop Curb)
- EXISTING FENCE

LEGEND OF PROPOSED FEATURES

- EMBANKMENT (SLOPE AS NOTED) (TOP, 3:1, BOTTOM)
- SANITARY SEWER (MH, 14.6m–200mmø SAN @ 1.5%)
- STORM SEWER (MH, 21.3m–300mmø STM @ 1.3%)
- WATERMAIN (200mmø WTM, HYD. SET, TEE)
- SEWER CROSSING (REFER TO CROSSING CHART) (X1)
- SHALLOW PIPE INSULATION (SEE DETAIL ON C2.3)
- PROPOSED BUILDING
- OVERHEAD DOOR
- MAN DOOR
- CONCRETE CURB (DROP CURB)
- FENCE
- PERFORATED BIG 'O' SUBDRAIN (SEE DETAIL ON C2.3)
- PROPOSED DOWNSPOUT (DS)
- RIP RAP (SIZE & TYPE AS NOTED)
- HEAVY DUTY ASPHALT. REFER TO SITE PLAN
- TACTILE
- LIGHT STANDARD (SEE ARCHITECTURAL DRAWINGS) (LP)

EX. CURB TO BE SAW CUT, REMOVED AND REPLACED WITH DROP CURB PER OPSD 600.040

30m SWALE @ 1.0% C/W SUBDRAIN

CBMH7 T/G=192.00 W INV.=190.79 S INV.=190.73 NI.INV=191.50 (SUBDRAIN)

DAYLIGHT TRIANGLE. REFER TO SITE PLAN

28.0m–300mmø STM @ 1.0%

CSW

16.9m–200mmø STM @ 0.5%

CB7.1 T/G=193.45 E INV.=190.87

ASPHALT

MH4 T/G=192.36 N INV.=190.45 SW INV.=190.39

25.0m–300mmø STM @ 0.5%

SNOW STORAGE

CBMH3 T/G=191.70 NE INV.=190.27 S INV.=190.24

4 RUNS OF 5.0m SUBDRAIN. REFER TO DETAIL ON C2.3

R=26.0m

PROP. GENERATOR

32.3m–375mmø STM @ 0.5%

PROP. SIDEWALK

PROPOSED DOWNSPOUTS (TYP.)

PROP. TRANSFORMER INV.=190.56

9m TRENCH DRAIN (200mm WIDE K100 WITH TYPE 461Q DUCTILE IRON SLOTTED GRATE) MANUFACTURED BY ACO DRAIN OR APPROVED EQUIVALENT

7.0m–150mmø STM @ 2.5% FOR TRANSFORMER VAULT DRAIN

PROP. CONCRETE (INV @ TRENCH DRAIN=190.38)

TRENCH DRAIN T/G=190.70 INV.=190.30

PROP. ASPHALT

PIPE INSULATION (SEE DETAIL ON C2.3)

PROPOSED BUILDING FFE=194.35 BFE=190.75

CBMH2 T/G=191.70 NW INV.=190.08 SE INV.=190.02

45.2m–250mmø STM @ 0.5%

MH TO BE WATER TIGHT

MH1A T/G=191.58 W INV.=189.16 EX. SE INV.=189.10±

CBMH1(1500mmø) T/G=191.55 W INV.=189.94 NW INV.=189.91 EX.SE INV.=189.85± 90° BEND

2–45° BEND

200mmø WTM CAP & 50mm BLOWOFF

200x100mm TEE

EX. VALVE TO REMAIN

REMOVE & DISPOSE OF 50mm BLOW–OFF. CONNECT TO Ex. 200mm WTM w/ 200x150 REDUCER.

DRYER INTAKE. REFER TO SITE PLAN

SAN STUB INV.=189.78

CANOPY

12.9m–200mmø SAN @ 0.4%

STM STUB INV.=190.92

2.0m–375mmø STM @ 1.3%

CONC.

LANDSCAPE

PROP. GARBAGE ENCLOSURE

39.3m–200mmø SAN @ 0.4%

45.6m–525mmø STM @ 0.5%

100mmø DOM WTM

150mmø FIRE WTM

2–45° BENDS

2–90° BENDS

2.5m MIN

TAPER CURB

72.5m–200mmø SAN @ 0.4%

MH2A T/G=193.24 NW INV.=189.38 E INV.=189.32

CBMH5 T/G=193.05 NW INV.=190.20 SW INV.=190.20 S INV.=190.20 E INV.=190.17

68.9m–450mmø STM @ 0.5%

DAYLIGHT TRIANGLE

PROP. 1800mmø BACKFLOW CHAMBER. CHAMBER TO HAVE TESTABLE DVCA INSTALLED IN THE CHAMBER. CHAMBER TO BE WATERPROOF AND HAVE A SUMP TO ENSURE THE TESTABLE DVCA NEVER SUBMERGE. THE DVCA IS TO BE TESTED ON AN ANNUAL BASIS AND REPORT TO BE SENT TO NORFOLK COUNTY THAT DVCA PASSED.

CB8.1 T/G=192.15 NW INV.=190.55

SIGN

EX. CURB TO BE SAW CUT, REMOVED AND REPLACED WITH DROP CURB PER OPSD 600.040

2.0m x 2.0m RIP RAP PER OPSD 810.010 TYPE 'B'

STORM SEWER TO DAYLIGHT AT ELEVATION 192.15 c/w RODENT TRAP

CB1 T/G=193.55 W INV.=192.23

16.8m–200mmø STM @ 0.5%

PIPE INSULATION (SEE DETAIL ON C2.3)

MH7 T/G=193.98 N INV.=190.89 SW INV.=190.83

15.5m–375mmø STM @ 1.5%

TAPER CURB

MH3A T/G=193.69 NE INV.=189.73 SE INV.=189.67

CBMH6 T/G=193.41 W INV.=192.57 NE INV.=190.60 SE INV.=190.54

40m SWALE @ 1.0% C/W SUBDRAIN

40.3m–300mmø STM @ 0.5%

30m SWALE @ 1.0% C/W SUBDRAIN

R=1.5m

PROP. HYD.

29.7m–250mmø STM @ 1.0%

5.5m–250mmø STM @ 0.5%

MH8 T/G=193.07 SE INV.=190.25 N INV.=190.23

CB6.1 T/G=191.70 E INV.=190.77 N.INV=191.20(SUB DRAIN) SE.INV=191.20(SUB DRAIN)

48m SWALE @ 1.0% C/W SUBDRAIN

50m SWALE @ 1.0% C/W SUBDRAIN

CONCRETE BARRIER CURB PER OPSD 600.110

22.5m–250mmø STM @ 1.0%

CB5.1 T/G=191.70 NE INV.=190.44 NW.INV=191.20 (SUBDRAIN) SE.INV=191.20 (SUBDRAIN)

45m SWALE @ 1.1% C/W SUBDRAIN

DOVER COAST BOULEVARD

EX. 525mmø STM @ 0.50%

EX. 300mmø PVC STM

EX. 250mmø SAN @ 0.40%

EX. 375mmø STM @ 0.50%

EX. 1050mmø STM @ 0.50%

EX. 900mmø STM

EX. 200mmø SAN @ 1.40%

EX. 675mmø STM @ 0.50%

EX. 200mmø WTM

EX. 450mmø SAN @ 0.25%

EX. 250mmø SAN @ 0.23%

EX. 300mmø PVC WTM

EX. 525mmø STM @ 0.50%

EX. 300mmø SAN @ 0.40%

EX. MH T/G=192.90 E.INV=189.95 S.INV=189.96

EX. MH T/G=192.86 E.INV=190.34 N.INV=190.22 S.INV=190.09

EX. MH T/G=192.62 N.INV=189.81 S.INV=189.77

EX. MH T/G=192.44 N.INV=189.81 S.INV=189.69 E.INV=189.99

EX. MH T/G=192.30 NW.INV=189.68 SE.INV=189.91 SW.INV=189.61

EX. MH T/G=192.33 NE.INV=189.20 E.INV=189.32 SW.INV=189.27

EX. MH T/G=192.00 N.INV=189.05 S.INV=189.02

EX. MH T/G=192.21 NW.INV=188.99 NE.INV=188.95 SW.INV=188.92

EX. MH T/G=192.14 NW.INV=189.77 NE.INV=189.40 SW.INV=189.32

EX. CB T/G=192.65 W.INV=191.44

EX. CB T/G=192.63 E.INV=191.61

EX. CB T/G=192.10

EX. CB T/G=191.96 S.INV=190.72

EX. WV

EX. HYD.

EX. Hydro Vault

EX. U/G Hydro Wire

EX. U/G Lighting Wire

EX. U/G Water

EX. U/G Strm

EX. Drive drop

EX. CL Road

EX. C&G

EX. EP

EX. LS

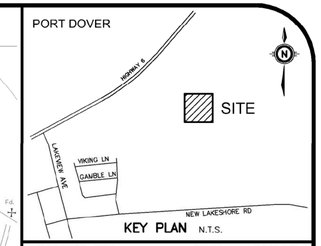
Fd. SIB

Fd. CC

Fd. IB

93.51

PORT DOVER



KEY PLAN N.T.S.

GEODETIC BM ELEV. = 182.23m

BENCHMARK STATION C011976U002.

LOCATED AT HIGHWAY NO. 6 LIFT BRIDGE OVER LYNN RIVER, 0.8km EAST OF POST OFFICE, TABLET IN SOUTH FACE OF CONCRETE CURB AT SOUTH SIDE OF BRIDGE, 43cm FROM EAST END, 30cm BELOW TOP, NEAR ROAD LEVEL.

SITE BENCHMARK ELEV. = m

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	REISSUED FOR SPA	GPB	2023-02-28
3.	ISSUED FOR CM RFP	GPB	2023-01-24
2.	REISSUED FOR SPA	GPB	2022-12-21
1.	ISSUED TO OWNER FOR SPA	GPB	2022-02-25

MTE
Engineers, Scientists, Surveyors
(905) 639-2552 www.mte85.com

LICENCED PROFESSIONAL ENGINEER G.P. BERENYI 100058712 2022-02-28 Digital Original PROVINCE OF ONTARIO
44661-100

NOT FOR CONSTRUCTION

CLIENT
REVERA INC.
290 Queen Street South Kitchener

PROJECT
PORT DOVER LTC FACILITY CIVIL WORKS
1234 Ontario 6 Port Dover

DRAWING
SITE SERVICING PLAN

Project Manager G.BERENYI	Project No. 44661-100
Design By RNC/ALP	Checked By GPB
Drawn By SDU	Checked By GPB
Surveyed By MTE	Drawing No. C2.2
Date Jan.28/22	
Scale 1:300	Sheet 3 of 4

February 27, 2023 – 7:32 p.m. — Plotted By: RCalogero

44661-100-C2.3
SITE SERVICING PLAN
P:\P\44661\100\44661-100-C2

MTE FILE No:

February 27, 2023 — 7:02 p.m. — Plotted By: RCalogero

CONSTRUCTION NOTES AND SPECIFICATIONS

1. GENERAL

1.1. THESE PLANS ARE NOT FOR CONSTRUCTION UNTIL SIGNED AND SEALED BY ENGINEER AND APPROVED BY THE LOCAL MUNICIPALITY.

1.2. THESE PLANS ARE TO BE USED FOR SERVICING AND GRADING ONLY; ANY OTHER INFORMATION SHOWN IS FOR ILLUSTRATION PURPOSES ONLY. THESE PLANS MUST NOT BE USED TO SITE THE PROPOSED BUILDING.

1.3. NO CHANGES ARE TO BE MADE WITHOUT THE APPROVAL OF THE DESIGN ENGINEER.

1.4. THESE PLANS ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE PERMISSION OF MTE CONSULTANTS INC.

1.5. PRIOR TO CONSTRUCTION, THE CONTRACTOR MUST:

1.5.1. CHECK AND VERIFY ALL EXISTING CONDITIONS, LOCATIONS AND ELEVATIONS WHICH INCLUDES BUT IS NOT LIMITED TO THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS AND EXISTING INVERTS. REPORT ALL DISCREPANCIES TO THE ENGINEER PRIOR TO PROCEEDING.

1.5.2. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.

1.5.3. VERIFY THAT THE FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS (WHICH MAY APPEAR ON THIS PLAN) COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.

1.5.4. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.

1.6. THE CONTRACTOR SHALL ASSUME ALL LIABILITY FOR ANY DAMAGE TO EXISTING WORKS. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL DAMAGED AND/OR DISTURBED PROPERTY WITHIN THE MUNICIPAL RIGHT-OF-WAY TO LOCAL MUNICIPALITY STANDARDS

1.7. ALL WORKS ON A MUNICIPAL RIGHT-OF-WAY WITH THE EXCEPTION OF WATERMAIN TAPPING. TO BE INSTALLED BY THE OWNER'S CONTRACTOR AT OWNER'S EXPENSE IN ACCORDANCE WITH THE LOCAL MUNICIPALITY'S "PROCEDURE FOR OFF-SITE WORKS BY PRIVATE CONTRACTOR". THE OWNER AND CONTRACTOR ARE TO ENSURE OFF-SITE WORKS PERMIT IS IN PLACE PRIOR TO CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR RESTORATION OF ALL AFFECTED PROPERTY TO ORIGINAL CONDITION. ALL BOULEVARD AREAS SHALL BE RESTORED WITH 150mm TOPSOIL AND SOD.

1.8. ALL UNDERGROUND SERVICES ARE TO BE CONSTRUCTED IN FULL COMPLIANCE WITH THE ONTARIO PROVINCIAL BUILDING CODE (PART 7, PLUMBING), THE ONTARIO PROVINCIAL STANDARD SPECIFICATIONS (OPSS) AND THE REQUIREMENTS OF THE LOCAL MUNICIPALITY AND THE REGIONAL MUNICIPALITY OF WATERLOO; WHICH CODES AND REGULATIONS SHALL SUPERSEDE ALL OTHERS.

1.9. CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE, DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.

1.10. SANITARY AND STORM SEWERS AND SERVICES TO HAVE A MINIMUM 1.4m COVER TO TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED PIPE IN ACCORDANCE WITH APPLICABLE "SEWER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. CONTACT DESIGN ENGINEER FOR "SEWER PIPE INSULATION DETAIL" IF REQUIRED.

1.11. PLAN TO BE READ IN CONJUNCTION WITH SWM REPORT AND DRAWINGS C2.1 AND C2.2 PREPARED BY MTE CONSULTANTS INC. AND LANDSCAPE PLAN.

1.12. SITE PLAN INFORMATION TAKEN FROM PLAN PREPARED BY MMMC ARCHITECTS RECEIVED DECEMBER 20, 2022.

1.13. EXISTING TOPOGRAPHIC AND LEGAL INFORMATION TAKEN FROM PLAN PREPARED BY MTE, DATED AUGUST 27, 2017. MTE ASSUMES THAT ALL TOPOGRAPHICAL INFORMATION IS AN ACCURATE REPRESENTATION OF CURRENT CONDITIONS.

1.14. CONTRACTOR TO OBTAIN WRITTEN PERMISSION FROM ADJACENT PROPERTY OWNER PRIOR TO ENTERING UPON NEIGHBOURING LANDS TO UNDERTAKE ANY WORK. COPIES OF THESE LETTERS OF CONSENT SHALL BE SUBMITTED TO THE DEPARTMENT OF PUBLIC WORKS FOR APPROVAL PRIOR TO ANY WORK BEING PERFORMED. FAILURE TO COMPLY WITH THE ABOVE IS AT CONTRACTOR'S OWN RISK.

1.15. RETAINING WALLS TO BE DESIGNED BY OTHERS. FOR WALLS EXCEEDING 1.0m IN HEIGHT, SHOP DRAWINGS MUST BE SUBMITTED FOR REVIEW AND APPROVAL AND BUILDING PERMIT MUST BE OBTAINED. WALLS OVER 0.6m IN HEIGHT REQUIRE HIGH SIDE OF RETAINING WALLS TO BE BACKFILLED WITH FREE DRAINING MATERIAL.

1.16. ALL RETAINING WALLS 1.0m IN HEIGHT AND OVER MUST BE APPROVED BY THE CBO. ALL RETAINING WALLS LESS THAN 1.0m IN HEIGHT MUST BE APPROVED BY PLANNING.

1.17. SITE SERVICING CONTRACTOR TO TERMINATE ALL SERVICES 1 METRE FROM FOUNDATION WALL.

1.18. FILTER FABRIC TO BE TERRAFIX 200R OR APPROVED EQUAL.

1.19. MAXIMUM GRASSED SLOPE TO BE 3:1. SLOPES GREATER THAN 3:1 TO BE LANDSCAPED WITH LOW MAINTENANCE GROUND COVER.

1.20. SIDE SLOPES OF ALL STOCKPILES OR EXTRACTION FACES TO BE MAINTAINED AT 70 DEGREES OR LESS BETWEEN EARLY APRIL AND LATE AUGUST TO DETER BANK SWALLOWS FROM NESTING.

1.21. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD INCLUDING THE SUPPLY, INSTALLATION AND REMOVAL OF ALL NECESSARY SIGNALS, DELINEATORS, MARKERS, AND BARRIERS. ALL SIGNS, ETC. SHALL CONFORM TO THE STANDARDS OF THE LOCAL MUNICIPALITY AND THE MTO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

1.22. THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND, WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

1.23. CONTRACTOR TO MAINTAIN A 'CONFINED TRENCH CONDITION' IN ALL SEWER AND SERVICE TRENCHES.

1.24. FOLLOWING COMPLETION OF PROPOSED WORKS AND PRIOR TO OCCUPANCY INSPECTION, ALL STORM AND SANITARY SEWERS ARE TO BE FLUSHED, AND ALL CATCHBASIN AND CATCHBASIN MANHOLE SUMPS ARE TO BE CLEANED OF DEBRIS AND SILT.

2. STORM SEWERS

2.1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030, 802.031, OR 802.032. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRANULAR "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

2.2. STORM SEWERS 200mmø TO 375mmø SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 ASTM-D3034 OR RIBBED PVC SEWER PIPE CSA B182.4-M90 ASTM-F794 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS. RIBBED PVC NOT TO BE USED WITHIN RIGHT-OF-WAY.

2.3. STORM SEWERS, 450mmø AND LARGER, SHALL BE CONCRETE PIPE, CSA-A257.2 65-D WITH RUBBER GASKET JOINT OR RIBBED PVC SEWER PIPE CSA B182.4-M90 ASTM-F794 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC RIBBED PVC NOT TO BE USED WITHIN RIGHT-OF-WAY.

2.4. FACTORY FABRICATED WYES SHALL BE USED FOR ALL SERVICE CONNECTIONS.

2.5. MANHOLES AND MANHOLE CATCHBASINS TO BE 1200mmø PRECAST WITH ALUMINIUM STEPS AT 300mm CENTRES AS PER OPSD 701.010 UNLESS OTHERWISE SPECIFIED.

2.6. CATCHBASINS TO BE 600mm SQUARE PRECAST AS PER OPSD 705.010.

2.7. CATCHBASIN MANHOLES AND CATCHBASINS TO HAVE A MINIMUM 600mm DEEP SUMP. WHEN THE STRUCTURE INCLUDES THE INSTALLATION OF A SNOUT (OR APPROVED EQUIVALENT) THE SUMP DEPTH TO BE MIN 2.5 TIMES THE OUTLET PIPE DIAMETER SIZE.

2.8. MANHOLE AND CATCHBASIN, FRAMES, GRATES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.

2.9. STORM MANHOLE LIDS TO BE PER OPSD 401.010 – TYPE 'B' CATCHBASIN AND CATCHBASIN MANHOLE GRATES TO BE PER OPSD 400.100. DITCH INLET CATCHBASIN GRATES TO BE PER OPSD 403.010.

2.10. STORM STRUCTURES TO HAVE A MAXIMUM OF THREE ADJUSTMENT UNITS (300mm MAXIMUM TOTAL) AND A MINIMUM OF ONE RISER.

2.11. STORM SEWERS AND SERVICES TO HAVE MINIMUM 1.4m COVER TO TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED SEWER PIPE IN ACCORDANCE WITH APPLICABLE "SEWER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. INSULATION SHALL BE RIGID EXTRUDED POLYSTYRENE (EPS) BOARD, WITH A THICKNESS SUFFICIENT TO PROVIDE AN RSI-1.76 (R10) INSULATING FACTOR (TYPICALLY 50-65mm). INSULATION BOARD WIDTH SHALL BE 1.8m FOR UP TO 200mm NOMINAL PIPE DIAMETER, 2.4m FOR 201mm-800mm DIAMETER AND 3.0m FOR 801mm-1400mm. ALL JOINTS SHALL BE TIGHTLY BUTTED TOGETHER (TAPE OR OTHERWISE SECURE JOINTS TO RESIST MOVEMENT DURING BACKFILL COVER). RIGID EPS BOARD SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 140kPa (20psi), AND A MAXIMUM WATER ABSORPTION RATE OF 2.0% BY VOLUME. ACCEPTABLE PRODUCTS ARE DOW STYROFOAM-SM OR -HI (FULL LINE), OWENS CORNING FOAMULAR (200, 250, OR HIGHER), PLASTISPAN HD-M28 OR OTHER ENGINEER-APPROVED EQUIVALENT.

2.12. UNDER NO CIRCUMSTANCES SHALL THE BUILDING FOUNDATION DRAINS BE CONNECTED DIRECTLY TO THE STORM SEWER SYSTEM.

2.13. ALL WEEPING TILE DRAINAGE TO BE PUMPED TO THE STORM SEWER SYSTEM.

3. SANITARY SEWERS

3.1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRANULAR "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

3.2. SANITARY SEWERS 150mmø AND SMALLER SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR28 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

3.3. SANITARY SEWERS 200mmø TO 600mmø INCLUSIVE SHALL BE POLYVINYL CHLORIDE (PVC) PIPE DR35 ASTM-D3034 WITH INTEGRAL BELL AND SPIGOT UTILIZING FLEXIBLE ELASTOMERIC SEALS.

3.4. MANHOLES TO BE 1200mmø PRECAST WITH ALUMINIUM STEPS AT 300mm CENTRES AS PER OPSD 701.010 UNLESS OTHERWISE SPECIFIED.

3.5. MANHOLES TO BE BENCHED PER OPSD 701.021.

3.6. SANITARY MANHOLE LIDS TO BE PER OPSD 401.010 –TYPE 'A'.

3.7. MANHOLE FRAMES, CASTINGS AND LIDS TO BE QUALITY GREY IRON ASTM A48 CLASS 30B.

3.8. SANITARY STRUCTURES TO HAVE A MAXIMUM OF THREE ADJUSTMENT UNITS (300mm MAXIMUM TOTAL) AND A MINIMUM OF ONE RISER.

3.9. FACTORY FABRICATED WYES SHALL BE USED FOR ALL SERVICE CONNECTIONS.

3.10. SANITARY SEWERS AND SERVICES TO HAVE MINIMUM 1.4m COVER ON TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED PIPE IN ACCORDANCE WITH APPLICABLE "SEWER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. INSULATION SHALL BE RIGID EXTRUDED POLYSTYRENE (EPS) BOARD, WITH A THICKNESS SUFFICIENT TO PROVIDE AN RSI-1.76 (R10) INSULATING FACTOR (TYPICALLY 50-65mm). INSULATION BOARD WIDTH SHALL BE 1.8m FOR UP TO 200mm NOMINAL PIPE DIAMETER. 2.4m FOR 201mm-800mm DIAMETER AND 3.0m FOR 801mm-1400mm. ALL JOINTS SHALL BE TIGHTLY BUTTED TOGETHER (TAPE OR OTHERWISE SECURE JOINTS TO RESIST MOVEMENT DURING BACKFILL PLACEMENT). RIGID EPS BOARD SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 140kPa (20psi), AND A MAXIMUM WATER ABSORPTION RATE OF 2.0% BY VOLUME. ACCEPTABLE PRODUCTS ARE DOW STYROFOAM-SM OR -HI (FULL LINE), OWENS CORNING FOAMULAR (200, 250, OR HIGHER), PLASTISPAN HD-M28 OR OTHER ENGINEER-APPROVED EQUIVALENT.

3.11. PVC FORCEMAIN SHALL HAVE TWU STRANDED COPPER, AWG8 TRACER WIRE STRAPPED TO TOP AT 5 METRE INTERVALS.

3.12. CONTRACTOR RESPONSIBLE FOR TESTING OF SANITARY SEWERS IN ACCORDANCE WITH OPSS 410.

4. WATERMAINS

4.1. PIPE BEDDING FOR RIGID PIPE TO BE CLASS "B" AS PER OPSD 802.030. PIPE BEDDING FOR FLEXIBLE PIPE TO BE AS PER OPSD 802.010. BEDDING MATERIAL AND COVER MATERIAL TO BE GRANULAR "A". TRENCH BACKFILL TO BE NATIVE MATERIAL REPLACED IN 300mm LIFTS AND COMPACTED TO 95% STANDARD PROCTOR DENSITY.

4.2. WATERMAINS 100mmø AND LARGER SHALL BE PVC C900 CLASS 150 INSTALLED WITH MINIMUM 2.0 METRES OF COVER. FITTINGS 100mmø AND LARGER SHALL BE PVC CLASS 150 (DR18) CSA B137.3.

4.3. WATERMAIN FITTINGS TO BE SUPPLIED WITH MECHANICAL JOINT RESTRAINTS. FOR WATERMAIN PIPE SIZES 150mmø OR LESS ALL PIPE JOINTS TO BE RESTRAINED WITHIN 5.0m FROM ALL FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. FOR WATERMAIN PIPE SIZES GREATER THAN 150mmø ALL PIPE JOINTS TO BE RESTRAINED WITHIN 10.0m FROM ALL FITTINGS, IN EACH DIRECTION, UNLESS SHOWN OTHERWISE ON THE CONTRACT DRAWINGS. ALL TEES TO HAVE MINIMUM 2.0m SOLID PIPE LENGTH ON EACH RUN OF THE TEE, OR PROVIDE A THRUST BLOCK PER OPSD 1103.010.

4.4. ALL METALLIC FITTINGS (EXCLUDING CURB/MAIN STOP AND BRASS FITTINGS) AND APPURTENANCES INCLUDING SADDLES, VALVES, TEES, BENDS ETC ARE TO BE WRAPPED WITH AN APPROVED PETROLATUM SYSTEM CONSISTING OF PASTE, MASTIC AND TAPE. PARTICULAR ATTENTION SHALL BE PAID TO ANODE INSTALLATION. CONTRACTOR TO REFER TO THE MOST RECENT EDITION OF THE LOCAL MUNICIPALITY AND AREA MUNICIPALITIES DESIGN GUIDELINES AND SUPPLEMENTAL SPECIFICATIONS FOR MUNICIPAL SERVICES.

4.5. WATERMAIN VALVES 100mmø AND LARGER SHALL BE AS PER AWWA C509 – MUELLER A2360-23 OR APPROVED EQUIVALENT (OPEN LEFT) INCLUDING VALVE BOX AND 2.3Kg ANODE INCLUDING ANODE PROTECTION INSTALLED PER LOCAL MUNICIPALITY STANDARDS.

4.6. PVC WATERMAIN SHALL HAVE TWU STRANDED COPPER, AWG8 TRACER WIRE STRAPPED TO TOP AT 5 METRE INTERVALS. TRACER WIRE SHALL BE BROUGHT TO THE SURFACE AT ALL HYDRANTS AND CAD WELDED TO THE LOWER FLANGE OF THE HYDRANT.

4.7. HYDRANTS SHALL BE CANADA VALVE "CENTURY" OR APPROVED EQUIVALENT WITH 2-64mm HOSE CONNECTIONS INCLUDING 5.5Kg ANODE.

4.8. MAIN STOPS, CURB STOPS AND COUPLINGS SHALL BE AWWA C-800 COPPER TO COPPER FLANGED OR COMPRESSION CONNECTION OR APPROVED EQUIVALENT.

4.9. SERVICE BOXES TO BE FERGUSON ECLIPSE TYPE FIGURE 222 SIZE NO. 9 OR APPROVED EQUIVALENT COMPLETE WITH ROD AND PLUG.

4.10. WATER CONNECTIONS MAY BE PLACED IN THE SAME TRENCH WITH A STORM OR SANITARY CONNECTION ONLY IF A MINIMUM VERTICAL SEPARATION OF 500mm IS MAINTAINED BETWEEN THE WATER SERVICE AND ANY OTHER PIPE, IN ACCORDANCE WITH SECTION 7.3.5.7.(2)(a)(i) OF THE ONTARIO BUILDING CODE.

4.11. ALL WATERMAINS AND SERVICES TO HAVE MINIMUM 2.0m COVER ON TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL CONTACT DESIGN ENGINEER FOR "WATER PIPE INSULATION DETAIL".

4.12. ALL WATERMAINS AND SERVICES TO HAVE MINIMUM 2.0m COVER ON TOP OF PIPE. WHERE COVER TO TOP OF PIPE IS DEFICIENT, CONTRACTOR SHALL INSTALL SHALLOW BURIED PIPE IN ACCORDANCE WITH APPLICABLE "WATER PIPE INSULATION DETAIL" INDICATED IN DRAWING DETAILS. INSULATION SHALL BE RIGID EXTRUDED POLYSTYRENE (EPS) BOARD, WITH A THICKNESS SUFFICIENT TO PROVIDE AN RSI-3.52 (R20) INSULATING FACTOR (TYPICALLY 100-130mm). INSULATION BOARD WIDTH SHALL BE 2.4m FOR UP TO 200mm NOMINAL PIPE DIAMETER, 3.0m FOR 201mm-305mm DIAMETER. INSULATION BOARD SHALL BE INSTALLED WITH MINIMUM2-LAYERS, OVERLAPPED MINIMUM 300mm AT ALL JOINTS. ALL JOINTS SHALL BE TIGHTLY BUTTED TOGETHER (TAPE OR OTHERWISE SECURE JOINTS TO RESIST MOVEMENT DURING BACKFILL PLACEMENT). RIGID EPS BOARD SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 140kPa (20psi), AND A MAXIMUM WATER ABSORPTION RATE OF 2.0% BY VOLUME.ACCEPTABLE PRODUCTS ARE DOW STYROFOAM-SM OR -HI (FULL LINE), OWENS CORNING FOAMULAR (200, 250, OR HIGHER), PLASTISPAN HD-M28 OR OTHER ENGINEER-APPROVED EQUIVALENT.

4.13. ALL WATERMAIN TO BE PRESSURE TESTED IN ACCORDANCE WITH OPSS 441. DISINFECT ALL WATERMAIN IN ACCORDANCE WITH AWWA C 651-99 INCLUDING CHLORINATION, BACKFLOW PREVENTOR AND 24 HOUR DUPLICATE SAMPLING. ALL TESTING AND DISINFECTION TO BE COMPLETED UNDER THE SUPERVISION OF THE ENGINEER. **(CONTRACTOR TO SUBMIT WATER COMMISSIONING PLAN IN ACCORDANCE WITH DGSSMS. THIS PLAN MUST BE APPROVED BY THE LOCAL MUNICIPALITY PRIOR TO ANY WATERMAIN WORK).**

4.14. PRIOR TO OCCUPANCY, CONTRACTOR MUST COMMISSION FIRE FLOW TEST FOR PRIVATE ON-SITE HYDRANT. PROVIDE RESULT TO DESIGN ENGINEER.

5. EROSION AND SEDIMENT CONTROL

5.1. CONTRACTOR TO INSTALL EROSION CONTROL MEASURES AS SHOWN PRIOR TO CONSTRUCTION AND MAINTAIN IN GOOD CONDITION UNTIL CONSTRUCTION IS COMPLETED AND ALL DISTURBED GROUND SURFACES HAVE BEEN RESTABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE COVER.

5.2. ALL SEDIMENT CONTROL FENCING TO BE INSTALLED PRIOR TO ANY AREA GRADING, EXCAVATING OR DEMOLITION COMMENCING.

5.3. EROSION CONTROL FENCING TO BE INSTALLED AROUND BASE OF ALL STOCKPILES. ALL STOCKPILES TO BE KEPT 2.5m MINIMUM FROM PROPERTY LINE.

5.4. EROSION PROTECTION TO BE PROVIDED AROUND ALL STORM AND SANITARY MHs AND CBs.

5.5. CONSTRUCTION ACCESS (MUD MAT) TO BE PROVIDED ON-SITE AT ALL LOCATIONS WHERE CONSTRUCTION VEHICLES EXIT THE SITE. CONSTRUCTION ACCESS (MUD MAT) SHALL BE A MINIMUM OF 3.0m WIDE, 15.0m LONG (LENGTH MAY VARY DEPENDING ON SITE LAYOUT) AND 0.3m DEEP AND SHALL CONSIST OF 200mm CLEAR STONE MATERIAL OR APPROVED EQUIVALENT. PROPOSED EROSION FENCING TO TIE INTO MUD MAT. CONTRACTOR TO ENSURE ALL VEHICLES LEAVE THE SITE VIA THE MUD MAT AND THAT THE MAT IS MAINTAINED IN A MANNER TO MAXIMIZE EFFECTIVENESS AT ALL TIMES.

5.6. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED AS SITE DEVELOPMENT PROGRESSES. CONTRACTOR TO PROVIDE ALL ADDITIONAL EROSION CONTROL STRUCTURES.

5.7. EROSION CONTROL STRUCTURES TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN RESTABILIZED.

5.8. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE ENGINEER AND THE LOCAL MUNICIPALITY'S DEPARTMENT OF PUBLIC WORKS.

5.9. CONTRACTOR TO CLEAN ROADWAY AND SIDEWALKS OF SEDIMENTS RESULTING FROM CONSTRUCTION TRAFFIC FROM THE SITE EACH DAY.

5.10. CONTRACTOR MUST REMOVE EROSION AND SEDIMENTATION FENCING PRIOR TO COMPLETION OF PROJECT. CONTRACTOR TO HAVE EROSION AND SEDIMENTATION FENCE INSPECTED WHEN VEGETATION HAS ESTABLISHED, BUT PRIOR TO FENCE BECOMING OVERGROWN. ENGINEER'S REPRESENTATIVE TO DETERMINE IF VEGETATION HAS REACHED THE CRITICAL POINT AND WILL THEN INSTRUCT CONTRACTOR TO REMOVE FENCE.

6. MAINTENANCE RECOMMENDATIONS

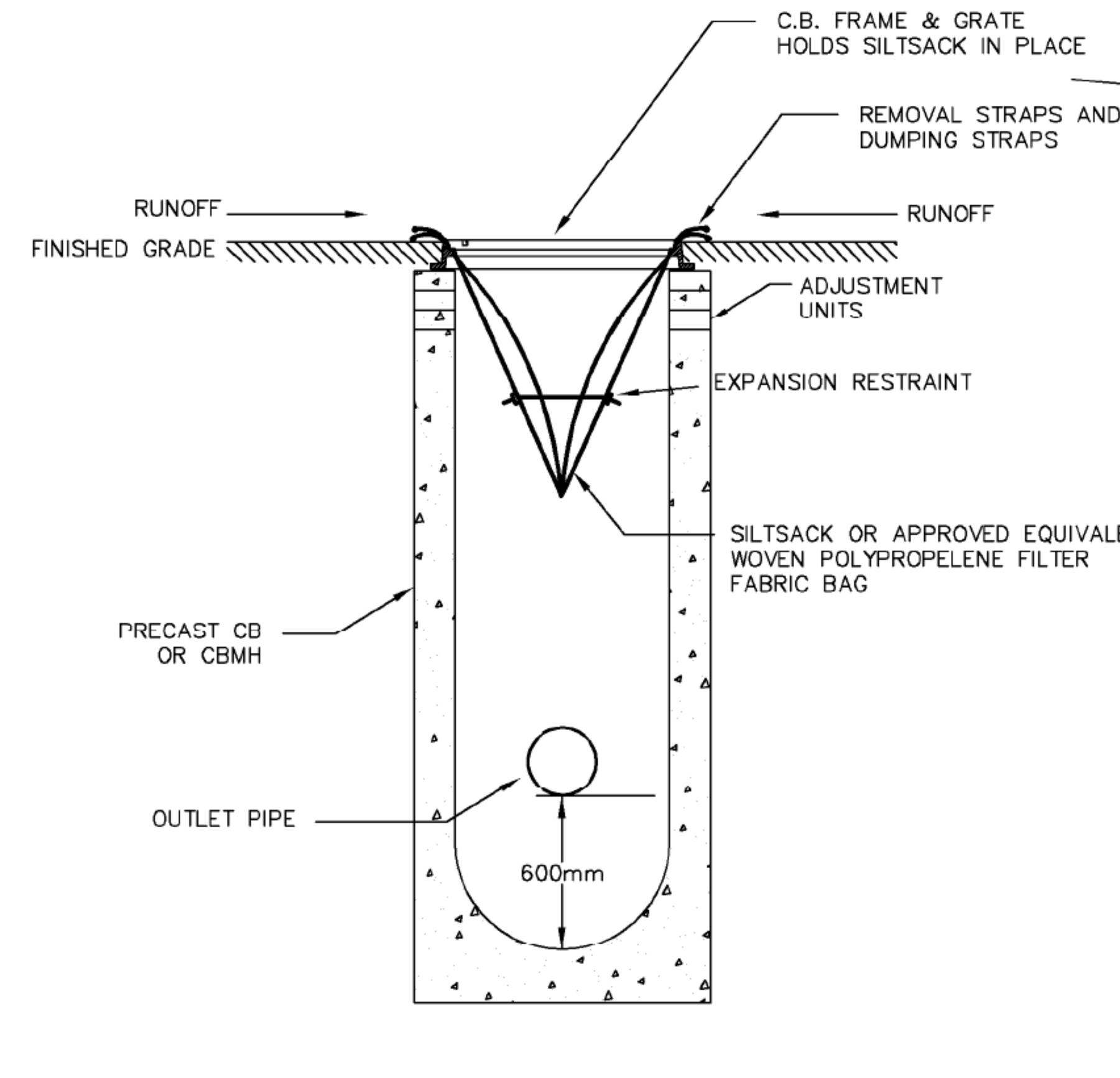
6.1. REMOVE SEDIMENT AND CONTAMINANTS ANNUALLY AND REINSTATE STORM WATER MANAGEMENT FACILITY ACCORDING TO THE DESIGN OUTLINED ON THIS PLAN.

6.2. EROSION CONTROL STRUCTURES TO BE MONITORED REGULARLY AND ANY DAMAGE REPAIRED IMMEDIATELY. SEDIMENTS TO BE REMOVED WHEN ACCUMULATIONS REACH A MAXIMUM OF 1/3 THE HEIGHT OF THE FENCE.

6.3. OWNER'S REPRESENTATIVE TO MONITOR EROSION CONTROL STRUCTURES TO ENSURE FENCING IS INSTALLED AND MAINTENANCE IS PERFORMED TO CITY REQUIREMENTS.

6.4. THE PROPOSED STORMCEPTOR(STC) WILL REQUIRE REGULAR ANNUAL MAINTENANCE. OWNER TO ENTER INTO A MAINTENANCE AGREEMENT WITH A SUITABLE CONTRACTOR TO COMPLETE THIS WORK.

6.5. THE PROPOSED SNOUT/S WILL REQUIRE REGULAR MAINTENANCE DURING AND AFTER CONSTRUCTION IN ACCORDANCE WITH THE MAINTENANCE RECOMMENDATIONS OUTLINED IN SNOUT BEST MANAGEMENT PRODUCTS INC. DOCUMENT. THIS INCLUDES BUT IS NOT LIMITED TO REMOVAL OF SEDIMENT FROM THE SUMP, REMOVAL OF FLOATABLES AND TRASH AND ANNUAL INSPECTION OF THE ANTI-SIPHON VENT, ACCESS HATCH AND TRASH SCREEN. OWNER TO ENTER INTO A MAINTENANCE AGREEMENT WITH A SUITABLE CONTRACTOR TO COMPLETE THIS WORK.



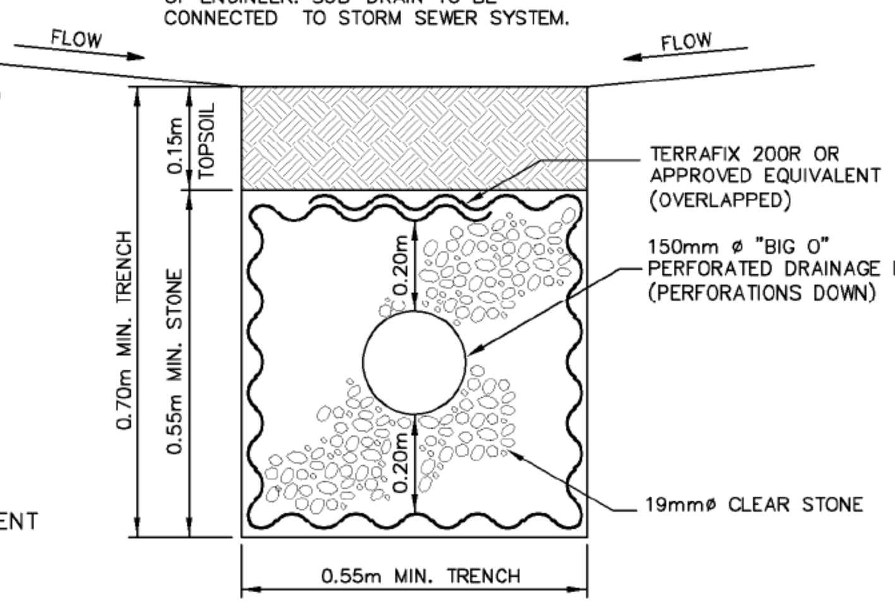
MAINTENANCE SCHEDULE

-INSPECT AFTER EVERY MAJOR RAIN EVENT.
-INSPECT EVERY 3 WEEKS MINIMUM.
-SILTSACK SHOULD NEVER BE OVER HALF FULL.
-FULL BAG CAN BE REMOVED, DUMPED, CLEANED AND REUSED
(TO REMOVE INSERT 25mm REBAR INTO REMOVAL FLAP POCKETS)
(TO DUMP INSERT 25mm REBAR INTO BOTH DUMPING STRAPS)

TEMPORARY SILTSACK SILTATION CONTROL IN CB

N.T.S.

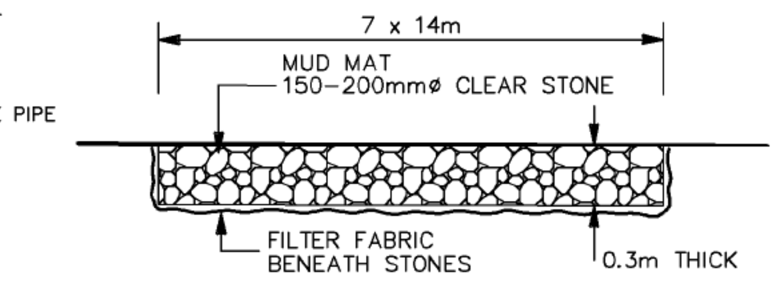
NOTE:
INSTALLATION OF SUB-DRAIN AT DIRECTION OF ENGINEER. SUB-DRAIN TO BE CONNECTED TO STORM SEWER SYSTEM.



PERFORATED SUB-DRAIN DETAIL

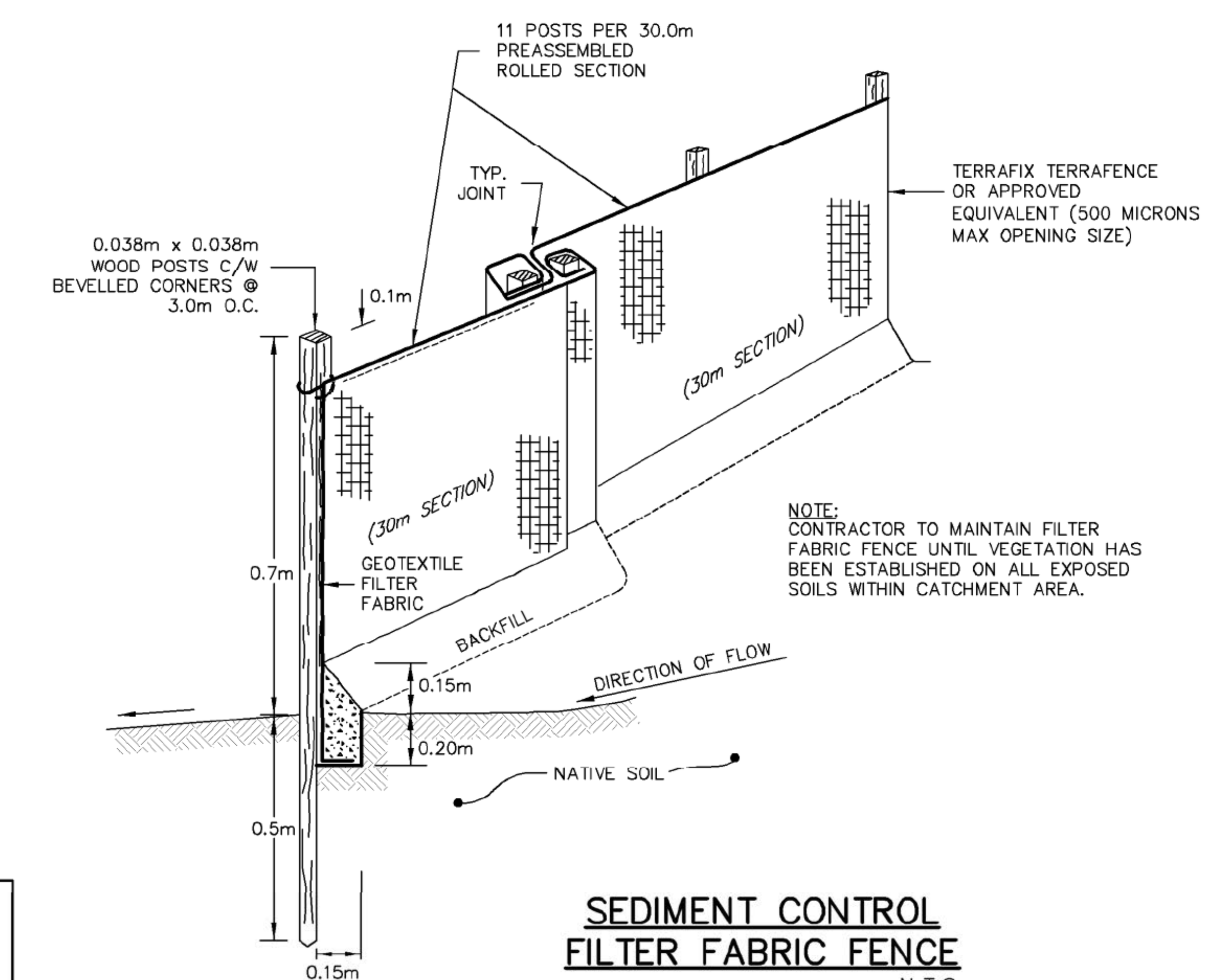
N.T.S.

DESIGNATED ACCESS FOR ALL CONSTRUCTION TRAFFIC.
INSTALL 'MUD MAT', AS PER DETAIL BELOW, PRIOR TO ANY OTHER CONSTRUCTION. MAT TO BE MAINTAINED IN GOOD WORKING ORDER UNTIL GRADING WORKS ARE COMPLETED AND GRANULAR "A" & "B" HAVE BEEN PLACED.



CONSTRUCTION ACCESS DETAIL

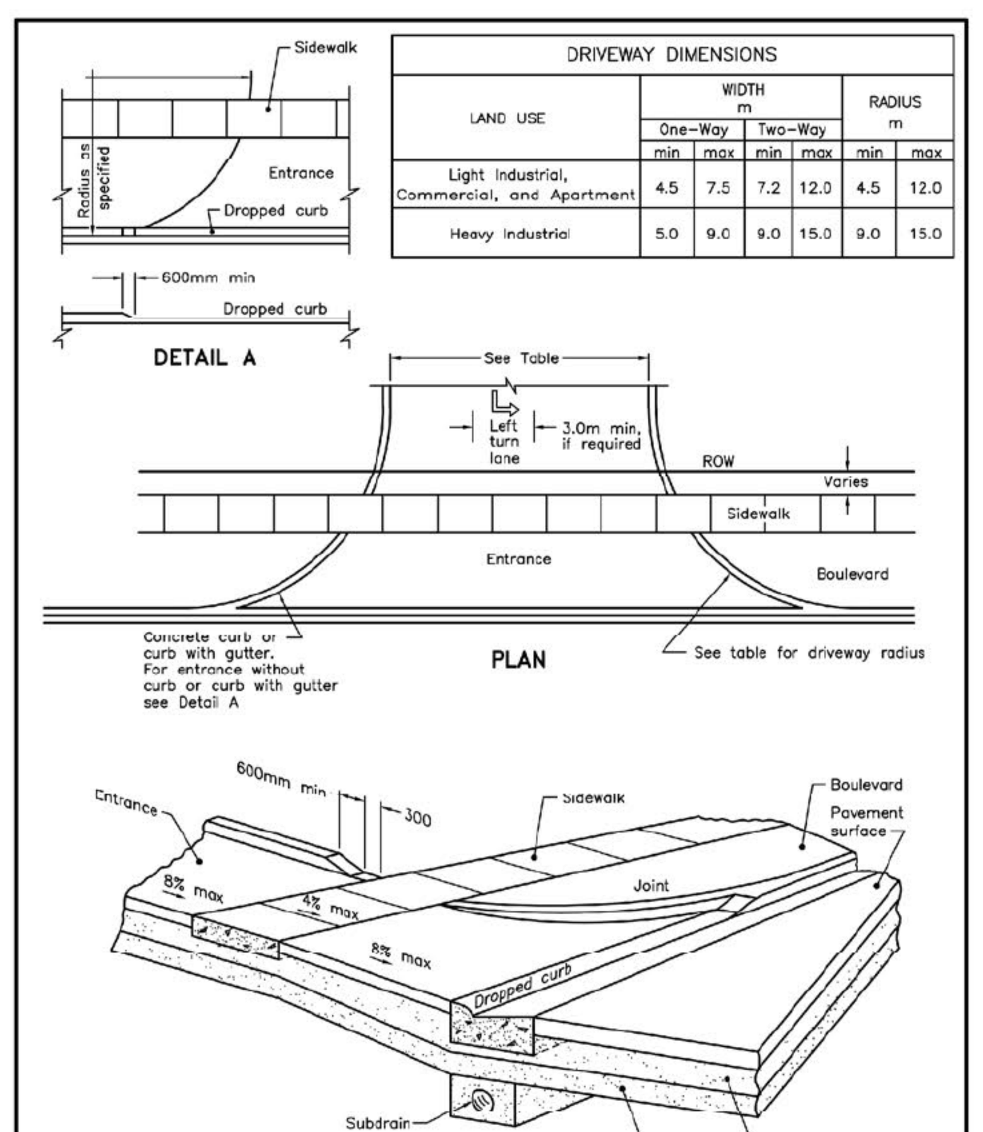
N.T.S.



NOTE:
CONTRACTOR TO MAINTAIN FILTER FABRIC FENCE UNTIL VEGETATION HAS BEEN ESTABLISHED ON ALL EXPOSED SOILS WITHIN CATCHMENT AREA.

SEDIMENT CONTROL FILTER FABRIC FENCE

N.T.S.



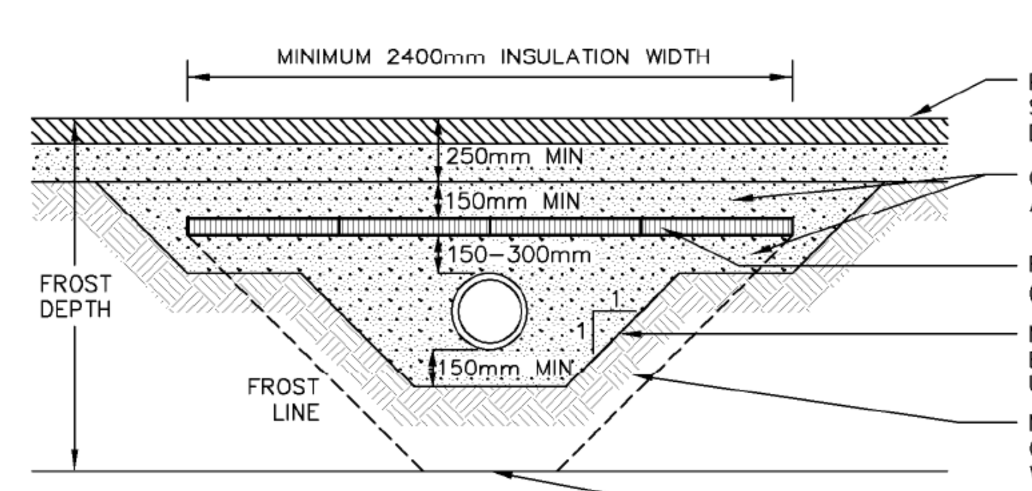
DRIVEWAY DIMENSIONS						
LAND USE	WIDTH m				RADIUS m	
	One-Way		Two-Way			
	min	max	min	max	min	max
Light Industrial, Commercial, and Apartment	4.5	7.5	7.2	12.0	4.5	12.0
Heavy Industrial	5.0	9.0	9.0	15.0	9.0	15.0

NOTES:
A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING — Nov 2018 — Rev 2

URBAN INDUSTRIAL, COMMERCIAL, AND APARTMENT ENTRANCES

OPSD 350.010

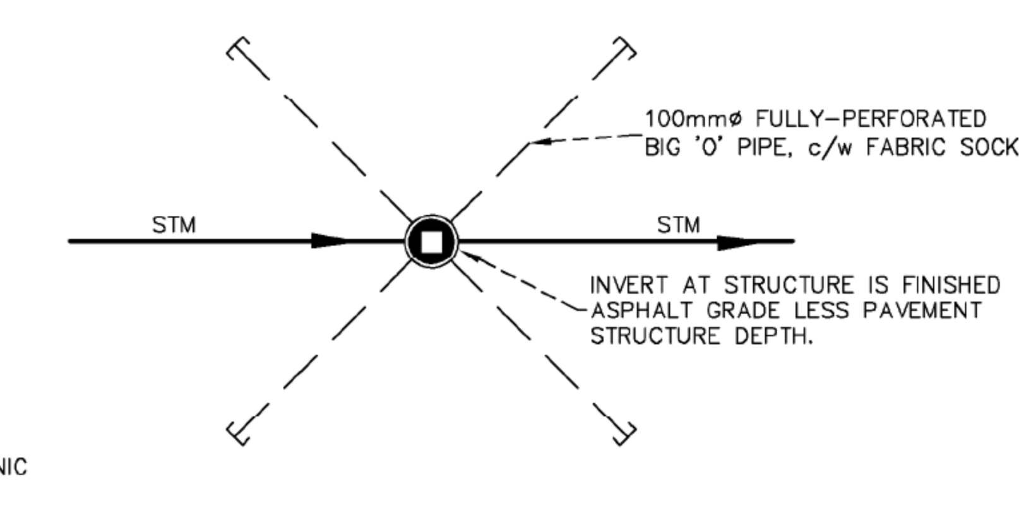


- PAVEMENT STRUCTURE (ASPHALT AND/OR GRANULAR), OR SELECT NATIVE MATERIAL AND TOPSOIL, AS SPECIFIED ON DRAWINGS
- GRANULAR 'A' BEDDING & BACK FILL BELOW AND ABOVE PIPE AND INSULATION BOARD, COMPACTED TO MINIMUM 95% SPMDD
- RIGID EPS-INSULATION BOARD PER SPECIFICATION NOTES (MINIMUM R10-THICKNESS, TYPICALLY 50-65mm)
- NOTE: TRENCH SIDE-SLOPES IN AREAS OF PIPE INSULATION TO BE MAXIMUM 1:1 SLOPE, NO VERTICAL SECTIONS ALLOWED UNLESS INDICATED IN DETAIL
- NATIVE SOILS – WHERE NATIVE SOIL IS SOFT AND/OR OF ORGANIC CONTENT, REMOVE TO DEPTH OF SUITABLE SOILS AND REPLACE WITH GRANULAR-B2 MATERIAL COMPACTED TO 95% SPMDD, OR CONSTRUCT IN ACCORDANCE WITH WRITTEN DIRECTION FROM GEOTECHNICAL CONSULTANT
- FROST DEPTH – PROTECT SOIL ZONE UNDER PIPE FROM FREEZING REFER TO OPSD 3400.011 FOR SPECIFIC LOCAL FROST DEPTH

SEWER PIPE INSULATION DETAIL

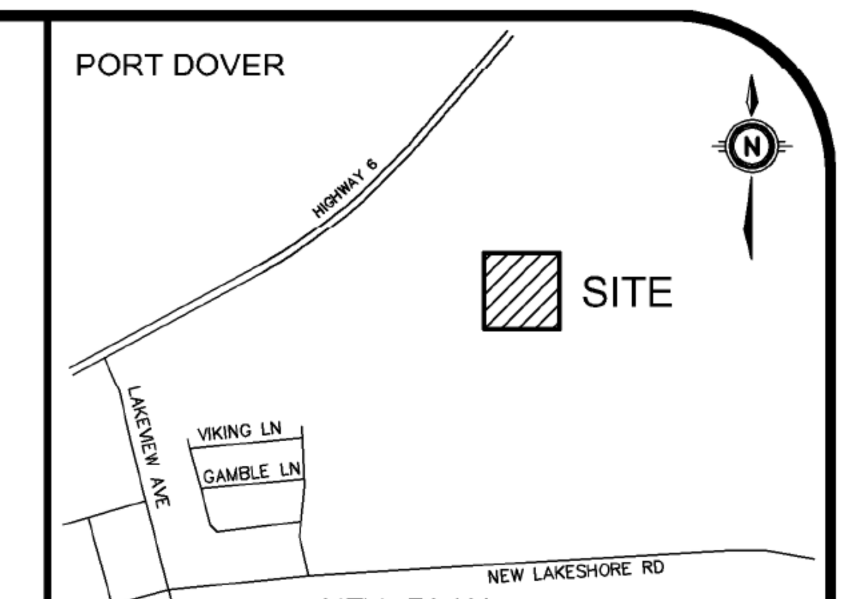
FOR SEWER PIPES HAVING LESS THAN 1400mm COVER AND MINIMUM 615mm COVER
N.T.S.

NOTES:
1. THE OWNER SHALL AGREE TO BE FULLY LIABLE FOR ALL COSTS AND ANY DAMAGES INCURRED AS A RESULT OF THE RAISING OF DUST OR THE EROSION, SPILLAGE OR TRACKING OF SOIL OR OTHER DEBRIS FROM THE LANDS ONTO ADJACENT LANDS AND MUNICIPAL HIGHWAYS, AND WILL INDEMNIFY THE COUNTY AGAINST ANY CLAIM MADE AS A RESULT OF SUCH PROBLEMS.
2. THE OWNER SHALL AGREE TO REGULARLY INSPECT THE PROPERTY FOR DISCARDED WASTE MATERIAL OR ITEMS THAT MAY ACCUMULATE ON LANDS. THE OWNER SHALL COLLECT AND DISPOSE OF SAID WASTE FORTHWITH IN AN APPROPRIATE MANNER TO THE SATISFACTION OF THE DIRECTOR OF DEVELOPMENT ENGINEERING, ALL TO PREVENT UNSIGHTLY CONDITIONS.
3. THE OWNER SHALL INSTALL AT THE OWNER'S COST, ANY FIRE HYDRANT REQUIRED BY THE ONTARIO BUILDING CODE TO THE SATISFACTION OF THE COUNTY'S CHIEF BUILDING OFFICIAL



PAVEMENT SUBDRAIN DETAIL TYPICAL PLAN VIEW

N.T.S.



KEY PLAN N.T.S.

GEODETIC BM — **ELEV. = 182.23m**
BENCHMARK STATION 0011976U002.

LOCATED AT HIGHWAY NO. 6 LIFT BRIDGE OVER LYNN RIVER, 0.8km EAST OF POST OFFICE, TABLET IN SOUTH FACE OF CONCRETE CURB AT SOUTH SIDE OF BRIDGE, 43cm FROM EAST END, 30cm BELOW TOP, NEAR ROAD LEVEL.

SITE BENCHMARK — **ELEV. = m**

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	REISSUED FOR SPA	GPB	2023-02-28
3.	ISSUED FOR CM RFP	GPB	2023-01-24
2.	REISSUED FOR SPA	GPB	2022-12-21
1.	ISSUED TO OWNER FOR SPA	GPB	2022-02-25

MTE
Engineers, Scientists, Surveyors
(905) 639-2552 www.mte85.com

LICENSED PROFESSIONAL ENGINEER G.P. BERENYI 100058712 2023-02-28 Digital Original PROVINCE OF ONTARIO
44661-100

NOT FOR CONSTRUCTION

CLIENT
REVERA INC.
290 Queen Street South — Kitchener

PROJECT
PORT DOVER LTC FACILITY CIVIL WORKS
1234 Ontario 6 — Port Dover

DRAWING
NOTES & DETAILS PLAN

Project Manager: G.BERENYI	Project No.: **44661-100**
Design By: RNC/ALP	Checked By: GPB
Drawn By: SDU	Checked By: GPB
Surveyed By: MTE	Drawing No.: **C2.3**
Date: Jan.28/22	
Scale: 1:300	Sheet **4** of **4**

Port Dover LTC Facility

Functional Servicing & Stormwater Management Report

Project Location:
1234 Ontario 6, Port Dover, ON

Prepared for:
Revera Inc.
290 Queen Street South, Kitchener, ON

Prepared by:
MTE Consultants
1016 Sutton Drive, Unit A
Burlington, ON L7L 6B8

February 28, 2022
Revised: February 28, 2023

MTE File No.: 44661-100

Engineers, Scientists, Surveyors.

Contents

Figures

Tables

1.0 Introduction

1.1 Overview

MTE Consultants Inc. were retained by Revera Inc. to complete the site grading, servicing, and stormwater management design for the proposed development located at the intersection of Barrett Court and Dover Coast Boulevard in Port Dover, Ontario (hereon in referred to as the "subject site"). Refer to Figure 1 for Location Plan. This report will outline a functional servicing and stormwater management strategy for the proposed development.

The subject site is a parcel of land comprised of an open field with a total area of approximately 2.3 ha on a vacant lot. The site is bounded by existing residential properties to the west and south, future commercial property to the easy, and Highway 6 to the north. The proponent plans to construct a 128 bed, two storey, long-term care (LTC) facility with associated surface parking and landscape areas. Existing municipal storm and combined sewers and watermain services are located on the abutting right-of-way's which will be utilized to service the proposed development.

The functional servicing described in this report will provide additional detailed information on the proposed servicing scheme for the site. Please refer to the site plan and the enclosed MTE drawings for additional information.

1.2 Background Information

The following documents were referenced in the preparation of this report:

- Ref. 1: Port Dover – Revera Long Term Care – Water Model by *R.V. Anderson Associates Limited* (2022)
- Ref. 2: Fire Underwriters Survey (2020)
- Ref. 3: *Norfolk County Design Criteria (2017).*
- Ref. 4: *Dover Coast Developments by Development Engineering Limited (2017).*
- Ref. 5: *Ontario Building Code (2012).*
- Ref. 6: *Design Guidelines for Drinking-Water Systems, Ministry of the Environment and Climate Change (2008).*
- Ref. 7: *Design Guidelines for Sewage Works, Ministry of the Environment and Climate Change (2008).*
- Ref. 8: *Erosion & Sediment Control Guideline for Urban Construction (December, 2006).*

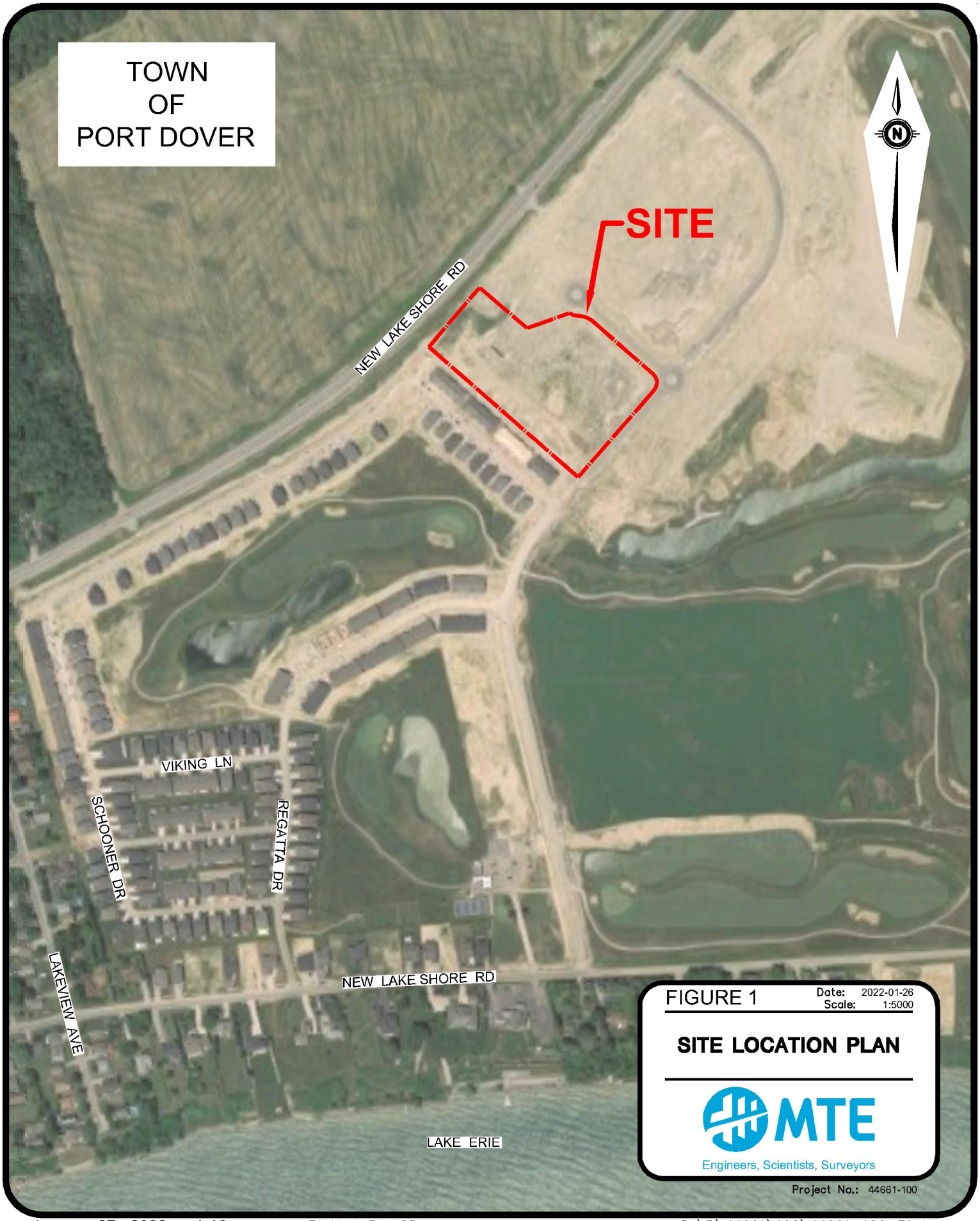


FIGURE 1

Date: 2022-01-26
Scale: 1:5000

SITE LOCATION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 44661-100

January 27, 2022 — 1:19 p.m. — Plotted By: SDu

P:\P\44661\100\44661-100-F1.dwg

2.0 Stormwater Management

2.1 Existing Conditions

Under existing conditions, the site consists of an undeveloped green field. Based on the topographic survey for the site and the Dover Coast subdivision drawings by Development Engineering, there is an existing 1050mm diameter storm sewer within Dover Coast Boulevard draining southwest and a 600mm diameter storm stub provided to the subject site at the Dover Coast property line. The site generally drains from north to south (towards Dover Coast Boulevard).

The site is part of the overall Dover Coast Development which will consist of the subject site, residential blocks, a retirement home, a hotel, commercial blocks, municipal roadways, an 18-hole golf course and stormwater management (SWM) facilities all of which will be located south of Highway 6.

Development Engineering (London) Limited were retained to complete the engineering design for the proposed Dover Coast Development including Phase 2 to 4 and have prepared a SWM report for Phase 2 of the Dover Coast Development dated December 2015. The report reviews the design of Phase 1 completed by Vallee Consulting dated 2009 and provides SWM design details for SWM B and C. Note that the 2009 Vallee SWM report also included SWMF “A”, however Development Engineering has proposed this facility be converted to a passive golf course with the developed drainage area diverted to SWMF B for attenuation and treatment. The subject site, noted as Proposed Commercial Block 2 (Sub-catchment area B400) in the 2015 Development Engineering report will drain to SWMF B.

The SWM strategy for the Dover Coast Development as documented in the 2015 Development Engineering report is to provide attenuation through over-control of minor flow conveyance via storm sewers and major overland flow routes with release to the Ellwanger Drain. Additionally, Development Engineering has designed SWMF B to provide an 80% Total Suspended Solids (TSS) removal efficiency for quality control and control post-development peak flows for the 2 to the 100-year strom events to pre-development levels for all upstream drainage areas. Please refer to the SWM report and design drawings by Development Engineering for additional information.

As shown on the Master Storm Area Plan (Drawing M1) by Development Engineering, the subject site is labeled as Catchment A32 (Future Retirement Home) with a total area of 2.208ha and a run-off coefficient “C” of 0.73.

2.2 Proposed Conditions

Under proposed conditions, the proponent plans to construct a 128 bed, two storey, long-term care (LTC) facility with associated surface parking and landscape areas. Proposed catch basins will be installed in the parking lot and landscaped areas to pick up drainage, which will convey run-off to the 600mm diameter storm service stub for the site via a network of proposed site storm sewers.

2.3 Water Quantity

The proposed development will have a footprint of approximately 2.0ha within the total subject lands area of 2.208ha. There is 0.76ha of impervious cover proposed within the site which will consist of associated surface parking, sidewalks and building. When calculated over the total site, the following can be determined:

i. Under existing conditions, the site is approximately 0% impervious.

ii. Under proposed conditions, the site is approximately 34% impervious.

The following is known about the proposed development:

1) The subject site is part of the upstream catchment area of the aforementioned SWM Facility B which forms part of the overall Dover Coast Development.

2) The SWM Facility B and municipal storm sewer system has been designed with adequate capacity to service the site area (total area of 2.208ha) with a composite run-off coefficient of 0.73.

3) Under post development (proposed) conditions, the site area (total area of 2.0 ha) will drain to SWM facility B at a run-off coefficient of 0.44.

Given that the subject site under post development conditions has a composite run-off coefficient less than what the downstream SWM facility and municipal storm sewer system has been designed for, no stormwater quantity controls are proposed for the subject property.

2.4 Water Quality Control

Stormwater quality control for the subject site is being provided in the downstream receiving stormwater management pond (SWMF B). This pond has been designed to provide the MOECC's Level 1 (Enhanced or 80% SS Removal Rate) water quality protection for the subject site. Given that the subject site under post development conditions has a run-off coefficient less than that of the drainage area for which the SWM facility has been designed for, no stormwater quality controls are proposed for the subject property.

2.5 Sediment and Erosion Control

Sediment and erosion control measures will be implemented on site during construction and will conform to the Erosion & Sediment Control Guideline for Urban Construction (Ref 6) and Norfolk County Standards.

Sediment and erosion control measures will include:

- Installation of silt control fencing at strategic locations around the perimeter of the site where feasible.
- Preventing silt or sediment laden water from entering inlets (catch basins / catch basin manholes) by wrapping their tops with filter fabric or installing silt sacks.
- Construction of 7m x 14m mud mat at the exit from the site to Dover Coast Boulevard to mitigate the transportation of sediments to the surrounding roads.
- Maintaining sediment and erosion control structures in good repair (including periodic cleaning as required) until such time that the Engineer or Norfolk County approves their removal. Erosion control measures to be inspected daily and after any rainfall event.

3.0 Sanitary Sewer Servicing

3.1 Existing Conditions

Currently, the area of the proposed development does not generate sanitary flows. There is an existing 200mm diameter sanitary sewer at 0.4% slope within Dover Coast Boulevard and a 200mm diameter sanitary stub at 0.5% slope provided for the site off Dover Coast Boulevard. The full-flow capacity of the existing 200mm diameter sewer within Dover Coast Boulevard at a 0.4% slope is approximately 20.7 L/s.

3.2 Sanitary Demands

The anticipated sanitary discharge from the proposed development was estimated using the average daily flows for a LTC facility as specified in the Norfolk Design Criteria Section 9 (refer to Appendix B). Table 3.1 provides an estimate of the residential population and the number of units in each type of building. The sanitary sewer discharge rates from the development are summarized in Table 3.2 and detailed calculations are found in Appendix B.

Table 3.1 - Population Estimate

Unit Types	Total Number of Units [A]	Residents [B]	Staff [C]	Incremental Population (people) [D]
Long-Term Care				
1 bedroom units	128	128	64	192
			Total Estimated Population	**192**

[A] # of beds taken from site plan by MMMC Architects dated 2022/01/10
[B] Population based on occupant load of 1 persons/bed from OBC 3.1.17.1.c.i
[C] Staff population assumed to be 2 residents to every 1 staff
[D] Total population = Residents + Staff

Table 3.2 - Sanitary Sewer Discharge from Site

Land Use	Population (people)	Average Flow (L/s)	Peak Flow (L/s)
Long-Term Care Units	192 [A]	0.67 [B]	2.77 [C]
Total Peak Sanitary Demand for Site (with infiltration allowance)			**3.33** [D]

[A] Population Estimate: see Table 3.1
[B] Average flow based on 300 L/ca/day (Long-term Care sanitary sewage flow based on Dover Coast Development Plan (2017)). Avg Flow = 300*192/(24*60*60) = 0.67 L/s
[C] Peak flow based on a Harmon Peaking Factor (PF) = 1 + [14 / (4 + P0.5)] where P = cumulative population in thousands
PF = 1 + [14 / (4 + $0.192^{0.5}$)] = 4.15
Peak Flow = (Avg. Flow) x (PF) = (0.67 L/s) x (4.15) = 2.77 L/s
[D] Total Peak flow with infiltration = Total Peak flow + infiltration allowance = 2.77 + 0.560 = 3.33 L/s
Where infiltration is based on 0.40 l/s/ha. Area reflects site area (1.8 ha), I = 0.28*2.0 = 0.560 L/s

3.3 Proposed Sanitary Servicing Plan and Capacity Analysis

As calculated in Table 3.2, the total peak sanitary discharge from the site is 3.33 L/s.

The proposed building will be serviced by a 200mm diameter sanitary service at 0.4% slope (full flow capacity = 20.7 L/s) that will connect to the existing 200mm diameter sanitary stub on the Dover Coast property line (see Drawing C1.2). The calculated sanitary discharge rate of 3.33 L/s (per Table 3.2) is less than the capacity of the existing 200mm diameter sewer (20.7 L/s) and represents 16% of the total sewer capacity. Given that the estimated flow is well below the full flow capacity of the sewer main, and the Dover Coast subdivision design (sanitary sewer design sheet and drainage area plan M2) has allotted a total population of 240 people for the site, there is not expected to be any sanitary capacity issues. Refer to Appendix B for the sanitary design sheet and drainage plan M2.

4.0 Domestic and Fire Water Supply Servicing

4.1 Existing Conditions

The existing municipal water distribution system around the site consists of a 300mm diameter watermain within Barret Court and Dover Coast Boulevard. An existing fire hydrant exists on the south-west side of Barret Court as well as on the west side of Dover Coast Boulevard. Hydrant flow testing was conducted for the hydrant located on Dover Coast Boulevard as well as the hydrant on Barrett Court in September 2018. Results of hydrant flows tests can be found in Appendix C.

4.2 Domestic Water Demands

The expected domestic water demands for the proposed development was estimated using the Norfolk County Design Criteria Section 10 (2017). Table 4.1 summarizes the domestic water demand requirements for the Average Day, Maximum Day and Peak Hour demand scenarios and detailed calculations are provided in Appendix C. It should be noted that average day peak factor is 1.0, the max day peak factor is 2.25 and the peak hour factor is 4.0 in accordance with City of Hamilton standards.

Table 4.1 - Domestic Water Demands

Apartment Demands		
Population:	192 people (see Table 3.1)	
Average Day Demand:	450 L/c/d x 192 people =	1.00 L/s
Maximum Day Demand:	2.25 x 1.00 L/s =	2.25 L/s
Peak Hour Demand:	4.0 x 1.00 L/s =	4.00 L/s

4.3 Fire Flow Demands

Fire flow demand for the proposed development was also determined using the methodology outlined in Water Supply for Public Fire Protection (Fire Underwriters Survey (FUS), 2020). The fire flow for the proposed building was evaluated. The fire demand is summarized in Table 4.2 and detailed calculations are provided in Appendix C.

Table 4.2 - FUS Fire Flow Requirement

Building	Fire Underwriters Survey (FUS) Flow Rate
LTC Facility	116.7 L/s (7,000 L/min)

4.4 Proposed Water Servicing Plan and Analysis

Water servicing for the site will include the installation of a 150mm diameter fire service that will connect to the existing 200mm diameter watermain stub, which is located at the Dover Coast property line. The proposed 100mm domestic service will tee off the existing 200mm water service before property line. Please refer to Drawing C1.2 for further details.

R.V. Anderson Associates Limited has conducted an analysis of the impact of the proposed Revera Long Term Care on the water distribution system in Port Dover, as requested by Norfolk County. The results from the analysis determined that there is approximately 120 L/s available fire flow for the development, which is higher than the required 116.7 L/s. Therefore, there is sufficient capacity to support the fire flow demand for the proposed development.

In addition, as part of the Norfolk County Water Supply Operational Strategy report by WSP dated January 2021, there are plans to improve the water supply and provide adequate pressure within Port Dover. Our understanding is the planned upgrades will be completed prior to building occupancy and will address system pressure and supply. There are plans to improve the water supply and pressure within the Port Dover Coast Development.

Furthermore, at the building permit stage, a sprinkler consultant will prepare a detailed sprinkler design in accordance with applicable codes and regulations.

5.0 Conclusions and Recommendations

Based on the information provided herein, it is concluded that the development can be constructed to meet the requirements of the Norfolk County. Therefore, it is concluded that:

i. Under proposed conditions, the composite run-off coefficient is less than what the downstream SWM facility and municipal storm sewer system has been designed for. Therefore, no stormwater quantity controls are proposed.

ii. Stormwater quality controls for the subject site is being provided in the downstream receiving stormwater management pond (SWMF B). Therefore, no additional stormwater quality controls are proposed for the subject property.

Additionally, it is recommended that:

iii. Erosion and sediment controls be installed as described in Section 2.5 of this report.

iv. Sanitary servicing for the development be installed as described in Section 3.3 of this report.

v. Water servicing for the development be installed as described in Section 4.4 of this report.

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

All of which is respectfully submitted,

MTE Consultants Inc.

Rosie Calogero, B.Eng.
Project Manager
905-639-2552 ext. 2425
rcalogero@mte85.com

George Berenyi, P.Eng.
Manager, Civil Engineering
905-639-2552 ext. 2461
gberenyi@mte85.com

RNC:gpb

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Appendix A

Stormwater Management

Scheduler – Run Design & Layout

Free Public Access Software

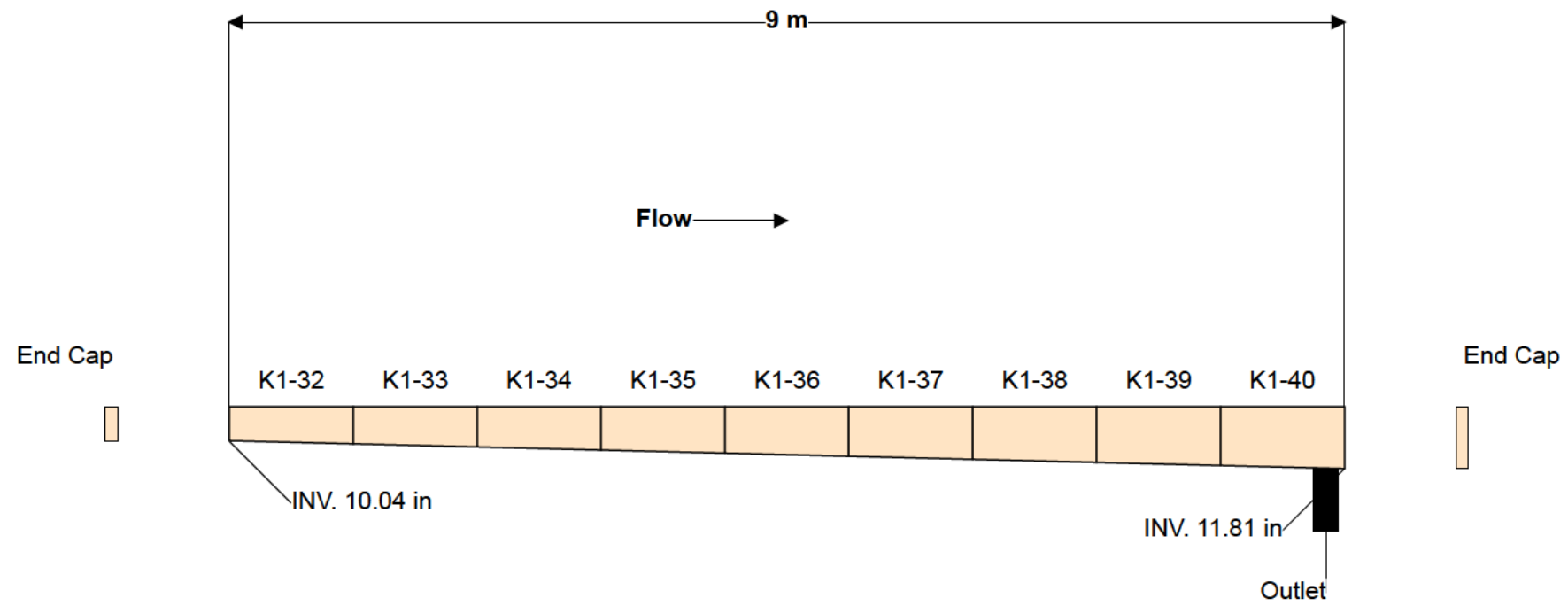
Run Name: TD-1 **Total Length:** 9 m

Project Details

Name: Port Dover LTC
Address: Port Dover
City: Port Dover **State/Region:** ON
Country: Canada

Drawn By

Name: Ricardo Vargas
Company: ACO Systems Ltd
Phone:
Email: Ricardo Vargas@aco com



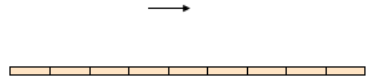
Legend

→ Flow Direction
INV Invert Depth of Channel

ELEVATION

NOT TO SCALE

PLAN



ACO

www.acocan.ca

ACO Systems, Ltd.

2910 Brighton Rd
Oakville, ON L6H 5S3
Phone: 905-829-0665
Email: info@acocan ca

General Notes

1 It is the customers responsibility to ensure that each product is fit for it's intended purpose and that the actual conditions are suitable
2 This run design and layout is only intended to be used as a guide Refer to engineer's construction drawings for further information If in doubt, seek engineering advice
3 The run layout does not show the concrete surround (encasement) refer to Site Installation Manual

ACO Product (Click Spec Info for more information)

System: KlassikDrain K100 (Spec Info)
Grate: Type 461Q (Spec Info)

Drawn By: Ricardo Vargas
Date: 2022-02-17 19:49
Page: 2 of 2 **Run:** 3 of 3

Scheduler – Run Design & Layout

Free Public Access Software

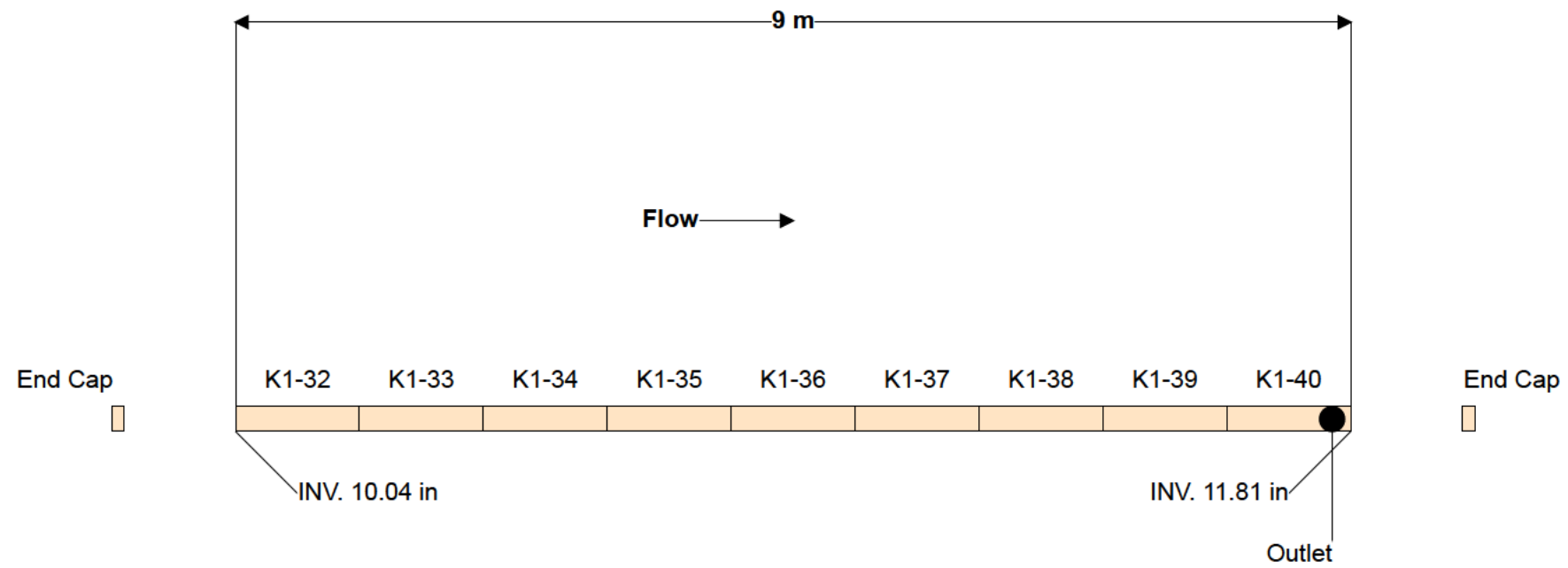
Run Name: TD-1 **Total Length:** 9 m

Project Details

Name: Port Dover LTC
Address: Port Dover
City: Port Dover **State/Region:** ON
Country: Canada

Drawn By

Name: Ricardo Vargas
Company: ACO Systems Ltd
Phone:
Email: Ricardo Vargas@aco com



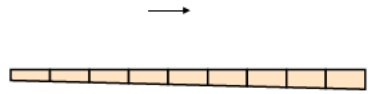
Legend

→ Flow Direction
INV Invert Depth of Channel

PLAN

NOT TO SCALE

ELEVATION



ACO Systems, Ltd.

2910 Brighton Rd
Oakville, ON L6H 5S3
Phone: 905-829-0665
Email: info@acocan ca

www.acocan.ca

General Notes

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2 This run design and layout is only intended to be used as a guide Refer to engineer's construction drawings for further information If in doubt, seek engineering advice
3 The run layout does not show the concrete surround (encasement) refer to Site Installation Manual

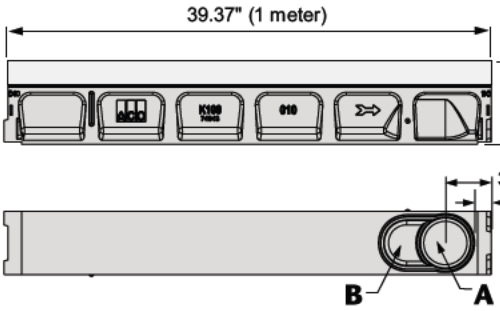
ACO Product (Click Spec Info for more information)

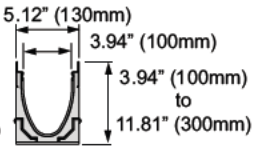
System: KlassikDrain K100 (Spec Info)
Grate: Type 461Q (Spec Info)

Drawn By: Ricardo Vargas
Date: 2022-02-17 19:49
Page: 1 of 2 **Run:** 3 of 3

KlassikDrain - K100 Galvanized steel edge rail channel system

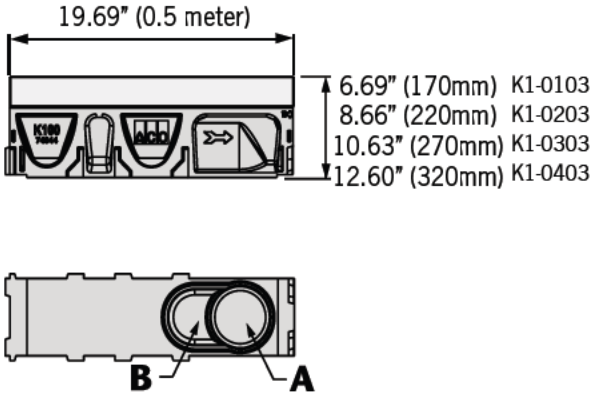
One meter channel



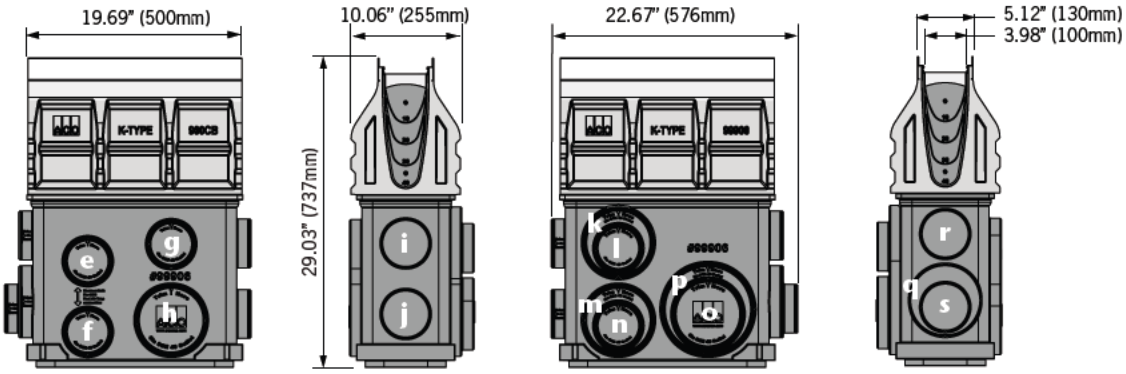


Half meter channel

Knock-outs included on every 5th channel



Type K901G In-line catch basin

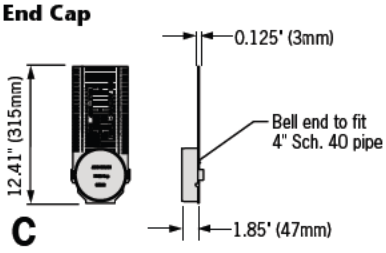


Total capacity =
10.49 gallons

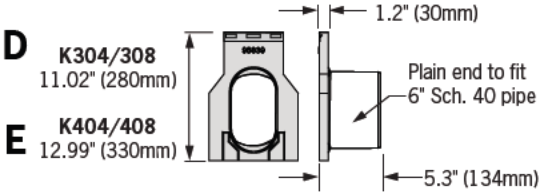
Outlet flow rates

Outlet	Product	Outlet size (Sch. 40)	Invert Depth	GPM	CFS
a	Bottom outlet - K00	4" round	3.94"	108	0.24
a	Bottom outlet - K40	4" round	11.81"	187	0.42
b	Bottom outlet - K00	6" oval	3.94"	177	0.39
b	Bottom outlet - K40	6" oval	11.81"	306	0.68
c	End outlet - K20	4" round	7.87"	132	0.29
c	End outlet - K40	4" round	11.81"	171	0.38
d	K1-308-6 6" outlet cap	6" oval	9.84"	233	0.52
d	K1-408-6 6" outlet cap	6" oval	11.81"	264	0.59
e	Type K1-901G	4" round	20.68"	235	0.52
f	Type K1-901G	4" round	27.17"	226	0.50
g	Type K1-901G	4" round	18.99"	265	0.59
h	Type K1-901G	6" round	27.17"	263	0.59
i	Type K1-901G	4" round	19.30"	222	0.49
j	Type K1-901G	4" round	25.67"	586	1.30
k	Type K1-901G	6" round	19.99"	269	0.60
l	Type K1-901G	4" round	19.36"	227	0.51
m	Type K1-901G	6" round	27.30"	604	1.35
n	Type K1-901G	4" round	26.43"	505	1.12
o	Type K1-901G	6" round	26.43"	593	1.32
p	Type K1-901G	8" round	27.30"	1051	2.34
q	Type K1-901G	6" round	25.85"	273	0.61
r	Type K1-901G	4" round	18.56"	235	0.52
s	Type K1-901G	4" round	25.30"	224	0.50

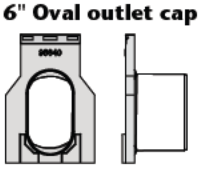
End Cap



6" Oval inlet cap



6" Oval outlet cap



Note: These are the pipe flow rates at the specified outlet, **NOT** channel flow rates. Catch basin flow rates are without trash bucket - using trash bucket reduces flow.

ACO Specification Information

ACO DRAIN

KlassikDrain - K100 Galvanized steel edge rail channel system

Description	Part No.	Invert Inches[2]	Invert mm[2]	Weight Lbs.
K1-00 Neutral channel - 39.37" (1m)[3]	**74041**	**3.94**	**100**	**28.1**
K1-1 Sloped channel - 39.37" (1m)	**74001**	4.13	105	28.1
K1-2 Sloped channel - 39.37" (1m)	**74002**	4.33	110	28.9
K1-3 Sloped channel - 39.37" (1m)	**74003**	4.53	115	29.7
K1-4 Sloped channel - 39.37" (1m)	**74004**	4.72	120	30.5
K1-5 Sloped channel - 39.37" (1m)[1]	**74005**	4.92	125	31.3
K1-6 Sloped channel - 39.37" (1m)	**74006**	5.12	130	32.1
K1-7 Sloped channel - 39.37" (1m)	**74007**	5.31	135	32.9
K1-8 Sloped channel - 39.37" (1m)	**74008**	5.51	140	33.7
K1-9 Sloped channel - 39.37" (1m)	**74009**	5.71	145	34.5
K1-10 Sloped channel - 39.37" (1m)[1]	**74010**	5.91	150	35.3
K1-010 Neutral channel - 39.37" (1m)[3]	**74043**	**5.91**	**150**	**35.3**
K1-0103 Neutral channel - 19.69" (0.5m)[3]	**74044**	**5.91**	**150**	**17.0**
K1-11 Sloped channel - 39.37" (1m)	**74011**	6.10	155	36.1
K1-12 Sloped channel - 39.37" (1m)	**74012**	6.30	160	36.9
K1-13 Sloped channel - 39.37" (1m)	**74013**	6.50	165	37.7
K1-14 Sloped channel - 39.37" (1m)	**74014**	6.69	170	38.5
K1-15 Sloped channel - 39.37" (1m)[1]	**74015**	6.89	175	39.3
K1-16 Sloped channel - 39.37" (1m)	**74016**	7.09	180	40.1
K1-17 Sloped channel - 39.37" (1m)	**74017**	7.28	185	40.9
K1-18 Sloped channel - 39.37" (1m)	**74018**	7.48	190	41.7
K1-19 Sloped channel - 39.37" (1m)	**74019**	7.68	195	42.5
K1-20 Sloped channel - 39.37" (1m)[1]	**74020**	7.87	200	43.4
K1-020 Neutral channel - 39.37" (1m)[3]	**74045**	**7.87**	**200**	**43.4**
K1-0203 Neutral channel - 19.69" (0.5m)[3]	**74046**	**7.87**	**200**	**20.5**
K1-21 Sloped channel - 39.37" (1m)	**74021**	8.07	205	44.2
K1-22 Sloped channel - 39.37" (1m)	**74022**	8.27	210	45.0
K1-23 Sloped channel - 39.37" (1m)	**74023**	8.46	215	45.8
K1-24 Sloped channel - 39.37" (1m)	**74024**	8.66	220	46.6
K1-25 Sloped channel - 39.37" (1m)[1]	**74025**	8.86	225	47.4
K1-26 Sloped channel - 39.37" (1m)	**74026**	9.06	230	48.2
K1-27 Sloped channel - 39.37" (1m)	**74027**	9.25	235	49.0

Description	Part No.	Invert Inches[2]	Invert mm[2]	Weight Lbs.
K1-28 Sloped channel - 39.37" (1m)	**74028**	9.45	240	49.8
K1-29 Sloped channel - 39.37" (1m)	**74029**	9.65	245	50.6
K1-30 Sloped channel - 39.37" (1m)[1]	**74030**	9.84	250	51.4
K1-030 Neutral channel - 39.37" (1m)[3]	**74047**	**9.84**	**250**	**51.4**
K1-0303 Neutral channel - 19.69" (0.5m)[3]	**74048**	**9.84**	**250**	**24.0**
K1-31 Sloped channel - 39.37" (1m)	**74031**	10.04	255	52.2
K1-32 Sloped channel - 39.37" (1m)	**74032**	10.24	260	53.0
K1-33 Sloped channel - 39.37" (1m)	**74033**	10.43	265	53.8
K1-34 Sloped channel - 39.37" (1m)	**74034**	10.63	270	54.6
K1-35 Sloped channel - 39.37" (1m)[1]	**74035**	10.83	275	55.4
K1-36 Sloped channel - 39.37" (1m)	**74036**	11.02	280	56.2
K1-37 Sloped channel - 39.37" (1m)	**74037**	11.22	285	57.0
K1-38 Sloped channel - 39.37" (1m)	**74038**	11.42	290	57.9
K1-39 Sloped channel - 39.37" (1m)	**74039**	11.61	295	58.7
K1-40 Sloped channel - 39.37" (1m)[1]	**74040**	11.81	300	59.5
K1-040 Neutral channel - 39.37" (1m)[3]	**74049**	**11.81**	**300**	**59.5**
K1-0403 Neutral channel - 19.69" (0.5m)[3]	**74050**	**11.81**	**300**	**27.5**
K1-901G In-line catch basin - 19.69" (0.5m)[4]	**94608**	28.81	701.9	52.6
K1-621G catch basin - 19.69" (0.5m)[4]	**94617**	28.84	732.5	55.8
K1-631G catch basin - 19.69" (0.5m)[4]	**94631**	40.84	1037.4	65.8
K1-Series 600 Optional plastic riser	**99902**	-	-	10.0
Foul air trap - fits both 900 & 600 series basins	**90854**	-	-	1.2
K1-304-6 6" Inlet Cap	**96839**	9.84	250	5.2
K1-308-6 6" Outlet Cap	**96840**	9.84	250	5.0
K1-404-6 6" Inlet Cap	**96834**	11.81	300	6.0
K1-408-6 6" Outlet Cap	**96836**	11.81	300	5.8
Universal end cap	**96822**	11.81	300	0.4
Debris strainer for 4" bottom knockout	**93488**	-	-	0.2
4" Oval to 6" round outlet adapter	**95140**	-	-	1.1
K1-Installation device	**97477**	-	-	2.8
Grate removal tool	**01318**	-	-	0.3
K1-QuickLok locking bar	**02899**	-	-	0.1

Notes:
1. This channel offers a bottom knockout feature; 4" round/6" oval.
2. Inverts shown are for the male end; for female invert depth subtract 5mm (≈0.2") from the male invert (except for neutral channels, where it will be same as male invert). To calculate the overall channel depth add 20mm (≈0.8") to invert depth.
3. This catch basin kit includes a polymer concrete top, removable Quicklok locking bar, trash bucket and plastic base. Select an appropriate grate.
4. This catch basin kit includes a polymer concrete top, removable Quicklok locking bar, deep trash bucket, plastic riser and plastic base. Select an appropriate grate.

Specifications

General
The surface drainage system shall be ACO Drain K100 complete with gratings secured with 'QuickLok' locking as manufactured by ACO, Inc. or approved equal.

Materials
The trench system bodies shall be manufactured from polyester polymer concrete with the minimum properties as follows:

Compressive strength:	14,000 psi
Flexural strength:	4,000 psi
Water absorption	0.07%
Frost proof	YES
Salt proof	YES
Dilute acid and alkali resistant	YES

The nominal clear opening shall be 4" (100mm) with overall width of 5.12" (130mm). Pre-cast units shall be manufactured with either an invert slope of 0.5% or with neutral invert and have a wall thickness of at least 0.50" (13mm). Each unit will feature a partial radius in the trench bottom and a male to female interconnecting end profile. Units shall have horizontal cast in anchoring keys on the outside wall to ensure maximum mechanical bond to the surrounding bedding material and pavement surface. The galvanized steel edge rail will be integrally cast in by the manufacturer to ensure maximum homogeneity between polymer concrete body and edge rail. Each edge rail shall be at least 3/32" (2.5mm) thick.

Grates
Grates shall be specified. See separate ACO Spec Info grate sheets for details. After removal of grates and 'QuickLok' bar there shall be uninterrupted access to the trench to aid maintenance.

Installation
The trench drain system shall be installed in accordance with the manufacturer's installation instructions and recommendations.

ACO, Inc.
Northeast Sales Office
9470 Pinecone Drive
Mentor, OH 44060
Tel: (440) 639-7230
Toll free: (800) 543-4764
Fax: (440) 639-7235

West Sales Office
825 W. Beechcraft St.
Casa Grande, AZ 85122
Tel: (520) 421-9988
Toll Free: (888) 490-9552
Fax: (520) 421-9899

Southeast Sales Office
4211 Pleasant Road
Fort Mill, SC 29708
Toll free: (800) 543-4764
Fax: (803) 802-1063

Electronic Contact:
info@acousa.com
www.acousa.com

Type 461Q Ductile iron slotted grate

ACO Specification Information

Product Features

- Certified to EN 1433 Load Class E - 135,000 lbs - 2,788 psi
- Uses 'QuickLok' boltless locking system
- Suitable for use with K100, KS100, H100-8, H100-10, H100K-8 H100KS-8, and NW100 channels
- Manufactured from ductile iron to ASTM A 536-84 - Grade 65-45-12
- E- coated for improved resistance against rust
- Bicycle Tire Penetration Resistant to AS 3996 - 2006

Specifications

General

The surface drainage system shall be ACO Drain K100, KS100, H100-8, H100-10, H100K-8, H100KS-8, and NW100 channels* complete with ACO Type 461Q Ductile iron slotted grate with 'QuickLok' locking as manufactured by ACO, Inc. or similar approved.

Materials

The covers shall be manufactured from ductile iron and have ***minimum*** properties as follows:

- ***Independently certified to meet Load Class E to EN 1433 - 135,000 lbs - 2,788 psi***
- ***Ductile iron to ASTM A 536-84 - Grade 65-45-12***
- ***Intake area of 34.88 sq. in. (225 cm²) per half meter of grate***

The overall width of 4.84" (123mm) and overall length of 19.69" (500mm). Slots measure at a maximum of 3.95" (100.2mm).

Installation

The trench drain system and grates shall be installed in accordance with the manufacturer's installation instructions and recommendations.

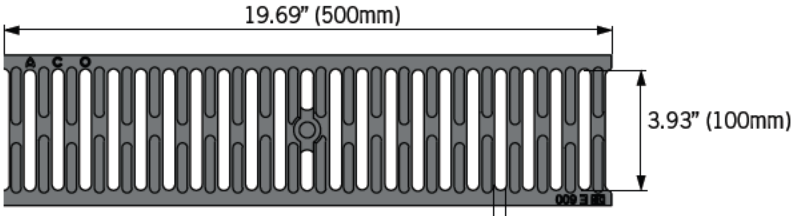
* delete as appropriate

ACO DRAIN

Type 461Q Ductile iron slotted grate

ACO Specification Information

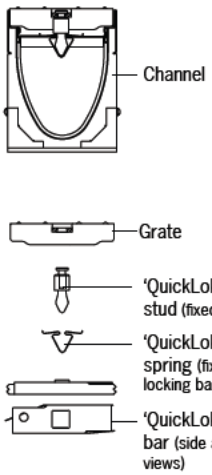
Plan view



Side elevation

Description	Part No.	Length inches *(mm)*	Width inches *(mm)*	Weight lbs.
QuickLok grate				
Type 461Q Ductile iron slotted grate	**96752**	19.69 (*500*)	4.84 (*123*)	10.2
QuickLok locking bar	**02899**	-	-	0.1
QuickLok grate removal tool	**01318**	-	-	0.3

'QuickLok' locking mechanism



ACO 'QuickLok' is a patented boltless locking system, grates are removed and replaced with the minimum time and effort for ease of maintenance. The unique design provides a positive 'snap down' fit into the locking bar. A stud is fixed to the grate which 'locks' into the spring clip in the locking bar.

The 'QuickLok' stud is made from stainless steel and high density nylon, the locking bar and clip are stainless steel, for use in both general purpose and corrosive environments.

ACO, Inc.
Northeast Sales Office
9470 Pinecone Drive
Mentor, OH 44060
Tel: (440) 639-7230
Toll free: (800) 543-4764
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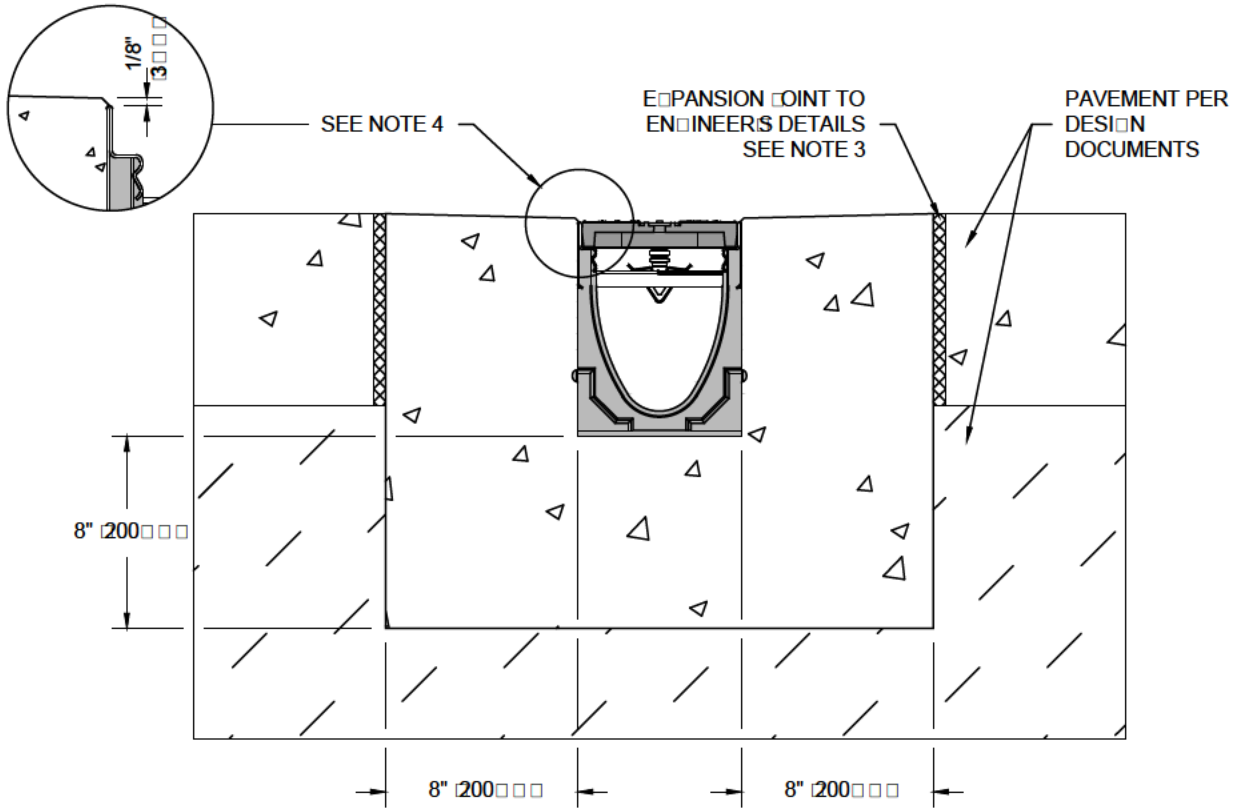

NOTES:
1. IT IS NECESSARY TO ENSURE MINIMUM DIMENSIONS SHOWN ARE SUITABLE FOR EXISTING GROUND CONDITIONS. *ENGINEERING ADVICE MAY BE REQUIRED.*
2. MINIMUM CONCRETE STRENGTH OF 4,000 PSI IS RECOMMENDED. CONCRETE SHOULD BE VIBRATED TO ELIMINATE AIR POCKETS.
3. EXPANSION AND CONTRACTION CONTROL JOINTS AND REINFORCEMENT ARE RECOMMENDED TO PROTECT CHANNEL AND CONCRETE SURROUND. *ENGINEERING ADVICE MAY BE REQUIRED.*
4. THE FINISHED LEVEL OF THE CONCRETE SURROUND MUST BE APPROX. 1/8" (3 mm) ABOVE THE TOP OF THE CHANNEL EDGE.
5. CONCRETE BASE THICKNESS SHOULD MATCH SLAB THICKNESS. ENGINEERING ADVICE MAY BE REQUIRED TO DETERMINE PROPER LOAD CLASS.
6. REFER TO ACO'S LATEST INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS.

SPECIFICATION CLAUSE

K100 KLASSIKDRAIN - LOAD CLASS E

GENERAL

THE SURFACE DRAINAGE SYSTEM SHALL BE POLYMER CONCRETE K100 CHANNEL SYSTEM WITH GALVANIZED STEEL EDGE RAILS AS MANUFACTURED BY ACO POLYMER PRODUCTS, INC.

MATERIALS

CHANNELS SHALL BE MANUFACTURED FROM POLYESTER RESIN POLYMER CONCRETE WITH AN INTEGRALLY CAST-IN GALVANIZED STEEL EDGE RAIL. MINIMUM PROPERTIES OF POLYMER CONCRETE WILL BE AS FOLLOWS:

COMPRESSIVE STRENGTH	14,000 PSI
FLEXURAL STRENGTH	4,000 PSI
TENSILE STRENGTH	1,500 PSI
WATER ABSORPTION	0.07%
FROST PROOF	YES
DILUTE ACID AND ALKALI RESISTANT	YES
B117 SALT SPRAY TEST COMPLIANT	YES

THE SYSTEM SHALL BE 4" (100 mm) NOMINAL INTERNAL WIDTH WITH A 5.1" (130 mm) OVERALL WIDTH AND A BUILT-IN SLOPE OF 0.5%. CHANNEL INVERT SHALL HAVE DEVELOPED "V" SHAPE. ALL CHANNELS SHALL BE INTERLOCKING WITH A MALE/FEMALE JOINT.

THE COMPLETE DRAINAGE SYSTEM SHALL BE BY ACO POLYMER PRODUCTS, INC. ANY DEVIATION OR PARTIAL SYSTEM DESIGN AND/OR IMPROPER INSTALLATION WILL VOID ANY AND ALL WARRANTIES PROVIDED BY ACO POLYMER PRODUCTS, INC.

CHANNEL SHALL WITHSTAND LOADING TO PROPER LOAD CLASS AS OUTLINED BY EN 1433. GRATE TYPE SHALL BE APPROPRIATE TO MEET THE SYSTEM LOAD CLASS SPECIFIED AND INTENDED APPLICATION. GRATES SHALL BE SECURED USING QUICKLOCK BOLTLESS LOCKING SYSTEM. CHANNEL AND GRATE SHALL BE CERTIFIED TO MEET THE SPECIFIED EN 1433 LOAD CLASS. THE SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.

K1-E-ECP

DATE: 08/24/15

K100 KLASSIKDRAIN LOAD CLASS E

Exposed Concrete Pavement

INSTALLATION DRAWING ACO DRAIN

ACO Polymer Products, Inc.

825 E. Beechcraft St
Casa Grande AZ 85122
Tel: 520 421 9988
Fax: 520 421 9899

9470 Pinecone Dr.
Mentor OH 44060
Tel: 440 639 7230
Fax: 440 639 7235

4211 Pleasant Rd.
Fort Mill SC 29708
Tel: 440 639 7230
Fax: 803 802 1063

Arizona Tel: 888-490-9552 e-mail: sales@acousa.com Ohio Tel: 800-543-4764 www.acousa.com South Carolina Tel: 800-543-4764

PROJECT NO.: **DEL13-124**
DATE: **DECEMBER 2015**

PREPARED FOR:

DOVER COAST CONDOMINIUM DEVELOPMENT - PHASE 2

DOVER COAST – PORT DOVER, ONTARIO
HIGHWAY 6 / NEW LAKESHORE RD.
STORMWATER MANAGEMENT DESIGN REPORT

development engineering (London) Limited

CONSULTING CIVIL ENGINEERS

Table of Contents

Tables

Appendices

REPORT PREPARED BY:

Laurence R. Murray, P.Eng.
SWM/Project Engineer

REPORT REVIEWED BY:

Les Janos, P.Eng.
Review Engineer

Note: This Stormwater Management Report has been prepared on behalf of Dover Coast Developments (2079095 Ontario Ltd.), to support the engineering design for the proposed Dover Coast Phase 2 Vacant Land Condominium Development. This report has been prepared for the sole use of Dover Coast Developments (the Client) and any reliance upon this information by any third party is made at the risk of that party. Development Engineering (London) Limited assumes no liability for any injury, loss or damage suffered by any third party based upon decisions made or actions that arise due to that party's reliance upon or interpretation of the contents of this report.

1. INTRODUCTION

1.1 DOVER COAST CONDOMINIUM DEVELOPMENT

Development Engineering (London) Limited has been retained to undertake the engineering design for the proposed Dover Coast Development including Phases 2 to 4 residential vacant land condominiums and future retirement home, long-term care, commercial and Hotel Blocks (refer to Figure A, Appendix B). These lands form Part of Lot 14, Concession 1, geographic township of Woodhouse, in the County of Norfolk, located between New Lakeshore Road and Highway 6 (east of Lakeview Ave.) in Port Dover. The subject development area (formerly agricultural lands) covers approximately 36 Ha, with approximately 8.5ha of external drainage area to the north including a portion of Highway 6.

Phase 1 of the Dover Coast development was designed by G.D. Vallee Engineering Ltd. (Vallee) and constructed in 2011-2012. Stormwater Management/Irrigation Wet Pond Facilities (SWMF), identified as SWMF D & E in the (2009) Vallee Stormwater Management Report (ref. excerpts in Appendix A), have been constructed. The balance of the site development requires the construction of two (2) additional SWMF's (B&C) shown in Figure B, Appendix B. SWMF C will operate in series with the existing downstream pond D and E (as originally designed by Vallee) discharging to Ellwanger Municipal Drain 7. SWMF B will operate independently with a sewer outfall to the Ellwanger Municipal Drain (Branch No. 1). The proposed major overland flow (spill) routes for both SWMF's will be to the southeast per existing conditions, however, the ponds are oversized and therefore major spill is not anticipated under normal conditions. An approximate breakdown of the overall drainage area is as follows:

SWMF B (east) – *Outlet to Ellwanger Municipal Drain Main Branch No.1 (total drainage area 28.29ha)*

- 1.90 Ha External Drainage (C=0.28 - Agricultural lands and Highway 6 ROW);
- 2.64 Ha Nursing Home Block (C=0.73);
- 4.35 Ha Commercial Block/Long-Term Care Facility (C=0.73);
- 2.44 Ha Hotel Block (C=0.73);
- 1.35 Ha Condominium Residential Area (C= 0.51 - incl. 15 to 23 metre wide ROWs);
- 9.58 Ha Condominium Residential and Municipal Right-of-ways (C=0.51);
- 6.02 Ha Condominium SWM block/Golf Course (C=0.36).

SWMF C (west) – *Outlet to existing SWMF D (total drainage area 16.23ha)*

- 6.57 Ha External drainage (C=0.28 - Agricultural lands and Highway 6 ROW);
- 3.64 Ha Condominium Residential (C=0.51 - incl. 15 to 23 metre wide ROWs) and;
- 6.02 Ha Condominium SWM block/Golf Course (C=0.30)

The 2009 Vallee SWM report also included SWMF 'A', which is proposed to be converted to a passive golf course/irrigation feature, and the proposed developed drainage area diverted to SWMF B for attenuation and treatment. The proposed development lands will be serviced by both private and municipal storm sewers. Golf course cart/pedestrian path linkage is proposed jointly with maintenance access to the SWMF's. The SWM system will provide storage for approximately 8.5ha (total) of external undeveloped lands and a portion of Highway 6 to the north of the subject development lands.

1.2 SITE CONSTRAINTS

The Dover Coast development lands are bound by Highway 6 to the north, existing residential lots (on Lakeview Ave.) to the west, Dover Coast (Phase 1)/New Lakeshore Road to the south and golf course lands to the east. The site topography under current conditions effectively sheds runoff in a southeasterly direction toward the Ellwanger Drain, which ultimately discharges to Lake Erie south of New Lakeshore Road. Geodetic elevations range between 192 m in the northwest corner of site to 186.5 m at the Ellwanger Drain Main Branch (outlet). The primary SWMF/development constraints affecting the design are noted as follows:

- Ellwanger Drain Main Branch No.1 topographic elevation (outlet for SWMF B);
- Existing Ellwanger Drain No.7 pipe invert elevations (inlet to SWMF C from Hwy 6);

Modifications to the upper branches of both Municipal Drains are proposed, concurrent and in conjunction with the proposed development; this is further discussed under section 3.2 of this report.

1.3 PURPOSE OF THIS REPORT

The purpose of this Stormwater Management Report is to:

- Identify existing site characteristics including any external drainage conditions;
- Design a stormwater conveyance and detention system to accommodate both minor and major stormwater runoff from the subject site development area while incorporating appropriate Best Management Practices for controlling erosion and sedimentation;
- Design a stormwater management system that can attenuate the post-development flows to pre-development rates or lower for storm events up to the 100-year event; has regard for existing capacity constraints and; provides the required level of quality control (Enhanced) prior to releasing the runoff.

This report was prepared to supplement the Proponent's E.C.A. application to Ministry of Environment and Climate Change (MOECC) under Section 53, Ontario Water Resources Act. It should be noted that this report has been prepared to essentially match or improve peak flows for SWM as originally noted in the 2009 Vallee SWM Report (excerpts enclosed in appendix A).

1.4 KEY PROJECT REFERENCES & GUIDELINES

Related planning level and background reports previously prepared in support of The Dover Coast development include the following:

- Geotechnical Investigation, Soil Engineers Ltd. (March 2006);
- Dover Coast (Phase 1) SWM Report, Vallee (June 2009);
- Ellwanger Municipal Drain No. 7 Report, Vallee (July 2011, rev. Aug. 2011)
- Preliminary SWM Servicing Design Brief, Development Engineering (February 2015)

An updated Ellwanger Drainage Report will be prepared by Spriet Assocaites (forthcoming December 2015) to document changes to the Municipal Drains. It is anticipated that the Subdivision Agreement will identify the need for SWMF monitoring and maintenance by the Condominium Board(s). The Operation and Maintenance manual for the pond will be prepared (under separate cover) with due regard for County standards as typically required pursuant to MOE approval conditions.

2. GEOTECHNICAL (SOIL) CONDITIONS

A geotechnical investigation was completed for the site by Soil Engineers Ltd. in March 2006 and a supplemental native soils review completed by Vallee as part of their 2009 SWM Report. The lands are situated within the Haldimand Clay plain physiographic region, consistently described as firm to stiff silty clay with occasional loose and wet sandy silt deposits, (SCS hydrologic soil group 'C' – CN 82). Topsoil depth averages 250mm to 560mm across the site based upon fourteen (14) borehole logs.

Geotechnical analysis across the site indicates presence of groundwater conditions generally between 2.1m and 4m in depth. Groundwater seepage is anticipated to be low (clay) to moderate (sandy silt), and no requirement for groundwater control is anticipated. All residential basements should include sump pits and ejector pumps with discharge to either the storm sewer system or surface sufficiently away from the backfill envelope to prevent short circuiting to the footing drains.

In view of the underlying clay aquitard across the subject lands ($k = 10^{-5}$ to 10^{-8}), a water balance analysis is not considered critical to subdivision design as the impervious native subsoils are not conducive to groundwater recharge at this site. As such, low impact development (LID) stormwater recharge applications are not recommended for the subject lands on the basis of subsoil conditions. The underlying sandy silt (pockets) and clay subsoils are, however, considered appropriate for the excavation of the SWM pond facilities near the east and west limits of the site.

3. SWM FACILITY DESIGN CONSIDERATIONS

3.1 SWM STRATEGY

The SWM strategy for the proposed development as originally developed by Vallee is to provide attenuation through over-control of minor flow conveyance via storm sewers and major overland flow routes with release to the Ellwanger Drain as noted. Additionally, the SWMF's are oversized to provide irrigation drawdown above the permanent pool elevation, below the extended detention/active control stages.

The proposed 2.03 ha (SWMF B) and 1.28 ha (SWMF C) SWM Block areas, shown in Figure B, have been integrated with the surrounding golf course areas to provide aesthetic benefits to encourage local enjoyment. Golf course walking/cart paths are also integrated with the SWM Block maintenance accesses where required. SWMF B will outlet directly to the Ellwanger Drain No.1 Main Branch channel while SWMF C will discharge through a storm sewer outfall to the southeast into SWMF D (with in-series outlet to SWMF E ultimately discharging to the Ellwanger Drain). The proposed major overland flow system is also generally to the southeast, where SWMF B discharges over the golf course (via a defined flow route and an in-series irrigation pond) and ultimately to the Ellwanger Drain. SWMF C outlets over the Regatta Drive extension (Dover Coast Phase 2) maintaining all flow to SWMF D.

The overall servicing and grading design for the proposed Phase 2 condominium development is premised upon separation of the minor and major drainage systems for conveyance into the respective SWMF's which will serve to over-control storm runoff. Major inflow routes are provided into the main cell of each SWMF per typical design practice.

3.2 MUNICIPAL DRAINS

Spriet Associates have been appointed by Norfolk County to complete the proposed Municipal Drain changes through the Municipal Drain Act, concurrent and in conjunction with the subject development design. Refer to Figures 1 to 6 in Appendix B for an outline of existing conditions, proposed changes and associated drainage areas. Both the MTO and County have been consulted and the servicing strategy approved, with detailed design under review. A summary of the proposed updates to the Drainage Engineer's reports (forthcoming December 2015) under the Drainage Act are as follows:

- Reassessment of the Ellwanger Drain Main Branch No. 1 & No. 7 and M schedules to reflect the new tax roll representing Dover Coast Phase 2 lots;
- Abandonment of portions of the Ellwanger Drains No. 1, Branch 1 and No. 7 once they can be intercepted/diverted by the Phase 2 storm sewer system into SWMF's B and C;
- Reassessment of the Ellwanger Drain schedules to reflect the new tax roll representing Dover Coast Phase 2 lots, MTO Highway 6 and the diversion of runoff to/from the golf course;

Diversion of the upper portion of Ellwanger Drain No.1 into SWMF B and No. 7 into SWMF C will result in a significant increase in flood storage on the subject lands (based upon cut and fill differential) relative to current conditions.

3.3 SWMF OUTFALLS

As shown in Figure 1, Drawings 11 and 12 in Appendix B, the proposed SWMF B sewer outfall is to the Ellwanger Branch No. 1 Main Drain (525mm dia. pipe) with new junction 1200mm manhole structure, and SWMF C is proposed to incorporate a 750mm pipe connected to an existing 900mm pipe with headwall to the southeast into SWMF D (with in-series outlet to SWMF E and ultimately to the Ellwanger Drain).

3.4 MINOR AND MAJOR STORMWATER FLOWS

A system of sewers for minor stormwater conveyance has been designed to convey runoff from both the subject and upstream external lands tributary to both SWMF's. The design of the sewer network has been completed via a storm area plan & design sheet on the Subdivision Engineering plans (ref. Municipal works drawings 1, 4, 5, 9). Refer to Phase 2 works sheets 4 to 7 for storm sewer profiles. County design standards dictate that storm sewers be designed for a 5 year return period storm event. Based on this, the downstream most section of trunk sewers are:

- SWMF B - 1200mm sewer @ 0.40% - 2,466 L/s uniform capacity has been sized to convey the total 5-year peak flow of 2,235 L/s (Rational Method Sewer Design Sheet) into the forebay area;
- SWMF C – 675mm sewer @ 0.65% - 678 L/s uniform capacity has been sized to convey the total 5-year peak flow of 343 L/s (Rational Method Sewer Design Sheet) into the forebay area.

Cross referencing the SWMM5 modelling output for the equivalent 5-year event runoff for SWMF B – 3,395 L/s and SWMF C - 928 L/s, these peak flows are higher than the above noted design sheet peak flows, however, they include direct surface runoff (golf course areas) to the SWMF's, and are un-routed through the developed portion of the development (i.e. hydrograph lag through local/trunk the sewers). Consequently, these are more conservative for the purposes of SWMF sizing. The golf course area (and some minor portions of the residential rear yards) will discharge directly to SWMF's via surface sheet

flow and are not to be collected by the storm sewer system. All major storm flow will be contained within the road allowances (<0.30m) and proposed drainage easements dedicated for storm runoff conveyance, where not directly tributary overland to the SWMF's. The SWMF's have been designed such that all first flush flows will enter the quality cell of the pond (forebay). Wherever practical, major overland routes have been directed to the SWM pond away from the sediment forebay.

4. HYDROLOGY

4.1 HYDROLOGIC PARAMETERS

The 4-hour Chicago design storms with return periods of 2, 5, 10, 25, 50 and 100 years were applied in the hydrologic modelling for this development over a fairly modest urban catchment of 44.5 ha. The Norfolk County rainfall hyetograph parameters used in the modeling are reproduced in Table 1 below:

Table 1 - Rainfall Intensities for Design Storm Events (mm/hr) = $\frac{A}{(t+B)^C}$

	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A	529.711	583.017	670.324	721.533	766.038	801.041
B	4.501	3.007	3.007	2.253	1.898	1.501
C	0.745	0.703	0.698	0.679	0.668	0.657

4.2 MODEL CATCHMENT PARAMETERS

The hydrologic response of the lands under intense rainfall events was simulated using the SWMM5 hydrologic/hydraulic model developed by the US EPA. The SWMM5 hydrologic modelling program is recognized as being appropriate for generating runoff hydrographs for both urban and rural catchments and to assess the performance of SWM detention storage facilities including pipe hydraulic calculations. The model catchment values typically include the SCS Curve Number for tributary land use and soil conditions in consideration of antecedent moisture, degree of imperviousness (total and directly connected) initial abstraction, overland flow lengths, ground slopes, and Mannings surface roughness coefficient under sheetflow conditions. *It is noted, SWMM5 does not use traditional catchment 'time of concentration' parameter input values, as the hydrograph response time is generated based on subcatchment area, width, slope and roughness parameters.*

The total and directly connected impervious parameters (expressed 'Pervious' and 'Impervious' routing) associated with the proposed Phase 2 development were calculated for a typical residential lot and roadway area (ref. Figure 2 Appendix B). Non-residential land use values (Highway 6 and High density blocks) were assigned select calculated impervious values.

As noted in Section 2, the SCS (Soil Conservation Service) Curve Number Infiltration method was used for calculating net effective rainfall for the pervious fractions using the model, (CN=82) as per the 2009 Vallee SWM Report for typical type C soils. A CN value of 98 is automatically applied to impervious

surfaces under the SWMM5 model. The event based model also uses Depression Storage (DS), otherwise known as Initial Abstraction (IA), for both pervious and impervious areas that must be satisfied along with infiltration. A conservative DS value of 2mm was used for the pervious grassed areas and 1mm on the impervious surfaces. Refer to Appendix C for details.

4.3 2009 VALLEE TARGET DESIGN FLOW CONDITIONS

The Vallee SWM design, included in their 2009 Report, was premised on post-to-pre development attenuation control utilizing a system of 5 ponds (A to E). This design approach is maintained, but as only SWMF B & C are under detailed design review, the post development rates as calculated by Vallee for these two SWMF's will be taken as the target values for each respective rainfall event in Table 2.

Table 2 – Vallee SWMF Peak Target Discharge Rates (L/s)

SWMF	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A&B	148	209	264	333	368	428
C	44	65	85	113	134	170

Note: Vallee SWMF's A & B are proposed to be combined into one proposed SWMF 'B'

4.4 PROPOSED (POST-DEVELOPMENT) PHASE 2 CONDITIONS

In reference to Figure B (Appendix B) which identifies the post-development catchments, the proposed wet pond SWMF's are to be located in topographic low areas on the subject development lands. Appendix C provides a detailed breakdown of tributary drainage area for each SWMF. *It is noted the overall external drainage areas (north of Highway 6) may be eliminated (redirected) in future should these lands develop privately. It is assumed these would drain north instead with storm sewer servicing.*

In regards to the commercial/high-density apartment blocks draining to SWMF B, the runoff coefficient (% impervious) values listed and modelled are the maximum allowable for quantity/quality control when merging development drainage for the former Vallee SWMF A. Should site plan applications be submitted in the future for development of these blocks with higher intensification, on-site SWM control would be required to account for the difference; i.e. some peak flow damping and quality roughing (surface oils/courser sediment removal) upstream of SWMF B.

5. SWM WET DETENTION POND FACILITY DESIGNS

5.1 SWMF DESIGN CRITERIA

As previously noted, the stormwater management strategy for the Phase 2 SWMF's is to essentially match Vallee peak outflow rates and irrigation drawdown buffer. In addition, the following criteria were applied in designing the grading scheme and SWM facility:

- Minimize surface grading in consideration of natural topography, required roadway, lot and golf course grading;
- Apply side slopes between 3-to-1 and 5-to-1 with a 2m aquatic safety bench around the perimeter of the pond near permanent pool stage;
- Provide a facility footprint that complements the golf course as an amenity feature and serves as a buffer function to the adjacent condominium residences;
- Establish suitable permanent pool elevation in order to intercept the Ellwanger Municipal Drains (No. 1/B1 & 7) as required;
- Provide the required permanent pool storage for water quality control based upon 'Enhanced' Level 1 treatment (MOE 2003);
- Provide the required active storage for extended detention with concurrent capability for downstream erosion protection;
- Limit maximum water depth within the facility to approximately 3.0 m during the 100-year event;
- Provide a design that balances the operational and functional objectives of the SWM facility while mindful of the economic considerations for site servicing costs and;
- Provide a perimeter maintenance access for operations staff.

5.2 SWMF Storage Analysis

The proposed SWM facilities B & C have been sized to provide detention of their respective developed catchment areas based upon an average % imperviousness. This includes the proposed residential, golf course, commercial (to SWMF B only) and external areas. Tables 3 summarizes the tributary area and % impervious for each SWM facility.

Table 3 – Summary Drainage Areas and % Imperviousness

SWMF	Residential & ROW's	Golf Course/ SWM Block	Commercial/ Apartment	External (incl. Hwy 6)	Total Area (ha)	Avg. % Imp
B	10.93	6.02	9.44	1.90	28.29	48
C	3.64	6.02	-	6.57	16.23	20

Refer to Figure C in Appendix B and Summary tables in Appendix C for more information. To provide an enhanced level of quality treatment, the storage volumes provided for the permanent pool and extended detention active (erosion control) exceed the minimum storage requirements obtained from typical MOE event-based drawdown criteria. The calculated required and design SWMF storage volumes are summarized in Tables 4 and 5 below:

Table 4: SWMF B - Facility Target Storage Volumes

	Storage Volume (m^3)	
	Required	**Provided**
Permanent Pool *	3,748	16,874
Irrigation Buffer (Min.)	-	*7,089*
Extended Detention (active) **	4,163	~~6,170~~ ← 9,421
Quantity Control Storage (incl. Ext. Det.)***	13,824	16,241
Extra (freeboard above emergency spillway)	-	5,394
Total (Perm. Pool + Active)	*17,572*	45,598

Notes: * Based upon Level 1 control wet pond;
** Pro-rated runoff vol. from 25mm-4hr Chicago Event.
*** Based on max. storage vol. utilized under 100yr event (from SWMM5)

For SWMF B, a minimum of 3,748 m^3 storage in the permanent pool and the greater of the extended detention storage (1,131 m^3) or the erosion control discharge constraint (4,163 m^3), as derived from the 25mm-4 hour storm runoff volume is to be provided (pro-rated 14.7mm over 28.29ha). The SWM Facility is configured to yield a 1.70 metre deep permanent pool with a proposed volume of 16,874 m^3.

Table 5: SWMF C - Facility Target Storage Volumes

	Storage Volume (m^3)	
	Required	**Provided**
Permanent Pool *	1,623	~~7,314~~ ← 5,830
Irrigation Buffer (Min.)	-	~~*4,488*~~ ← 3,775
Extended Detention (active) **	1,581	~~2,370~~ ← 4,213
Quantity Control Storage (incl. Ext. Det.)***	6,665	~~7,000~~ ← 6,973
Extra (freeboard above emergency spillway)	-	~~6,102~~ ← 4,518
Total (Perm. Pool + Active)	*8,288*	~~24,904~~ ← 21,099

Notes: * Based upon Level 1 control wet pond;
** Pro-rated runoff vol. from 25mm-4hr Chicago Event.
*** Based on max. storage vol. utilized under 100yr event (from SWMM5)

For SWMF C, a minimum of 1,623 m^3 storage in the permanent pool and the greater of the extended detention storage (649 m^3) or the erosion control discharge constraint (1,581 m^3), as derived from the 25mm-4 hour storm runoff volume is to be provided (pro-rated 9.7mm over 16.23ha). The SWM Facility is configured to yield a 1.25 metre deep permanent pool with a proposed volume of 7,281 m^3. Refer to Appendix C for calculation details.

5.3 SWMF DESIGN ELEVATIONS

As illustrated in the engineering plans and model results in Appendix D, the proposed SWM pond elevations are summarized below:

SWMF B

- Base of SWMF Stage = 186.50 m (forebay) / 186.50 m (quantity cell)
- Permanent Pool Stage = 188.20 m (approx. 1.8 m below grade; 1.7m forebay depth)
- Inlet Storm Sewer (1200mm dia.) Headwall Invert = 188.50 m
- Irrigation Buffer = 188.70 (approx. 0.5m deep zone for drawdown)
- Outlet-1 Quality/Ext. Detention Control Lid = 188.10 m (600x600mm DICB w/ 450mm reverse slope pipe inv. 187.33)
- Outlet -2 Quantity Control Lid = 189.30 m (600x600mm DICB w/ 450mm pipe inv. 188.43m)
- Storm Sewer Outfall (1500 MH) Invert = 188.35 m, control MH structure with:
    - 450mm PVC reverse pipe with 375mm orifice plate for Extended Detention/Quality Orifice Control from Outlet-1, Invert = 188.70 m
    - 450mm PVC pipe for active quantity control stage from Outlet-2, Invert = 188.35m
    - 525mm outlet pipe to Ellwanger Drain No. 1 downstream of MH; pipe capacity (340 L/s) governs when combined peak discharge from Outlets 1 & 2 exceeds this value.
- Emergency Spillway Stage = 189.70 m (10m wide trapezoidal weir with 12:1 sideslopes)
- Perimeter Grades = 190.00m (Top of SWMF B)

SWMF C

- Base of SWMF Stage = 187.25 m (forebay) / 187.25 m (quantity cell)
- Permanent Pool Stage = 188.50 m (approx. 1.75 m below grade; 1.25m forebay depth)
- Inlet Storm Sewer (675mm dia.) Headwall Invert = 188.70 m
- Irrigation Buffer = 189.00 (approx. 0.5m deep zone for drawdown)
- Outlet-1 Quality/Ext. Detention/Active Quantity Control Lid = 188.40 m (600x600 mm DICB w/ 375mm reverse slope pipe inv. 187.73)
- Outlet -2 Overflow Control Lid = 189.70 m (1200x600 mm DDICB w/ 525mm pipe inv. 188.63)
- Storm Sewer Outfall (1500 MH) Invert = 188.35 m, control MH structure with:
    - 375mm PVC reverse pipe with 280mm orifice plate for Extended Detention/Quality /Active Quantity Orifice Control from Outlet-1, Invert = 189.00 m
    - 525mm PVC pipe for overflow control stage from Outlet-2, Invert = 188.61m
- Emergency Spillway Stage = 190.70 m (4m wide asphalt maintenance pathway)
- Perimeter Grades = 190.25m (Top of SWMF C)

The inlet sewer to both SWMF's B & C are set such that the maximum active pond water elevation would impose minor submergence of the inlet sewers at the headwall under 5 year storm conditions. Conveyance complications under minor storm conditions are not anticipated as the runoff (peak inflow) hydrograph time to peak is expected to occur on the order of 3 hours in advance of the maximum 5 year pond stage (storage hydrograph) in both SWMF's B & C.

5.4 SWMF CONTROLS & OUTLET DESIGN

Functional design details of the proposed outlet works are shown on the Engineering Drawings 11, 12 & 15 (Appendix B). The stage/storage outlet control is proposed as described in the SWMF B & C rating tables in Appendix C.

SWMF B

The first stage Outlet-1 (quality and erosion control volumes outlet) is proposed to consist of a reverse sloped 450mm diameter pipe and the 375mm orifice plate inside the control maintenance structure located along the south of the facility. The 375mm diameter orifice plate (inv.) will be set at the top of the irrigation level (elev. 188.70m), above the permanent pool elevation (elev. 188.20m). This stage is configured to detain and release the extended detention volume for a period of between 24 and 48 hours. Under such a configuration, the pipe intake is submerged under the permanent pool with a ditch inlet catchbasin (DICB; sill = 188.10m, inv. = 189.30m) such that floating debris/free oil may be captured in the pond during operation and maintenance activities. This also protects the minor outlet from clogging during storm events and winter ice buildup.

The quantity control Outlet-2 is proposed to incorporate a positively sloped 450mm pipe from a ditch inlet catchbasin (DICB) in the upper southeast slope of SWMF B with sill at 189.30m and pipe invert 188.43m. Outlet-2 will restrict outflow at the mid to upper range of the active storage. A 10 metre wide rip-rap lined emergency spillway (with 12:1 sideslopes) is proposed on the east embankment of SWMF B as an emergency bypass at elevation 189.70m. This weir will facilitate the discharge of major flows that exceed the typical operating range active storage volumes (i.e. >100 year event). The design active storage provided (13,977 m^3) amounts to approximately 508 cubic metres per hectare at the spillway stage, not including freeboard. The overflow weir structure would not typically be operational under normal storm conditions (as modelled) provided the other two outlet pipes are functioning.

SWMF C

As previously noted, the lower stage Outlet-1 will control quality, erosion control and peak flow volumes utilizing a 280mm diameter orifice (inv.) set at the top of the irrigation level (elev. 189.00m), above the permanent pool elevation (elev. 188.50m). This dual stage is configured to detain and release the extended detention volume for a period of between 24 and 48 hours as well as quantity peak flows above this up to and including the 100 year event. Outlet-1 is proposed to consist of a reverse sloped 375mm diameter pipe with the 280mm orifice plate at the control maintenance structure (ST-31) located in the southwest corner of the facility. Under such a configuration, the pipe intake is submerged under the permanent pool with a ditch inlet catchbasin (DICB; sill = 188.40m, inv. = 187.73m) such that floating debris/free oil may be captured in the pond during operation and maintenance activities. This also protects the minor outlet from clogging during storm events and winter ice buildup. The design active storage provided (6,975 m3) amounts to approximately 430 cubic metres per hectare, not including freeboard above this.

Outlet-2 is an overflow control, proposed to incorporate a positively sloped 525mm pipe with a double ditch inlet catchbasin (DDICB) adjacent to Outlet-1, (sill = 189.70, pipe invert 188.63m). The overflow outlet control will provide relief above the upper range of active storage, or in the case of Outlet-1 blockage. Under normal conditions, Outlet-2 will not be utilized.

5.5 SWMF QUALITY AND EROSION CONTROL

The quality storage requirements are based on the Ministry of the Environment (MOE) March 2003 Stormwater Management Planning and Design Manual for an Enhanced level of protection (Level 1). In view of the receiving system, the design objective proposed herein is to achieve a minimum 80% Total Suspended Solids removal in the proposed SWM Facility as noted under Section 5.2 to provide the required level of quality treatment, Refer to calculations in Appendix C. Temporary sediment control measures are discussed in Section 7 of this report.

5.6 IRRIGATION DRAWDOWN BUFFER

Both proposed SWMF's have a 0.5m deep irrigation drawdown buffer above the respective permanent pool elevations comprising approximately 7,089 m^3 (SWMF B) and 3,775 m^3 (SWMF C). It is understood a valved gravity drawdown system will be implemented to recharge SWMF's D & E which supply the irrigation suction system. The irrigation drawdown buffer/controls will be independent of the SWMF's outlet controls and should have no impact to the operation to the ponds quantity/quality performance.

5.7 SWMF QUANTITY CONTROL

Post-Development quantity control targets for the SWMF's B & C are based on control such that post-development peak flows for the 2 to the 100 year storm events do not exceed pre-development conditions per the Vallee SWM Report.

Peak flows from the Dover Coast Phase 2 development at SWMF B & C are summarised in Table 6. For each storm event simulation, the storage (node) routing and outlet pipe (link) drawdown was calculated by SWMM5 software to determine peak active storage/outflow used for the outlet configuration described by the rating table (Appendix C).

Table 6: Summary of Peak SWMF Outflows (L/s)

SWMF	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
B	123	162	188	246	296	340
C	41	64	78	94	104	119

Note: Outlet from SWMF B to Ellwanger Drain No. 1, SWMF C to SWMF D (Phase 1).

From Table 6 the following is noted:

- All events are below target Post-development peak flow rates as set by Vallee (ref. Table 2) to the respective outlet location; as such quantity control criteria is met;
- The outlet to SWMF B is a 525mm pipe (0.5%) which has a uniform flow (unsurcharged) capacity of approximate 340 L/s. During larger rainfall events (>25yr), this pipe capacity (tailwater condition) begins to govern over of the combined peak discharge rates of Outlets 1 & 2.

Reference should be drawn to the plans and figures in Appendix B which describe the proposed SWMF's B &C. Operations and Maintenance of the SWM pond facilities will become the ultimate responsibility of the Condominium Board upon assumption, as discussed further under section 7.

6. EROSION AND SEDIMENT CONTROL

Mitigation of impacts to adjacent lands is proposed with strategic alignment of sediment barriers along down-gradient property boundaries and regular monitoring through the construction period. Protection of the existing Dover Coast Phase 1 to guard against excessive mud tracking onto the road should be a key objective during construction. To facilitate control of stormwater runoff during construction, it is critical that effective sediment controls be implemented and maintained throughout the work zone. It is recommended that the following measures be implemented to mitigate the release of impaired storm runoff during construction phase:

- Installation of silt fence, rock check dams, diversion swales, sediment basins or other similar temporary facilities throughout the site during construction in order to reduce overland flow velocities and trap coarse sediment on-site;
- Prevent silt or sediment laden runoff from entering inlets (catchbasins / catchbasin manholes) by wrapping their tops with filter fabric (or commercial equivalents) and incorporating straw bale filters (flow checks);
- Sod any proposed swales where feasible immediately following construction to reduce runoff velocities and mitigate erosion. In general, minimizing the duration of soil exposure in erosion prone areas by implementing vegetation coverage (i.e. hydro seeding) is recommended;
- Maintenance of sediment and erosion control structures (including periodic cleaning as required) until such time as the Engineer or the Municipality approves their removal. The Contractor should maintain an inspection log to track important site observations, effectiveness of controls after 12mm (or greater) rainfall events, remedial measures undertaken, maintenance operations, decommissioning dates and any other pertinent site activity;
- Installation of temporary measures at the site construction entrance to minimize tracking of mud and debris onto adjacent roads;

The proposed strategy for erosion and sediment control is expected to apply the concept of multiple barrier controls, which are intended to work concurrently at source, within the conveyance system, and at down-gradient flow confluences to protect receivers.

7. OPERATION & MAINTENANCE

The proposed SWMF's will have ongoing maintenance requirements related to sediment accumulations, erosion monitoring and vegetation control. The design described in this report provides for a wet detention pond function with extended detention storage to promote sediment accumulation. The SWM facility configuration has regard for the length to width ratios recommended by the 2003 MOE Design Guidelines to promote the target Enhanced level of suspended solids settlement under first flush (quality) storm events.

Based on conservative annual sediment loading estimates in the order of 1.25-1.90 m^3/ hectare (MOE Table 6.3), sediment removal is expected to be required at approximately 20 year intervals. It is recommended that sediment removal be completed utilizing a long reach excavator along the east shoreline fringe zones, or within a dewatered forebay cell. Dedicated maintenance access ramps are to be provided to both pond cells adjacent to the forebay berm for equipment access to the pond floor.

The SWM facility should be inspected at the onset of each season (i.e. a minimum four (4) times per year). These facilities should also be inspected following each significant rainfall event to ensure that the pond features (i.e. inlet, outlet, spillway etc.) are in good physical and operating condition. The following items should be checked with each inspection:

- Obstructions, dead vegetation or refuse at the inlet, outlet, diversion structure, or spillways;
- Evidence of oil/grease contamination, pollutant/hydrocarbon spills (e.g. gasoline), and/or unnatural odour in the pond;
- Accumulation of algae and/or other form of choking vegetation;
- Sediment accumulation or erosion around pond features;
- Effectiveness of installed erosion control measures;
- Evidence of significant disruptive animal activity such as burrowing or damming;
- Evidence of seepage through berms or hydraulic malfunctioning such as frequent overtopping of the high water levels following significant rainfall events;
- Evidence of fish stocking, community activities, vandalism, or encroachment;
- Evidence of ice damage;
- Status of the pond's safety features and grading (e.g. fencing, slopes, safety grates, retaining walls);
- Evidence of prolonged drawdown (over 4 days) of the extended detention storage component.

A detailed Operations and Maintenance manual for the facility can be prepared concurrent with the SWM design submission to the MOE, to guide future Condominium Operations/Maintenance staff and to supplement agency approvals as required. As a standard condition of MOE approval, this O&M manual would be prepared with regard for the County standards, to include consideration for:

- Baseline conditions prior to construction;
- Phased Implementation (where applicable);
- During Construction – function of various controls;
- After Construction – SWMF function prior to Condominium Board assumption;
- Water quality considerations;
- Hydrologic operating regimes, under varying levels of catchment development.

8.1 POST-CONSTRUCTION OPERATIONS AND MAINTENANCE

During phased development build-out and prior to Condominium Board assumption, the Developer is typically responsible for such things as road maintenance, sewer flushing, sediment removal, pond monitoring and repair, landscape maintenance, and trash removal. Although these are to be covered in

more detail in the Operation and Maintenance Plan, several of the more common considerations are listed below for cursory review:

- **Detention Pond SWMF Drawdown Monitoring**

  The proposed SWM facilities will require regular monitoring and maintenance to verify they operate with the intended efficiencies and to monitor sediment accumulation both in the forebay and the main basin. The SWM facilities will serve as wet detention ponds with extended detention storage to promote sediment accumulation and to reduce downstream outflow rates for flood and erosion protection. The SWM facilities configuration satisfies the length to width ratios (MOE Guidelines, 2003) to promote the required level of suspended solids settlement under a quality storm event.

  It is estimated that the drawdown times of the quality and erosion control volume is between 64 and 68 hours. If drawdown times were found to typically exceed this range, the outlet structure should be examined for blockage. A water level gauge is proposed (ref. Drawings 11, 12 & 15 Appendix B) with 100mm increment markings.

- **Catchbasin/Maintenance Hole Sump and Orifice Inspection**

  Semi-annual inspection and/or sediment removal at all catchbasin and manhole sumps may be warranted to prevent excess buildup of sediment levels and subsequent passage downstream with scour. Additionally, visual inspection of the quality outlet structure for signs of damage or plugging will be periodically required to maintain the design outflow characteristics. These structures are located as shown in the Engineering Plans (Appendix B).

8. CONCLUSIONS & RECOMMENDATIONS

Based on the information provided herein, it is concluded that:

- The SWM control approach for the subject Dover Coast Phase 2 works meets the various objectives and constraints, and should responsibly manage storm runoff with due regard for adjacent and downstream interests. SWMF's B & C provide service to ±8.5ha of external lands, however this area may decrease in the future with potential private development north of Highway 6;
- The total active storage available in the wet ponds SWMF B (574 m^3/ hectare) and SWMF C (430 m^3/ hectare) has capacity to safely detain up to the 100 year (4-hour) storm runoff with controlled release to the Ellwanger Drain Branch No. 1 and SWMF D respectively, at no greater than the equivalent pre-development flows as established by Vallee Engineering (2009);
- The various quality control design considerations, in conjunction with responsible operation and maintenance activities, should provide an effective means of managing water quality impacts;
- All sewers constructed within future municipal road allowances under s.53 of the Ontario Water Resources Act, are proposed to be assumed ultimately by Norfolk County, subject to the provisions of the Dover Coast Development agreement.
- Reassessment of Ellwanger Drain Schedules with the Norfolk County Drainage Superintendent, including portions to be abandoned/replaced;

The information enclosed herein, supplementing the Dover Coast Development Phase 2 Engineering Drawings, is submitted in support of OWRA approval for the SWMF works described herein. This SWM Design Report has been prepared on behalf of Dover Coast Developments, based upon currently available information, to overview the servicing strategy for Phase 2 works. Specifically, submission of this report is intended to support Agency approvals.

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Appendix A

Background Information –
2009 Vallee SWM Report Excerpts

COPY

Storm Water Management Report

Dover Coast Development

South of Highway No. 6

Port Dover – Norfolk County - Ontario

vallee

Consulting Engineers, Architects & Planners

June 24, 2009

Our Project #08-110

Table 3 Post Development Sub Catchments				
Area	Total Area (ha)	Residential Unit Area (ha)	SWM/ Golf Course (ha)	Commercial/High Density Residential (ha)
Area A	16.31	5.52	8.50	2.28 (Commercial)
Area B	18.41	7.29	6.36	3.26 (Commercial) 1.50 (Apartments)
Area C	9.90	3.30	6.60	
Area D	14.20	9.80	4.40	
Area E	14.20	8.90	4.00	1.30 (Apartments)

Post development, impervious land areas will be introduced to each of these areas to differing degrees. For commercial and high-density residential areas it has been assumed that 95% of the area associated with these uses will be impervious with 85% of the total area directly connected to storm sewer systems.

For the residential unit area the following assumptions have been made with respect to impervious surfaces introduced post development.

- Assumed Roof Area per Dwelling Unit $185m^2$
- Assumed Driveway Area per Dwelling Unit $45\ m^2$
- Road Area per metre of Length (includes sidewalk one side) $11m^2/m$
  (Road area considered directly connected to storm sewers)

The following summarizes the anticipated impervious areas for each of the sub catchment areas of the overall site.

Area A
- Number of Units 99
- Length of Road 1,150m
- Impervious Area Associated with Units 3.54 ha (1.27 ha directly connected)
- Impervious Area Associated with Commercial 2.17 ha (1.94 ha directly connected)

Area B
- Number of Units 103
- Length of Road 1,445m
- Impervious Area Associated with Units 3.96 ha (1.59 ha directly connected)
- Impervious Area Associated with Commercial 3.10 ha (2.77 ha directly connected)
- Impervious Area Assoicated with High Density 1.43 ha (1.28 ha directly connected)

Area C
- Number of Units 58
- Length of Road 690m
- Impervious Area Associated with Units 2.09 ha (0.76 ha directly connected)

Area D

- Number of Units 158
- Length of Road 1,412m
- Impervious Area Associated with Units 5.19 ha (1.55 ha directly connected)

Area E

- Number of Units 164
- Length of Road 1,795m
- Impervious Area Associated with Units 5.75 ha (1.97 ha directly connected)
- Impervious Area Associated with High Density 1.24 ha (1.11 ha directly connected)

These five (5) areas represent the portion of the entire site that will be developed for residential or commercial purposes. There remains an area (Area F) of 43.72 ha that will be golf course only with no residential units proposed and therefore no significant increase in impervious surfaces.

Minor and major storm drainage systems will convey the runoff from each of these five (5) areas to their SWM Facility. The minor system is to be made up of the storm sewer system and is designed for the 5-year, 15 min. inlet time storm for Simcoe and will discharge to the proposed storm water detention pond(s).

The major system is made up of overland flow routes that will occur as a result of the grading of overall site and the road profiles. Typically these routes will follow the proposed roadways and ultimately end at the proposed SWM facilities.

Discharge to Storage Relationship

To determine the required level of storage for a storm water detention pond, the post-development conditions were modeled, again using the SWMHYMO computer model. In order for the computer model to determine the storage volume required the relationship between the storage volume of the pond and the discharge must be defined and is referred to as the pond rating curve. This rating curve is determined by calculating volume of the proposed pond facility up to a proposed contour elevation and then calculating the expected discharge from the facility based on the water level at this contour elevation and the proposed outlet control configuration.

In this case discharge is controlled from each of the five (5) ponds by a weir. Each weir will be located on the side of a catch basin structure at the outlet end of the pond. The elevation and width of the weir will vary from pond to pond and the discharge of each weir can be defined by:

- $Q = 1.67 * w * h^{3/2}$

  where: w = width of weir (m)
  h = height of water above weir, (m)

Table 4 summarizes the weir configuration for each of the five (5) ponds.

Table 4 Weir Configurations		
Pond	**Width of Weir (m)**	**Weir Elevation (m)**
Pond A	0.25	189.50
Pond B	0.25	188.70
Pond C	0.25	189.00
Pond D	0.25	187.00
Pond E	0.25	187.00

The rating curve for each of the ponds is appended to this report as Appendix B.

Post Development Outlet Configuration

As is noted on Figure 1, the five (5) pre development sub-catchment areas all outlet to different conveyance systems ultimately to Lake Erie. Generally the post development sub catchment areas will follow the pre development areas with some overlap. Typically, in a case such as this it would be the intention to utilize the pre-development outlets as the outlets for the various SWM facilities.

However, since it is the intention of the proposed SWM facilities to also address operational and maintenance needs of the proposed golf course, there is desire to have these facilities connected in some way. This will allow some flexibility in controlling water level in the SWM facilities to maximize the amount of water that is available for irrigation.

Finally, the Environmental Impact Study completed by Niblett Environmental Associates Inc. identified the existing ravine at the southeast corner of the site as an area that should be maintained in its current form and capacity. This area currently serves as the outlet for the pre-development area PRE5, the largest of the pre-development areas. This ravine was identified as the water source for downstream fish habitat. The EIS therefore recommended that flows to this ravine be maintained at the existing flow regime or slightly enhanced.

Therefore, it seems logical to combine or share outlets from the proposed facilities to aid with the operation and maintenance of the golf course and also direct these outlets to the existing ravine located at the southeast corner of the property. The combined post development discharge to this ravine will therefore be limited to the pre-development regime for the area PRE5 (reference Table 2).

Post Development Model

Figure 3 provides a schematic of the post development SWMHYMO model. This figure summarizes the overall site along with the facilities that flow into each other as well as those that share an outlet. In general, Pond A and B share an outlet and discharge into the receiving ravine at its north end. Pond C discharges into Pond D which then shares an outlet with Pond E and discharges to the receiving ravine midway along its length.

Table 5 summarizes the post development conditions for the storm events analyzed. In all cases the post development flows are less than the pre-development conditions. The output file generated by SWMHYMO is appended to this report for all of the storm events analyzed.

Table 5 Post Development – Storm Water Runoff					
Storm Event	Outlet Ponds A & B (m3/s)	Outlet Ponds C, D & E (m3/s)	Golf Course (m3/s)	Total Site (m3/s)	Pre-Development (m3/s)
2-year	0.148	0.172	0.477	0.793	0.809
5-year	0.209	0.249	0.687	1.138	1.165
10-year	0.264	0.320	0.872	1.449	1.478
25-year	0.333	0.418	1.111	1.853	1.884
50-year	0.368	0.491	1.325	2.180	2.245
100-year	0.428	0.612	1.628	2.663	2.759

For all storm events the post development discharge from the site to the ravine has been reduced to less than pre development values.

4.0 Proposed Detention Pond

The Ministry of the Environment's document titled **Stormwater Management Practices Planning and Design Manual** (March 2003) was used in conjunction with requirements of Norfolk County to determine the design for the storm water ponds for Dover Coast development. The following summarizes the design guidelines presented by the manual along with the corresponding value for the proposed facility.

a) Storage Sizing: Table 3.2 of the MOE design manual provides levels of storage volume required dependent on the percent impervious land area. Table 6 summarizes the calculation for each of the five (5) ponds.

Table 6 Water Quality Storage Requirements – MOE Guidelines					
Item	Pond A	Pond B	Pond C	Pond D	Pond E
Contributing Area (ha)	16.31 ha	18.41 ha	9.90 ha	14.20 ha	14.20 ha
Impervious Land Area (ha)	5.71 ha or 35%	8.48 ha or 46%	2.09 ha or 21%	5.19 or 37%	6.96 ha or 49%
Storage Requirement (m^3/ha)	140 m^3/ha	167.5 m^3/ha	105 m^3/ha	145 m^3/ha	175 m^3/ha
Permanent Pool Required (m^3)	1,631 m^3	2,347 m^3	644 m^3	1,491m^3	1,917m^3
Permanent Pool Provided (m^3)	15,730 m^3	4,895m^3	4,050 m^3	3,702 m^3	5,210 m^3
Extended Detention Required (m^3)	652 m^3	736 m^3	396 m^3	568 m^3	568 m^3
Extended Detention Provided (m^3)	3,310 m^3	3,516 m^3	1,507 m^3	2,531m^3	2,706 m^3

Table 9 Dover Coast Development SWM Facility Summary					
Item	Pond A	Pond B	Pond C	Pond D	Pond E
Pond Bottom	187.75m	186.95m	187.25m	185.25m	185.25m
Top Slope	190.50m	189.70m	189.70m	188.00m	188.00m
Permanent Pool	189.00m	188.20m	188.50m	186.50m	186.50m
Irrigation Buffer	189.50m	188.70m	189.00m	187.00m	187.00m
Forebay Vol	1,652m3	232 m3	580 m3	252 m3	296 m3
Perm. Pool Vol	15,730 m3	4,895m3	4,050 m3	3,702 m3	5,210 m3
Irrigation Vol	8,512 m3	3,208m3	2,732 m3	2,514 m3	3,521 m3
Max Storage Req'd	8,640 m3 (Elev 189.95m)	8,912 m3 (Elev 189.51m)	4,070 m3 (Elev 189.55m)	6,644 m3 (Elev 187.92m)	6,772 m3 (Elev 187.70m)
Discharge Control	0.25m wide weir at 189.50m	0.25m wide weir at 188.70m	0.25m wide weir at 189.00m	0.25m wide weir at 187.00m	0.25m wide weir at 187.00
Outlet					

6.0 Erosion and Sediment Control

A copy of the Environmental Protection specification for this project is appended to this report. During construction, the contractor is required to protect the work site and all adjacent lands from sediment and erosion regardless of the source to the satisfaction of all applicable parties. The measures installed by the contractor are to remain in place until such time as there is no further threat of damage.

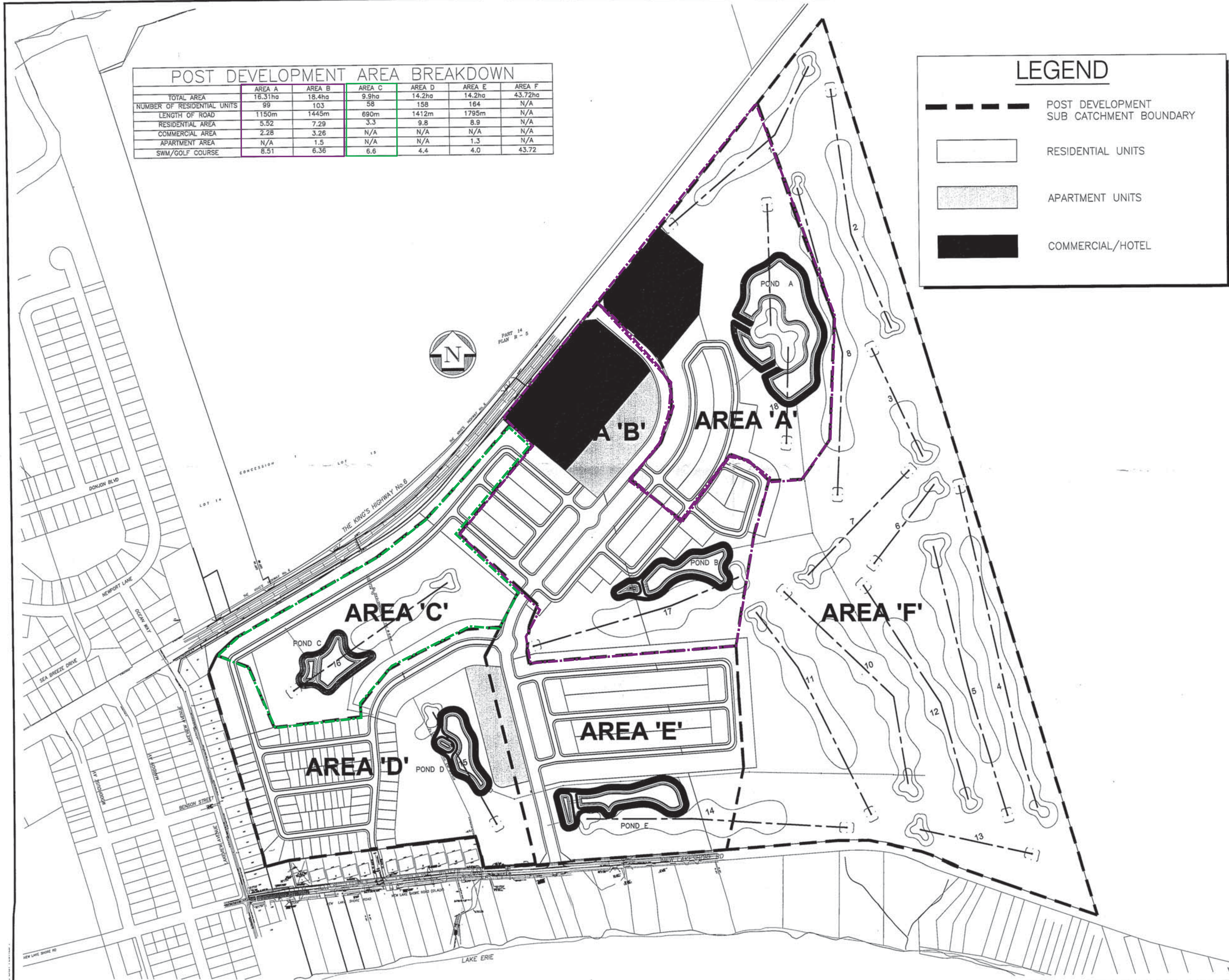
7.0 Irrigation Buffer

As was mentioned, the intention is to integrate the proposed SWM ponds within the proposed golf course to address the playing and operational needs of the golf course. During the summer months the demand for the irrigation water would be at it highest while the generation of source water for the ponds, surface runoff from the development, would be the lowest. Therefore it is proposed to provide an irrigation buffer within each pond. This buffer would be defined by the depth from the top of the permanent pool up to the proposed outlet control weir in each pond. In all of the ponds this depth has been set at 0.5m. Table 10 summarizes the volume of runoff that would be available for irrigation purposes.

Table 10 Irrigation Buffer Volumes	
Pond	Volume (m^3)
Pond A	8,512
Pond B	3,208
Pond C	2,732
Pond D	2,514
Pond E	3,521

POST DEVELOPMENT AREA BREAKDOWN

	AREA A	AREA B	AREA C	AREA D	AREA E	AREA F
TOTAL AREA	16.31ha	18.4ha	9.9ha	14.2ha	14.2ha	43.72ha
NUMBER OF RESIDENTIAL UNITS	99	103	58	158	164	N/A
LENGTH OF ROAD	1150m	1445m	690m	1412m	1795m	N/A
RESIDENTIAL AREA	5.52	7.29	3.3	9.8	8.9	N/A
COMMERCIAL AREA	2.28	3.26	N/A	N/A	N/A	N/A
APARTMENT AREA	N/A	1.5	N/A	N/A	1.3	N/A
SWM/GOLF COURSE	8.51	6.36	6.6	4.4	4.0	43.72



REV. No.	DATE	REVISION
0	JUNE 23/09	SWM REPORT

vallee

Consulting Engineers, Architects & Planners

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Stamp: LICENSED PROFESSIONAL ENGINEER T. G. SMITH JUN 24/09 PROVINCE OF ONTARIO

Project Title: DOVER COAST
SWM REPORT
PORT DOVER-NORFOLK COUNTY

Drawing Title: FIGURE 2
POST DEVELOPMENT DRAINAGE AREAS AND POND LOCATIONS

Designed by : TGS	Drawn By :
Checked by : TGS	Date Started : APRIL 2009
Drawing Scale : 1:3000	Drawing No.
Project No. 08-110	F2

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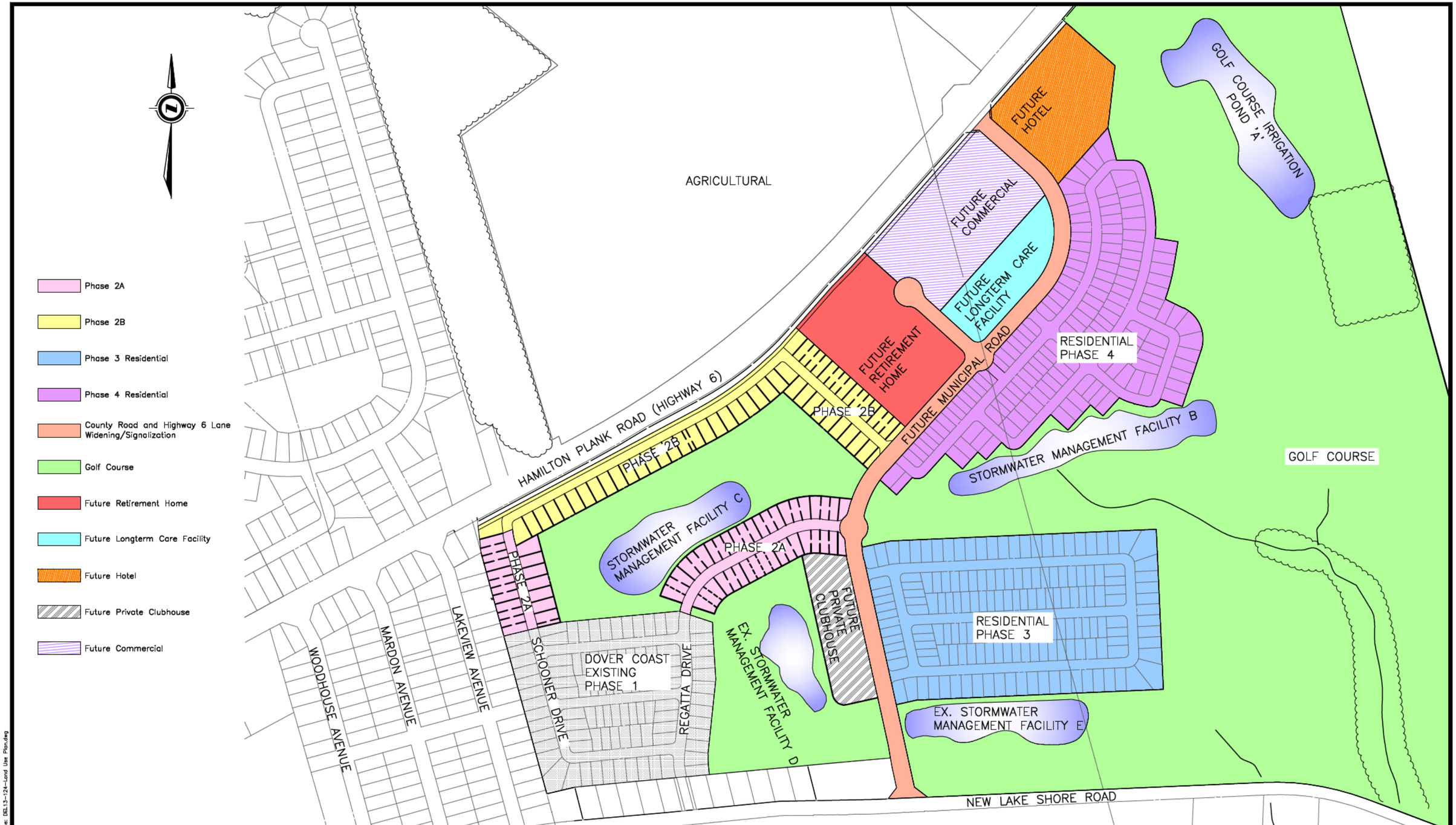
Appendix B

SWM Figures

Figure A – Land Use Map
Figure B – Storm Drainage Areas
Figure C – Typical Residential % Imp.
Figures 1-6 Ellwanger Municipal Drain Changes
Drawings 11, 12 & 15 - SWMF B & C



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DOVER COAST DEVELOPMENT

LAND USE MAP

SCALE: 1:5000

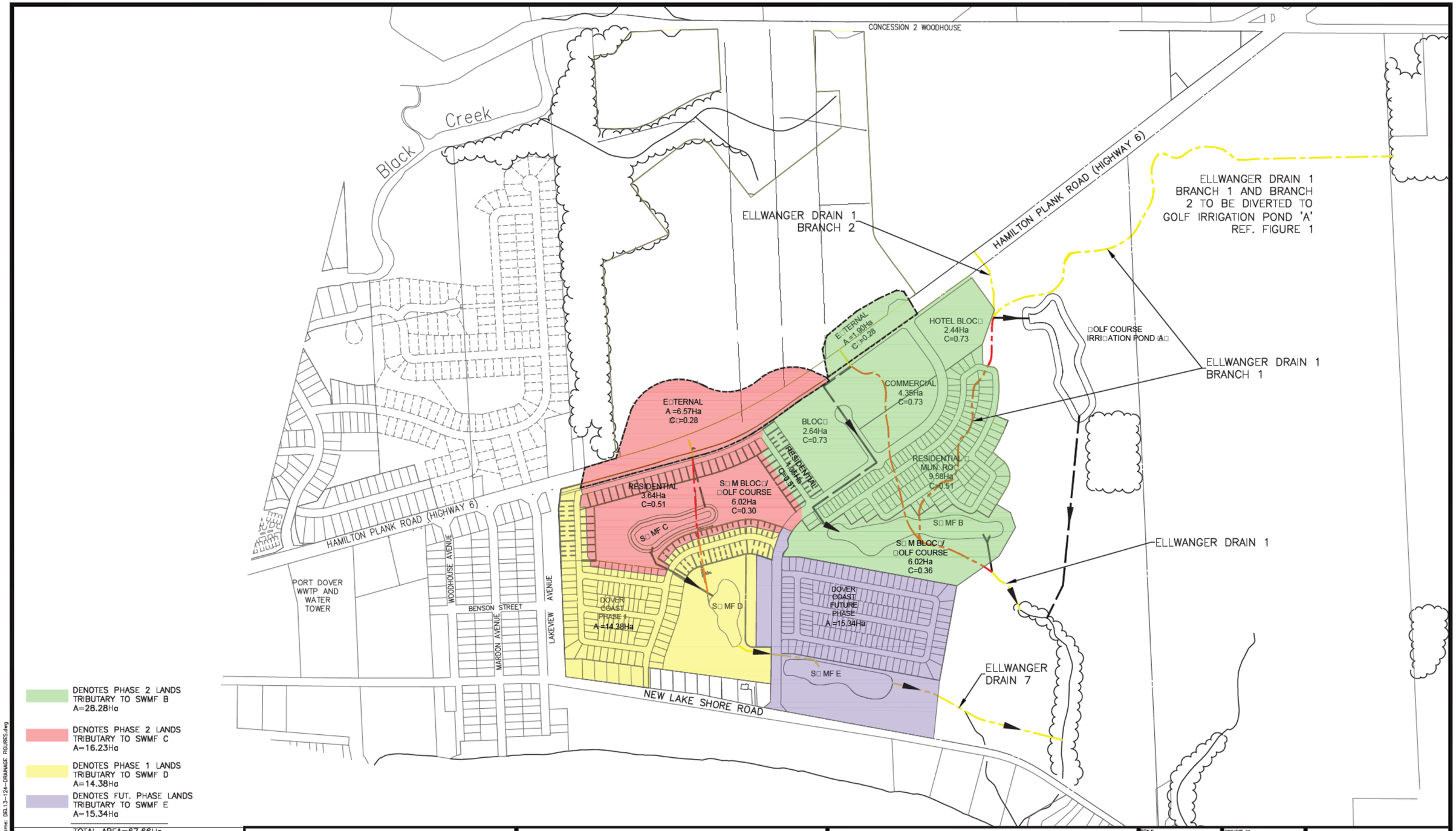
PROJECT N°: DEL13-124

DRAWN BY: R

DATE: OCT. 2015

Figure Number: A

Plotted: Oct.08/15-2:48pm Name: DEL13-124-Land Use Plan.dwg



DOVER COAST DEVELOPMENT

SWMF STORM DRAINAGE AREAS

SCALE: NTS

PROJECT N°: DEL13□124

DRAWN BY: □R

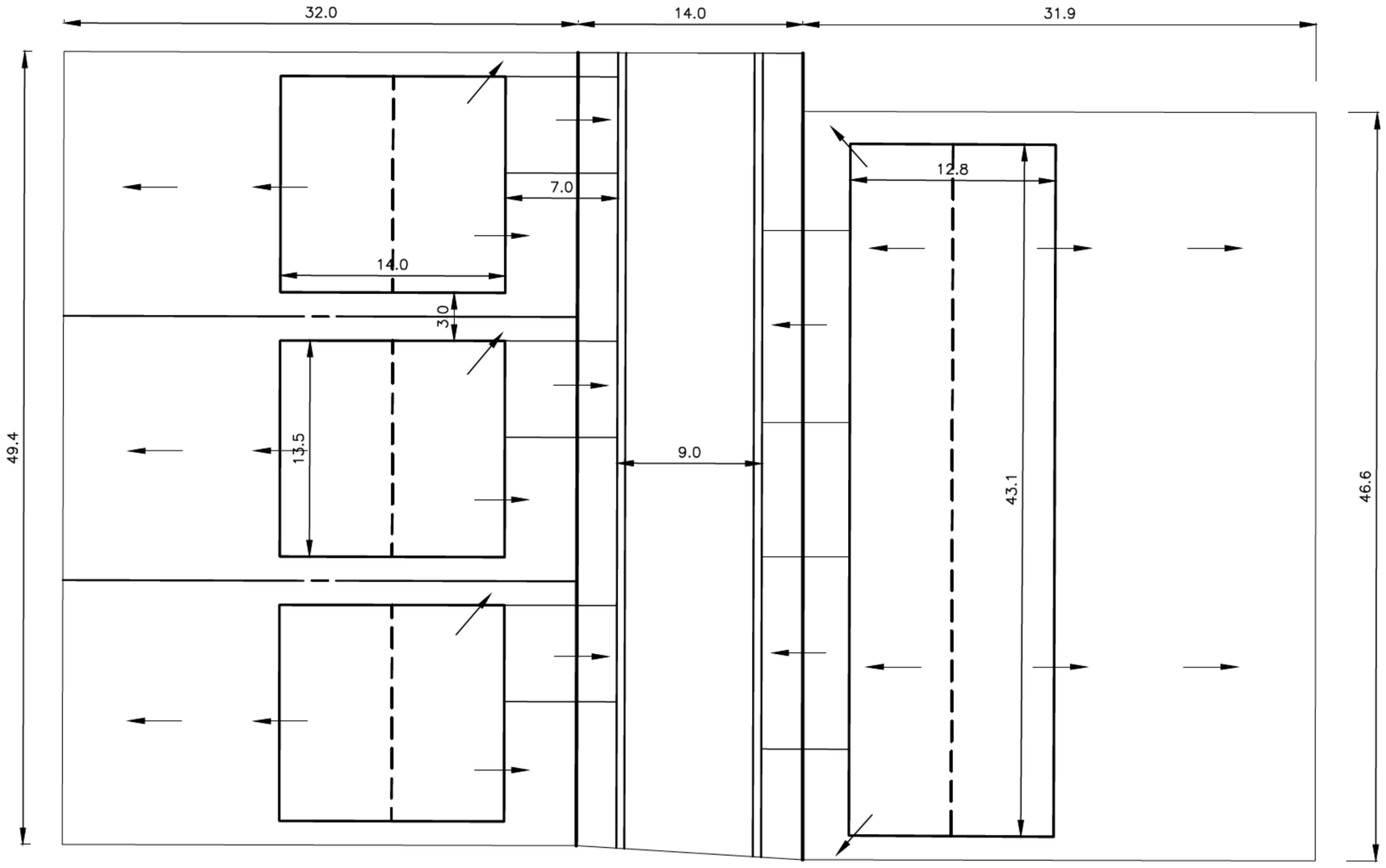
DATE: OCT. 2015

Fi□ure Nu□ □er: B

Plotted: Oct.08/15--3:47pm Name: DEL13-124-DRAINAGE FIGURES.dwg

TYPICAL RESIDENTIAL (TOWNHOUSE/DETACHED LOTS) AND ROADWAY AREA

- HOUSE COVERAGE ON LOT TAKEN AS MAX. PER ZONING
- 6.0m WIDE DRIVEWAYS



IMPERVIOUS AREA = 1705m²
TOTAL AREA = 3810m²
(45%)

DIRECT IMPERVIOUS RUNOFF (XIMP, TO SEWER)

INDIRECT IMPERVIOUS RUNOFF (TO PERVIOUS SURFACES)

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DOVER COAST SUBDIVISION (PHASE 2)

TYPICAL RESIDENTIAL PERCENT IMPERVIOUS AREAS

SCALE: NTS

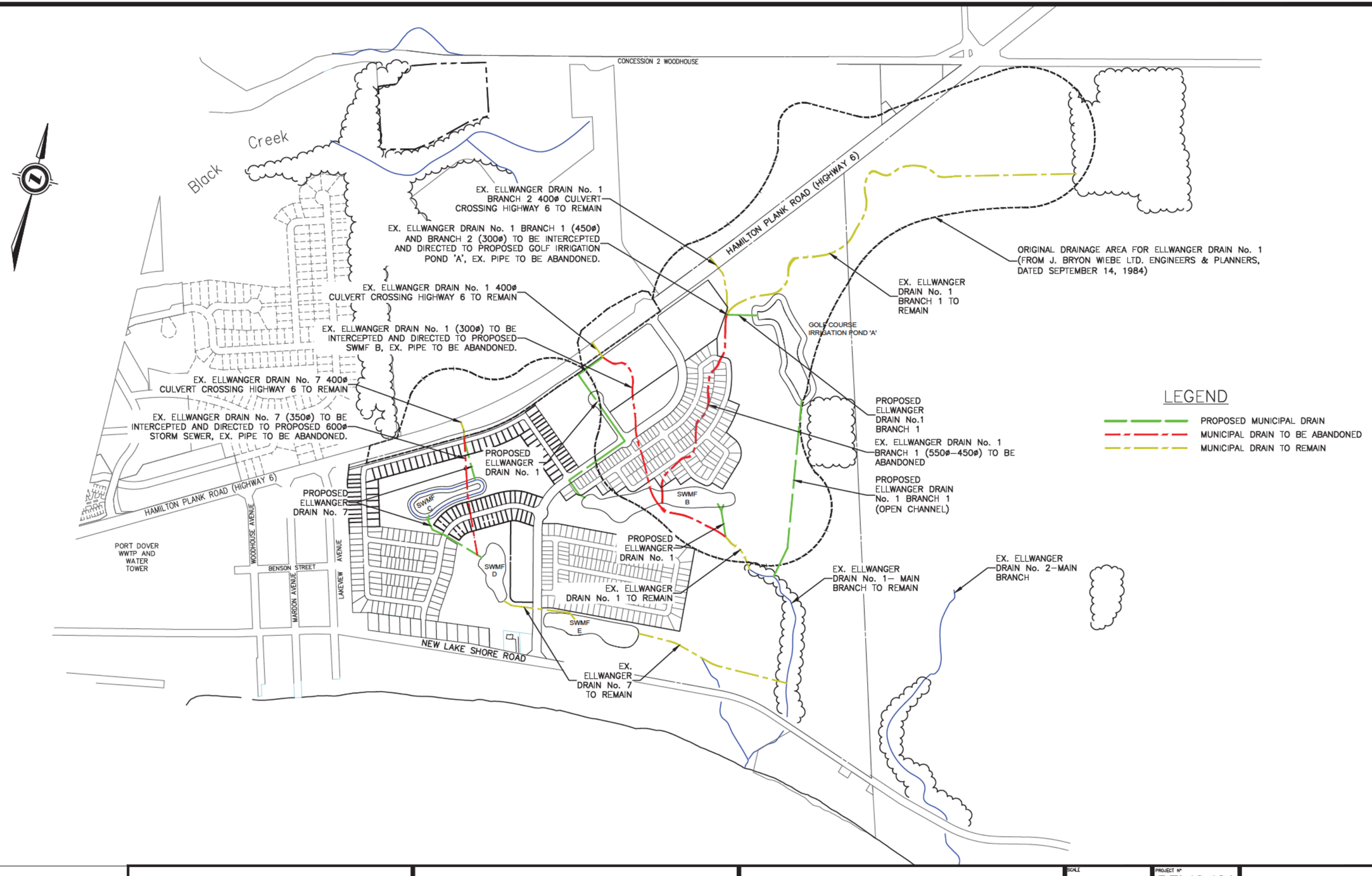
PROJECT N°: DEL13□124

DRAWN BY: □C

DATE: OCT. 2015

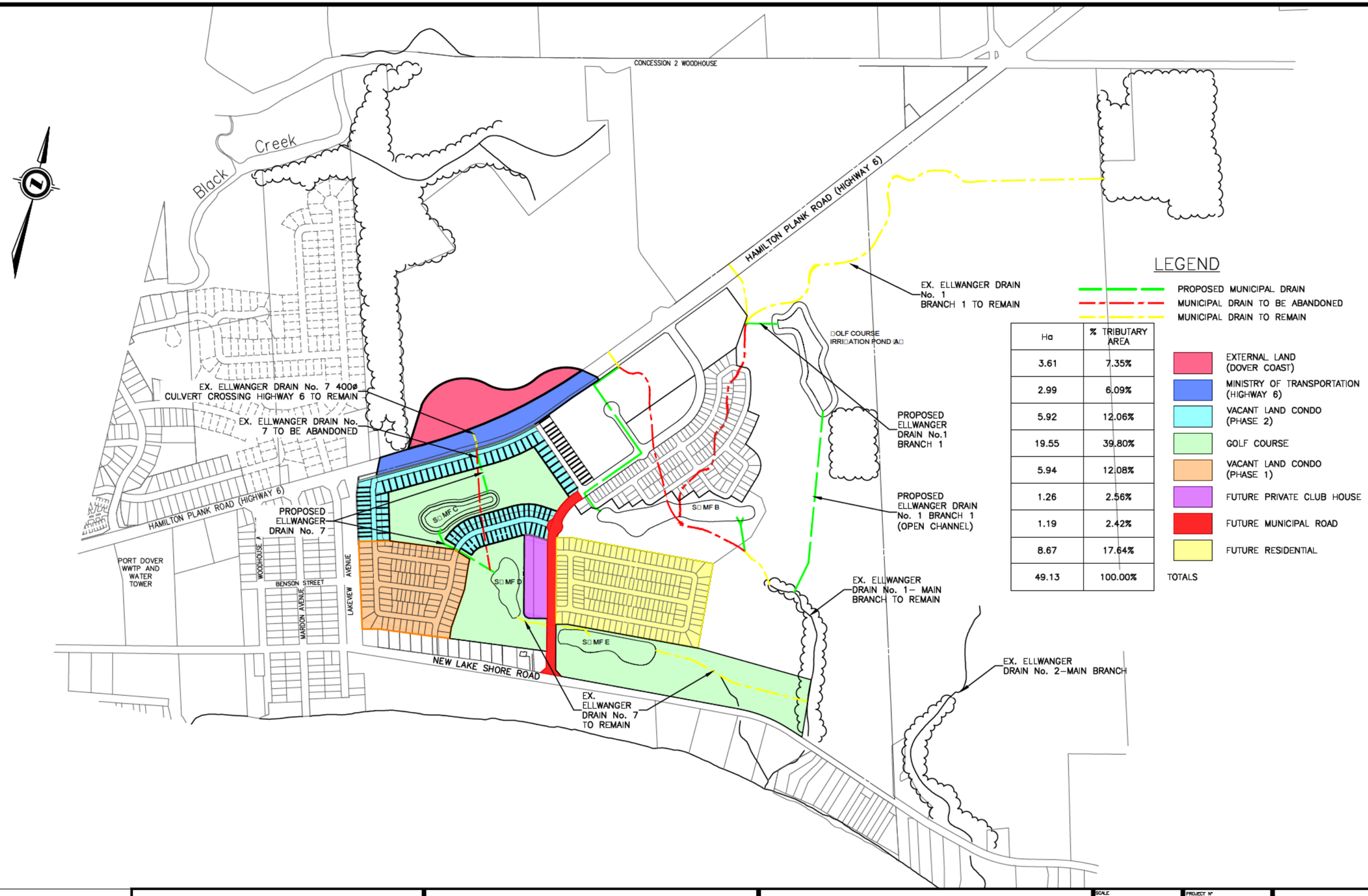
Fi□ure Nu□ □er: C

Plotted: Oct.08/15--11:10am Name: DEL13-124 residential impervious areas.dwg



		DOVER COAST DEVELOPMENT	**ELLWANGER DRAINS No. 1 AND No.7**	SCALE: **NTS**	PROJECT N°: DEL13-124 DRAWN BY: RQ DATE: MAR. 2015	Figure Number: 1

Plotted: Apr.13/15–10:28am Name: DEL13–124–DRAINAGE FIGURES.dwg



LEGEND

- PROPOSED MUNICIPAL DRAIN
- MUNICIPAL DRAIN TO BE ABANDONED
- MUNICIPAL DRAIN TO REMAIN

Ha	% TRIBUTARY AREA	
3.61	7.35%	EXTERNAL LAND (DOVER COAST)
2.99	6.09%	MINISTRY OF TRANSPORTATION (HIGHWAY 6)
5.92	12.06%	VACANT LAND CONDO (PHASE 2)
19.55	39.80%	GOLF COURSE
5.94	12.08%	VACANT LAND CONDO (PHASE 1)
1.26	2.56%	FUTURE PRIVATE CLUB HOUSE
1.19	2.42%	FUTURE MUNICIPAL ROAD
8.67	17.64%	FUTURE RESIDENTIAL
49.13	100.00%	TOTALS

DOVER COAST DEVELOPMENT

ELLWANGER DRAIN No.7

SCALE: NTS

PROJECT N°: DEL13-124

DRAWN BY: R

DATE: MAR. 2015

Figure Number: 2

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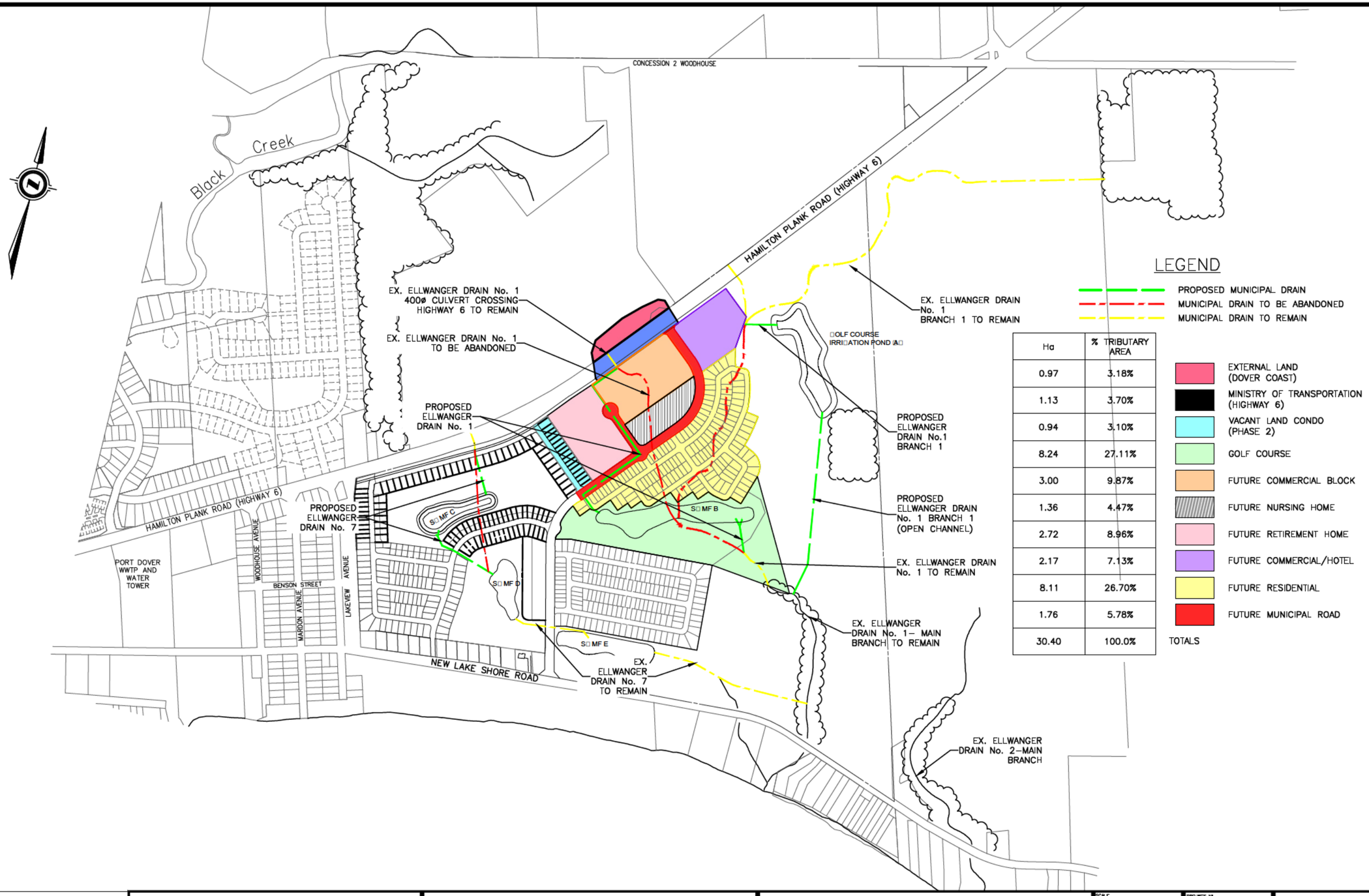

Ha	% TRIBUTARY AREA	
0.97	3.18%	
1.13	3.70%	
0.94	3.10%	
8.24	27.11%	
3.00	9.87%	
1.36	4.47%	
2.72	8.96%	
2.17	7.13%	
8.11	26.70%	
1.76	5.78%	
30.40	100.0%	TOTALS

DOVER COAST DEVELOPMENT

ELLWANGER DRAIN No.1

SCALE: **NTS**

PROJECT N°: DEL13□124

DRAWN BY: R□

DATE: MAR. 2015

Fi□ure Nu□ □er: 3

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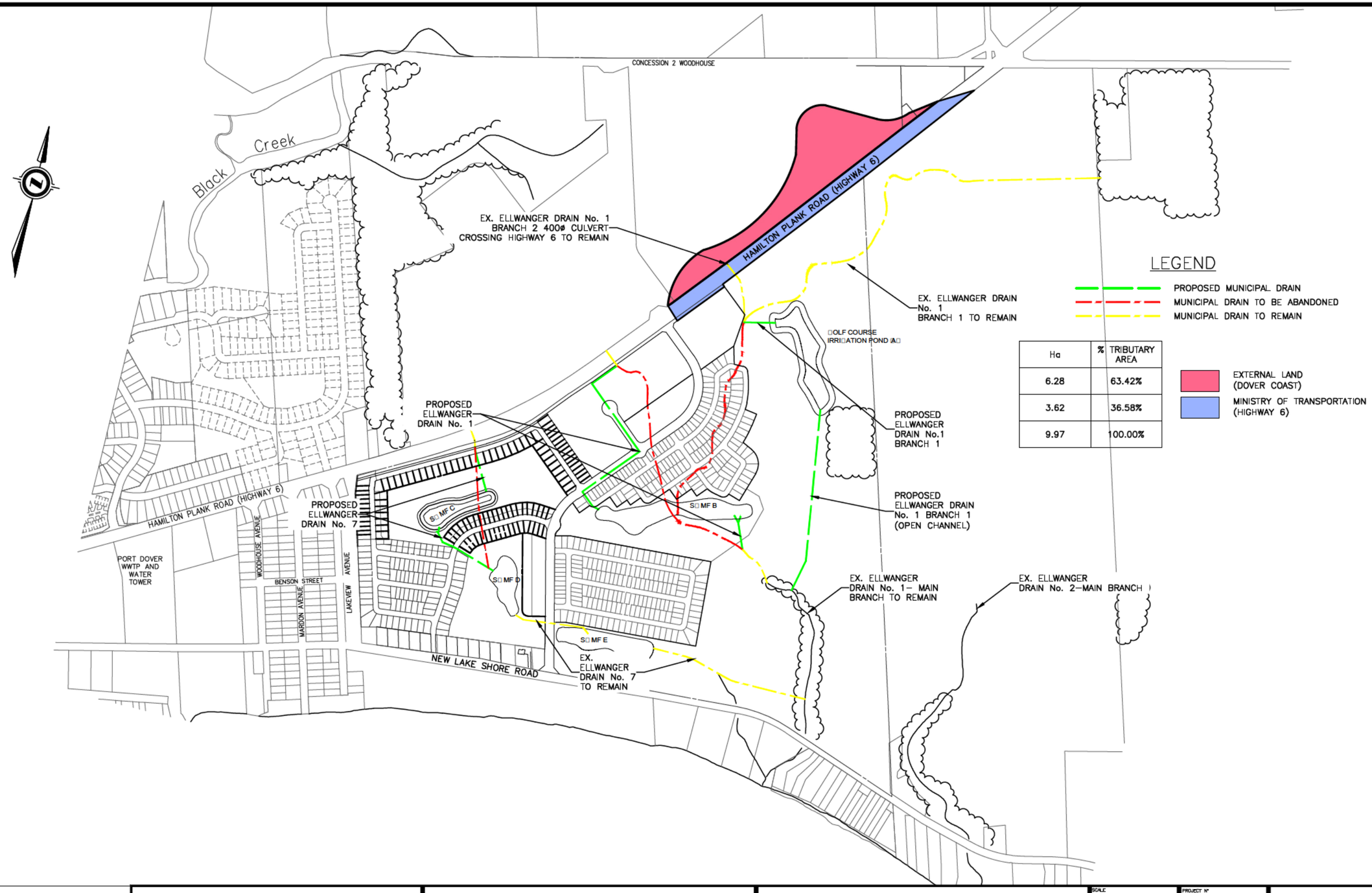

Ha	% TRIBUTARY AREA
6.28	63.42%
3.62	36.58%
9.97	100.00%

		DOVER COAST DEVELOPMENT	**ELLWANGER DRAIN No.1 BRANCH 2**	NTS	PROJECT N° DEL13□124 DRAWN BY: R□ DATE: MAR. 2015	Fi□ure Nu□ □er 4

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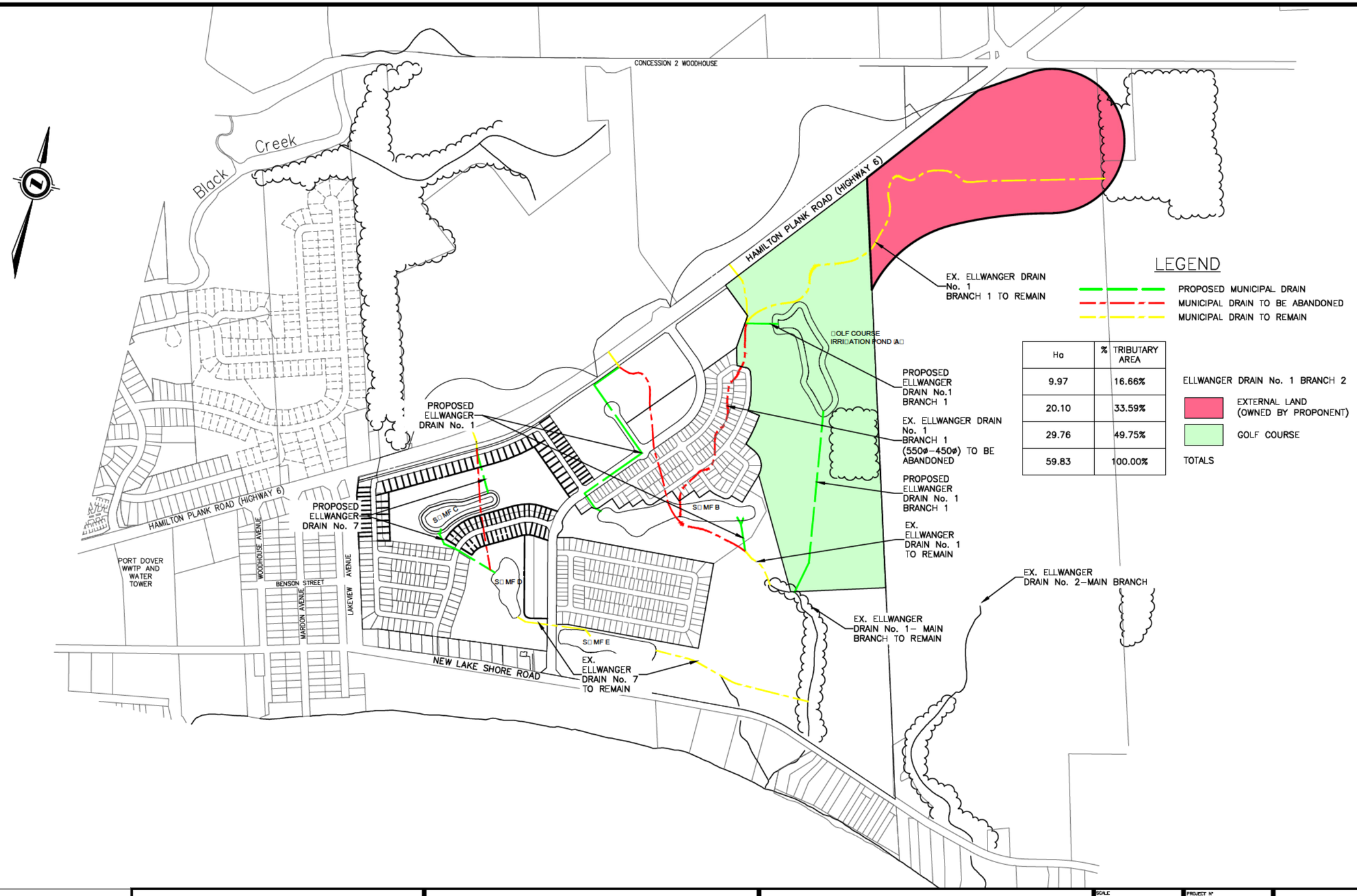


Ha	% TRIBUTARY AREA
9.97	16.66%
20.10	33.59%
29.76	49.75%
59.83	100.00%

DOVER COAST DEVELOPMENT

ELLWANGER DRAIN No.1 BRANCH 1

SCALE: NTS

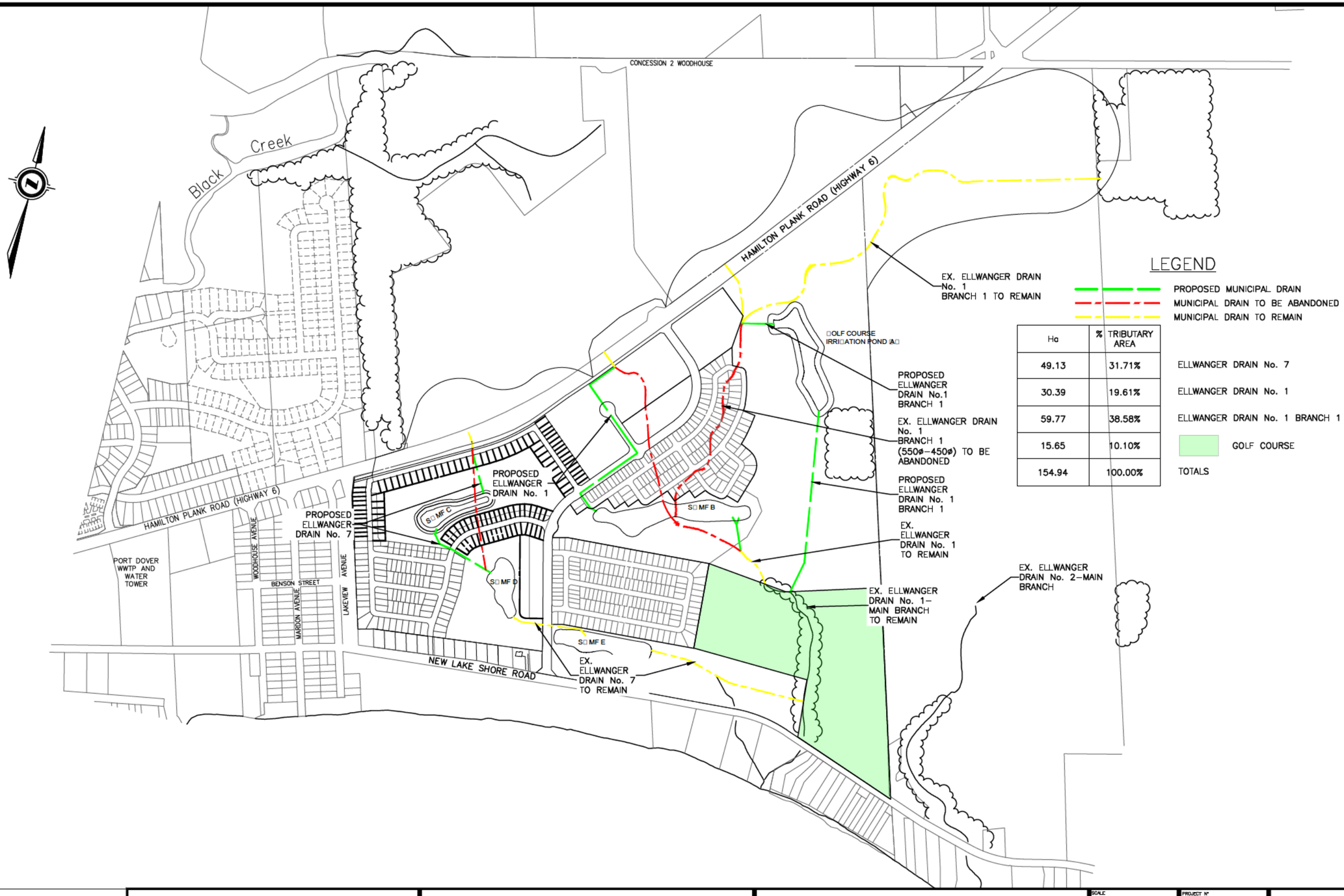
PROJECT N°: DEL13-124

DRAWN BY: R

DATE: MAR. 2015

Figure Number: 5

Plotted: Oct.15/15–10:40am Name: DEL13–124–DRAINAGE FIGURES.dwg



LEGEND

- PROPOSED MUNICIPAL DRAIN
- MUNICIPAL DRAIN TO BE ABANDONED
- MUNICIPAL DRAIN TO REMAIN

Ha	% TRIBUTARY AREA	
49.13	31.71%	ELLWANGER DRAIN No. 7
30.39	19.61%	ELLWANGER DRAIN No. 1
59.77	38.58%	ELLWANGER DRAIN No. 1 BRANCH 1
15.65	10.10%	GOLF COURSE
154.94	100.00%	TOTALS

DOVER COAST DEVELOPMENT

ELLWANGER DRAIN No.1 MAIN BRANCH

SCALE: NTS

PROJECT N°: DEL13□124

DRAWN BY: R□

DATE: MAR. 2015

Fi□ure Nu□ □er: 6

Plotted: Oct.15/15–10:41am Name: DEL13–124–DRAINAGE FIGURES.dwg

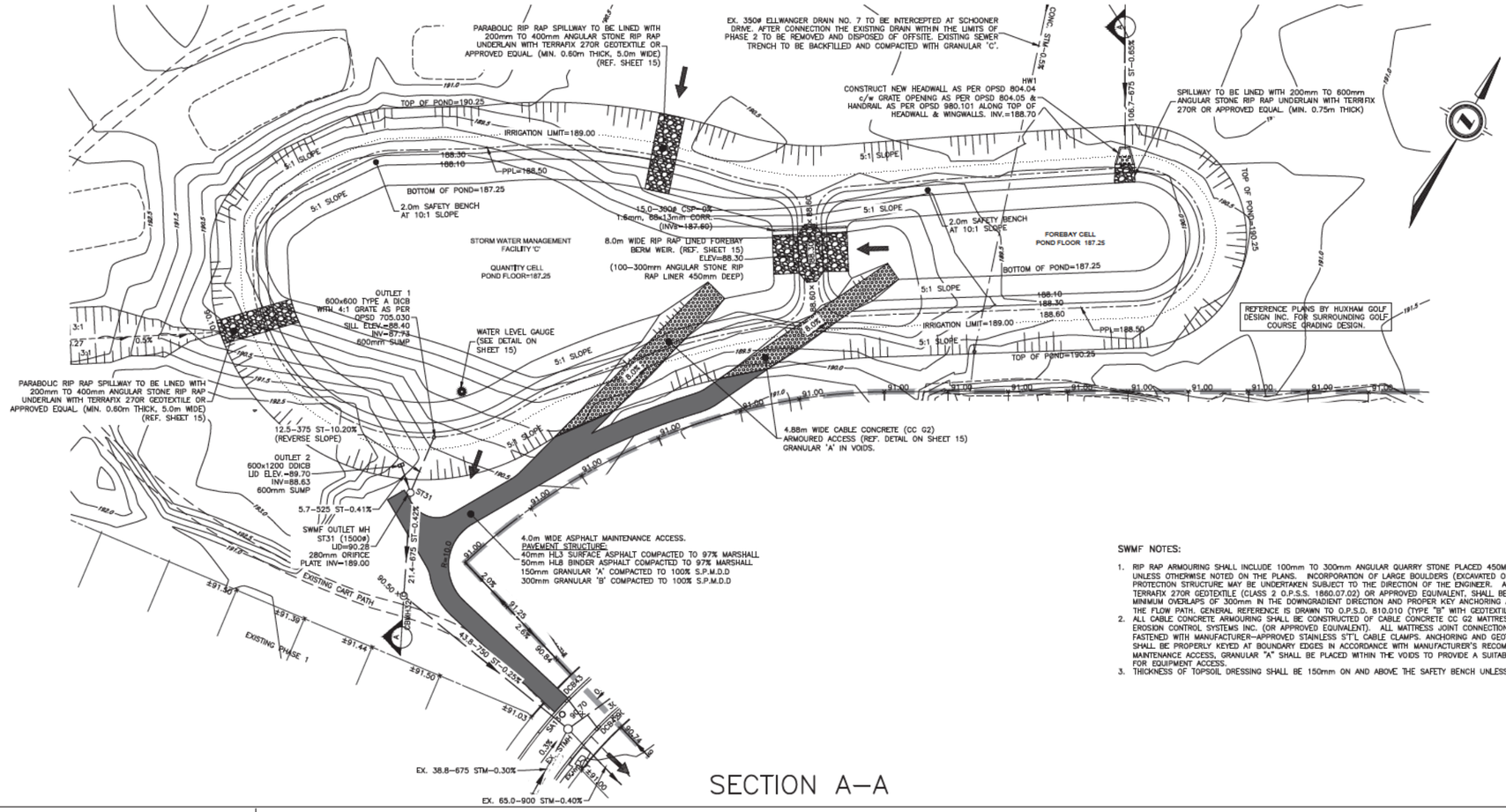
LEGEND

- 78.65 — DENOTES PROPOSED GRADE
- ±78.65 — DENOTES EX. GRADE TO BE MATCHED
- DENOTES OVERLAND FLOW DIRECTION
- DENOTES RIP RAP SPILLWAY
- DENOTES CABLE CONCRETE (CC G2) ACCESS WITH GRANULAR 'A' IN VOIDS
- DENOTES ASPHALT MAINTENANCE ACCESS

I HEREBY CERTIFY THAT THE PROPOSED GRADING AND APPURTENANT DRAINAGE WORKS COMPLY WITH SOUND ENGINEERING DESIGN AND THAT THE PROPOSED GRADING IS COMPATIBLE WITH APPLICABLE CITY BYLAWS AND THE EXISTING DRAINAGE PATTERNS ON AND ACROSS THESE LANDS AND ADJOINING LANDS.

SEDIMENT AND EROSION CONTROL NOTES

1. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
2. ALL EROSION CONTROL MEASURES TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.
3. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.
4. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
5. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
6. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
7. PROTECT ALL CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R).
8. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
9. PREVENT WIND-BLOWN DUST.
10. STRAW BALES TO BE USED IN LOCALIZED AREAS AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
11. STRAW BALES TO BE TERMINATED BY ROUNDING BALES TO CONTAIN AND FILTER RUNOFF.
12. WHEN ALL RESTORATION IS COMPLETED REMOVE SEDIMENT CONTROL MEASURES AND RESTORE IMPACTED AREAS.
13. ALL OF THE ABOVE NOTES AND SEDIMENT AND EROSION CONTROL MEASURES AND ANY ADDITIONAL SEDIMENT AND EROSION CONTROL MEASURES ARE TO BE IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON SEDIMENT AND EROSION CONTROL FOR URBAN CONSTRUCTION SITES.



SWMF NOTES:

1. RIP RAP ARMOURING SHALL INCLUDE 100mm TO 300mm ANGULAR QUARRY STONE PLACED 450MM DEEP (TYPICAL), UNLESS OTHERWISE NOTED ON THE PLANS. INCORPORATION OF LARGE BOULDERS (EXCAVATED ON–SITE) INTO THE PROTECTION STRUCTURE MAY BE UNDERTAKEN SUBJECT TO THE DIRECTION OF THE ENGINEER. AN UNDERLAY OF TERRAFIX 270R GEOTEXTILE (CLASS 2 O.P.S.S. 1860.07.02) OR APPROVED EQUIVALENT, SHALL BE PROVIDED WITH MINIMUM OVERLAPS OF 300mm IN THE DOWNGRADIENT DIRECTION AND PROPER KEY ANCHORING AT BOUNDARIES WITHIN THE FLOW PATH. GENERAL REFERENCE IS DRAWN TO O.P.S.D. 810.010 (TYPE "B" WITH GEOTEXTILE UNDERLAY).
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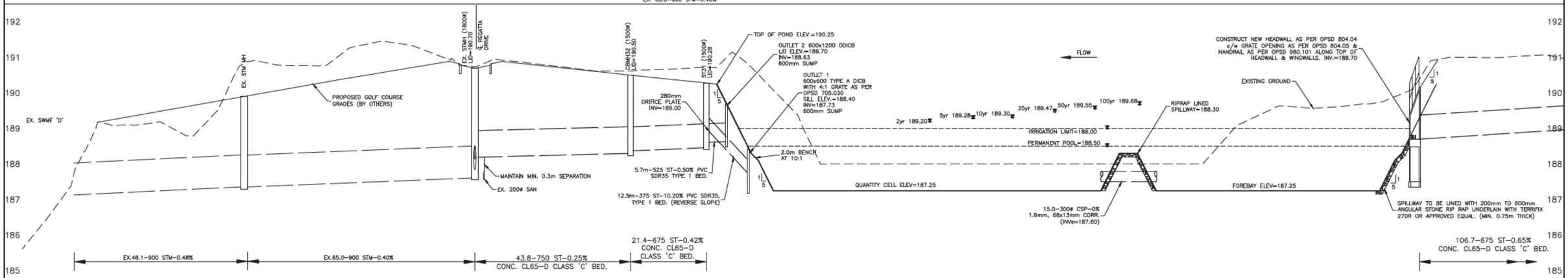
3. THICKNESS OF TOPSOIL DRESSING SHALL BE 150mm ON AND ABOVE THE SAFETY BENCH UNLESS INDICATED OTHERWISE.

SECTION A–A



EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN BY JR	1	FIRST SUBMISSION TO COUNTY	MARCH 06/15	DEL'K
DRAWN BY JR	2	SECOND SUBMISSION TO COUNTY	AUG. 21/15	DEL'K
CHECKED BY JF/LJ				
F.BK. 1054				
FILE: DEL13-124 P&P (PH2).DWG				

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ENGINEER'S STAMP

Norfolk County

SCALE
HORIZONTAL – 1:500
VERTICAL – 1:50

TITLE
DOVER COAST – PHASE 2
PORT DOVER, ONTARIO

STORM WATER MANAGEMENT FACILITY 'C' GRADING & CROSS SECTION

PROJECT No. DEL13–124
SHEET No. 11
PLAN FILE No.

Issue Oct/06/15–11:50am DEL13–124 P&P (PH2).dwg

LEGEND

- 78.65 — DENOTES PROPOSED GRADE
- ±78.65x — DENOTES EX. GRADE TO BE MATCHED
- DENOTES OVERLAND FLOW DIRECTION
- DENOTES RIP RAP SPILLWAY
- DENOTES CABLE CONCRETE (CC G2) ACCESS WITH GRANULAR 'A' IN VOIDS
- DENOTES ASPHALT MAINTENANCE ACCESS

REFERENCE GOLF COURSE DESIGN PLANS BY HUXHAM GOLF DESIGN INC. FOR MAJOR OVERLAND FLOW ROUTE

FUTURE PRIVATE ROAD

EXISTING MUNICIPAL DRAINS TO BE INTERCEPTED UPSTREAM.

PARABOLIC RIP RAP SPILLWAY TO BE LINED WITH 200mm TO 400mm ANGULAR STONE RIP RAP UNDERLAIN WITH TERRAFIX 270R GEOTEXTILE OR APPROVED EQUAL. (MIN. 0.60m THICK, 5.0m WIDE) (REF. SHEET 15)

4.0m WIDE ASPHALT MAINTENANCE ACCESS.
PAVEMENT STRUCTURE:
40mm HL3 SURFACE ASPHALT COMPACTED TO 97% MARSHALL
50mm HL8 BINDER ASPHALT COMPACTED TO 97% MARSHALL
150mm GRANULAR 'A' COMPACTED TO 100% S.P.M.D.D
300mm GRANULAR 'B' COMPACTED TO 100% S.P.M.D.D

4.88m WIDE CABLE CONCRETE (CC G2) ARMOURED ACCESS (REF. DETAIL ON SHEET 15) GRANULAR 'A' IN VOIDS.

SPILLWAY TO BE LINED WITH 200mm TO 600mm ANGULAR STONE RIP RAP UNDERLAIN WITH TERRIFIX 270R OR APPROVED EQUAL. (MIN. 0.75m THICK)

WATER LEVEL GAUGE (SEE DETAIL ON SHEET 15)

ST17

18.3–1200 ST–0.40%

TOP OF POND=190.00
IRRIGATION LEVEL=188.70
PPL=188.20
BOTTOM OF POND=186.50

3:1 SLOPE

8.0m WIDE RIP RAP LINED FOREBAY BERM SPILLWAY WEIR. (SEE SHEET 15)
(100–300mm ANGULAR STONE RIP RAP LINER 450mm DEEP)

STORM WATER MANAGEMENT FACILITY 'B'

FOREBAY CELL POND FLOOR 186.50

HW2
CONSTRUCT NEW HEADWALL AS PER OPSD 804.04
c/w GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. INV.=188.50

14.0–300ø CSP–0% 1.6mm, 68x13mm CORR. (INVs=187.00)

OUTLET 1
600x600 TYPE A DICB WITH 3:1 GRATE AS PER OPSD 705.030
SILL ELEV.=188.10
INV=187.33
600mm SUMP

QUANTITY CELL POND FLOOR=186.50

12.8–450 ST–10.75% (REVERSE SLOPE)

OUTLET 2
600x600 CB
LID ELEV.=189.30
INV=188.43
600mm SUMP

9.5–450 ST–0.90%

SWMF OUTLET MH (1500ø) LID=192.00
375mm ORIFICE PLATE
INV=188.70
(CONNECT EX. 525ø CONC. MUNICIPAL DRAIN)

EMERGENCY SPILLWAY WEIR – 10m WIDE WITH 12:1 SIDE SLOPES SILL ELEV=189.70

SPILLWAY TO BE LINED WITH 200mm TO 600mm ANGULAR STONE RIP RAP UNDERLAIN WITH TERRIFIX 270R OR APPROVED EQUAL. (MIN. 0.75m THICK)

2.0m SAFETY BENCH AT 10:1 SLOPE

BOTTOM OF POND=186.50
PPL=188.20
187.90
188.00
IRRIGATION LEVEL=188.70
TOP OF POND=190.00

EXISTING 525ø CONCRETE MUNICIPAL DRAIN (ELLWANGER DRAIN NO. 1 MAIN BRANCH)

GOLF COURSE HOLE 17

PROPOSED GOLF COURSE

GOLF COURSE HOLE 12

SWMF NOTES:

1. RIP RAP ARMOURING SHALL INCLUDE 100mm TO 300mm ANGULAR QUARRY STONE PLACED 450MM DEEP (TYPICAL), UNLESS OTHERWISE NOTED ON THE PLANS. INCORPORATION OF LARGE BOULDERS (EXCAVATED ON–SITE) INTO THE PROTECTION STRUCTURE MAY BE UNDERTAKEN SUBJECT TO THE DIRECTION OF THE ENGINEER. AN UNDERLAY OF TERRAFIX 270R GEOTEXTILE (CLASS 2 O.P.S.S. 1860.07.02) OR APPROVED EQUIVALENT, SHALL BE PROVIDED WITH MINIMUM OVERLAPS OF 300mm IN THE DOWNGRADIENT DIRECTION AND PROPER KEY ANCHORING AT BOUNDARIES WITHIN THE FLOW PATH. GENERAL REFERENCE IS DRAWN TO O.P.S.D. 810.010 (TYPE "B" WITH GEOTEXTILE UNDERLAY).
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3. THICKNESS OF TOPSOIL DRESSING SHALL BE 150mm ON AND ABOVE THE SAFETY BENCH UNLESS INDICATED OTHERWISE.
4. REF. SHEET 11 FOR SEDIMENT AND EROSION CONTROL NOTES.

I HEREBY CERTIFY THAT THE PROPOSED GRADING AND APPURTENANT DRAINAGE WORKS COMPLY WITH SOUND ENGINEERING DESIGN AND THAT THE PROPOSED GRADING IS COMPATIBLE WITH APPLICABLE CITY BYLAWS AND THE EXISTING DRAINAGE PATTERNS ON AND ACROSS THESE LANDS AND ADJOINING LANDS.

SECTION A–A

ST17 (3000ø) LID=191.35

CONSTRUCT NEW HEADWALL AS PER OPSD 804.04 c/w GRATE OPENING AS PER OPSD 804.05 & HANDRAIL AS PER OPSD 980.101 ALONG TOP OF HEADWALL & WINGWALLS. INV.=188.50

2yr 189.10 5yr 189.20 10yr 189.30 25yr 189.41 50yr 189.50 100yr 189.66

EMERGENCY SPILLWAY WEIR – 10m WIDE, 0.3m DEEP WITH 12:1 SIDE SLOPES SILL ELEV=189.70 (SCHEMATIC ONLY – SEE PLAN FOR ACTUAL LOCATION)

EXISTING GROUND

FLOW

10m

TOP OF POND ELEV.=190.0

OUTLET 2
600x600 CB
LID ELEV.=89.30
INV=88.43
600mm SUMP

SWMF OUTLET MH (1500ø) LID=191.00

APPROXIMATE GRADE OF GOLF COURSE

375mm ORIFICE PLATE INV=188.70

IRRIGATION LIMIT=188.70

PERMANENT POOL=188.20

RIPRAP LINED SPILLWAY=188.00

18.3–1200 ST–0.40% CONC. CL65–D

SPILLWAY TO BE LINED WITH 200mm TO 600mm ANGULAR STONE RIP RAP UNDERLAIN WITH TERRIFIX 270R OR APPROVED EQUAL. (MIN. 0.75m THICK)

15.0–300ø CSP–0% 1.6mm, 68x13mm CORR. (INVs=187.00)

OUTLET 1
600x600 TYPE A DICB WITH 3:1 GRATE AS PER OPSD 705.030
SILL ELEV.=88.10
INV=87.33
600mm SUMP

9.5m–450 ST–0.9% PVC SDR35 TYPE 1 BED.

12.8m–450 ST–10.75% PVC SDR35, TYPE 1 BED. (REVERSE SLOPE) C/W 375mm ORIFICE (SEE SHEET 15)

FOREBAY ELEV=186.50

QUANTITY CELL ELEV=186.50

EXISTING 525ø CONCRETE MUNICIPAL DRAIN – 0.35% (ELLWANGER DRAIN NO. 1 MAIN BRANCH)

188.60INV 188.57ø 188.50 187.335 188.435 188.709 188.309 188.355

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN BY JR	1	FIRST SUBMISSION TO COUNTY	MARCH 06/15	DEL'L
DRAWN BY JR	2	SECOND SUBMISSION TO COUNTY	AUG. 21/15	DEL'L
CHECKED BY JP/LJ	3	THIRD SUBMISSION TO COUNTY	OCT. 29/15	DEL'L
F.BK. 1054	4	ADDED BLOCKS 117 & 118	NOV. 9/15	DEL'L
	4	REVISED SWMF B OUTLET	DEC. 2/15	DEL'L
FILE: DEL13–124 PMP (PH2).DWG				

CONSULTANT OR DIVISION

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development engineering (London) Limited
CONSULTING CIVIL ENGINEERS

ENGINEER'S STAMP

Norfolk County

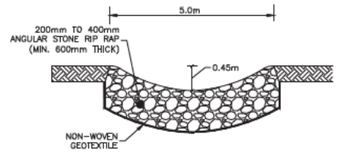
SCALE
HORIZONTAL – 1:500
5 0 10m
VERTICAL – 1:50
0.5 0 1m

TITLE
DOVER COAST – PHASE 2
PORT DOVER, ONTARIO

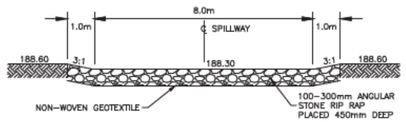
STORM WATER MANAGEMENT FACILITY 'B'
GRADING & CROSS SECTION

PROJECT No. DEL13–124
SHEET No. 12
PLAN FILE No.

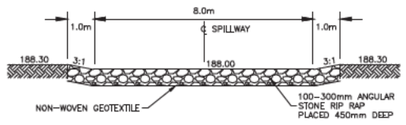
Date Dec.03/15–3:09pm DEL13–124 PMP (PH2).dwg



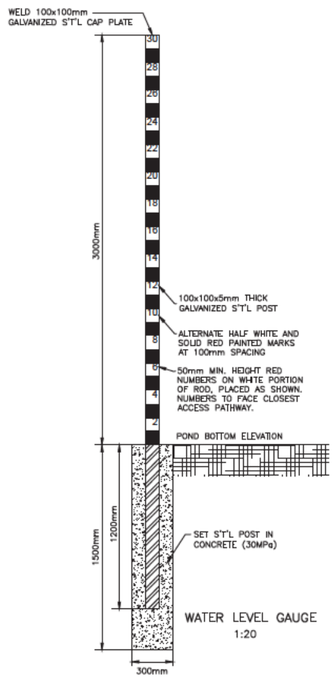
PARABOLIC RIP RAP
INLET SPILLWAY
HORZ. SCALE 1:100
VERT. SCALE 1:50



SWMF C
FOREBAY BERM SPILLWAY
HORZ. SCALE 1:100

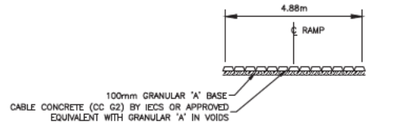


SWMF B
FOREBAY BERM SPILLWAY
HORZ. SCALE 1:100

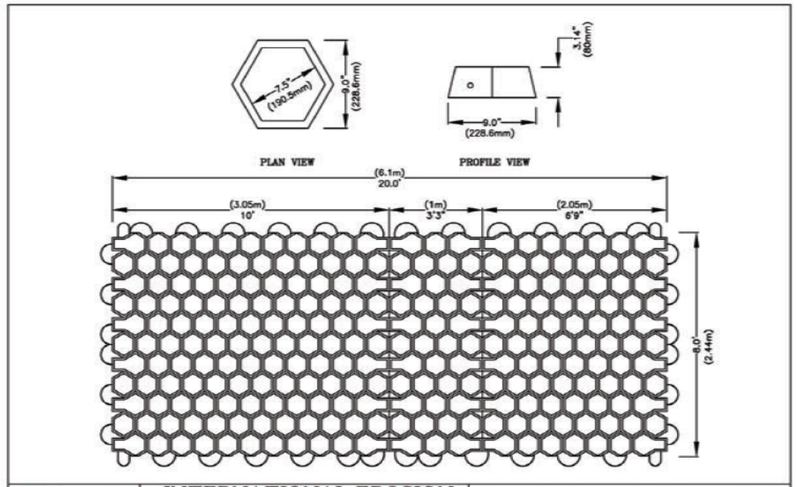


WATER LEVEL GAUGE
1:20

ORIFICE PLATE DETAIL
(OUTLET 1, SWMF 'B')
NTS



CABLE CONCRETE ACCESS RAMP
SCALE: 1:100



IECS

INTERNATIONAL EROSION CONTROL SYSTEMS
22253 Hoskins Line
Rodney, ON, N0L 2C0
Phone: 800-821-7462
Fax: 866-496-1990
www.iecs.com

CC-G2 CLOSED CELL
SHOP DRAWINGS

DRAWN BY:	CHECKED BY:	
D. JOHNSTON	L. ARVAI	
SCALE: N.T.S	DATE: 03/19/13	SHEET 1 OF 1

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION	DETAILS	No.	REVISIONS	DATE	CONSULTANT
					DESIGN BY JR	1	FIRST SUBMISSION TO COUNTY	MARCH 06/15	DEDJL
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					F.BK. 1054				
					FILE: DEL13-124 PWP (PH2).DWG				

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Norfolk County

SCALE

TITLE
DOVER COAST - PHASE 2
PORT DOVER, ONTARIO

STORM WATER MANAGEMENT
DETAILS

PROJECT No. DEL13-124
SHEET No. 15
PLAN FILE No.

development engineering (London) Limited

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Appendix C

Summary Calculation Tables

SWMF ‘B’

SWMF ‘C’

DEL13-124: Dover Coast Developments, Pond B Revised Design - Norfolk County

Site Runoff Coefficient Values						
Area Type	**Area (m^2)**	**Area (ha)**	**Runoff Coefficient 'C'**	**(AxC)**	**Average "C"**	**% Imp**
2009 Vallee Post-Dev. Design						
Residential Area 'A'	55,200	5.52	0.65	3.59		64
Residential Area 'B'	72,900	7.29	0.65	4.74		64
Commerical Area 'A'	22,800	2.28	0.87	1.97		95
Commerical Area 'B'	47,600	4.76	0.87	4.12		95
SWM/Golf Course Area 'A'	85,000	8.50	0.20	1.70		0
SWM/Golf Course Area 'B'	63,600	6.36	0.20	1.27		0
Total Tributary Area =	347,100	34.71		17.39	0.50	**43**
2015 Proposed Post Dev. Design						
Residential Area + ROW	109,310	10.93	0.51	5.57		44
SWM/Golf Course Area	60,200	6.02	0.36	2.15		22
Commerical/Hotel Blocks	94,350	9.44	0.73	6.89		76
External Area (Hwy/North Lands)	19,000	1.90	0.28	0.53		11
Total Tributary Area =	282,860	28.29		15.14	0.54	**48**

SWMM5 Catchment Areas						
Runoff Area	**Area (m^2)**	**Area (ha)**	**Runoff Coefficient 'C'**	**(AxC)**	**Average "C"**	**% Imp**
2009 Vallee Post-Dev. Design (SWMHYMO)						
Ex. Site Area to SWMF 'A'	163,000	16.30	0.45	7.26		35
Ex. Site Area to SWMF 'B'	184,100	18.41	0.55	10.13		50
Total Tributary Area =	347,100	34.71		17.39	0.50	**43**
2015 Proposed Post Dev. Design 'B'						
B100 - Proposed Residential & ROW Area [1]	95,770	9.58	0.51	4.90		45
B200 - Proposed Hotel Block [2]	24,410	2.44	0.73	1.77		75
B300 - Proposed Commerical/Res. Block [2]	43,540	4.35	0.73	3.16		75
B400 - Proposed Commerical Block [2]	26,400	2.64	0.73	1.91		75
B500 - Proposed Residential & ROW Area [1]	13,540	1.35	0.51	0.69		45
B600 - SWM/Golf Course Area	60,200	6.02	0.36	2.15		22
B700 - External Area (Hwy/North Lands)	19,000	1.90	0.28	0.53		11
Total Tributary Area =	282,860	28.29		15.12	0.53	**48**

Note:

[1] *For the purposes of SWMF 'B' sizing, the residential area runoff coefficient has been set at C=0.51 including ROWs*

[2] *All Commercial Blocks have a typical design runoff coefficient around C=0.85; however an allowable design C= 0.73 is applied to the SWMF 'B' resizing . This allows for on-site SWM controls (rooftop, parking level, underground storage and Oil-Grit-sepeartors) to be designed on the future commerical blocks to provide the difference between the actual and allowable design.*

Date: 15 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124: Dover Coast Developments, Pond B Revised Design - Norfolk County

PROPOSED DEVELOPED CONDITIONS HYDROLOGIC MODELING PARAMETERS

Subcatchment ID	Subcatchment Description	Subactchment Routing	% Routed Over Subcatch Area*	Area (ha)	Imp. %	Perv. CN*	Perv. Ia (mm)	Imp. Ia (mm)	Subcatchment Flow Length (m)	Manning "n" Perv.	Manning "n" Imperv.	Subcatchment Slope (%)
B100	Proposed Residential & ROW Area 1	Pervious	25	9.58	45	82	2.00	1.00	120	0.120	0.015	2
B200	Proposed Hotel Block 2	Impervious	85	2.44	75	82	2.00	1.00	110	0.120	0.015	2
B300	Proposed Commerical/Res. Block 2	Impervious	85	4.35	75	82	2.00	1.00	150	0.120	0.015	2
B400	Proposed Commerical Block 2	Impervious	85	2.64	75	82	2.00	1.00	100	0.120	0.015	2
B500	Proposed Residential & ROW Area 1	Pervious	25	1.35	45	82	2.00	1.00	80	0.120	0.015	2
B600	SWMF B/Golf Course Area	Pervious	20	6.02	22	82	2.00	1.00	85	0.120	0.015	2
B700	External Area (Hwy/North Lands)	Impervious	50	1.90	11	82	2.00	1.00	100	0.120	0.015	2

Note: * % Routed refers to % of previous surface area routed over impervious surface area (or vice versa) for surface abstraction, compared to direct outlet flow to sewers/outlet.

Date: 15 Sept 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124: Dover Coast Developments, Pond B Revised Design - Norfolk County

Runoff Area	SWMM5 Summary Peak Flow Output (L/s) Storm Event					
	2yr	5yr	10yr	25yr	50yr	100yr
Vallee 2009 Design SWMF (A&B)						
Proposed Subdivision / Golf Course Area	2176	3403	4273	5454	6653	7721
Peak SWMF A&B Storage (cu.m)	*6,828*	*8,841*	*10,575*	*12,984*	*14,708*	*17,552*
Peak Outflow to Ellwanger Drain #1	**148**	**209**	**264**	**333**	**368**	**428**
Post Development Condition SWMF B						
A100 - Proposed Residential Area & ROW	532	829	1042	1314	1617	1879
A200 - Proposed Hotel Block	358	533	649	791	947	1067
A300 - Proposed Commerical/Ret. Block	600	901	1102	1347	1619	1827
A400 - Proposed Commerical Block	373	558	681	832	998	1126
A500 - Proposed Residential & ROW Area	95	151	193	250	310	368
A600 - SWM/Golf Course Area	221	341	427	539	661	771
A700 - External Area (Hwy/North Lands)	53	86	112	150	190	231
Peak Uncontrolled Runoff/Inflow to SWMF B *	**2229**	**3395**	**4202**	**5217**	**6337**	**7264**
Peak System/Sag Storage (cu.m)	*5,335*	*6,940*	*8,408*	*10,358*	*11,651*	*13,824*
Peak Outflow to Ellwanger Drain #1	**123**	**162**	**188**	**246**	**296**	**340**

Note: * Subcatchment runoff is not directly additive as Peak Uncontrolled Inflow to SWMF C due to hydrograph time lag.

Date: 15 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124 - Dover Coast Development
SWMF 'B' - Pond Rating Curve

Stage	Elevation (m)	Depth (m)	Area (m2)	Inc. Vol (m3)	Vol. (m3)	Q (L/s) Outlet-1 280mm Orifice	Outlet-2 DICB w/ 525mm	Overflow Weir 10m wide 12:1 sideslopes	Outlet 525mm Uniform Capacity to Ellwanger Drain
Base	186.5	0.0	7,480	0	0				
Forebay / Perm. Pool	186.6	0.1	7,741	761	761				
	186.7	0.2	8,002	787	1,548				
	186.8	0.3	8,262	813	2,361				
	186.9	0.4	8,523	839	3,201				
	187.0	0.5	8,784	865	4,066				
	187.1	0.6	9,045	891	4,957				
	187.2	0.7	9,306	918	5,875				
	187.3	0.8	9,566	944	6,819				
	187.4	0.9	9,827	970	7,788				
	187.5	1.0	10,083	996	8,784				
	187.6	1.1	10,344	1,021	9,805				
	187.7	1.2	10,605	1,047	10,853				
	187.8	1.3	10,865	1,074	11,926				
	187.9	1.4	11,126	1,100	13,026				
2m Safety Edge	188.0	1.5	12,950	1,204	14,229				
2m Safety Ledge	188.1	1.6	13,211	1,308	15,537				
PPL	188.2	1.7	13,521	1,337	**16,874**				
Irrigation Buffer	188.3	1.8	13,732	1,363	1,363				
	188.4	1.9	13,993	1,386	2,749				
	188.5	2.0	14,353	1,417	4,166				
	188.6	2.1	14,614	1,448	5,615	-			
Outlet-1	188.7	2.2	14,875	1,474	**7,089**	0	-	-	-
Extended Detention Storage	188.8	2.3	15,135	1,501	1,501	0	-	-	
	188.9	2.4	15,396	1,527	3,027	0	-	-	
	189.0	2.5	15,733	1,556	4,584	0	-	-	
	189.1	2.6	15,994	1,586	6,170	0	-	-	
	189.2	2.7	16,255	1,612	7,782	175	-	-	
Outlet-2	189.3	2.8	16,515	1,639	9,421	205	0	-	
Active Storage	189.4	2.9	16,776	1,665	11,085	227	70	-	
	189.5	3.0	17,060	1,692	12,777	249	188	-	
	189.6	3.1	17,321	1,719	14,496	270	311	-	340
Weir-2	189.7	3.2	17,582	1,745	**16,241**	288	504	0	
Freeboard	189.8	3.3	17,842	1,771	1,771	305	585	485	
	189.9	3.4	18,103	1,797	3,568	321	602	1,528	
Top	190.0	3.5	18,400	1,825	**5,394**	337	650	2,526	

Avg. Base Length =	180	m
Avg. Base Width =	12	m
Sideslopes =	3	H:V
Inlet Pipe Inv. =	188.90	m
Forebay Area =	4586	m2
Active Storage Provided =	574	m3/ha
Extened Det. Drawdown =	68	hrs

(based on SWMM5 output)

Peak Outflow / Vol.		
Q (L/s)	V (m3)	
123	5,335	<= 2yr
162	6,940	<= 5yr
188	8,408	<= 10yr
246	10,358	<= 25yr
296	11,651	<= 50yr
340	13,824	<= 100yr

Note: Outlet 525mm pipe with unform capcaity of 340 L/s (0.5% slope) governs SWMF B outflow > 25yr event; i.e. pipe friction taliwater conditions begin to limit full outflow from Outlet's 1 & 2.

Date: 15 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124 - Dover Coast Development SWMF B
QUALITY CONTROL VOLUME

Using MOE - SWM Guidelines Criteria /2003

PERMANENT POOL VOLUME

Drainage Area	= 28.286 Ha	
Imperviousness	= 48 %	<= Includes Dover Coast at Full Runoff Coeff. (C=0.85 for Commerical Blocks) & External Areas
Protection Level :		
Enhanced Level 80% Long Term S.S removal	[Table 3.2; Storm water Management Planning and Design Manual March 2003]	
SWMP Type :	WetPond	
Storage Volume for Impervious Level 48 %	= 133 m3/ Ha	<= 173cu.m/ha Less 40cu.m/ha
Storage Volume for Drainage Area 28.286 Ha is	= 3748 m3	
Permanent Pool Volume	= 3748 m3	

EROSION CONTROL VOLUME

Extended Detention Volume	= 40 m3/ Ha	
Extended Detention Volume for Area 28.286 Ha is	= 1131 m3	
25mm 4Hr Chicago Post Dev. Runoff Volume in Depth	= 14.72 mm	
Erosion Control Volume	= 4163 m3	<== SWMM5; combined Dover Coast & External Areas

Governing Erosion Control Volume = 4163 m3

SUMMARY OF QUALITY CONTROL VOLUME

Permanent Pool Volume	= 3748 m3
Erosion Control Volume	= 4163 m3
Total (PPL+ACTIVE CONTROL) Volume	= 7911 m3

Date: 15 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124 - Dover Coast Development SWMF B
Sediment Forebay Sizing Calculations

Using MOE - SWM Guidelines Criteria /2003

Settling

Dist = sqrt(r*Q_p/v_s)
= **40.50 m**
< forebay length (120m)

r : 1 = L to w ratio — r = 4 — Avg. 120m long x 30m wide
Q_p = peak SWM outflow during quality storm — Q_p = 0.1230
v_s = settling velocity for 0.15 mm particles (m/s) — v_s = 0.0003

Dispersion Length

Dist = 8Q/dv
= **56.03 m**
< forebay length (120m)

y = total depth of forebay from permanent pool (m) — y = 1.7
Q = 10 yr max inlet flow (m^3/s) — Q = 4 202 — (from model)
d = depth of perm pool in forebay (m) — d = 1.2 — (based on 0.5m depth sediment in forebay section)
v_f = desired vel in forebay (m/s) — v_f = 0.5

Velocity

v = Q/A
= **0.09 m/s**

b = bottom width (avg) of forebay (m) — b = 40 — required
Q = 10yr inlet flow (m^3/s) — Q = 4 202
A = cross-sectional area (m^2) — A = 48 — (based on 0.5m depth sediment in forebay section)
Therefore, **Velocity Target Satisfied**
Target velocity = 0.15 — V_{targ} = 0.15

Cleanout Frequency

Table 5.3 MOEE SWMPP Guidelines

cleanout = Vol/(load*A_{sew}*effic)
= **25.0 years**

A_{sew} = Contributing Sewer Area (ha) — A_{sew} = 28.3
Imp = Percent Impervious (%) — Imp = 48%
load = Sediment Loading (m^3/ha/y) — load = 1.9 — (assumed higher loading)
effic = Removal Efficiency (%) — effic = 80%
Targ = Cleanout Frequency Target (years) — Targ = 10
Vol = Bottom 30% volume (m^3) — Vol = 1056

Therefore, **Cleanout Frequency Satisfied**

Surface Area Check

SA_f/SA_{pp} = **34%**

SA_f = Forebay Surface Area (m^2) — SA_f = 4586
SA_{pp} = Total Permanent Pool Surface Area (m^2) — SA_{pp} = 13521
Therefore, **The forebay size is OK**
Targ = Forebay size (as % of Permanent Pool Area) — Targ = 33%

Date: 15 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

SWMFB Major Inflow Channel from St. to Spillway

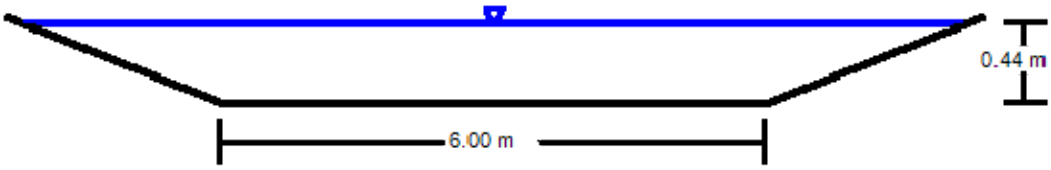
Project Description

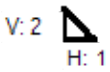
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.078	
Channel Slope	0.03000	m/m
Normal Depth	0.44	m
Left Side Slope	5.00	m/m (H:V)
Right Side Slope	5.00	m/m (H:V)
Bottom Width	6.00	m
Discharge	3869.00	L/s

Cross Section Image





SWMF B Major Inflow Spillway from channel

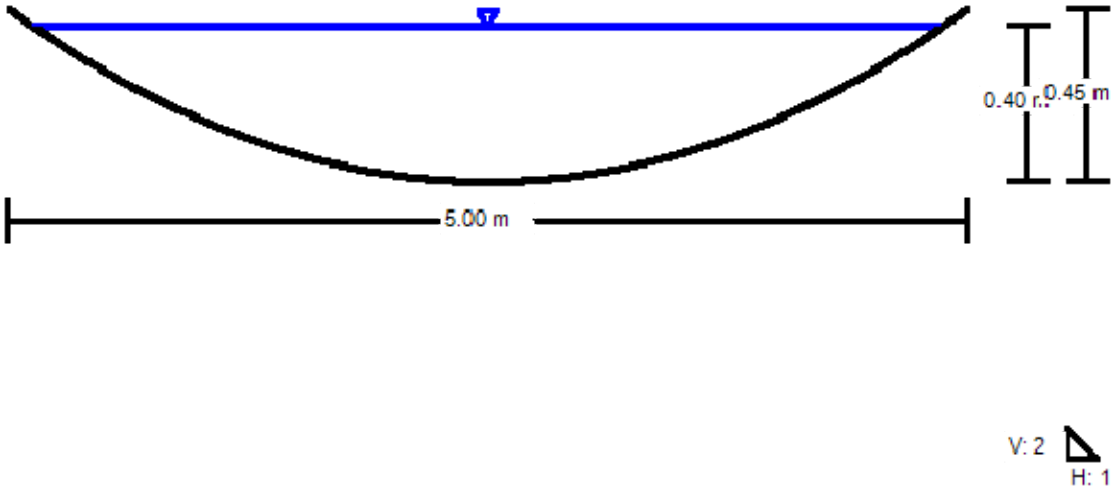
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.078	
Channel Slope	0.33000	m/m
Constructed Depth	0.45	m
Normal Depth	0.40	m
Constructed Top Width	5.00	m
Discharge	3869.00	L/s

Cross Section Image



DEL13-124: Dover Coast Developments, Pond C Revised Design - Norfolk County

Site Runoff Coefficient Values						
Area Type	**Area** (m^2)	**Area** (ha)	**Runoff Coefficient 'C'**	**(AxC)**	**Average "C"**	**% Imp**
2009 Vallee Post-Dev. Design						
Residential Area	33,000	3.30	0.64	2.12		63
SWM/Golf Course Area	66,000	6.60	0.20	1.32		0
Total Tributary Area =	99,000	9.90		3.44	0.35	**21**
2015 Proposed Post Dev. Design						
Residential Area	36,420	3.64	0.51	1.86		45
SWM/Golf Course Area	60,200	6.02	0.30	1.80		14
External Area (Hwy/North Lands)	65,700	6.57	0.28	1.84		11
Total Tributary Area =	162,320	16.23		5.51	0.34	**20**

SWMM5 Catchment Areas						
Runoff Area	**Area** (m^2)	**Area** (ha)	**Runoff Coefficient 'C'**	**(AxC)**	**Average "C"**	**% Imp**
2009 Vallee Post-Dev. Design (SWMHYMO)						
Ex. Site Area	99,000	9.90	0.35	3.44		21
Total Tributary Area =	99,000	9.90		3.44	0.35	**21**
2015 Proposed Post Dev. Design						
C100 - Proposed Residential Area[1]	36420	3.64	0.51	1.86		45
C200 - SWM/Golf Course Area	60200	6.02	0.30	1.80		14
C300 - External Area (Hwy 6/North Lands)	65700	6.57	0.28	1.84		11
Total Tributary Area =	162320	16.23		5.51	0.34	**20**

Note:

[1] *For the purposes of SWMF C sizing, the residential area runoff coefficient has been set at C=0.51 including rear-yard areas that may sheet directly across the golf course.*

Date: 05 September 2015
Prepared By: L.Murray, P.Eng.
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DEL13-124: Dover Coast Developments, Pond C Revised Design - Norfolk County

PROPOSED DEVELOPED CONDITIONS HYDROLOGIC MODELING PARAMETERS

Subcatchment ID	Subcatchment Description	Subactchment Routing	% Routed Over Subcatch Area*	Area (ha)	Imp. %	Perv. CN*	Perv. Ia (mm)	Imp. Ia (mm)	Subcatchment Flow Length (m)	Manning "n" Perv.	Manning "n" Imperv.	Subcatchment Slope (%)
C100	Proposed Residential Area	Pervious	25	3.64	45	82	2.00	1.00	50	0.120	0.015	2
C200	SWMF C/Golf Course Area	Pervious	20	6.02	14	82	2.00	1.00	100	0.120	0.015	2
C300	External Area (Hwy 6/North Lands)	Impervious	25	6.57	11	82	2.00	1.00	150	0.120	0.015	3

Note: * % Routed refers to % of previous surface area routed over impervious surface area (or vice versa) for surface abstraction, compared to direct outlet flow to sewers/outlet.

Date: 15 Sept 2015
Prepared By: L.Murray, P.Eng.
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DEL13-124: Dover Coast Developments, Pond C Revised Design - Norfolk County

Runoff Area	SWMM5 Summary Peak Flow Output (L/s)					
	Storm Event					
	2yr	5yr	10yr	25yr	50yr	100yr
Vallee 2009 Design						
Proposed Subdivision / Golf Course Area	310	483	630	834	1057	1212
Peak SWMF C Storage (cu.m)	*1507*	*1999*	*2426*	*2992*	*3411*	*4070*
Peak Outflow w. SWMF D	**44**	**65**	**85**	**113**	**134**	**170**
Post Development Condition						
A100 - Proposed Subdivision Area	266	406	501	617	749	852
A200 - Golf Course / SWMF Block	163	256	326	425	532	637
A300 - External Highway/North Lands Area	172	267	338	437	544	650
Peak Uncontrolled Runoff/Inflow to SWMF C *	**601**	**928**	**1165**	**1479**	**1824**	**2138**
SWMF C - Peak Storage (cu.m)	*2017*	*2854*	*3628*	*4707*	*5540*	*6869*
Peak Controlled Outflow w. SWMF D	**43**	**57**	**67**	**79**	**87**	**98**

Note: * Subcatchment runoff is not directly additive as Peak Uncontrolled Inflow to SWMF C due to hydrograph time lag

Date: 28 September 2015

Prepared By: L.Murray, P.Eng.

Development Engineering (London) Ltd.

DEL13-124 - Dover Coast Development
SWMF 'C' - Pond Rating Curve

Stage	Elevation (m)	Depth (m)	Area (m3)	Inc. Vol (m3)	Vol (m3)	Q (L/s) Outlet-1 240mm Orifice w/ 375mm reverse pipe	Q (L/s) Outlet-3 DDICB w/ 525mm pipe
Base	187 25	0.00	3336	0			
	187 50	0.25	3551	861	861		
	187.75	0.50	3775	916	1,777		
	188 00	0.75	4006	973	2,749		
2m Safety	188 25	1.00	6734	1,343	4,092		
PPL	188 50	1.25	7176	1,739	**5,830**		
Irrig. Buffer	188.75	1.50	7539	1,839	1,839	-	-
Outlet-1	189 00	1.75	7948	1,936	**3,775**	0	-
Extended Detention Storage	189 05	1.80	8044	400	400	4	-
	189.10	1.85	8140	405	804	9	-
	189.15	1.90	8236	409	1,214	21	-
	189 20	1.95	8331	414	1,628	29	-
	189 25	2.00	8427	419	2,047	44	-
	189 30	2.05	8522	424	2,471	51	-
	189 35	2.10	8618	428	2,899	57	-
	189.40	2.15	8713	433	3,332	62	-
	189.45	2.20	8811	438	3,770	70	-
Outlet-2	189 50	2.25	8908	443	4,213	76	-
Active Storage	189 55	2.30	9007	448	4,661	80	-
	189.60	2.35	9105	453	5,114	84	-
	189.65	2.40	9208	458	5,572	87	-
	189.70	2.45	9310	463	6,035	92	-
	189.75	2.50	9416	468	6,503	94	-
Outlet-3	189 80	2.55	9522	473	**6,976**	99	0
Freeboard	189 85	2.60	9639	479	479	102	18
	189 90	2.65	9756	485	964	105	63
	189 95	2.70	9879	491	1,455	109	167
	190 00	2.75	10002	497	1,952	111	285
	190 05	2.80	10113	503	2,455	114	400
	190.10	2.85	10223	508	2,963	117	506
	190.15	2.90	10324	514	3,477	120	680
	190 20	2.95	10425	519	3,995	123	771
Top	190 25	3.00	10474	522	**4,518**	126	863

Avg. Base Length =	166	m
Avg. Base Width =	20	m
Sideslopes =	5	H:V
Inlet Pipe Inv. =	188.70	m
Top of Pond =	190.25	m
CL Roadway =	190.75	m
Forebay Area =	2138	m2
Active Storage Provided =	430	m3/ha
Extened Det. Drawdown =	64	hrs

(based on SWMM5 output)

Peak Outflow / Vol		
Q (L/s)	V (m3)	
43	2,017	<= 2yr
-	-	
57	2,854	<= 5yr
-	-	
67	3,628	<= 10yr
-	-	
79	4,707	<= 25yr
-	-	
87	5,540	<= 50yr
-	-	
-	-	
98	6,869	<= 100yr

Date: 28 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124 - Dover Coast Development SWMF C
QUALITY CONTROL VOLUME

Using MOE - SWM Guidelines Criteria /2003

PERMANENT POOL VOLUME

Drainage Area	= 16.230 Ha	
Imperviousness	= 20 %	<= Includes Dover Coast Golf Course & External Areas

Protection Level :

Enhanced Level 80% Long Term S.S removal — [Table 3.2; Storm water Management Planning and Design Manual March 2003]

SWMP Type : — WetPond

Storage Volume for Impervious Level 20 %	= 100 m3/ Ha	<= Use 35% Imp value
Storage Volume for Drainage Area 16.23 Ha is	= 1623 m3	
Permanent Pool Volume	= 1623 m3	

EROSION CONTROL VOLUME

Extended Detention Volume	= 40 m3/ Ha	
Extended Detention Volume for Area 16.23 Ha is	= 649 m3	
25mm 4Hr Chicago Post Dev. Runoff Volume in Depth	= 9.7 mm	<= Pro-rated SWMM5 runoff for 25mm event from catchment areas
Erosion Control Volume	= 1581 m3	

Governing Erosion Control Volume = 1581 m3

SUMMARY OF REQUIRED MIN. QUALITY CONTROL VOLUME

Permanent Pool Volume	= 1623 m3
Erosion Control Volume	= 1581 m3
Total (PPL+ACTIVE CONTROL) Volume	= 3204 m3

Date: 15 Sept 2015

Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

DEL13-124 - Dover Coast Development SWMF C
Sediment Forebay Sizing Calculations
Using MOE - SWM Guidelines Criteria /2003

Settling

Dist = sqrt(r*Q_p/v_s) — r : 1 = L to w ratio — r = 4.96296 — Avg. 67m long x 13.5m wide

= **26.04 m** — Q_p = peak SWM outflow during quality storm — Q_p = 0.0410

OK < forebay length (67m) — v_s = settling velocity for 0.15 mm particles (m/s) — v_s = 0.0003

Dispersion Length

y = total depth of forebay from permanent pool (m) — y = 1.25

Dist = 8Q/dv — Q = 10 yr max inlet flow (m^3/s) — Q = 1.165 — (from SWMM5 model)

= 24.85 m — d = depth of perm pool in forebay (m) — d = 0.75 — (assume sediment accumulation

OK < forebay length (67m) — v_f = desired vel in forebay (m/s) — v_f = 0.5 — depthto 0.5m in forebay)

Velocity

v = Q/A — b = bottom width (avg) of forebay (m) — b = 20 — required

= **0.08 m/s** — Q = 10yr inlet flow (m^3/s) — Q = 1.165

A = cross-sectional area (m^2) — A = 15 — (based on 0.5m depth sediment in forebay section)

Therefore, **Velocity Target Satisfied** — Target velocity = 0.15 — V_{targ} = 0.15

q

Cleanout Frequency

Table 5.3 MOEE SWMPP Guidelines — A_{sew} = Contributing Sewer Area (ha) — A_{sew} = 16.232

Imp = Percent Impervious (%) — Imp = 20%

cleanout = Vol/(load*A_{sew}*effic) — load = Sediment Loading (m^3/ha/y) — load = 1.25 — (assumed higher loading)

= 27.0 years — effic = Removal Efficiency (%) — effic = 80%

Targ = Cleanout Frequency Target (years) — Targ = 10

Vol = Bottom 30% volume (m^3) — Vol = 426

Therefore, **Cleanout Frequency Satisfied**

Surface Area Check

SA_f/SA_{pp} = **29%** — SA_f = Forebay Surface Area (m^2) — SA_f = 2138

SA_{pp} = Total Permanent Pool Surface Area (m^2) — SA_{pp} = 7281

Therefore, **The forebay size is OK!** — Targ = Forebay size (as % of Permanent Pool Area) — Targ = 33%

Date: 15 September 2015
Prepared By: L.Murray, P.Eng.
Development Engineering (London) Ltd.

SWMF C Major Inflow Channel from St. to spillway

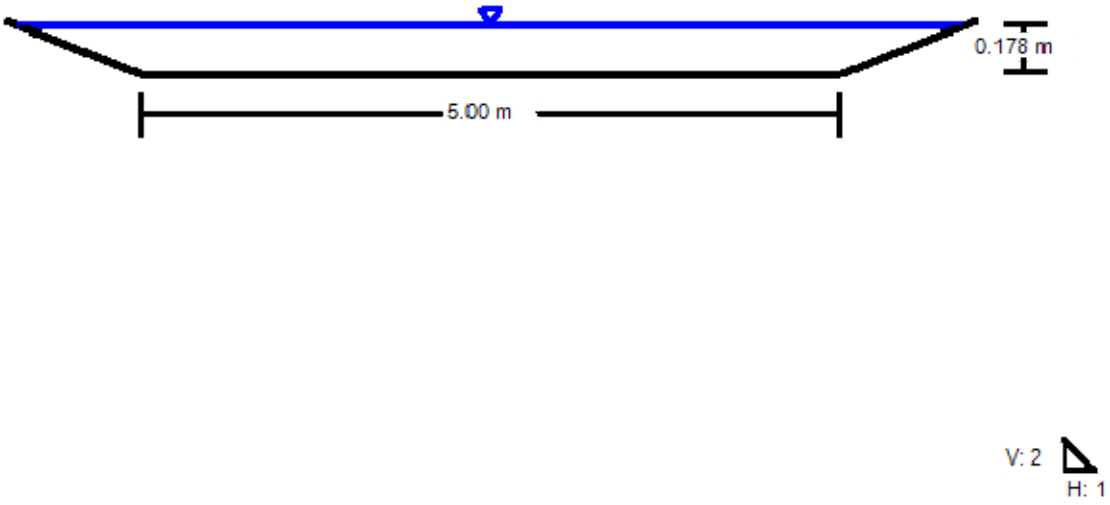
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.035	
Channel Slope	0.02000	m/m
Normal Depth	0.178	m
Left Side Slope	5.00	m/m (H:V)
Right Side Slope	5.00	m/m (H:V)
Bottom Width	5.00	m
Discharge	1210.00	L/s

Cross Section Image



SWMF C Major Inflow Spillway from Channel

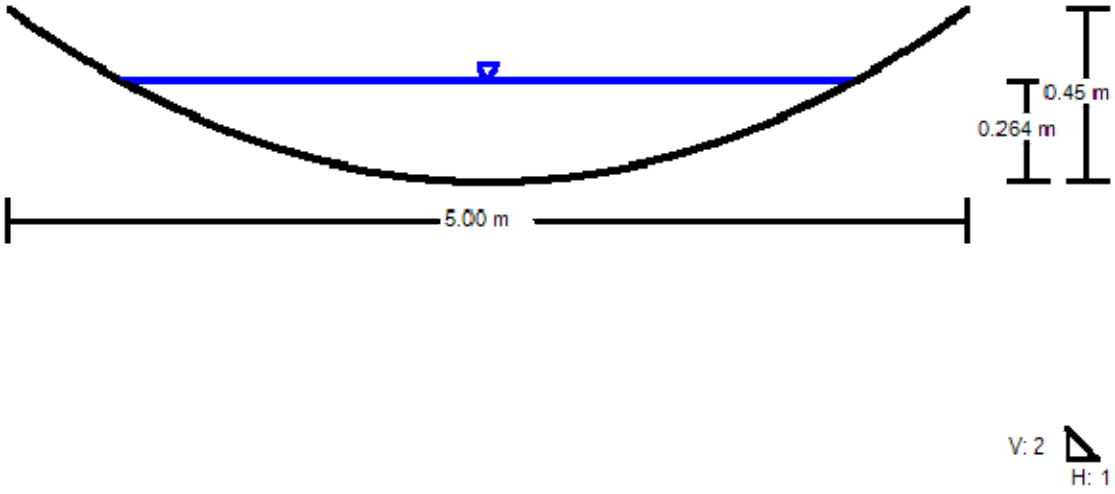
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.078	
Channel Slope	0.20000	m/m
Constructed Depth	0.45	m
Normal Depth	0.264	m
Constructed Top Width	5.00	m
Discharge	1200.00	L/s

Cross Section Image



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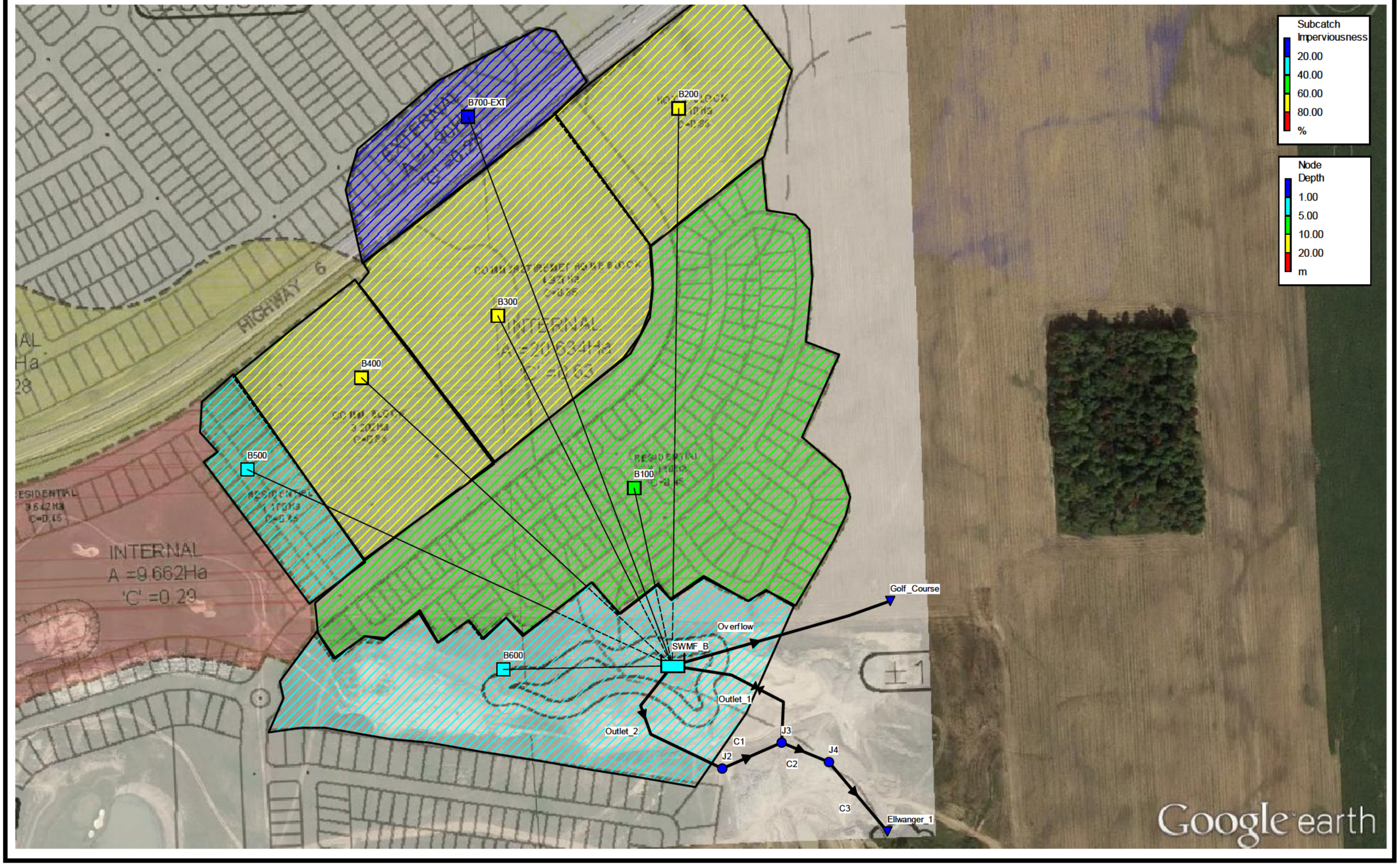
Appendix D

Post-Development SWMM5 Hydrologic Model Schematic & Output

SWMF 'B'

SWMF 'C'



DEL13-124 DOVER COAST DEVELOPMENT CONCEPT SWM REPORT

SWMF B POST DEVELOPMENT - SWMM5 MODEL SCHEMATIC

DEL13-124 Dover Coast, Norfolk - Pond B Post Development - 2yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond B Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-24-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 3.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.114        39.385
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.418        14.766
Surface Runoff ...........         0.673        23.790
Final Surface Storage ....         0.026         0.929
Continuity Error (%) .....        -0.253


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.673         6.728
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.650         6.504
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         2.396        23.961
Final Stored Volume ......         2.418        24.185
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     3.00 sec
Average Time Step           :     3.00 sec
Maximum Time Step           :     3.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
B100	39.38	0.00	0.00	16.03	22.54	2.16	531.81	0.572
B200	39.38	0.00	0.00	6.28	32.45	0.79	357.78	0.824
B300	39.38	0.00	0.00	6.35	32.37	1.41	599.97	0.822
B400	39.38	0.00	0.00	6.32	32.40	0.86	372.60	0.823
B500	39.39	0.00	0.00	16.62	21.93	0.30	95.40	0.557
B600	39.39	0.00	0.00	22.80	15.58	0.94	221.25	0.396
B700-EXT	39.38	0.00	0.00	23.54	14.72	0.28	52.85	0.374

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J3	JUNCTION	0.07	0.23	188.58	0 04:37
J4	JUNCTION	0.09	0.30	188.25	0 04:40
J2	JUNCTION	0.02	0.15	188.58	0 04:37
Ellwanger_1	OUTFALL	0.00	0.00	187.45	0 00:00
Golf_Course	OUTFALL	0.00	0.00	188.40	0 00:00
SWMF_B	STORAGE	2.28	2.55	189.05	0 04:37

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J3	JUNCTION	0.00	122.89	0 04:37	0.000	6.505
J4	JUNCTION	0.00	122.89	0 04:37	0.000	6.504
J2	JUNCTION	0.00	0.36	0 01:41	0.000	0.001
Ellwanger_1	OUTFALL	0.00	122.87	0 04:40	0.000	6.504
Golf_Course	OUTFALL	0.00	0.00	0 00:00	0.000	0.000
SWMF_B	STORAGE	2230.32	2230.32	0 01:40	6.728	30.689

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary

****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SWMF_B	25.189	55	0	29.298	64	0 04:37	122.89

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Ellwanger_1	99.03	19.00	122.87	6.504
Golf_Course	0.00	0.00	0.00	0.000
System	49.51	19.00	122.87	6.504

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.36	0 01:41	0.04	0.00	0.43
C2	CONDUIT	122.89	0 04:37	1.28	0.40	0.46
Overflow	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	122.87	0 04:40	1.12	0.57	0.50
Outlet_2	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
Outlet_1	ORIFICE	122.89	0 04:37			0.93

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.00	0.70	0.00	0.30	0.00	0.00	0.00	0.00	0.0000
C2	1.00	0.00	0.00	0.00	0.04	0.02	0.00	0.94	0.97	0.0000
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.75	0.0000
Outlet_2	11.84	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 15:35:47 2015
Analysis ended on: Mon Sep 21 15:35:48 2015
Total elapsed time: 00:00:01

DEL13-124 Dover Coast, Norfolk - Pond B Post Development - 5yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond B Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-24-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 3.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.371        48.478
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.459        16.217
Surface Runoff ...........         0.890        31.482
Final Surface Storage ....         0.027         0.953
Continuity Error (%) .....        -0.359


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.890         8.904
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.867         8.666
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         2.396        23.961
Final Stored Volume ......         2.420        24.198
Continuity Error (%) .....         0.000


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     3.00 sec
Average Time Step           :     3.00 sec
Maximum Time Step           :     3.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
B100	48.48	0.00	0.00	17.48	30.20	2.89	828.59	0.623
B200	48.48	0.00	0.00	6.98	40.96	1.00	533.12	0.845
B300	48.48	0.00	0.00	7.04	40.87	1.78	900.91	0.843
B400	48.48	0.00	0.00	7.02	40.91	1.08	557.96	0.844
B500	48.48	0.00	0.00	18.39	29.33	0.40	151.03	0.605
B600	48.48	0.00	0.00	25.04	22.44	1.35	340.99	0.463
B700-EXT	48.48	0.00	0.00	26.00	21.35	0.41	85.55	0.440

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J3	JUNCTION	0.08	0.27	188.62	0 04:32
J4	JUNCTION	0.10	0.36	188.31	0 04:35
J2	JUNCTION	0.03	0.19	188.62	0 04:32
Ellwanger_1	OUTFALL	0.00	0.00	187.45	0 00:00
Golf_Course	OUTFALL	0.00	0.00	188.40	0 00:00
SWMF_B	STORAGE	2.30	2.65	189.15	0 04:32

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J3	JUNCTION	0.00	162.33	0 04:32	0.000	8.668
J4	JUNCTION	0.00	162.33	0 04:32	0.000	8.667
J2	JUNCTION	0.00	0.50	0 01:40	0.000	0.001
Ellwanger_1	OUTFALL	0.00	162.32	0 04:35	0.000	8.666
Golf_Course	OUTFALL	0.00	0.00	0 00:00	0.000	0.000
SWMF_B	STORAGE	3395.87	3395.87	0 01:40	8.903	32.864

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary

****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SWMF_B	25.438	56	0	30.903	68	0 04:32	162.33

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Ellwanger_1	99.05	25.32	162.32	8.666
Golf_Course	0.00	0.00	0.00	0.000
System	49.52	25.32	162.32	8.666

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.50	0 01:40	0.05	0.00	0.52
C2	CONDUIT	162.33	0 04:32	1.33	0.53	0.55
Overflow	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	162.32	0 04:35	1.21	0.75	0.60
Outlet_2	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
Outlet_1	ORIFICE	162.33	0 04:32			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.00	0.67	0.00	0.33	0.00	0.00	0.00	0.00	0.0000
C2	1.00	0.00	0.00	0.00	0.09	0.01	0.00	0.90	0.97	0.0000
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.75	0.0000
Outlet_2	11.84	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 15:44:02 2015
Analysis ended on: Mon Sep 21 15:44:03 2015
Total elapsed time: 00:00:01

DEL13-124 Dover Coast, Norfolk - Pond B Post Development - 10yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond B Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-24-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 3.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.586        56.083
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.490        17.322
Surface Runoff ...........         1.076        38.040
Final Surface Storage ....         0.027         0.942
Continuity Error (%) .....        -0.395


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.076        10.758
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.051        10.511
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         2.396        23.961
Final Stored Volume ......         2.421        24.208
Continuity Error (%) .....         0.001


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     3.00 sec
Average Time Step           :     3.00 sec
Maximum Time Step           :     3.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
B100	56.08	0.00	0.00	18.61	36.71	3.52	1041.87	0.655
B200	56.08	0.00	0.00	7.50	48.14	1.17	649.41	0.858
B300	56.08	0.00	0.00	7.56	48.04	2.09	1102.13	0.857
B400	56.08	0.00	0.00	7.54	48.08	1.27	681.49	0.857
B500	56.08	0.00	0.00	19.68	35.68	0.48	193.04	0.636
B600	56.08	0.00	0.00	26.75	28.40	1.71	426.57	0.506
B700-EXT	56.08	0.00	0.00	27.84	27.14	0.52	111.89	0.484

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J3	JUNCTION	0.09	0.30	188.65	0 04:32
J4	JUNCTION	0.11	0.40	188.35	0 04:35
J2	JUNCTION	0.03	0.22	188.65	0 04:32
Ellwanger_1	OUTFALL	0.00	0.00	187.45	0 00:00
Golf_Course	OUTFALL	0.00	0.00	188.40	0 00:00
SWMF_B	STORAGE	2.31	2.74	189.24	0 04:31

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J3	JUNCTION	0.00	188.40	0 04:31	0.000	10.513
J4	JUNCTION	0.00	188.40	0 04:32	0.000	10.511
J2	JUNCTION	0.00	0.61	0 01:41	0.000	0.001
Ellwanger_1	OUTFALL	0.00	188.39	0 04:35	0.000	10.511
Golf_Course	OUTFALL	0.00	0.00	0 00:00	0.000	0.000
SWMF_B	STORAGE	4203.52	4203.52	0 01:40	10.758	34.719

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary

****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SWMF_B	25.671	56	0	32.371	71	0 04:31	188.40

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Ellwanger_1	99.07	30.70	188.39	10.511
Golf_Course	0.00	0.00	0.00	0.000
System	49.54	30.70	188.39	10.511

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.61	0 01:41	0.06	0.00	0.58
C2	CONDUIT	188.40	0 04:32	1.34	0.62	0.62
Overflow	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	188.39	0 04:35	1.25	0.88	0.66
Outlet_2	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
Outlet_1	ORIFICE	188.40	0 04:31			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.00	0.64	0.00	0.35	0.00	0.00	0.00	0.00	0.0000
C2	1.00	0.00	0.00	0.00	0.11	0.01	0.00	0.87	0.96	0.0000
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.75	0.0000
Outlet_2	11.84	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Sep 21 15:42:56 2015
Analysis ended on: Mon Sep 21 15:42:57 2015
Total elapsed time: 00:00:01

DEL13-124 Dover Coast, Norfolk - Pond B Post Development - 25yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond B Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-24-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 3.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.867        66.023
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.529        18.688
Surface Runoff ...........         1.320        46.677
Final Surface Storage ....         0.027         0.945
Continuity Error (%) .....        -0.435


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.320        13.201
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.294        12.941
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         2.396        23.961
Final Stored Volume ......         2.422        24.220
Continuity Error (%) .....         0.001


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     3.00 sec
Average Time Step           :     3.00 sec
Maximum Time Step           :     3.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
B100	66.02	0.00	0.00	20.08	45.25	4.34	1314.23	0.685
B200	66.02	0.00	0.00	8.09	57.59	1.41	791.14	0.872
B300	66.02	0.00	0.00	8.15	57.48	2.50	1346.75	0.871
B400	66.02	0.00	0.00	8.13	57.52	1.52	831.76	0.871
B500	66.02	0.00	0.00	21.22	44.13	0.60	250.09	0.668
B600	66.02	0.00	0.00	28.85	36.25	2.18	538.62	0.549
B700-EXT	66.02	0.00	0.00	30.09	34.89	0.66	150.04	0.529

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J3	JUNCTION	0.10	0.36	188.71	0 04:29
J4	JUNCTION	0.13	0.54	188.49	0 04:34
J2	JUNCTION	0.04	0.28	188.71	0 04:28
Ellwanger_1	OUTFALL	0.00	0.00	187.45	0 00:00
Golf_Course	OUTFALL	0.00	0.00	188.40	0 00:00
SWMF_B	STORAGE	2.33	2.86	189.36	0 04:28

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J3	JUNCTION	0.00	246.56	0 04:28	0.000	12.943
J4	JUNCTION	0.00	246.56	0 04:29	0.000	12.941
J2	JUNCTION	0.00	28.73	0 04:28	0.000	0.170
Ellwanger_1	OUTFALL	0.00	246.23	0 04:35	0.000	12.941
Golf_Course	OUTFALL	0.00	0.00	0 00:00	0.000	0.000
SWMF_B	STORAGE	5218.91	5218.91	0 01:40	13.201	37.161

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary

****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SWMF_B	25.982	57	0	34.321	75	0 04:28	246.56

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Ellwanger_1	99.15	37.76	246.23	12.941
Golf_Course	0.00	0.00	0.00	0.000
System	49.58	37.76	246.23	12.941

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	28.73	0 04:28	0.24	0.14	0.71
C2	CONDUIT	246.56	0 04:29	1.36	0.81	0.81
Overflow	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	246.23	0 04:35	1.30	1.15	0.82
Outlet_2	CONDUIT	28.73	0 04:28	0.85	0.08	0.14
Outlet_1	ORIFICE	217.83	0 04:28			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.00	0.62	0.00	0.38	0.00	0.00	0.00	0.00	0.0000
C2	1.00	0.00	0.00	0.00	0.14	0.01	0.00	0.84	0.96	0.0000
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.75	0.0000
Outlet_2	11.84	0.97	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C3	0.01	0.01	0.01	2.38	0.01

Analysis begun on: Mon Sep 21 15:44:20 2015
Analysis ended on: Mon Sep 21 15:44:20 2015
Total elapsed time: < 1 sec

DEL13-124 Dover Coast, Norfolk - Pond B Post Development - 50yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond B Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-24-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 3.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         2.063        72.962
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.543        19.207
Surface Runoff ...........         1.504        53.171
Final Surface Storage ....         0.027         0.937
Continuity Error (%) .....        -0.485


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.504        15.038
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.477        14.772
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         2.396        23.961
Final Stored Volume ......         2.423        24.226
Continuity Error (%) .....         0.001


***************************
Time-Step Critical Elements
***************************
Link Outlet_2 (4.10%)


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     0.50 sec
Average Time Step           :     2.97 sec
Maximum Time Step           :     3.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
B100	72.96	0.00	0.00	20.56	51.78	4.96	1616.70	0.710
B200	72.96	0.00	0.00	8.40	64.31	1.57	947.32	0.881
B300	72.96	0.00	0.00	8.45	64.21	2.79	1619.06	0.880
B400	72.96	0.00	0.00	8.44	64.25	1.70	998.44	0.881
B500	72.96	0.00	0.00	21.97	50.39	0.68	310.45	0.691
B600	72.96	0.00	0.00	29.56	42.54	2.56	661.26	0.583
B700-EXT	72.96	0.00	0.00	31.07	40.86	0.78	190.39	0.560

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J3	JUNCTION	0.12	0.73	189.08	0 04:21
J4	JUNCTION	0.15	0.80	188.75	0 04:21
J2	JUNCTION	0.06	0.67	189.10	0 04:21
Ellwanger_1	OUTFALL	0.00	0.00	187.45	0 00:00
Golf_Course	OUTFALL	0.00	0.00	188.40	0 00:00
SWMF_B	STORAGE	2.35	2.93	189.43	0 04:21

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J3	JUNCTION	0.00	295.57	0 04:20	0.000	14.774
J4	JUNCTION	0.00	295.56	0 04:22	0.000	14.772
J2	JUNCTION	0.00	105.85	0 04:21	0.000	1.033
Ellwanger_1	OUTFALL	0.00	295.56	0 04:22	0.000	14.772
Golf_Course	OUTFALL	0.00	0.00	0 00:00	0.000	0.000
SWMF_B	STORAGE	6339.19	6339.19	0 01:40	15.038	38.998

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J4	JUNCTION	3.37	0.222	1.203

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SWMF_B	26.247	58	0	35.614	78	0 04:21	295.58

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Ellwanger_1	99.12	45.24	295.56	14.772
Golf_Course	0.00	0.00	0.00	0.000
System	49.56	45.24	295.56	14.772

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	105.85	0 04:21	0.67	0.51	1.00
C2	CONDUIT	295.56	0 04:22	1.37	0.97	1.00
Overflow	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	295.56	0 04:22	1.51	1.37	0.85
Outlet_2	CONDUIT	105.85	0 04:21	1.32	0.28	0.33
Outlet_1	ORIFICE	224.21	0 03:11			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.00	0.60	0.00	0.40	0.00	0.00	0.00	0.00	0.0000
C2	1.00	0.00	0.00	0.00	0.16	0.01	0.00	0.82	0.92	0.0000
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.75	0.0000
Outlet_2	11.84	0.94	0.00	0.00	0.00	0.00	0.00	0.06	0.07	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	2.90	2.90	2.90	0.01	0.01
C2	2.91	2.91	2.91	0.01	0.01
C3	0.01	0.01	0.01	4.72	0.01

```
Analysis begun on:  Mon Sep 21 15:45:30 2015
Analysis ended on:  Mon Sep 21 15:45:31 2015
Total elapsed time: 00:00:01
```

DEL13-124 Dover Coast, Norfolk - Pond B Post Development - 100yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond B Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-24-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 3.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         2.373        83.902
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.571        20.207
Surface Runoff ...........         1.785        63.132
Final Surface Storage ....         0.027         0.949
Continuity Error (%) .....        -0.461


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         1.785        17.855
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         1.758        17.579
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         2.396        23.961
Final Stored Volume ......         2.424        24.236
Continuity Error (%) .....         0.001


***************************
Time-Step Critical Elements
***************************
Link Outlet_2 (9.29%)


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
```

```
Minimum Time Step           :     0.52 sec
Average Time Step           :     2.90 sec
Maximum Time Step           :     3.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
B100	83.90	0.00	0.00	21.59	61.70	5.91	1878.74	0.735
B200	83.90	0.00	0.00	8.87	74.82	1.83	1066.77	0.892
B300	83.90	0.00	0.00	8.94	74.72	3.25	1827.43	0.891
B400	83.90	0.00	0.00	8.92	74.76	1.97	1125.87	0.891
B500	83.90	0.00	0.00	23.20	60.14	0.81	367.71	0.717
B600	83.90	0.00	0.00	31.06	51.98	3.13	770.84	0.620
B700-EXT	83.90	0.00	0.00	32.76	50.12	0.95	233.83	0.597

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J3	JUNCTION	0.17	1.10	189.45	0 04:20
J4	JUNCTION	0.20	1.07	189.02	0 04:20
J2	JUNCTION	0.12	1.12	189.55	0 04:20
Ellwanger_1	OUTFALL	0.00	0.00	187.45	0 00:00
Golf_Course	OUTFALL	0.00	0.00	188.40	0 00:00
SWMF_B	STORAGE	2.38	3.06	189.56	0 04:20

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J3	JUNCTION	0.00	339.80	0 04:19	0.000	17.581
J4	JUNCTION	0.00	339.80	0 04:21	0.000	17.579
J2	JUNCTION	0.00	234.88	0 04:19	0.000	3.640
Ellwanger_1	OUTFALL	0.00	339.80	0 04:21	0.000	17.579
Golf_Course	OUTFALL	0.00	0.00	0 00:00	0.000	0.000
SWMF_B	STORAGE	7266.35	7266.35	0 01:40	17.855	41.815

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J4	JUNCTION	6.06	0.490	0.935

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
SWMF_B	26.831	59	0	37.787	83	0 04:20	339.80

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
Ellwanger_1	99.19	60.58	339.80	17.579
Golf_Course	0.00	0.00	0.00	0.000
System	49.59	60.58	339.80	17.579

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	234.87	0 04:20	1.48	1.13	1.00
C2	CONDUIT	339.80	0 04:21	1.57	1.12	1.00
Overflow	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	339.80	0 04:21	1.69	1.58	0.88
Outlet_2	CONDUIT	234.88	0 04:19	1.66	0.62	0.66
Outlet_1	ORIFICE	226.57	0 02:26			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
C1	1.00	0.00	0.56	0.00	0.43	0.00	0.00	0.00	0.00	0.0000
C2	1.00	0.00	0.00	0.00	0.20	0.01	0.00	0.78	0.87	0.0000
Overflow	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.75	0.0000
Outlet_2	11.84	0.89	0.00	0.00	0.02	0.01	0.00	0.08	0.12	0.0000

****
Conduit Surcharge Summary
****

Conduit	Hours Full: Both Ends	Upstream	Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	5.72	5.72	5.72	2.37	2.37
C2	5.72	5.72	5.72	4.05	4.05
C3	0.01	0.01	0.01	7.11	0.01

```
Analysis begun on:  Mon Sep 21 15:46:29 2015
Analysis ended on:  Mon Sep 21 15:46:29 2015
Total elapsed time: < 1 sec
```

DEL13-124 DOVER COAST DEVELOPMENT CONCEPT SWM REPORT

SWMF C POST DEVELOPMENT - SWMM5 MODEL SCHEMATIC

DEL13-124 Dover Coast, Norfolk - Pond C Post Development 2yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond C Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-25-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 1.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         0.639        39.385
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.368        22.642
Surface Runoff ...........         0.254        15.657
Final Surface Storage ....         0.018         1.137
Continuity Error (%) .....        -0.127


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.254         2.541
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.248         2.476
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.960         9.605
Final Stored Volume ......         0.967         9.670
Continuity Error (%) .....         0.000


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.00 sec
```

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00
```

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
C100	39.38	0.00	0.00	15.50	22.96	0.84	266.69	0.583
C200	39.39	0.00	0.00	24.40	13.88	0.84	162.73	0.352
C300-EXT	39.38	0.00	0.00	24.99	13.24	0.87	171.99	0.336

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
J4	JUNCTION	0.04	0.14	188.44	0 05:17
J5	JUNCTION	0.03	0.12	187.73	0 05:17
J2	JUNCTION	0.00	0.00	188.63	0 00:00
J3	JUNCTION	0.04	0.13	188.59	0 05:16
SWMF_D	OUTFALL	0.04	0.12	187.47	0 05:17
SWMF_C	STORAGE	1.80	2.00	189.25	0 05:16

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr
J4	JUNCTION	0.00	42.76	0 05:16	0.000	2.476
J5	JUNCTION	0.00	42.76	0 05:17	0.000	2.476
J2	JUNCTION	0.00	0.00	0 00:00	0.000	0.000
J3	JUNCTION	0.00	42.76	0 05:16	0.000	2.476
SWMF_D	OUTFALL	0.00	42.76	0 05:17	0.000	2.476
SWMF_C	STORAGE	601.16	601.16	0 01:40	2.541	12.146

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS

SWMF_C	10.015	47	0	11.623	55	0	05:16	42.76	

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
SWMF_D	99.19	5.78	42.76	2.476
System	99.19	5.78	42.76	2.476

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
Outlet_2	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C1	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C3	CONDUIT	42.76	0 05:17	0.82	0.08	0.18
C4	CONDUIT	42.76	0 05:17	0.86	0.04	0.13
C2	CONDUIT	42.76	0 05:16	0.92	0.08	0.19
Outlet_1	ORIFICE	42.76	0 05:16			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	--- Fraction of Time in Flow Class ---- Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
Outlet_2	4.41	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.90	0.0000
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.77	0.0000
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.06	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 29 09:27:32 2015
Analysis ended on: Thu Oct 29 09:27:38 2015
Total elapsed time: 00:00:06

DEL13-124 Dover Coast, Norfolk - Pond C Post Development 5yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond C Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-25-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 1.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         0.787        48.478
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.405        24.974
Surface Runoff ...........         0.365        22.468
Final Surface Storage ....         0.018         1.120
Continuity Error (%) .....        -0.173


*************************        Volume         Volume
Flow Routing Continuity        hectare-m       10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.365         3.647
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.358         3.577
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.960         9.605
Final Stored Volume ......         0.967         9.675
Continuity Error (%) .....         0.000


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.00 sec
```

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


**************************
Subcatchment Runoff Summary
**************************

-----------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                mm         mm         mm         mm         mm  10^6 ltr      LPS
-----------------------------------------------------------------------------------------------------------
C100                     48.48       0.00       0.00      17.08      30.51        1.11   405.83   0.629
C200                     48.48       0.00       0.00      26.92      20.53        1.24   255.91   0.424
C300-EXT                 48.48       0.00       0.00      27.57      19.78        1.30   266.78   0.408


******************
Node Depth Summary
******************

-------------------------------------------------------------------
                              Average  Maximum  Maximum  Time of Max
                                Depth    Depth      HGL   Occurrence
Node                 Type      Meters   Meters   Meters  days hr:min
-------------------------------------------------------------------
J4                   JUNCTION    0.05     0.16   188.46     0  05:17
J5                   JUNCTION    0.04     0.14   187.75     0  05:18
J2                   JUNCTION    0.00     0.00   188.63     0  00:00
J3                   JUNCTION    0.04     0.15   188.61     0  05:17
SWMF_D               OUTFALL     0.04     0.14   187.49     0  05:18
SWMF_C               STORAGE     1.82     2.09   189.34     0  05:16


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------
                              Maximum  Maximum                  Lateral       Total
                              Lateral    Total  Time of Max      Inflow      Inflow
                               Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type         LPS      LPS  days hr:min    10^6 ltr    10^6 ltr
-------------------------------------------------------------------------------------
J4                   JUNCTION    0.00    57.01     0  05:17       0.000       3.577
J5                   JUNCTION    0.00    57.01     0  05:17       0.000       3.577
J2                   JUNCTION    0.00     0.00     0  00:00       0.000       0.000
J3                   JUNCTION    0.00    57.01     0  05:16       0.000       3.577
SWMF_D               OUTFALL     0.00    57.01     0  05:18       0.000       3.577
SWMF_C               STORAGE   928.10   928.10     0  01:40       3.647      13.252


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-----------------------------------------------------------------------------------------
                     Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                      Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit         1000 m3    Full  Loss       1000 m3    Full    days hr:min        LPS
```

SWMF_C	10.136	48	0	12.460	59	0	05:16	57.01	

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
SWMF_D	99.21	8.35	57.01	3.577
System	99.21	8.35	57.01	3.577

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
Outlet_2	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C1	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C3	CONDUIT	57.01	0	05:17	0.90	0.10	0.20
C4	CONDUIT	57.01	0	05:18	0.94	0.05	0.15
C2	CONDUIT	57.01	0	05:17	1.00	0.10	0.22
Outlet_1	ORIFICE	57.01	0	05:16			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
Outlet_2	4.41	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C1	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.90	0.0000
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.78	0.0000
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.05	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 29 09:28:28 2015
Analysis ended on: Thu Oct 29 09:28:35 2015
Total elapsed time: 00:00:07

DEL13-124 Dover Coast, Norfolk - Pond C Post Development 10yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond C Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-25-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 1.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         0.910        56.083
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.433        26.662
Surface Runoff ...........         0.461        28.394
Final Surface Storage ....         0.018         1.132
Continuity Error (%) .....        -0.188


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.461         4.609
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.453         4.535
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.960         9.605
Final Stored Volume ......         0.968         9.679
Continuity Error (%) .....         0.000


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.00 sec
```

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


**************************
Subcatchment Runoff Summary
**************************

-----------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                mm         mm         mm         mm         mm  10^6 ltr      LPS
-----------------------------------------------------------------------------------------------------------
C100                     56.08       0.00       0.00      18.24      36.99        1.35   501.06   0.660
C200                     56.08       0.00       0.00      28.72      26.34        1.59   326.75   0.470
C300-EXT                 56.08       0.00       0.00      29.45      25.52        1.68   338.21   0.455


******************
Node Depth Summary
******************

-------------------------------------------------------------------
                              Average  Maximum  Maximum  Time of Max
                                Depth    Depth      HGL   Occurrence
Node                 Type      Meters   Meters   Meters  days hr:min
-------------------------------------------------------------------
J4                   JUNCTION    0.06     0.18   188.48     0  05:18
J5                   JUNCTION    0.04     0.15   187.76     0  05:18
J2                   JUNCTION    0.00     0.00   188.63     0  00:00
J3                   JUNCTION    0.05     0.16   188.62     0  05:17
SWMF_D               OUTFALL     0.05     0.15   187.50     0  05:18
SWMF_C               STORAGE     1.83     2.18   189.43     0  05:17


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------
                              Maximum  Maximum                  Lateral       Total
                              Lateral    Total  Time of Max      Inflow      Inflow
                               Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type         LPS      LPS  days hr:min    10^6 ltr    10^6 ltr
-------------------------------------------------------------------------------------
J4                   JUNCTION    0.00    67.36     0  05:17       0.000       4.535
J5                   JUNCTION    0.00    67.36     0  05:18       0.000       4.535
J2                   JUNCTION    0.00     0.00     0  00:00       0.000       0.000
J3                   JUNCTION    0.00    67.36     0  05:17       0.000       4.535
SWMF_D               OUTFALL     0.00    67.36     0  05:18       0.000       4.535
SWMF_C               STORAGE  1165.49  1165.49     0  01:40       4.609      14.214


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-----------------------------------------------------------------------------------------------
                     Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                      Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit         1000 m3    Full  Loss       1000 m3    Full    days hr:min        LPS
```

SWMF_C	10.254	49	0	13.234	63	0	05:17	67.36	

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
SWMF_D	99.23	10.58	67.36	4.535
System	99.23	10.58	67.36	4.535

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
Outlet_2	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C1	CONDUIT	0.00	0	00:00	0.00	0.00	0.01
C3	CONDUIT	67.36	0	05:18	0.94	0.12	0.22
C4	CONDUIT	67.36	0	05:18	0.98	0.06	0.16
C2	CONDUIT	67.36	0	05:17	1.04	0.12	0.24
Outlet_1	ORIFICE	67.36	0	05:17			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
Outlet_2	4.41	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C1	1.00	0.95	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.89	0.0000
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.79	0.0000
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.04	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 29 09:31:09 2015
Analysis ended on: Thu Oct 29 09:31:15 2015
Total elapsed time: 00:00:06

DEL13-124 Dover Coast, Norfolk - Pond C Post Development 25yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond C Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-25-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 1.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.072        66.023
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.467        28.796
Surface Runoff ...........         0.588        36.242
Final Surface Storage ....         0.018         1.120
Continuity Error (%) .....        -0.205


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.588         5.883
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.580         5.804
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.960         9.605
Final Stored Volume ......         0.968         9.684
Continuity Error (%) .....         0.000


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.00 sec
```

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


**************************
Subcatchment Runoff Summary
**************************

-----------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                mm         mm         mm         mm         mm  10^6 ltr      LPS
-----------------------------------------------------------------------------------------------------------
C100                     66.02       0.00       0.00      19.72      45.52        1.66   617.46   0.690
C200                     66.02       0.00       0.00      30.97      34.02        2.05   425.18   0.515
C300-EXT                 66.02       0.00       0.00      31.83      33.13        2.18   437.21   0.502


******************
Node Depth Summary
******************

-------------------------------------------------------------------
                              Average  Maximum  Maximum  Time of Max
                                Depth    Depth      HGL   Occurrence
Node                 Type       Meters   Meters   Meters  days hr:min
-------------------------------------------------------------------
J4                   JUNCTION     0.06     0.19   188.49     0  05:19
J5                   JUNCTION     0.05     0.16   187.77     0  05:20
J2                   JUNCTION     0.00     0.00   188.63     0  05:19
J3                   JUNCTION     0.05     0.17   188.63     0  05:19
SWMF_D               OUTFALL      0.05     0.16   187.51     0  04:42
SWMF_C               STORAGE      1.85     2.31   189.56     0  05:19


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------
                              Maximum  Maximum                  Lateral       Total
                              Lateral    Total  Time of Max      Inflow      Inflow
                               Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type         LPS      LPS  days hr:min    10^6 ltr    10^6 ltr
-------------------------------------------------------------------------------------
J4                   JUNCTION    0.00    79.33     0  05:19       0.000       5.804
J5                   JUNCTION    0.00    79.33     0  05:20       0.000       5.804
J2                   JUNCTION    0.00     0.01     0  04:07       0.000       0.000
J3                   JUNCTION    0.00    79.33     0  05:19       0.000       5.804
SWMF_D               OUTFALL     0.00    79.33     0  05:20       0.000       5.804
SWMF_C               STORAGE  1479.13  1479.13     0  01:40       5.883      15.488


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


**********************
Node Flooding Summary
**********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-----------------------------------------------------------------------------------------
                     Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                      Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit         1000 m3    Full  Loss       1000 m3    Full    days hr:min        LPS
```

SWMF_C	10.428	49	0	14.313	68	0	05:19	79.33	

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
SWMF_D	99.30	13.53	79.33	5.804
System	99.30	13.53	79.33	5.804

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
Outlet_2	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C1	CONDUIT	0.01	0	04:07	0.01	0.00	0.03
C3	CONDUIT	79.33	0	05:20	0.99	0.14	0.24
C4	CONDUIT	79.33	0	05:20	1.03	0.07	0.18
C2	CONDUIT	79.33	0	05:19	1.10	0.15	0.26
Outlet_1	ORIFICE	79.33	0	05:19			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
Outlet_2	4.41	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C1	1.00	0.91	0.06	0.00	0.03	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.89	0.0000
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.81	0.0000
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.04	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 29 09:31:46 2015
Analysis ended on: Thu Oct 29 09:31:52 2015
Total elapsed time: 00:00:06

DEL13-124 Dover Coast, Norfolk - Pond C Post Development 50yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond C Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-25-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 1.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.184        72.962
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.480        29.572
Surface Runoff ...........         0.689        42.435
Final Surface Storage ....         0.018         1.120
Continuity Error (%) .....        -0.226


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------      ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.689         6.888
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.681         6.805
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.960         9.605
Final Stored Volume ......         0.969         9.688
Continuity Error (%) .....         0.000


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.00 sec
```

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


**************************
Subcatchment Runoff Summary
**************************

-----------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                mm         mm         mm         mm         mm  10^6 ltr      LPS
-----------------------------------------------------------------------------------------------------------
C100                     72.96       0.00       0.00      20.24      51.98        1.89   748.81   0.712
C200                     72.96       0.00       0.00      31.81      40.17        2.42   531.61   0.551
C300-EXT                 72.96       0.00       0.00      32.69      39.22        2.58   544.26   0.537


******************
Node Depth Summary
******************

-------------------------------------------------------------------
                              Average  Maximum  Maximum  Time of Max
                                Depth    Depth      HGL   Occurrence
Node                 Type       Meters   Meters   Meters  days hr:min
-------------------------------------------------------------------
J4                   JUNCTION     0.07     0.20   188.50     0  05:17
J5                   JUNCTION     0.05     0.17   187.78     0  05:18
J2                   JUNCTION     0.00     0.01   188.64     0  05:17
J3                   JUNCTION     0.06     0.18   188.64     0  05:17
SWMF_D               OUTFALL      0.05     0.17   187.52     0  05:18
SWMF_C               STORAGE      1.87     2.40   189.65     0  05:17


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------
                              Maximum  Maximum                  Lateral       Total
                              Lateral    Total  Time of Max      Inflow      Inflow
                               Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type         LPS      LPS  days hr:min    10^6 ltr    10^6 ltr
-------------------------------------------------------------------------------------
J4                   JUNCTION    0.00    87.26     0  05:17       0.000       6.805
J5                   JUNCTION    0.00    87.26     0  05:17       0.000       6.805
J2                   JUNCTION    0.00     0.01     0  03:11       0.000       0.000
J3                   JUNCTION    0.00    87.26     0  05:17       0.000       6.806
SWMF_D               OUTFALL     0.00    87.26     0  05:18       0.000       6.805
SWMF_C               STORAGE  1823.78  1823.78     0  01:40       6.888      16.493


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


**********************
Node Flooding Summary
**********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-----------------------------------------------------------------------------------------
                     Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                      Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit         1000 m3    Full  Loss       1000 m3    Full    days hr:min        LPS
```

SWMF_C	10.578	50	0	15.146	72	0	05:17	87.26

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
SWMF_D	99.27	15.87	87.26	6.805
System	99.27	15.87	87.26	6.805

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
Outlet_2	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
C1	CONDUIT	0.01	0 03:11	0.01	0.00	0.04
C3	CONDUIT	87.26	0 05:17	1.01	0.16	0.25
C4	CONDUIT	87.26	0 05:18	1.06	0.08	0.19
C2	CONDUIT	87.26	0 05:17	1.12	0.16	0.27
Outlet_1	ORIFICE	87.26	0 05:17			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
Outlet_2	4.41	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C1	1.00	0.89	0.05	0.00	0.06	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.89	0.0000
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.81	0.0000
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.03	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 29 09:32:19 2015
Analysis ended on: Thu Oct 29 09:32:25 2015
Total elapsed time: 00:00:06

DEL13-124 Dover Coast, Norfolk - Pond C Post Development 100yr Event

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

DEL13-124 Dover Coast, Norfolk - Pond C Post Development

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Starting Date ............ NOV-20-2009 00:00:00
Ending Date .............. NOV-25-2009 00:00:00
Antecedent Dry Days ...... 20.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 01:00:00
Routing Time Step ........ 1.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         1.362        83.902
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         0.505        31.119
Surface Runoff ...........         0.841        51.836
Final Surface Storage ....         0.018         1.129
Continuity Error (%) .....        -0.217


*************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.841         8.414
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         0.833         8.326
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.960         9.605
Final Stored Volume ......         0.969         9.693
Continuity Error (%) .....         0.000


**************************
Time-Step Critical Elements
**************************
None


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :     1.00 sec
```

```
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     2.00


**************************
Subcatchment Runoff Summary
**************************

-----------------------------------------------------------------------------------------------------------
                         Total      Total      Total      Total      Total       Total     Peak  Runoff
                        Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                mm         mm         mm         mm         mm  10^6 ltr      LPS
-----------------------------------------------------------------------------------------------------------
C100                     83.90       0.00       0.00      21.32      61.88        2.25   852.13   0.738
C200                     83.90       0.00       0.00      33.49      49.46        2.98   637.01   0.590
C300-EXT                 83.90       0.00       0.00      34.38      48.44        3.18   650.09   0.577


******************
Node Depth Summary
******************

-------------------------------------------------------------------
                              Average  Maximum  Maximum  Time of Max
                                Depth    Depth      HGL   Occurrence
Node                 Type      Meters   Meters   Meters  days hr:min
-------------------------------------------------------------------
J4                   JUNCTION    0.07     0.21   188.51     0  05:18
J5                   JUNCTION    0.06     0.18   187.79     0  05:18
J2                   JUNCTION    0.00     0.02   188.65     0  05:17
J3                   JUNCTION    0.07     0.19   188.65     0  05:17
SWMF_D               OUTFALL     0.06     0.18   187.53     0  05:18
SWMF_C               STORAGE     1.90     2.54   189.79     0  05:17


******************
Node Inflow Summary
******************

-------------------------------------------------------------------------------------
                              Maximum  Maximum                  Lateral       Total
                              Lateral    Total  Time of Max      Inflow      Inflow
                               Inflow   Inflow   Occurrence      Volume      Volume
Node                 Type         LPS      LPS  days hr:min    10^6 ltr    10^6 ltr
-------------------------------------------------------------------------------------
J4                   JUNCTION    0.00    98.34     0  05:18       0.000       8.326
J5                   JUNCTION    0.00    98.34     0  05:18       0.000       8.326
J2                   JUNCTION    0.00     0.01     0  02:35       0.000       0.000
J3                   JUNCTION    0.00    98.34     0  05:17       0.000       8.326
SWMF_D               OUTFALL     0.00    98.34     0  05:18       0.000       8.326
SWMF_C               STORAGE  2138.17  2138.17     0  01:40       8.414      18.019


**********************
Node Surcharge Summary
**********************

No nodes were surcharged.


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

-----------------------------------------------------------------------------------------
                     Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                      Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit         1000 m3    Full  Loss       1000 m3    Full    days hr:min        LPS
```

SWMF_C	10.828	51	0	16.475	78	0	05:17	98.34

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow LPS	Max. Flow LPS	Total Volume 10^6 ltr
SWMF_D	99.31	19.41	98.34	8.326
System	99.31	19.41	98.34	8.326

****
Link Flow Summary
****

Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
Outlet_2	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
C1	CONDUIT	0.01	0	02:35	0.01	0.00	0.06
C3	CONDUIT	98.34	0	05:18	1.05	0.18	0.26
C4	CONDUIT	98.34	0	05:18	1.10	0.09	0.20
C2	CONDUIT	98.34	0	05:18	1.16	0.18	0.29
Outlet_1	ORIFICE	98.34	0	05:17			1.00

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Avg. Froude Number	Avg. Flow Change
Outlet_2	4.41	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0000
C1	1.00	0.85	0.05	0.00	0.10	0.00	0.00	0.00	0.00	0.0000
C3	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.88	0.0000
C4	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.83	0.0000
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.02	0.0000

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 29 09:32:51 2015
Analysis ended on: Thu Oct 29 09:32:57 2015
Total elapsed time: 00:00:06

Appendix B

Sanitary Calculations

Revera Long-Term Care (LTC) Facility

Dover Coast, Port Dover, Ontario
Project No: 44661-100
Date: January 2022
Design By: RNC

Preliminary Sanitary Demand Calculations

Location	Long-Term Care						
	Units (ea)	Population Density (1 persons/bedroom) [1]	Population (persons)	Average Demand (L/s)	Average Demand (m^3/day)	Peak Flow (excluding infiltration) (L/s)	Total Sanitary Demand (L/s)
Long-Term Care Units 1 Bed	128	1	128	0.444	38.4		
Staff [3]	-	-	64	0.222	19.20		
Totals	**128**		**192**	**0.67**	**57.6**	**2.77**	**3.33**

Sanitary Demand		
Long-Term Care Daily Demands [2]	300	L/cap/day
	0.0035	L/cap/sec
Peak Flow [4]		
P (population)	0.192	thousands people
M (ratio of peak flow to average flow)	4.15	
Total Average Demand	0.67	l/s
I (infiltration allowance, 0.28 l/s/ha)	0.56	l/s
A (area, ha)	2	ha

Note 1: Population taken from site plan by MMMC Architects dated 2022/01/10
Note 2: Long-Term Care sanitary sewage flow based on Dover Coast Development Plan (2017)
Note 3: Staff population assumed to be 2 residents to every 1 staff
Note 4: Total Sanitary Peak Flow Demand calculations based on Norfo k Desgin Criteria Section 9 (2017)

Revera Port Dover

Norfolk County

City File No. n/a

MTE Project No. 44661-100

Date: February 17, 2022

Designed By: RNC

Checked By: GPB

File: Q:\44661\100\SAN\44661-100 Sanitary Calculations.xlsx

SANITARY SEWER DESIGN SHEET

ENGINEERING SERVICES

Drainage Area Plan No.: M2 (Dover Coast Developments)

DESIGN PARAMETERS

Design Flow

Design flow factor 300 L/c/d

Infiltration Factor: 0.6 L/s/ha

Mannings n: 0.015 dia < 600mm

0.013 dia ≥ 600mm

Min Velocity: 0.75 m/s

Max Velocity: 4.6 m/s

Peaking Factor

$$\text{PEAKING FACTOR (M)} = 1 + \frac{14}{4 + \sqrt{P}}$$

Max Peaking factor 5

Min Peaking Factor 2

MTE

LOCATION				SANITARY FLOW										DESIGN							
														Existing Sanitary Sewer Design Capacity					Actual	%	
Area No.	Street Name	From MH	To MH	Pop. Density [per/ha]	Incremental Area [ha]	Cumulative Area [ha]	Population Increment [per]	Cumulative Population [per]	Peaking Factor M	Average Flow l/s	Peak Flow l/s	Infil-tration l/s	Total Flow l/s	Diameter [mm]	Material n=0.015	Grade %	Capacity l/s	Velocity m/s	Velocity m/s	Pipe Full	Remarks
	SUBJECT SITE (PROPOSED DEVELOPMENT)	STUB	MH3A	-	2.00	2.00	192	192	4.15	0.667	2.77	0.56	3.33	200	PVC	0.40%	18.26	0.5745	0.4366	18%	
		MH3A	MH2A	-	0.00	2.00	0	192	4.15	0.67	2.77	0.56	3.33	200	PVC	0.40%	18.26	0.5745	0.4366	18%	
		MH2A	MH1A	-	0.00	2.00	0	192	4.15	0.67	2.77	0.56	3.33	200	PVC	0.40%	18.26	0.5745	0.4366	18%	

EXISTING SERVICE	DRAWING #, USE	DATE	AS CONSTRUCTED SERVICE	COMPLETION

No.	REVISIONS	DATE	CONSULTANT
1	FIRST SUBMISSION TO COUNTY	MARCH 06/15	DE(L)L
2	SECOND SUBMISSION TO COUNTY	OCT. 29/15	DE(L)L
3	REVISED PER COUNTY COMMENTS	JUNE 01/16	DE(L)L
4	ISSUED FOR APPROVAL	OCT. 14/16	DE(L)L
5	ADDED MEDICAL CENTRE	JUNE 20/2017	DE(L)L

FILE: DEL13-124 MASTER SERVICING.DWG

development engineering (London) Limited
CONSULTING CIVIL ENGINEERS
Consulting Civil Engineers
41 Adelaide St. N., Unit 71
London, Ontario N6B 3P4
Phone (519) 672-8310
Fax (519) 672-4182
e-mail: deveng@deveng.net

LICENSED PROFESSIONAL ENGINEER L.R. MURRAY 100142449 PROVINCE OF ONTARIO 27 Jul '17

Norfolk COUNTY

SCALE 1:3000

DOVER COAST – MUNICIPAL WORKS

PORT DOVER, ONTARIO

MASTER SANITARY AREA PLAN

PROJECT No. DEL13-124

SHEET No. M2

THE FOLLOWING POPULATION ALLOWANCES HAVE BEEN USED TO DESIGN THE SANITARY SEWERS:

RESIDENTIAL (EXISTING TOWN) =2.75 PEOPLE / UNIT
RESIDENTIAL (UNCERTAIN DEVELOPMENT) = 30 UNITS / HECTARE @ 2.75 PEOPLE / UNIT
RESIDENTIAL (DOVER COAST) = 1.8 PEOPLE / UNIT (SOUTH OF HWY. 5)
RESIDENTIAL (DOVER COAST) = 2.75 PEOPLE / UNIT (NORTH OF HWY. 5)
COMMERCIAL = 50 PEOPLE / HECTARE
PER CAPITA DESIGN SEWAGE (L / PERSON / DAY) = **300**

SANITARY SEWER DESIGN SHEET
NORFOLK COUNTY

DESIGN CRITERIA

SEWAGE = $\frac{300 \times M \times P/1000}{86\,400}$

INFILTRATION (DOVER COAST) = **0.13 L/s/ha**
INFILTRATION (EXISTING) = **0.28 L/s/ha**

PEAKING FACTOR (M) = $1 + \frac{14}{4 + \sqrt{P}}$

DATE: 42278.00
DESIGNED B JR/LM
CHECKED BY LM/JF

PROJECT FILE NO: DEL13-124

PROJECT NAME: DOVER COAST DEVELOPMENT
ULTIMATE BUILD OUT

LOCATION				AREA			POPULATION						SEWAGE FLOWS			SEWER DESIGN							PROFILE	
AREA No.	STREET	FROM MANHOLE	TO MANHOLE	NET OR GROSS	HECTARES	TOTAL HECTARES	PER HECTARE	PER LOT	NO. OF LOTS	DELTA POP.	TOTAL POP.	PEAKING FACTOR	INFILT L / s	SEWAGE L / s	Q TOTAL L / s	n	PIPE SIZE mm	SLOPE %	CAP L / s	VELOCITY m / s	LENGTH m	FALL IN SEWER	DROP IN MANHOLE	INVERT ELEVATION U.S.	INVERT ELEVATION D.S.
DOVER COAST - NORTH																								
F1	FUTURE				30.100	30.100	30	2.75		2493	2493	3.51	3.91	30.27	34.18	0.013	300	0.3	52.96	0.81				
F2	FUTURE				5.171	5.171	30	2.75		427	427	4.01	0.67	5.94	6.61	0.013	300	0.3	52.96	0.52				
F3	FUTURE				35.869	71.140	30	2.75		2959	5869	3.18	9.25	64.80	74.05	0.013	375	0.3	96.03	0.96				
DOVER COAST - SOUTH																								
A1 (HOTEL/COMM.)	DOVER COAST BLVD			N	2.210	2.210	120	(Rooms)		200	200	3.32	0.29	2.30	2.59	0.013	200	0.40	20.74	0.45				
A2 (COMMERCIAL)	DOVER COAST BLVD.			N	2.681	4.891	100.000	(Sq.Ft)		241	441	3.20	0.64	4.91	5.54	0.013	200	0.40	20.74	0.55				
	DOVER COAST BLVD.	SA35	SA34	N	0.000	4.891		1.80			441	4.00	0.64	6.13	6.77	0.013	250	0.40	37.61	0.59	54.8	0.219	0.030	190.55	189.33
	DOVER COAST BLVD.	SA34	SA33	N	0.000	4.891		1.80			441	4.00	0.64	6.13	6.77	0.013	250	0.40	37.61	0.59	50.5	0.202	0.030	189.30	189.10
	DOVER COAST BLVD.	SA33	SA32	N	0.000	4.891		1.80			441	4.00	0.64	6.13	6.77	0.013	250	0.40	37.61	0.59	43.2	0.173	0.030	189.07	189.90
	DOVER COAST BLVD.	SA32	SA31	N	0.000	4.891		1.80			441	4.00	0.64	6.13	6.77	0.013	250	0.40	37.61	0.59	40.4	0.162	0.030	189.87	189.71
A3 (Residential)	DOVER COAST BLVD	INSP.MH44	SA31	N	1.740	1.740		1.80	112	202	202	4.15	0.23	2.00	3.13	0.013	200	0.40	20.74	0.48				189.75	189.71
A3a (Medical Centre)	BARRETT COURT	INSP.MH49	SA48		0.990	0.990			*	18	18	4.40	0.13	0.28	0.40	0.013	200	0.40	20.74	0.00	17.2	0.069	0.030	189.97	189.90
	BARRETT COURT	SA48	SA47		0.000	0.990				0	18	4.40	0.13	0.28	0.40	0.013	200	0.40	20.74	0.00	65.6	0.262	0.030	189.87	189.61
	BARRETT COURT	SA47	SA30		0.000	0.990				0	18	4.40	0.13	0.28	0.40	0.013	200	0.40	20.74	0.00	70.9	0.284	0.030	189.58	189.30
	DOVER COAST BLVD.	SA31	SA30	N	0.000	6.631		1.80			643	3.92	0.86	8.74	9.60	0.013	250	0.39	37.14	0.62	94.5	0.369	0.030	189.68	189.30
	DOVER COAST BLVD.	SA30	SA29	N	0.000	6.631		1.80			643	3.92	0.86	8.74	9.60	0.013	250	0.40	37.61	0.63	78.7	0.315	0.030	189.27	188.95
A4 (RETIREMENT RESIDENCE)	DOVER COAST BLVD	INSP.MH43	SA29	N	2.618	2.618	160	(Beds)		240	240	4.12	0.34	3.43	3.77	0.013	200	0.40	20.74	0.51				189.04	188.99
	DOVER COAST BLVD	SA29	SA28	N	0.000	9.249		1.80			883	3.83	1.20	11.75	12.96	0.013	250	0.40	37.61	0.68	100.0	0.400	0.030	188.92	188.52
A31	SCHOONER DRIVE	SA37	SA36	N	0.682	0.682		1.80	13	23	23	4.37	0.09	0.36	0.44	0.013	200	0.70	27.44	0.22	96.4	0.668	0.030	189.92	189.25
A30	SCHOONER DRIVE	SA36	SA28A	N	0.675	1.357		1.80	11	20	43	4.33	0.18	0.65	0.83	0.013	200	0.70	27.44	0.30	83.2	0.582	0.030	189.22	188.64
	SCHOONER DRIVE	SA28A	SA28	N		1.357					43	4.33	0.18	0.65	0.83	0.013	200	0.70	27.44	0.30	12.5	0.088	0.030	188.61	188.52
A5	DOVER COAST BLVD.	SA28	SA27	N	9.249	19.855		1.80	142	256	1182	3.75	2.58	15.40	17.98	0.013	250	0.25	29.73	0.65	52.5	0.131	0.030	188.49	188.36
A6	DOVER COAST BLVD.	SA27	SA26	N	0.286	20.141					1182	3.75	2.62	15.40	18.01	0.013	250	0.25	29.73	0.65	46.3	0.116	0.030	188.33	188.22
A7 (PRIVATE CLUBHOUSE)	DOVER COAST BLVD	SA26	SA25	N	1.515	21.656				60	1242	3.74	2.82	16.11	18.93	0.013	250	0.25	29.73	0.65	45.8	0.115	0.030	188.17	188.06
	DOVER COAST BLVD.	SA25	SA24	N		21.656					1242	3.74	2.82	16.11	18.93	0.013	250	0.25	29.73	0.65	46.7	0.117	0.030	188.04	187.93
A8	DOVER COAST BLVD.	SA24	SA23	N	8.934	30.590		1.80	207	372	1614	3.66	3.98	20.49	24.46	0.013	250	0.25	29.73	0.68	71.7	0.179	0.030	187.90	187.72
	DOVER COAST BLVD.	SA23	SA22	N		30.590					1614	3.66	3.98	20.49	24.46	0.013	250	0.25	29.73	0.68	73.6	0.184	0.030	187.69	187.50
	DOVER COAST BLVD.	SA22	SA21	N		30.590					1614	3.66	3.98	20.49	24.46	0.013	250	0.25	29.73	0.68	77.1	0.193	0.030	187.47	187.28
A9	DOVER COAST BLVD.	SA21	SA20	N	0.405	30.995					1614	3.66	4.03	20.49	24.52	0.013	250	0.25	29.73	0.68	100.0	0.250	0.030	187.25	187.01
A10	NEW LAKESHORE	SA20	SA19	N	1.648	32.643		2.75	6	17	1630	3.65	4.24	20.68	24.92	0.013	300	0.25	48.35	0.69	40.2	0.101	0.030	186.98	186.87
	NEW LAKESHORE	SA19	EX. SANMH	N		32.643					1630	3.65	4.49	20.68	25.17	0.013	300	0.25	49.35	0.69	73.9	0.185	0.030	186.64	186.59
A11	NEW LAKESHORE			N	0.917	33.560		2.75	3	8	1638	3.65	4.75	20.77	25.52	0.013	300	0.22	45.36	0.67	66.2	0.148	0.030		
A12	NEW LAKESHORE			N	0.890	34.450		2.75	3	8	1647	3.65	5.00	20.87	25.87	0.013	300	0.23	46.37	0.68	61.6	0.141	0.030		
A13	NEW LAKESHORE			N	0.864	35.314		2.75	3	8	1655	3.65	5.24	20.96	26.20	0.013	300	0.24	47.37	0.70	63.3	0.152	0.030		
A14	REGATTA DRIVE	SA18	SA17	N	0.564	0.564		1.80	9	16	16	4.39	0.07	0.25	0.32	0.013	200	0.40	20.74	0.17	56.4	0.226	0.030	188.70	188.52
A15	REGATTA DRIVE	SA17	SA16	N	0.553	1.117		1.80	11	20	36	4.34	0.15	0.54	0.69	0.013	200	0.40	20.74	0.24	66.1	0.264	0.030	188.49	188.23
A16	REGATTA DRIVE	SA16	SA15	N	0.509	1.626		1.80	10	18	54	4.31	0.21	0.81	1.02	0.013	200	0.40	20.74	0.30	67.2	0.269	0.030	188.20	187.93
A17	REGATTA DRIVE	SA15	SA14	N	0.272	1.898		1.80	5	9	63	4.29	0.25	0.94	1.19	0.013	200	0.40	20.74	0.32	36.3	0.145	0.030	187.90	187.75
A18	REGATTA DRIVE	SA14	SA13	N	0.173	2.071		1.80	3	5	68	4.29	0.27	1.02	1.29	0.013	200	0.40	20.74	0.33	29.8	0.120	0.030	187.72	187.60
A19	REGATTA DRIVE	SA13	EX. SANMH	N	0.110	2.181		1.80	1	2	70	4.28	0.28	1.04	1.33	0.013	200	0.40	20.74	0.34				187.57	187.40
A20	VIKING LANE			N	0.600	0.600		1.80	10	18	18	4.39	0.08	0.27	0.35	0.013	200	0.40	20.74	0.17					
A21	REGATTA DRIVE			N	0.580	3.361		1.80	9	16	104	4.24	0.44	1.54	1.97	0.013	200	0.40	20.74	0.41					
A22	GAMBLE			N	0.460	0.460		1.80	9	16	16	4.39	0.06	0.25	0.31	0.013	200	0.40	20.74	0.16					
A23	REGATTA DRIVE			N	0.580	4.401		1.80	9	16	137	4.20	0.57	2.00	2.57	0.013	200	0.40	20.74	0.45					
A24	SCHOONER			N	0.480	0.480		1.80	7	13	13	4.40	0.06	0.19	0.26	0.013	200	0.40	20.74	0.15					
A25	REGATTA DRIVE			N	0.150	5.041		1.80	2	4	153	4.19	0.66	2.22	2.88	0.013	200	0.40	20.74	0.47					
A26	REGATTA DRIVE			N	0.100	5.141		1.80	0	0	153	4.19	0.67	2.22	2.89	0.013	200	0.40	20.74	0.47					
A27	NEW LAKESHORE			N	1.031	41.486		2.75	5	14	1622	3.62	6.20	22.88	29.07	0.013	300	0.27	50.26	0.75					
A28	NEW LAKESHORE			N	1.709	43.195		2.75	6	17	1638	3.61	6.57	23.07	29.74	0.013	300	0.21	44.31	0.68					
A29	NEW LAKESHORE			N	0.092	43.287		2.75	0	0	1638	3.61	6.70	23.07	29.77	0.013	300	0.25	48.35	0.73					
A32	SCHOONER DRIVE		SA12	N	0.108	0.108		1.80	0	0	0	4.50	0.01	0.00	0.01										
A33	SCHOONER DRIVE	SA12	SA11	N	0.333	0.441		1.80	4	7	7	4.43	0.06	0.11	0.17	0.013	200	0.70	27.44	0.16	67.2	0.470	0.030	190.48	190.01
A34	SCHOONER DRIVE	SA11	SA10	N	0.333	0.774		1.80	4	7	14	4.40	0.10	0.22	0.32	0.013	200	0.60	25.40	0.19	67.0	0.402	0.030	189.98	189.58
A35	SCHOONER DRIVE	SA10	SA9	N	0.506	1.280		1.80	6	11	25	4.37	0.17	0.38	0.55	0.013	200	0.40	20.74	0.21	100.0	0.400	0.030	189.55	189.15
A36	SCHOONER DRIVE	SA9	SA7	N	0.500	1.780		1.80	6	11	36	4.34	0.23	0.54	0.77	0.013	200	0.41	21.00	0.26	100.0	0.410	0.030	189.12	188.17
A37	SCHOONER DRIVE	SA7	SA6	N	0.431	2.211		1.80	5	9	45	4.32	0.29	0.66	0.95	0.013	200	0.40	20.74	0.29	100.0	0.400	0.030	188.58	188.28
A38	SCHOONER DRIVE	SA6	SA5	N	0.171	2.382		1.80	1	2	47	4.32	0.31	0.70	1.01	0.013	200	0.38	20.22	0.29	23.7	0.090	0.030	188.25	188.16
A39	SCHOONER DRIVE	SA5	SA4	N	0.502	2.884		1.80	9	16	63	4.29	0.37	0.94	1.31	0.013	200	0.38	20.22	0.33	78.5	0.288	0.030	188.13	187.82
A40	SCHOONER DRIVE	SA4	EX.CAP	N	0.543	3.427		1.80	10	18	81	4.27	0.45	1.20	1.65	0.013	200	0.40	20.74	0.38	58.7	0.235	0.030	187.79	187.55
A41	SCHOONER DRIVE	EX.CAP	EX.SANMH	N	0.270	3.697		1.80	4	7	88	4.26	0.48	1.30	1.78	0.013	200	0.46	22.24	0.41	34.8	0.160	0.030	187.55	187.39
A42	VIKING			N	0.520	0.520		1.80	9	16	16	4.39	0.07	0.25	0.31	0.013	200	0.50	23.19	0.18	101.5	0.508			
A43	SCHOONER			N	0.570	4.787		1.80	8	14	119	4.22	0.62	1.74	2.36	0.013	200	0.50	23.19	0.47	63.6	0.318			
A44	GAMBLE			N	0.410	0.410		1.80	8	14	14	4.40	0.05	0.22	0.27	0.013	200	0.50	23.19	0.17	91.7	0.459			
A45	SCHOONER			N	0.430	0.430		1.80	7	13	13	4.40	0.06	0.19	0.25	0.013	200	0.50	23.19	0.16	69.9	0.350			
A46	SCHOONER			N	0.200	0.630		1.80	2	4	16	4.39	0.08	0.25	0.33	0.013	200	0.50	23.19	0.16	17.4	0.087			
A47	SCHOONER			N	0.580	1.210		1.80	9	16	32	4.35	0.16	0.49	0.65	0.013	200	0.50	23.19	0.25	65.7	0.329			
A48	BENSON			N	0.090	6.497		1.80	0	0	166	4.18	0.84	2.40	3.25	0.013	200	0.50	23.19	0.53	48.5	0.243			
	HIGHWAY 6			N	0.000	71.140		2.75	0	0	5869	3.18	9.25	64.80	74.05	0.013	375	0.25	87.66	0.99	53.4	0.134			
	HIGHWAY 6			N	0.000	71.140		2.75	0	0	5869	3.18	9.25	64.80	74.05	0.013	375	0.25	87.66	0.89	57.2	0.143			
	HIGHWAY 6			N	0.000	71.140		2.75	0	0	5869	3.18	9.25	64.80	74.05	0.013	375	0.25	87.66	0.89	100.0	0.250			
	HIGHWAY 6			N	0.000	71.140		2.75	0	0	5869	3.18	9.25	64.80	74.05	0.013	375	0.25	87.66	0.89	14.6	0.037			
A49	LAKEVIEW			N	0.341	71.481		2.75	2	6	5875	3.18	9.34	64.85	74.20	0.013	**375**	0.25	87.66	0.89	71.0	0.178			
A50	LAKEVIEW			N	0.231	71.712		2.75	2	6	5875	3.18	9.41	64.85	74.26	0.013	375	0.25	87.66	0.89	55.6	0.139			
A51	LAKEVIEW			N	1.105	72.817		2.75	11	30	5905	3.18	9.72	65.14	74.86	0.013	**375**	0.25	87.66	0.89	100.6	0.252			
A52	LAKEVIEW			N	0.947	73.764		2.75	10	28	5932	3.18	9.86	65.41	75.39	0.013	375	0.25	87.66	0.90	99.4	0.249			
A53	LAKEVIEW			N	0.945	81.206		2.75	8	22	6062	3.17	11.09	66.65	77.74	0.013	**375**	0.25	87.66	0.90	87.8	0.220	0.030		
A54	LAKEVIEW			N	0.807	82.013		2.75	8	22	6084	3.16	11.32	66.86	78.18	0.013	**375**	0.25	87.66	0.91	86.0	0.215	0.030		
A55	LAKEVIEW			N	1.208	1.208		2.75	13	36	36	4.34	0.34	0.54	0.88	0.013	200	0.60	25.40	0.30					
A56	NEW LAKESHORE			N	0.190	126.508		2.75		0	7958	3.05	18.41	84.35	102.76	0.013	**450**	0.22	133.72	0.93	106.9	0.235	0.030		
A57	HIGHWAY 6			N	0.552	0.552		2.75	4	11	11	4.41	0.15	0.17	0.32	0.013	200	0.40	20.74	0.17					
A58	MARDON (N)			N	5.617	6.169		2.75	53	146	157	4.18	1.73	2.28	4.00	0.013	200	0.40	20.74	0.51					
A59	MARDON (S)			N	1.247	1.247		2.75	13	36	36	4.34	0.35	0.54	0.89	0.013	200	0.40	20.74	0.28					
A60	NEW LAKESHORE			N	0.183	134.107		2.75		0	8151	3.04	20.54	86.10	106.64	0.013	**450**	0.22	133.72	0.93	87.2	0.192	0.030		
A61	HIGHWAY 6			N	2.032	2.032		2.75			0	4.50	0.57	0.00	0.57	0.013	200	0.40	20.74	0.22					
A62	WOODHOUSE (N)			N	5.381	7.413		2.75	39	107	107	4.24	2.08	1.58	3.65	0.013	200	0.40	20.74	0.50					
A63	WOODHOUSE (S)			N	1.436	1.436		2.75	12	33	33	4.35	0.40	0.50	0.90	0.013	200	0.40	20.74	0.28					
A64	NEW LAKESHORE			N	0.174	142.966		2.75		0	8291	3.04	23.01	87.37	110.39	0.013	**450**	0.25	142.55	0.99	87.6	0.219	0.030		
A65	NEW LAKESHORE			N	3.755	146.711		2.75		0	8291	3.04	24.07	87.37	111.44	0.013	**450**	0.25	142.55	0.99	99.0	0.233	0.030		
A66	NEW LAKESHORE			N	2.372	149.083		2.75	30	83	8373	3.03	24.73	88.12	112.85	0.013	**450**	0.25	142.55	1.00	125.4	0.314	0.030		

MEDICAL CENTRE
*

EXISTING SERVICES	DRAWING #, SOURCE	DATE	AS CONSTRUCTED SERVICES	COMPLETION

DETAILS	No.	REVISIONS	DATE	CONSULTANT
DESIGN BY JR	1	FIRST SUBMISSION TO COUNTY	MARCH 06/15	DE(L)L
DRAWN BY JR	2	SECOND SUBMISSION TO COUNTY	OCT. 29/15	DE(L)L
CHECKED BY JF	3	REVISED PER COUNTY COMMENTS	JUNE 01/16	DE(L)L
F.BK. 1054	4	ISSUED FOR APPROVAL	OCT. 14/16	DE(L)L
	5	ADDED MEDICAL CENTRE	JUNE 20/2017	DE(L)L
FILE: DEL13-124 MASTER SERVICING.DWG				

CONSULTANT OR DIVISION

Consulting Civil Engineers
41 Adelaide St. N., Unit 71
London, Ontario N6B 3P4
Phone (519) 672-8310
Fax (519) 672-4182
e-mail: deveng@deveng.net

development engineering (London) Limited
CONSULTING CIVIL ENGINEERS

ENGINEER'S STAMP
LICENSED PROFESSIONAL ENGINEER
L.R. MURRAY
100142449
15 Jun '17
PROVINCE OF ONTARIO

Norfolk COUNTY

SCALE

TITLE
DOVER COAST – MUNICIPAL WORKS
PORT DOVER, ONTARIO

MASTER SANITARY DESIGN SHEET

PROJECT No. DEL13-124
SHEET No. M10
PLAN FILE No.

DEL13-124 Master Servicing.dwg
jcourtland Jun.20/17-11:59am

Appendix C

Water Calculations

Revera Long-Term Care (LTC) Facility

Dover Coast, Port Dover, Ontario
Project No: 44661-100
Date: January 2022
By: RNC

Preliminary Water Demand Calculations

Location	Long-Term Care						
	Units (ea)	Population Density (1 persons/bedroom)	Population (persons) [3]	Avg. Demand (L/s)	Avg. Demand (m^3/day)	Max Day Demand (L/s)	Peak Hour Demand (L/s)
Long-Term Care Units 1 Bed	128	1	128	0.6667	57.6	1.5	2.7
Staff [3]	-	-	64	0.3333	28.8	0.8	1.3
Totals	**128**		**192**	**1.00**	**86.4**	**2.25**	**4.00**

Water Demand		
Institutional Avg Daily Demands [1]	450	L/person/day
	0.0052	L/person/sec
Peak Hour Factor [2]		
PF=	4.00	
Max Day Factor [2]		
MDF=	2.25	

Note 1: Water Demands taken from Norfolk Design Criteria Section 9
Note 2: Peak Hour Factor and Max Day Factor taken from Norfolk Design Criteria
Note 3: Staff population assumed to be 2 residents to every 1 staff

Revera Long-Term Care (LTC) Facility

PRELIMINARY FIRE FLOW ANALYSIS

Dover Coast, Port Dover, Ontario

Project Number: 44661-100

Date: 2/8/2023

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 2020).

An estimate of the fire flow required is given by the following formula:

where:

RFF = the required fire flow in litres per minute

C = coefficient related to the type of construction
- = 1.5 for **Type V** Wood Frame Construction
- = 0.8 for **Type IV-A** Mass Timber Construction
- = 0.9 for **Type IV-B** Mass Timber Construction
- = 1.0 for **Type IV-C** Mass Timber Construction
- = 1.5 for **Type IV-D** Mass Timber Construction
- = 1.0 for **Type III** Ordinary Construction
- = 0.8 for **Type II** Noncombustible Costruction
- = 0.6 for **Type I** Fire Resistive Construction

A = Total Floor Area from largest sub-divided floor area from site plan as per definition below from FUS 2020:

> **Subdividing Buildings (Vertical Firewalls)**
>
> In determining Total Effective Area, a building may be subdivided if a vertical firewall with a fire-resistance rating of not less than 2 hours, and meeting the requirements of the National Building Code exists. If the firewall is properly constructed and all openings are properly protected in accordance with the NBC, then the boundary can be treated as protected with no exposure charge.

Floor area was calculated as followed:
A = Worst case scenario, Building seperated into three sections due to 2hr Fire Wall = 1150 m2 x 2 floors = 2300m2

Adjustments to the calculated fire flow can be made based on occupancy, sprinkler protection and exposure to other structures. The table below summarizes the adjustments made to the basic fire flow demand.

			(1)		(2)		(3)		(4)		**Final Adjusted**		
Building	Area "A"	C	Fire Flow "RFF"		Occupancy		Sprinkler		Exposure		**Fire Flow**		
	(m^2)	(Type V)	(l/min)	(l/s)	%	Adjusted Fire Flow (L/min)	%	Adjustment (L/min)	%	Adjustment (L/min)	**(L/min)**	**Rounded (L/min)**	**(L/s)**
Proposed Building	2,300	1.5	15,800	263.3	-15	13,430	-50	-6,715	0	0	6,715	7,000	**116.7**

(2) Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

-30% - Automatic sprinkler protection designed and installed in accordance with NFPA 13

-10% - Water supply is standard for both the system and Fire Department hose line

-10% - Fully supervised system

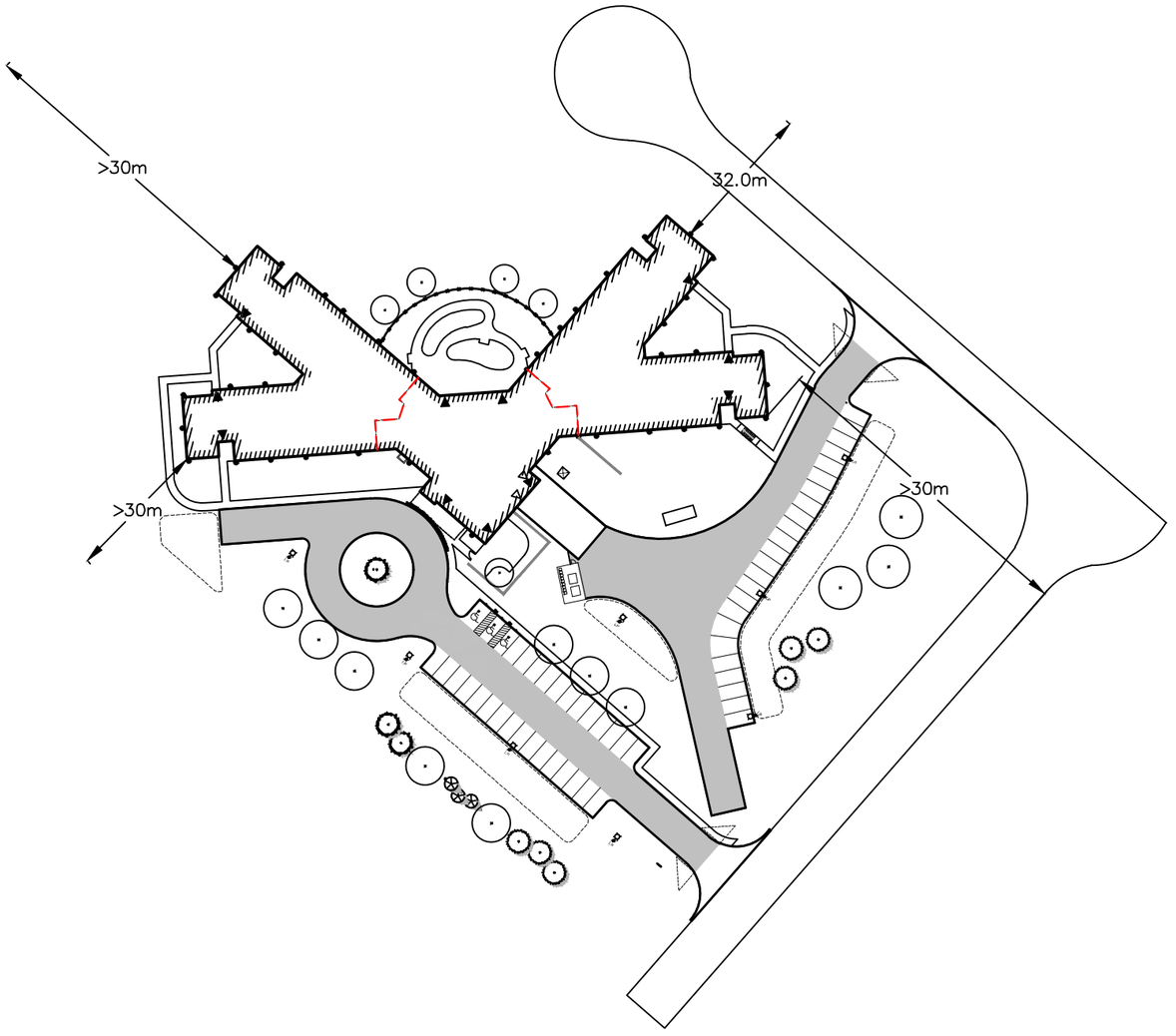
(4) Exposure

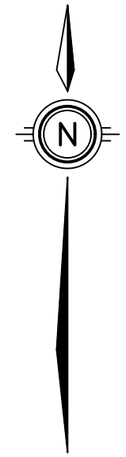
0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
>30	0%	exceed 75%

Building A

Direction	**Distance**	**%**
N	>30m	0
E	>30m	0
S	>30m	0
W	>30m	0
	Total	0

Note: Refer to exposure figure





LEGEND

PROPOSED BUILDING

20.79m — BUILDING EXPOSURE DISTANCES

FIRE WALL

Date: JAN 04/23
Scale: 1:1250

BUILDING EXPOSURE LAYOUT FOR FIRE FLOW CALCULATIONS

MTE

Engineers Scientists Surveyors

Project No.: 44661-100

February 28, 2023 — 9:24 a.m. — Plotted By: RCalogero

P:\P\44661\100\44661-100-FIRE EXPOSURE.dwg

R.V. Anderson Associates Limited
557 Southdale Road East Suite 200
London Ontario N6E 1A2 Canada
Tel 519 681 9916 Fax 855 833 4022
www.rvanderson.com

TECHNICAL MEMORANDUM

TO: Zeel Joshi, C.Tech **RVA:** 215718.37

FROM: David Evans, P.Eng.

DATE: September 9, 2022

SUBJECT: Port Dover - Revera Long Term Care – Water Model

1.0 INTRODUCTION

R.V. Anderson Associates Limited (RVA) has conducted an analysis of the impact of the proposed Revera Long Term Care on the water distribution system in Port Dover, as requested by Norfolk County (County).

2.0 Background

Revera Long Term Care plans to construct a 128-bed facility. The site is located at the intersection of Barrett Court and Dover Coast Boulevard.

The objective of this report is to determine the impact of the proposed development on the existing distribution system and evaluate the proposed watermains on their ability to deliver sufficient water flow to the proposed development under the Maximum Daily Demand (MDD) plus Fire Flow (FF) scenario and provide adequate pressures in the system under a Peak Hour Demand (PHD) scenario.

The County provided RVA with the following reports (including drawings and appendices) prepared by MTE Consultants to complete the analysis:

- Functional Servicing & Stormwater Management Report, February 2022;
- Site Grading & Site Servicing Plan, February 2022.

3.0 Summary of the Water Distribution Hydraulic Modelling

RVA used the Port Dover Water Distribution Model that was calibrated in 2019 to review the impact of the proposed development on the water distribution system.

The following points summarize the assumptions and analysis that were completed:

- The estimated population density is 192. Based on Dover Coast Development Plan (2017), typical water demands for the long term care facility is 300 L/cap/day. Average Flow is then estimated to be 0.67 L/s. PHD factor is 3.0 as per the Norfolk ISMP. MDD factor is 1.75 for the overall system as per the Norfolk ISMP update TM dated 2022;
- Simulations were completed to estimate the pressure in the system during PHD and available FF during MDD. The simulations were completed using the scenarios in the existing Water Distribution Model;
- According to the FUS Fire Flow Calculation, the required FF is estimated to be 217 L/s. Note that the designer is proposing that the building would be wood frame construction (structure essentially all combustible), which leads to a high FF requirement.
- The following proposed water distribution system upgrades are not yet completed; however, they were modeled as completed with the understanding these have been approved by the County and as such, included in the Master Water Model:

    - The Silver Lakes Estates Phase 6 Development;
    - The Lynn River Heights Development;
    - North Dover Mills Neighborhood Eggink Subdivision;
    - Nelson Street West Reconstruction; and
    - Sunning Hill Drive Reconstruction.

- The following proposed water distribution system upgrades have not been included in the master model, pending the final design and approval by the County:

    - Coast Road Condominium Development; and
    - Lynn Park Reconstruction.

4.0 Results of the hydraulic analysis

The following points summarize the results of the analysis completed by RVA.

4.1 Existing Condition

- Figure A-1 – Pressures during PHD in the vicinity are approximately 53 psi.
- Figure A-2 – Available FF during MDD at Dover Coast Blvd is approximately 161 L/s. Note that the existing available FF provided in this area is already lower than the FF requirement of 217 L/s without the proposed development.

4.2 Proposed Conditions

According to the functional servicing report provided, the water supply for proposed development would be connected to the existing 300mm diameter watermain on Dover Coast Blvd.

- Figure B-1 – Pressure during PHD would be approximately 53 psi, which is within the MECP recommended range of 40 – 100 psi. The development would have minimal impact on the pressure in the adjacent area.
- Figure B-2 – Available FF during MDD for the proposed development would be approximately 120 L/s, which is lower than the required FF of 217 L/s as anticipated. It would have minor impact on the FF to the adjacent area.

5.0 Conclusions

The water distribution network would provide enough pressure to the proposed development. However, the available FF in this area could not meet the required flow. Review of the fire protection plan for the proposed development is recommended.

Yours very truly,

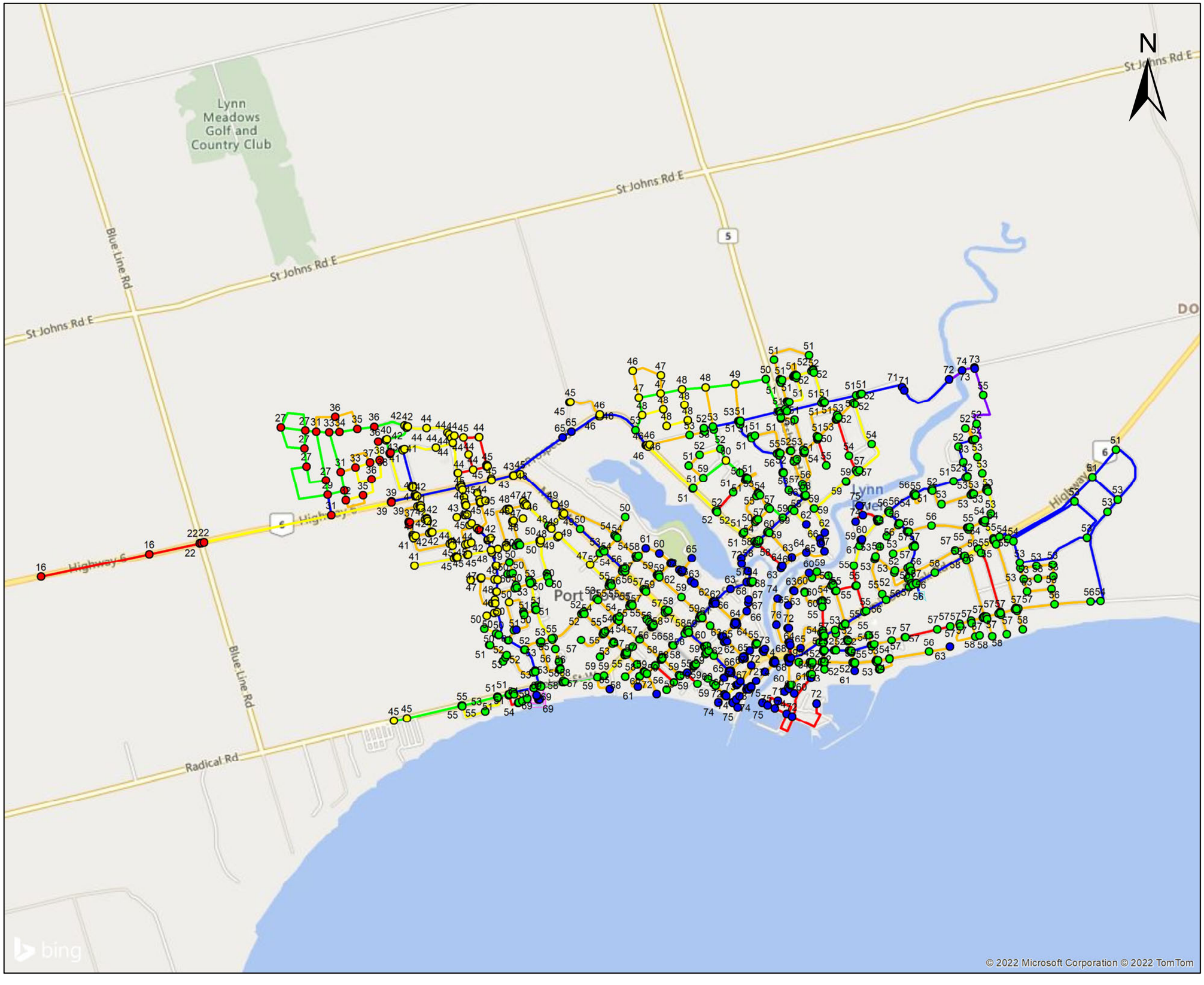
R.V. ANDERSON ASSOCIATES LIMITED

David Evans, P.Eng.
Senior Principal

Enclosures:
1. Figure 1 – Existing: Pressure During Peak Hour Demand
2. Figure 2 – Existing: Available Fire Flow During Max Day Demand + Fire Flow
3. Figure 3 – Proposed: Pressures During Peak Hour Demand

4. Figure 4 – Proposed: Available Fire Flow During Max Day Demand + Fire Flow

REVISIONS AND PUBLICATION REGISTER			
Revision #	**Date**	**Details**	**Distribution**
00	September 9, 2022	Tech Memo Issued via email	Zeel Joshi, C.Tech – Norfolk County



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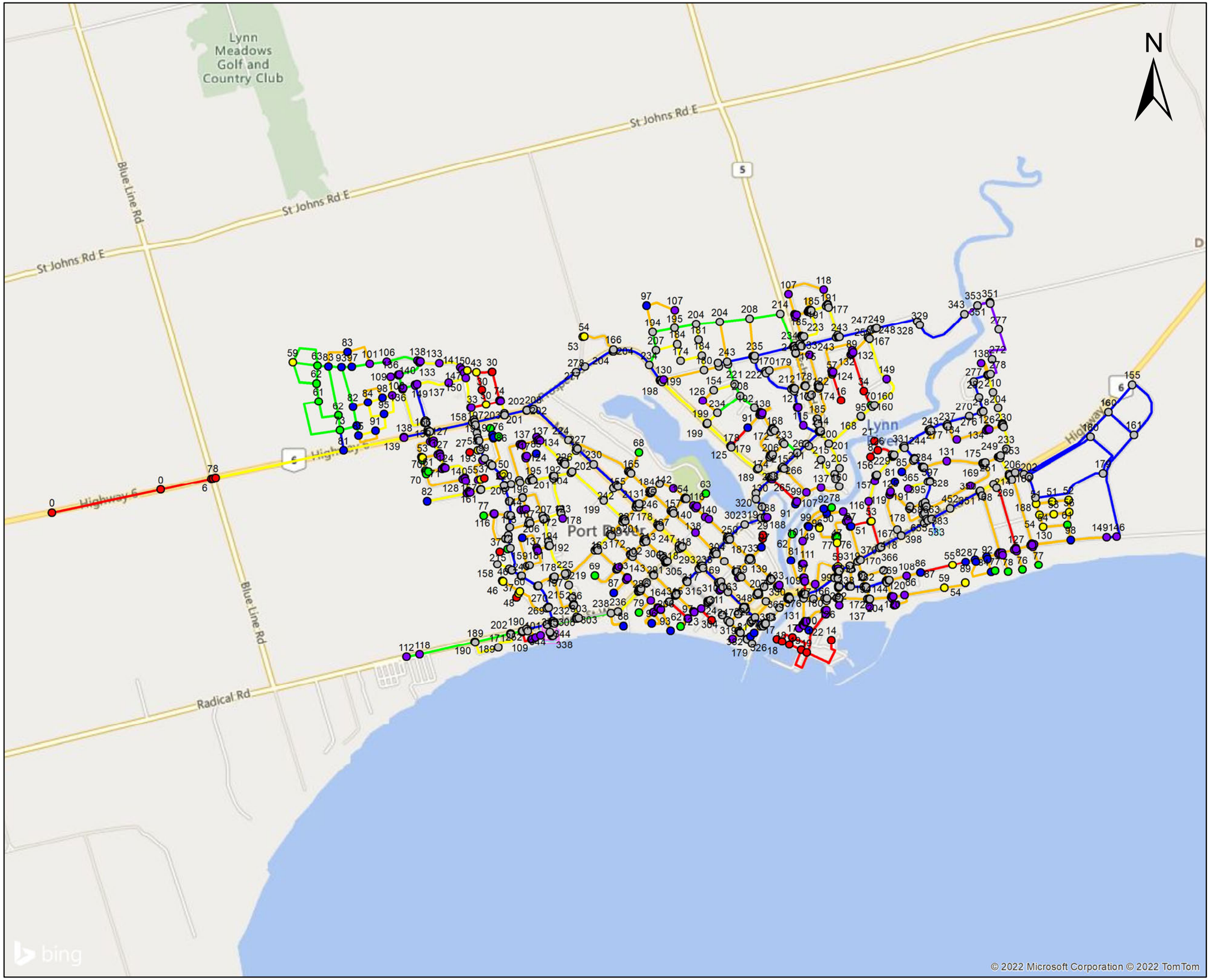

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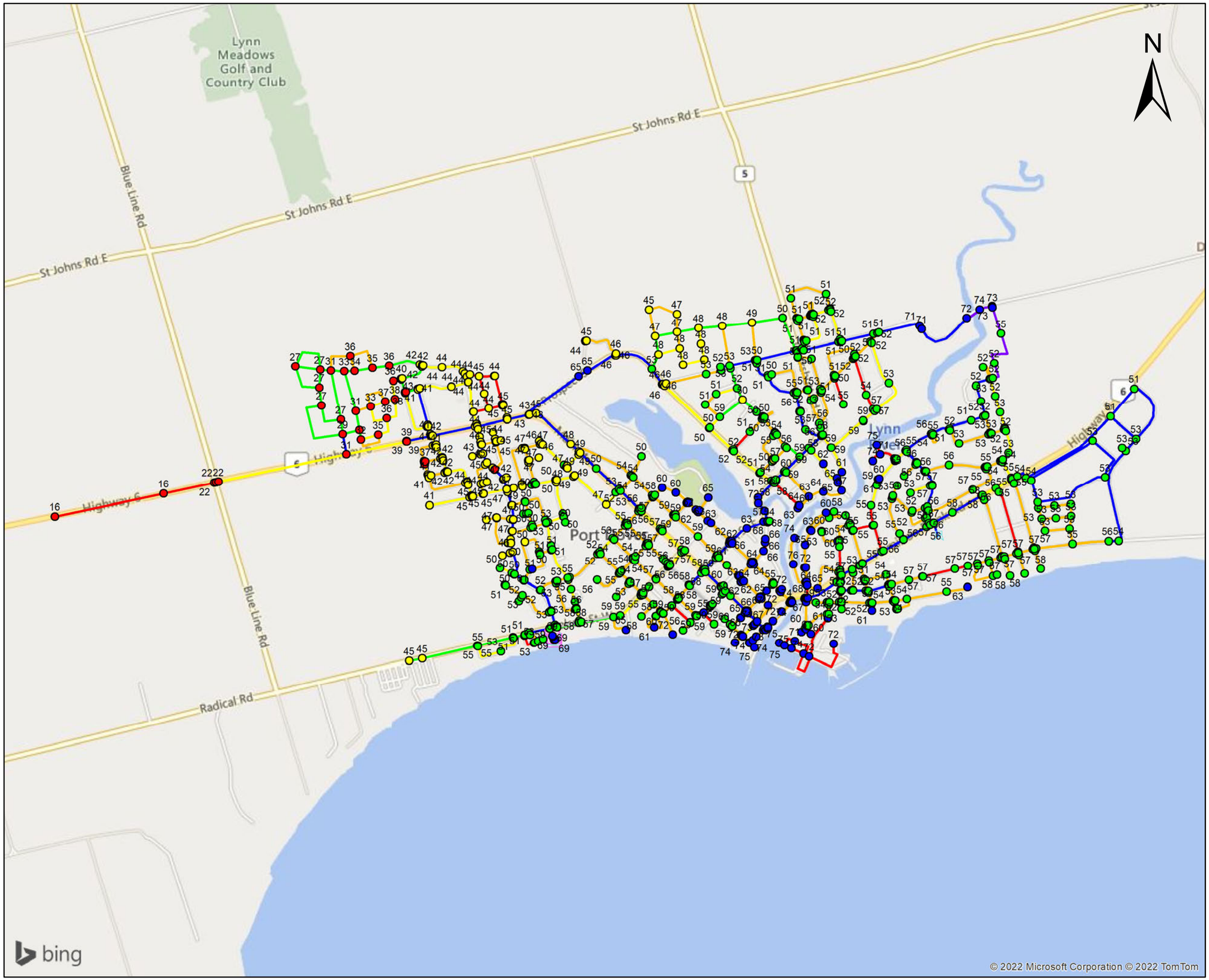

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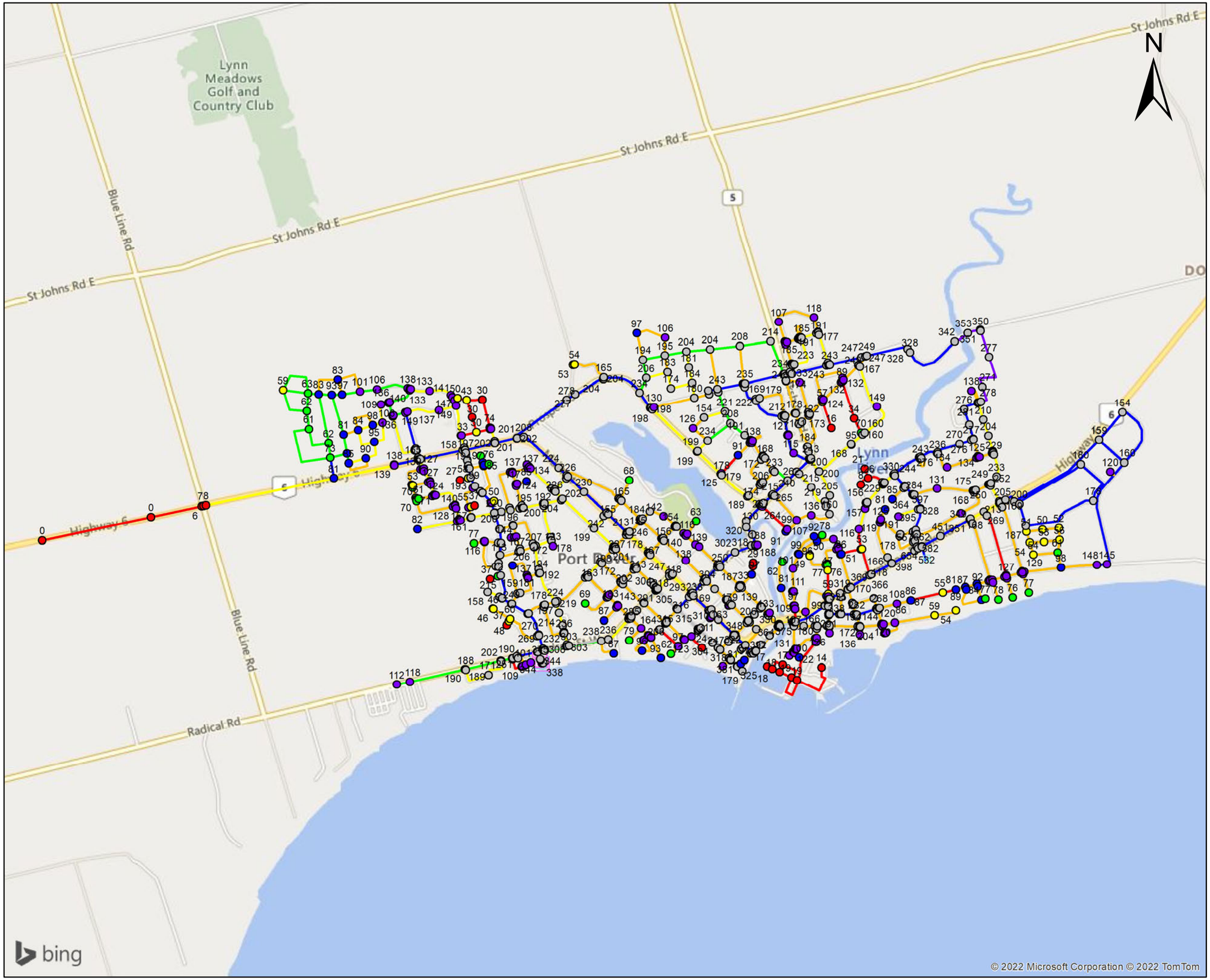
Meters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Lynn Meadows Golf and Country Club
Blue Line Rd
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Highway 6
Radical Rd
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1822 Revera Port Dover
Re: Norfolk Couny file SPPL202203

Response Date: March 1, 2023

Development Engineering Comments received on Feb 1, 2023 from Mohammad Alam, Principal Planner, Norfolk County
Re: Site Plan Application - 1st Submission

Comment #	Comment	Response From:	Response:
PLANNING DEPARTMENT			
	Development Engineering has completed the review of the submission and recommend that the site plan can **proceed with conditional approval** with the following:		
DEVELOPMENT ENGINEERING:			
	Functional Servicing and Storm Management Report		
1	**Water and Sanitary (Modelling)** Norfolk had the modelling completed for Water and Sanitary and can confirm that is adequate capacity with the sanitary and water system, except for the original fire flow calculations. It should be noted that the allocation of water and sanitary services is not granted until the agreement process, if available.	MTE	Fire Flow calculations have been reduced and there is now adequate capacity to support the Fire Flow. Refer to the submitted FSR.
2	**Fire Flow** The original fire flow calculation was determined to not to be achievable from the current watermain located within the Dover Coast Right of Way. Additional discussions between consultant and Norfolk County to determine the combustibility of the construction of the building as required by building code and meet the required Fire Underwriters Survey Guidelines. MTE Consultants have provided a new FUS Calculation to determine that with the use of additional fire separations, they can achieve a FUS of 116/7 l/s, which is under the current 120l/s as indicated in the modelling provided by the county consultant.	MTE	Fire Flow calculations have been reduced and there is now adequate capacity to support the Fire Flow. Refer to the submitted FSR.
3	**Storm Water Management** Norfolk County was able to confirm with the previous consultant from the Draft Approved Subdivision that the proposed system is within the storm water management requirements.	MTE	Noted.
	Civil Works		
4	**General Comment** The county would like to commend on the quality of the drawings that have been provided for review, in future submissions we ask that the existing grades at center line of the road be included for the Dover Coast Road and Barret Court.	MTE	Existing elevations for C/L of road have been added for Dover Coast Road and Barret Court.
	Site Grading & ESC Plan 2.1:		
5	Provide Roadway dimension and radii, this included for internal road, parking aisles, as well the entrance.	MTE	Roadway dimensions and radii included on grading plan. Refer to Site Plan for more details.
6	Please include the attached OPSD 350.010 Urban, Industrial, Commercial and Apartment Entrances.	MTE	OPSD 350.010 added to C2.3
7	The entrance on to Dover Coast Road Break in grade should be at property line, as all drainage within the site should be self-contained.	MTE	Entrance on Dover Coast Road has been re-graded to ensure drainage is self contained.
8	The proposed meter chamber should be included on the this sheet.	MTE	Backflow Chamber is included on grading plan C2.1
9	Please provide justification for the proposed 150mm Domestic Water Service.	MTE	Mechanical Consultant has confirmed a 100mm diameter water service is required to support the development.
10	Also, please note a measurement between the sanitary sewer service and thedomestic and fire water service must be noted (2.5 m minimum separation).	MTE	Note regarding minimum separation has been included on servicing plan.

11	Domestic Water Service has to be Tapped or Tee-off existing 200mm diameter water line prior to existing 200mm valve. New Domestic 150 mm valve to be installed at property line only.	MTE	Domestic service now tapped off existing 200mm water line prior to existing 200mm valve. New 100mm valve installed at PL.
12	Existing 200mm valve to be used as the Fire Service Valve. Reducer can be installed after Fire Service Valve, required.	MTE	Ex. 200mm valve and reduce to remain. Noted added to servicing plan.
13	A new Backflow Chamber to be install within private property, adjacent or close to P/L	MTE	Backflow chamber added to domestic line, within private property, close to P/L.
14	Chamber will require to have a testable DCVA installed in the chamber. Note: Reduced Pressure Flow Assembly cannot be installed underground. Attached is a recommended model that can be used or an approved equivalent. The proposed C400 cannot be installed in a chamber. A C400 RPZ or approved equivalent will need to be installed inside the building after the 150 mm Xylem OMNI C2 water meter.(See Attached) All appurtenances on the domestic water service have to be CSA & NSF, No Lead Approved.	MTE	Note added to servicing plan.
15	The proposed chamber will be required to be waterproof and have a sump in order that the Testable DCVA is never submerged. The DCVA must be tested on an annual basis and the report sent to Norfolk County that the DCVA passed.	MTE	Note added to servicing plan.
16	A schematic plan must be submitted for the installation of the water meter in the Mechanical Room NOTE: Norfolk County does not allow bypasses around a meter. By passes must be metered. Therefore, two RPZ must be installed. The cost and installation to manufacturer's specifications of the RPZs, meter, DCVA, chamber are the owners' responsibility.	EXP M	EXP (M) has submitted a water meter schematic. See attached drawing "1822 M7-01 MECHANICAL DETAILS 1".
	Transportation Brief		
17	Norfolk county is in agreement with the brief as submit and understand that the changes in the number of trips is justified, based on current technical guidelines.	MMMC	Noted with thanks.
	Architectural Site Plan Drawing Set		
18	**Site Survey B** There is a temporary Cul De Sac that is still registered, and may not be required, there should be an investigation with the subdivision developer, if it is to be removed on the subject property	MMMC	The temporary cul-de-sac has been added to the site plan.